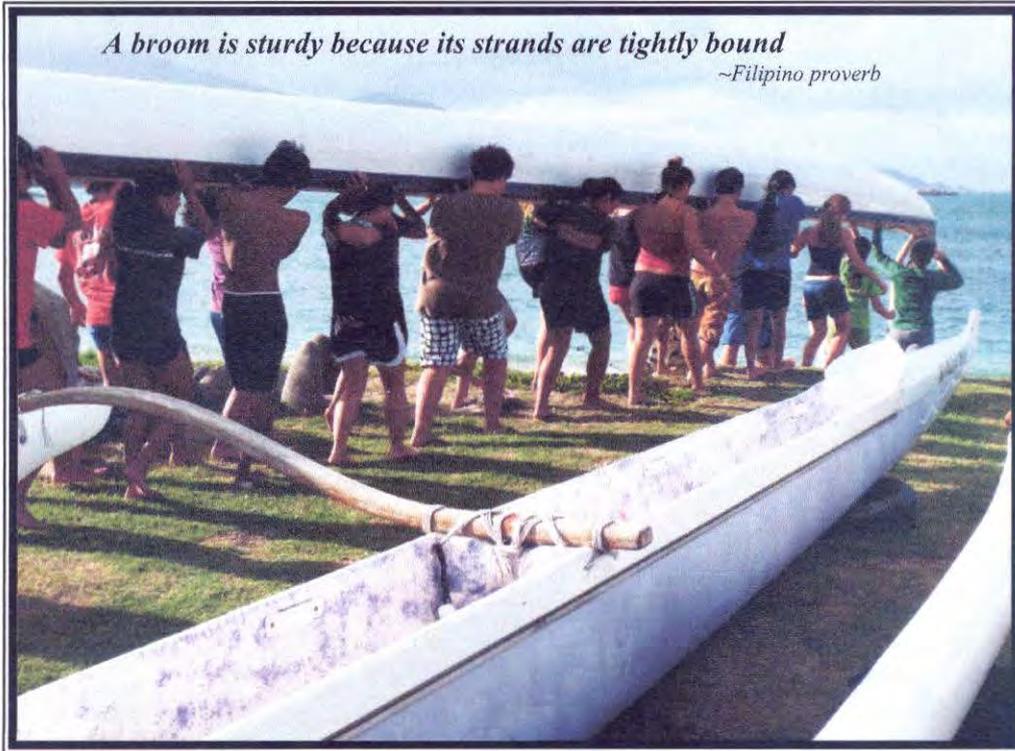


Chapter 1: Population



Canoe launch, Kahului.

Population change on the island is inevitable. In-migration and out-migration occur at different rates and for different reasons. Understanding that our overall population will likely follow recent upward trends, it is our responsibility to decide how we would like this growth to manifest itself. Population growth can have positive and negative impacts on the environment, socio-economic and cultural composition of the island, and visitor experience. Visitors and new residents may arrive to Maui with expectations and values that conflict with the local way of life, a lifestyle that has been rooted on Maui for generations.

POPULATION

The policies that are adopted to address the impacts of population change will ultimately define our expectations for the future, and are far more important than the population change itself.

Background Information

The 2030 Socio-Economic Forecast is a planning tool; it identifies future options for the community to consider. The community may want to adopt policies to achieve a specific outcome that differs from the forecasted outcome, and to minimize the undesirable impacts of current trends. The population projections are based on trends and model assumptions that are absent of policy changes or directives. The forecast affects both ongoing planning (project review and approval) and the desired future articulated by Maui's residents and political leaders (General Plan and Community Plans). Because a long-term forecast identifies long-term trends and omits short-term variations, there will be many surprises along the way, even if a forecast turns out to be highly accurate.

The forecast was based on projections developed by the State of Hawai'i Department of Business, Economic Development & Tourism (DBEDT). The forecast allocates expected countywide change to local areas. The DBEDT long-term econometric model draws on historical data over three decades, plus projections from DBEDT and national sources. The DBEDT model (and accordingly, the allocation model) is economically driven: industries that attract capital are taken as crucial to economic growth, which in turn leads to new jobs and increased population.

Historic Population Trends

To put population increase into perspective, it is appropriate to compare Maui Island's population increase to the other major islands in the Hawaiian chain throughout the recent past. It is evident from Table 1-1 (below) that while O'ahu experienced the most dramatic population increase during the 1950s, the other islands, including Maui, were impacted by the steepest increase in population between 1970 and 1990.

Table 1 - 1: State and Island Population 1960 - 2010

Area	1960	1970	1980	1990	2000	2010
State of Hawai'i	632,772	769,913	968,500	1,113,491	1,213,519	1,363,621
Island of O'ahu	500,409	630,528	764,600	838,534	876,156	953,207
Island of Hawai'i	61,332	63,468	92,900	121,572	149,244	185,406
Island of Maui	35,717	38,691	62,823	91,361	117,644	144,444
Island of Kaua'i	27,922	29,524	39,400	51,676	58,568	67,226

United States Census.

According to the 2030 Socio-Economic Forecast, the total population is not expected to increase equally throughout the island; rather, there are specific regions where population growth is more likely to occur at a higher rate than others.

Table 1 - 2: Community Plan Area Population 2000 – 2030

Community Plan Area	2000	2005	2010	2015	2020	2025	2030
West Maui	17,967	19,852	22,156	29,103	31,410	33,743	36,058
Kihei-Mākena	22,870	25,609	27,244	37,850	40,850	43,885	46,896
Wailuku-Kahului	41,503	46,626	54,433	52,343	56,492	60,689	64,853
Makawao-Pukalani-Kula	21,571	23,176	25,198	23,919	25,815	27,732	29,635
Pā'ia-Ha'ikū	11,866	12,210	13,122	11,332	12,230	13,139	14,040
Hāna	1,867	1,998	2,291	2,541	2,743	2,947	3,149
Total Maui Island	117,644	129,471	144,444	157,087	169,540	182,135	194,630

POPULATION

U.S. Census Bureau, 2000; Socio-Economic Forecast, Maui County Department of Planning, 2006, revised 2012.

Demographic Conditions, Trends, and Projections

Some demographic trends embedded in the forecast are consistent with the current projections.

- Between 2010 and 2030, the island's resident population is expected to grow from 144,444 to 194,630, an increase of 35 percent.
- The island's resident population is expected to grow at nearly an identical rate as the *de facto* population.
- The population is aging; the median age increased from 34.1 to 36.2 years between 1990 and 2000.
- Households are becoming smaller over time; Maui's household size is projected to decline from 2.94 persons per household in 2000 to 2.66 persons per household in 2030.

Economic Factors

- Wage and salary jobs are expected to increase by about 1.1 percent annually.
- *Per capita* income will increase very little (in constant dollars).
- Visitor counts will increase by about 1 percent annually.
- Because of high occupancy rates, construction of new units is expected to resume, and the supply of visitor units is expected to grow at 1 percent annually.
- The past rate of growth in resident population, housing, and jobs is higher than the rate of visitor growth. This indicates that Maui's economy has diversified and is less driven by tourism than in the past.

Community Plan Area Findings

To project future employment and housing needs for the island's Community Plan Areas, the forecast model allocated households based on historic trends, availability of entitled lands for development or redevelopment, development constraints, and careful consideration of planned and proposed development projects. The forecast model recognized that relatively isolated areas – such as Hāna – depend much more on the success of one major employer than do others; therefore, an economic downturn can have a devastating impact. Map 1-1 depicts Maui's major employment and population centers. For planning purposes, it is important to provide resident housing near employment.

Community Plan Area	Characteristics
West Maui	In the 1990s, this area saw significant population and job growth. Looking to the future, these trends are projected to continue through 2030. Local development potential to monitor includes timeshare, large master-planned communities, and Hawaiian Homelands. Timeshares and other transient vacation rentals are of particular interest for the impact they may have on island-wide job distribution. Timeshares have higher occupancies than hotels, but employ fewer workers at the lodging site.
Kihei-Mākena	This area has seen growth in the visitor industry, the technology sector, and expanding residential areas. It has had the smallest average household size, and anecdotally, its workforce is more transient than other areas. The forecast extends all these trends. Based in part on recent development proposals, the forecast shows stronger growth in residential units than in visitor units.

POPULATION

Community Plan Area	Characteristics
Wailuku-Kahului	This area remains the economic and population center of the island. In the 1990s, this area saw significant increases in trade, transportation, communications and utilities, and government jobs. Kahului Harbor is the port through which most cruise ship visitors reach Maui. The 2030 Socio-Economic Forecast suggests the Wailuku-Kahului Community Plan Area will grow faster than other parts of Maui, as former sugar lands are developed into residential subdivisions. Wailuku-Kahului is expected to maintain its status as home to more than a third of Maui's households.
Makawao-Pukalani-Kula	This area saw significant increases in population in the 1980s, but less growth subsequently. New development slowed because of water supply problems. Job growth occurred at a much faster rate, but the forecast calls for economic growth to continue at a slower pace. With only 1 job located in this area for every 2.5 households, most of the area's residents commute outside the area for work. This will continue to be the case; by 2030, the forecast shows only 2.1 local jobs per household.
Pā'ia-Ha'ikū	Since windsurfing became popular in the 1980s, this area has taken on new importance as the home of this sport. In the 1990s, upland regions saw new development of homes on large agricultural lots, with the area population increasing by 52 percent. In light of limited availability of suitable land for new homes, the forecast calls for much slower growth in housing and population.
Hāna	In recent years, this area has seen job losses and a decrease of children and young adults. Slow growth is projected over the planning period, provided the visitor economy remains healthy. Hāna has experienced new population resulting from in-migration.

CHALLENGES AND OPPORTUNITIES

The growth of Maui's resident and visitor population will create both challenges and opportunities. Population growth can exacerbate existing infrastructure-capacity deficiencies, place additional demands on environmental resources, foster shifts in the cultural and ethnic makeup of the population, and change the landscape. In addition, the loss of cultural identity and diversity has created social tensions that have increased over at least the last 20 years. The cultural understanding and sensitivity of new residents to the host culture has been a constant point of discussion throughout the MIP's public-engagement process.

Population Growth

Population growth can also contribute to the health of the community. Population growth is often necessary to maintain a growing economy, an expanding tax base, and employment opportunities. A host of negative social and economic conditions, such as unemployment, crime, family disintegration, and substance abuse, can be found in communities with longstanding population loss. Policies and actions to address population growth on Maui can be found throughout the MIP. Figure 1-1 depicts the projected growth in Maui's resident and *de facto* population to 2030.

Maui's population is aging; and recent data shows that trends related to Maui's aging population will be similar to the trends on the Mainland. Figure 1-2 portrays Maui's age distribution over time. This demographic change has significant impacts to public services as they relate to the elderly, including housing, transportation, health care, and elder care services.

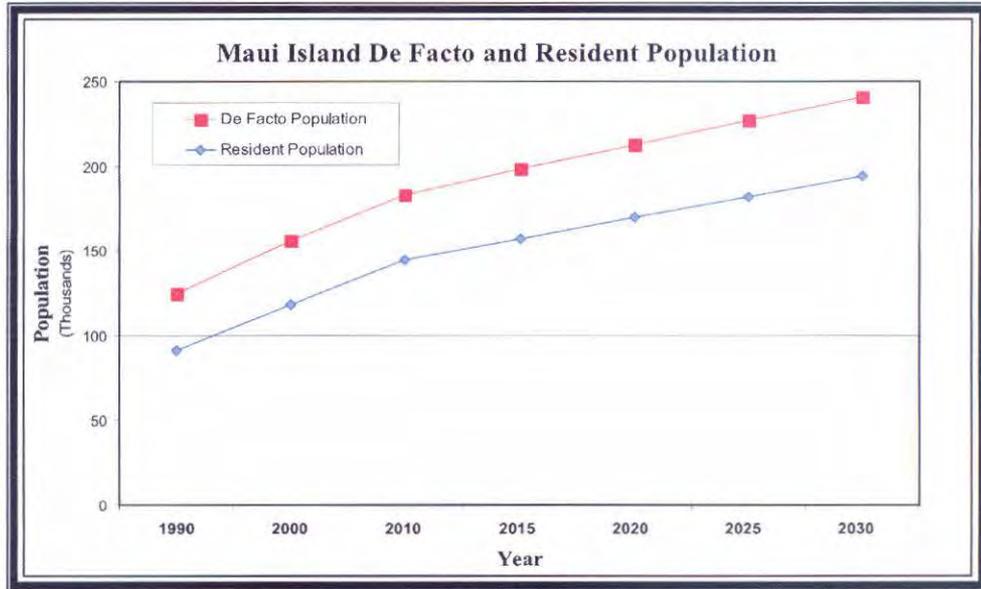


Figure 1 - 1. Maui Island Resident and De Facto Population Projections 1990 – 2030¹

**Aging
Population**

In addition to the challenge of providing more senior services, the wage-earning population that typically supports children and seniors will be proportionally smaller. Policies and actions to address the aging population can be found in this chapter as well as the Housing, Economic Development, Land Use, and Infrastructure and Public Facilities chapters.

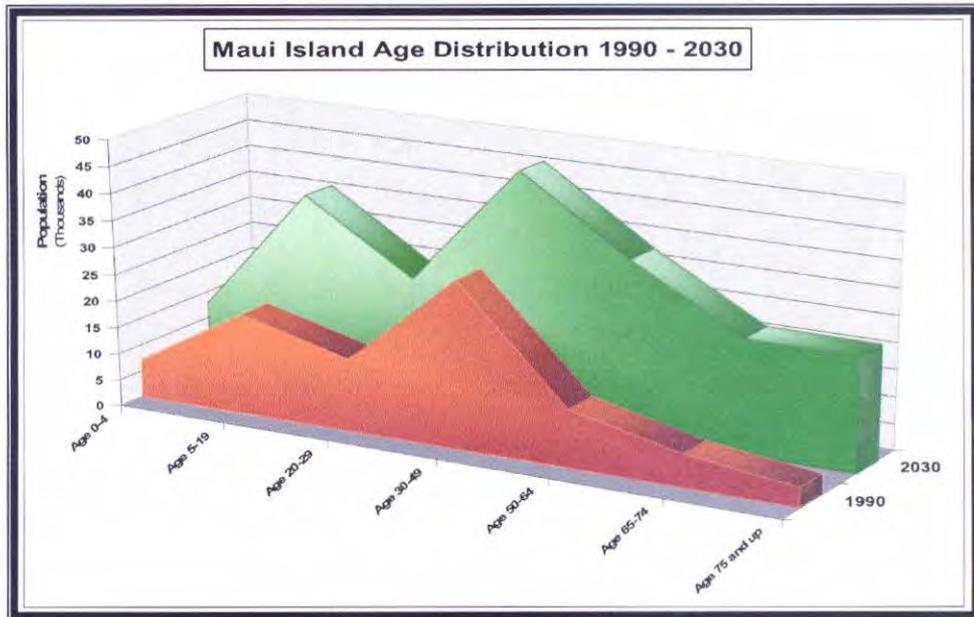


Figure 1 - 2. Maui Island Age Distribution 1990 – 2030.²

¹ Department of Business, Economic Development and Tourism, State of Hawai'i (2012). Population and Economic Projections for the State of Hawai'i to 2040 (March 2012).

POPULATION

Figure 1-3 compares the percentage of Mauians born in Hawai'i to the percentage born elsewhere. The percentage of those born in Hawai'i has dropped from 67 percent in 1980 to 53 percent in 2000. The out-migration of island residents is a result of Maui's high cost of housing, limited employment and educational opportunities, and the desire of some Maui residents to experience life outside of Hawai'i. Policies and actions to help provide a choice for island residents to remain on Maui can be found throughout the MIP.

Out-migration of Island Residents

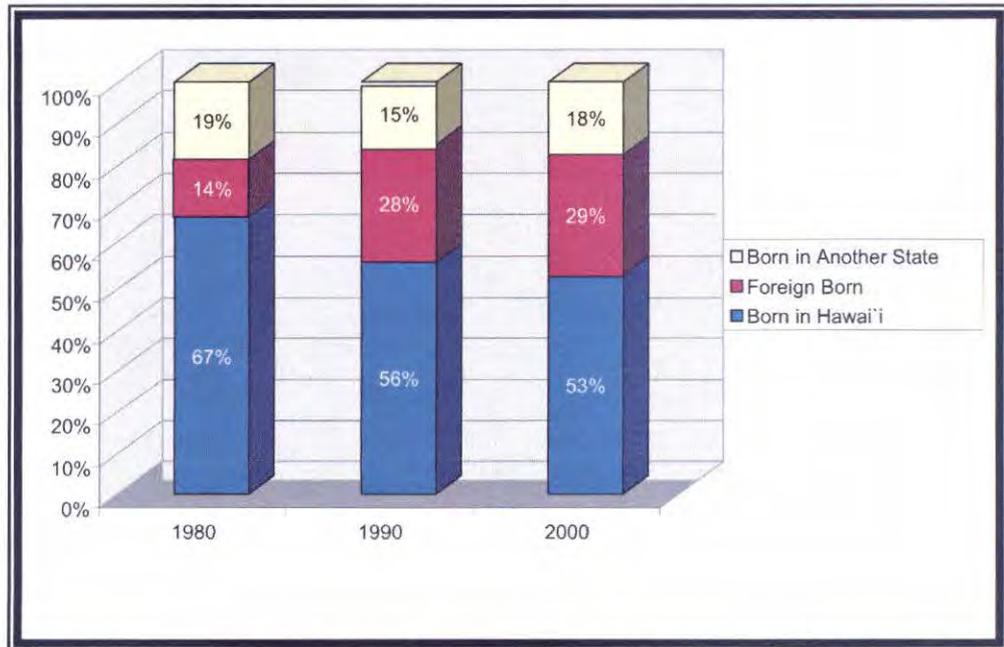


Figure 1 - 3. Maui Island Residents by Place of Birth 1980 – 2000. (Source: United States Census)

Ratio of Visitors to Residents

Figure 1-4 graphically depicts visitor/resident population trends from 1970 to the projection year of 2030. In 1970, the ratio of tourists to residents was approximately 1 to 20. This number has risen dramatically; by 2000, the ratio was approximately 1 to 3.

² Department of Business, Economic Development and Tourism, State of Hawai'i (2012). *Population and Economic Projections for the State of Hawai'i to 2040* (March 2012)

POPULATION



Figure 1 - 4. Maui Island Visitor/Resident Population 1970 – 2030³.

GOAL, OBJECTIVES, POLICIES, AND ACTIONS

Goal:

- 1.1 Maui's people, values, and lifestyles thrive through strong, healthy, and vibrant island communities.

Objective:

- 1.1.1 Greater retention and return of island residents by providing viable work, education, and lifestyle options.

Policies:

- 1.1.1.a Expand programs that enable the community to meet the education, employment, housing, and social goals of youth and young adults.

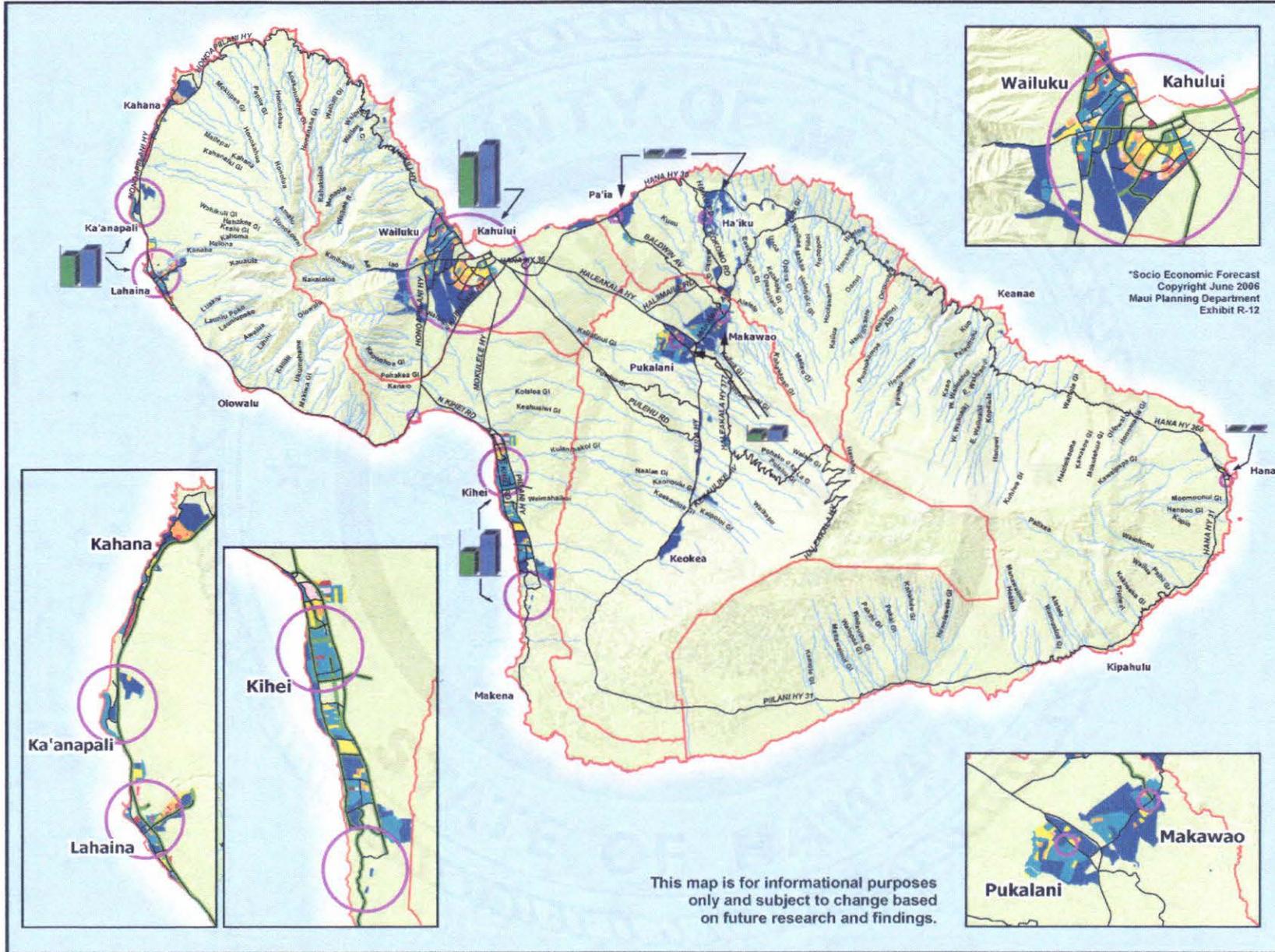
³ Population and Economic Projections for the State of Hawai'i to 2040 (March 2012).

POPULATION

- 1.1.1.b Expand housing, transportation, employment, and social opportunities to ensure residents are able to comfortably age within their communities.
- 1.1.1.c Measure and track resident satisfaction through surveys and community indicators.
- 1.1.1.d Support funding for transportation, housing, health care, recreation, and social service programs that help those with special needs (including the elderly and disabled).

Implementing Actions:

- 1.1.1-Action 1 Use an existing agency to facilitate education, employment, housing, social services, and other programs that help retain young adults on Maui.
- 1.1.1-Action 2 Identify existing and develop new funding sources for youth and family services (e.g., recreation, health care, education, housing, child care, etc.) and integrate such resources to achieve an effective outcome.
- 1.1.1-Action 3 Develop and regularly conduct a Community Satisfaction Survey to measure residents' quality-of-life, facilitate the development of informed policies/programs, and improve service delivery.



Employment & Population Density Map Island of Maui

Background Map
For Informational Purposes Only

Legend

- Primary Road
- Stream
- Regional Economic Center
- Community Plan Boundary
- Topography - 100 ft contour

Jobs by Community Plan Areas*

- Jobs 2005
- Jobs 2030

Population Density

Per Acre by Census Block

- 0.0 - 1
- 1.1 - 5
- 5.1 - 10
- 10.1 - 15
- 15.1 - 20
- 20.1 - 25
- 25.1 - 30
- 30.1 - 50
- 50.1 - 80
- 80.1 - 150



Scale bar: 0 to 1 mile

North arrow

Project Code: M-CE-1-2010000-01
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This is not a zoning map. Please contact the Planning Department for Zoning confirmation.

Prepared by:
Long Range Planning Division
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Map 1-1

This map is for informational purposes only and subject to change based on future research and findings.

COMMENTS AND UPDATES
FOR
INSTREAM FLOW STANDARDS ASSESSMENT REPORT
DATA NEEDS (Dated MAY 27, 2009)

Since the submission of the above mentioned assessment report and subsequent DWS responses to the Commission on Resource Management, Upcountry Maui and the DWS Water Systems have not significantly changed due to the economic downturn in 2008 and the following ordinance.

Maui County, Hawaii, Code of Ordinances >> Title 14 – PUBLIC SERVICES >> Article 1.0 Water >> Chapter 14.13 – WATER METER ISSUANCE PROVISIONS FOR THE UPCOUNTRY WATER SYSTEM >> 14.13.040 – Water service requests states that “On March 16, 1993, the upcountry water system was found to have insufficient water supply developed for fire protection, domestic, and irrigation purposes to take on new or additional water services without detriment to those already served in the regulated area. Since November 2, 1994, the department has maintained a priority list of premises, organized by date applications for new or additional water service were received for such premises. Effective as of January 1, 2013, the department will not accept any new applications to be placed on the priority list.” This ordinance has been a major factor in limiting meter issuance, growth, and development in Upcountry Maui.

WATER USE

Historical Metered Consumption

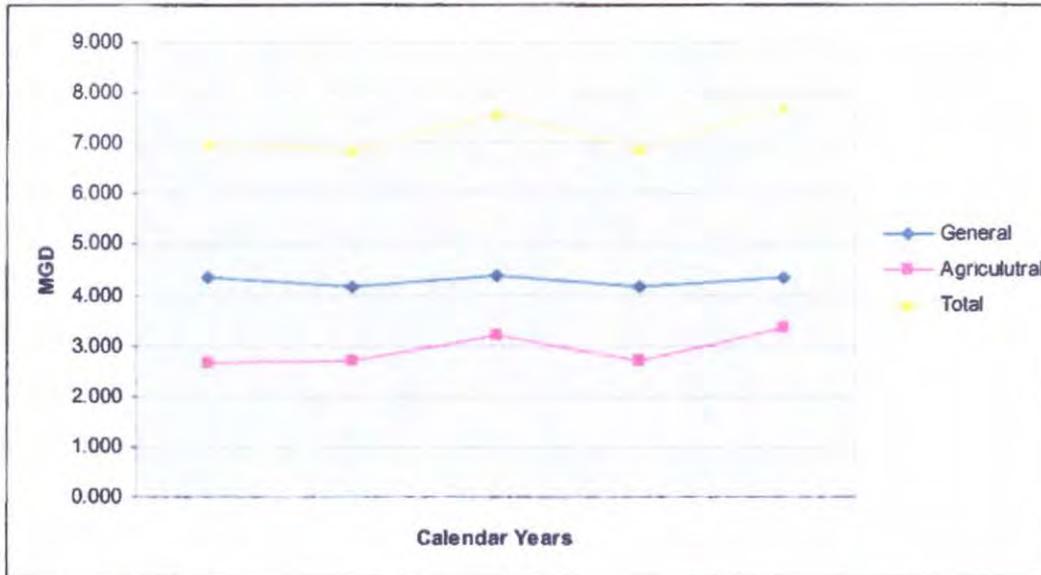
When compared to Figure 4 in the report dated May 27, 2009, metered consumption has not changed much. The difference between general and agricultural consumption also remains about the same.

Table 1 – Department of Water Supply, County of Maui, Consumption By District, General & Agricultural in Thousands of Gallons, Calendar Years 2008 through 2012

	2008	2009	2010	2011	2012
General					
Makawao	1,018,147	963,447	1,003,707	944,136	973,416
Kula	569,994	557,767	599,684	582,566	622,457
Subtotal	1,588,141	1,521,214	1,603,391	1,526,702	1,595,873
AG					
Makawao	116,989	110,245	106,023	88,461	85,249
Kula	855,841	873,223	1,067,543	898,098	1,141,231
Subtotal	972,830	983,468	1,173,566	986,559	1,226,480
Grand Total	2,560,971	2,504,682	2,776,957	2,513,261	2,822,353
Percent General	62.0%	60.7%	57.7%	60.7%	56.5%

Percent Agricultural 38.0% 39.3% 42.3% 39.3% 43.5%

Data from DWS Fiscal Division
Makawao District includes Haiku, Haliimale, Makawao, and Pukalani



A look at consumption by user class would also see only slight changes between user classes.

Water Production

The report provided much data on historical metered consumption. In order to emphasize how much water DWS needs, it would be preferable to use higher production data. DWS surface water is purchased from the East Maui Irrigation Company, a subsidiary of Alexander & Baldwin, Inc. DWS pays for metered water produced (effluent), not the influent or water going into the water treatment plants. Because of production losses, the water needed would be slightly higher than the production data.

Table 2 shows historical water production for calendar years 2004 through 2013.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Surface Water*	6.985	6.951	7.128	7.276	6.09	6.189	7.369	6.062	7.672	6.538
Ground Water	0.801	1.085	1.079	0.828	1.542	1.493	1.178	1.353	1.196	1.596
Total MGD	7.786	8.036	8.207	8.104	7.632	7.682	8.547	7.415	8.868	8.134

Data is from DWS Monthly Source Reports and monthly surface water purchases from EMI
* EMI purchases are based on Water Treatment Facility effluent or what is produced; because of production losses, the influent would be considerably higher than the

effluent.

Utilizing the same data, Table 3 shows the percentage of surface water to ground water production.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Surface Water	89.71%	86.50%	86.85%	89.78%	79.80%	80.56%	86.22%	81.75%	86.51%	80.38%
Ground Water	10.29%	13.50%	13.15%	10.22%	20.20%	19.44%	13.78%	18.25%	13.49%	19.62%

*Decrease use in ground water in 2008-2009 due to Kaupakalua Well pump out replacement
Increase in 2013 due to more pumping of the Pookela Well*

Within a few months, the Hamakuapoko Wells and the Granular Activated Carbon (GAC) Treatment System will be operational. This will allow the full-time use of the Pookela Well as a water source. It has been historically used as a back well for the Upcountry Water System. However, the preference is still the more cost-effective use of surface water.

Water Requirement

As of December 31, 2013, there are 1887 applicants on the Upcountry Water Service priority list. The DWS Engineering projected demand is approximately 7,487,157 gallons per day or 7.487 million gallons per day.

Table 4 – DWS Upcountry Water Service Priority List Water Demand as of December 31, 2013

Number of Meters Requested	DWS Engineering Projected Demand	DWS Haiku System	DWS Makawao System	DWS Upper Kula System	DWS Lower Kula System	Maui County Kula Agricultural Park
3,340	7,487,157	1,129,610	995,350	3,797,870	1,562,737	1,590

Table 5 shows the Maui Island Plan Population Projections and DWS Upcountry Water Demand Projections. The Maui Island Plan Population Projections designates growth areas. The water demand projections are, therefore, much smaller.

Table 5
Maui Island Plan Population Projections
And
DWS Upcountry Water Demand (GPD) Based on Maui Island Plan Population Projections

Maui Island Plan Population Projections

CP AREA	2010		2015		2020		2025		2030	Total 20 Year Growth	Average Annual Growth Over 20 Years
Makawao-Pukalani-Kula	25,198	-5.076%	23,919	7.927%	25,815	7.426%	27,732	6.862%	29,635	17.609%	0.880%
Pā'ia-Ha'ikū	13,122	-13.641%	11,332	7.924%	12,230	7.433%	13,139	6.857%	14,040	6.996%	0.350%
Total	38,320		35,251		38,045		40,871		43,675		

DWS Upcountry Water Demand Projections (GPD) Based on Maui Island Plan Population Projections

CP AREA	2010	% Increase	2015	% Increase	2020	% Increase	2025	% Increase	2030
Makawao - Pukalani-Kula	6.900	-5.076%	6.619	7.927%	7.143	7.426%	7.674	6.862%	8.200
Haiku	1.000	-13.641%	0.864	7.924%	0.932	7.433%	1.001	6.857%	1.070
Total Demand	7.900		7.482		8.075		8.675		9.270

2010 –Actual Water Production in millions of gallons per day

The DWS total production in calendar year 2013 was 8.134 million gallons per day. Based on the Maui Island Plan Population Projections, this total already surpasses the projected demand for 2020. Although the DWS Engineering Division's projected demand based on the Upcountry Water Service priority list may be a little high, it would be more practical to use this higher projected demand. An even higher total could be used when consideration any obligation to provide non-potable water for the Upper Kula agricultural waterline.

Alternate Water Sources

1. Water Losses

- Waikamoi Flume – Losses from the Waikamoi Flume were evident in the past. However, the losses could not be determined because there were no gauges to determine the losses. Today, the installation of a flume is nearing completion.

- o Water system losses or unaccounted for water – An on-going leak detection program could prevent the loss of millions of gallons of water. Table 6 shows the a water audit generated by the AWWA WLCC Water Audit Software in 2011. Two employees within the Water Resource & Planning Division were assigned to do county-wide leak detection. However, their positions has since been eliminated within this division. The creation of two new positions (pipe fitters) in Field Operations to do leak detection is included in the FY 2015 budget

Year	District	Production	Consumption	Loss	% Loss
FY 07	Central	9,350	8,145	1,205	12.9%
FY 07	Upcountry	3,189	2,799	390	12.2%
FY 07	East	118	70	48	40.7%
FY 07	West	2,158	1,987	171	7.9%
FY 07	Molokai	483	296	187	38.7%
	Total	15,298	13,306	1,992	13.0%

FY 08	Central	9,028	7,933	1,095	12.1%
FY 08	Upcountry	2,702	2,300	402	14.9%
FY 08	East	133	68	65	48.9%
FY 08	West	2,217	1,973	244	11.0%
FY 08	Molokai	486	288	198	40.7%
	Total	14,566	12,562	2,004	13.8%

FY 09	Central	8,343	7,332	1,011	12.1%
FY 09	Upcountry	2,656	2,445	211	7.9%
FY 09	East	132	65	67	50.8%
FY 09	West	1,874	1,815	59	3.1%
FY 09	Molokai	423	279	144	34.0%
	Total	13,404	11,943	1,461	10.9%

FY 10	Central	8,787	7,475	1,312	14.9%
FY 10	Upcountry	2,815	2,675	140	5.0%
FY 10	East	124	62	62	50.0%
FY 10	West	1,965	1,836	129	6.6%
FY 10	Molokai	387	277	110	28.4%
	Total	14,078	12,333	1,745	12.4%

FY 11	Central	8,531	7,132	1,399	16.4%
FY 11	Upcountry	2,887	2,588	299	10.4%

FY 11	East	128	63	65	50.8%
FY 11	West	1,976	1,765	211	10.7%
FY 11	Molokai	345	260	85	24.6%
	Total	13,867	11,808	2,059	14.8%

Units in millions of gallons

2. Plan to shift from surface water to more ground water (50%) would be more reliable but not be cost effective. In 2010, the estimated cost over a 25 year period was approximately \$117 million if the price of oil was \$75 per barrel. Today, with the price of oil at or over \$100 per barrel, the cost would be considerably higher.
3. Expansion of raw water storage at Piiholo or Kamole WTF – Although it may sound like a good idea for many in the public, it is not a cost-effective investment. The cost is extremely high for a small amount of reliability.

Conclusion

The DWS depends on the availability of surface water for general and agricultural use. Although ground water is more reliable, especially in times of drought, it's more cost-effective to use surface water, if available. However, as the recent Maui County Council deliberations on the proposed FY 2015 budget have made clear, the Council believes that the County of Maui has not fully recovered from the economic downturn which began in 2008. They have been cautious about increasing expenditures, taxes, rates, and fees that would impact the citizens of the County. Specific to the DWS, they have cut some water use rates and also lowered the fees for a 5/8-inch meter. This impacts expenditures on capital improvement projects such as wells and reservoirs. It is likely that the current cautiousness on spending will continue into the near future.

The Petition to Amend Interim Instream Flow Standards for the East Maui Streams may impact, not only Alexander & Baldwin, Inc., but the DWS, County of Maui, Department of Agriculture, State of Hawaii, Olinda-Kula Soil and Water Conservation District, and the USDA's Natural Resources Conservation Service. The WATERSHED AGREEMENT between the afore mentioned agencies was to complete the Upcountry Watershed Project's dedicated non-potable agricultural waterline for Upper Kula agricultural users (farmers). The State of Hawaii has spent millions of dollars on the project. The state legislature appropriated and the governor released \$1.5 million to extend the waterline.

Twenty-two streams impact the Wailoa Ditch which then impact the DWS Kamole WTF and the County of Maui Kula Agricultural Park. Four streams impact the Piiholo WTF. Three streams impact the Olinda WTF and the Upcountry Watershed Project (non-potable) Agricultural Waterline. Even with future growth and the installation of a dedicated agricultural waterline in Upper Kula, DWS only

uses a small fraction of the available surface water. However, any negative impact on Alexander & Baldwin, Inc. stream diversions may also negatively impact the DWS and the County of Maui.

Table 1 Historical Metered Consumption for DWS Upcountry District (Makawao-Hali'imaile-Pukalani-Kula-Haiku)
Millions of Gallons per Day

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
General	3.871	4.382	4.083	3.693	4.003	4.146	4.370	4.823	4.461	4.778	4.387	4.441	4.455	4.270	4.239	3.955	4.195	4.072
Ag Potable	1.931	2.300	1.923	1.829	2.382	2.474	2.504	2.563	1.908	2.320	2.138	2.378	2.293	2.244	2.128	2.272	2.363	2.261
Ag Non Potable	0.504	0.634	0.481	0.374	0.512	0.555	0.505	0.690	0.433	0.582	0.575	0.571	0.566	0.532	0.440	0.452	0.568	0.500
Total Potable	5.802	6.682	6.007	5.521	6.381	6.620	6.873	7.387	6.368	7.098	6.525	6.820	6.748	6.514	6.367	6.227	6.558	6.333
Total	6.306	7.317	6.487	5.895	6.897	7.175	7.379	8.077	6.801	7.680	7.100	7.391	7.314	7.046	6.807	6.679	7.126	6.833

Data from DWS Billing

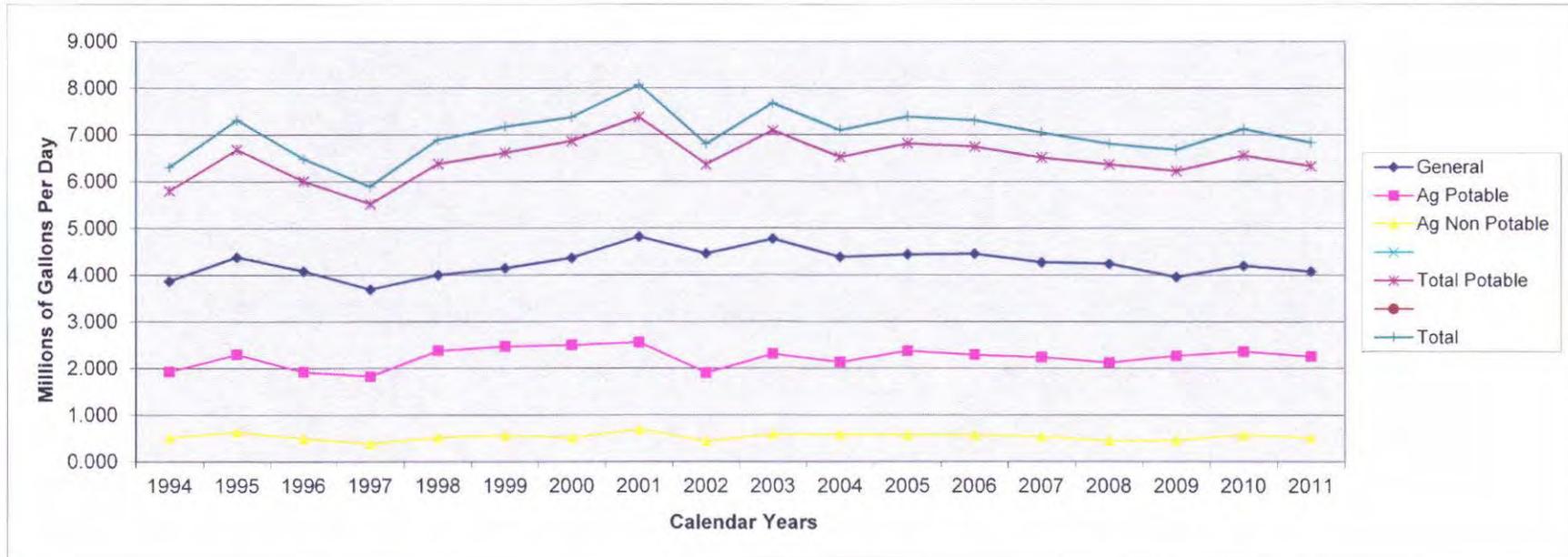


Table 2A DWS Metered Consumption for Makawao-Pukalani-Hali'imaile-Kula Community Plan District

	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY 2012
Makawao	0.831	0.951	1.152	0.880	0.920	0.979	0.955	1.090	0.953	1.013	0.957	0.896	0.890	0.894	0.881
Pukalani	0.784	0.940	0.961	0.913	0.957	1.051	1.015	0.994	0.998	1.070	1.006	0.915	1.023	0.975	0.981
Hali'imaile	0.087	0.100	0.102	0.096	0.091	0.098	0.105	0.108	0.106	0.087	0.094	0.093	0.092	0.094	0.093
Upper Kula	1.050	1.289	1.256	1.380	1.497	1.383	1.205	1.337	1.344	1.515	1.348	1.258	1.369	1.494	1.556
Ulupalakua-Kanaio	0.148	0.184	0.188	0.188	0.198	0.190	0.151	0.157	0.166	0.157	0.144	0.117	0.142	0.118	0.159
Lower Kula	2.136	2.487	2.110	2.255	2.353	2.181	2.078	2.208	2.217	2.230	1.868	2.014	2.109	2.148	2.312
Kula Ag Park	0.479	0.516	0.580	0.578	0.585	0.529	0.527	0.647	0.605	0.585	0.473	0.410	0.557	0.525	0.532
Total	5.515	6.467	6.349	6.290	6.601	6.411	6.036	6.541	6.389	6.657	5.890	5.703	6.182	6.248	6.514

Data from DWS Billing System

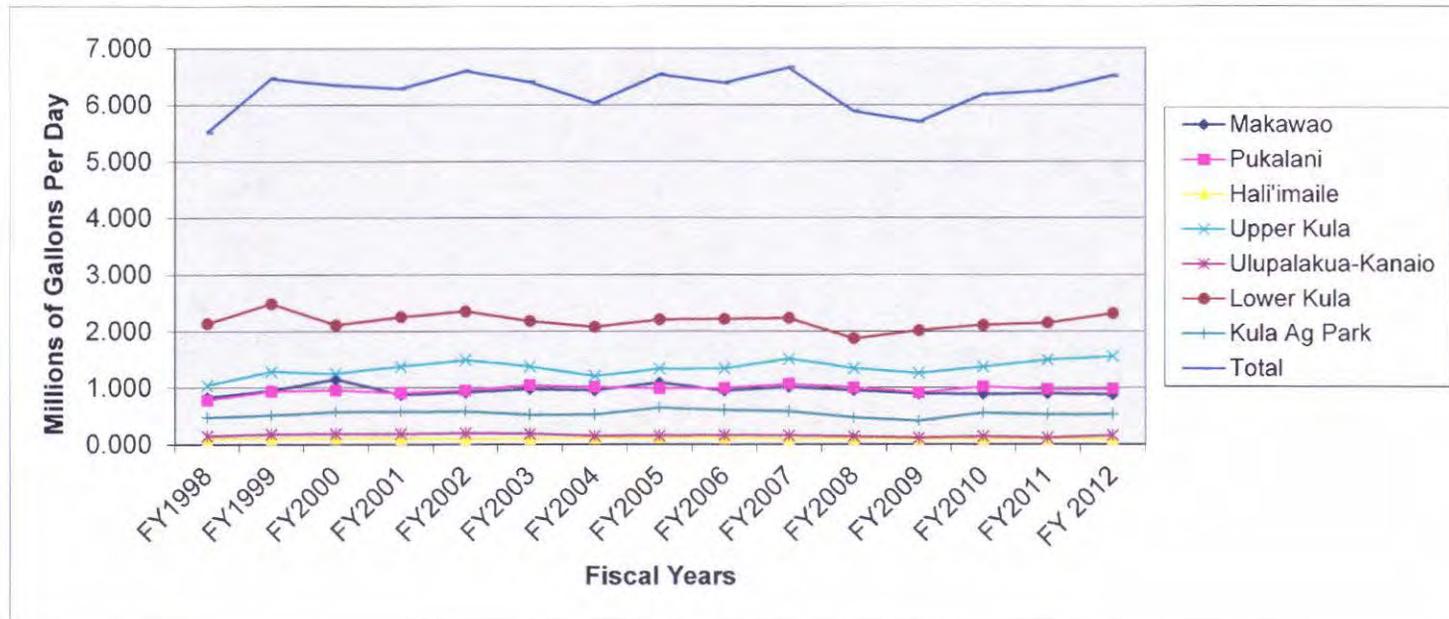


Table 2B DWS Meter Consumption for Haiku

	FY1998	FY1999	FY2000	FY2001	FT2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012
Kokomo-K	0.380	0.385	0.465	0.431	0.446	0.496	0.488	0.507	0.483	0.491	0.470	0.531	0.441	0.450	0.427
Kuiaha	0.115	0.099	0.137	0.142	0.125	0.145	0.159	0.163	0.157	0.017	0.189	0.190	0.180	0.143	0.139
Haiku-Pau	0.287	0.289	0.345	0.337	0.334	0.378	0.402	0.404	0.384	0.409	0.416	0.426	0.382	0.370	0.352
Total	0.782	0.773	0.947	0.910	0.905	1.019	1.049	1.074	1.024	0.917	1.075	1.147	1.003	0.963	0.918

Data from DWS Billing System

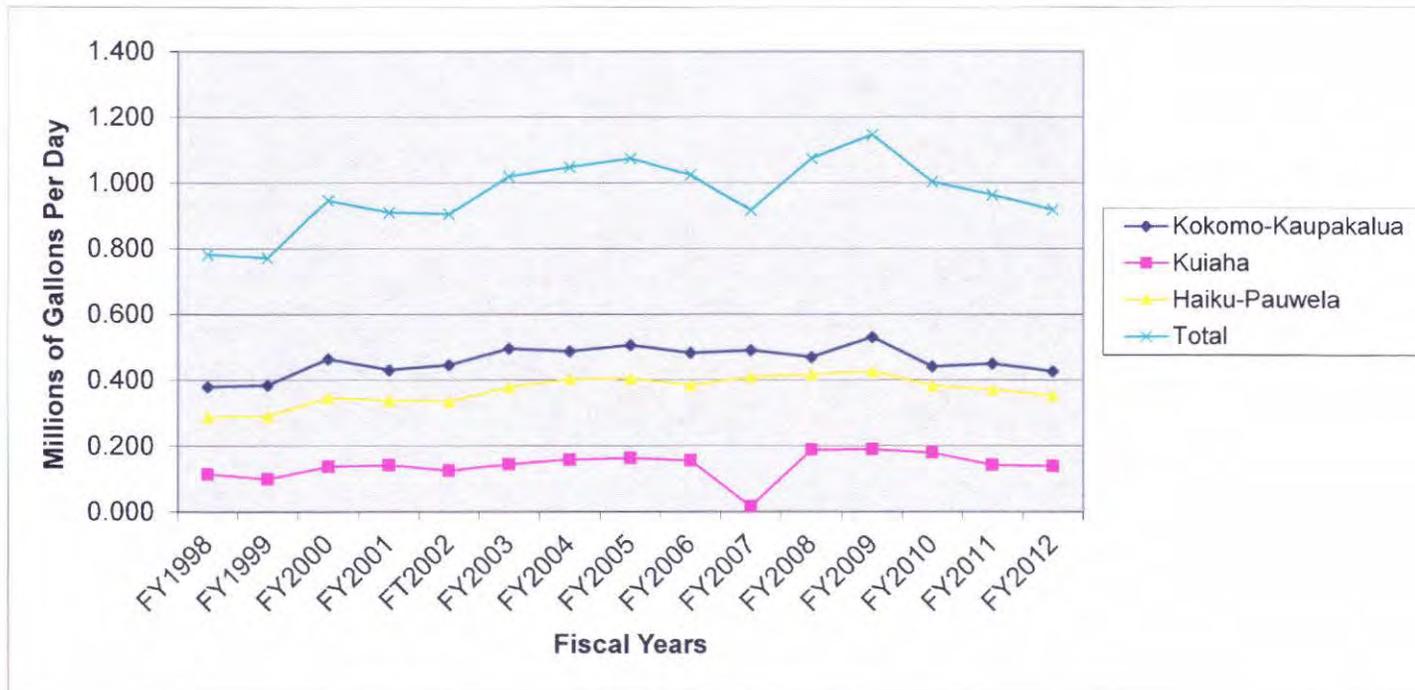


Table 4 DWS Monthly Production (Millions of Gallons Per Day)

	2006	2007	2008	2009	2010	2011	2012
Jan	7.649	7.914	6.283	5.351	7.623	5.553	8.210
Feb	6.245	7.327	6.038	6.342	7.316	5.673	8.111
Mar	6.279	7.182	7.637	5.338	6.912	6.425	7.286
Apr	7.332	8.602	7.531	6.648	7.778	7.608	8.728
May	7.887	9.756	8.084	7.764	8.633	7.627	9.492
Jun	9.625	9.959	8.738	8.750	9.718	8.464	9.403
Jul	10.567	8.913	8.564	8.911	10.039	8.792	9.329
Aug	10.645	8.485	8.479	8.273	10.585	9.362	10.260
Sep	9.594	7.745	8.407	9.219	10.319	9.179	8.774
Oct	7.889	8.323	8.414	8.966	9.038	9.074	9.269
Nov	6.835	6.952	6.859	7.864	7.892	7.508	8.885
Dec	7.121	5.718	6.530	6.623	6.387	7.057	8.218

Data from DWS Water Reports

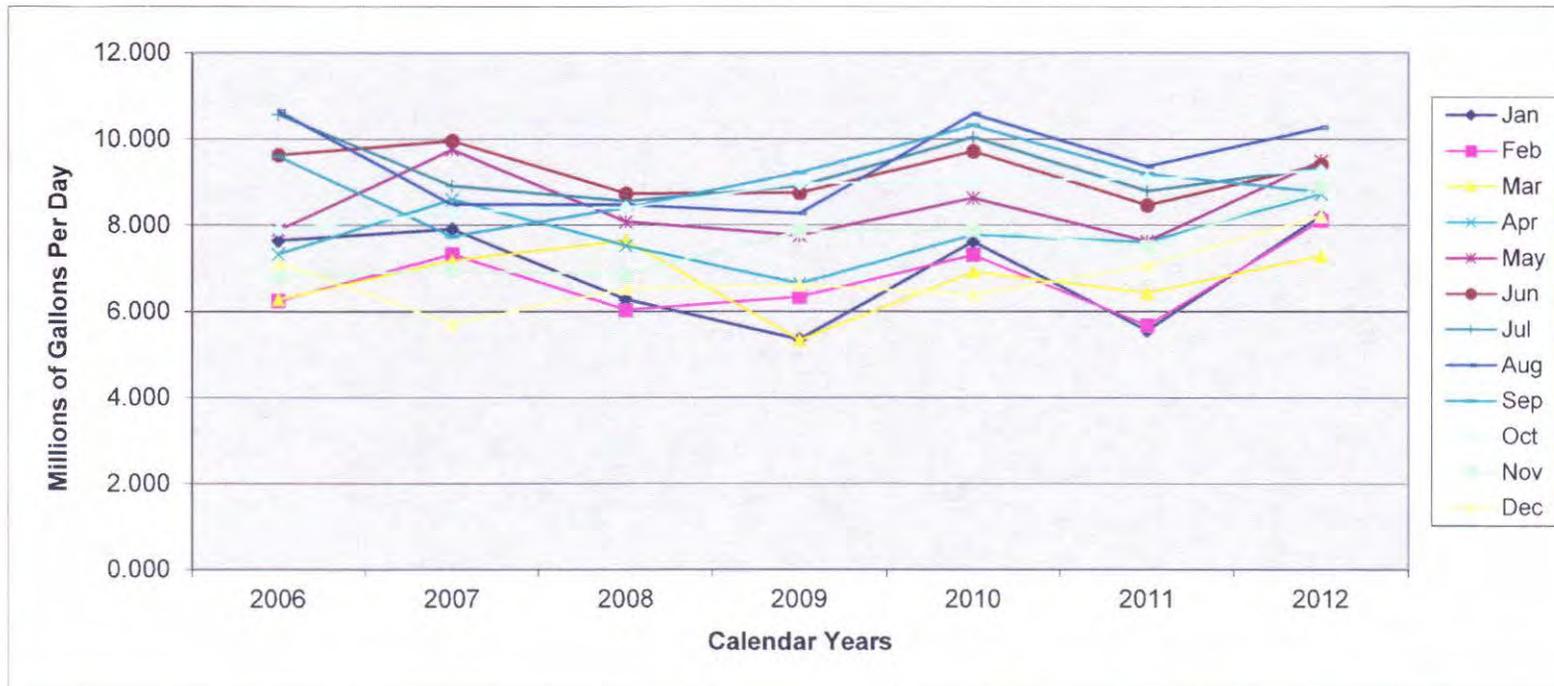


Table 5 Maui Island Plan Population Projections

CP AREA	2000		2005		2010		2015		2020		2025		2030	TOTAL 20 YR GROWTH	AVG ANNUAL GROWTH over 20 Years
West Maui	17,967	10.491%	19,852	5.239%	20,892	8.305%	22,627	7.509%	24,326	6.487%	25,904	5.849%	27,419	31.242%	1.562%
Kīhei- Mākena	22,870	11.976%	25,609	6.299%	27,222	9.217%	29,731	8.331%	32,208	7.203%	34,528	6.485%	36,767	35.064%	1.753%
Wailuku- Kahului	41,503	12.344%	46,626	6.559%	49,684	9.440%	54,374	8.526%	59,010	7.377%	63,363	6.632%	67,565	35.989%	1.799%
Makawao- Pukalani- Kula	21,571	7.441%	23,176	2.960%	23,862	6.278%	25,360	5.647%	26,792	4.796%	28,077	4.299%	29,284	22.722%	1.136%
Pā'ia-Ha'ikū	11,866	2.899%	12,210	-0.672%	12,128	2.853%	12,474	2.325%	12,764	1.637%	12,973	1.372%	13,151	8.435%	0.422%
Hāna	1,867	7.017%	1,998	2.603%	2,050	6.000%	2,173	5.384%	2,290	4.498%	2,393	4.137%	2,492	21.561%	1.078%
Total Maui Island	117,644	10.053%	129,471	4.918%	135,838	8.025%	146,739	7.258%	157,390	6.258%	167,239	5.649%	176,687	30.072%	1.504%

DWS Upcountry Water Demand Projections (GPD) Based on Maui Island Plan Population Projections

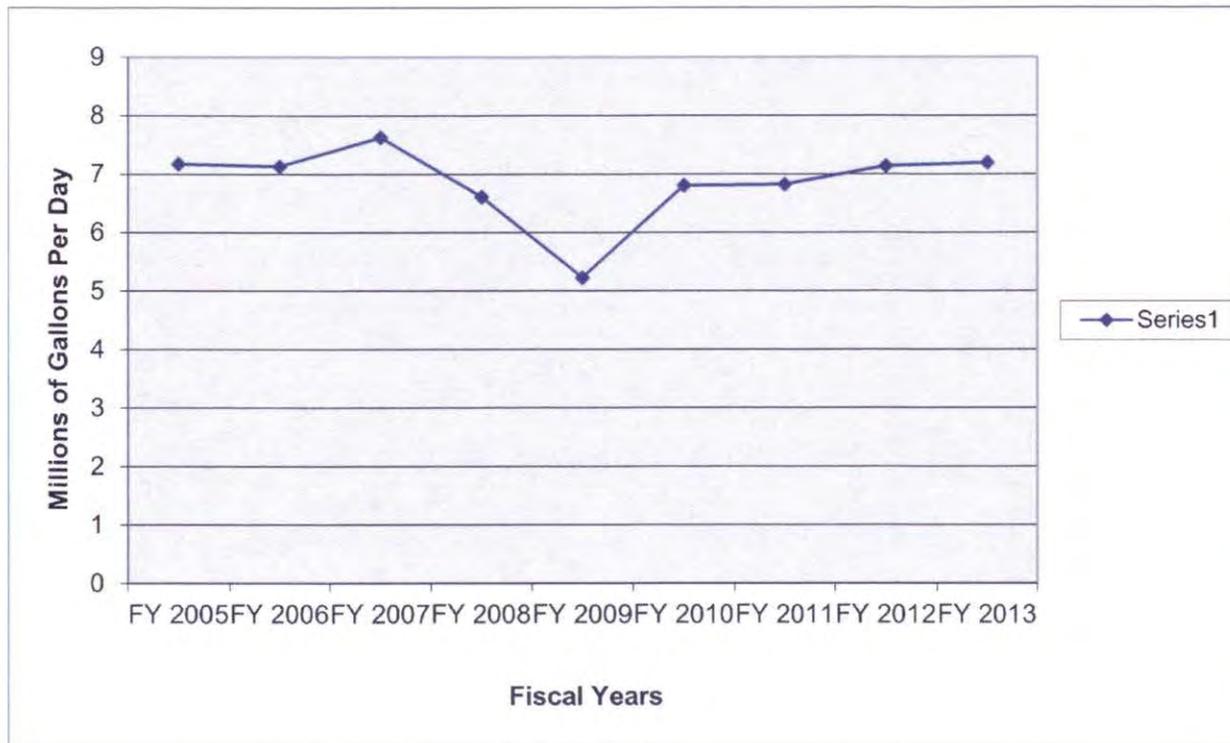
CP AREA	2000		2005		2010	% Increase	2015	% Increase	2020	% Increase	2025	% Increase	2030
Makawao - Pukalani- Kula					6,900,000	0.06278	7,333,182	0.05647	7,747,287	0.04796	8,118,847	0.04299	8,467,876
Haiku					1,000,000	0.02853	1,028,530	0.02325	1,052,443	0.01637	1,069,672	0.01372	1,084,348
Total Demand					7,900,000		8,361,712		8,799,730		9,188,518		9,552,224

Table 9 Surface Water Purchases from East Maui Irrigation Company, Ltd.

(Millions of Gallons Per Day)

FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
7.169	7.126	7.622	6.607	5.227	6.799	6.819	7.137	7.190

Data from DWS Fiscal Division



DWS Power and Pumping Costs for the Upcountry System

Table 11 DWS Power and Pumping Costs for the Upcountry Water System

Calendar Year	2008	2009	2010	2011
Total Dollars	\$4,894,737	\$2,309,054	\$3,781,970	\$4,452,787

Data from DWS Fiscal Division

INSTREAM FLOW STANDARD ASSESSMENT REPORT

DATA NEEDS

Prepared for

**Commission on Water Resource Management
Stream Protection and Management Division**

**Department of Water Supply
County of Maui**

May 27, 2009

EXHIBIT "B-003"

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INTRODUCTION

This document is prepared in response to a request by the State Commission on Water Resource Management for "Instream Flow Standard Assessment Report Data Needs". Information is provided in the order requested. Therefore, a general system description appears later in this document, in the section responding to questions on water supply and sources of water. The three figures that follow are intended to help orient the reader at the outset:

- Figure 1 Community Plan Districts on the island of Maui.
- Figure 2 The County of Maui Department of Water Supply's "Upcountry System" or "Upcountry Water District", showing five distinct sub-district areas, each served by a slightly different set of sources and waterlines during normal operating conditions.
- Figure 3 The Upcountry Water District overlaid on the Makawao-Pukalani-Kula and Paia-Haiku Community Plan boundaries.

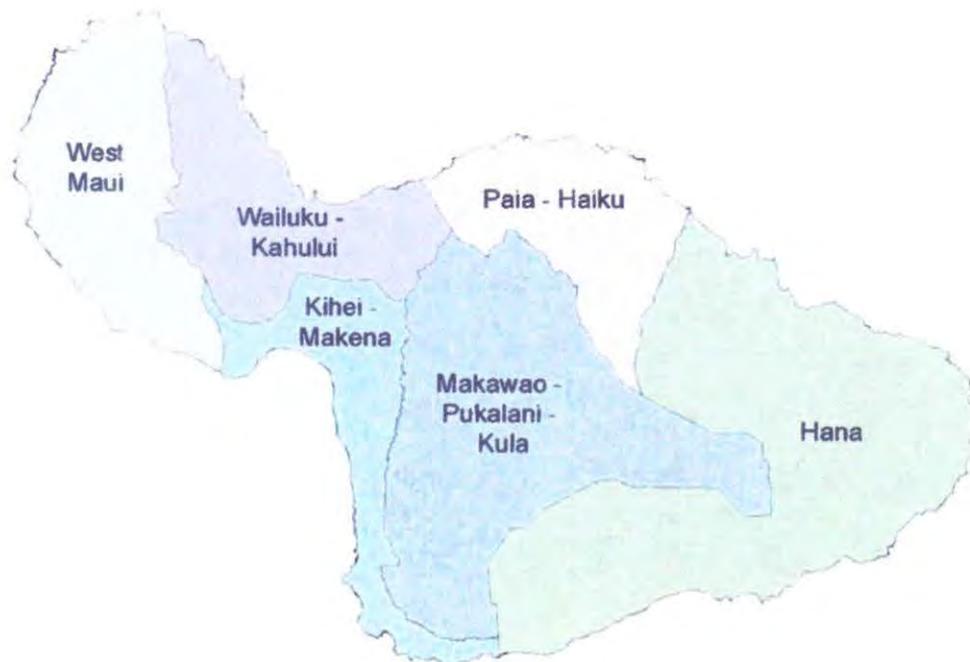


Figure 1 Community Plan Boundaries - Maui Island

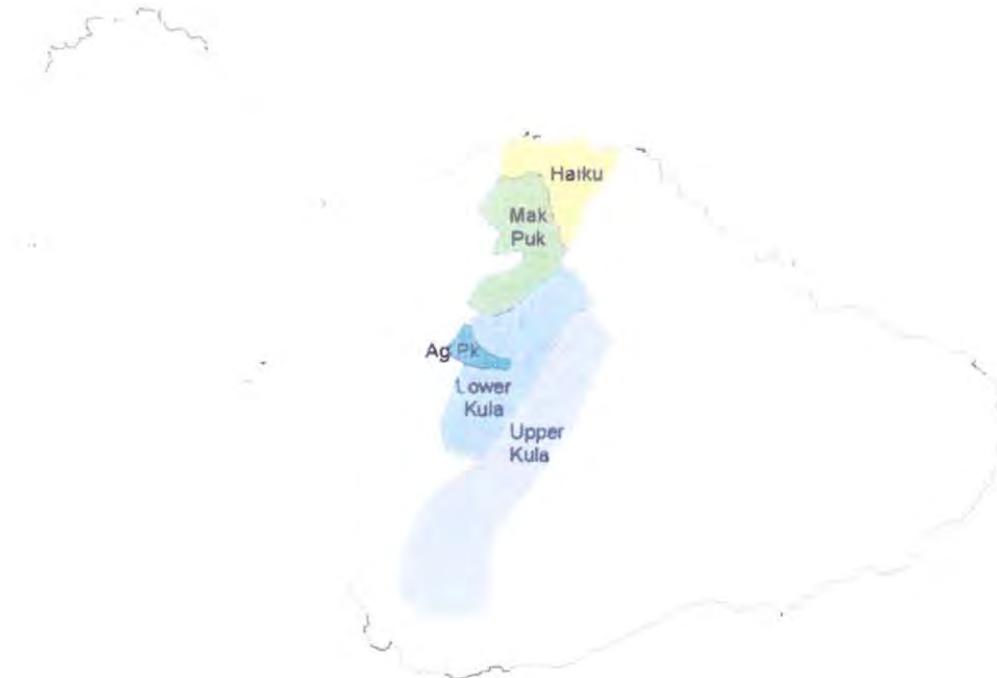


Figure 2 County of Maui Department of Water Supply - Upcountry Water District - Normal Operating Conditions

The “Upcountry Water District” may be operationally divided into five, or technically six sub-systems:

- Upper Kula (including Ulupalakua-Kanaio) - (shown in purple)
- Lower Kula (shown in blue)
- Makawao-Pukalani - (shown in green)
- Haiku-Kokomo - (shown in lime)
- Kula Ag Park - (shown in teal)
(non-potable system, not connected to the other sub-systems)
- Opana/Awalau - (not shown - too small to show separately)
(non-potable, not connected to other systems, serves only 4 meters)

These are described further in the section of this document pertaining to water supply and sources. The potable Upcountry systems are interconnected and rely on each other for backup. During dry seasons or droughts, water is frequently pumped from the lower systems to the upper. Similarly, during wet times, water may flow from higher service areas to lower. This is cost-effective, and also necessary. Lower pumping expense during wet seasons enables the Department to have the funds for uphill pumping during dry months, which would otherwise be cost-prohibitive. Surface water sources can also provide backup to areas normally served by groundwater during repairs or maintenance.

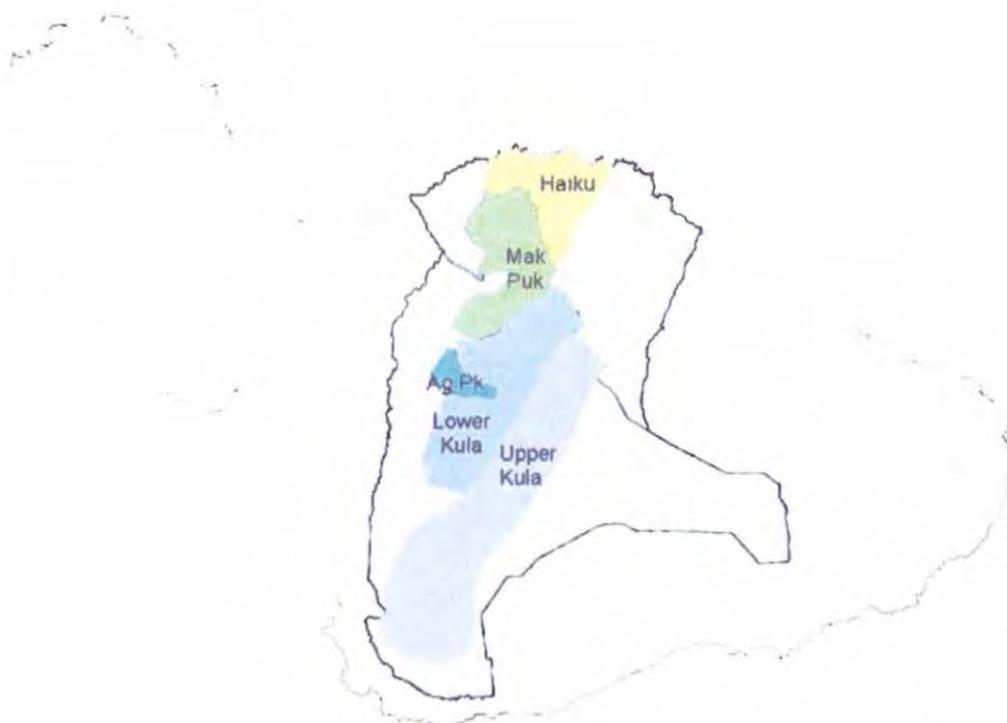


Figure 3 Upcountry Water District overlaid on Makawao-Pukalani-Kula and Paia-Haiku Community Plan District Boundaries

As shown in Figure 3 above, there is not a perfect one-to-one match between the Upcountry Water District or subdistricts and the Makawao-Pukalani-Kula or Paia-Haiku Community Plan District boundaries. Community Plan boundaries are political divisions used for land use planning. They do not shift with new source development or seasonal needs. Water Districts are areas which typically share a set of sources and transmission facilities. Their boundaries are determined by water sources and operational parameters. So it is not surprising that these would not match perfectly.

WATER USE

Historical trends

DWS historical water use is documented and characterized in various tables below:

- Figure 4 shows the historical metered consumption by the DWS Upcountry District (Makawao, Hali'imaile, Pukalani, Kula and Haiku).
- Figure 5 shows the historical metered consumption for the Makawao-Pukalani-Kula Community Plan District (Makawao, Hali'imaile, Pukalani and Kula).
- Figure 6 shows the historical metered consumption for the Haiku portion of the Paia-Haiku Community Plan District
- Figure 7 shows seasonal variation in consumption in the Makawao-Pukalani-Kula Community Plan District
- Figure 8 shows seasonal variation in consumption in the Paia-Haiku Community Plan District
- Figure 9 shows the historical water use by user class codes for the Makawao-Pukalani-Kula Community Plan District
- Figure 10 shows the historical water use by user class codes for the Haiku portion of the Paia-Haiku Community Plan District
- Figure 11 shows historical annual rainfalls for specified locations.

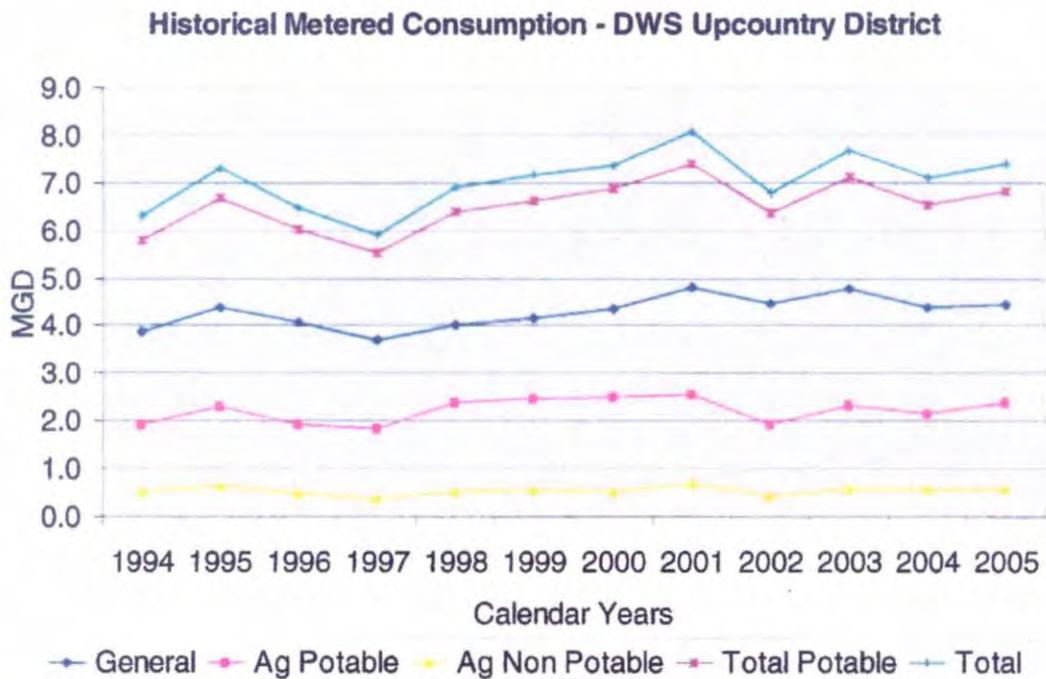


Figure 4 Historical Metered Consumption - Upcountry District

Table 1 Historical Metered Consumption for DWS Upcountry District (Makawao-Hali'imaile-Pukalani-Kula-Haiku)
Millions of Gallons per Day

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
General	3.871	4.382	4.083	3.693	4.003	4.146	4.370	4.823	4.461	4.778	4.387	4.441
Ag Potable	1.931	2.300	1.923	1.829	2.382	2.474	2.504	2.563	1.908	2.320	2.138	2.378
Ag Non Potable	0.504	0.634	0.481	0.374	0.512	0.555	0.505	0.690	0.433	0.582	0.575	0.571
Total Potable	5.802	6.682	6.007	5.521	6.381	6.620	6.873	7.387	6.368	7.098	6.525	6.820
Total	6.306	7.317	6.487	5.895	6.897	7.175	7.379	8.077	6.801	7.680	7.100	7.391

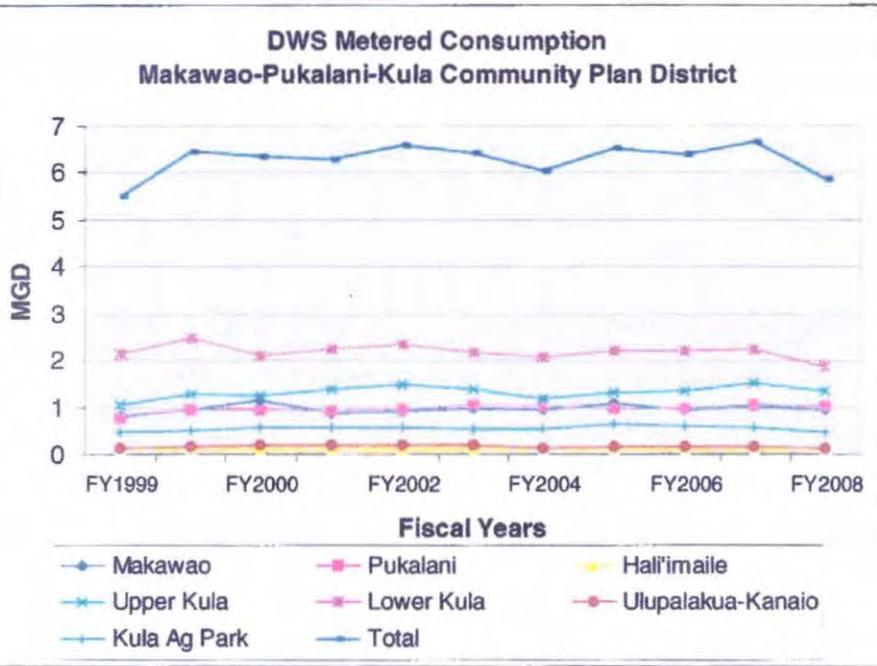


Figure 5 DWS Metered Consumption - Makawao-Pukalani-Kula

Historical metered consumption for the Makawao-Pukalani-Kula Community Plan District averaged about 6.286 MGD for the period shown. For FY 2008, average daily consumption was 5.89 MGD. Lower Kula dominates water consumption in this community plan district. Historical metered consumption for Haiku averages about 0.952 MGD for the period shown. For FY 2008, average daily consumption in the Haiku portion of the Paia-Haiku Community Plan was 1.075.

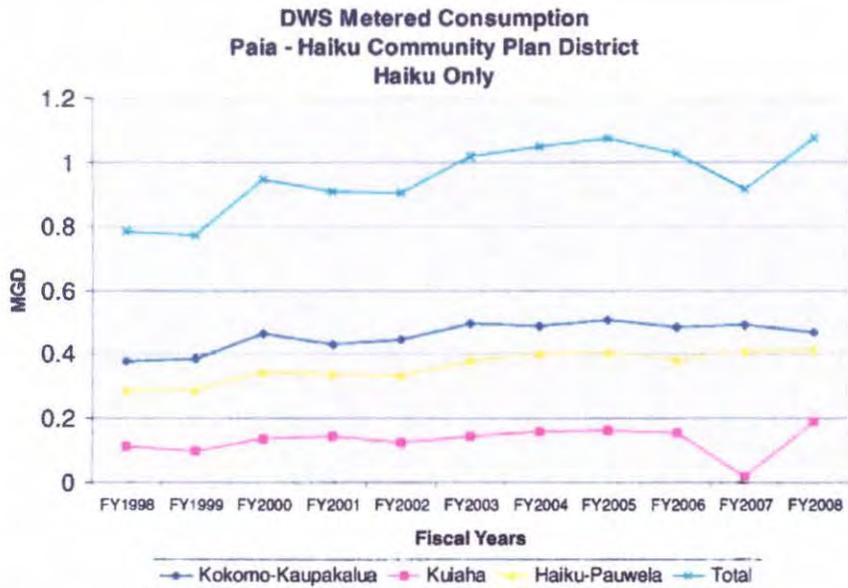


Figure 6 DWS Metered Consumption - Haiku

Figures 7 and 8 and Table 3 show water use from 2002 to 2006 by user class. Single Family and Agricultural uses account for the lion's share of consumption in these areas. Both areas demonstrate a strong seasonal variation in consumption, particularly in these two classes.

DWS Consumption by Use Class Code
Makawao - Pukalani - Kula CPD

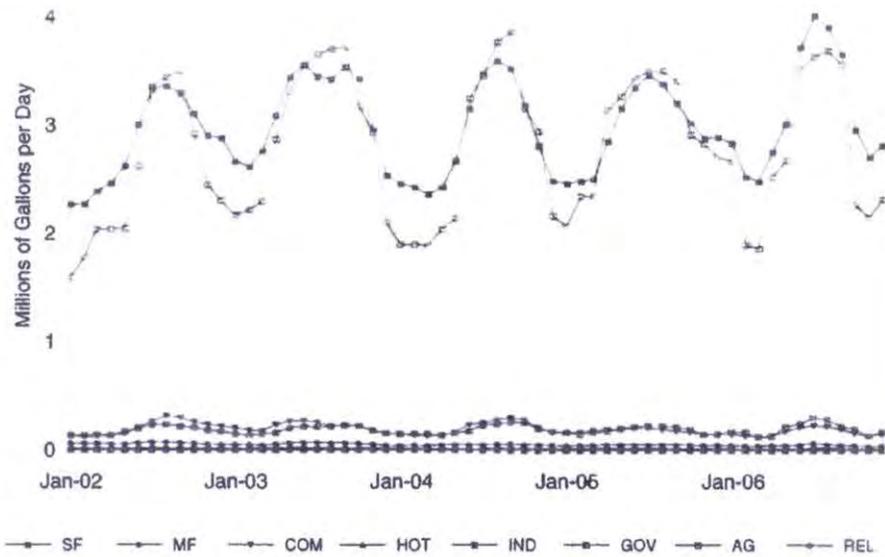


Figure 7 Makawao-Pukalani-Kula Consumption by User Class

DWS Consumption by Use Class Code
Paia - Haiku CPD

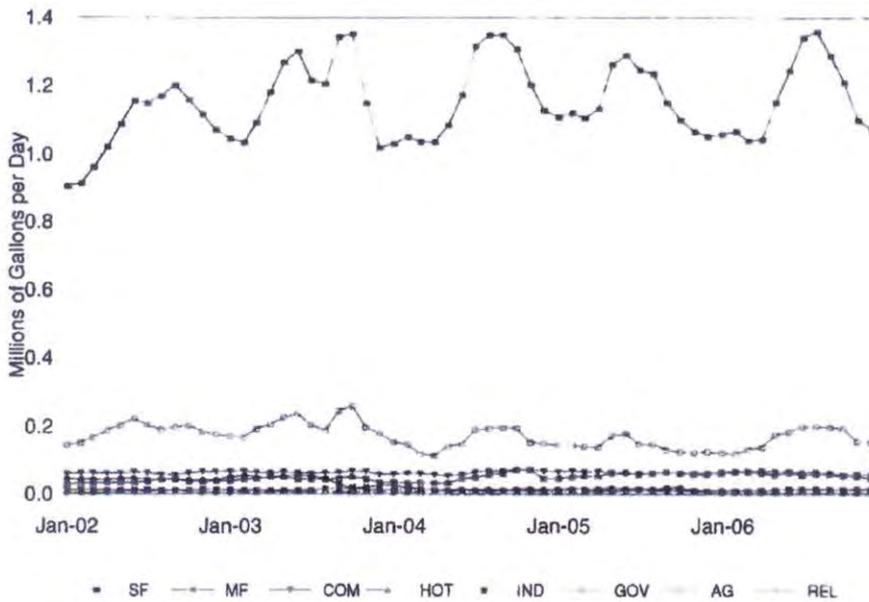


Figure 8 Haiku Consumption by User Class

Table 2 DWS Upcountry - Metered Consumption by Community Plan (Millions of Gallons per Day)

DWS Metered Consumption by Makawao-Pukalani-Kula Community Plan District

	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Makawao	0.831	0.951	1.152	0.880	0.920	0.979	0.955	1.090	0.953	1.013	0.957
Pukalani	0.784	0.940	0.961	0.913	0.957	1.051	1.015	0.994	0.998	1.070	1.006
Hali'imaile	0.087	0.100	0.102	0.096	0.091	0.098	0.105	0.108	0.106	0.087	0.094
Upper Kula	1.050	1.289	1.256	1.380	1.497	1.383	1.205	1.337	1.344	1.515	1.348
Lower Kula	2.136	2.487	2.110	2.255	2.353	2.181	2.078	2.208	2.217	2.230	1.868
Ulupalakua-Kanaio	0.148	0.184	0.188	0.188	0.198	0.190	0.151	0.157	0.166	0.157	0.144
Kula Ag Park	0.479	0.516	0.580	0.578	0.585	0.529	0.527	0.647	0.605	0.585	0.473
Total	5.515	6.467	6.349	6.290	6.601	6.411	6.036	6.541	6.389	6.657	5.890

DWS Metered Consumption for Haiku

	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Kokomo-Kaupakalua	0.380	0.385	0.465	0.431	0.446	0.496	0.488	0.507	0.483	0.491	0.470
Kuiaha	0.115	0.099	0.137	0.142	0.125	0.145	0.159	0.163	0.157	0.017	0.189
Haiku-Pauwela	0.287	0.289	0.345	0.337	0.334	0.378	0.402	0.404	0.384	0.409	0.416
Total	0.782	0.773	0.947	0.910	0.905	1.019	1.049	1.074	1.024	0.917	1.075
Total (including Haiku)	6.297	7.240	7.296	7.200	7.506	7.430	7.085	7.615	7.413	7.574	6.965

Figures 9 and 10 show the breakdown by use classes on an annual basis from 1994 through 2006. As shown in Figure 9, Single Family use has been growing faster than other uses in both Makawao-Pukalani-Kula and Paia-Haiku.

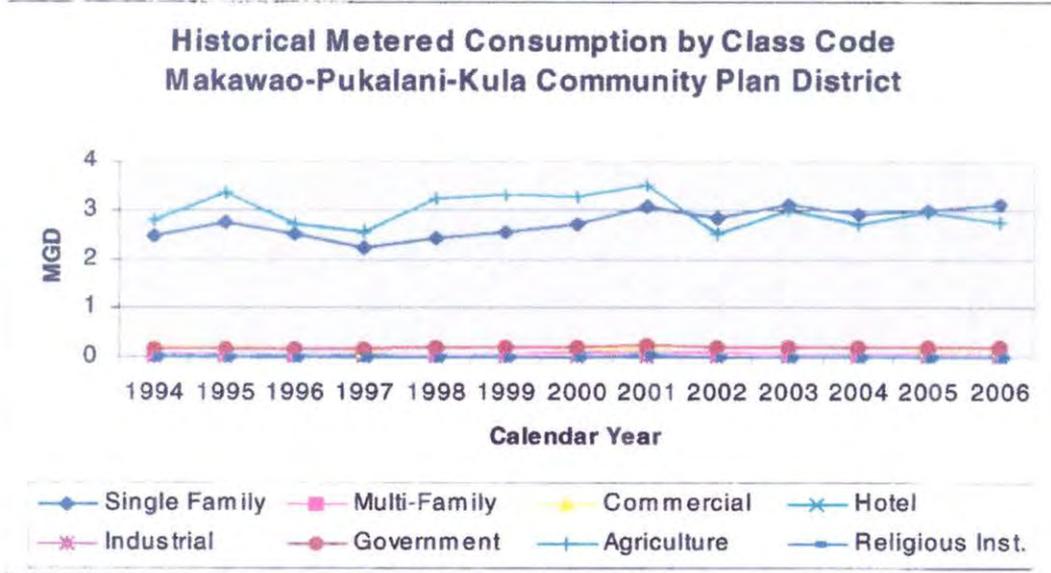


Figure 9 Historical Annual Consumption by User Class - Makawao-Pukalani-Kula Community Plan District (Makawao, Hali`imaile, Pukalani & Kula)

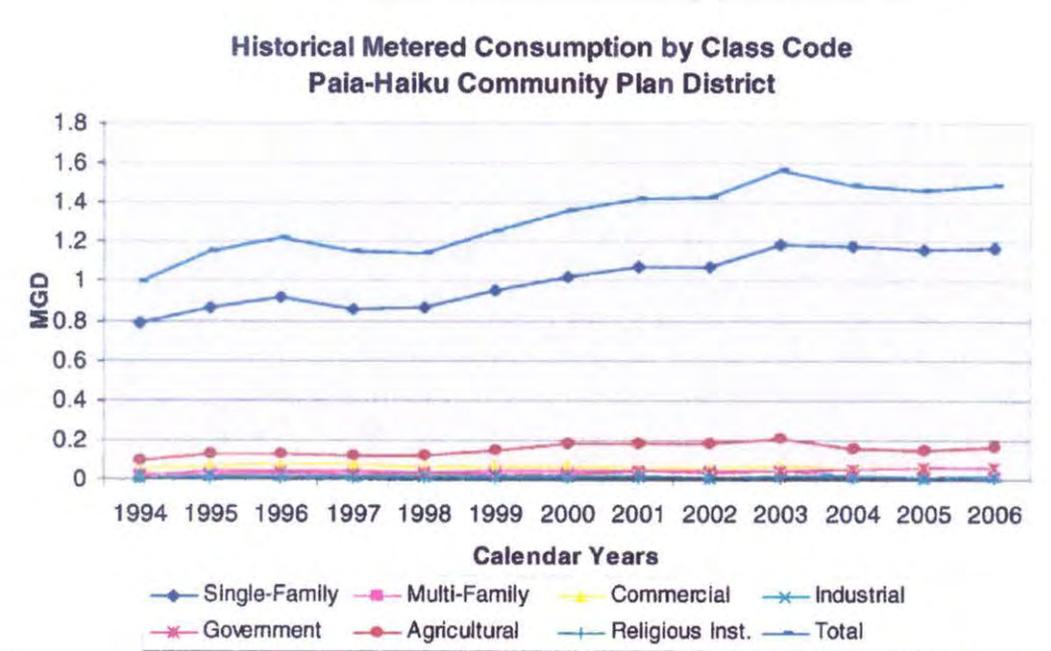


Figure 10 Historical Annual Consumption by User Class - Paia-Haiku Community Plan District - Haiku Only

Table 3 DWS Consumption by User Class (Millions of Gallons per Day)

DWS Historical Metered Consumption by User Class for the Makawao-Pukalani-Kula Community Plan District

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Single Family	2.446	2.756	2.496	2.221	2.443	2.526	2.716	3.066	2.828	3.122	2.89	2.97	3.118
Multi-Family	0.041	0.051	0.045	0.041	0.036	0.06	0.065	0.07	0.065	0.059	0.05	0.049	0.048
Commercial	0.183	0.19	0.207	0.136	0.185	0.208	0.16	0.187	0.208	0.219	0.205	0.177	0.171
Hotel	0.006	0.007	0.006	0.006	0.007	0.008	0.011	0.011	0.009	0.007	0.006	0.01	0.006
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Government	0.168	0.166	0.172	0.175	0.219	0.198	0.215	0.237	0.182	0.188	0.191	0.186	0.199
Agriculture	2.781	3.357	2.719	2.53	3.241	3.327	3.26	3.513	2.51	2.973	2.708	2.952	2.732
Religious Inst.	0.016	0.02	0.016	0.015	0.017	0.018	0.018	0.021	0.015	0.019	0.017	0.016	0.017
Total	5.642	6.546	5.662	5.123	6.149	6.345	6.445	7.106	5.817	6.588	6.066	6.361	6.291

DWS Historical Metered Consumption by User Class for the Paia-Haiku Community Plan District

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Single-Family	0.790	0.864	0.914	0.857	0.868	0.950	1.019	1.070	1.077	1.185	1.176	1.157	1.166
Multi-Family	0.016	0.044	0.047	0.043	0.037	0.040	0.041	0.047	0.043	0.040	0.014	0.016	0.014
Commercial	0.051	0.065	0.076	0.079	0.060	0.066	0.070	0.064	0.062	0.065	0.064	0.065	0.065
Industrial	0.012	0.013	0.018	0.016	0.021	0.019	0.018	0.016	0.012	0.015	0.014	0.012	0.014
Government	0.026	0.026	0.031	0.028	0.034	0.026	0.025	0.039	0.036	0.045	0.048	0.058	0.059
Agricultural	0.095	0.130	0.129	0.121	0.120	0.143	0.178	0.178	0.186	0.207	0.159	0.144	0.165
Religious Inst.	0.007	0.008	0.007	0.006	0.006	0.007	0.005	0.005	0.007	0.007	0.009	0.012	0.006
Total	0.998	1.149	1.223	1.150	1.145	1.251	1.356	1.420	1.425	1.565	1.485	1.464	1.490
Total (including Haiku)	6.640	7.695	6.885	6.273	7.294	7.596	7.801	8.526	7.242	8.153	7.551	7.825	7.781

Annual Rainfall At Specified Locations

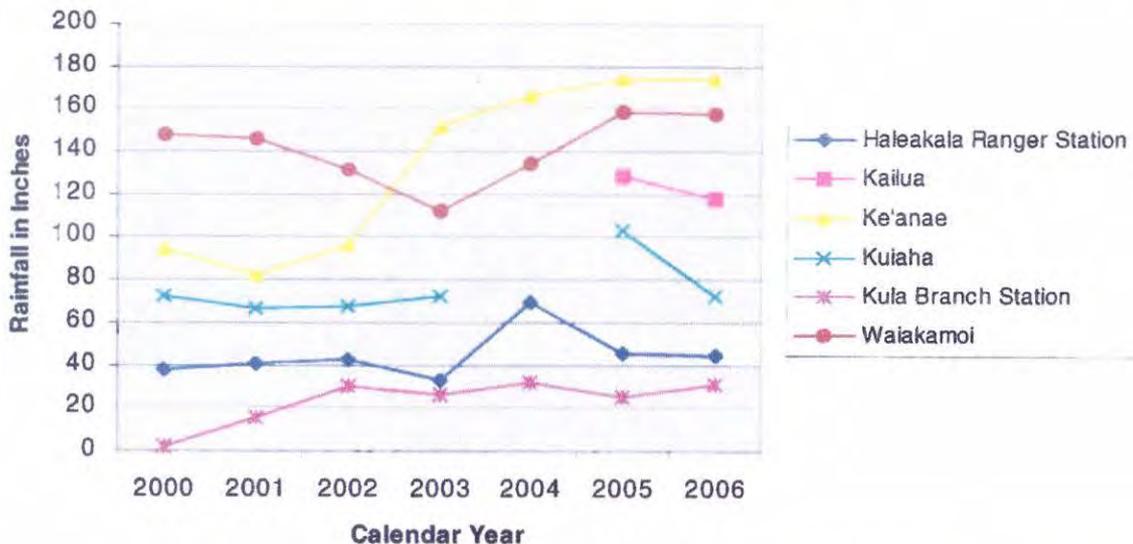


Figure 11 Annual Rainfall Source: U.S. Department of Commerce, National Oceanographic and Atmospheric Administration, National Weather Forecast Office, Honolulu

In general, mild temperatures, cool and northeasterly winds, and a rainy season characterize the months of October through April. A dry and warmer season characterize the months of May through September.

Data from the U.S. Geological Survey National Hydrography Dataset indicate certain trends during the following water years:

- During 1913 to 2002, there is an indication of generally decreasing rainfall.
- During 1933 to 2002, base flows increased from 1933 to about 1940, and decreased after about 1960 to 2002.
- During 1953 to 2002, there is an indication of downward trends in rainfall.
- During 1973 to 2002, there was below average rainfall during the 1970s.
- During 2002 to 2005, rainfall increased annually in East Maui.

However, further study is needed to determine whether the downward rainfall trends will continue or whether the observed patterns are part of a long-term cycle in which rainfall may increase to previous levels during 1913 to the early 1940s.

(Source: *Trends in Streamflow Characteristics at Long-Term Gaging Stations; Scientific Investigations Report 2004-5080*)

Water Treatment Facilities Production Log for Upcountry System

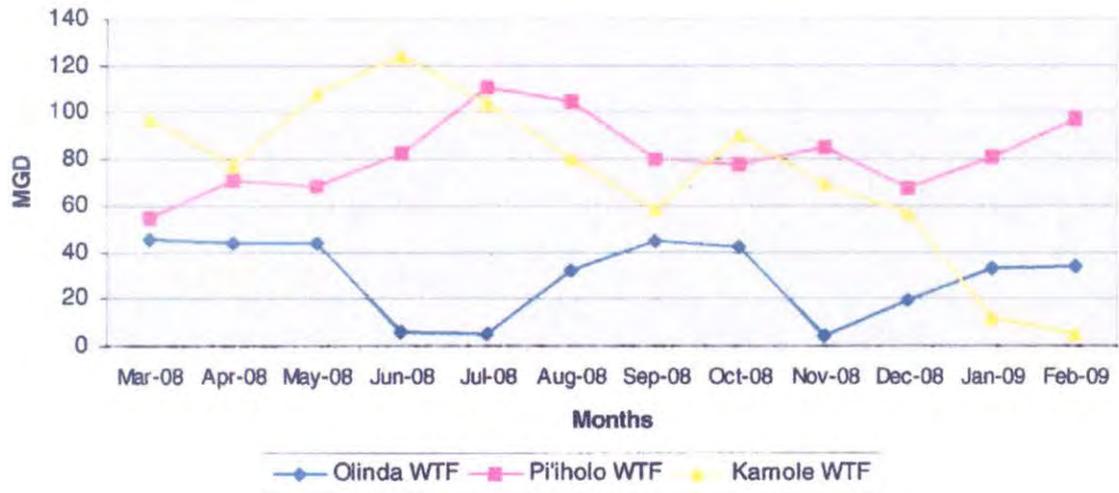


Figure 12 DWS Upcountry System - Monthly Production

The DWS Monthly Water Treatment Facilities Production Logs for the past twelve months ending February 2009 reflect the fact that lower elevation sources are pumped to higher elevation reservoirs during the early dry months.

Table 4 DWS Monthly Water Treatment Facilities Production Logs for Upcountry Water System (Millions of Gallons)

	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09
Olinda WTF	45.450	44.250	43.940	6.170	5.430	31.900	44.530	42.510	4.590	19.380	32.720	34.000
Pi'iholo WTF	54.588	71.224	68.274	82.697	110.276	104.550	80.330	77.778	85.443	67.360	81.347	96.578
Kamole WTF	97.034	77.265	108.330	124.053	103.608	80.018	58.232	89.929	69.196	56.574	12.028	5.323

Current Use

The total consumption for the Department of Water Supply's Upcountry Water District in 2008 was 6.966 MGD. This is further broken down into general and agricultural rate classes.

- General consumption by Makawao-Pukalani-Kula Community Plan District for fiscal year 2008 was 4.352 MGD.
- Agricultural consumption by Makawao-Pukalani-Kula Community Plan District was 2.614 MGD.

Future Demands

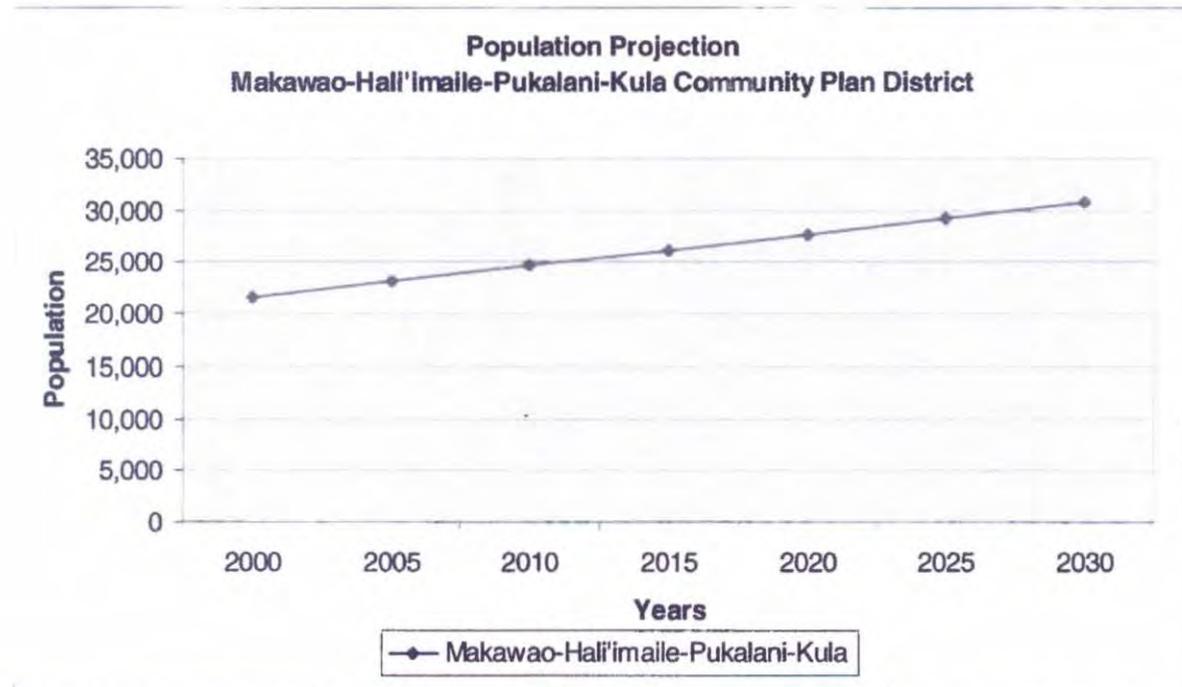


Figure 13 Population Projection - Makawao-Pukalani-Kula Community Plan (does not include Haiku)

Table 5 Community Plan Upcountry District (Makawao-Pukalani-Kula) Population Projection

2000	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>	<u>2030</u>
21,571	23,176	24,644	26,098	27,640	29,243	30,880

Baseline population projections for the Makawao-Pukalani-Kula Community Plan District show an increase of 9,309 or a 45.3% increase from 2000 to 2030.

Table 6 Demand for Resident and Non-Resident Housing Units - Makawao-Pukalani-Kula Community Plan District

<u>Existing 2004 Land Use Database</u>	<u>2015 Housing Demand</u>	<u>2015 Need for Additional Units</u>	<u>2030 Housing Demand</u>	<u>2030 Need for Additional Units</u>	<u>Sum of Additional Units Needed to 2030</u>
8,747	10,563	1,816	13,121	2,558	4,374

Upcountry Water District - Upcountry Water Service Request List (waiting list)
As of May 15, 2008, there were 1,312 applicants on the list for building permit applications, subdivisions and water service requests.

Urban development (planned/committed and planned designated) for Community Plan Upcountry District (Makawao-Pukalani-Kula) from Long Range Planning, Department of Planning, County of Maui:

- Hali'imaile Residential (A&B, Inc.) - 148 single family (SF) units
- Grove Ranch Lots - 9 SF units
- Kualono - 49 SF units
- Kulamalu Town Center - 14 SF units
- Cottages at Kulamalu - 12 SF units and 28 multi-family (MF) units
- Mauna Lani - 6 SF units
- Kauhale Lani Residential Subdivision - 156 SF units
- Barto Project Crook Estate Project District 3 - 54 SF units
- Department of Hawaiian Home Lands (DHHL) Waiohuli-Keokea subdivisions - per WATER CREDITS AGREEMENT made on December 9, 1997, the Department of Water Supply agreed to commit five hundred thousand gallons of potable water per average day to DHHL for DHHL home sites in the Makawao-Pukalani-Kula Community Plan District.

Urban development (proposed)

- Hali'imaile Expansion A&B, Inc. 400 - 1,200 SF units
- Hali'imaile Expansion (ML&P) - 1,500 units
- Kula Meadowood - 130 SF and 130 MF units
- Makawao Mauka Homes - 95 SF and 100 MF units
- Pukalani Uplands - 98 SF units
- DHHL Waiohuli-Keokea subdivisions - 1,100 SF units

Forecasted Demand

DWS Actual and Projected Consumption Total All Classes Upcountry District

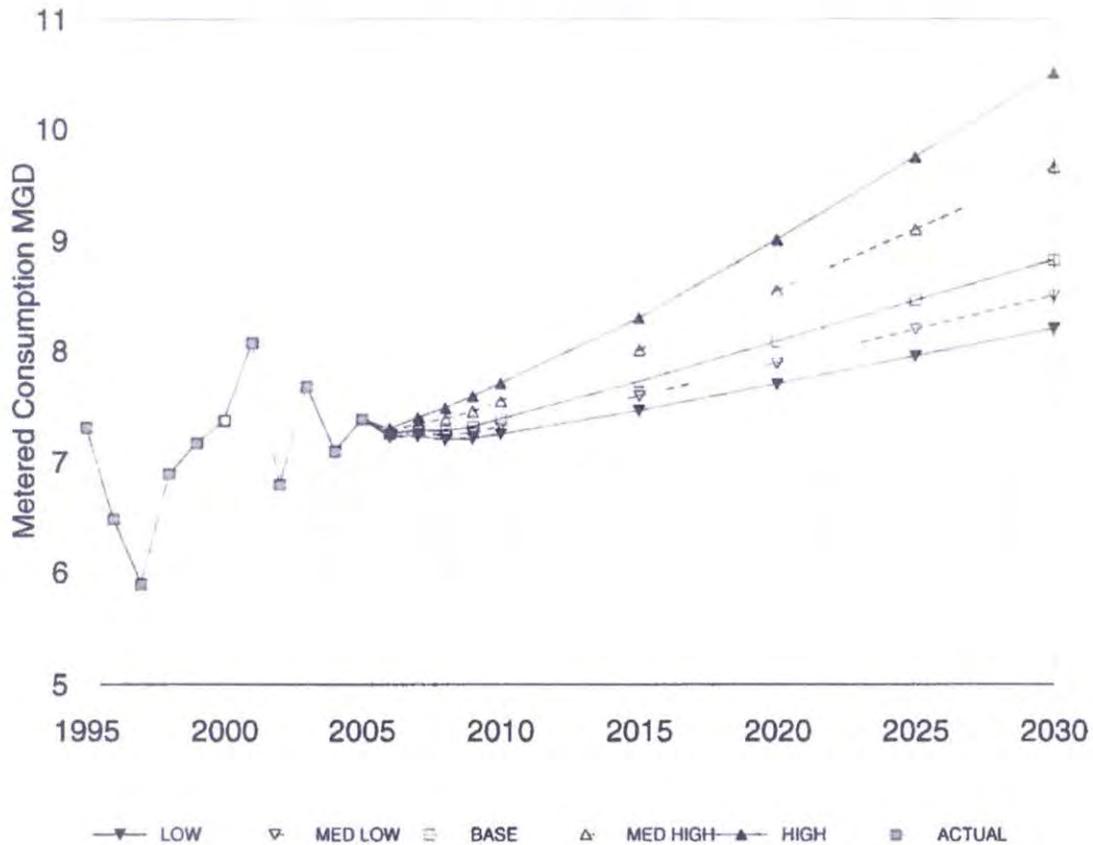


Figure 14 Community Plan District Unit Forecast 2006 Update for the Makawao-Pukalani-Kula District Water Use and Demand Draft, Econometric Model by Haiku Design & Analysis.

The guidelines for updating the Hawaii Water Plan indicate that a range of forecasts should be evaluated in planning for water supply. These are graphed in Figure 14 above, and shown in Table 7 below. Forecasts for the Upcountry Water District in general range from about 8.5 to 11 MGD by the year 2030, with the base case prediction at about 9.75.

Table 7 Upcountry Metered and Forecasted Demand

Historical Metered Consumption and Projected Consumption Demographic Forecast (Base Case) (Millions of Gallons per Day)		2005	2010	2015	2020	2025	2030
Upcountry							
	Low Case	4.441	4.483	4.754	5.041	5.313	5.577
	Medium Low Case	4.441	4.571	4.945	5.313	5.664	6.010
General	Base Case	4.441	4.659	5.137	5.577	6.010	6.444
	Medium High Case	4.441	4.754	5.313	5.837	6.379	6.921
	High Case	4.441	4.848	5.485	6.092	6.715	7.339
	Low Case	2.378	2.258	2.258	2.258	2.258	2.258
	Medium Low Case	2.378	2.292	2.326	2.361	2.397	2.434
Ag Potable	Base Case	2.378	2.326	2.397	2.472	2.551	2.634
	Medium High Case	2.378	2.343	2.433	2.530	2.633	2.744
	High Case	2.378	2.361	2.471	2.591	2.721	2.862
	Low Case	6.820	6.742	7.013	7.299	7.571	7.835
	Medium Low Case	6.820	6.863	7.271	7.674	8.061	8.444
Total Potable	Base Case	6.820	6.984	7.534	8.049	8.561	9.078
	Medium High Case	6.820	7.097	7.746	8.367	9.012	9.665
	High Case	6.820	7.208	7.956	8.683	9.436	10.201
	Low Case	0.571	0.573	0.573	0.573	0.573	0.573
	Medium Low Case	0.571	0.583	0.592	0.602	0.612	0.622
Ag Non Potable	Base Case	0.571	0.592	0.612	0.633	0.654	0.676
	Medium High Case	0.571	0.597	0.622	0.649	0.676	0.704
	High Case	0.571	0.602	0.633	0.665	0.699	0.734
	Low Case	7.391	7.315	7.586	7.872	8.144	8.408
	Medium Low Case	7.391	7.445	7.864	8.276	8.673	9.067
Total	Base Case	7.391	7.577	8.146	8.681	9.215	9.754
	Medium High Case	7.391	7.695	8.369	9.015	9.688	10.370
	High Case	7.391	7.810	8.589	9.347	10.134	10.935

WATER USE PURPOSE

Who is using the water and what is the water used for

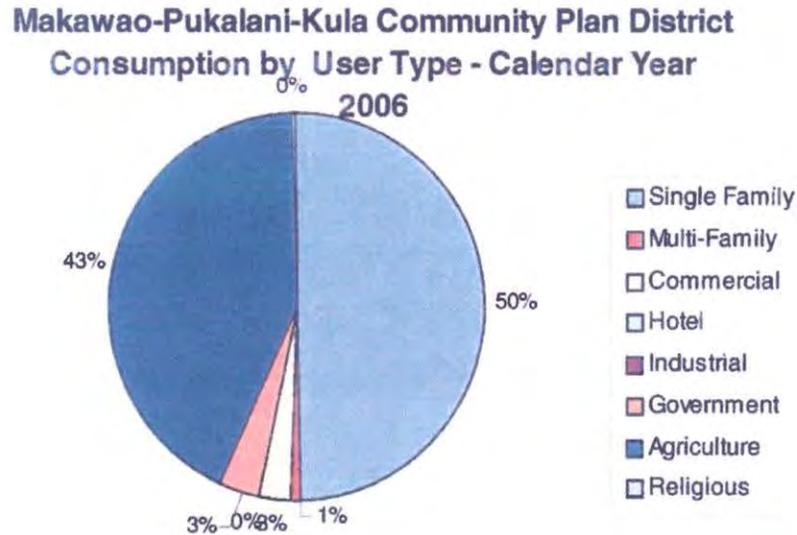


Figure 15 Makawao-Pukalani-Kula Community Plan District Consumption By User Type

Consumption by User Type - Calendar Year 2006 Makawao-Pukalani-Kula Community Plan District

- Single Family - 3.118 MGD
- Multi-Family - 0.048 MGD
- Commercial - 0.171 MGD
- Hotel - 0.006 MGD
- Industrial - 0.0 MGD
- Government - 0.199 MGD
- Agricultural - 2.732 MGD
- Religious - 0.017 MGD

General and Agricultural Water Meters Issued in DWS Upcountry District - FY 2008 Makawao-Hali'imaile-Pukalani-Kula-Haiku

- Regular (General) - 9,136 or 92.7%
- Agricultural - 717 or 7.3%

Agricultural Water Use

Table 8 Agricultural Water Use in Community Plan Upcountry District*

	<u>Acres</u>	<u>Number of Farms</u>
Pineapple	1,200	2
Vegetables and Melons	800	100
Onions, Green Onion, Head Cabbage, Chinese Cabbage, Tomato, Beans, Lettuce, Taro, Cucumber, Zucchini, Herbs, Sweet Corn, Celery, Daikon, Egg Plant, Ginger Root, Parsley, Romaine Lettuce, Peas, Watercress, Radish, Dasheen and Sweet Potato		
Fruits	600	150
Bananas, Oranges, Persimmons, Avocado, grapes, Limes, Lemons, Cherimoya, Mango, Plums, Peaches, Loquat		
Coffee	200	12
Protea, Nursery & Tropicals	150	12
Protea, Nursery, Ginger, Heliconia, Nursery Operations and Turf		
Livestock		
Cattle	93,000	120
Hogs		50
Other - Sheep, Deer, Goats		20

* Data from the Office of Economic Development, County of Maui and the Maui County Farm Bureau (includes some East Maui farms)

Hydroelectric Use

Although DWS does not utilize hydroelectric sources, this and other energy alternatives are being considered as an independent component of the Upcountry District Water Use and Development Plan.

Recreational and Ornamental Use

The Community Plan Upcountry District has one golf course, the Pukalani Country Club. It has a private well are used for golf course and landscape irrigation.

WATER REQUIREMENT

Minimum water requirement for current use

**Table 9 Surface Water Purchases from East Maui Irrigation Company, Ltd.
(Millions of Gallons per Day)**

<u>FY2005</u>	<u>FY2006</u>	<u>FY2007</u>	<u>FY2008</u>	<u>FY2009 *</u>
7.169	7.126	7.622	6.607	5.227

* (FY 09 number reflects only 8 months - year to date July, 2008 through February 2009)

Decreased surface water purchases in FY2008 and FY 2009 may be attributed to several factors:

- Higher rainfall months from February 2009 to April 2009
- DWS price structure and price increases
- Lower defacto population
- Decreased economic activity associated with the current recession
- Appeals for conservation by DWS
- DWS conservation program implementation
- Adoption of newer and more efficient appliances

DWS Monthly Source Report

Pookela Well is used as a back up well in the Makawao-Pukalani-Kula Community Plan District. During fiscal year 2008, the DWS Monthly Source Reports showed an average of 0.188 MGD. For the one year period ending in February 2009, the report showed an average of 0.328 MGD.

Prioritize Water Use Purposes

In determining whether drought conditions are warranted, DWS monitors five components of the Upcountry water system:

- Wailoa Ditch flows
- Pi'iholo Water Treatment Plant and reservoir levels and flows
- Kamole Water Treatment Plant flows
- Waikamoi reservoir and Kahakapao reservoir levels and flows
- Olinda Water Treatment Plant flows

For the DWS Upcountry District (Makawao-Hali'imaile-Pukalani-Kula-Haiku), the Board of Water Supply Resolution No. 98-18 outlines actions for DWS to implement varying stages of a declaration of drought. Response actions are based on ditch flows, and water treatment plant and reservoir capacities. Actions may include voluntary and mandatory water use restrictions, operational controls, and public education and outreach activities.

During declaration of droughts and the drier months, DHHL makes requests to its lessees for water conservation.

In recent decades, agricultural consumers and farmers have been exempt from water restrictions during declarations of drought.

Currently, there are about 27,000 head of cattle in Upcountry Maui and Hana. Cattle require a minimum of 20 GPD or a total of 540,000 GPD. There are also about 6,000 head of deer being farmed. Deer require a minimum of 10 GPD or a total of 60,000 GPD. Although there are no current figures available, other livestock include pigs, sheep, goats, elk and horses. Without water livestock such as cattle die within a couple of days or less.

The U.S. Department of Agriculture offers post disaster programs that share with agricultural producers the cost of rehabilitating eligible farmlands damaged from natural disasters and provide emergency water conservation assistance. The funds are used for conservation practices and compensation for livestock and agricultural losses. Since 1999, more than \$1,000,000.00 has been dispersed on Maui for drought related compensation.

Typically, during a drought, monitoring and enforcement are more lenient for homes using less than three or four hundred gallons per day. Drought enforcement has not had to reach the point where a more stringent life-line amount has had to be set.

No prioritization of uses has been set in Maui as of this draft. However, both Hawaiian Home Lands and preservation of Agriculture are typically deemed high-priority uses within the county. There is some concern as to whether potential future conflicts for drought supply will result from continued growth upcountry, combined with build-out of the Hawaiian Homes project and intended agricultural park.

Policies regarding allocation, distribution and reliability are under discussion, both as part of the Water Use and Development Plan (WUDP) Process and in other venues. However, it is doubtful that all such potential issues can be fully resolved in the upcoming iteration of the WUDP.

WATER SUPPLY

Sources of water

Surface water

- Wailoa Ditch - The Wailoa Ditch runs at approximately 1,100 feet and draws water from approximately 200 East Maui streams as far east as Makapipi. Water from this collection system is used in two areas of the system. The Kamole Weir Water Treatment Plant withdraws water from the Wailoa Collection System and is the primary source of water for Makawao,

Pukalani and Hali'imaile. During drought conditions, this plant can also serve water to Lower Kula, and ultimately even Upper Kula. This was also once the main source for the system to Haiku and eastward, and still backs up this region for pump failures or repairs and maintenance. Water for the Kula Agricultural Park is also drawn from a ditch downstream of the Kamole Weir Water Treatment Plant in the Omaopio region.

- Upper Kula Collection System - The collection system that serves the primary source for the Upper Kula system runs at about 4,200 feet and draws water from the Waikamoi, Haipuaena, Middle Branch Puohokamoa, West Branch Puohokamoa and Kailua Streams. Water from the collection system is treated at the Olinda Water Treatment Plant and serves the Upper Kula and Ulupalakua-Kanaio regions. When water is plentiful, it can also serve Lower Kula and even below. During a drought, this source is backed up by the Lower Kula and ultimately Wailoa sources, with Pookela as the supplemental source.
- Lower Kula Collection System - The Lower Kula collection system runs at about 2,900 feet and draws water primarily from the East and West Waikamoi, Honomanu, Haipuaena, West Branch Puohokamoa, Middle Branch Puohokamoa and East Branch Puohokamoa Streams. Water is treated at the Pi'iholo Water Treatment Plant and serves the Lower Kula area. During wet times, this water can serve the lower elevation areas of Makawao-Pukalani. During drought, this water can be used to supplement the Upper Kula system.
- Opana Stream at Awalau - This is a small source shared by Maui Land and Pineapple Company, Haleakala Ranch, Kaonuolu Ranch and DWS. DWS takes only a small portion of the water and it currently serves only four non-potable meters, with a total water use between 2,000 and 2,500 GPD.

Surface water purchases from the East Maui Irrigation Company, Ltd. have averaged 7,131,353 GPD during the four fiscal years, peaking in fiscal year 2007 with 7,622,079 GPD.

Ground water

Three wells currently serve the Upcountry system. The Pookela well serves as backup source for the surface water systems. While the Kaupakalua well could serve as additional backup with some capital expenditure, its main function is as the major source for Haiku. The Haiku well serves the lower elevations of the Haiku service area.

Table 10 Ground Water Capacity in the DWS Upcountry System

<u>Well</u>	<u>Pump Capacity</u> GPM	<u>Well Capacity</u> GPD	<u>Function</u>
Pookela	900	1,296,000	Backup well; can serve several system areas
Kaupakalua	1,020	1,468,800	Major source for Haiku sub-district
Haiku	320	460,000	Source for small portion of Haiku sub-district

Contractual Obligations and Agreements

- **MASTER WATER AGREEMENT** - The East Maui Irrigation Company, Ltd. and Hawaiian Commercial & Sugar Company, Ltd. and the Board of Water Supply of the County of Maui signed a master agreement on December 22, 1961. The agreement was extended for another 25 years.

- **WATER CREDITS AGREEMENT**

The AGREEMENT between the STATE OF HAWAII, DEPARTMENT OF HAWAIIAN HOME LANDS, an agency of the Hawaiian Homes Commission, and the COUNTY OF MAUI DEPARTMENT OF WATER SUPPLY made an agreement on December 9, 1997.

Highlights of the AGREEMENT:

- DWS shall commit five hundred thousand gallons (500,000) gallons of potable water per average day to DHHL for the DHHL Homesites except during any drought affecting the Lower Kula area.
- In consideration of its contribution for construction including (1) off-site Booster Pumping Station at Kula Kai Reservoir, and construction of transmission water main from Naalae Road to DHHL subdivision, and (2) construction of on-site reservoirs, booster pumps, and transmission lines, which shall be licensed to the DWS in perpetuity, DHHL shall receive from the DWS water credits as follows:
 - a. Source Credits - No credits for source.
 - b. Transmission and Storage Credits - No payments for transmission and storage components of the fees shall be required of DHHL by DWS
 - c. Additional Credits - DHHL shall receive from the DWS an additional \$1,561,600 credit for increasing the transmission and storage capacity of the DWS water system beyond current and planned DWS and future DWS and DHHL needs.

- **KULA AGRICULTURAL PARK WATER RESERVOIR AGREEMENT**

The AGREEMENT between the County of Maui, East Maui Irrigation Company, Limited (EMI) and Alexander & Baldwin, Inc., through its division Hawaiian Commercial & Sugar Company was made on December 30, 2002.

Highlights of the Agreement:

- The County, among other things, has the right to withdraw up to 1.5 million gallons of water per twenty four hour period to serve the needs of the Kula Agricultural Park.
- The County to complete upgrades of the Park pumps and relocate them to A&B's Reservoir 40.
- The County wishes to have the right to use such water to serve, in addition to the needs of the Park, agricultural needs of that certain Haleakala Ranch Company property located at TMK No. 2-3-02:7, to be used as an agricultural park.

- The County shall require users of withdrawn water to use their best efforts to limit their use of such water during times of water shortage.

Minimum amount of water supplied by the Upcountry water system during drought conditions

The following are estimated drought capacities for the Upcountry water treatment plants:

- Kamole Weir Water Treatment Plant - 4.5 MGD
- Olinda Water Treatment Plant - 1.2 MGD
- Pi'iholo Water Treatment Plant - 2.11 MGD

With an additional 100 million gallon raw water storage, there would be an additional 1.19 MGD or 3.3 MGD.

With an additional 300 million gallon raw water storage, there would be an additional 2.73 MGD or 4.84 MGD.

Po'okela Well is only used for drought and emergency backup.

The Upcountry water system is an interconnected system that uses about 90% surface water and 10% ground water. The use of surface water has been very cost efficient. During periods of low rainfall and surface flows, DWS uses a declaration of drought, operational controls, and public education and appeals of conservation. Typically, treated surface water from the Kamole Weir Water Treatment Plant is pumped to higher elevation reservoirs with its high lift pumps prior to the drier months.

Alternate water sources

- Hamakuapoko Wells - There are two wells each with a capacity of 720,000 GPD. During periods of low flow in the Wailoa Ditch, these wells can be pumped to the ditch downstream of the plant but upstream of the Kula Agricultural Park. At this point the ditch is called the Hamakua Ditch, but it is essentially a downstream portion of the same system. In exchange for pumping these wells to provide additional irrigation water in the ditch, an equivalent amount of water may be removed from the upstream, Wailoa Ditch portion for treatment at the Kamole Weir Water Treatment Plant.
- Recycled water from wastewater treatment plants are not currently available for the Upcountry water system. However, treated wastewater from Pukalani is mixed with wellwater and used to irrigate the Pukalani Golf Course.
- The USDA-Central Maui Soil and Water Conservation District is conducting a Stormwater Reclamation Planning and Engineering Study to examine possible design and siting for storage of surface water in the Lower Kula system area in support of the Hawaii Hazard Mitigation Plan and the County of Maui Drought Mitigation Strategy. The strategy program is administered by the State Commission on Water Resource Management. Funding is provided by a state appropriation. Technical assistance will be provided by the USDA Natural Resources Conservation Service. They will conduct data collection and technical analyses and prepare the study report. The study report should be completed by

September 2009.

- In addition, the Draft Final Candidate Strategies Chapter for the Upcountry District for the Water Use and Development Plan evaluates the following major options:
 - Incremental basal well development
 - Expansion fo raw water capacity
 - "Drought proof" full basal backup
 - Extensive conservation measures, with or without redirecting or restricting growth

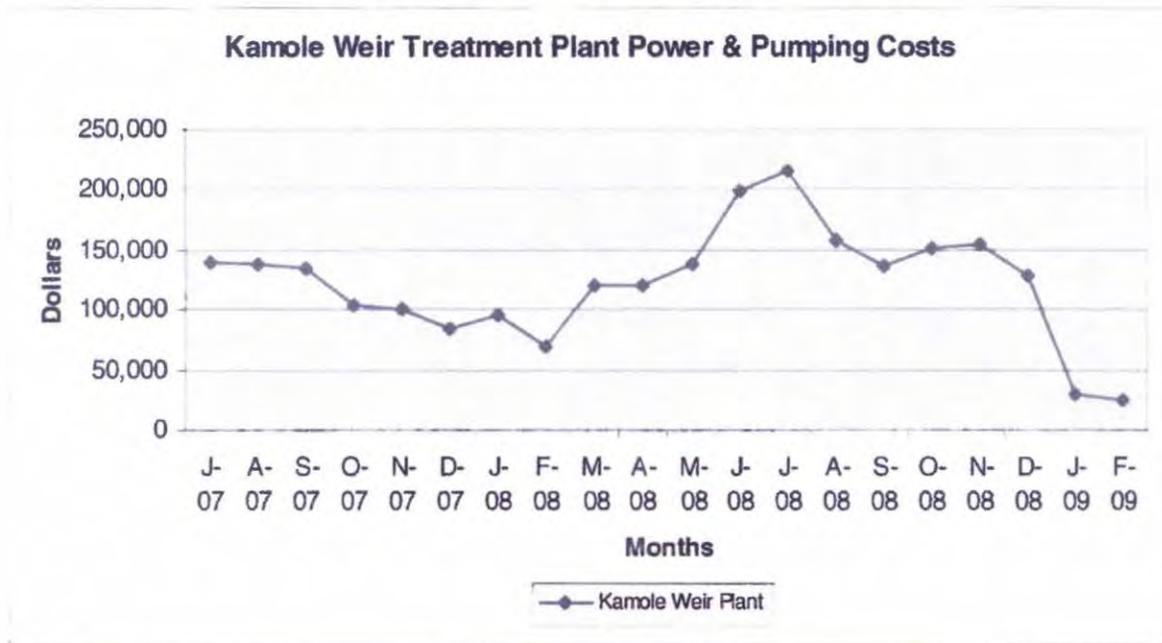


Figure 16 DWS Kamole Weir Treatment Plant Power & Pumping Costs (includes highlift pumps)

ECONOMIC IMPACT

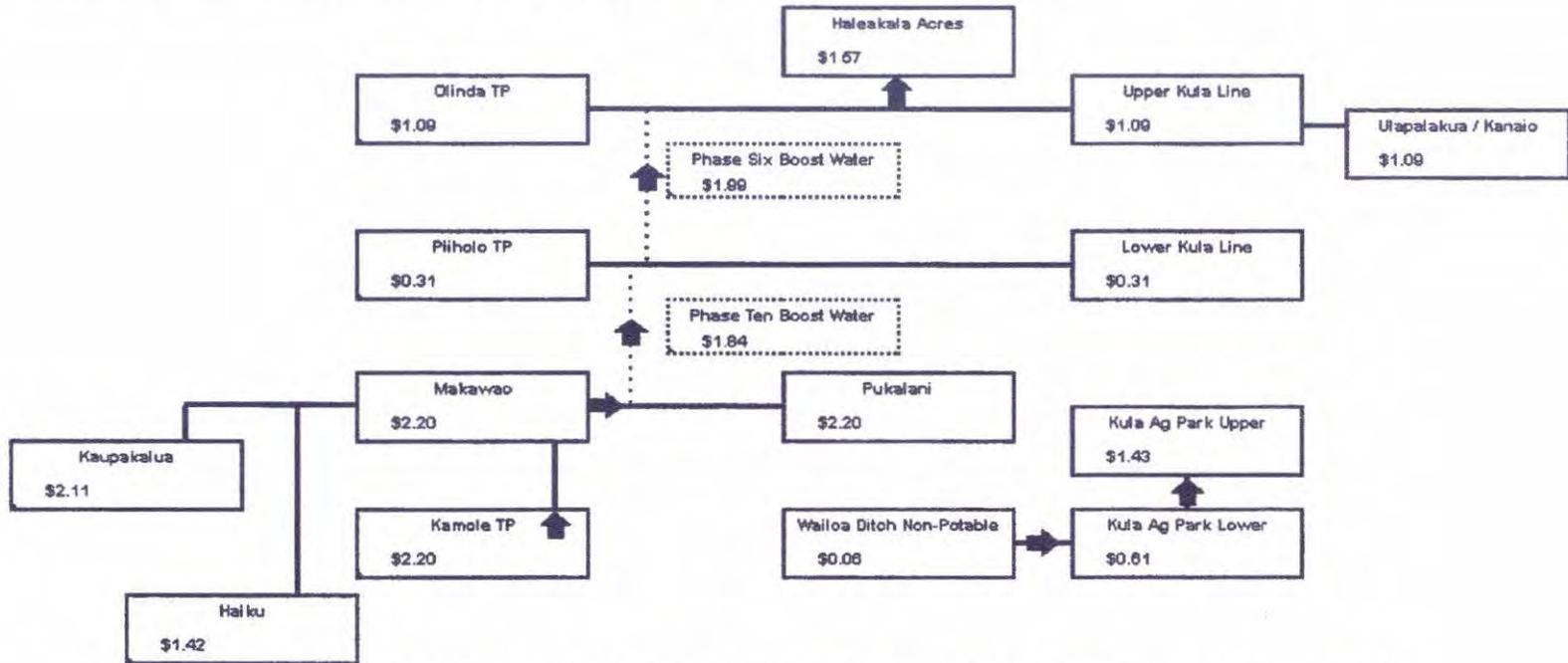
When water drops 25%, 50%, 75% or more

Power and Pumping Costs

Over 26% of DWS operating costs during 2007 were for power and pumping (more than 10.5 million dollars). With strong seasonal variation demands, power and pumping costs peak in summer months. Drought operations can run up hundreds of thousands in extra expenses. Power and pumping costs for the Kamole Weir Water Treatment Plant are higher than any others in the Upcountry system.

Figure 17 on the following page provides short-run marginal costs to serve 1,000 gallons of water at various elevations. These differences are almost entirely due to power and pumping.

Upcountry System Variable Operating Costs by Geographic Area (Short Run Marginal Costs)



The variable operating costs of producing and delivering water to each water tank on the DWS system was calculated. These costs are presented for several geographic areas in the chart below. Variable operating costs include the cost of electrical energy for water pumping and any other costs that vary directly with the amount of water produced. The cost shown for each area is the calculated variable water production cost per thousand gallons for the year 2008. Shaded boxes show water source production costs. Arrows show booster pumps. Dotted boxes show the additional costs of water boosted to higher elevations under some summer months and drought conditions.

Figure 17 Upcountry System Variable Operating Costs (Short Run Marginal Costs)

Table 11 DWS Power and Pumping Costs for Upcountry Water System Facilities

	N-07	D-07	J-08	F-08	M-08	A-08	M-08	J-08	J-08	A-08	S-08	O-08	N-08	D-08	J-09	F-09
Haleakala Acres Tank #36	782	795	1,004	1,448	1,467	1,066	1,029	1,372	1,328	1,202	1,589	1,334	997	754	867	608
Omaopio Steel Tank	83	84	89	147	93	93	149	98	164	172	103	105	162	149	86	120
Harry Field Tank #371	2,404	2,479	2,451	2,779	2,668	2,674	2,500	13,927	29,252	28,921	9,038	2,596	13,826	20,141	4,324	1,704
Mauka Estates Pump #1	43	44	46	47	47	46	49	48	48	49	50	49	49	47	47	45
Kealahou Tank 30K #401	43	42	47	47	47	47	46	50	49	48	49	49	48	47	47	44
Kula Kai Tank #358	3,199	2,746	3,483	3,350	3,578	3,628	3,654	17,063	29,959	29,525	5,802	3,796	15,675	19,388	3,637	2,038
Kula Ag Park A	9,718	6,054	7,854	7,898	10,174	10,622	10,812	14,021	12,640	12,795	15,732	14,789	11,640	7,857	5,008	3,251
Kula Ag Park B	12,024	7,326	10,339	10,085	12,946	12,137	12,570	15,294	15,114	15,588	17,416	17,975	13,291	8,609	6,106	4,877
Kula Ag Park Pump #3	26	26	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Kamole Weir Plant	100,749	84,166	95,028	69,245	120,581	120,740	138,763	198,199	214,998	157,749	136,898	151,157	155,280	128,067	29,180	23,861
Maluhia Tank #255	3,224	6,468	3,108	3,147	17,733	17,228	22,989	69,263	78,763	22,121	3,102	9,071	50,175	30,629	3,102	3,102
Pookela Tank #256	3,083	4,968	2,395	3,661	19,247	12,985	15,947	43,489	48,327	15,308	9,677	11,835	31,607	18,999	2,311	2,327
1285 Makawao Ave.	0	0	0	0	0	133	106	116	116	127	120	120	106	101	96	80
Olinda Tank 50K #254	2,944	6,235	3,120	3,159	14,852	14,848	21,523	63,563	70,575	21,011	3,134	7,990	42,114		3,134	3,134
Piiholo Main Line	26	26	27	28	28	28	28	28	28	28	28	28	28	28	28	28
A/C Kamole Storage Tank	26	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Kahakapao Reservoir	26	26	28	28	28	28	35	32	28	31	28	28	28	35	32	32
Lower Kula WTP	5,417	3,715	5,970	4,600	6,109	6,251	6,924	6,747	7,979	8,974	8,409	8,159	7,449	5,946	5,178	4,660
Haiku Well Pump Station	11,355	12,064	13,439	12,803	15,609	15,329	16,848	18,749	19,186	18,993	19,141	18,836	17,410	13,439	11,869	9,605
Olinda Road Pole #E69	46	46	50	50	50	50	50	52	52	52	54	52	51	50	49	46
Olinda WTP	13,323	9,743	13,771	11,324	15,305	16,142	17,035	14,598	2,611	4,434	24,662	22,199	11,466	5,801	12,111	10,128
Upper Kimo Tank	1,142	1,142	1,198	293	292	242	245	13,609	29,768	28,346	7,603	1,214	12,660	20,508	3,423	1,223
Lower Kula Booster	1,593	1,009	1,069	1,082	1,082	11,856	15,210	23,927	29,551	30,496	23,530	19,228	22,923	17,154	7,867	6,281
Kula Hwy. #3000	26	26	27	28	28	28	28	28	28	28	28	28	28	28	28	28
Kula Hwy. #2355	30	26	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Kula Res. Lots Bstr. Pumps	498	531	666	790	678	710	700	591	674	635	721	654	708	636	552	414
Kaupakalua Road Well	972	30,226	48,724	48,120	52,745	54,685	64,631	71,466	76,650	75,101	78,311	77,435	61,414	51,744	45,672	35,206
Holomua Rd., H'Poko	211	170	232	191	191	241	248	262	277	289	228	162	325	1,559	126	152
Olinda Rd. #E12 Pookela	3,211	5,774	3,457	3,900	4,487	3,093	4,409	44,024	77,381	7,403	28,735	3,066	59,122	17,501	4,806	3,875
Hamakuapoko Well #2	343	259	329	292	292	292	248	318	337	351	355	408	553	3,029	256	227

Agricultural Costs

Whenever there is low rainfall and surface water flows, agricultural production and income decrease. Planting and irrigation schedules are altered producing lower crop yields. More agricultural produce must be imported. Imported produce lose freshness and have added packaging and transportation costs. Local restaurants also depend heavily on local produce which include vegetables, fruits and livestock.

Recent agricultural losses:

- During the 1996 drought that affected Hawaii, Maui and Molokai, there were heavy damages to agriculture and especially to cattle. State-wide cattle losses totaled at least \$9.4 million.
- During the 1998-1999 drought, state-wide cattle losses were estimated at \$6.5 million.
- During the 2000-2002 drought, state-wide cattle losses were projected at \$9 million.
- A&B, Inc., mostly through HC&S, lost nearly \$13 million in 2008 as a result of lower yields due to prior droughts.
- A&B, Inc. anticipates even greater losses in 2009 due to prior droughts.

Development and Construction Costs

Maui County Administrative, Title 16, Chapter 106, Water Meter Issuance Rule for the Upcountry system states that there is a finding of insufficient water supply developed for fire protection, domestic and irrigation purposes to take on new or additional services without detriment to those already served in the regulated area.

Until additional water sources are added to the Upcountry system, future development will be limited in the both the Community Plan Upcountry District (Makawao-Pukalani-Kula) and the DWS Upcountry District for water service (Makawao-Hali'imaile-Pukalani-Kula-Haiku).

All of the capital plans currently under analysis for the Water Use and Development Plan represent an expenditure beyond the Department's current rates and fees. To meet anticipated demands while accounting for drought and/or the need to pump, DWS will have to invest on the order of \$9,000 per service for the source portion of the Water System Development Fee alone. The current fee of \$6,030 covers source, storage and transmission. So even in the absence of drought, planning for drought-prone conditions is expensive.

Restricting offstream uses

Offstream users include domestic and municipal, irrigation, industrial and hydroelectric. The County of Maui and DWS currently use surface water for domestic, municipal and irrigation purposes.

- **Domestic and municipal uses**
 - Under existing conditions, the Upcountry system is already prone to seasonal restrictions, which are exacerbated during drought conditions. Further restrictions on such use could create negative impacts to the community.
 - Among the municipal uses served by the DWS system are hospitals, schools,

and other important community facilities. Increasing the severity of restrictions on the Upcountry system could ultimately reach the point of affecting these crucial services.

- In fiscal year 2008, the Upcountry system served 9,853 meters in the “Upcountry” communities, including Makawao, Hali’imaile, Pukalani, Kula, Ulupalakua-Kanaio and Haiku.
 - The DWS Upcountry system also serves the Department of Hawaiian Home Lands, which would be adversely affected by further domestic and municipal restrictions.
 - Continued use of surface water from East Maui streams is consistent with state land use designations.
 - Continued use of surface water from East Maui streams is consistent with the Maui County General Plan. The General Plan objectives are “to provide an adequate supply of potable and irrigation water to meet the needs of Maui County’s residents” and “to make more efficient use of the our ground, surface and recycled sources”.
 - Continued use of surface water from East Maui streams does not interfere with the right of DHHL. DHHL does not have its own potable water source. The WATER CREDITS AGREEMENT between DHHL and DWS on December 9, 1997 supports DHHL’s Waiohuli-Keokea subdivisions by agreeing to provide 500,000 GPD of potable water.
 - Despite considerable effort to improve operating efficiency, limit additional commitments, and encourage conservation, DWS has been unable to supply sufficient and reliable potable water to meet seasonal demands for its Makawao-Pukalani-Kula District customers.
- **Irrigation use**
 - Article XI, Section 3, of the State Constitution, states that “The state shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands”.
 - The preservation of agricultural lands has been a key objective of the last several community plans for the Upcountry region. However, drought-prone conditions have already created problems for many farmers. Further restrictions to agricultural irrigation could have detrimental impacts to an already-staggering sector.
 - As noted earlier, the KULA AGRICULTURAL PARK WATER RESERVOIR AGREEMENT gives the County of Maui the right to withdraw up to 1.5 million gallons per day from EMI’s Hamakua Ditch. Non-potable water use for irrigation of agricultural farms requires that the water be pumped up to the park at varying points. The park has a total of 445 acres and supports 26 farms.
 - The majority of the farms on the Upcountry system utilize water that is treated at three water treatment plants. Most of these farms produce diversified agriculture or livestock.

Until more cost effective water sources are available for general and agricultural services served by the Upcountry system, the County of Maui and DWS continue to rely on surface

water from East Maui streams.

WATER USE EFFICIENCY

DWS has existing and pending programs to improve efficiency. Between fiscal years 2007 and 2008, the number of meters in the Upcountry system increased, while consumption dropped. In fairness, efficiency is only one of the factors that have contributed to this downward trend in consumption. The current downward trend in both general and agricultural consumption may be attributed to:

- Increase in rainfall during the months of February 2009 through April 2009
- DWS price structure and price increases
- Lower defacto population
- Decreased economic activity associated with the current recession
- Appeals for conservation by DWS
- DWS conservation program implementation
- Wet weather in recent months

Irrigation efficiency

● **Farm irrigation**

For most of the agricultural operations, including DHHL, on the Upcountry system, water use is potable. The exception would be the Kula Agricultural Park which uses non-potable water. Agricultural water rates are available for qualified operations. Most agricultural users utilize the most efficient irrigation techniques available.

The Natural Resources Conservation District has cooperative agreements with most of the Upcountry farmers for conservation and water as well as prevention of soil erosion. Although these agreements are voluntary, the NRCS provides expertise and assistance with improving efficiency.

● **Landscaping**

DWS co-funds operations of the Maui Nui Botanical Garden, and funded construction of its nursery and portions of other facilities and displays. They are a resource that provides expertise in the propagation and maintenance of native plants, promotes water conservation, irrigation and maintenance techniques, and serves as a major demonstration and educational facility.

DWS promotes conservation in its staff comment letters for discretionary projects by promoting:

- The use of climate-adapted native plants to conserve water and protect the watershed from degradation due to invasive alien species.
- The maintenance of fixtures to prevent leaks and the loss of water.
- The use of low-flow fixtures and devices in faucets, showerheads, urinals, water

- closets and hose bibs.
- The prevention of over-watering by automated irrigation systems by providing rain-sensors on all automated controllers. Check and reset controllers at least once a month to reflect the monthly changes in evaporation rates at the site. As an alternative, provide more automated, soil-moisture sensors on controllers.
- Limiting irrigated turf by using low-water use plants and ground cover.
- The use of brackish water or reclaimed water for dust control and for non-potable uses during construction.
- Looking for opportunities to conserve water. For example, use a broom instead of a hose to clear debris.

Ways to decrease water use and water needs

The Maui County Department of Water Supply is developing and expanding its conservation program, which includes both supply-side and demand-side measures.

Past experiences

Supply-side measures to date include leak detection, preventive and predictive maintenance, use of reclaimed water and alternate system backups and resource protective measures.

Leak Detection: Though the County has long practiced leak detection, due to staffing it has historically been primarily reactive. Leak detection staff were sent out when a leak was suspected, either based on system performance, or flow and pressure monitoring undertaken as part of hydraulic model development or other efforts. The Department now has a proactive program. A preliminary water audit by district has been completed and eighteen miles of distribution line has been surveyed in the first quarter of this year (versus ten in the same quarter last year). We are in the process of hiring additional leak detection staff and expect the pace to increase. Leak detection equipment includes digital correlating loggers, a digital correlator, a leak detector and a line tracer. More detection equipment is also in the FY2010 budget. Systematic survey and detection of leaks may be supplemented by flow and pressure monitoring as needed. Several major leaks have been identified and repaired.

Preventive & Predictive Maintenance: This is two pronged. Facilities are regularly maintained and pumps are periodically calibrated. In the course of such maintenance, facilities are regularly checked for signs of wear. DWS also has a system inventory with age, diameter and material of lines and other facilities. Based upon the status and performance of system facilities, upon known inventory status and demand trends, DWS maintains a 30-year project list. This can help to reduce unaccounted-for water in the system by targeting old and substandard lines for replacement.

Reclaimed Water Use: About 3.905 MGD is in use county-wide with 1.8 MGD utilized in South Maui. As part of its Water Use and Development Plan process, DWS is currently investigating the costs and benefits of large scale capital investment to further expand this use to offset potable use.

Back-up Sources: In the event of a major leak, most areas of the system can be served by other sources so that any key portion of the system could be valved off as needed.

Watershed and Resource Protection: The Department spent \$1,223,500 in FY2008. It has budgeted \$1,252,500 for FY2009 and \$1,256,000 for FY2010 to protect and monitor water resources, including more than \$600,000 on watershed protection. DWS also has co-funded studies to monitor stream flow, duration, temperatures, aquatic and ecologic features of East Maui streams in the recent past. Department staff give talks and run ads on the importance of watershed protection as well as co-sponsoring events at the Maui Nui Botanical Garden facility.

Demand-side measures to date include fixture distribution, a tiered rate structure, educational programs, and regulations as well as resource protection. Ongoing planning efforts are evaluating the benefits and costs of increased aggressiveness in these efforts.

Fixture Distribution: To date DWS has given out 36,713 low-flow showerheads, 33,596 bathroom aerators, 21,567 kitchen aerators, 19,763 self-closing hose nozzles, and many more leak detection dye tablets, versus a customer base of about 35,000 meters. Despite what would seem like high market penetration, estimated savings based on these giveaways is only about half a million gallons per day. More aggressive fixture distribution programs under consideration include audits and direct install programs, as well as rebates and incentives for larger appliances.

Audits/Retrofits: The Department co-funded its first direct install retrofits in the late 1990s with low flow toilets. However, no large scale programs were funded. More recently retrofit trials of high efficiency toilets have been started in the Central District. If these continue to prove successful, retrofits will expand to the Upcountry district. Ongoing retrofit trials include:

- Ka Hale A Ke Ola, a homeless resource center with about 70 units and two dormitories - 74 toilets, two urinals, 76 showers and 76 faucets have been retrofitted, and almost immediately realized substantial water savings.
- Hale Makana O Waiale is a low income housing complex with 200 units. Two hundred showerheads, 200 bathroom and kitchen aerators will be replaced with more water efficient models.
- All DWS properties and the 5th and 9th floors of the county building are being retrofitted with 10 waterless urinals and 22 dual flush toilets.
- DWS staff are working with the Department of Parks and Recreation staff to retrofit aquatic facilities with more efficient fixtures and conserve water in other ways.

The Water Use and Development Plan in progress is evaluating the costs and benefits of high efficiency fixture rebates and direct installation programs. Ongoing trials will help to provide some preliminary data on the effectiveness of some of these options. Longer term options for the future may also include review of various means of sub-metering multi-family units and multi-purpose buildings. Studies indicate that metering un-metered units is among the most effective conservation measures, by billing explicitly for use rather hiding this cost in the rent.

Conservation Pricing: DWS currently has a tiered rate structure to encourage conservation. Data improvements under way could enable the Department to move forward a more

aggressive tier structure.

Regulation: The Maui County has the following existing regulations and rules that support conservation: 1) Prohibition of discharging cooling system water into the public wastewater system; 2) Requirements that low-flow fixtures are required in new development; 3) Requirements that all commercial properties within 100 feet of a reclaimed water line utilize reclaimed water for irrigation and other non-potable uses; 4) A water waste prohibition with provision for discontinuation of service where negligent or wasteful use of water exists; 5) A provision enabling the water director to enact special conservation measures in order to forestall water shortages. In addition, a comprehensive conservation ordinance has been drafted, and may be implemented in stages. Discussions with various consultants about how to phase such implementation is under way. Though the draft is fairly comprehensive, initial provisions enacted may focus on simple measures which have been proven effective - such as limited landscape watering days.

Education and Behavior Modification: Conservation marketing efforts include ads run on all local radio stations and newspapers to encourage water conservation. The permit review process is also utilized as an educational tool, with use-specific conservation tips and location-specific landscape tips included in each review. The Department participates in about 25 public events per year, such as the County Fair, Earth Day and Taro festivals. In order to provide demonstration and an ongoing educational facility with demonstration and learning, the Department funds the operations of the Maui Nui Botanical Garden.

The local paper, the Maui News, publishes a weekly update of water use, including past use, for all districts within the County of Maui. It also has surface water and storage capacities, and water treatment plant production (for Upcountry systems) and rainfall data.

Expanded education and marketing efforts under consideration include targeted marketing survey and campaign development, a hotel awards program, a building manager users group, and an agricultural users group.

In addition to the previously mentioned items, DWS also promotes the utilization of low-flow fixtures and devices, and the maintenance of fixtures to prevent leaks in its comment letters on discretionary projects.

Landscaping: Maui DWS co-funds operations of the Maui Nui Botanical Garden, and funded construction of its nursery and portions of other facilities and displays. This provides a resource for promoting expertise in propagating and maintaining native plant materials, helps to increase the potential marketability of appropriate plants, promotes a conservation ethic, provides training on appropriate propagation, planting, irrigation and maintenance techniques, and generally helps to increase the likelihood of successful appropriate landscapes with a "Hawaiian Sense of Place". It also helps protect watersheds by promoting native and non-invasive plants over potentially invasive species, providing for educational opportunities on the importance of the watershed and how to protect it, and serving as a major demonstration and educational facility. The nursery is also a source of native plants for the Department outreach projects and give-aways. The Department developed (with help from the arborist committee) and prints a brochure entitled "Saving Water in your Yard, What and How to Plant in your

Area", which is distributed by the Maui Nui Botanical Garden as well as by the Department at events and permit reviews. Future plans for landscape conservation include a conservation ordinance, landscape audit and retrofit program, and smaller satellite demonstration projects. DWS is also investigating the costs and benefits of major capital expenditure in reclaimed water transmission to offset use of potable water in South Maui landscapes. The pending conservation ordinance includes mandatory watering schedules and irrigation efficiency measures among other requirements.

Ongoing Planning Efforts: Source options considered as part of the Water Use and Development Plan process will include consideration of extensive conservation measures as a source supply. In order to displace or delay source development, an aggressive program is required. Preliminary design of such a program is ongoing as part of the Water Use and Development Plan process. Anticipated program elements include targeted audit and direct install programs, rebates and incentives, expanded conservation requirements for landscaping and other uses, expanded marketing efforts including user groups, such as a hotel awards program, a building manager information program, agricultural user working groups/services, as well as energy production and efficiency measures, continued watershed protection and restoration, and possible major capital expenditure to support reclaimed water use.

Future

- A second conservation specialist is currently in recruitment.
- A comprehensive water conservation ordinance has been drafted that would require more efficient landscape irrigation practices, as well as retrofit on resale and other measures. This ordinance is in draft form and undergoing review. Based on the advice of conservation professionals, it will be broken out in phases rather than attempt to pass the entire program at once.
- DWS will continue its implementation of a declaration of drought in varying stages as a management measure to control water use.
- The Water Use and Development Plan for the Makawao-Pukalani-Kula District, as well as other county districts, is considering extensive conservation measures as a supply source.
- Work is ongoing to fill data gaps and gather geographic and other information that will enable the Department to design a better-targeted and more steeply tiered water rate structure in the future.
- Expanded education and marketing efforts under consideration include targeted marketing survey and campaign development, a hotel awards program, a building manager users group, and an agricultural users group.

Future Changes

- **Changes in water use or needs**
 - The Maui County Farm Bureau does not envision major changes in farm acreage in the near future. Increase production will be dependent on the availability of water. However, it does anticipate a larger number of farmed deer.
 - As noted earlier, there are thousands of single family and multi-family units either planned/committed, planned/designated or proposed in the Makawao-Pukalani-Kula District. There are also hundreds of applicants on the Upcountry Water

Service list for subdivisions, building permit applications and water service requests. However, the previously mentioned Water Meter Issuance Rule for the Upcountry system prevents future development in the Makawao-Pukalani-Kula District until sufficient and new water sources are developed.

- **Changes in the capacity of the Upcountry water system**

- The County of Maui SIX YEAR CAPITAL PROGRAM includes the following projects that will increase system capacity.
 - Waikamoi Flume Improvements (FY 2010-2012) will rehabilitate and reconstruct an old and leaking existing structure which may add a considerable amount of surface water for the Olinda Treatment Plant.
 - Upcountry water storage (FY2011-2015) for the Lower Kula system.
- Other changes that will increase system capacity include:
 - Extensive conservation program to add source, including the retrofit of highly efficient low flow toilets as well as showerheads and kitchen and bathroom faucet aerators.
 - Cooperative ventures with the private sector for new ground water sources.
 - 1) ML&P's Pi'iholo Well - Although the well is completed, its production is lower than anticipated. Negotiations are ongoing.
 - 2) A&B, Inc. well for its Hali'imaile subdivision is still in its planning stage. Negotiations are ongoing.
- Water Use and Development Plan, Upcountry District, Final Candidate Strategies (draft) will offer future alternatives for increasing system capacity. These strategies include:
 - Expansion of raw water storage at Kamole for the Kamole Water Treatment Plant or Lower Kula for the Pi'iholo Water Treatment Plant
 - Full basal groundwater backup well
 - Limited growth with extensive conservation measures and keep demands within surface water system capacity
 - Expanded Kamole Water Treatment Plant capacity and volume
- Other measures that are considered in the plan include:
 - Watershed protection and restoration measures to help maintain healthy forests that add water to streams and the groundwater aquifers. DWS's current watershed grant funding includes the Tri-Isle RC&D, Maui Invasive Species Committee, The Nature Conservancy, and the East Maui Watershed Partnership. It also includes grant funding of the Leeward Haleakala Watershed Restoration Partnership.
 - Stream restoration measures that create a more balanced use of surface water. The County and DWS supports the establishment of instream flow standards for East Maui streams.



Figure 18 Land Use Policy Map for Makawao-Hali'imaile-Pukalani-Kula Showing Proposed Urban Growth Boundary



- Completed
- Planned / Committed
- Planned/ Designated
- Proposed

Figure 19 Planned Land Uses In Upcountry Region

**KULA AGRICULTURAL PARK
FINANCIAL ANALYSIS OF THE WATER SYSTEM**

Prepared for:

*County of Maui
Office of Economic Development*

**August 2013
(Revised May 2014)**

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EXHIBIT "B-004"

KULA AGRICULTURAL PARK
Financial Analysis of the Water System

I. Background

Created to promote the diversification of agriculture in upcountry Maui, the Kula Agricultural Park (KAP) currently consists of 31 farm lots ranging in size from 7 to 29 acres, for a total size of 445 acres. Construction of the KAP was completed in 1985.

Irrigation water is currently supplied to the KAP by pumping water from the Hamakua Ditch, which is owned by East Maui Irrigation (EMI), to two storage reservoirs located in the KAP. The two reservoirs have a storage capacity of approximately 5.4 million gallons (MG). Potable water is scarce on Maui and is generally not used for irrigation of crops.

Much of the original improvements installed in 1985 are still in use. Replacement of only the reservoir liners was completed in 2011. Various options to provide a more reliable supply of irrigation water to the KAP were investigated in a Preliminary Engineering Report (PER) prepared by Fukunaga and Associates, Inc., dated November 2006.

Ownership responsibility of the KAP currently resides with the County of Maui Office of Economic Development (OED). OED has an agreement with the County of Maui Department of Water Supply (DWS) whereby the DWS provides day-to-day operations and maintenance services and collects and keeps the revenues generated from the sale of water.

II. Purpose

The purpose of this report is to perform a financial analysis of the KAP water system. Over a 20 year period (2014-2034), revenue (income) will be compared to overall system costs.

III. Revenue

All consumption data was provided by the DWS. Using the data obtained for 2009, 2011 and 2012, a 20 year revenue projection was generated, beginning in 2014 and ending in 2034.

Billing is based on a water service fee and consumption charges. The water service fee is determined by meter size, as shown in Table 1.

The water service fee ranges from \$15.00 per meter per month for a 5/8" meter to \$1,000 per meter per month for an 8" meter. KAP services meters ranging in size from 5/8" to 2".

Table 1: FY 2014 Water Service Charge

5/8"	\$15.00
3/4"	\$22.00
1"	\$35.00
1.5"	\$68.00
2"	\$105.00
3"	\$195.00
4"	\$320.00
6"	\$635.00
8"	\$1,000.00

Consumption charges are in dollars per 1,000 gallons. Currently, for fiscal year 2014, the DWS charges \$1.15 per 1,000 gallons, over 15,000 gallons. However, according to account history (February 2011 to February 2013) provided by DWS, even if

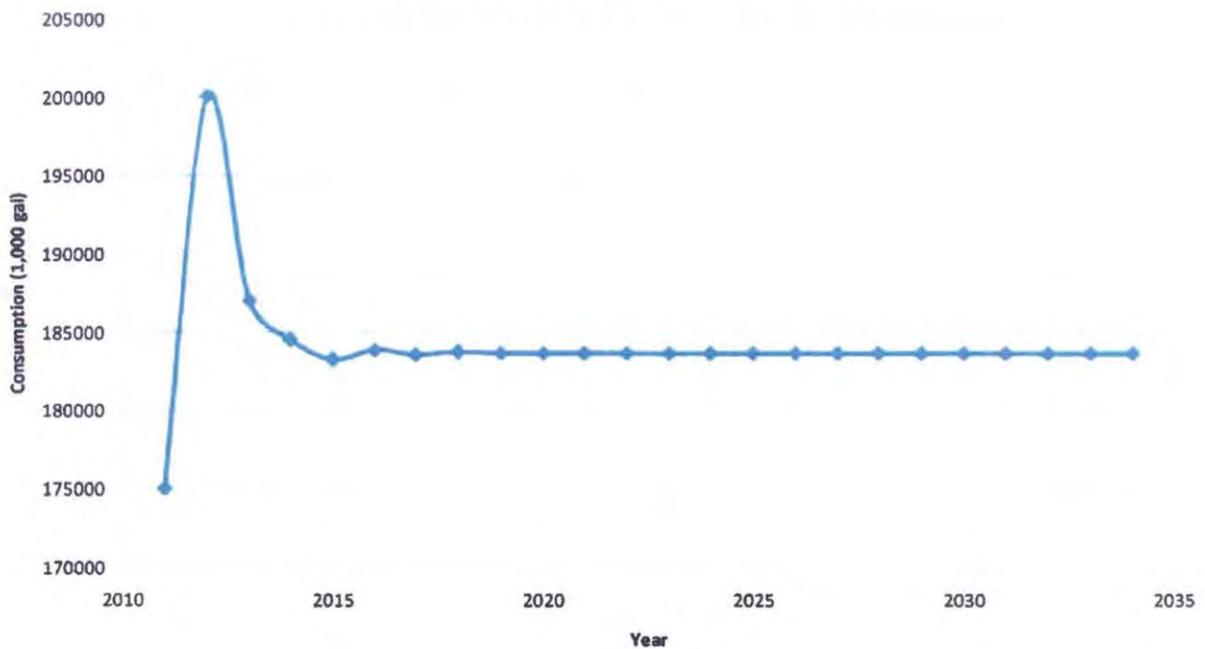
consumption falls below 15,000 gallons, customers still pay the prescribed agricultural consumption rate of \$1.15 per 1,000 gallons.

It was determined that over the course of three years (2009, 2011 and 2012), the water base charge increased annually at the start of each fiscal year. However, the rate at which the increase occurred could not be derived from the data provided. For the purposes of the 20 year revenue projection, the water base charge was increased at an annual rate of 5%, beginning at the start of fiscal year 2013.

In addition, it was also determined that over the course of three years (2009, 2011 and 2012), agricultural consumption charges have increased by 5 cents at the start of the fiscal year. For the purposes of this financial analysis, the agricultural consumption charge was increased annually at a rate of 5%, beginning at the start of fiscal year 2013.

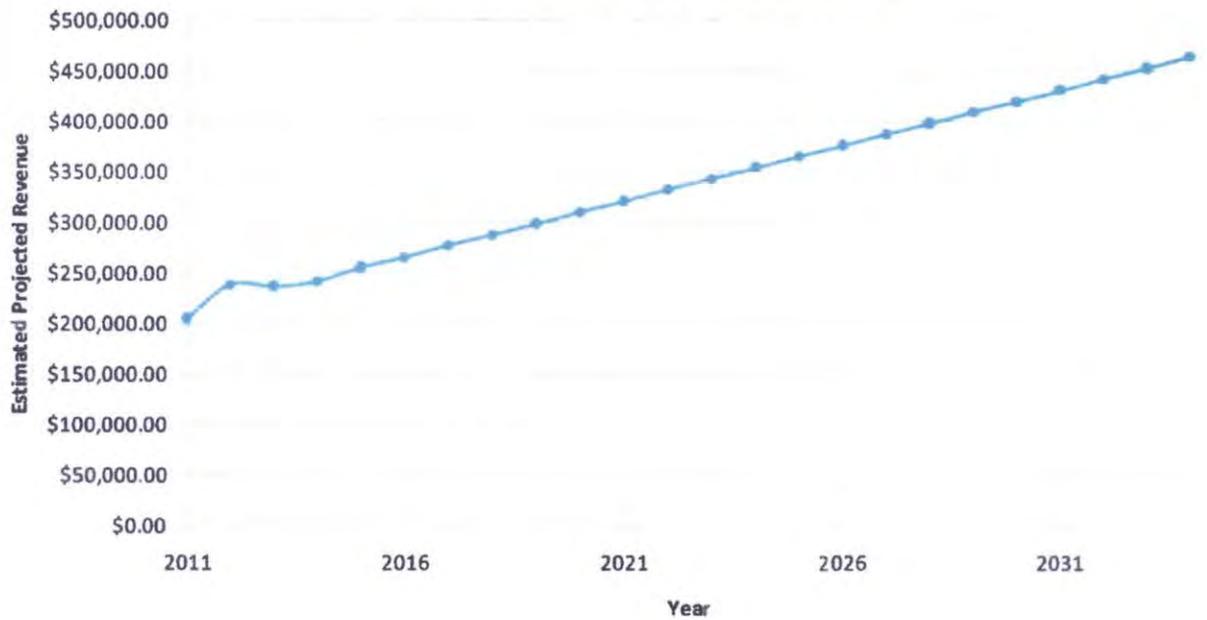
The consumption projection for each account was determined through averages. For example, consumption for 2013 was determined by averaging 2011 and 2012 consumption data provided by the DWS. Using the 2011 and 2012 data as a baseline, the consumption for 2014 was determined by averaging the consumption data for 2012 and 2013. The consumption for 2015 was determined by averaging the consumption data for 2013 and 2014, etc.

Figure 1: KAP 20 Year Projected Consumption



Over the course of the 20 year economic projection, the consumption approached 183,000 kgal/year in 2034, as shown in Figure 1. The projection for annual consumption is higher than the historical average (175,000 kgal) because the annual consumption for 2012 (200,122 kgal) was unusually higher than the historical average, skewing the subsequent consumption data that was projected over 20 years.

Figure 2: KAP 20 Year Projected Revenue



The curve derived for the 20 year projected revenue scheme is relatively linear, as shown in Figure 2. Following the year 2012, the consumption for each respective year was averaged; indicative of the linear pattern that is evident in the graph. However, for 2012, the data received did reveal an aberrant increase in consumption for that respective year.

IV. Costs

A. On-going Operations and Maintenance

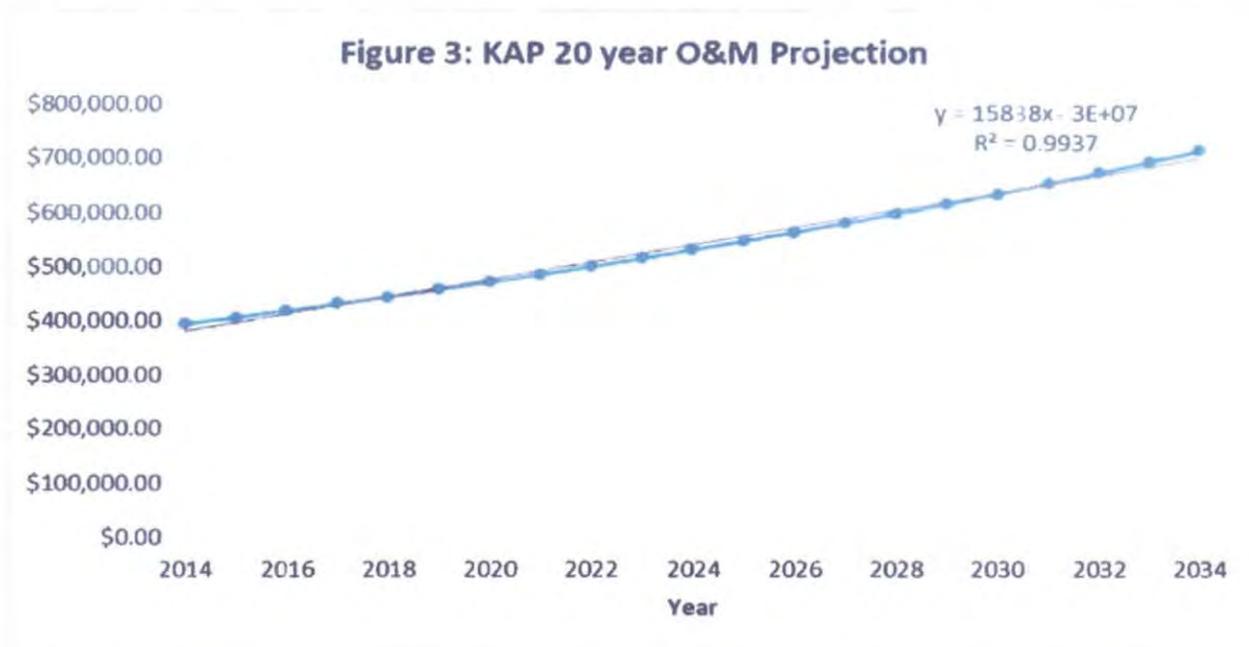
The operation and maintenance (O&M) costs associated with the KAP for 2011 were provided by DWS Operations and are summarized in Table 2. The electricity cost is for the calendar year 2013 and was provided by DWS.

Table 2: KAP O&M Costs

	300	6912.00	2000.00		
	150	3589.50	2000.00	365545.35	
	50	1335.50	1000.00		
		11837.00	5000.00	365545.35	\$382,382.35

The costs include labor, maintenance and electricity, associated with the 2 reservoirs and 2 pump stations. Labor costs do not include benefits. O&M for the ditch system and Reservoir 40 are performed by EMI.

O&M costs were increased at an annual rate of 3% to account for inflation. These costs assume the same number of hours will be needed in order to operate and maintain the system. The curve derived for the 20 year projected operations and maintenance costs are relatively linear due to the constant annual inflation rate increase. The 20 year O&M projection is shown in Figure 3.



B. Long-term Capital Requirements

Table 3 is a summary of the necessary long-term CIP improvements needed to replace the major components of the KAP. After over 28 years of operation, only the reservoir liners have been replaced. It is assumed that the remaining items (\$11.8 million) will have to be replaced, and amortized, over the 20 year study period.

Table 3: Summary of CIP and Associated Costs*

Item	Description	Cost (\$)
1	Replace Force Main	\$8,445,307.50
2	Replace Reservoir 40 PS	\$2,700,000.00
3	Replace Lower Reservoir Pumps	\$558,000.00
4	Replace Reservoir Liners**	\$700,000.00
TOTAL		\$11,703,307.50
		Say \$11,800,000

*Refer to Appendix A for a breakdown of the costs

**Replaced in 2011

Table 4 depicts an amortization schedule that was generated for the total cost of the required CIPs (Table 3). Using an annual annuity payment, an interest rate of 5%, a principal amount of \$11.8 million and a term of 20 years, the annual payment amounted to \$946,862.53, totaling \$18,937,250.58 at the end of the 20 year term.

Table 4: Loan Amortization Schedule for KAP CIPs

	Annual			
	5%			
	\$11,800,000.00			
	\$946,862.53			
	20			
	\$18,937,250.60			
1	\$590,000.00	\$356,862.53	\$946,862.53	\$11,443,137.47
2	\$572,156.87	\$374,705.66	\$946,862.53	\$11,068,431.81
3	\$553,421.59	\$393,440.94	\$946,862.53	\$10,674,990.87
4	\$533,749.54	\$413,112.99	\$946,862.53	\$10,261,877.89
5	\$513,093.89	\$433,768.64	\$946,862.53	\$9,828,109.25
6	\$491,405.46	\$455,457.07	\$946,862.53	\$9,372,652.18
7	\$468,632.61	\$478,229.92	\$946,862.53	\$8,894,422.26
8	\$444,721.11	\$502,141.42	\$946,862.53	\$8,392,280.85
9	\$419,614.04	\$527,248.49	\$946,862.53	\$7,865,032.36
10	\$393,251.62	\$553,610.91	\$946,862.53	\$7,311,421.45
11	\$365,571.07	\$581,291.46	\$946,862.53	\$6,730,129.99
12	\$336,506.50	\$610,356.03	\$946,862.53	\$6,119,773.96
13	\$305,988.70	\$640,873.83	\$946,862.53	\$5,478,900.13
14	\$273,945.01	\$672,917.52	\$946,862.53	\$4,805,982.60
15	\$240,299.13	\$706,563.40	\$946,862.53	\$4,099,419.20
16	\$204,970.96	\$741,891.57	\$946,862.53	\$3,357,527.63
17	\$167,876.38	\$778,986.15	\$946,862.53	\$2,578,541.49
18	\$128,927.07	\$817,935.46	\$946,862.53	\$1,760,606.03
19	\$88,030.30	\$858,832.23	\$946,862.53	\$901,773.80
20	\$45,088.69	\$901,773.84	\$946,862.53	\$0.00

V. Comparison of Revenue vs. Costs

Figure 4 and Table 5 depicts the annual "deficit" incurred when the annual O&M costs and the amortized CIP cost are subtracted from the annual revenue.

As figure 4 reveals, the annual deficit incurred would slowly decline over the course of the 20 year projection as annual revenues increase over time. This deficit would have to be covered by revenue from other sources, either from revenue from water sales from other systems or from general county, state or federal grants.

It may be that all of the CIP improvements desired in IV B above would not be necessary within the 20 year period ending in 2034. Nonetheless, because of the large cost of replacing the force main and the Reservoir 40 pump stations, installation of either of the improvements would still create a deficit situation.

Figure 4: KAP Annual Deficit

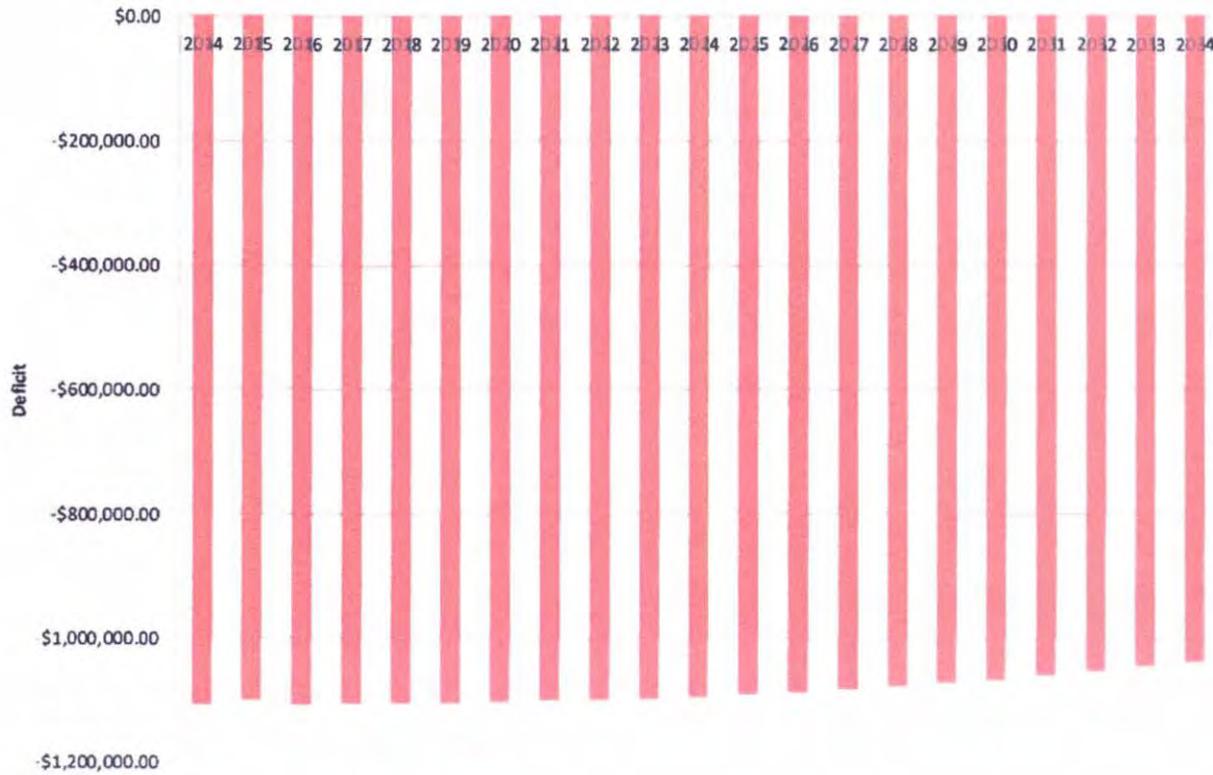


Table 5: KAP Annual Deficit

Year	Deficit
2011	
2012	
2013	
2014	-\$1,109,490.95
2015	-\$1,102,408.98
2016	-\$1,108,044.66
2017	-\$1,106,838.65
2018	-\$1,106,671.99
2019	-\$1,105,528.79
2020	-\$1,104,434.12
2021	-\$1,102,814.53
2022	-\$1,100,933.68
2023	-\$1,098,613.48
2024	-\$1,095,905.41
2025	-\$1,092,737.92
2026	-\$1,089,101.42
2027	-\$1,084,951.01
2028	-\$1,080,257.41
2029	-\$1,074,980.03
2030	-\$1,069,080.97
2031	-\$1,062,517.49
2032	-\$1,055,245.78
2033	-\$1,047,218.76
2034	-\$1,038,387.04

VI. Summary

The KAP has been in operation for over 28 years. Other than the replacement of the reservoir liners in 2011, the original transmission lines, distribution lines, pumps, motor controls, meters, etc. are by and large still being used. Currently, the day-to-day operations and maintenance expenses exceed water sales revenue. When future CIP project requirements are amortized into the income stream, major deficits loom (see Figure 4).

In the long term, sustainability of the KAP water system will depend on subsidies from other county, state or federal sources.

Appendix A: Cost Estimate

Fukunaga & Associates, Inc.	COST ESTIMATE				DATE: 14-Aug-13		SHEET	
Activity and Location:	Contract Number:				Job Number:			
Project:	Spec:		Checked By:		ID#:			
Kula Ag pump station	Estimated By: WM		Status of Design: Planning		PM Approval:		Category:	
Item Description:	QUANTITY		MATERIAL COST		LABOR COST		ENGINEERING ESTIMATE	
Replace Existing PS	NO	UNIT	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
DIVISION 2: SITE WORK								
Structural excavation	600	CY					\$ 150.00	\$ 90,000.00
Shoring	2300	SF	\$ 10.00	\$ 23,000.00	\$ 20.00	\$ 46,000.00	\$ 30.00	\$ 69,000.00
Subtotal Site Work							\$ 159,000.00	
DIVISION 3: CONCRETE								
Concrete	150	CY	\$ 550.00	\$ 82,500.00	\$ 375.00	\$ 56,250.00	\$ 925.00	\$ 138,750.00
5x3 hatch	1	EA	\$ 2,000.00	\$ 2,000.00	\$ 750.00	\$ 750.00	\$ 2,750.00	\$ 2,750.00
Stairs	25	EA					\$ 500.00	\$ 12,500.00
Subtotal Concrete							\$ 154,000.00	
DIVISION 11: EQUIPMENT								
Screens	2	EA	\$ 20,000.00	\$ 40,000.00	\$ 10,000.00	\$ 20,000.00	\$ 30,000.00	\$ 60,000.00
VTP	2	EA	\$ 80,000.00	\$ 160,000.00	\$ 50,000.00	\$ 100,000.00	\$ 130,000.00	\$ 260,000.00
Secondary Electrical	20	%						\$ 64,000.00
Subtotal Equipment							\$ 324,000.00	

DIVISION 15: MECHANICAL								
Trench & backfill	350	CY					\$ 200.00	\$ 70,000.00
12" swing check valve	3	EA	\$ 5,000.00	\$ 15,000.00	\$ 2,500.00	\$ 7,500.00	\$ 7,500.00	\$ 22,500.00
12" PV	6	EA	\$ 2,000.00	\$ 12,000.00	\$ 1,000.00	\$ 6,000.00	\$ 3,000.00	\$ 18,000.00
24" GV	1	EA	\$ 18,200.00	\$ 18,200.00	\$ 1,000.00	\$ 1,000.00	\$ 19,200.00	\$ 19,200.00
16" DIP	1100	LF	\$ 300.00	\$ 330,000.00	\$ 250.00	\$ 275,000.00	\$ 550.00	\$ 605,000.00
16" DIP 90 Elbow	4	EA	\$ 1,100.00	\$ 4,400.00	\$ 600.00	\$ 2,400.00	\$ 1,700.00	\$ 6,800.00
12x12x16 tee (DIP)	1	EA	\$ 700.00	\$ 700.00	\$ 400.00	\$ 400.00	\$ 1,100.00	\$ 1,100.00
16x16x16 tee (DIP)	1	EA	\$ 1,600.00	\$ 1,600.00	\$ 800.00	\$ 800.00	\$ 2,400.00	\$ 2,400.00
24x24x16 tee (DIP)	1	EA	\$ 3,800.00	\$ 3,800.00	\$ 1,200.00	\$ 1,200.00	\$ 5,000.00	\$ 5,000.00
Connect to existing 16" pipe	1	LS					\$ 1,000.00	\$ 1,000.00
Pipe supports	8	EA	\$ 1,000.00	\$ 8,000.00	\$ 500.00	\$ 4,000.00	\$ 1,500.00	\$ 12,000.00
ARV	2	EA	\$ 2,000.00	\$ 4,000.00	\$ 1,000.00	\$ 2,000.00	\$ 3,000.00	\$ 6,000.00
Support 24" pipe	1	EA	\$ 2,000.00	\$ 2,000.00	\$ 1,500.00	\$ 1,500.00	\$ 3,500.00	\$ 3,500.00
16" Core through wall	1	LS					\$ 2,000.00	\$ 2,000.00
Subtotal Mechanical								\$ 774,500.00
DIVISION 16: ELECTRICAL								
Electrical Distribution System	25	%						\$ 360,375.00
Subtotal Electrical								\$ 360,375.00
Site Work	10	%						\$ 180,187.50
Contingency	20	%						\$ 360,375.00
Neighbor Island Factor	15	%						\$ 270,281.25
TOTAL								\$ 2,612,718.75
							say	\$ 2,700,000.00

Kula Ag Park
Maui County: Office of Economic Development
Cost Estimate: Replace Existing Pumps @ Lower Reservoir

Item	Qty	Unit	Unit Cost	Subtotal
Pump & motor	2	ea	\$ 150,000.00	\$ 300,000.00
Column, tube, & shaft	20	lf	\$ 750.00	\$ 15,000.00
Remove existing pumps (includes rig mob/demob)	1	LS	\$ 150,000.00	\$ 150,000.00
Contingency	20%			\$ 93,000.00
TOTAL				\$ 558,000.00

MASTER WATER AGREEMENT

BY AND BETWEEN

EAST MAUI IRRIGATION COMPANY, LIMITED

and

HAWAIIAN COMMERCIAL & SUGAR COMPANY, LIMITED

AND THE

BOARD OF WATER SUPPLY

of the

COUNTY OF MAUI

December 22, 1961

EXHIBIT "B-005"

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THIS AGREEMENT made as of this 22nd day of December, 1961, by and between the EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation ("EMI"), whose post office address is Paia, Maui, and HAWAIIAN COMMERCIAL AND SUGAR COMPANY, LIMITED, a Hawaii corporation ("HC&S"), whose post office address is Puunene, Maui, hereinafter called "the Vendors", and the BOARD OF WATER SUPPLY of the County of Maui, a Board duly created and existing under the laws of the State of Hawaii, in the name of and on behalf of the COUNTY OF MAUI, a political subdivision of the State of Hawaii, whose post office address is Wailuku, Maui, Hawaii, which County of Maui is hereinafter called "the Vendee",

W I T N E S S E T H:

ARTICLE I

Water Rights

1. Sources of Water. The Vendors agree to deliver and the Vendee agrees to accept water at the following sources:

a. In the existing aqueduct system of the Vendee and from the flow in the natural channels (at points below the Haleakala Ranch Company pipeline and sources of supply therefor located at an elevation of approximately five thousand feet (5000')) within that portion of Haiku-Uka owned by the Vendors, the approximate boundaries of which are indicated in red on Exhibit A attached hereto; subject to prior existing rights of others, if any, to take such waters.

b. (1) In the eight inch (8") pipeline from the Awalau-Opana water development tunnels, ditches, springs and natural channels of the Vendors in the approximate

area indicated in green on said Exhibit A; and (2) In the four inch (4") pipeline from the Huluhulunui water development tunnel and springs in the approximate area indicated in yellow on said Exhibit A; subject to prior existing rights of others, if any, to take such waters.

c. From the Wailoa Ditch of EMI at the following points indicated in red on Exhibit B attached hereto: (1) In the six inch (6") pipeline connected in the cross cut in the Huluhulunui branch of the Kuiaha gulch; (2) In the eight inch (8") pipeline in Lilikoi gulch; and (3) In the four inch (4") pipeline connected to the pump sump drawing water in the Lilikoi gulch.

d. From the water systems of HC&S at the following points: (1) In the two inch (2") pipeline connected to the HC&S penstock and indicated in green on said Exhibit B; (2) In the two inch (2") pipeline connected to the HC&S Paia Village supply and indicated in yellow on said Exhibit B; (3) In the four inch (4") pipeline connected to the HC&S Paia Village and mill supply line and indicated in blue on said Exhibit B; (4) In the four inch (4") pipeline connected to the HC&S Hamakuapoko Village supply and indicated in orange on said Exhibit B; (5) In the pipeline connected to the HC&S Spreckelsville Village supply and indicated in brown on said Exhibit B; and (6) In the pipeline connected to the HC&S Puunene Village supply and not indicated on the Exhibits.

e. In the one inch (1") pipeline from the water development tunnel of EMI above the Koolau Ditch between Kahiwa and Makapipi gulches not indicated on the Exhibits.

f. It is understood and agreed that when the

four inch (4") pipeline at source lc(3) is not in use by the Vendee, measurement may be by-passed and said line used by EMI to convey water from source lb(2) into the Wailoa Ditch of EMI.

g. Delivery of water will be made only at the above listed sources, and at such additional points as may be agreed upon in writing by the parties, and the Vendee agrees to not enlarge the pipelines or otherwise increase the quantities of water withdrawn from said sources without the consent in writing of the Vendors.

2. Easements. a. For source la above the Vendors hereby grant to the Vendee an easement (1) for the existing aqueduct system of the Vendee and to extend, construct, operate, maintain and repair ditches, flumes, pipelines, pumps, dams and reservoirs and to tunnel at any suitable points within the drainage area (excepting, however, that portion tributary to the aforementioned Haleakala Ranch Company pipeline) for the conveyance of water to the Vendee's Kula pipeline, and/or Waikamoi pumping station, and (2) to maintain, operate and repair said Kula pipeline.

b. For sources lb throughle above, the Vendors hereby grant to the Vendee easements ten feet (10') in width (five feet (5') to the left and five feet (5') to the right of the center lines of the existing pipelines) over, under and across the lands owned by the Vendors for the conveyance of water and for the maintenance, operation, construction and repair of the Vendee's aqueduct system.

c. The easements granted in subparagraphs a and b above will be used by the Vendee in such manner so as to not interfere with the activities of the Vendors. Any or all of said easements and the installations lying

therein shall be moved to an alternate location at the Vendee's expense when required by the Vendors and on provision by the Vendors of a reasonably adequate alternate easement. Relocation of said easements will not be arbitrarily or capriciously required, but only when in the opinion of the Vendors the existing location of an easement presents an impediment to the higher and better use of the land on which it is located.

d. The Vendee agrees that it will maintain in good order and condition the gate to the westerly boundary of the Makawao Forest Reserve and will keep the same at all times locked with a suitable lock, except when authorized traffic is passing through said gate, and will provide keys to same for use by the Vendors. Entrance to the area shall be authorized by the Vendee only for its employees and other parties occupied in the construction, operation, maintenance and repair of the Vendee's water facilities, and such authorization shall be issued in accordance with the rules and regulations of the Department of Health of the State of Hawaii.

3. Quantities of Water. a. The Vendee shall be entitled to take from the below listed sources up to but not in excess of the below listed quantities of water per day:

<u>SOURCE</u>	<u>QUANTITY IN GALLONS</u>
la	5,000,000
lb	1,500,000
lc	800,000
ld	600,000
le	6,000

b. The Vendors do not guarantee the continuance or constancy of the water supply and shall not be liable in any manner for the failure of same or of any water

conveyance project which may be undertaken by the Vendee, and in case said supply shall prove or become inadequate, whether due to a diminution or failure either from natural causes or because of any taking of water therefrom by the Vendors or by any third parties, the Vendors shall not be required to acquire, develop, replace or otherwise provide or furnish any other or additional water on account thereof; provided, however, that neither the Vendors, nor any other parties claiming by, through or under them, or either of them, shall utilize water for power development in such fashion or to such extent so as to prevent the Vendee from taking up to a maximum of five million (5,000,000) gallons per 24 hours by natural stream flow at the Waikamoi Main Line Intake and/or at the Pump Station Intake, or so as to make it necessary for the Vendee to pump water from the three thousand foot (3000') level when said water is otherwise available at the Waikamoi Main Line Intake level.

c. In the event the total supply of water from all sources now enjoyed by the Vendors shall be materially reduced, either temporarily or permanently, by the exhaustion or diminution of the water supply from any source because of the failure, for any reason, of the Vendors to secure the renewal of any water license, lease or other rights now contributing to said total supply, whether or not said license, lease or other rights shall be connected with or directly affect the sources which are the subject of this agreement, and in consequence thereof any material portion of the supply otherwise deliverable hereunder is deemed to be necessary by the Vendors for their own use, the Vendors shall have the right in any such event

to use for their own purposes such portion or all of said water as may be deemed necessary by them; provided, however, that the Vendors shall give the Vendee at least one (1) year's written notice of said intended use.

4. Storage Reservoirs. a. EMI, for the purpose of enabling the Vendee to provide storage facilities for additional water for its Kula pipeline, hereby grants to the Vendee the right to enter in and upon the area of source 1a, but below the Haleakala Ranch Company's aforementioned pipeline, and to construct, maintain, operate and repair such reservoirs, dams, pipelines, pumping plants, flumes, ditches and other facilities within said area as may be deemed necessary by the Vendee for the collection and storage of water and the conveyance and pumping thereof to and from such reservoirs to the Kula pipeline, upon the understanding and condition that all such storage reservoir construction shall be made as leak proof as reasonably possible and that EMI shall be notified in writing of the Vendee's intention to construct such reservoirs, dams and other installations, and plans showing proposed location and details of construction shall be submitted to EMI and its approval obtained in writing, before any construction is undertaken. Should any storage reservoir in this water supply system prove to be leaky and to show a loss of over twenty per cent (20%) per month of water stored therein, it shall be by-passed immediately by conveying the water through or around such leaky reservoir by pipeline until the leaky condition of the reservoir has been corrected and the reservoir put back in reasonably water tight condition.

b. In the installation, construction and maintenance of such reservoirs, dams, pipelines, pumping plants, flumes, ditches and other facilities, the Vendee agrees that it will not unnecessarily damage or destroy forest growth, ground cover, fences or other property and that when at any time the natural forest growth or ground cover is removed, or any excavation or landslide occurs along the roads, trails, flumes, pipelines, ditches, pumping plants, reservoir sites, or other facilities in the area of the Vendee's operations, the Vendee will make provisions, satisfactory to the Vendors, to contain the mud, debris, or other moveable excavated material within the site, by proper dams, dikes or revetments which will prevent such material from being washed down into the streams and facilities by the heavy rainfall common to the area. Furthermore, the Vendee agrees that it will use every available means to prevent contamination or pollution of the water and that in the installation, maintenance and construction of its facilities, and in the taking of water, it will in all cases comply with the rules and regulations of the Department of Agriculture and the Department of Health of the State of Hawaii concerning the prevention of contamination or pollution, and that the Vendee will replant the area with suitable forest growth and ground cover so as to prevent soil erosion.

5. Term. The term of this agreement, subject to the covenants and conditions hereinafter contained, shall be from the first day of January, 1962, for the period of twenty-four (24) years and six (6) months then next ensuing, to and including the thirtieth day of June, 1986; provided,

however, that all easements and rights granted to the Vendee hereunder shall be extinguished at the end of the term hereof, or at such time as any or all of the easements and rights granted to EMI are extinguished under that certain agreement dated March 18, 1938 by and between the Territory of Hawaii and EMI, recorded in the Bureau of Conveyances of the State of Hawaii in Book 1435, Pages 1-12, whichever is sooner; and provided further, that all of such facilities presently constructed and to be constructed by the Vendee on its aqueduct system shall revert to the Vendors at the end of the term hereof, or at such time as any or all of the facilities presently constructed and to be constructed by EMI on their aqueduct system shall revert to the State under said agreement of March 18, 1938, whichever is sooner; notwithstanding the foregoing, all said easements and rights of way of the Vendee shall be extinguished and all said water facilities of the Vendee shall revert to the Vendors on abandonment or nonuse of the same for a continuous period of two (2) years or more.

6. Use of Water. Water taken by the Vendee from source 1a shall be used only for the purpose of supplying the Vendee's Kula pipeline system and Olinda lateral above the Awalau-Makawao supply line, except in an emergency and under conditions agreed to in writing by EMI. Water taken by the Vendee from all sources is to be subject to regulations by the Vendee, which shall stipulate that when the Vendors shall notify the Vendee that the total flow from all their ditches, reservoirs, water development tunnels, and natural stream flows into their aqueduct system has been diminished by natural causes or disaster or other circumstances

Waikamoi

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so that the total flow in the aqueduct system available for delivery to HC&S has been reduced to fifteen per cent (15%) of the normal capacity of the Maliko water delivery siphons of EMI, which for the purposes of this agreement shall be designated as 370 million (370,000,000) gallons per day, the Vendee shall restrict the use of water from all sources to only essential uses as designated by the Vendee.

7. Quality of Water. The Vendors shall exercise reasonable care in the course of their normal operations to prevent pollution of the water delivered at the various sources listed above, but shall not otherwise be responsible for the quality or potability of the water. The Vendee will exercise reasonable care to prevent pollution of the water in the areas of its operations.

ARTICLE II

Water Rates

1. Rates. a. The Vendee shall pay to the Vendors, net over and above any other fees, assessments or charges hereby payable by the Vendee with respect thereto, the below listed rates per thousand gallons for water from the below listed sources during the first nine years and six months of the term hereof up to and including June 30, 1971:

<u>SOURCE</u>	<u>PRICE</u>
1a	1.0 cents
1b	6.0 "
1c	4.0 "
1d	6.0 "
1e	4.0 "

b. For and during each of the five (5) year periods from July 1, 1971 to and including June 30, 1976, from July 1, 1976 to and including June 30, 1981, and from

July 1, 1981 to and including June 30, 1986, the water rates shall consist of such amounts per thousand gallons as shall be agreed to in writing by the Vendors and Vendee prior to the beginning of each of said periods, and if the Vendors and Vendee shall fail to reach such agreement prior to forty-five (45) days immediately preceding the commencement of each of said periods, then the water rates shall be such amounts per thousand gallons as shall be determined by appraisal, but in no event shall any of such water rates be less than the corresponding water rates in effect for the immediately preceding period.

2. Appraisal. Whenever this agreement provides that the water rates shall be determined by appraisal, the determination by appraisal for the purpose of setting the water rates shall be conclusive and such appraisal shall constitute the appraisal required hereby. Such appraisal shall be made by three (3) arbitrators appointed and constituted as provided hereafter in ARTICLE V hereof. The appraisal of water rates shall be based upon the then market value of the water for the uses authorized under the terms of this agreement.

3. Payment. The water rates herein reserved shall be paid by the Vendee, without any deduction, within ten (10) days of the presentation of bills to it to be rendered monthly by the Vendors.

4. Water Measurement. The Vendee shall install and maintain suitable meters or other measuring devices (hereinafter called "meters") satisfactory to the Vendors for the purpose of measuring the total amount of water delivered at all delivery points. The meters shall be

maintained within a two per cent (2%) accuracy and shall be tested every five years by the Vendee. Separate meters shall be installed by the Vendee to measure the water pumped into the Kula pipeline from each pump installed below said line and at all other points which may be required by the Vendors for a proper determination of the quantity of water being taken. Readings of the meters shall be taken and recorded by the Vendee at sufficient intervals so as to give a record in such form and degree of accuracy as is satisfactory to the Vendors. Reports of such readings shall be delivered by the Vendee to the Vendors at such intervals as shall be agreeable to the Vendors and the Vendors shall have the right at all times to inspect and make copies of the records of the Vendee and to make independent readings and verify all measurements taken by the Vendee. Where the Vendee operates a continuous water stage recorder or makes any other water measurements within any of the sources listed above, copies of all the flow charts and/or records of individual water measurements shall be furnished to the Vendors.

ARTICLE III

Covenants

The Vendee hereby covenants with the Vendors as follows:

1. Payment of Water Rates. The Vendee will pay all the water rates and other charges herein reserved in lawful currency of the United States of America at the times and in the manner aforesaid to the Vendors or to such other person or corporation as shall be designated by the Vendors in writing at least ten (10) days prior to the next

ensuing payment date.

2. Maintenance and Repair. The Vendee will, at its own expense from time to time and at all times during said term, well and substantially repair, maintain, amend and keep its water facilities, at any time during said term existing on the Vendors' land, with all necessary reparations and amendments whatsoever, in good order and condition and will not allow any unnecessary loss or waste of water. Ordinary wear and tear and unavoidable casualty are excluded from the provisions of this paragraph.

3. Observance of Laws. The Vendee will, during the whole of said term, observe and perform all laws, ordinances, rules and regulations whether now or hereafter made by any governmental authority for the time being applicable to said land or water or the use thereof, and will indemnify the Vendors against all actions, suits, claims and damages by whomsoever brought or made by reason of the nonobservance or nonperformance of said laws, ordinances, rules and regulations or of this covenant.

4. Waste and Unlawful Use. The Vendee will not make or suffer any strip or waste or unlawful, improper or offensive use of the Vendors' water or land or any part thereof.

5. Assignments. The Vendee will not, without the prior written consent of the Vendors, assign this agreement or any part thereof.

6. Costs and Expenses of Vendors. The Vendee will pay to the Vendors all costs and expenses, including reasonable attorneys' fees, incurred or paid by the Vendors in enforcing any of the covenants and conditions herein

contained, in collecting any delinquent water rates or other charges hereunder payable by the Vendee, or incurred by or imposed upon the Vendors by or in connection with any litigation commenced by or against the Vendee (other than condemnation proceedings) to which the Vendors shall, without fault, be made party.

7. Indemnity. The Vendee will indemnify and hold harmless the Vendors from and against all claims and demands for loss or damage, including claims for property damages, personal injury or wrongful death, arising out of or in connection with the use of the Vendors' land or water by the Vendee or any person claiming by, through or under it, or any failure of the Vendee to maintain its water facilities in a safe condition, and the Vendee will reimburse the Vendors for all costs and expenses, including reasonable attorneys' fees, paid or incurred by the Vendors in connection with the defense of any such claims. The provisions of this paragraph shall not be applicable to claims and demands caused by the wilful act or the negligence of the Vendors or the failure of the Vendors to comply with the provisions of this agreement.

8. Assumption of Risk by Vendee. The Vendee will and does hereby assume all risk of loss or damage to property of whatsoever kind or nature stored or placed by it or its agents on the Vendors' land and does hereby agree that the Vendors will not be responsible for loss or damage to any such property, and the Vendee hereby agrees to indemnify and save harmless the Vendors from and against any and all claims for such loss or damage, other than damage caused by the wilful act or negligence of the Vendors.

9. Extension of Agreement. Notwithstanding the provisions of paragraph 5 on page 7 of this agreement, this agreement shall be extended from time to time and shall remain in effect so long as EMI continues to enjoy the easements and rights granted to it by the then Territory of Hawaii under said agreement of March 18, 1938 and licenses issued thereunder; provided, however, that the rates to be paid by the Vendee to the Vendors for water taken during said extension or extensions shall be adjusted for each five (5) year period of such extended term in accordance with the provisions of ARTICLE II hereof; and provided further, that said extension or extensions shall not affect the reversionary rights of Vendors under said paragraph 5 but such adjusted rates shall not include compensation to the Vendors for the facilities of the Vendee which revert to Vendors under the provisions of said paragraph 5 unless and until the State of Hawaii shall include in the rates to be charged EMI for State water taken by EMI under licenses from the said State, compensation for facilities constructed by EMI under the provisions of the said agreement of March 18, 1938 and licenses issued thereunder, and which may revert to the State.

ARTICLE IV

Condemnation

1. Consequences of Condemnation. In the event at any time or times during said term the Vendors' land, or any part thereof or interest therein subject to this agreement, shall be taken or condemned by any authority having the power of eminent domain, then and in every such case all easements, rights and improvements of the Vendee in and upon any part of the Vendors' land so taken or condemned and all rights to

any water thereon shall at once be extinguished and/or revert to the Vendors.

2. Compensation and Damages. In every such case of taking or condemnation of the Vendors' land or any part thereof, all compensation and damages payable for or on account of said land shall be payable to and be the sole property of the Vendors, and the Vendee shall have no interest or claim to such compensation or damages or any part thereof whatsoever; and all compensation and damages payable for or on account of any buildings and other improvements on or erected on the demised land during said term and any plans and other preparations therefor shall be payable to the Vendors and the Vendee, as their respective interests shall appear, and said respective interests in such compensation and damages payable for or on account of any such building or other improvement shall be fixed and determined as of the date when the Vendee shall by reason of such taking or condemnation lose the right to possession of such part of the demised premises so taken or condemned as follows:

a. The interest of the Vendors therein shall be a proportionate amount of such compensation and damages in the ratio which the expired portion of the term of this agreement from the date hereof or the date of original completion of said building or improvement (herein called the "effective date"), whichever is later, to the date of such taking or condemnation, bears to the portion of said term from the said effective date to the date of expiration of said term;

b. The Vendee's interest therein shall be the balance of such compensation and damages after first deducting

therefrom the amount of the interest of the Vendors therein as hereinbefore defined;

Notwithstanding the provisions of this ARTICLE IV, the Vendee shall have the right to claim and recover from the condemning authority, but not from the Vendors, such compensation as may be separately awarded or recoverable by the Vendee with respect to all improvements upon the premises condemned which are removable and which would be classified as trade fixtures or other portable equipment and machinery used in connection with the rights granted to the Vendee herein.

ARTICLE V

Arbitration

If at any time during the term of this agreement or after the expiration or sooner determination thereof, any question, dispute, difference or disagreement shall arise between the parties hereto which cannot be adjusted or settled by them to their mutual satisfaction, then every such matter shall, at the desire of either party, be submitted to and be determined by three (3) arbitrators in the manner provided by Chapter 188 of the Revised Laws of Hawaii 1955, as the same now is or may from time to time be amended, in which case either party may give to the other party written notice of its desire to have an arbitration of the matter in question and appoint one of the arbitrators in said notice, whereupon the other party, within ten (10) days after the receipt of such notice, shall appoint a second arbitrator and, in case of failure so to do, the party who has already appointed an arbitrator may have the second arbitrator appointed by a judge of the Circuit Court of the Second Judicial Circuit of the State of Hawaii, and the two arbitrators so appointed, in either

manner, shall appoint the third arbitrator, and in the event that the two arbitrators so appointed shall, within ten (10) days after the appointment of the second arbitrator, fail to appoint the third arbitrator, either party may have the third arbitrator appointed by said judge, and the three arbitrators so appointed shall thereupon proceed to determine the matter in question and the decision of any two of them shall be final, conclusive and binding upon the Vendors and the Vendee unless the same shall be vacated, modified or corrected as by said statute provided. The arbitrators shall have all the powers and duties prescribed by said statute and judgment may be entered upon such award by the said Circuit Court as provided by said statute and said judgment shall not be subject to appeal. Each of the parties shall pay its own expenses but the compensation and expenses of the arbitrators shall be borne equally by both parties.

ARTICLE VI

Default

1. Events and Consequences of Default. This agreement is upon the express condition that if any one or more of the following events of default shall occur, to wit:

a. The Vendee shall fail to pay the water rates herein reserved or any part thereof within thirty (30) days after the same become due, or

b. The Vendee shall fail to observe or perform any other of the covenants herein contained and on the part of the Vendee to be observed and performed, and such failure shall continue for a period of sixty (60) days after written notice thereof given by the Vendors to the Vendee, then and in case of any such default the Vendors may, upon the occurrence of such

event of default or at any time thereafter during the continuance of such default, at its option, terminate this agreement by giving ten (10) days' written notice thereof to the Vendee, without resort to any legal process, all without prejudice to any other remedy or right of action which the Vendors may have for such default.

2. Acceptance of Water Rates Not Waiver. The acceptance of payment of water rates by the Vendors or their agents shall not be deemed to be a waiver by them of any breach by the Vendee of any covenant herein contained. The waiver by the Vendors of any breach shall not operate to extinguish the covenant or condition, the breach whereof has been waived nor be deemed to be a waiver by the Vendors of their right to terminate this agreement for any breach thereof.

ARTICLE VII

Miscellaneous

1. Definitions. The terms "party" and "parties" as used herein mean and include the Vendors (collectively) and the Vendee.

2. Notices. Any notice or demand to be given to or served upon either the Vendors or the Vendee in connection with this agreement shall be deemed to have been sufficiently given or served for all purposes by being sent as registered mail, postage prepaid, addressed to such party at its post office address hereinbefore specified or at such other post office address as such party may from time to time designate in writing to the other party, or by being delivered personally to any officer of such party within the State of Hawaii, and any such notice or demand shall be deemed conclusively to have been given or served on the date of such registration or

personal delivery.

3. Article and Section Headings. The article and section headings herein are inserted only for convenience and reference and shall in no way define, limit or describe the scope or intent of any provision of this agreement.

4. Successors and Assigns. All the terms, covenants, and conditions of this agreement shall inure to the benefit of and be binding upon the successors and assigns of the Vendors and the successors and permitted assigns of the Vendee to the same extent as said terms, covenants and conditions inure to the benefit of and are binding upon the Vendors and the Vendee respectively.

5. Cancellation of Prior Agreements. This agreement is intended to and shall cancel and terminate all previous water agreements in effect between the Vendors and the Vendee.

6. Private Contract. Nothing herein contained shall be construed as impressing this agreement with the character of a public service contract and no owner of any water privilege, domestic, commercial or otherwise, granted by the Vendee, shall have any right, title or interest in or to any of the water deliverable to the Vendee hereunder which shall be enforceable against or be binding upon the Vendors.

7. Rates Not Indicative. In the event of condemnation of any land or water rights in the areas covered by this agreement, the water rates contained in this agreement shall not be taken as indicative of the true value of the land or water rights, nor shall they be used for appraisal purposes on such taking.

8. Payment of Taxes and Other Governmental Charges. The Vendee will pay before the same respectively become

delinquent all taxes, rates, assessments, charges and other outgoings of every description which are now or may during said term be assessed (a) against source la or any part thereof or (b) on account of any rights granted hereunder to the Vendee, or to which source la (or any land or chattels of the Vendors on account of the granting of said rights) is now or may during said term become liable, whether assessed to or payable by the Vendors or Vendee. The Vendee will also pay the amount of the state general excise and/or sales taxes or other similar taxes levied or imposed upon the amount of the water rates payable hereunder; PROVIDED, HOWEVER, that nothing herein contained shall prevent the Vendee from contesting in good faith, by any appropriate proceedings commenced before the same becomes delinquent, the validity or amount of any such tax, rate, assessment or charge, nor require the payment thereof until the final determination of such contest adversely to the Vendee; PROVIDED, HOWEVER, that the Vendee will pay all such taxes, rates, assessments or charges, together with all interest, penalties, fines and costs accrued thereon or imposed in connection therewith, forthwith upon the commencement of proceedings to foreclose any lien on any land or chattels of the Vendors as security therefor or within such further time as may be duly allowed by any stay of such foreclosure proceedings; and PROVIDED, FURTHER, that if the Vendee shall fail to pay any such taxes, rates, assessments and charges as herein provided, the Vendors may at any time thereafter pay the same, together with any interest, penalties, fines and costs accrued thereon or imposed in connection therewith, and the Vendee will repay to the Vendors upon demand therefor the full amount so paid by the Vendors, together with

interest thereon at the rate of seven per cent (7%) per annum.

IN WITNESS WHEREOF, the parties hereto have caused these presents to be executed this 22nd day of December, 1961.

EAST MAUI IRRIGATION COMPANY, LIMITED

[Handwritten signature]
VICE-PRESIDENT

STATE OF HAWAII

CITY AND COUNTY OF HONOLULU)

On this 22nd day of December, 1961, before me appeared J. T. WATERHOUSE and R. G. JAMIESON, to me personally known, who, being by me duly sworn, did say that they are the VICE-PRESIDENT and TREASURER, respectively, of HAWAIIAN COMMERCIAL AND SUGAR COMPANY, LIMITED, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation, and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and the said J. T. WATERHOUSE and R. G. JAMIESON severally acknowledged said instrument to be the free act and deed of said corporation.
STATE OF HAWAII
CITY AND COUNTY OF HONOLULU)

On this 22nd day of December, 1961, before me appeared C. C. CADAGAN and W. E. SHEKHAN, to me personally known, who, being by me duly sworn, did say that they are the VICE-PRESIDENT and JUDICIAL SECRETARY, respectively, of EAST MAUI IRRIGATION COMPANY, LIMITED, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation, and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and the said C. C. CADAGAN and W. E. SHEKHAN severally acknowledged said instrument to be the free act and deed of said corporation.

[Handwritten signature]
Notary Public, First Judicial
Circuit, State of Hawaii
My Commission expires: Oct. 16, 1965

interest thereon at the rate of seven per cent (7%) per annum.

IN WITNESS WHEREOF, the parties hereto have caused these presents to be executed this 22nd day of December 1961.

EAST MAUI IRRIGATION COMPANY, LIMITED

By [Signature]
its VICE-PRESIDENT

By [Signature]
its

HAWAIIAN COMMERCIAL AND SUGAR COMPANY, LIMITED

By [Signature]
its VICE-PRESIDENT

By [Signature]
its TREASURER

BOARD OF WATER SUPPLY of the COUNTY OF MAUI

By [Signature]
its Chairman

By _____
its

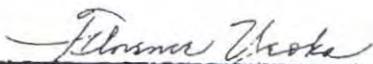
Approved as to form:

Kase Higa

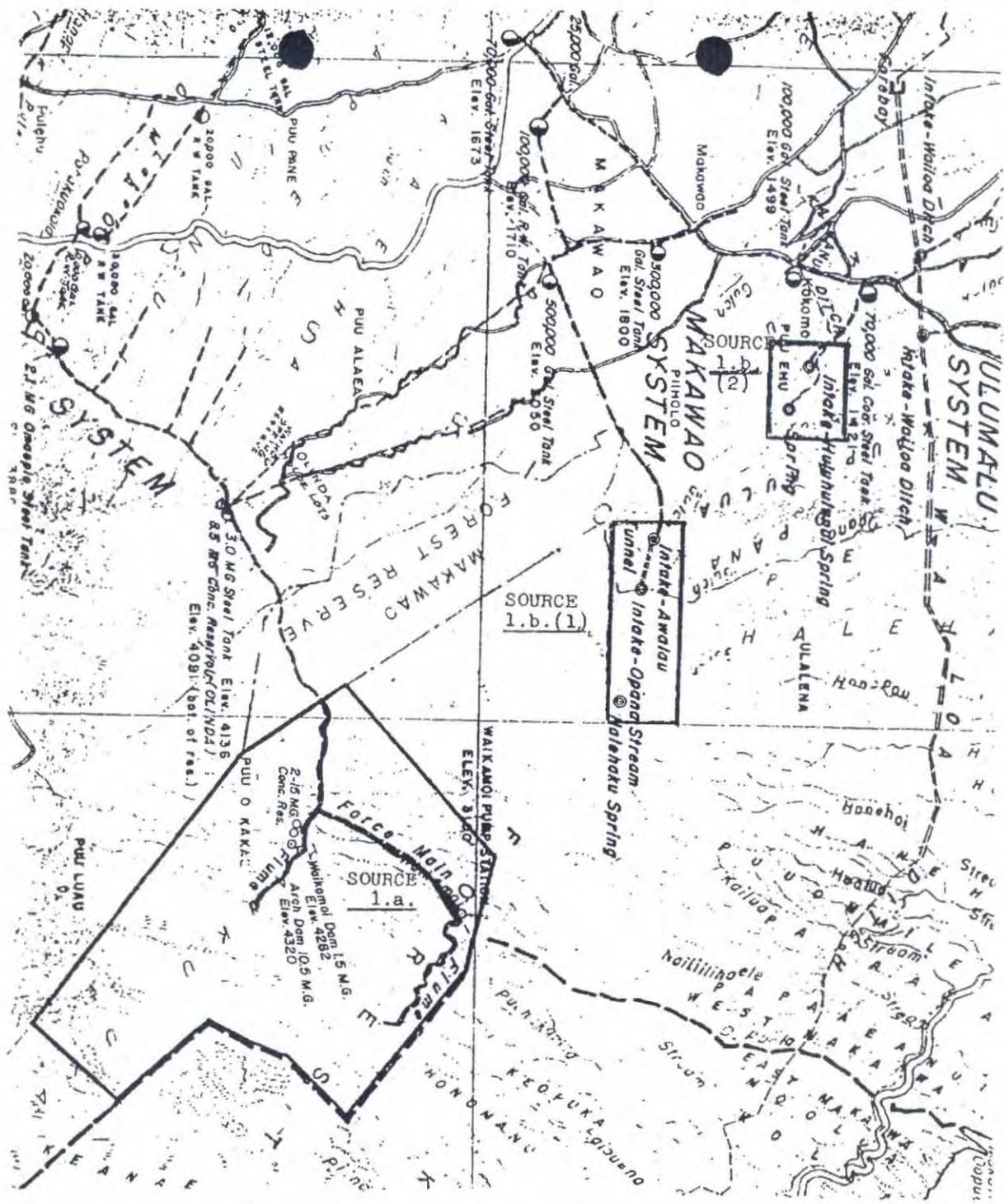
Deputy County Attorney
County of Maui.

STATE OF HAWAII)
) 52
COUNTY OF MAUI)

On this 22nd day of December, 1961, before me appeared FRANK MUNOZ, to me personally known, who, by me duly sworn did say that he is the Chairman of the Board of Water Supply of the County of Maui, a Board duly created and existing under the laws of the State of Hawaii, and that the foregoing instrument was signed on behalf of said Board of Water Supply of the County of Maui by authority of said Board, and the said FRANK MUNOZ acknowledged the said instrument to be the free act and deed of the said Board of Water Supply of the County of Maui.


Notary Public, Second Judicial
Circuit, State of Hawaii.

My commission expires 2/9/63.

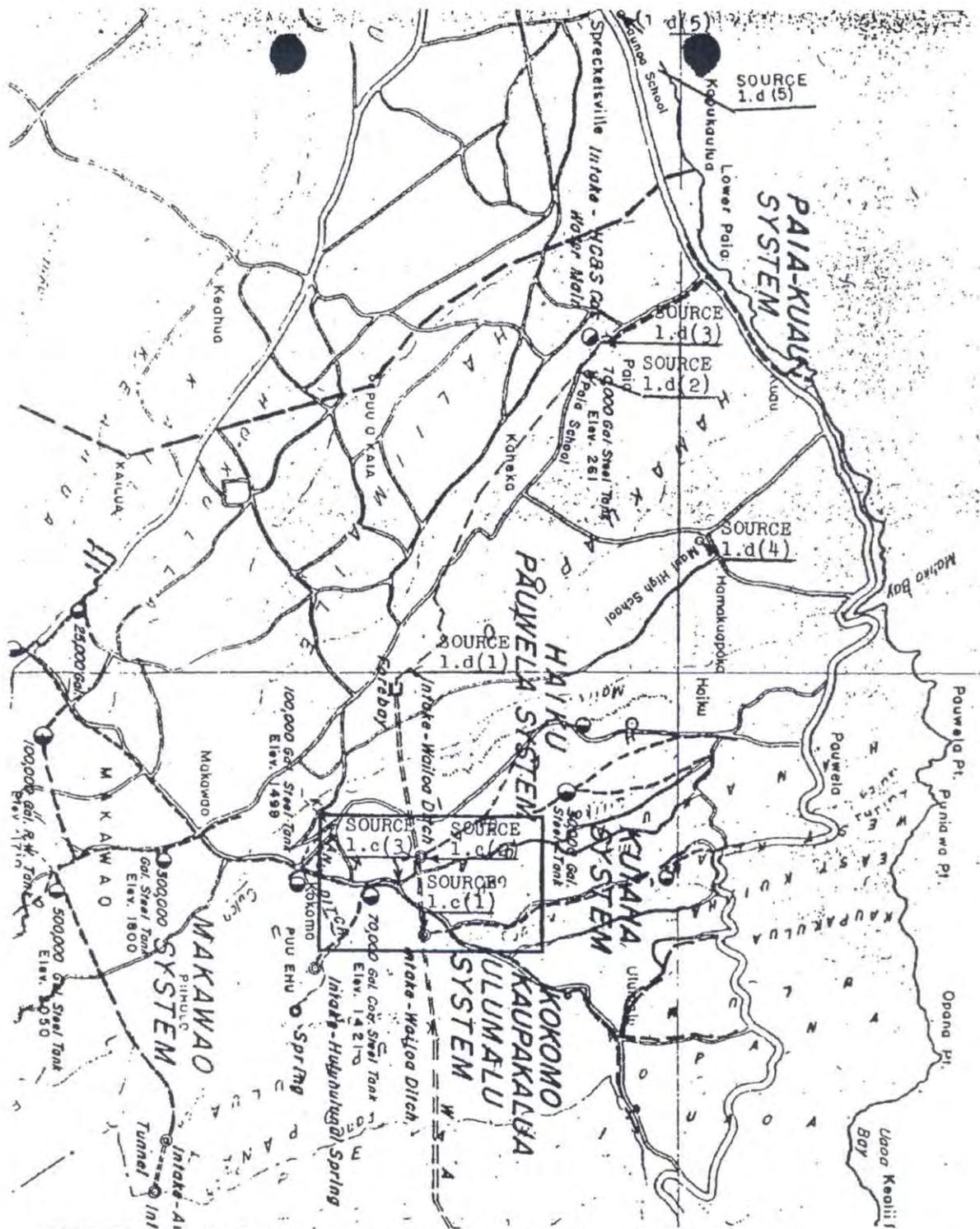


- SOURCE 1.a. Haiku-Uka Watershed of Vendors, indicated in red.
- SOURCE 1.b(1) Awalau-Opana water development tunnels, ditches, springs and natural channels of the Vendors, indicated in green.
- SOURCE 1.b(2) HC&S Huluhulunui water development tunnel and springs, indicated in yellow.

Approximate Scale 1" = 1 mile.

EXHIBIT "A"

Print from map of Vendee dated 9/30/53.



SOURCES 1.c. Walloa Ditch of EMI, indicated in red. (1): In the cross cut in the Huluhulunui branch of the Kulaha gulch. (2): In Liliko'i gulch. (3): Pump sump drawing water in the Liliko'i gulch.

SOURCES 1.d. HC&S Domestic water systems. (1): Penstock indicated in green. (2): Paia Village supply indicated in yellow. (3): Paia Village and mill supply line indicated in blue. (4): Hamakuapoko Village supply indicated in orange. (5): Spreckelsville Village supply indicated in brown. (6): Puunene Village supply not indicated on the Exhibit.

SOURCE 1.e. EMI water development tunnel above the Koolau Ditch near Makapipi not indicated on Exhibit.

Approximate Scale 1" = 1 mile.

Print from map of Vendeer dated 9/30/53.

EXHIBIT "B"

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM made as of the 31st day of December, 1973, by and between the BOARD OF WATER SUPPLY OF THE COUNTY OF MAUI, whose post office address is Kalana O Maui, Wailuku, Maui, Hawaii, hereinafter called BWS, and EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose post office address is Paia, Maui, Hawaii, hereinafter called EMI, and HAWAIIAN COMMERCIAL AND SUGAR COMPANY, a division of Alexander & Baldwin, Inc., whose post office address is Puunene, Maui, Hawaii, hereinafter called HC&S.

Background. At the present time EMI is the holder of three general licenses from the State of Hawaii covering the following areas: License No. 3505 (Nahiku), which license expires on June 30, 1976, General License No. S-3695 (Honomanu), which license expires June 30, 1986, and General License No. 3578 (Huelo), which license expires June 30, 1981. EMI also has a revocable permit for the Keanae area with the State of Hawaii, pending an offering for a new license for public bid sometime in 1974. The approximate locations of the respective license areas are indicated in Exhibit A attached hereto. Further, EMI, HC&S and BWS have entered into an agreement (herein called the "1961 Agreement") whereby BWS has the right to collect water in areas owned or leased by EMI and HC&S in the Waiakamoi area and the Awalau Intake area, the approximate boundaries of which are indicated in black on Exhibit B.

In order to establish a constant and steady flow of water for the continued growth and progress of the Island of Maui, the parties have agreed to the following terms and

EXHIBIT "B-006"

conditions concerning the collection and delivery of water by EMI in the east Maui area with respect to the properties under license by EMI with the State of Hawaii and also on properties owned by EMI to be used by BWS for public water purposes in the Kula and Nakawao and Nahiku water systems of BWS.

1. Nahiku. EMI will continue to collect and deliver to BWS at the rates provided herein up to 6,000 gallons of water per twenty-four hour day to serve the Nahiku community. The delivery point shall be the same point as presently used by EMI and BWS.

2. Waiakamoi and Awalau Areas. As of January 1, 1974, EMI will be appointed the exclusive manager to collect and deliver water in the area presently under license to BWS from EMI and WC&S, the approximate area of which is indicated in red on Exhibit B. Within that area EMI shall be responsible, at its expense, for the operation, maintenance, repair of the water collection and conveying facilities and the operation of the water storage and pumping facilities and shall collect at the highest elevation possible the maximum quantity of water that is economically feasible. EMI agrees at its expense and at its sole discretion to replace existing collection facilities or install additional collection facilities, or both, in order to improve the collection of water in this area. Any replacements to the existing collection facilities or any additional collection facilities installed by EMI shall belong to BWS upon completion of construction of each item.

Title to the existing water collection facilities installed by BWS shall remain with BWS. BWS shall be responsible for the maintenance of the storage facilities in this area

except that EMI shall perform minor maintenance on Puohokamoā dam and the three Waiakamoi dams. The portion of the system under the operational jurisdiction of BWS is colored in blue and under the operational jurisdiction of EMI is colored in red on the sketch attached hereto as Exhibit C.

EMI will at its expense from time to time and at all times during the term of this agreement, repair, maintain, amend and keep water collection facilities at any time during the term of this agreement existing within the collection area in good operational order and condition and will not allow unnecessary loss or waste of water.

Extensive and substantial damages to the collection and conveying and storage facilities owned by BWS as provided herein due to acts of God or events beyond the control of EMI requiring restoration or replacement of the facilities shall be the responsibility of BWS. Actual restoration and replacement of the existing facilities shall be subject to budgetary limitations of BWS which agrees to exercise reasonable judgment and good faith to include the costs, or portions thereof, of restoration and replacement in the ensuing budget or budgets. Actual restoration and replacement of additional facilities constructed by EMI shall be made at the discretion of BWS which decision shall be final and shall not be subject to arbitration.

At the end of the term of this agreement or sooner termination as provided herein, EMI shall surrender the collection and conveying facilities presently existing on the property together with any and all improvements or additional

facilities EMI may have installed to BWS in good operational order and condition, ordinary wear and tear or damages due to acts of God or beyond the control of EMI being excepted.

To the extent inconsistent with the terms of this agreement, the provisions of the agreement dated January 22, 1961, ("1961" Agreement") by and between the parties herein shall be cancelled and terminated by mutual agreement.

All water collected by EMI in the Waiakamoi and Awalau Intake areas shall be discharged into the following points:

Waiakamoi and Olinda Reservoirs
Waiakamoi Pump
Awalau Intake
Piholo Reservoir

The parties shall, if necessary, execute a more definitive agreement outlining the duties and responsibilities of each party consistent with the terms of this agreement.

3. Wailoa Ditch. From the waters collected by EMI in the Wailoa Ditch System EMI will make available to BWS up to ~~12 million gallons of water per twenty-four hour~~ period. ~~An additional 4 million gallons of water per twenty-four hour period as needed by BWS will be made available by EMI to BWS upon one year's written notice to EMI.~~

Waters from the Wailoa Ditch shall be delivered to BWS at the following points presently used by EMI and BWS:
Huluhulunui, Lilikoi and Kamole Forebay.

4. Proportionate Reduction. If EMI is not successful in acquiring or holding the licenses mentioned hereinabove or in the event of a court ruling or the adoption of any governmental statute, ordinance, regulation or policy including but not limited to the withdrawal by the State of any lands under license or the condemnation of any lands under license, reducing the amount of water collected or

delivered by EMI or affecting the capability of EMI to collect or deliver water, then subject to and with the approval of the BWS by a vote of 2/3 of the members present, the amount of water to be delivered to BWS hereunder may be reduced proportionately; provided that in the event EMI is not successful in acquiring or holding the licenses mentioned hereinabove, then BWS will approve a proportionate reduction only (1) if the replacement State license included a provision wherein the licensee is required to make the proportionate amount of water available to BWS and (2) after a vote of 2/3 of the members present at a meeting duly called.

5. Due Diligence. EMI agrees to comply with the terms of the existing State licenses and to use due diligence to acquire replacement licenses as the present licenses, including the Keanae license, expire and replacement licenses for the same area containing substantially similar terms, other than the rent, are offered for bid by the State. BWS agrees to request the State Board of Land and Natural Resources to include a provision in any replacement license that the licensee make available to BWS amounts of water consistent with this agreement.

6. Additional Delivery Points. Additional delivery points may be added from time to time as mutually agreed between the parties. In the event the parties fail to agree and a party desires another delivery point to be added, then the same shall be determined by arbitration as provided herein.

7. Water Charges. BWS shall pay to EMI the sum of six cents per thousand gallons delivered by EMI to BWS from the Nahiku and Waiakamoi and Awala'u Intake Systems and the Wailoa Ditch System. This rate shall remain fixed for the term of this agreement. After the lapse of fifteen (15) years of the term of this agreement, EMI may request for

an adjustment in the water charges due to increases in the cost to EMI of (1) payments to the State for water pursuant to the licenses mentioned herein; (2) fuel oil; (3) salaries and wages of EMI employees. BWS shall consider the request only after an affirmative vote of 2/3 of the members of the Board present at such meeting duly called agreeing to consider the request. In the event BWS should decide to consider the request by a vote of 2/3 of the members present, then BWS shall determine the request of EMI by a vote of 2/3 of the members present. The decision of BWS shall be final and shall not be subject to arbitration.

BWS shall install and maintain suitable meters or other measuring devices (hereinafter called meters) satisfactory to EMI for the purpose of measuring the total amount of water as provided herein. The meters shall be maintained within 2% accuracy and shall be tested every three years by BWS. Separate meters shall be installed by BWS to measure the water at any additional delivery point which may be required by EMI for a proper determination of the quantity of water being taken. Readings of the meters shall be taken and recorded by BWS at sufficient intervals so as to give a record in such form and degree of accuracy as shall be satisfactory to both parties. Reports of such readings shall be delivered by BWS to EMI at such intervals as shall be agreeable to the parties and EMI shall have the right at all times to inspect and make copies of the records of BWS and to make independent readings to verify all measurements taken by BWS. Where BWS operates a continuous water stage recorder which makes other water measurements within any of the sources listed above, copies of all the flow charts and/or records of individual water measurements shall be furnished to EMI.

BWS will pay the water charges herein mentioned in lawful currency of the United States at times and in the manner provided above to FMI or such other person or corporation as shall be designated by FMI in writing at least 10 days prior to the next ensuing payment.

8. Priority. BWS shall use insofar as practical all of the water collected in the Waiakamoi and Waiwala Intake Systems prior to pumping water collected at Kamole Forebay. ~~EMI shall give BWS priority in the use of water in fulfilling EMI's obligations set forth herein before any other private use.~~

9. Water Delivery. If the State of Hawaii requires in any replacement license to the licenses mentioned hereinabove that the licensee make available to BWS for public consumption and use certain portion of the water collected in the license area and the successful bidder is a person, partnership or corporation other than EMI or FCGS or any corporation affiliated with Alexander & Baldwin, Inc. and said licensee delivers said water to a convenient point of connection onto the Wailoa Ditch System, then FMI agrees to convey said water from the point of connection onto the Wailoa Ditch System to the points of delivery specified in this agreement to BWS free of any charge whatsoever.

10. Improvements to Wailoa Ditch System. FMI recognizes that improvements to the collection system for the Wailoa Ditch System may be necessary in order for EMI to provide the amount of water provided herein to BWS. EMI agrees that it shall at its expense make the necessary improvements as may be required. To the extent required by maintenance the parties recognize that portions of the Wailoa Ditch System may from time

to time be shut down for short periods of time. In such cases diversion of the water from one area to another may be necessary and each party shall cooperate with the other in order to permit the repair and maintenance of the Wailoa Ditch System.

11. Anti-Pollution. EMI agrees that it will use diligent efforts to prevent contamination or pollution of the water and that in the installation, maintenance and construction of collection facilities, and in the collection and delivery of water, it will in all cases comply with the rules and regulations of the Department of Land and Natural Resources, Department of Agriculture and the Department of Health of the State of Hawaii concerning the prevention of contamination or pollution. EMI shall not be otherwise responsible for the quality or potability of the water delivered to BWS according to the terms of this agreement.

12. Excuse of Performance. Anything in this agreement to the contrary notwithstanding, providing such cause is not due to the willful act or neglect of EMI, EMI shall not be deemed in default with respect to the performance of any of the terms, covenants and conditions of this agreement if same shall be due to any strike, lockout, civil commotion, war-like operation, invasion, rebellion, hostilities, military or usurped power, sabotage, governmental regulations or controls, inability to obtain any material, service, or financing, through act of God or other cause beyond the control of EMI.

13. Term. The term of this agreement shall be for twenty (20) years commencing January 1, 1974, and ~~terminating~~

~~terminating on December 31, 1993~~; provided, however, that this agreement may be extended from time to time by mutual agreement; provided further, that if any party decides not to extend the term of this agreement beyond December 31, 1993, then such party must give written notice of its decision to the other party prior to December 31, 1991; failure to provide such notice by December 31, 1991 shall extend, with the consent of the other party, this agreement for a period of two years if no notice is given by December 31, 1993, or if notice is given after December 31, 1991 but before December 31, 1993, then this agreement shall be extended, with the consent of the other party, for a period of two years from the date such notice was given.

14. Arbitration. Except as provided in paragraphs 2 and 7, if at any time during the term of this agreement or after the expiration or sooner determination thereof, any question, dispute, difference or disagreement shall arise between the parties hereto which cannot be adjusted or settled by them to their mutual satisfaction, then every such matter shall, at the desire of either party, be submitted to and be determined by three (3) arbitrators in the manner provided by Chapter 658 of the Hawaii Revised Statutes, as the same now is or may from time to time be amended, in which case either party may give to the other party written notice of its desire to have an arbitration of the matter in question and appoint one of the arbitrators in said notice, whereupon the other party, within ten (10) days after the receipt of such notice, shall appoint a second arbitrator and, in case of failure so to do, the party who has already appointed an arbitrator may have the second arbitrator appointed by a judge of the Circuit Court of the Second Judicial Circuit of the State of Hawaii, and the two arbitrators so appointed, in either manner, shall appoint

the third arbitrator, and in the event that the two arbitrators so appointed shall, within ten (10) days after the appointment of the second arbitrator, fail to appoint the third arbitrator, either party may have the third arbitrator appointed by said judge, and the three arbitrators so appointed shall thereupon proceed to determine the matter in question and the decision of any two of them shall be final, conclusive and binding upon the parties unless the same shall be vacated, modified or corrected as by said statute provided. The arbitrators shall have all the powers and duties prescribed by said statute and judgment may be entered upon such award by the said Circuit Court as provided by said statute and said judgment shall not be subject to appeal. Each of the parties shall pay its own expenses but the compensation and expenses of the arbitrators shall be borne equally by both parties.

15. Default. This agreement is upon the express condition that if any one or more of the following events of default shall occur, to wit:

- a. BWS shall fail to pay the water rates herein reserved or any part thereof within thirty (30) days after the same become due, or
- b. EMI shall fail to observe or perform any of the covenants herein contained and on the part of EMI to be observed and performed, and such failure shall continue for a period of sixty (60) days after written notice thereof given by BWS to EMI.

Then and in case of any such default EMI or BWS as the case may be, may, upon the occurrence of such event of default or at any time thereafter during the continuance

of such default, at its respective option, terminate this agreement by giving ten (10) days' written notice thereof to the defaulting party without resort to any legal process, all without prejudice to any other remedy or right of action which the other party may have for such default.

In addition the parties agree to enter into discussions for the purpose of entering into an alternate default provision in the event of default by EMI.

16. Acceptance of Water Rates Not Waiver. The acceptance of payment of water rates by EMI or its agents shall not be deemed to be a waiver by it of any breach by BWS of any covenant herein contained. The waiver by any party of any breach shall not operate to extinguish the covenant or condition, the breach whereof has been waived nor be deemed to be a waiver by such party of its right to terminate this agreement for any breach thereof.

17. Miscellaneous.

a. Definitions. The terms "party" and "parties" as used herein mean and include EMI, HC&S and the BWS.

b. Notices. Any notice or demand to be given to or served upon a party in connection with this agreement shall be deemed to have been sufficiently given or served for all purposes by being sent as registered mail, postage prepaid, addressed to such party at its post office address hereinbefore specified or at such other post office address as such party may from time to time designate in writing to the other party, or by being delivered personally to any officer of such party within the State of Hawaii, and any

such notice or demand shall be deemed conclusively to have been given or served on the date of such registration or personal delivery.

18. Successors and Assigns. All the terms, covenants, and conditions of this agreement shall inure to the benefit of and be binding upon the successors and assigns of all parties.

19. Private Contract. Nothing herein contained shall be construed as impressing this agreement with the character of a public service contract and no owner of any water privilege, domestic, commercial or otherwise, granted by BWS, shall have any right, title or interest in or to any of the water deliverable to BWS which shall be enforceable against or be binding upon EMI.

20. Rates Not Indicative. In the event of condemnation of any land or water rights in the areas covered by this agreement, the water rates contained in this agreement shall not be taken as indicative of the true value of the land or water rights, nor shall they be used for appraisal purposes on such taking.

21. Amendment. This agreement may be amended by mutual agreement in writing executed by both parties.

22. Consent. To the extent required by the above-mentioned State licenses the participation of EMI in this agreement is subject to the approval of the Board of Land and Natural Resources of the State of Hawaii.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed this 31st day of December, 1973, effective as of December 31, 1973.

BOARD OF WATER SUPPLY OF
THE COUNTY OF MAUI

By David Kamejo
Its

EAST MAUI IRRIGATION COMPANY,
LIMITED

By William S. Ham
ITS VICE-PRESIDENT

By Philip Smith
ITS VICE-PRESIDENT

ALEXANDER & BALDWIN, INC.

By Michael C. H. H.
ITS EXECUTIVE VICE-PRESIDENT

By Willis R. Deming
ITS SECRETARY

STATE OF HAWAII)
) ss.
COUNTY OF MAUI)

On this 31st day of DECEMBER, 1973,

before me appeared DAVID NOBRIGA, to me personally known, who, being by me duly sworn, did say that he is the Chairman of the BOARD OF WATER SUPPLY OF THE COUNTY OF MAUI, and that the seal affixed to the foregoing instrument is the seal of said Board of Water Supply and that the instrument was signed and sealed in behalf of said Board of Water Supply by authority of

the said Board, and said DAVID NOBRIGA acknowledged the instrument to be the free act and deed of said Board of Water Supply.

Flannery Chokwa
NOTARY PUBLIC, Second Judicial
Circuit, State of Hawaii.

My commission expires: 2/9/75

STATE OF HAWAII)
) ss.
COUNTY OF MAUI)

On this 31st day of December, 1973,

before me appeared William S. Harris and
Phil Seal, to me personally known, who,
being by me duly sworn, did say that they are the
Vice President and Vice President

respectively, of EAST MAUI IRRIGATION COMPANY, LIMITED, a
Hawaii corporation; that the seal affixed to the foregoing
instrument is the corporate seal of said corporation; that
said instrument was signed and sealed in behalf of said
corporation by authority of its Board of Directors and
said Officers acknowledged said instrument to be the free
act and deed of said corporation.

Kiyoshi K. Kawanishi
NOTARY PUBLIC, Second Judicial
Circuit, State of Hawaii.

My commission expires: 1/10/75

STATE OF HAWAII)
CITY AND COUNTY OF HONOLULU) ss.

On this 31st day of December, 1972,
before me appeared Michael Ulysses and
Willis R. Deming, to me personally known, who,
being by me duly sworn, did say that they are the
Executive Vice President and Vice President Secretary,
respectively, of ALEXANDER & BALDWIN, INC., a Hawaii cor-
poration; that the seal affixed to the foregoing instru-
ment is the corporate seal of said corporation; that said instru-
ment was signed and sealed in behalf of said corporation
by authority of its Board of Directors and said Officers
acknowledged said instrument to be the free act and deed
of said corporation.

Patricia M. Hono
NOTARY PUBLIC, First Judicial
Circuit, State of Hawaii.

My commission expires: 10/1/76

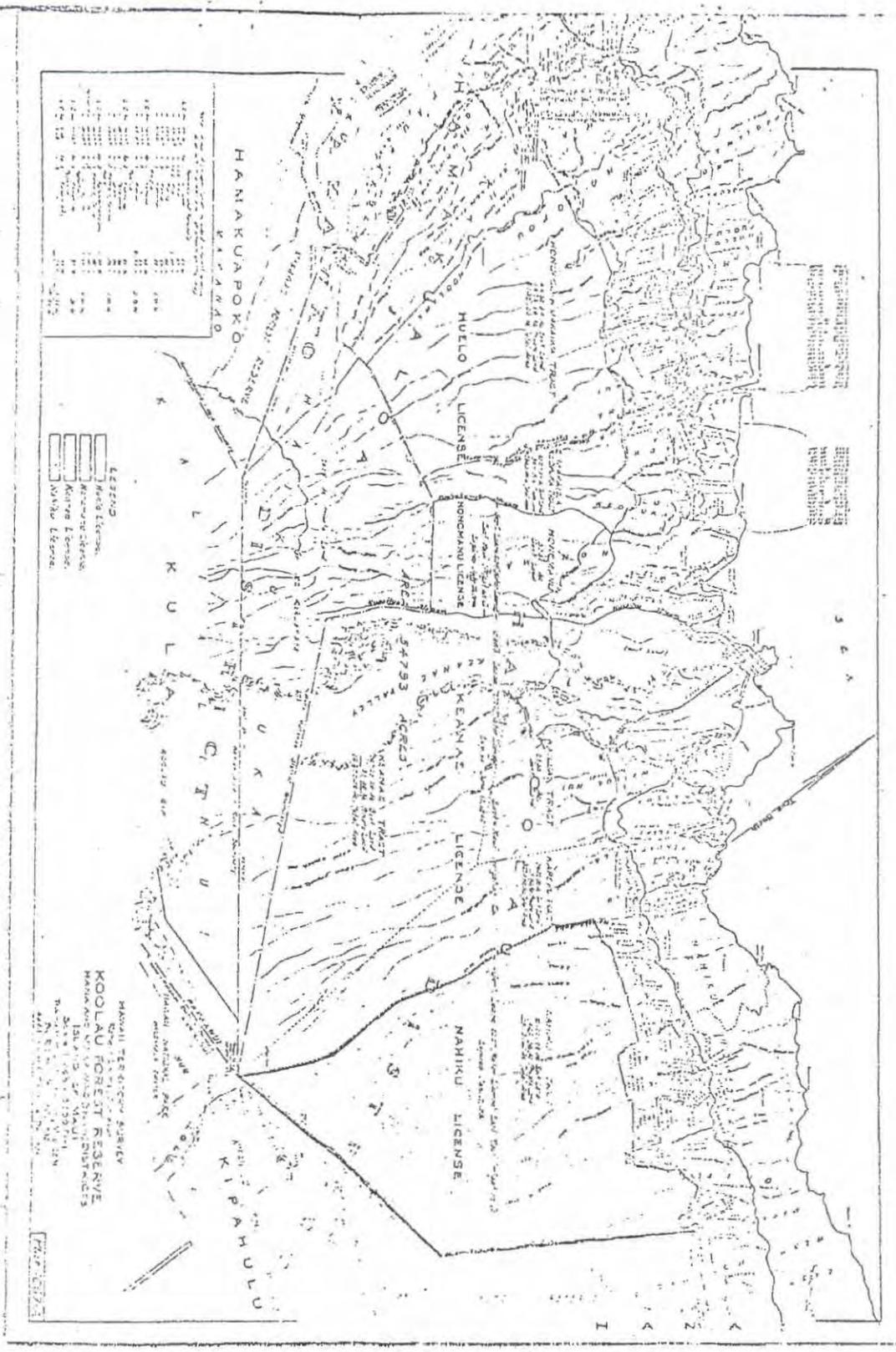


EXHIBIT A

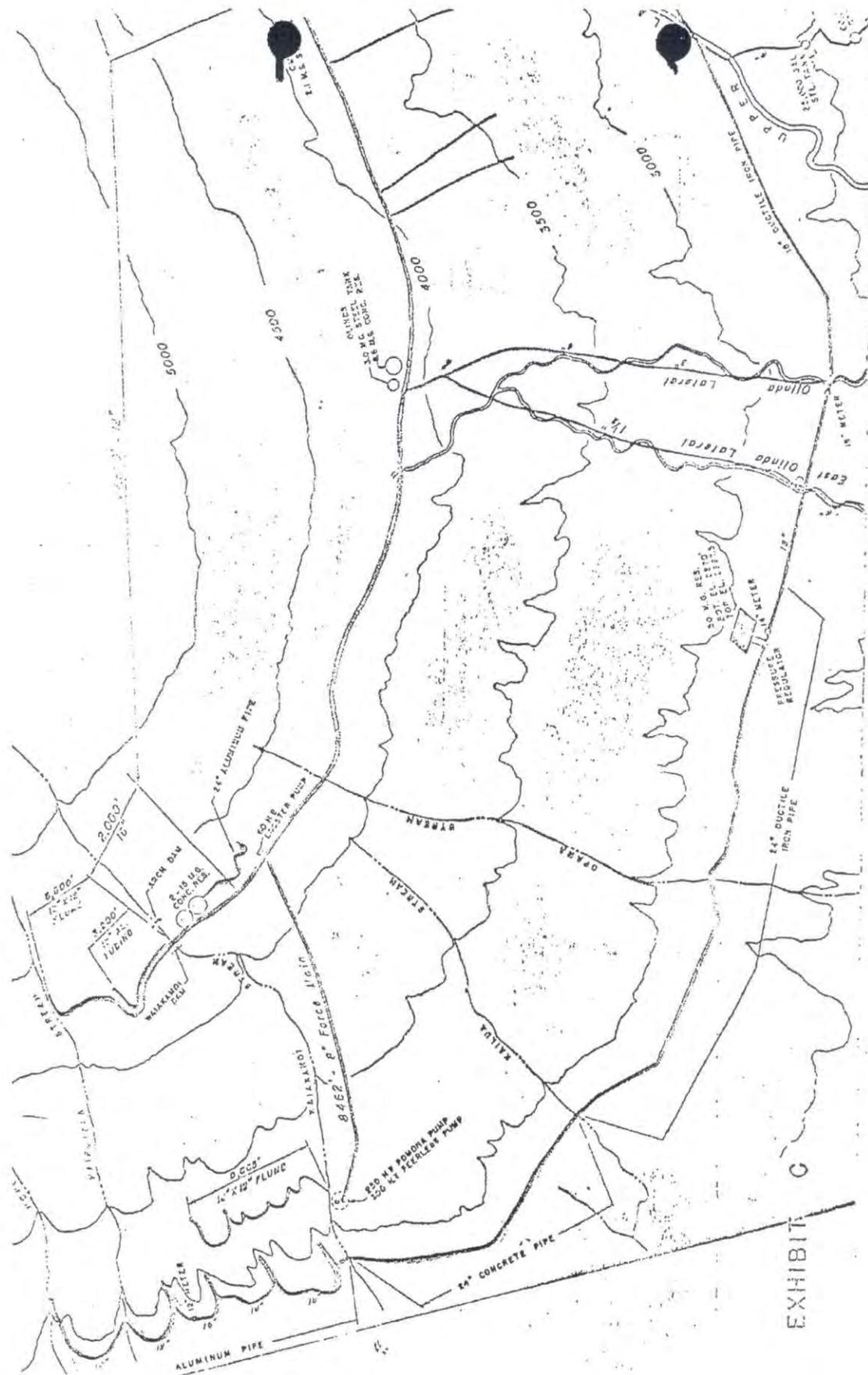


EXHIBIT C

AMENDMENT TO
MEMORANDUM OF UNDERSTANDING

THIS AMENDMENT, made and entered into this 1st day of May, 1992, by and amongst EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose mailin address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "EMI", A&B-HAWAII, INC., HAWAIIAN COMMERCIAL AND SUGAR COMPANY, a division of Alexander & Baldwin, Inc., whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "HC&S", and the BOARD OF WATER SUPPLY of the County of Maui, whose principal place of business and mailing address is 250 S. High Street, Wailuku, Hawaii 96793, referred to as the "Board",

W I T N E S S E T H:

WHEREAS, on December 31, 1973, EMI, HC&S, and the Board entered into that certain Memorandum of Understanding relating, in part, to the collection and delivery of water by EMI, the maintenance of certain water collection facilities, and the furnishing of water to the Board; and

WHEREAS, the term of the Memorandum of Understanding is scheduled to terminate on December 31, 1993; and

WHEREAS, the parties hereto desire to extend the Memorandum of Understanding for a period of two years; now, therefore,

IN CONSIDERATION of the mutual promises and agreements hereinafter set forth, the parties hereto agree as follows:

1. Item 13 is deleted in its entirety and substituted with the following:

EXHIBIT "B-007"

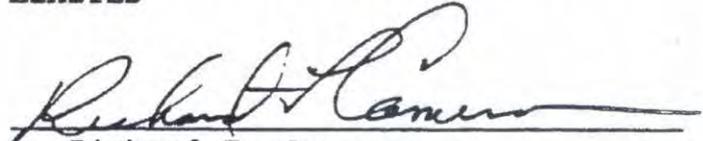
"13. Term. The term of this agreement shall be for twenty two (22) years commencing January 1, 1974, and terminating on December 31, 1995; provided, however, that this agreement may be extended from time to time by mutual agreement."

2. Save and except as amended herein, the Memorandum of Understanding shall remain in force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed on the date first above written.

EMI:

EAST MAUI IRRIGATION COMPANY,
LIMITED



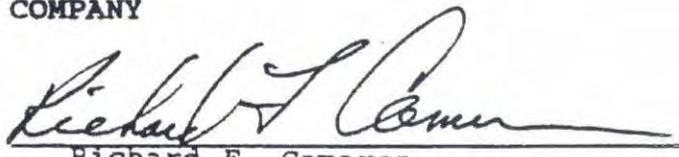
Richard F. Cameron
(Please type or print name above)
Its Senior Vice President



Lyle A. Wilkinson
(Please type or print name above)
Its Assistant Secretary

HC&S:

HAWAIIAN COMMERCIAL AND SUGAR
COMPANY

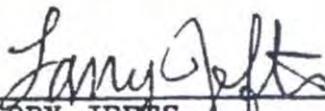


Richard F. Cameron
(Please type or print name above)
Its General Manager

(Please type or print name above)
Its _____

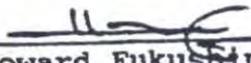
Board:

BOARD OF WATER SUPPLY,
COUNTY OF MAUI



LARRY JEETS
Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:



Howard Fukushima
Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 1st day of April, 1992, before me appeared Richard F. Cameron and Lyle A. Wilkinson, to me personally known, who, being by me duly sworn, did say that they are the Sr. Vice President and Asst. Secretary ^{and} respectively, of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Valerie L. Nakashima
Notary Public, State of Hawaii
My commission expires: 5/25/92

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 1st day of April, 1992, before me appeared Richard F. Cameron and _____, to me personally known, who, being by me duly sworn, did say that they are the General Manager and _____ respectively, of HAWAIIAN COMMERCIAL AND SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Valerie L. Nakashima
Notary Public, State of Hawaii
My commission expires: 5/25/92

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 15th day of May, 1992, before me appeared Larry Jeffs, to me personally known, who, being by me duly sworn, did say that he is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui, and that the seal affixed to the foregoing instrument is the lawful seal of the said BOARD OF WATER SUPPLY, and that the said instrument was signed and sealed on behalf of the said BOARD OF WATER SUPPLY, and the said Larry Jeffs acknowledged the said instrument to be the free act and deed of the said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

ea

[Signature]
Notary Public, State of Hawaii
My commission expires: 4/19/94

**SECOND AMENDMENT TO
MEMORANDUM OF UNDERSTANDING**

THIS AMENDMENT, made and entered into this 25th day of April, 1994, by and amongst EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "EMI", A & B HAWAII, INC., through its division, HAWAIIAN COMMERCIAL AND SUGAR COMPANY, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "HC & S", and the BOARD OF WATER SUPPLY of the County of Maui, whose principal place of business and mailing address is 200 S. High Street, Wailuku, Hawaii 96793, referred to as "BWS",

W I T N E S S E T H:

WHEREAS, on December 31, 1973, EMI, HC&S and BWS entered into that certain Memorandum of Understanding, referred to as the "Memorandum", relating, in part, to the collection and delivery of water by EMI to, the maintenance of certain water collection facilities of, and the furnishing of water to BWS; and

WHEREAS, on May 1, 1992, EMI, HC&S and BWS entered into that certain Amendment to Memorandum of Understanding relating to the extension of the Memorandum from December 31, 1993 until December 31, 1995; and

WHEREAS, the Memorandum permits BWS to withdraw up to 6,000 gallons of water per twenty-four hour day to serve the Nahiku community; and

WHEREAS, the maximum daily usage of the Nahiku community is

EXHIBIT "B-008"

COM 0025

currently 12,600 gallons per day; and

WHEREAS, BWS desires to increase the withdrawal rate for the Nahiku community; now, therefore,

IN CONSIDERATION of the mutual promises and agreements hereinafter set forth, the parties hereto agree as follows:

1. Item 1 of the Memorandum is deleted in its entirety and substituted with the following:

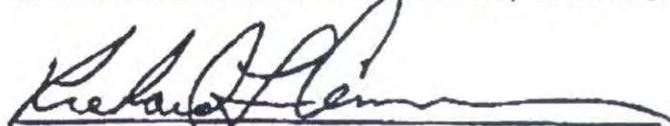
"1. Nahiku. EMI will continue to collect and deliver to BWS at the rates provided herein up to 20,000 gallons of water per twenty-four hour day to serve the Nahiku community. The delivery point shall be the same point as presently used by EMI and BWS."

2. Save and except as amended herein, the Memorandum, as amended on May 1, 1992, remains in force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed on the date first above written.

EMI:

EAST MAUI IRRIGATION COMPANY, LIMITED

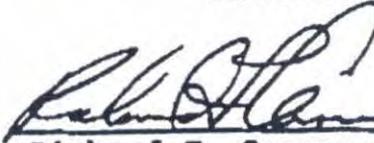


Richard F. Cameron
(Please type or print name above)
Its Executive Vice President

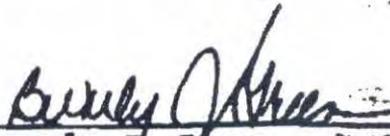


Beverly J. Green
(Please type or print name above)
Its Secretary

A & B HAWAII, INC.
through its division
HAWAIIAN COMMERCIAL AND SUGAR
COMPANY



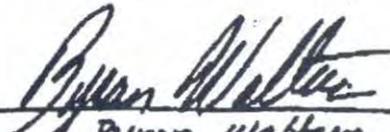
Richard F. Cameron
(Please type or print name above)
Its Senior Vice President



Beverly J. Green
(Please type or print name above)
Its Secretary

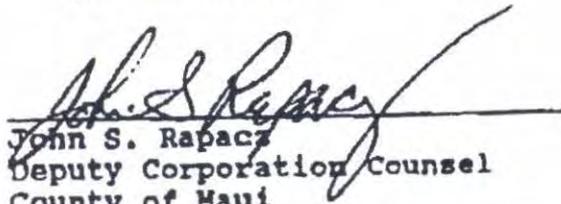
BWS:

BOARD OF WATER SUPPLY
COUNTY OF MAUI

Larry Jaffe / Byron Watters
Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:



John S. Rapacz
Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 25th day of April, 1994, before me appeared Richard F. Cameron and Beverly J. Green, to me personally known, who, being by me duly sworn, did say that they are the Executive Vice President and Secretary, respectively, of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.



Notary Public, State of Hawaii

My commission expires: 7/15/94

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 25th day of April, 1994, before me appeared Richard F. Cameron and Beverly J. Green, to me personally known, who, being by me duly sworn, did say that they are the Senior Vice President and Secretary, respectively, of A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officers acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.



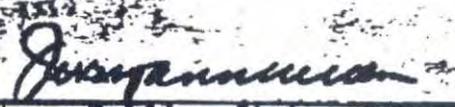
Notary Public, State of Hawaii

My commission expires: 7/15/94

STATE OF HAWAII)
) 58.
COUNTY OF MAUI)

On this 26th day of April, 1994, before me appeared Byron Walters, to me personally known, who, being by me duly sworn, did say that he is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui, and that the seal affixed to the foregoing instrument is the lawful seal of the said BOARD OF WATER SUPPLY, and that the said instrument was signed and sealed on behalf of the said BOARD OF WATER SUPPLY, and the said Byron Walters acknowledged the said instrument to be the free act and deed of said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.



Notary Public, State of Hawaii

My commission expires: 4/19/98

THIRD AMENDMENT TO
MEMORANDUM OF UNDERSTANDING

THIS AMENDMENT, made and entered into this 3rd day of January, 1996, by and among EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "EMI," A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "HC&S," and the BOARD OF WATER SUPPLY of the County of Maui, whose principal place of business and mailing address is 250 S. High Street, Wailuku, Hawaii 96793, referred to as "BWS,"

W I T N E S S E T H:

WHEREAS, the Memorandum of Understanding entered into on December 31, 1973 by and among EMI, HC&S and BWS, which subsequently was amended by an Amendment dated May 1, 1992 and Second Amendment dated April 25, 1994, permits BWS to withdraw up to 16 million gallons of water per twenty-four hour period from the Wailoa Ditch System; and

WHEREAS, the Wailoa Ditch System provides, on average, 55% of HC&S's water needs, is essential to HC&S's ability to pump the groundwater wells which provide the other 45% of HC&S's water needs, and is necessary to run HC&S's two mills and pumps for HC&S's 16 brackish water wells in the central isthmus; and

WHEREAS, on numerous occasions, BWS's right to withdraw water from the Wailoa Ditch System has, during times of extended drought, put HC&S under severe stress; and

WHEREAS, the term of the Memorandum of Understanding is scheduled to terminate on December 31, 1995; and

WHEREAS, the parties hereto desire to extend the Memorandum of Understanding for a period of one year; now, therefore,

IN CONSIDERATION of the mutual promises and agreements hereinafter set forth, the parties hereto agree as follows:

1. The following sentence is hereby added to the end of the first paragraph of Paragraph 3:

"BWS agrees to use its best efforts to minimize its intake of water from the Wailoa Ditch System whenever the total flow in the Wailoa Ditch System drops below 55 million gallons per twenty-four hour period, and to ~~use its best efforts to move forward on a timely basis~~ with necessary steps, including the installation and utilization of surface water storage of peak flows, so

that BWS will be able to reduce its dependency on the Wailoa Ditch System whenever the total flow is below 55 million gallons per twenty-four hour period."

2. Paragraph 13 is hereby deleted in its entirety and substituted with the following:

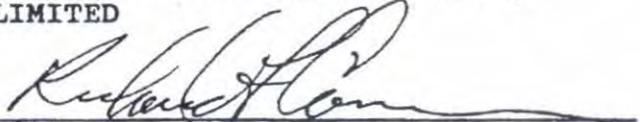
"13. Term. The term of this agreement shall be for twenty-three (23) years commencing January 1, 1974 and terminating on December 31, 1996; provided, however, that this agreement may be extended from time to time by mutual agreement."

3. Save and except as amended herein, the Memorandum of Understanding, as previously amended, shall remain in full force and effect.

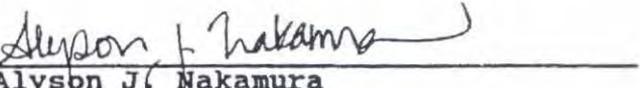
IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed on the date first above written.

EMI:

EAST MAUI IRRIGATION COMPANY,
LIMITED



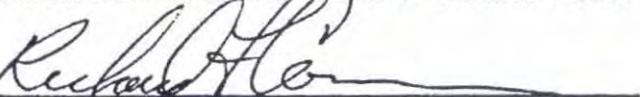
Richard F. Cameron
Its Executive Vice President



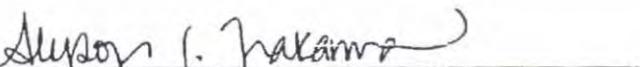
Alyson J. Nakamura
Its Secretary

HC&S:

A&B-HAWAII, INC., THROUGH ITS DIVISION
HAWAIIAN COMMERCIAL AND SUGAR COMPANY



Richard F. Cameron
Its Senior Vice President



Alyson J. Nakamura
Its Secretary

BWS:

BOARD OF WATER SUPPLY,
COUNTY OF MAUI

Marie Kimmey

Marie Kimmey

(Please type or print name above)

Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:

Gary W. Zakian

GARY W. ZAKIAN

(Please type or print name above)

Its Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 9th day of January, 1996, before me appeared RICHARD F. CAMERON, to me personally known, who, being by me duly sworn, did say that he is the Executive Vice President of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Korala L. Maua
Notary Public, State of Hawaii

My commission expires: 9/6/96

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 3rd day of January, 1996, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn, did say that she is the Secretary of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Aileen S. Miyahara
Notary Public, State of Hawaii

My commission expires: 7/15/98

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 8th day of January, 1996, before me appeared RICHARD F. CAMERON, to me personally known, who, being by me duly sworn, did say that he is the Senior Vice President of A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Loralee L. Merritt
Notary Public, State of Hawaii

My commission expires: 1/16/96

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 3rd day of January, 1996, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn, did say that she is the Secretary of A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Alyson J. Nakamura
Notary Public, State of Hawaii

My commission expires: 7/15/98

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 7th day of ~~January~~ ^{February}, 1996, before me appeared Marie Kimmey, to me personally known, who, being by me duly sworn, did say that she is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui, and that the seal affixed to the foregoing instrument is the lawful seal of the said BOARD OF WATER SUPPLY, and that the said instrument was signed and sealed on behalf of the said BOARD OF WATER SUPPLY, and the said Marie Kimmey acknowledged the said instrument to be the free act and deed of the said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Jerry [Signature]
Notary Public, State of Hawaii
My commission expires: 4/19/98

J

FOURTH AMENDMENT TO
MEMORANDUM OF UNDERSTANDING

THIS AMENDMENT, made and entered into this 30th day of December, 1996, by and between EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose business mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "EMI," A&B-HAWAII, INC., through its division, HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "HC&S," and the BOARD OF WATER SUPPLY of the County of Maui, whose principal place of business and mailing address is 200 S. High Street, Wailuku, Hawaii 96793, referred to as "BWS,"

W I T N E S S E T H:

WHEREAS, on December 31, 1973, EMI, HC&S and BWS entered into that certain Memorandum of Understanding, which subsequently was amended by an Amendment dated May 1, 1992, Second Amendment dated April 25, 1994, Third Amendment dated January 3, 1996 and Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir dated March 21, 1996 (the Memorandum of Understanding, as so amended, is hereinafter referred to as the "Memorandum"), relating in part to the operation, maintenance and repair of the Waikamoi water system; and

WHEREAS, the term of the Memorandum is scheduled to terminate on December 31, 1996; and

WHEREAS, the parties hereto desire to extend the Memorandum for a period of one year; and

WHEREAS, on March 21, 1996, EMI, HC&S, and BWS entered into that certain Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir, relating to BWS using its best efforts to fund as expeditiously as possible the repairs currently necessary, in the discretion of EMI, to the Waikamoi Upper Flume, referred to as the "Flume"; and

WHEREAS, the Flume is under the operational jurisdiction of EMI as provided in the Memorandum; and

WHEREAS, the redwood covers, trestles, footings, braces, etc. of the Flume, are in need of replacement to maintain proper water transmission for the Upper Kula Water System; and

WHEREAS, the Flume is now in a state of major disrepair and there is concern that it may fail; and

WHEREAS, ~~extensive and substantial damages~~ to the Waikamoi collection and conveying and storage facilities owned by BWS due

to acts of God or events beyond the control of EMI requiring restoration or replacement of the facilities is the responsibility of BWS; and

WHEREAS, EMI represents that, due to the sensitive nature of the ecological resources of the area serving as a source of domestic water, and its inaccessibility and varied terrain, EMI must limit access to its Waikamoi lands; and

WHEREAS, EMI reconstructed the Flume back in 1974-75, and is very familiar with both the Waikamoi water system and the area; and

WHEREAS, BWS has budgeted \$60,000.00 for the necessary maintenance and repair of the Flume for fiscal year 1996-1997; and

WHEREAS, BWS had previously purchased redwood lumber for the repairs to the Flume, which lumber was determined to be inadequate for said repairs; now, therefore,

IN CONSIDERATION of the mutual promises and agreements hereinafter set forth, the parties hereto agree as follows:

1. The fourth paragraph of Paragraph 2 is deleted in its entirety and substituted with the following:

"Extensive and substantial damages to the collection and conveying and storage facilities owned by BWS as provided herein due to acts of God or events beyond the control of EMI requiring restoration or replacement of the facilities shall be the responsibility of BWS. Actual restoration and replacement of existing facilities shall be subject to budgetary limitations of BWS, which agrees to exercise reasonable judgment and good faith to include the costs, or portions thereof, of restoration and replacement in the ensuing budget or budgets. Actual restoration and replacement of additional facilities constructed by EMI shall be made at the discretion of BWS, which decision shall be final and shall not be subject to arbitration. With regard to restoration of the Waikamoi Upper Flume required by damages, existing as of December 17, 1996, to the facilities (herein called the "1996 Repairs"), BWS shall use its best efforts to fund as expeditiously as possible the repairs deemed necessary in the discretion of EMI. BWS and EMI agree to begin the 1996 Repairs as soon as practicable and to coordinate with each other to undertake such repairs. If the Waikamoi Upper Flume fails or suffers a major disruption due to the delay in funding these necessary repairs, BWS shall not be permitted to compensate for the reduction of Waikamoi system water by taking water from the Wailoa Ditch System. The exact nature, scope and total cost of the 1996 Repairs, including total reasonable reimbursement

for labor (including overhead), will not be known until EMI proceeds with the repairs, but the cost during the fiscal year ending June 30, 1997 shall not exceed \$60,000.00."

2. With regard to the 1996 Repairs referred to in the new fourth paragraph of Paragraph 2 described above:

- a. EMI shall be responsible for designating the materials needed for the repairs, but shall not be responsible for any problems arising out of or related to the condition of the materials.
- b. BWS shall be responsible for ordering and purchasing all materials, including replacement of any materials that do not meet full specifications (e.g., replacement of that portion of BWS's previously-purchased lumber that EMI determines cannot be salvaged), and for the condition of the materials and delivery of same to the jobsite location designated by EMI, referred to as the "Jobsite."
- c. EMI shall, to the extent feasible in its sole discretion, salvage as much of BWS's previously-purchased redwood lumber (119 pieces 2"x12"x18' dimension, con heart, RS, and 279 pieces 2"x12"x20' dimension, con heart, RS), referred to as "Salvaged Lumber," for the repairs to the Flume, said salvage to include milling the redwood to proper dimensions at cost to BWS not to exceed \$2,500.00 for labor.
- d. BWS shall provide delivery of the Salvaged Lumber to the milling site designated by EMI, and later to the Jobsite.
- e. BWS shall provide a container for weather and security protection of all redwood lumber and all other materials delivered to the Jobsite for the repairs.
- f. EMI shall apply the non-skid surface treatment in accordance to the manufacture's recommendations.
- g. EMI shall be responsible for any loss or damage to materials accepted at the Jobsite in the event such loss or damage arises directly and solely from EMI's negligence, but EMI shall not be deemed a bailor or warehouseman with respect to such materials.
- h. BWS shall make payment on said invoices within 30 days after receipt, and agrees that interest will accrue on late payments at the rate of 12% per annum.

3. Paragraph 3 is hereby replaced in its entirety with the following:

"3. Wailoa Ditch. From the waters collected by EMI in the Wailoa Ditch System, EMI will make available to BWS up to 8-1/2 million gallons of water per twenty-four hour period, allocated as follows: up to 7 million gallons of water per twenty-four hour period from the Kamole Weir delivery point, and up to 1-1/2 million gallons of water per twenty-four hour period from the Hamakua Ditch delivery point to serve the needs of the Kula Agricultural Park (pursuant to the letter dated July 27, 1982 from HC&S and EMI to the Department of Water Supply of the County of Maui). The foregoing is subject to the limitations on withdrawal set forth in the Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir, dated March 21, 1996. BWS agrees to use its best efforts to minimize its intake of water from the Wailoa Ditch System whenever the total flow in the Wailoa Ditch System drops below 55 million gallons per twenty-four hour period, and to use its best efforts to move forward on a timely basis with necessary steps, including the installation and utilization of surface water storage of peak flows, so that BWS will be able to reduce its dependency on the Wailoa Ditch System whenever the total flow is below 55 million gallons per twenty-four hour period.

Waters from the Wailoa Ditch shall be delivered to BWS at the following points presently used by EMI/HC&S and BWS:

Kamole Forebay and Hamakua Ditch near Reservoir 40."

4. With regard to the construction of the proposed reservoir at Kamole Weir, BWS warrants that it will use its best efforts to meet, or cause to be met, the deadlines set forth in the engineering schedule attached hereto as Exhibit "A" and incorporated herein by reference. The parties agree to discuss modification of the '8-1/2 million gallons of water per twenty-four hour period' amount, referred to in Section 3 above, when the proposed reservoir comes on line.

5. Paragraph 13 is hereby deleted in its entirety and substituted with the following:

"13. Term. The term of this agreement shall be for twenty-four (24) years commencing January 1, 1974 and terminating on December 31, 1997; provided, however, that this agreement may be extended from time to time by mutual agreement."

6. ~~Save and except as amended herein, the Memorandum, as previously amended, shall remain in full force and effect.~~

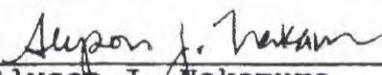
IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed on the date first above written.

EMI:

EAST MAUI IRRIGATION COMPANY,
LIMITED



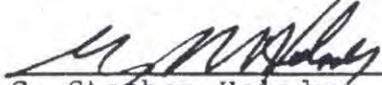
G. Stephen Holaday
Its Vice President



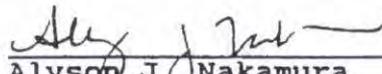
Alyson J. Nakamura
Its Secretary

HC&S:

A&B-HAWAII, INC., THROUGH ITS DIVISION
HAWAIIAN COMMERCIAL AND SUGAR COMPANY



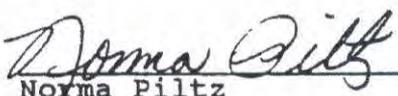
G. Stephen Holaday
Its Senior Vice President



Alyson J. Nakamura
Its Secretary

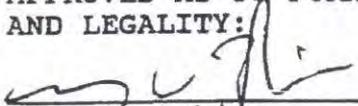
BWS:

BOARD OF WATER SUPPLY
COUNTY OF MAUI



Norma Piltz
Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:



Gary W. Zakian
Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
City & County of Honolulu) SS.
~~COUNTY OF MAUI~~)

On this 3rd day of ~~December, 1996~~ January, 1997, before me appeared G. Stephen Holad, ~~RICHARD F. CAMERON~~, to me personally known, who, being by me duly sworn, did say that he is the ~~Executive~~ Vice President of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Stephen K. McQuigari
Notary Public, State of Hawaii

My commission expires: 2/18/97

STATE OF HAWAII)
CITY & COUNTY OF HONOLULU) SS.

On this 30th day of December, 1996, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn, did say that she is the Secretary of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Alyson J. Nakamura
Notary Public, State of Hawaii

My commission expires: 7/15/98

STATE OF HAWAII)
City & County of Honolulu) SS.
~~COUNTY OF MAUI~~)

January, 1997 G. Stephen Holaday
On this 3rd day of ~~December, 1996~~, before me appeared
~~RICHARD F. CAMERON~~, to me personally known, who, being by me duly
sworn, did say that he is the Senior Vice President of
A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL &
SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the
foregoing instrument is the corporate seal of said corporation;
and that said instrument was signed and sealed on behalf of said
corporation by authority of its Board of Directors, and the said
officer acknowledged said instrument to be the free act and deed
of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official
seal.

Suzanne K. McLaughlin
Notary Public, State of Hawaii

My commission expires: 2/18/97

STATE OF HAWAII)
CITY & COUNTY OF HONOLULU) SS.

On this 30th day of December, 1996, before me appeared
ALYSON J. NAKAMURA, to me personally known, who, being by me duly
sworn, did say that she is the Secretary of A&B-HAWAII, INC.,
through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a
Hawaii corporation; that the seal affixed to the foregoing
instrument is the corporate seal of said corporation; and that
said instrument was signed and sealed on behalf of said corpora-
tion by authority of its Board of Directors, and the said officer
acknowledged said instrument to be the free act and deed of said
corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official
seal.

Alyson J. Nakamura
Notary Public, State of Hawaii

My commission expires: 7/15/98

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 27th day of December, 1996, before me appeared Norma Piltz, to me personally known, who, being by me duly sworn, did say that she is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui, and that the seal affixed to the foregoing instrument is the lawful seal of the said BOARD OF WATER SUPPLY, and that the said instrument was signed and sealed on behalf of the said BOARD OF WATER SUPPLY, and the said Norma Piltz acknowledged the said instrument to be the free act and deed of the said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Joseph Pennington
Notary Public, State of Hawaii

My commission expires: 4/19/98

sw

ORIGINAL

FIFTH AMENDMENT TO MEMORANDUM OF UNDERSTANDING

THIS AMENDMENT, made and entered into this 20th day of January, 1998, by and between EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose business mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "EMI," A&B-HAWAII, INC., through its division, HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "HC&S," and the BOARD OF WATER SUPPLY of the County of Maui, whose principal place of business and mailing address is 200 S. High Street, Wailuku, Hawaii 96793, referred to as "BWS,"

W I T N E S S E T H:

WHEREAS, on December 31, 1973, EMI, HC&S and BWS entered into that certain Memorandum of Understanding, which subsequently was amended by an Amendment dated May 1, 1992, Second Amendment dated April 25, 1994, Third Amendment dated January 3, 1996, Fourth Amendment dated December 30, 1996, Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir dated March 21, 1996, and Addendum to Fourth Amendment dated May 6, 1997 (the Memorandum of Understanding, as so amended, is hereinafter referred to as the "Memorandum"), relating in part to the operation, maintenance and repair of the Waikamoi water system; and

WHEREAS, the term of the Memorandum is scheduled to terminate on December 31, 1997; and

WHEREAS, the parties hereto desire to extend the Memorandum for a period of one year; and

WHEREAS, on March 21, 1996, EMI, HC&S, and BWS entered into that certain Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir, relating to BWS using its best efforts to fund as expeditiously as possible the repairs currently necessary, in the discretion of EMI, to the Waikamoi Upper Flume, referred to as the "Flume"; and

WHEREAS, BWS budgeted \$60,000.00 for the necessary maintenance and repair of the Flume for fiscal year 1996-1997; and

WHEREAS, BWS has budgeted \$60,000.00 for the necessary maintenance and repair of the Flume for fiscal year 1997-1998; and

WHEREAS, EMI has agreed to provide BWS with an additional 175,000 gallons per day from the Wailoa Ditch System;

NOW, THEREFORE, in consideration of the mutual promises and agreements hereinafter set forth, the parties agree as follows:

Amend

1. The fourth paragraph of Paragraph 2 is deleted in its entirety and substituted with the following:

"Extensive and substantial damages to the collection and conveying and storage facilities owned by BWS as provided herein due to acts of God or events beyond the control of EMI requiring restoration or replacement of the facilities shall be the responsibility of BWS. Actual restoration and replacement of existing facilities shall be subject to budgetary limitations of BWS, which agrees to exercise reasonable judgment and good faith to include the costs, or portions thereof, of restoration and replacement in the ensuing budget or budgets. Actual restoration and replacement of additional facilities constructed by EMI shall be made at the discretion of BWS, which decision shall be final and shall not be subject to arbitration. With regard to restoration of the Waikamoi Upper Flume required by damages, existing as of December 17, 1996, to the facilities (herein called the "1996 Repairs"), BWS shall use its best efforts to fund as expeditiously as possible the repairs deemed necessary in the discretion of EMI. BWS and EMI agree to begin the 1996 Repairs as soon as practicable and to coordinate with each other to undertake such repairs. If the Waikamoi Upper Flume fails or suffers a major disruption due to the delay in funding these necessary repairs, BWS shall not be permitted to compensate for the reduction of Waikamoi system water by taking water from the Wailoa Ditch System. The exact nature, scope and total cost of the 1996 Repairs, including total reasonable reimbursement for labor (including overhead), will not be known until EMI proceeds with the repairs, but the cost during the fiscal year ending June 30, 1998 shall not exceed the sum of \$60,000,00 and any additional funds appropriated by the BWS during such fiscal year pursuant to its best efforts obligations to expeditiously fund the 1996 Repairs."

2. The first sentence of Paragraph 3 is hereby replaced in its entirety with the following:

"From the waters collected by EMI in the Wailoa Ditch System, EMI will make available to BWS up to 8.675 million gallons of water per twenty-four-hour period, allocated as follows: up to 7.175 million gallons of water per twenty-four-hour period from the Kamole Weir delivery point, and up to 1-1/2 million gallons of water per twenty-four-hour period from the Hamakua Ditch delivery point to serve the needs of the Kula Agricultural Park (pursuant to the letter dated July 27, 1982 from HC&S and EMI to the Department of Water Supply of the County of Maui)."

3. Paragraph 13 is hereby deleted in its entirety and substituted with the following:

"13. Term. The term of this agreement shall be for twenty-five (25) years commencing January 1, 1974 and terminating on December 31, 1998; provided, however, that this agreement may be extended from time to time by mutual agreement."

4. Save and except as amended herein, the Memorandum, as previously amended, shall remain in full force and effect.

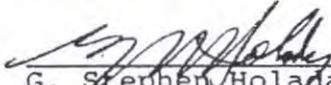
5. Facsimile signatures shall be deemed valid as original signatures. However, each party shall forward original signature pages to the other parties upon execution.

6. This Amendment may be executed in counterpart signature pages.

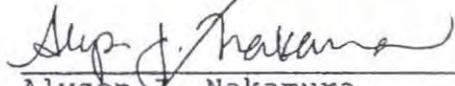
IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed on the date first above written.

EMI:

EAST MAUI IRRIGATION COMPANY,
LIMITED



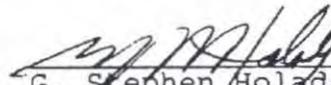
G. Stephen Holaday
Its Vice President **EXEC. VICE PRESIDENT**



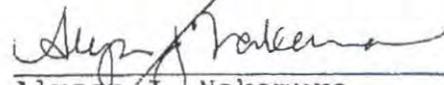
Alyson J. Nakamura
Its Secretary

HC&S:

A&B-HAWAII, INC., THROUGH ITS DIVISION
HAWAIIAN COMMERCIAL AND SUGAR COMPANY



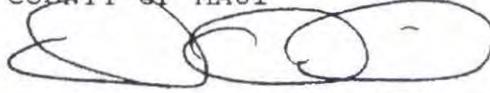
G. Stephen Holaday
Its Senior Vice President



Alyson J. Nakamura
Its Secretary

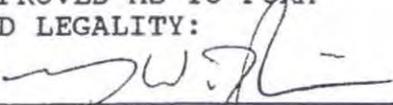
BWS:

BOARD OF WATER SUPPLY
COUNTY OF MAUI



Dorvin D. Leis
Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:



Gary W. Zakian
Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
) SS:
CITY & COUNTY OF HONOLULU)

On this 23rd day of February 1998, before me appeared G. STEPHEN HOLADAY, to me personally known, who, being by me duly sworn or affirmed, did say that he is the Executive Vice President of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Aileen S. Miyakura
Notary Public, State of Hawaii

My Commission Expires: 7/15/98

STATE OF HAWAII)
) SS:
CITY & COUNTY OF HONOLULU)

On this 27th day of February 1998, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn or affirmed, did say that she is the Secretary of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Aileen S. Miyakura
Notary Public, State of Hawaii

My Commission Expires: 7/15/98

STATE OF HAWAII)
) SS:
CITY & COUNTY OF HONOLULU)

On this 23rd day of February 1998, before me appeared G. STEPHEN HOLADAY, to me personally known, who, being by me duly sworn or affirmed, did say that he is the Senior Vice President of A&B-HAWAII, INC., a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Queen S. Miyahara
Notary Public, State of Hawaii

My Commission Expires: 7/15/98

STATE OF HAWAII)
) SS:
CITY & COUNTY OF HONOLULU)

On this 27th day of February 1998, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn or affirmed, did say that she is the Secretary of A&B-HAWAII, INC., a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Queen S. Miyahara
Notary Public, State of Hawaii

My Commission Expires: 7/15/98

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 12th day of ^{February} ~~January~~, 1998, before me appeared *Swamp*
Dorvin D. Leis, to me personally known, who, being
by me duly sworn, did say that he is the Chairperson of the
BOARD OF WATER SUPPLY of the County of Maui, and that the seal
affixed to the foregoing instrument is the lawful seal of the
said BOARD OF WATER SUPPLY, and that the said instrument was
signed and sealed on behalf of the said BOARD OF WATER SUPPLY,
and the said Dorvin D. Leis acknowledged the
said instrument to be the free act and deed of the said BOARD OF
WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official
seal.

Joseph M. ...

Notary Public, State of Hawaii
My commission expires: 4/19/98

SIXTH AMENDMENT TO
MEMORANDUM OF UNDERSTANDING

THIS AMENDMENT, made and entered into this 28th day of December, 1998, and effective as of December 31, 1998, by and between EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose business mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "EMI," A&B-HAWAII, INC., through its division, HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "HC&S," and the BOARD OF WATER SUPPLY of the County of Maui, whose principal place of business and mailing address is 200 S. High Street, Wailuku, Hawaii 96793, referred to as "BWS,"

W I T N E S S E T H:

WHEREAS, on December 31, 1973, EMI, HC&S and BWS entered into that certain Memorandum of Understanding, which subsequently was amended by an Amendment dated May 1, 1992, Second Amendment dated April 25, 1994, Third Amendment dated January 3, 1996, Fourth Amendment dated December 30, 1996, Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir dated March 21, 1996, Addendum to Fourth Amendment dated May 6, 1997, and Fifth Amendment dated January 20, 1998 (the Memorandum of Understanding, as so amended, is hereinafter referred to as the "Memorandum"), relating in part to the operation, maintenance and repair of the Waikamoi water system; and

WHEREAS, the term of the Memorandum is scheduled to terminate on December 31, 1998; and

WHEREAS, the parties hereto desire to extend the Memorandum for a period of one year; and

WHEREAS, on March 21, 1996, EMI, HC&S, and BWS entered into that certain Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir, relating to BWS using its best efforts to fund as expeditiously as possible the repairs currently necessary, in the discretion of EMI, to the Waikamoi Upper Flume, referred to as the "Flume"; and

WHEREAS, BWS budgeted \$60,000.00 for the necessary maintenance and repair of the Flume for fiscal year 1997-1998; and

WHEREAS, BWS has budgeted \$60,000.00 for the necessary maintenance and repair of the Flume for fiscal year 1998-1999;

NOW, THEREFORE, in consideration of the mutual promises and agreements hereinafter set forth, the parties agree as follows:

1. BWS agrees to make available and to utilize the \$60,000.00, budgeted in the fiscal year 1998-1999 budget, for the necessary repair and maintenance of the Flume.

2. Paragraph 13 is hereby deleted in its entirety and substituted with the following:

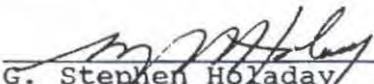
"13. Term. The term of this agreement shall be for twenty-six (26) years commencing January 1, 1974 and terminating on December 31, 1999; provided, however, that this agreement may be extended from time to time by mutual agreement."

3. Save and except as amended herein, the Memorandum, as previously amended, shall remain in full force and effect.

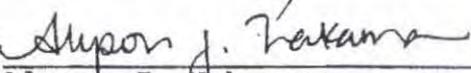
IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed on the date first above written.

EMI:

EAST MAUI IRRIGATION COMPANY,
LIMITED



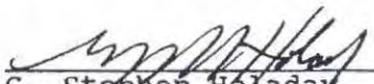
G. Stephen Holaday
Its Executive Vice President



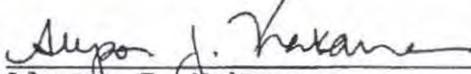
Alyson J. Nakamura
Its Secretary

HC&S:

A&B-HAWAII, INC., THROUGH ITS DIVISION
HAWAIIAN COMMERCIAL AND SUGAR COMPANY



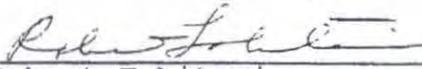
G. Stephen Holaday
Its Senior Vice President



Alyson J. Nakamura
Its Secretary

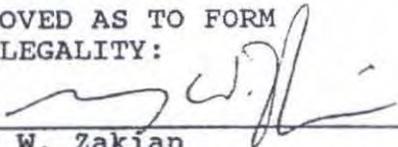
BWS:

BOARD OF WATER SUPPLY
COUNTY OF MAUI



Robert Takitani
Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:



Gary W. Zakian
Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 29th day of December, 1998, before me appeared G. STEPHEN HOLADAY, to me personally known, who, being by me duly sworn, did say that he is the Executive Vice President of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Lorau K. Mawri

Notary Public, State of Hawaii

My commission expires: 9/10/2000

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 28th day of December, 1998, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn, did say that she is the Secretary of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Aileen S. Miyahara

Notary Public, State of Hawaii

My commission expires: 7/15/02



STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 29th day of December, 1998, before me appeared G. STEPHEN HOLADAY, to me personally known, who, being by me duly sworn, did say that he is the Senior Vice President of A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

L.S.

Loralee K. Mauwi
Notary Public, State of Hawaii
My commission expires: 9/10/2000

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 28th day of December, 1998, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn, did say that she is the Secretary of A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.



Aileen S. Miyahara
Notary Public, State of Hawaii
My commission expires: 7/15/02

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

January 1999

On this *26th* day of ~~December~~ 1998, before me appeared Robert K. Takitani, to me personally known, who, being by me duly sworn, did say that he is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui, and that the seal affixed to the foregoing instrument is the lawful seal of the said BOARD OF WATER SUPPLY, and that the said instrument was signed and sealed on behalf of the said BOARD OF WATER SUPPLY, and the said Robert K. Takitani acknowledged the said instrument to be the free act and deed of the said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

W

Jerry Ann Wells
Notary Public, State of Hawaii
Jerry Ann Wells
My commission expires: 4/19/2002

SEVENTH AMENDMENT TO
MEMORANDUM OF UNDERSTANDING

THIS AMENDMENT, made and entered into this 29 day of December, 1999, and effective as of December 31, 1999, by and between EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose business mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "EMI," A&B-HAWAII, INC., through its division, HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "HC&S," and the BOARD OF WATER SUPPLY of the County of Maui, whose principal place of business and mailing address is 200 S. High Street, Wailuku, Hawaii 96793, referred to as "BWS,"

W I T N E S S E T H:

WHEREAS, on December 31, 1973, EMI, HC&S and BWS entered into that certain Memorandum of Understanding, which subsequently was amended by an Amendment dated May 1, 1992, Second Amendment dated April 25, 1994, Third Amendment dated January 3, 1996, Fourth Amendment dated December 30, 1996, Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir dated March 21, 1996 ("1996 Agreement"), Addendum to Fourth Amendment dated May 6, 1997, Fifth Amendment dated January 20, 1998, and Sixth Amendment dated December 28, 1998 (the Memorandum of Understanding, as so amended, is hereinafter referred to as the "Memorandum"), relating in part to the collection and delivery of water by EMI to BWS, and to the operation, maintenance and repair of the Waikamoi water system; and

WHEREAS, the term of the Memorandum is scheduled to terminate on December 31, 1999; and

WHEREAS, the parties hereto desire to extend the Memorandum for a period of two months;

NOW, THEREFORE, in consideration of the mutual promises and agreements hereinafter set forth, the parties agree as follows:

1. Paragraph 13 of the Memorandum is hereby deleted in its entirety and substituted with the following:

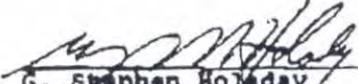
"13. Term. The term of this agreement shall be for twenty-six (26) years and two (2) months commencing January 1, 1974 and terminating on February 29, 2000; provided, however, that this agreement may be extended from time to time by mutual agreement."

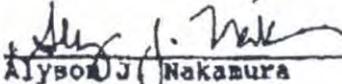
2. ~~Save and except as amended herein, the Memorandum, as previously amended, shall remain in full force and effect.~~

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed on the date first above written.

EMI:

EAST MAUI IRRIGATION COMPANY,
LIMITED

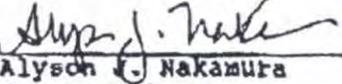

G. Stephen Hodaday
Its President


Alyson J. Nakamura
Its Secretary

HC&S:

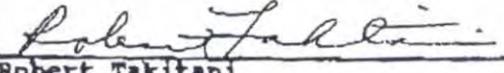
A&B-HAWAII, INC., THROUGH ITS DIVISION
HAWAIIAN COMMERCIAL AND SUGAR COMPANY


G. Stephen Hodaday
Its Senior Vice President

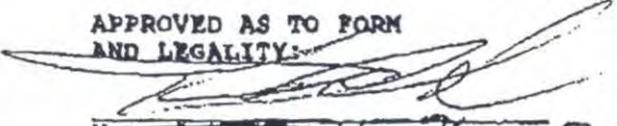

Alyson J. Nakamura
Its Secretary

BWS:

BOARD OF WATER SUPPLY
COUNTY OF MAUI


Robert Takitani
Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:


Thomas P. Rack
Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 29TH day of December, 1999, before me appeared G. STEPHEN HOLADAY, to me personally known, who, being by me duly sworn, did say that he is the President of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.



Aileen S. Miyahara AILEEN S. MIYAHARA
Notary Public, State of Hawaii

My commission expires: 7/15/02

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 29TH day of December, 1999, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn, did say that she is the Secretary of EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.



Aileen S. Miyahara AILEEN S. MIYAHARA
Notary Public, State of Hawaii

My commission expires: 7/15/02

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 29TH day of December, 1999, before me appeared G. STEPHEN HOLADAY, to me personally known, who, being by me duly sworn, did say that he is the Senior Vice President of A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.



Aileen S. Miyahara AILEEN S. MIYAHARA
Notary Public, State of Hawaii

My commission expires: 7/15/02

STATE OF HAWAII)
) SS.
CITY & COUNTY OF HONOLULU)

On this 29TH day of December, 1999, before me appeared ALYSON J. NAKAMURA, to me personally known, who, being by me duly sworn, did say that she is the Secretary of A&B-HAWAII, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.



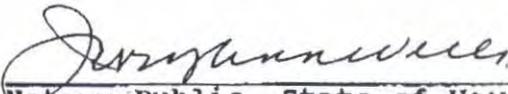
Aileen S. Miyahara AILEEN S. MIYAHARA
Notary Public, State of Hawaii

My commission expires: 7/15/02

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 30th day of December, 1999, before me appeared Robert Takitani, to me personally known, who, being by me duly sworn, did say that he is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui, and that the seal affixed to the foregoing instrument is the lawful seal of the said BOARD OF WATER SUPPLY, and that the said instrument was signed and sealed on behalf of the said BOARD OF WATER SUPPLY, and the said Robert Takitani acknowledged the said instrument to be the free act and deed of the said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.



Notary Public, State of Hawaii
Jerry Ann Wells
My commission expires: 4/19/2002

EIGHTH AMENDMENT TO
MEMORANDUM OF UNDERSTANDING

THIS AMENDMENT, made and entered into this ^{28th} day of March, 2000, and effective as of February 29, 2000, by and between EAST MAUI IRRIGATION COMPANY, LIMITED, a Hawaii corporation, whose business mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "EMI," ALEXANDER & BALDWIN, INC., through its division, HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation, whose mailing address is P. O. Box 266, Puunene, Hawaii 96784, referred to as "HC&S," and the BOARD OF WATER SUPPLY of the County of Maui, whose principal place of business and mailing address is 200 S. High Street, Wailuku, Hawaii 96793, referred to as "BWS,"

W I T N E S S E T H:

WHEREAS, on December 31, 1973, EMI, HC&S and BWS entered into that certain Memorandum of Understanding, which subsequently was amended by an Amendment dated May 1, 1992, Second Amendment dated April 25, 1994, Third Amendment dated January 3, 1996, Fourth Amendment dated December 30, 1996, Agreement Re 1973 Memorandum of Understanding, Repairs to Waikamoi Water System, Construction of Reservoir at Kamole Weir dated March 21, 1996 ("1996 Agreement"), Addendum to Fourth Amendment dated May 6, 1997, Fifth Amendment dated January 20, 1998, Sixth Amendment dated December 28, 1998, and Seventh Amendment dated December 29, 1999 (the Memorandum of Understanding, as so amended, is hereinafter referred to as the "Memorandum"), relating in part to the collection and delivery of water by EMI to BWS, and to the operation, maintenance and repair of the Waikamoi water system; and

WHEREAS, the term of the Memorandum is scheduled to terminate on February 29, 2000; and

WHEREAS, the parties hereto desire to extend the Memorandum for a period of two months;

NOW, THEREFORE, in consideration of the mutual promises and agreements hereinafter set forth, the parties agree as follows:

1. Paragraph 13 of the Memorandum is hereby deleted in its entirety and substituted with the following:

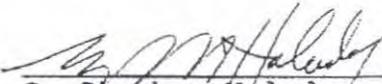
"13. Term. The term of this agreement shall be for twenty-six (26) years and four (4) months commencing January 1, 1974 and terminating on April 30, 2000; provided, however, that this agreement may be extended from time to time by mutual agreement."

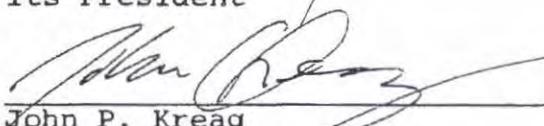
2. Save and except as amended herein, the Memorandum, as previously amended, shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed on the date first above written.

EMI:

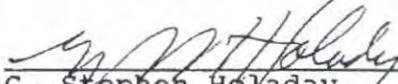
EAST MAUI IRRIGATION COMPANY,
LIMITED

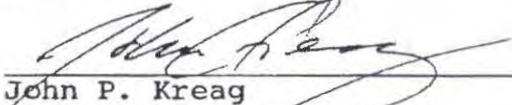

G. Stephen Holaday
Its President


John P. Kreag
Its Assistant Secretary

HC&S:

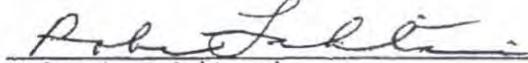
ALEXANDER & BALDWIN, INC.,
THROUGH ITS DIVISION, HAWAIIAN
COMMERCIAL & SUGAR COMPANY


G. Stephen Holaday
Its Vice President


John P. Kreag
Its Assistant Treasurer

BWS:

BOARD OF WATER SUPPLY
COUNTY OF MAUI


Robert Takitani
Its Chairperson

APPROVED AS TO FORM
AND LEGALITY:


Howard M. Fukushima
Deputy Corporation Counsel
County of Maui

STATE OF HAWAII)
Maui)
CITY & COUNTY OF HONOLULU) SS.

On this 14th day of ~~March~~ ^{April}, 2000, before me appeared G. STEPHEN HOLADAY, to me personally known, who, being by me duly sworn, did say that he is the Vice President of ALEXANDER & BALDWIN, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Valerie L. Nakashima
Valerie L. Nakashima
Notary Public, State of Hawaii

L.S.

My commission expires: 5/25/00

STATE OF HAWAII)
Maui)
CITY & COUNTY OF HONOLULU) SS.

On this 14th day of ~~March~~ ^{April}, 2000, before me appeared JOHN P. KREAG, to me personally known, who, being by me duly sworn, did say that he is the Assistant Treasurer of ALEXANDER & BALDWIN, INC., through its division HAWAIIAN COMMERCIAL & SUGAR COMPANY, a Hawaii corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; and that said instrument was signed and sealed on behalf of said corporation by authority of its Board of Directors, and the said officer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Valerie L. Nakashima
Valerie L. Nakashima
Notary Public, State of Hawaii

L.S.

My commission expires: 5/25/00

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 28th day of March, 2000, before me appeared Robert Takitani, to me personally known, who, being by me duly sworn, did say that he is the Chairperson of the BOARD OF WATER SUPPLY of the County of Maui, and that the seal affixed to the foregoing instrument is the lawful seal of the said BOARD OF WATER SUPPLY, and that the said instrument was signed and sealed on behalf of the said BOARD OF WATER SUPPLY, and the said Robert Takitani acknowledged the said instrument to be the free act and deed of the said BOARD OF WATER SUPPLY.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

JW

Jerry Ann Wells
Jerry Ann Wells
Notary Public, State of Hawaii
My commission expires: 4/19/2002

**MEMORANDUM OF UNDERSTANDING CONCERNING
SETTLEMENT OF WATER AND RELATED ISSUES**

Pursuant to this Memorandum of Understanding, the Board of Water Supply, County of Maui ("BWS") and Alexander & Baldwin, Inc. ("A&B") hereby agree to cooperate on certain matters being discussed by the parties relating to the following subjects:

1. Wailoa Ditch
2. Iao-Waikapu Ditch
3. H'poko Wells
4. Power
5. Central Maui Source Joint Venture ("JV")
6. East Maui Water Development Plan

The implementation of this Memorandum will be pursuant to one or more agreements to be negotiated and agreed upon as a package. The parties agree as follows:

1. Wailoa Ditch

The 1973 Memorandum of Understanding ("MOU") will be amended (the "Amendment") to accomplish the following:

- (a) Increase the BWS's allotment to 12 mgd with option for additional 4 mgd (per original agreement).
- (b) During periods of low flow, BWS to have minimum allotment of 8.2 mgd.
- (c) During periods of low flow, HC&S will have a minimum flow of 8.2 mgd (9.4 mgd should fire flow be required).
- (d) When the ditch flow drops below the combined minimum needs of BWS and HC&S (i.e., 16.4 mgd, or 17.6 mgd with fire flow), then BWS and HC&S each shall be entitled to receive: (a) its respective direct contribution to the ditch flow (i.e., BWS would be entitled to the portion of ditch flow attributable to ground water it pumps into the ditch, and HC&S would be entitled to the portion of the ditch flow attributable to its East Maui lands (30%); and (b) 50% of the amount of ditch flow remaining after deducting the parties' direct contributions from the total.
- (e) During periods of low flow, HC&S will not divert water to lower elevation ditch systems.

EXHIBIT "B-015"

- (f) When the three-day average flow in the ditch falls below 55 mgd, BWS shall fully utilize all available ground water sources to supplement the Upcountry system and encourage conservation practices by domestic water users.
- (g) Extend the term of the MOU for 25 years.
- (h) The fee charged to BWS will remain unchanged (six cents per thousand gallons).
- (I) BWS to initiate and implement a long-term plan for permanent improvements to the Waikamoi flume system.
- (j) A&B to cooperate in the development of a dual system to serve Upcountry diversified agriculture.
- (k) BWS will develop and implement a stream flow monitoring program to provide current baseline data.
- (l) As long-term agricultural water needs are reduced, a stream restoration program will be studied, developed, and initiated by BWS.
- (m) In return for increasing the allocation of ditch water to BWS, A&B may receive an appropriate allocation of domestic water (subject to normal system-wide limitations and conformity with general and community plans), to be mutually agreed upon in the Amendment.
- (n) BWS shall utilize its best efforts to maintain storage levels at 80% of maximum capacity of both Piiholo and Kahakapao reservoirs.
- (o) BWS shall pursue the implementation of additional raw water storage in the Lower Kula system.
- (p) BWS shall cooperate with A&B regarding appropriate permits or leases (short and long-term) for East Maui waters from the State of Hawaii.
- (q) BWS to pursue ground water development for Upcountry Maui to mitigate drought effects. For example, BWS shall pursue exploratory wells (i.e., Lower Kula and Pulehu) to supplement the domestic water sources for Upcountry. A&B may participate in such well development in exchange for an appropriate water allocation (subject to normal system-wide limitations and conformity with general and community plans).
- (r) BWS to pursue, with HC&S's cooperation, establishing supplemental water sources to maintain the viability of the Kula Ag Park.

2. Iao Waikapu Ditch

Subject to Wailuku Agribusiness's agreement, a new Agreement Concerning Temporary Withdrawal from the Iao Waikapu Ditch will be entered into and include the following terms:

- (a) BWS shall be entitled to withdraw up to 300,000 gallons per day from the Iao Waikapu Ditch, except when the flow in the Iao Stream falls below 11.5 mgd.
- (b) BWS shall pay a monthly charge of \$2,000 for this allocation.
- (c) BWS shall be entitled to take additional water (for a total withdrawal of up to 2 million gallons per day) whenever the flow in Iao Stream exceeds 55 mgd. For this additional water, BWS shall pay \$0.12 per thousand gallons (not including water used for back-washing filters).
- (d) The term of the agreement shall be two years and may be extended upon mutual agreement of the parties.

3. H'poko Wells

BWS and HC&S to pursue the following:

- (a) BWS to expedite completion of necessary engineering reports and will pursue approvals to utilize the wells for domestic purposes.
- (b) A&B will convey all necessary land and easements to BWS.
- (c) Subject to the completion and acceptance of the East Maui Development Plan EIS, A&B will consider participating in the construction of the transmission line from the well site to the BWS's Paia system in exchange for an appropriate allocation of water for its participation.
- (d) In consideration of providing such necessary land and easements, A&B may receive an appropriate allocation of domestic water (subject to normal system-wide limitations and conformity with general and community plans) to be mutually agreed to.

4. Power

BWS and HC&S intend to pursue the following:

- (a) HC&S will provide appropriate information on its transmission and distribution system to BWS or its consultants.
- (b) HC&S shall provide available power to BWS at mutually agreed upon locations, at a price not to exceed that paid by Maui Electric. BWS understands that the power being provided is not "firm", and that it shall be responsible for any necessary stand-by generators.
- (c) BWS shall, with HC&S's cooperation, explore the long-term feasibility of developing hydroelectric and other alternative energy sources.

5. Central Maui Source Joint Venture

- (a) BWS acknowledges that there is an unmet obligation to the Central Maui Source Joint Venture arising out of the JV's prior development of three wells having an installed pumping capacity of 13.4 mgd.
- (b) Subject to the approval of the other parties to the JV, BWS and the JV shall enter into a mutually acceptable settlement agreement resolving all outstanding issues regarding the Central Maui Source Joint Venture.
- (c) Any entitlement arising out of this resolution shall be for properties the JV members own or subsequently acquire for development within the area served by the Central Maui system; rights may be transferred to a subsequent purchaser or developer, but may not otherwise be transferred.
- (d) Within 30 days of the Memorandum, the Chairman of BWS (and/or his designees) shall enter into negotiations with representatives of the JV on a settlement agreement to establish:
 - (1) Existing usage by members of the JV;
 - (2) Future usage standards to be applied;
 - (3) The remaining entitlement of the JV;
 - (4) The terms and conditions of providing and utilizing the entitlement.

6. East Maui Water Development Plan

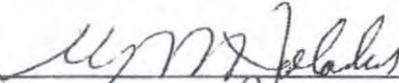
BWS and HC&S intend to pursue the following:

- (a) BWS to proceed expeditiously with the supplemental EIS for the project as originally planned.
- (b) BWS will assure that stream flow monitoring is an integral part of the scope of work.
- (c) A&B may participate in the project in exchange for an appropriate water allocation (subject to normal system-wide limitations and conformity with general and community plans).

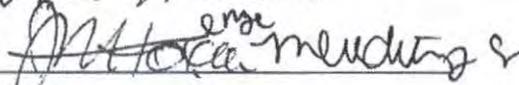
IN WITNESS WHEREOF, the parties hereto have caused their duly authorized representatives to execute this Memorandum of Understanding as of this 13th day of ~~March~~ ^{April}, 2000.

ALEXANDER & BALDWIN, INC.

APPROVED AS TO FORM AND LEGALITY:

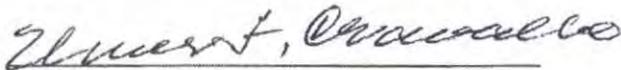

Its Vice President

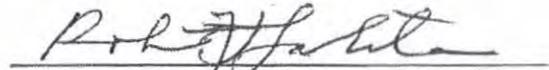

Deputy Corporation Counsel

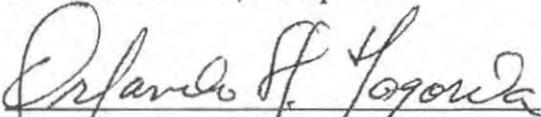

Its Vice president

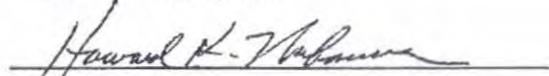
Date: April 13, 2000

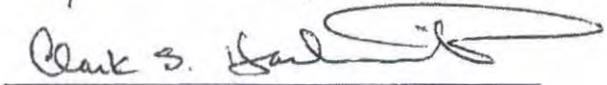
MAUI COUNTY BOARD OF WATER SUPPLY


Elmer F. Cravalho, Chairperson

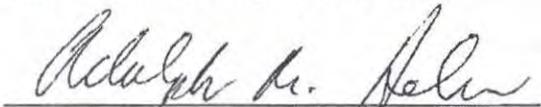

Robert K. Takitani, Board Member and Past Chairperson

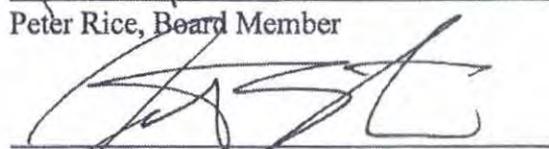

Orlando A. Tagorda, Vice Chairperson

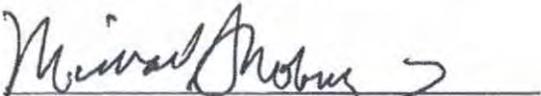

Howard Nakamura, Board Member


Clark S. Hashimoto, Board Member


Peter Rice, Board Member


Adolph M. Helm, Board Member


Jonathan A. Starr, Board Member


Michael A. Nobriga, Board Member

1955 Main Street, Suite 200
Wailuku, HI 96793

T: 808.244.7005
F: 808.244.9026

RECEIVED
CORPORATION COUNSEL

2014 DEC 23 PM 4: 13



December 23, 2014

Mr. Caleb P. Rowe, Deputy Corporation Counsel
County of Maui
Department of the Corporation Counsel
200 South High Street, 3rd Floor
Wailuku, HI 96793

1055.146325

Subject: Petition to Amend Interim Instream Flow Standards for Waikamoi, Puohokamo, Haipuaena, Punalau/Kolea, Honomanu, West Wailuaiki, East Wailuaiki, Kopiliula, Puakaa, Waiohue, Paakea, Kapaula & Hanawi Streams; Case No. CCH-MA13-01

Dear Mr. Rowe,

At your request, Brown and Caldwell has reviewed the documents provided by the County of Maui and conducted an engineering analysis of the impact to the County of Maui Department of Water Supply (DWS) should the Commission on Water Resource Management (CWRM) reduce or eliminate the County's use of East Maui surface water. In addition, we have assessed the economic benefits to the County if it were able to use a greater volume of East Maui surface water to meet future customer water requirements.

Qualifications

Brown and Caldwell is an environmental engineering and consulting firm with offices located nationwide. Brown and Caldwell has had an office on Maui for over 20 years, and we have assisted the County of Maui with planning and design of water and wastewater infrastructure projects throughout our period of presence on the island.

This report was prepared by Craig Lekven. Craig is a registered Professional Civil Engineer in Hawaii and California, and has 26 years of experience planning and designing water and wastewater infrastructure projects. Craig is the Supervising Engineer in Brown and Caldwell's Maui office, and has managed projects for the County of Maui throughout his 6 year tenure on the island.

EXHIBIT "B-016"

Documents Reviewed

Table 1 lists the documents that were reviewed as part of the preparation of this report.

Table 1. Documents Reviewed			
Ref. No.	Title	Author	Date
1	West to East – East Maui Streams (Table)	DWS	May 20, 2014 ^a
2	Instream Flow Standard Assessment Report, Data Needs	DWS	May 27, 2009
3	Comments and Updates for Instream Flow Standards Assessment Report, Data Needs (Dated May 27, 2009)	DWS	May 29, 2014 ^a
4	Kula Agricultural Park, Financial Analysis of the Water System	Fukunaga and Associates, Inc.	August 2013 (Revised May 2014)
5	Maui County Water Use and Development Plan, Upcountry District, Final Strategies Report (Draft)	Haiku Design & Analysis	July 27, 2009
6	Upcountry Maui Water System Optimization Analysis	DWS	September 12, 2012
7	2001-2011 Wailoa Ditch Charts.xls (spreadsheet)	DWS	August 14, 2014 ^a
8	CST PER JGALS PMV5.xls (spreadsheet)	DWS	July 21, 2014 ^a
9	Updates to Instream Flow Standard Assessment Report tables (various spreadsheets)	DWS	July 8, 2014 ^a

^a No printed date on document; date shown is the PDF computer file date.

Population Projections

DWS uses a combination of groundwater and surface water from East Maui streams to supply its Upcountry customers. Approximately 80 percent of DWS Upcountry water comes from surface water sources. The Maui Island Plan includes growth projections for the community planning areas that include the DWS Upcountry Service Area. Table 2 presents the population projections for the two community planning areas that encompass the DWS Upcountry Service Area. The community planning areas are geographically larger than the DWS Upcountry Service Area and include communities that are not part of the DWS Upcountry Service Area (e.g., Paia). However, the population projections shown in Table 2 can be used to project future water requirements within the DWS Upcountry Service Area assuming growth occurs throughout the community planning area and is not concentrated within specific areas outside the DWS Upcountry Service Area.

Table 2. Maui Island Plan Population Projections for Upcountry Community Planning Areas			
Description	Community Planning Area		Total
	Makawao – Pukalani – Kula	Paia – Haiku	
Year 2010 population	23,862	12,128	35,990
Year 2030 population	29,284	13,151	42,435
Projected population increase	5,422	1,023	6,445
Percentage increase	23 percent	8 percent	18 percent

Source: Reference 3

Water Demand Projections

The demand for domestic water will grow as the population grows. DWS has developed water demand projections that are summarized in Table 3. Note that Paia water demands are not included because the community is part of the DWS Central District. Also note that Table 3 is based on population projections only; if agricultural production increases the water demand will increase beyond what is shown in the Table 3.

Table 3. Upcountry District Water Demand Projections			
Upcountry Communities	Average Water Demand		
	Year 2010	Year 2030	Increase
Makawao - Pukalani - Kula	6.90 mgd	8.47 mgd	1.57 mgd (+23%)
Haiku	1.00 mgd	1.08 mgd	0.08 mgd (+8%)
Total	7.90 mgd	9.55 mgd	1.65 mgd (+21%)

Source: Reference 3.

Note: mgd = million gallons per day.

The values shown in Table 3 are average annual demands. Domestic and agricultural water use varies throughout the year. Consumption will generally be greater during the summer months because customers will use more water for irrigation and other outdoor purposes. Water demand is typically lower than the annual average during the winter months because precipitation provides much of the water that landscapes require to thrive. A water utility must be able to provide water to meet its customers' demand needs at all times, and therefore must have capacity that is greater than the average annual demand. Water utilities consider the following factors when determining future needs:

- Peak day demands – to ensure enough water is available at all times.
- Reliability factors – to ensure sufficient water supply to its customers even if elements of the water supply system are offline for maintenance purposes.
- System losses – system leakage and other unmetered losses that are typical for all water distribution systems.

Upcountry Water Meter Priority List

In 1993 the DWS determined that the Upcountry water systems had insufficient supply for fire protection, domestic, and irrigation purposes to take on new or additional services without detriment to the existing customers. In 1994 the DWS initiated a water meter priority list for land owners who had applied for water service in the Upcountry service area. The moratorium on issuing water meters has limited new development in the service area for 20 years. In 2012 there were 1,312 applications for Upcountry water service on the priority list. DWS determined that if they issued water meters to all who were on the list at that time the average demand would increase by 3.5 mgd (Reference 6). As of June 30, 2014 the list had grown to 1,852 applicants, for a total demand increase of 7.5 mgd. Figure 1 shows the locations of the applicants, who are scattered throughout the Upcountry area.

Path: P:\Projects\Maui, County of (HI)\146325 East Maui IFS Support\GIS\MXD\Upcountry Maui Water Meter Applicants.mxd User: YNoda Date: 11/20/2014

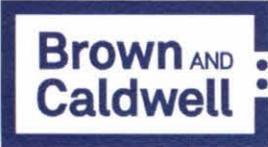
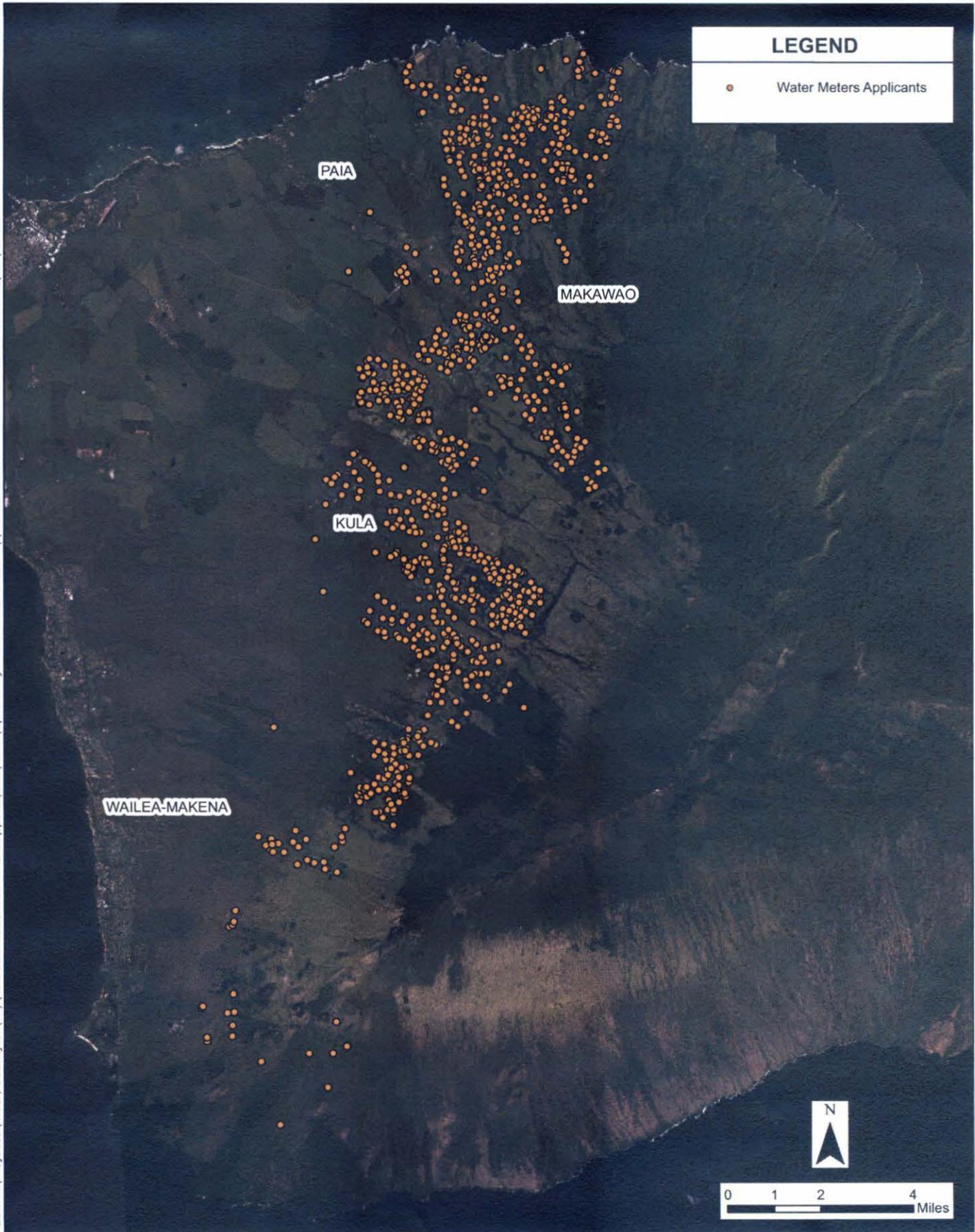


Figure1
1312 Upcountry Water Meter Applicants as of 2008

The current County administration has made reducing the size of the water meter priority list a priority, and initiated an Upcountry Water System Optimization Study to determine if additional water meters could be issued. This “in-house” engineering effort was meant to identify how the Upcountry system could be operated and/or improved to maximize service to customers. The study findings are discussed later in this report, but Table 4 compares the water demand projections based on the Maui Island Plan and the Upcountry Water Meter Priority List. As shown in the table, if all water meter applicants were allowed to connect to the system the water demand would increase significantly beyond the Maui Island Plan projections.

Table 4. Comparison of Water Demand Projections	
Basis of Projection	Year 2030 Average Water Demand Increase
Maui Island Plan population growth projections	1.65 mgd (+21%)
Upcountry water meter priority list (1,852 applicants)	7.5 mgd (+95%)

Water Customer Profile

The Upcountry District includes a variety of DWS customer types. Table 5 shows Upcountry water use, divided into two customer classes. Residential use includes single family residential, multifamily residential, and Department of Hawaiian Homelands properties. Agriculture use includes 466 farm and ranch properties growing fruits and vegetables, coffee, flowers, and livestock.

Table 5. Upcountry Customer Classes and Water Use		
Customer Class	Percentage ^a	Year 2010 Average Daily Flow ^a
Residential, commercial, institutional	59%	4.66
Agriculture (potable and non-potable)	41%	3.24
Totals	100%	7.90

^a Derived from Reference 9.

Note: mgd = million gallons per day.

The 445-acre Kula Agricultural Park (KAP) is also included within the boundaries of the DWS Upcountry District, but does not receive potable water from DWS. Instead, the KAP is supplied water from the Hamakua Ditch, which is stored in two storage reservoirs with a total capacity of approximately 5.4 million gallons (mgal). The KAP currently consists of 31 farm lots ranging in size from 7 to 29 acres. The KAP is owned by the County of Maui. DWS operates and maintains the KAP water system, and KAP water users are metered and billed by DWS. A few properties near Olinda also receive non-potable water from DWS for agricultural purposes.

Existing Surface Water Sources for Upcountry Water System

DWS treats surface water at three Upcountry water treatment plants (WTPs), as summarized in Table 6. Adequate source water must be available for the WTPs to operate at their production capacities; the raw water storage reservoirs at the Piiholo and Olinda WTPs enhance the reliability of those facilities by equalizing the source water supply. During times of drought the WTPs may not be able to operate at their production capacities due to lack of source water.

Table 6. DWS Upcountry Surface Water Treatment Plants				
Facility	Raw Water Source ^a	Raw Water Storage	Approximate Source Elevation	Production Capacity
Kamole WTP	Wailoa Ditch	None	1,100 ft MSL	6.0 mgd
Piiholo WTP	Piiholo Reservoir	50 mgal	2,900 ft MSL	5.0 mgd
Olinda WTP	Waikamoi and Kahakapao Reservoirs	130 mgal	4,200 ft MSL	2.0 mgd
Total surface water production capacity:				13.0 mgd
Total reliable capacity ^b :				7.0 mgd

^a See Table 7 for contributing streams.

^b Treatment capacity with largest facility off-line for maintenance purposes.

Notes: ft MSL = feet above mean sea level, mgd = million gallons per day.

Source: Reference 6.

Table 7 provides a summary of the East Maui Streams that contribute surface water to the DWS Upcountry water systems.

Table 7. East Maui Streams that Contribute Surface Water to DWS Upcountry Water Systems			
Stream	Kamole WTP and Kula Agricultural Park	Piihoho WTP	Olinda WTP
Honopou	■		
Hanehoi and Puolua	■		
Alo	■		
Waikamoi	■	■	■
Wahinepee			
Puohokamoa – West, Middle, and East Branches	■	■	■
Haipuaena	■	■	■
Kolea – East and Punalau	■		
Honomanu	■	■	
Nuaailua	■		
Piinaau	■		
Palauhulu	■		
Waianu/Ohia			
Waiokamilo			
Kualani			
East and West Wailuanui	■		
Waikani			
West Wailuaiki	■		
East Wailuaiki	■		
Kopiliula	■		
Puakaa	■		
Waiohue	■		
Paakea	■		
Waiaka	■		
Kapaula	■		
Hanawi	■		
Makapipi, East and West	■		

Source: Reference 1.

Existing Groundwater Sources for Upcountry Water Systems

Table 8 lists the existing groundwater sources for the DWS Upcountry Water Systems. All wells draw from the basal aquifer, located approximately at sea level.

Table 8. Existing Groundwater Sources for DWS Upcountry Water Systems	
Description	Production Capacity
Haiku Well	0.5 mgd
Pookela Well	1.3 mgd
Kaupakalua Wells (two wells in operation)	1.6 mgd
Total groundwater production capacity	3.4 mgd
Reliable groundwater production capacity ^a	2.1 mgd
Emergency source: Hamakuapoko wells ^b	1.5 mgd
Total groundwater production capacity in emergency conditions ^c	4.9 mgd
Reliable groundwater production capacity for emergency conditions ^d	3.4 mgd

^a Production capacity with Pookela well off-line for maintenance purposes.

^b Maui County Code Section 14.01.050 limits Hamakuapoko wells use to emergency conditions only.

^c All wells in operation.

^d Hamakuapoko wells as backup to all other wells.

Note: mgd = million gallons per day.

The Hamakuapoko wells facility can produce 1.5 million gallons per day (mgd), but the water must be treated with granular activated carbon to remove legacy pesticides from former pineapple production. DWS recently upgraded the granular activated carbon system to allow production of drinking water that meets all state and Federal drinking water requirements. However, the Maui County Code currently limits the use of the wells to emergency drought conditions only, due to the local community's concerns regarding the legacy pesticides and water safety perceptions. Section 14.01.050 of the Maui County Code states:

Water from Hamakuapoko Wells 1 and 2 shall only be provided for:

1. *Agricultural purposes;*
2. *Consumers of the department's upcountry water system as defined in section 14.13.030 of this code when a drought is declared pursuant to section 14.06.010 of this code; and*
3. *Backup to the department's existing upcountry water system facilities.*

Water quality sampling schedules shall comply with department of health regulations and with standards set by the United States Environmental Protection Agency.

As per Ordinance, DWS will use the Hamakuapoko wells as a "last resort" to meet customer needs in emergency conditions.

Production Capacity Summary

Table 9 summarizes the current total and reliable production capacity that is available to DWS. Adequate source water must be available for the WTPs to operate at their production capacities. DWS relies on both surface water and groundwater to meet customer needs. Note that there is currently insufficient groundwater production capacity available to replace surface water capacity, and groundwater sources can only supply a portion of the current 7.9 mgd average demand.

Source	Total Capacity (mgd)	Reliable Capacity (mgd)
Surface water	13.0	7.0
Groundwater	4.9	2.1
Total	17.9	9.1

Note: mgd = million gallons per day.

Upcountry Water System Operation

DWS operates four separate water systems in the Upcountry District, as summarized in Table 10.

Water System Name	Communities Served	Primary Water Source(s)
Upper Kula	Kula, Waiakoa, Keokea, Ulupalakua, Kanaio	Olinda WTP
Lower Kula	Olinda, Kula Kai, Omaopio, Pulehu	Piiholo WTP
Makawao	Haiku, Haliimaile, Makawao, Pukalani	Kamole WTP Haiku and Kaupakalua Wells
Kula Agriculture Park	Kula Agriculture Park	Hamakua Ditch (non-potable)

The Makawao and Lower Kula systems are operated using free chlorine for disinfection purposes. The Upper Kula system is different in that the source water of the Olinda WTP contains high levels of natural organic matter (NOM) that includes dissolved organic carbon (DOC) that is not completely removed by the water treatment process. The DOC that is present in the treated water can react with free chlorine to form disinfection byproducts (DBPs) that can exceed United States Environmental Protection Agency (USEPA) and State of Hawaii Department of Health (DOH) regulatory thresholds. DWS uses an alternative disinfectant (chloramines) in the Upper Kula system to keep DBP concentrations below USEPA and DOH regulatory thresholds. Water that is disinfected with chloramines is not compatible with water that is disinfected with free chlorine, so water in the Upper Kula system cannot be freely exchanged with water in the two other potable systems.

During normal conditions the three potable water systems are operated independently, and treated surface water constitutes the majority of water delivered to the Upcountry customers. During drought conditions DWS implements the following strategies, as needed:

- Water is pumped from the Makawao system up to the Lower Kula system to supplement water supply from the Piiholo WTP.
- The Pookela well is operated to supplement water supply from the Kamole WTP.
- Water is pumped from the Lower Kula system up to the Upper Kula system. This action requires public prior notification because the Upper Kula disinfectant must be changed from chloramines to free

chlorine to ensure compatibility with Lower Kula system water. In this mode, the Olinda WTP is operated at a substantially reduced rate to only supply high-elevation customers on Olinda Road near the WTP that continue to receive chloramine-disinfected water.

Wailoa Ditch Operation

The Kamole WTP is DWS's largest surface water treatment facility, and its raw water source is the Wailoa Ditch, owned and operated by East Maui Irrigation Company (EMI). DWS pays a delivery fee (currently \$0.06/1,000 gallons) to EMI for surface water delivered via EMI's ditch systems. The fee compensates EMI for the costs to operate and maintain the raw water collection and transmission systems.

During normal conditions DWS withdraws only a small portion of the total Wailoa Ditch flow, which has a capacity of up to 200 mgd. During drought conditions DWS withdraws the first 6 mgd, and what remains is used by HC&S for irrigation purposes.

Comparison of Surface Water vs. Groundwater Operational Costs

Source water located at higher elevation is more valuable to DWS than water located at lower elevation because of the energy required to pump water uphill. DWS currently incurs significant electricity costs (\$4.5 million in 2011) to pump water from lower elevations to higher elevations in the Upcountry service area. The most significant pumping costs are incurred when basal groundwater, located slightly above sea level, must be pumped up to higher elevations. Table 11 provides our estimates of the costs to pump basal groundwater to the Upcountry WTPs to replace surface water from the facilities' surface water sources. Groundwater does not need to be treated like surface water, so there are water treatment cost savings when groundwater is supplied. Table 11 shows the net cost to replace surface water with groundwater, obtained by subtracting the surface water treatment cost from the groundwater pumping cost. Note that it is necessary to pump Kamole WTP treated surface water uphill to the Pookela Tank, whereas the Piiholo and Olinda WTPs are located at higher elevations than their service areas and water flows downhill to their respective customers. As shown in the table, the costs to replace surface water with basal groundwater are significant, particularly at the two higher-elevation WTP service areas. The County's water rate structure is uniform for all customers throughout the County, so water rates are not dependent on what service area a customer is located. The Upcountry service area is DWS's most expensive service area, due to the high elevations of the communities served. The availability of high elevation Upcountry surface water sources benefits all DWS customers by keeping the cost to serve Upcountry residents as low as possible. In addition, many of the island's diversified agricultural operations and small family farms are located Upcountry, and the presence of surface water benefits all island residents in the form of locally-grown produce and food security.

Table 11. Unit Operational Costs to Replace Surface Water with Basal Groundwater

Facility	Approximate Surface Water Source Elevation (ft MSL)	Approximate Supply Tank Elevation (ft MSL)	Cost to Pump Groundwater to Supply Tank (per 1,000 gallons)	Cost to Treat Surface Water at WTP ^a (per 1,000 gallons)	Net Cost Increase to Replace Surface Water with Groundwater (per 1,000 gallons)
Kamole WTP	1,100	1,820	\$3.11	\$1.47	\$1.64
Piiholo WTP	2,900	2,900	\$4.95	\$0.88	\$4.07
Olinda WTP	4,200	4,200	\$7.17	\$1.24	\$5.93

Assumptions: Electricity cost = \$0.40/kW-hr, pump efficiency = 80%, motor efficiency = 90%.

Note: ft MSL = feet above mean sea level.

^a Source: Reference 8.

Upcountry Water System Optimization Study

To determine if new water meters could be issued, DWS prepared statistical evaluations of daily surface and groundwater production, reservoir storage volumes, ditch flows, and booster pumping for the ten-year period from 2001 through 2011. Key findings of the Optimization Study are summarized in Table 12. The 95th percentile daily demand is 0.6 mgd greater than the reliable production capacity that was shown in Table 9.

Table 12. Upcountry Water System Optimization Study	
Description	Value
Upcountry Water Demand	
Average daily demand	7.3 mgd
Standard deviation	1.5 mgd
95th percentile daily demand	9.7 mgd
Peak day demand (one occurrence in 10 years)	11.6 mgd
Wailoa Ditch Flow	
Average flow	94 mgd
Standard deviation	55 mgd
Median flow	77 mgd
Number of days where flow was less than 20 mgd	50 days
Longest continuous span of no flow	5 days

Note: mgd = million gallons per day.

Source: Reference 6.

DWS has determined that another 1.75 mgd of demand could be added to the service area without decreasing the level of service to existing customers with a combination of increased source by using the Hamakuapoko wells for emergency backup purposes, increased booster pumping from the lower elevation systems to the higher elevation systems, and implementation of systems to allow water transfer from the Makawao and Lower Kula Systems to the Upper Kula System without having to change the Upper Kula disinfectant (Reference 6).

As was shown in Table 4, DWS expects Upcountry water demands to increase at least 1.65 mgd over the next 20 years (based on the Maui Island Plan population projections), but there are enough applicants on the Upcountry Water Meter Priority List to create substantially greater water demands. The Upcountry Water System Optimization Study findings support the 20-year growth projections in the Maui Island Plan, but there is insufficient water supply to issue water meters to all properties that have applied for Upcountry water service. Therefore, additional water will potentially be required to meet the needs of future customers due to the de-facto growth restriction that the Upcountry Water Meter Priority List has imposed on the area for the last 20 years.

DWS began offering new water meters to customers on the priority list in May 2014 on the basis of the study findings and adoption of a new County policy and completion of rehabilitation measures that allow the Hamakuapoko wells to be used in emergency conditions. DWS plans to work its way down the priority list (in order of priority) until the available reliable water supply is allocated to customers. Customers are required to pay the capital cost associated with extending water lines to service their property. DWS anticipates that approximately 50 percent of all customers that are offered new water meters may decline offered service due to high connection costs to provide service to their properties.

Impact of Reduced Surface Water Supplies

The subject hearings have the potential to reduce or eliminate DWS access to surface water supplies, which is the most cost-effective way for DWS to serve its Upcountry customers. The impact to DWS of reduced surface water supplies will be a function of how the CWRM chooses to implement mandates to ensure sufficient water is available for in-stream uses.

- **Reductions in ditch flows.** A possible scenario is a CWRM mandate for EMI to reduce Wailoa Ditch flows to ensure sufficient water is available for in-stream uses. When water is plentiful there is sufficient water for all needs. However, during drought conditions off-stream users are likely to be impacted. Peak water demands generally occur during the summer months due to irrigation demands. Irrigation demands are a function of crop evapotranspiration and precipitation rates. Therefore, peak water demands are likely to coincide with drought conditions. The impact to DWS in this scenario would depend on the magnitude of the ditch flow reduction. A reduction in ditch flow would have the effect of reducing the reliability of the DWS system, requiring mitigation measures to ensure customer and life safety (e.g., water for fire suppression) needs can be met. The larger the ditch flow reductions, the greater the mitigation measures required. As described below, mitigation measures could include construction of additional basal wells and/or raw water storage reservoirs to ensure system reliability during drought conditions. DWS would incur capital costs and higher operating costs as a result.
- **Reductions in surface water supplies.** A second scenario would be a CWRM mandate for DWS to reduce surface water use to ensure sufficient water is available for in-stream uses. Year-round reduction of surface water supply would have a significantly greater impact to DWS than mandated reductions in EMI ditch flow. Year-round reductions in surface water supplies would require development of additional basal wells to augment the remaining surface water supplies and ensure reliability. DWS would incur capital costs to construct new basal wells, and higher operating costs to replace the lost surface water supplies with higher-cost groundwater.
- **Elimination of surface water supplies.** The most extreme scenario would be a CWRM mandate to eliminate surface water use in one or all DWS water systems to ensure sufficient water is available for in-stream uses. Complete elimination of surface water supply to one or all water systems would have an extreme impact to DWS. Existing surface water supplies would need to be replaced with a new basal groundwater system to replace lost surface water supplies. It would take DWS many years to construct a replacement system. Operating costs would increase significantly to replace lost surface water with higher-cost groundwater.

Strategies to Meet Future Demands and/or Reduced Surface Water Supplies

DWS has evaluated a wide variety of candidate strategies (in Reference 5) to meet the long-term future demands in the Upcountry system and/or to respond to surface water supply reductions that may result from the subject hearings. The candidate strategies that appear to be most cost effective consist of combinations of additional basal well capacity and/or construction of raw water storage reservoirs. The final candidate strategies are listed in Table 13. The strategy numbered zero represents the status quo operation of the Wailoa Ditch, with no reduction in Wailoa Ditch flow as a result of the subject hearings. Strategies 1 through 5 all assume a 20-mgd reduction in Wailoa Ditch flow to support in-stream uses.

Table 13. Final Candidate Strategies

Strategy	20-mgd Reduction in Wailoa Ditch Flow Assumed	Incremental Basal Well Development	Lower Kula Reservoir		Kamole Reservoir	
			100 mgal	300 mgal	100 mgal	200 mgal
0		X				
1	X	X				
2	X	X	X			
3	X	X	X		X	
4	X			X		
5	X		X			X

Note: mgal = million gallons.

All five strategies consist of a group of projects designed to reliably meet the future water demands of the customers. The strategies share common elements including:

- Construction of two additional wells near Makawao.
- Booster pumping improvements.
- Conservation and efficiency measures.
- Exploratory and investigative measures.
- Watershed protection and restoration measures.
- Stream restoration measures.

The main elements of the strategies are discussed below.

Incremental Basal Well Development

This element consists of constructing new wells at the 1,300 foot elevation to pump to the Kokomo tank, and/or wells at the 1,800 foot elevation to deliver water to the Pookela tank. Transmission pipelines, storage tanks, and booster pump stations would be added to meet future needs.

DWS entered into a Consent Decree in 2003 that requires that the Department vigorously investigate and pursue additional Na Wai Eha surface water and conduct rigorous cost/benefit analyses of other water source options before developing groundwater in the East Maui region. The recent Na Wai Eha agreement has closed the option of developing additional Na Wai Eha surface water. Reference 5 and other studies constitute rigorous cost/benefit analyses of the available options. Development of additional basal wells is a viable strategy to meet future needs from a technical perspective; however, there are legal issues that must be resolved before DWS can proceed with implementation.

DWS has not identified specific well sites at this time.

Expansion of Raw Water Storage Capacity

These elements consist of constructing additional raw water storage reservoirs to store water from wet periods for use during dry periods. DWS has evaluated reservoirs ranging from 100 mgal to 300 mgal in size, located to serve the Olinda, Piihoho, and/or Kamole WTPs. The DWS analyses determined the most cost-effective reservoirs would be:

- A 100 mgal to 300 mgal reservoir designed to feed the Piihoho WTP.
- A 100 mgal to 200 mgal reservoir designed to feed the Kamole WTP.

Specific reservoir sites have not been identified, and there could be significant environmental issues to overcome before a reservoir could be constructed.

Comparison of Groundwater and Raw Water Storage Capacity Elements

There are fundamental differences in the development of new groundwater sources versus construction of raw water storage reservoirs to mitigate Upcountry drought conditions. New reservoirs carry high capital costs, but have lower operation and maintenance costs compared to groundwater wells. There must be sufficient source water available to fill the reservoir. New wells carry relatively lower capital costs, but also require transmission and storage improvements to be integrated into the existing water delivery systems. In addition, there is always risk associated with drilling new wells because of the uncertainty of the quantity and quality of water that will be present. As presented above, operational costs for basal groundwater sources are higher than for Upcountry surface water sources due to the cost to pump groundwater up from sea level to the water delivery systems.

Conservation Measures

All of the final candidate strategies presented above include conservation and efficiency measures. DWS's conservation measures have included:

- Water rate modifications to encourage conservation.
- Leak detection and repair to reduce distribution system losses.
- Preventative and predictive maintenance to reduce system losses.
- Back-up sources so that in the event of a major leak most areas can be isolated and served by alternate sources.
- Watershed and resource protection, DWS funding to watershed partnerships.
- Low-flow fixture distribution, including showerheads, bathroom aerators, kitchen aerators, self-closing hose nozzles, and leak detection dye tablets.
- Water audits and direct fixture retrofits.
- Development of regulations related to water conservation.
- Public education and outreach activities.

DWS long-term planning efforts have also considered implementation of extensive water conservation measures as a strategy to meet future needs. Water conservation achievements are typically expressed as a percentage of the "technical potential". The technical potential is an estimate of the amount of water that could potentially be saved by implementing water conservation measures and practices. DWS economic analyses have shown that a water conservation program goal to achieve 45 percent of the technical potential would yield the best economic returns. The types of conservation measures that have been identified as having good potential to help achieve 45 percent of the technical potential include:

- Residential / commercial audits and direct installation for indoor and landscape irrigation users.
- Education and publicity program to encourage water conservation and promote program participation.
- Direct installation of efficient fixtures at customer premises including toilets, showerheads, and sink faucet flow restrictors.
- Audits of existing irrigation system equipment and practices and specific resulting recommendations to customer to improve efficiency.
- Direct installation of targeted "high payback" fixtures in commercial premises.
- High efficiency fixture rebates.
- High efficiency washing machines.
- High efficiency toilets and waterless urinals.
- Agricultural user group and services.

Some water conservation measures will result in tangible source water savings that can be reliably allocated to new users, while other types of measures rely on customer behavioral changes that can

relapse and diminish the water savings. For example, detecting and repairing distribution leaks results in water savings that can be safely allocated to new customers. However, measures that rely on customer behavioral changes present a challenge to water agencies as to whether or not the realized water savings can be safely allocated to new customers; if the behavior changes are not permanent the water savings are reduced and the water agency could end up being short of water. Therefore, some types of conservation measure savings can be safely used as equivalents to new source, but others cannot until the water agency is comfortable that the resulting savings are permanent.

Life-Cycle Cost Evaluations

Life-cycle cost comparisons were developed based on the information presented in Reference 5. The life-cycle costs incorporate capital, operating, and maintenance costs over a defined planning period, and include inflationary effects. The use of life-cycle costs allows evaluation of different alternatives on an equal basis. The life-cycle costs are expressed as the net present value (NPV) of all the costs incurred during the planning period. The NPV is the amount of money that would need to be set aside today at a defined interest (discount) rate to fund the project or strategy.

Capital costs were escalated to current (July 2014) dollars using Engineering News Record's 20-City Construction Cost Index. Operation and maintenance costs were escalated to current dollars using the Consumer Price Index. The following assumptions were used to develop the life-cycle cost comparisons:

- 25-year planning period.
- The baseline case water demand projection results in a need for an additional 1.65 mgd average production rate at the end of the planning period.
- A linear increase in the production rate occurs over the planning period.
- Discount rate of 6 percent, for consistency with the value used in Reference 5.
- Inflation rate of 3 percent, for consistency with the value used in Reference 5.

Life Cycle Costs of Final Candidate Strategies

Table 14 provides a summary of our analysis of the life-cycle costs of the final candidate strategies described above. The life-cycle and unit costs shown in Table 14 appear to be somewhat similar due to the programmatic nature of the DWS analysis in Reference 5. From a planning perspective, all of the strategies carry similar life-cycle costs so other factors will ultimately weigh heavily on what strategy DWS chooses to implement. Our opinion of the implementation risk associated with each strategy highlights some of the differences associated with each strategy. In general, we feel new basal wells would be easier to develop than new storage reservoirs due to the need for capital financing mechanisms to construct expensive reservoirs, and potential environmental issues associated with constructing a new reservoir in the Lower Kula area.

The table shows the life-cycle unit costs to supply water to Upcountry customers are quite high. By comparison, our recent similar analysis for the Central District showed unit costs of less than \$10 per 1,000 gallons, less than 1/3 the price of the Upcountry District water.

Table 14. Life-Cycle Costs of Final Candidate Strategies

Strategy	20-mgd Wailoa Ditch Flow Reduction Assumed?	Life-Cycle Cost, NPV	Unit Cost	Opinion of Implementation Risk
Incremental basal wells	No	\$230 million	\$31/kgal	Medium, if legal issues are resolved. Drilling new wells incurs water quantity and quality risks
Incremental basal wells	Yes	\$260 million	\$35/kgal	
Incremental basal wells, Lower Kula reservoir	Yes	\$260 million	\$35/kgal	High, due to potential environmental issues and high capital costs associated with new reservoir development. Also risk of maintaining additional surface water "rights".
Incremental basal wells, Lower Kula reservoir, Kamole reservoir	Yes	\$260 million	\$35/kgal	
Lower Kula reservoir	Yes	\$260 million	\$35/kgal	
Lower Kula reservoir, Kamole reservoir	Yes	\$250 million	\$33/kgal	

Notes: kgal = 1,000 gallons, mgd = million gallons per day, NPV = net present value.

Economic Impact of Wailoa Ditch Flow Reductions

A possible outcome of the subject hearings would be a requirement for EMI to maintain minimum flows in the subject streams to support in-stream uses. Maintaining minimum stream flows will reduce the amount of water that EMI can deliver via its ditch system. When water is plentiful there would be no impact to DWS, but during dry times DWS could be affected by Wailoa Ditch flow reductions. For example, currently when the ditch flow is 20 mgd DWS has access to the full 6 mgd reliable capacity of the Kamole WTP. If the subject hearings mandate that 20 mgd be kept in the streams there would be no Wailoa Ditch flow under the same conditions, and there would be no surface water available for DWS. Under this scenario DWS would need to rely on groundwater resources and/or water stored in new raw water storage reservoirs to meet the needs of its customers until Wailoa Ditch flows resumed.

We evaluated the Wailoa Ditch flow data that DWS used in its Upcountry Water System Optimization Study to assess how Wailoa Ditch flow reductions could potentially impact DWS. The evaluation considered the average number of days per year that DWS would not have access to the full production capacity of the Kamole WTP (6 mgd) due to reduced ditch flow. Figure 2 shows the results of the analysis, which considered no reduction in ditch flow up to 25 percent of the ditch capacity (50 mgd). The chart shows small impacts for flow reductions of up to about 15 mgd. Above 15 mgd the impacts increase at a higher rate. The greatest number of continuous days DWS did not have access to ditch flow during the data period was 5 days in 2009. Figure 2 suggests that if Wailoa Ditch flows were reduced 15 mgd then DWS would experience about 5 days every year where it would not have access to the full 6 mgd production capacity of the Kamole WTP.

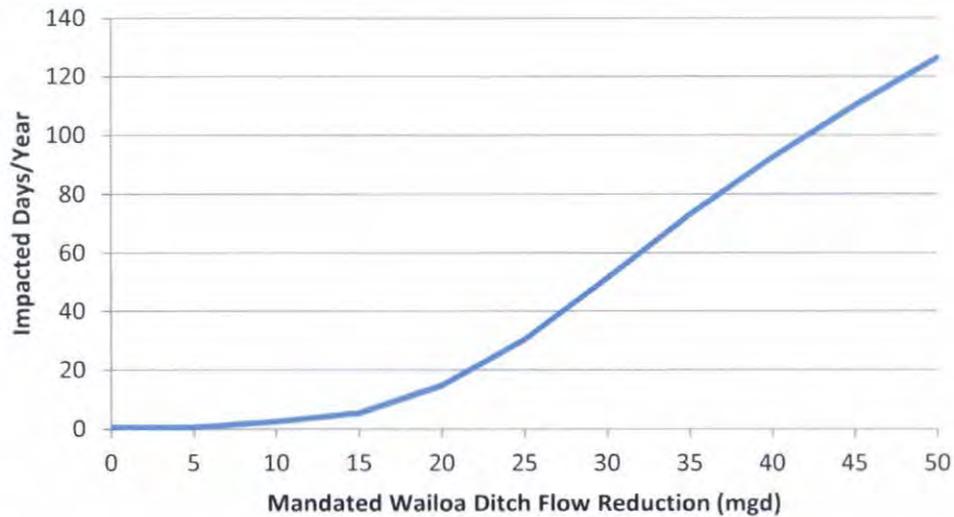


Figure 2. Days per Year DWS would be Impacted by Mandated Wailoa Ditch Flow Reductions

The incremental life-cycle costs for constructing and operating infrastructure to mitigate a 20-mgd Wailoa Ditch flow reduction can be determined by subtracting the cost of Alternative 1 from Alternative 0 in Table 14. The incremental life-cycle costs for other Wailoa Ditch flow reductions shown in Figure 2 were evaluated. The life-cycle cost evaluation results are shown in Figure 3.

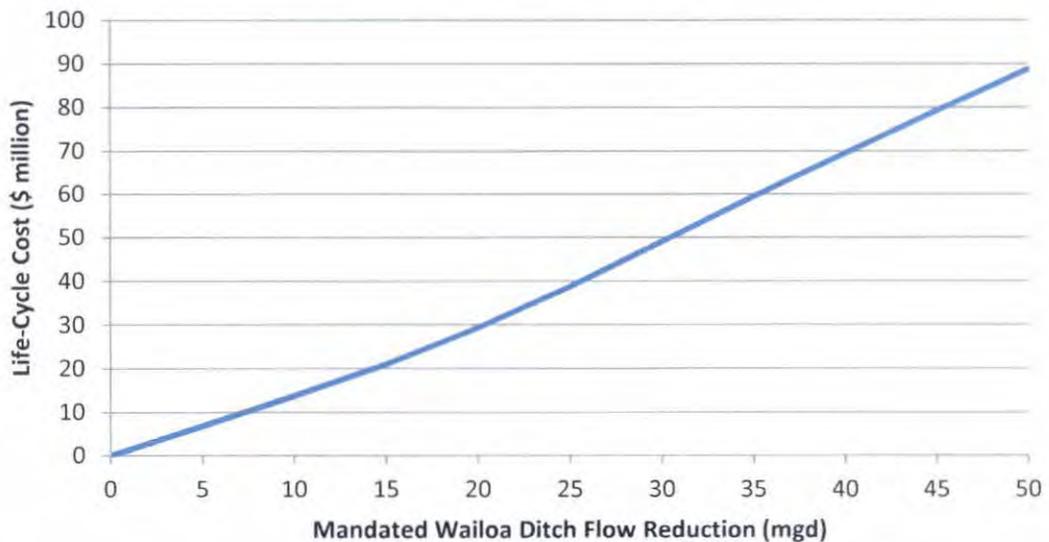


Figure 3. Life-Cycle Cost Impact to DWS for Mandated Wailoa Ditch Flow Reductions

Economic Impact of Year-Round Reduction in Surface Water Supply

Another potential outcome of the subject hearings could be a mandate for DWS to reduce its use of surface water throughout the year to support in-stream uses. A life-cycle cost evaluation was prepared to assess the economic impact of this scenario, assuming flow reductions up to the reliable capacity of each WTP. The results are shown graphically in Figure 4. The graph shows that a given flow reduction imposed on the higher-elevation WTPs have greater impact to DWS than flow reductions imposed on the lower-elevation WTPs, due to the higher cost to deliver water to higher-elevation service areas.

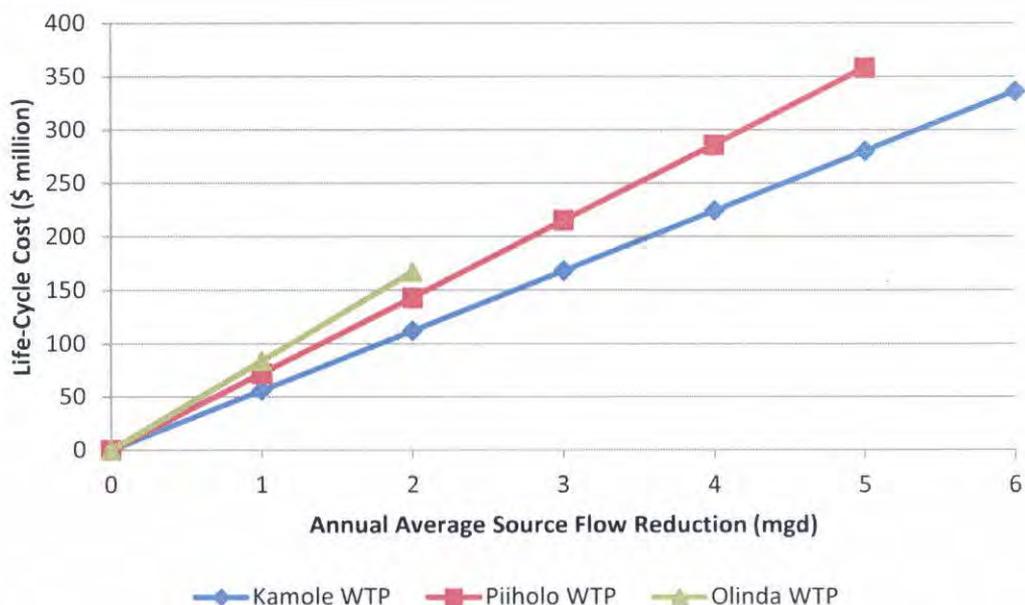


Figure 4. Life-Cycle Cost Impact to DWS for Year-Round Reduction in Source Flow

Economic Impact of Elimination of Surface Water Supplies

Figure 4 can be used to assess the economic impact if DWS were mandated to stop using surface water for its Upcountry system and replaced it with groundwater. Table 15 summarizes the results. The table shows that the surface water that DWS uses for its Upcountry water systems would be very expensive to replace.

Table 15. Economic Impact if DWS Eliminated Surface Water from Upcountry System		
Facility	Production Capacity	Life-Cycle Value of Surface Water
Kamole WTP	6.0 mgd	\$336 million
Piihoho WTP	5.0 mgd	\$358 million
Olinda WTP	2.0 mgd	\$167 million
Total	13.0 mgd	\$861 million

Note: mgd = million gallons per day.

Economic Benefit of Increased Surface Water Supplies

If additional reliable year-round surface water were available to DWS the existing WTPs could be expanded to meet the future Upcountry demands. DWS would incur capital costs to expand WTP treatment capacity and clearwell capacity, and would incur operating costs associated with treating the additional water. In addition, DWS would incur capital and operating costs associated with expanding GAC systems to remove DOC from the treated water produced at the Olinda and Piihoho WTPs. The benefits of increased surface water supplies are avoided costs associated with constructing and operating new wells and/or raw water storage reservoirs. Table 16 summarizes our estimate of the net life-cycle cost benefits DWS would realize with increased surface water supplies at each of the three WTPs. The life-cycle economic benefits would range from \$11 million to \$37 million per mgd of increased surface water supply, with larger benefits realized at the higher-elevation WTPs.

Table 16. Life-Cycle Cost Benefits of Additional Reliable Year-Round Surface Water Supplies			
Description	Kamole WTP	Piiholo WTP	Olinda WTP
Expand WTP capacity	\$8.8 million/mgd	\$8.8 million/mgd	\$8.8 million/mgd
Expand GAC capacity	Not required	\$1.2 million/mgd	\$1.2 million/mgd
Operate expanded WTP	\$250,000/year/mgd	\$117,000/year/mgd	\$332,000/year/mgd
Operate expanded GAC	Not required	\$400,000/year/mgd	\$400,000/year/mgd
Avoided well construction	\$8.9 million/mgd	\$8.9 million/mgd	\$8.9 million/mgd
Avoided groundwater pumping cost	\$1.1 million/year/mgd	\$1.8 million/year/mgd	\$2.6 million/year/mgd
Life-cycle cost benefit	\$11 million/mgd	\$33 million/mgd	\$37 million/mgd

Summary

Access to surface water is critical to DWS's mission to supply water to its Upcountry customers. The economic impact of reductions in Wailoa Ditch flows to support in-stream uses will depend on the magnitude of the reductions. The economic impact to the Department for a 15 mgd reduction in Wailoa Ditch flow could be on the order of \$21 million over a 25-year planning period (Figure 3). Restoring a flow of 1 mgd to each of the 22 streams (22 mgd total) that supply raw water to the WTPs could have a \$33 million impact to DWS over the same 25-year period (Figure 3).

Mandated source water reductions to the three WTPs would have greater economic impacts. A 1 mgd reduction could cost DWS \$56 million to \$84 million over a 25-year planning period, depending on the WTP that is affected (Figure 4).

The benefit that DWS would realize from an increase of reliable surface water supplies range from \$11 million to \$37 million per mgd over a 25-year planning period, depending on the WTP where the additional source is realized (Table 16).

Very truly yours,

Brown and Caldwell



Craig C. Lekven, P.E.
 Supervising Engineer

CCL:ic



Exp. 4/30/16

June 30, 2014

SUBJECT TO CHANGEUPCOUNTRY WATER SERVICEPriority List for Building Permit Applications,
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<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1	1/4/1999	2-3-07:001		WR 1295
2	1/5/1999	2-3-58:036		A 99 0010
3	1/13/1999	2-4-36:006		A 99 0064
4	1/14/1999	2-2-16:116		A 99 0070
5	1/20/1999	2-8-02:158		WR 1277
6	1/26/1999	2-3-55:031		A 99 0121
7	2/22/1999	2-3-03:156	25A2	WR 1279
8	3/2/1999	2-3-13:052		SD
9	3/11/1999	2-3-60:062	47	A 99 0424
10	3/19/1999	2-8-06:010		SD
11	3/19/1999	2-8-06:040		SD
12	3/31/1999	2-7-06:009		SD
13	4/5/1999	2-8-10:042		A 99 0580
14	4/15/1999	2-2-13:047		WR 1281
15	5/6/1999	2-8-04:027	22-A	WR 1285
16	5/7/1999	2-3-57:102		A 99 0884
17	5/13/1999	2-3-60:041		A 99 0928
18	5/21/1999	2-2-04:017		SD
19	5/25/1999	2-8-04:038		A 99 1022
20	5/26/1999	2-3-50:021		A 99 1057
21	6/4/1999	2-3-53:005		A 99 1108
22	6/7/1999	2-4-32:014		A 99 1127
23	6/14/1999	2-7-10:045		WR 1296
24	6/25/1999	2-4-32:027		A 99 1273
25	7/6/1999	2-2-04:088	27-C-3	WR 1300
26	7/7/1999	2-7-12:115		WR 1594
27	7/13/1999	2-8-03:044		SD 00-026
28	7/16/1999	2-2-16:034		WR 1312
29	7/19/1999	2-8-02:006		SD
30	7/19/1999	2-7-24:010		WR 1294
31	7/27/1999	2-3-08:013		SD
32	7/29/1999	2-2-03:004		WR 1309
33	7/30/1999	2-4-32:027		A 99 1561
34	8/16/1999	2-3-03:171		SD 01-058
35	8/16/1999	2-3-03:171		SD 01-059
36	8/27/1999	2-7-12:014		SD 02-006
37	8/30/1999	2-3-50:043		A 99 1759
38	8/30/1999	2-2-05:042	40-A	WR 1303
39	9/8/1999	2-7-13:050		A 99 1846
40	9/10/1999	2-3-14:045		SD
41	9/16/1999	2-3-22:129		A 99 1911
42	9/24/1999	2-7-12:080		SD
43	9/24/1999	2-2-04:006		WR 1301
44	9/24/1999	2-7-35:003	17-C	WR 1302
45	10/8/1999	2-7-23:003		SD 99-072
46	10/12/1999	2-4-13:184	2	A 99 2127
47	10/13/1999	2-7-13:067		WR 1306
48	10/14/1999	2-4-30:094	2	A 99 2141
49	10/18/1999	2-7-16:002		WR 1313
50	10/19/1999	2-1-08:048		WR 1549
51	10/20/1999	2-2-16:099		SD
52	10/20/1999	2-2-16:119		SD
53	10/26/1999	2-7-12:230		A 99 2200
54	10/28/1999	2-3-02:107		A 99 2217

EXHIBIT "B-017"

Reference Prefix
A = bldg. permit
SD = subdivision
WR = water serv

June 30, 2014

SUBJECT TO CHANGE**UPCOUNTRY WATER SERVICE**Priority List for Building Permit Applications,
Subdivisions & Water Service Requests

<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
55	11/8/1999	2-4-07:017		WR 1310
56	11/8/1999	2-3-47:037	265	WR 1311
57	11/15/1999	2-2-13:050		SD 99-082
58	11/15/1999	2-2-15:013		SD 99-083
59	11/15/1999	2-2-15:012		SD 99-084
60	11/24/1999	2-7-11:017		A 99 2382
61	12/2/1999	2-2-12:050		WR 1315
62	12/10/1999	2-7-13:125		SD
63	12/16/1999	2-3-08:015		SD 99-114
64	12/20/1999	2-3-58:027		A 99 2617
65	12/21/1999	2-2-04:007		SD 99-115
66	12/29/1999	2-3-22:021		A 99 2661
67	1/27/2000	2-7-02:010		SD
68	2/2/2000	2-4-32:014		WR 1323
69	2/14/2000	2-3-15:011		WR 1352
70	2/16/2000	2-2-06:033		SD
71	2/22/2000	2-7-24:009		SD
72	2/22/2000	2-3-19:004		WR 1324
73	3/2/2000	2-7-12:083		WR 1342
74	3/13/2000	2-7-13:077		WR 1341
75	3/15/2000	2-4-21:029		A 00 0557
76	3/24/2000	2-4-21:015		A 00 0618
77	3/28/2000	2-4-06:126		A 00 0634
78	4/13/2000	2-2-06:016		SD 00-031
79	4/13/2000	2-8-04:104		WR 1336
80	5/4/2000	2-2-13:049		WR 1362
81	5/11/2000	2-2-16:002		A 00 1012
82	5/22/2000	2-3-02:005		SD 02-121
83	5/25/2000	2-7-12:067		SD
84	5/26/2000	2-7-14:057		WR 1351
85	6/1/2000	2-3-13:005		WR 1359
86	6/2/2000	2-3-44:054	5B	WR 1354
87	6/7/2000	2-4-30:019		A 00 1283
88	6/7/2000	2-4-12:004		WR 1361
89	6/14/2000	2-7-22:034		A 00 1334
90	6/21/2000	2-7-08:021		SD 01-011
91	7/11/2000	2-7-02:066		WR 1374
92	7/13/2000	2-7-33:021		WR 1379
93	7/17/2000	2-7-24:023		WR 1377
94	7/18/2000	2-2-05:077		WR 1378
95	7/19/2000	2-3-03:149		WR 1380
96	8/1/2000	2-4-36:076		A 00 1702
97	8/2/2000	2-3-01:095		WR 1382
98	8/10/2000	2-3-58:009		A 00 1779
99	8/22/2000	2-4-13:027		WR 1384
100	9/1/2000	2-7-10:011		WR 1385
101	9/14/2000	2-7-02:137		WR 1386
102	9/15/2000	2-8-04:008		A 00 2118
103	9/15/2000	2-1-04:099		WR 1391
104	9/19/2000	2-3-03:152		WR 1392
105	9/20/2000	2-3-49:047		A 00 2163
106	9/22/2000	2-8-03:049		SD 02-060
107	9/26/2000	2-2-16:076		WR 1394
108	9/29/2000	2-3-03:002		SD 00-090

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<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
109	10/2/2000	2-4-35:021		A 00 2243
110	10/2/2000	2-3-22:007		SD 00-089
111	10/3/2000	2-7-08:142		WR 1393
112	10/5/2000	2-8-03:006		SD 02-069
113	10/10/2000	2-3-15:004		SD
114	10/19/2000	2-4-13:011		SD
115	10/19/2000	2-8-11:010		WR 1406
116	10/25/2000	2-2-19:006		A 00 2430
117	10/26/2000	2-4-05:124		A 00 2440
118	10/26/2000	2-8-09:001		SD
119	11/8/2000	2-7-22:001		WR 1412
120	11/8/2000	2-7-22:002		WR 1413
121	11/8/2000	2-7-22:015		WR 1414
122	11/13/2000	2-4-06:003		SD
123	11/22/2000	2-4-13:050		SD
124	11/27/2000	2-4-27:007		SD
125	11/28/2000	2-2-12:045		SD
126	12/4/2000	2-8-01:071		WR 1430
127	12/8/2000	2-4-40:044	13B-1	WR 1427
128	12/8/2000	2-4-40:045	13B-2	WR 1428
129	12/13/2000	2-3-38:005		WR 1429
130	12/14/2000	2-2-19:005		SD
131	12/22/2000	2-3-62:025		A 00 2871
132	1/2/2001	2-8-04:101		A 01 0002
133	1/4/2001	2-4-19:008	D-1	WR 1433
134	1/8/2001	2-3-14:006		WR 1440
135	1/16/2001	2-7-02:056		SD 01-009
136	1/25/2001	2-4-13:029		WR 1438
137	1/29/2001	2-7-03:002		SD
138	1/30/2001	2-4-15:038		SD
139	2/1/2001	2-8-09:006		SD
140	2/8/2001	2-3-22:002		SD
141	2/9/2001	2-7-11:063		WR 1443
142	2/12/2001	2-2-03:033		SD
143	2/13/2001	2-4-13:142		WR 1442
144	2/14/2001	2-3-10:009		WR 1444
145	2/20/2001	2-2-03:013		WR 1441
146	2/21/2001	2-2-16:024		WR 1446
147	2/21/2001	2-3-11:004		WR 1447
148	2/22/2001	2-3-62:016		A 01 0378
149	3/5/2001	2-3-59:001		WR 1450
150	3/7/2001	2-8-05:069		SD 01-025
151	3/15/2001	2-8-02:110	P	A 01 0583
152	3/15/2001	2-3-19:018		SD
153	3/15/2001	2-3-19:018		WR 1454
154	3/19/2001	2-3-03:060		SD
155	3/19/2001	2-7-04:023		SD 02-133
156	4/19/2001	2-2-03:005		WR 1461
157	4/20/2001	2-7-03:110		WR 1462
158	4/24/2001	2-4-04:009		WR 1463
159	4/25/2001	2-8-01:081		WR 1464
160	4/26/2001	2-2-16:031		A 01 1006
161	4/27/2001	2-7-12:115		A 01 1014
162	4/30/2001	2-8-03:043		SD 01-048

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163	5/18/2001	2-2-03:012		WR 1469
164	5/22/2001	2-2-16:036		SD
165	5/22/2001	2-7-14:046		SD
166	5/30/2001	2-2-18:030	10-A	WR 1470
167	5/31/2001	2-7-13:056		WR 1474
168	6/27/2001	2-3-04:026	3	WR 1477
169	6/27/2001	2-7-13:125	41-B	WR 1480
170	6/28/2001	2-3-60:069		A 01 1478
171	6/29/2001	2-2-14:010		SD 01-070
172	7/10/2001	2-2-08:001		SD 01-073
173	7/11/2001	2-8-09:016		A 01 1557
174	7/20/2001	2-2-01:009		WR 1494
175	7/23/2001	2-3-03:171		SD 01-076
176	7/24/2001	2-7-02:044		SD
177	7/25/2001	2-7-02:081		A 01 1654
178	7/25/2001	2-3-01:030		WR 1491
179	7/26/2001	2-2-03:014		WR 1493
180	7/31/2001	2-7-14:045		SD
181	8/6/2001	2-3-14:050		WR 1545
182	8/10/2001	2-5-04:078		WR 1476
183	8/13/2001	2-3-22:082		SD
184	8/15/2001	2-4-13:144		A 01 1860
185	9/7/2001	2-8-02:012		SD
186	9/20/2001	2-3-32:008		SD
187	9/21/2001	2-3-13:004		SD 01-099
188	10/4/2001	2-2-19:006		WR 1503
189	10/8/2001	2-2-06:112		WR 1492
190	10/16/2001	2-7-02:093		SD
191	10/16/2001	2-7-11:050		SD 01-110
192	10/17/2001	2-7-02:063	2-B	WR 1501
193	10/19/2001	2-2-16:086		SD 01-112
194	10/22/2001	2-7-29:011		WR 1546
195	10/26/2001	2-3-60:065		A 01 2403
196	10/26/2001	2-2-03:005		WR 1504
197	10/29/2001	2-7-06:020		SD 01-115
198	10/31/2001	2-3-58:054		WR 1505
199	11/1/2001	2-8-09:012		SD 01-118
200	11/1/2001	2-2-12:002		WR 1506
201	11/5/2001	2-7-35:002		A 01 2452
202	11/5/2001	2-7-11:075		WR 1507
203	11/14/2001	2-3-22:094		A 01 2517
204	11/15/2001	2-4-32:038		WR 1508
205	11/15/2001	2-1-08:003		WR 1511
206	11/16/2001	2-7-33:007		A 01 2540
207	11/16/2001	2-2-13:049		SD
208	11/21/2001	2-2-04:007		A 01 2591
209	11/30/2001	2-4-15:038		A 01 2637
210	11/30/2001	2-4-15:038		A 01 2638
211	12/4/2001	2-3-14:027		A 01 2654
212	12/4/2001	2-8-02:149		WR 1512
213	12/7/2001	2-3-19:005		WR 1513
214	12/12/2001	2-2-16:091		WR 1514
215	12/13/2001	2-8-09:013		WR 1510
216	12/17/2001	2-3-28:021		SD 02-003

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217	1/25/2002	2-7-04:006		SD 02-011
218	1/29/2002	2-8-09:060		WR 1520
219	1/31/2002	2-7-25:004		A 02 0164
220	2/4/2002	2-3-32:003		SD
221	2/4/2002	2-7-13:154		SD
222	2/7/2002	2-7-12:078		SD 02-015
223	2/12/2002	2-4-07:017		SD
224	2/15/2002	2-3-20:005		WR 1525
225	2/19/2002	2-7-16:045		WR 1536
226	2/22/2002	2-7-10:045		WR 1526
227	2/22/2002	2-7-13:156		WR 1529
228	2/26/2002	2-7-16:003		WR 1528
229	2/28/2002	2-2-02:009		WR 1527
230	3/18/2002	2-7-13:178		SD 02-025
231	3/21/2002	2-3-32:011		SD
232	3/27/2002	2-3-02:014		SD
233	4/1/2002	2-3-13:032		WR 1532
234	4/3/2002	2-7-09:090		WR 1533
235	4/11/2002	2-7-16:044		A 02 0713
236	4/11/2002	2-2-16:031		SD
237	4/16/2002	2-4-03:021		SD
238	4/17/2002	2-7-02:050		SD 02-037
239	4/17/2002	2-3-48:034		WR 1538
240	4/20/2002	2-3-52:002		A 02 0785
241	4/22/2002	2-2-12:001		WR 1539
242	4/25/2002	2-4-34:006		A 02 0840
243	4/29/2002	2-7-02:044		SD
244	4/30/2002	2-7-01:067		WR 1542
245	4/30/2002	2-3-03:037		WR 1650
246	5/7/2002	2-4-03:032		WR 1543
247	5/9/2002	2-3-09:048		A 02 0992
248	5/10/2002	2-7-16:004		SD
249	5/17/2002	2-7-02:112	15	WR 1548
250	5/22/2002	2-1-08:024		SD
251	5/24/2002	2-4-15:007		WR 1551
252	6/4/2002	2-3-19:006		SD
253	6/7/2002	2-2-13:050		SD 99-082
254	6/7/2002	2-8-04:099		WR 1552
255	6/7/2002	2-8-04:102		WR 1553
256	6/14/2002	2-3-39:006		SD
257	6/19/2002	2-3-33:199		A02 1323
258	6/27/2002	2-7-09:037		WR 1560
259	6/28/2002	2-2-16:018		SD
260	7/10/2002	2-4-13:007		A02 1531
261	7/10/2002	2-7-05:022		WR 1558
262	7/11/2002	2-7-16:003		SD
263	7/11/2002	2-8-02:230		WR 1561
264	7/13/2002	2-2-12:060		SD
265	7/13/2002	2-2-12:067		SD
266	7/19/2002	2-2-06:010	27-A	WR 1562
267	7/22/2002	2-3-03:197		SD 02-072
268	7/25/2002	2-3-41:033		A 02 1625
269	7/26/2002	2-4-13:175		SD
270	7/26/2002	2-2-15:029		WR 1565

Reference Prefix
A = bldg. permit application
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<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
271	7/29/2002	2-7-31:025		WR 1563
272	7/30/2002	2-3-32:004		WR 1564
273	8/5/2002	2-7-14:045		SD
274	8/8/2002	2-3-10:038		A 02 1721
275	8/20/2002	2-3-20:074	104-B	WR 1566
276	8/21/2002	2-3-16:004		SD
277	8/21/2002	2-3-16:005		SD
278	8/23/2002	2-3-22:061		SD
279	8/26/2002	2-7-08:125		WR 1573
280	8/28/2002	2-3-43:049		A 02 1889
281	9/3/2002	2-2-16:098		WR 1571
282	9/3/2002	2-3-48:003	386	WR 1579
283	9/4/2002	2-7-16:002		WR 1572
284	9/6/2002	2-7-12:033	1-A-1	WR 1574
285	9/6/2002	2-3-03:007		WR 1580
286	9/10/2002	2-7-01:067		SD 02-092
287	9/16/2002	2-7-30:003		SD 02-093
288	9/17/2002	2-3-36:005		A 02 2033
289	9/20/2002	2-2-16:122		A 02 2068
290	9/23/2002	2-7-08:000		WR 1575
291	9/24/2002	2-3-51:011		WR 1581
292	9/25/2002	2-2-21:003		SD
293	9/26/2002	2-3-41:060		WR 1606
294	9/27/2002	2-2-09:026		SD
295	9/27/2002	2-3-59:024		SD 02-098
296	9/27/2002	2-7-12:101		WR 1608
297	9/30/2002	2-7-08:002		SD
298	9/30/2002	2-7-12:063		SD
299	9/30/2002	2-3-15:008		WR 1582
300	9/30/2002	2-3-58:027	27	WR 1583
301	10/1/2002	2-2-02:003		WR 1607
302	10/1/2002	2-3-20:011		WR 1609
303	10/3/2002	2-3-38:008		SD
304	10/3/2002	2-7-09:082		SD
305	10/3/2002	2-4-13:090		WR 1585
306	10/3/2002	2-7-16:019		WR 1710
307	10/4/2002	2-3-37:023		SD
308	10/4/2002	2-7-08:010		SD
309	10/4/2002	2-8-05:040		WR 1586
310	10/4/2002	2-3-38:010		WR 1587
311	10/4/2002	2-2-15:044		WR 1588
312	10/4/2002	2-1-02:023		WR 1590
313	10/7/2002	2-7-12:083		SD 02-102
314	10/7/2002	2-4-14:007		WR 1591
315	10/7/2002	2-4-13:006		WR 1603
316	10/8/2002	2-2-13:047		WR 1601
317	10/9/2002	2-2-15:020		SD
318	10/9/2002	2-3-13:090		WR 1602
319	10/9/2002	2-1-05:011		WR 1614
320	10/10/2002	2-3-01:040		SD
321	10/11/2002	2-2-01:004	Gr 544:2	WR 1589
322	10/11/2002	2-7-08:045		WR 1613
323	10/14/2002	2-2-15:038		WR 1604
324	10/14/2002	2-2-09:021		WR 1605

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<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
325	10/14/2002	2-2-04:092	1	WR 1621
326	10/15/2002	2-7-02:034		WR 1584
327	10/15/2002	2-1-05:012		WR 1611
328	10/15/2002	2-1-08:066		WR 1622
329	10/16/2002	2-7-08:141		WR 1596
330	10/16/2002	2-3-16:019		WR 1612
331	10/16/2002	2-7-03:117		WR 1626
332	10/16/2002	2-2-03:079		WR 1627
333	10/17/2002	2-8-02:040		A 02 2269
334	10/18/2002	2-3-03:197		SD 02-072
335	10/21/2002	2-3-31:018		SD
336	10/21/2002	2-7-26:001		SD
337	10/21/2002	2-3-60:033		WR 1616
338	10/21/2002	2-1-03:028		WR 1617
339	10/21/2002	2-1-03:039		WR 1623
340	10/21/2002	2-8-05:018		WR 1624
341	10/23/2002	2-1-05:011		WR 1615
342	10/25/2002	2-7-08:124		WR 1625
343	10/25/2002	2-2-06:045		WR 1628
344	10/28/2002	2-7-08:042		SD 02-115
345	10/28/2002	2-1-04:097		WR 1631
346	10/29/2002	2-7-10:089		WR 1632
347	10/31/2002	2-2-11:031		SD
348	10/31/2002	2-7-12:084		WR 1630
349	10/31/2002	2-2-04:004		WR 1633
350	11/4/2002	2-4-13:007		WR 1619
351	11/4/2002	2-1-03:020		WR 1634
352	11/7/2002	2-1-03:018		WR 1699
353	11/8/2002	2-2-03:016		SD
354	11/8/2002	2-2-03:017		SD
355	11/8/2002	2-2-04:017		SD
356	11/8/2002	2-8-02:034		WR 1635
357	11/8/2002	2-2-04:024		WR 1638
358	11/8/2002	2-2-04:025		WR 1639
359	11/8/2002	2-2-04:026		WR 1640
360	11/12/2002	2-2-06:025		WR 1636
361	11/14/2002	2-1-08:025		SD
362	11/19/2002	2-4-13:006		SD
363	11/20/2002	2-2-15:019		SD
364	11/20/2002	2-3-33:163		WR 1637
365	11/21/2002	2-3-03:037		SD 02-128
366	11/21/2002	2-8-04:097		WR 1618
367	11/22/2002	2-7-02:004		SD 02-134
368	11/26/2002	2-1-04:087		SD
369	11/26/2002	2-8-02:227		WR 1657
370	11/27/2002	2-7-13:081		A 02 2590
371	11/27/2002	2-3-15:002		SD 02-131
372	11/27/2002	2-3-15:004		SD 02-131
373	11/27/2002	2-3-22:067		WR 1610
374	11/27/2002	2-2-16:013		WR 1977
375	11/29/2002	2-3-26:023		SD
376	11/29/2002	2-2-19:042		WR 1658
377	11/29/2002	2-8-06:037		WR 1662
378	12/2/2002	2-3-03:035		SD

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<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
379	12/2/2002	2-3-40:032		WR 1659
380	12/3/2002	2-3-32:016		SD
381	12/3/2002	2-2-05:090		WR 1643
382	12/3/2002	2-2-05:091		WR 1644
383	12/3/2002	2-2-05:094		WR 1645
384	12/3/2002	2-7-08:028		WR 1660
385	12/4/2002	2-4-15:024		WR 1418
386	12/4/2002	2-3-44:044		WR 1661
387	12/5/2002	2-2-02:038		WR 1647
388	12/5/2002	2-2-02:022		WR 1649
389	12/5/2002	2-1-02:016		WR 2181
390	12/6/2002	2-7-13:022		SD 03-001
391	12/6/2002	2-7-30:025		WR 1663
392	12/6/2002	2-2-01:042		WR 1706
393	12/8/2002	2-7-12:147		WR 1859
394	12/9/2002	2-4-35:109		WR 1664
395	12/9/2002	2-3-46:006		WR 1666
396	12/9/2002	2-2-12:044		WR 1672
397	12/10/2002	2-7-35:035		WR 1665
398	12/11/2002	2-8-09:069		WR 1668
399	12/13/2002	2-2-02:005		SD
400	12/13/2002	2-2-04:023		WR 1673
401	12/16/2002	2-3-53:039		SD
402	12/16/2002	2-7-08:009		WR 1648
403	12/16/2002	2-3-13:055		WR 1669
404	12/16/2002	2-2-05:001		WR 1894
405	12/16/2002	2-2-05:002		WR 1895
406	12/16/2002	2-2-05:003		WR 1896
407	12/16/2002	2-2-05:055		WR 1897
408	12/17/2002	2-7-13:162		WR 1670
409	12/19/2002	2-7-12:147		SD
410	12/23/2002	2-7-14:057		SD 03-002
411	12/23/2002	2-2-16:075		WR 1675
412	12/23/2002	2-8-02:114		WR 1700
413	12/25/2002	2-2-02:037		WR 1746
414	12/26/2002	2-2-01:010		SD
415	12/26/2002	2-8-03:006		SD 03-003
416	12/30/2002	2-8-11:008		WR 1676
417	12/31/2002	2-3-53:037		SD
418	12/31/2002	2-7-12:263		SD
419	12/31/2002	2-2-05:045		WR 1677
420	12/31/2002	2-7-12:263		WR 1678
421	1/3/2003	2-4-35:021		WR 1679
422	1/6/2003	2-3-01:083		WR 1680
423	1/8/2003	2-3-14:012		WR 1681
424	1/8/2003	2-3-30:049		WR 1888
425	1/15/2003	2-7-12:262		SD
426	1/15/2003	2-7-12:262		WR 1683
427	1/16/2003	2-2-15:042		WR 1701
428	1/23/2003	2-2-09:002		SD
429	1/23/2003	2-4-11:021		SD
430	1/29/2003	2-8-09:051		WR 1684
431	2/4/2003	2-4-11:016		WR 1685
432	2/4/2003	2-3-03:026		WR 1719

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<u>Priority Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
433 2/4/2003	2-3-03:180		WR 1720
434 2/5/2003	2-2-16:034		SD 03-018
435 2/5/2003	2-3-12:054		WR 1686
436 2/6/2003	2-7-23:002		WR 1702
437 2/10/2003	2-8-10:045		WR 1688
438 2/10/2003	2-4-14:005		WR 1689
439 2/11/2003	2-2-13:015		WR 1687
440 2/13/2003	2-3-12:025		SD
441 2/18/2003	2-2-16:020		SD
442 2/18/2003	2-3-36:048		WR 1690
443 2/19/2003	2-2-15:077		WR 1691
444 2/19/2003	2-2-15:033		WR 1692
445 2/20/2003	2-3-57:060		WR 1694
446 2/20/2003	2-2-05:044		WR 1695
447 2/21/2003	2-7-12:199		WR 1696
448 2/24/2003	2-3-12:032		WR 1705
449 2/25/2003	2-5-03:010		SD
450 2/25/2003	2-7-12:058		SD
451 2/25/2003	2-7-13:152		SD
452 2/27/2003	2-7-14:075		SD
453 2/27/2003	2-3-13:037		WR 1698
454 2/28/2003	2-3-02:014		SD
455 2/28/2003	2-3-60:091		WR 1697
456 3/3/2003	2-7-02:107		WR 1703
457 3/5/2003	2-3-40:020		WR 1704
458 3/7/2003	2-3-36:024		WR 1708
459 3/17/2003	2-7-10:004		WR 1709
460 3/17/2003	2-4-36:115		WR 1711
461 3/18/2003	2-7-12:014		WR 1712
462 3/21/2003	2-3-01:063		WR 1713
463 3/25/2003	2-7-13:065		WR 1714
464 3/27/2003	2-2-15:032		WR 1716
465 4/1/2003	2-3-53:024		SD
466 4/1/2003	2-7-03:093		SD 03-029
467 4/3/2003	2-7-13:070		WR 1717
468 4/8/2003	2-2-02:014		WR 1722
469 4/11/2003	2-2-09:028		WR 1723
470 4/16/2003	2-7-12:116		WR 1718
471 4/21/2003	2-4-15:001		SD
472 4/21/2003	2-4-15:001		WR 1721
473 4/23/2003	2-7-22:005		SD 03-042
474 4/24/2003	2-4-11:026		WR 1724
475 4/25/2003	2-1-05:049		WR 1727
476 4/25/2003	2-7-12:077		WR 1734
477 4/25/2003	2-7-12:264		WR 1735
478 4/28/2003	2-7-02:023		SD 03-043
479 4/29/2003	2-3-13:035		WR 1726
480 4/30/2003	2-3-33:004		WR 1725
481 4/30/2003	2-3-13:001		WR 1728
482 5/1/2003	2-3-33:004		SD
483 5/1/2003	2-4-03:022		SD
484 5/1/2003	2-4-36:011		WR 1729
485 5/6/2003	2-7-08:020		SD
486 5/7/2003	2-3-03:143		SD

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<u>Priority Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
487 5/7/2003	2-3-03:196		SD
488 5/7/2003	2-3-20:031		WR 1730
489 5/7/2003	2-7-13:014		WR 1731
490 5/7/2003	2-7-13:014		WR 1732
491 5/7/2003	2-7-13:014		WR 1733
492 5/12/2003	2-7-08:114		SD
493 5/12/2003	2-3-41:061		WR 1736
494 5/12/2003	2-1-04:099		WR 1737
495 5/12/2003	2-7-08:126		WR 1738
496 5/13/2003	2-7-12:119		WR 1739
497 5/14/2003	2-3-27:007		WR 1744
498 5/15/2003	2-3-13:057		WR 1740
499 5/19/2003	2-3-15:028		WR 1741
500 5/19/2003	2-3-16:009		WR 1742
501 5/19/2003	2-3-16:011		WR 1743
502 5/27/2003	2-7-08:047		SD 03-046
503 5/29/2003	2-7-33:003		WR 1745
504 6/2/2003	2-4-38:002		SD
505 6/2/2003	2-7-22:009		SD
506 6/2/2003	2-4-01:004		SD 03-047
507 6/3/2003	2-4-13:153		WR 1752
508 6/4/2003	2-3-13:002		SD
509 6/4/2003	2-7-11:001		SD
510 6/4/2003	2-7-12:021		SD 03-050
511 6/6/2003	2-4-13:006		A 03 1390
512 6/6/2003	2-7-08:057		WR 1747
513 6/6/2003	2-2-09:016		WR 1751
514 6/10/2003	2-3-49:013		WR 1748
515 6/10/2003	2-3-13:035		WR 1753
516 6/12/2003	2-2-09:083		WR 1754
517 6/18/2003	2-8-01:079		WR 1759
518 6/19/2003	2-7-13:133		WR 1758
519 6/20/2003	2-4-18:018		SD
520 6/20/2003	2-7-13:134		WR 1756
521 6/20/2003	2-7-13:087		WR 1757
522 6/23/2003	2-7-13:136		WR 1755
523 6/25/2003	2-8-03:059		SD 03-054
524 6/26/2003	2-4-07:031		WR 1715
525 7/1/2003	2-7-13:042		SD
526 7/3/2003	2-3-40:014		WR 1764
527 7/7/2003	2-7-13:160		WR 1763
528 7/7/2003	2-3-58:047		WR 1765
529 7/7/2003	2-3-33:177		WR 1766
530 7/8/2003	2-3-57:113		WR 1767
531 7/8/2003	2-3-57:103		WR 1768
532 7/9/2003	2-3-03:099		SD
533 7/14/2003	2-4-07:040		A 03 1696
534 7/14/2003	2-4-13:198		WR 1749
535 7/15/2003	2-3-44:069		WR 1769
536 7/23/2003	2-3-40:022		WR 1770
537 7/24/2003	2-7-13:193		WR 1771
538 7/29/2003	2-3-03:107		SD
539 7/30/2003	2-3-43:051		SD
540 7/30/2003	2-3-43:051		WR 1772

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<u>Priority Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
541 7/30/2003	2-8-03:039		WR 1773
542 7/31/2003	2-2-19:024		WR 1774
543 8/1/2003	2-7-27:016		WR 1760
544 8/4/2003	2-3-49:002		WR 1776
545 8/6/2003	2-3-24:001		SD
546 8/6/2003	2-7-13:078		WR 1777
547 8/14/2003	2-8-09:011		WR 1778
548 8/19/2003	2-2-19:006		WR 1781
549 8/20/2003	2-4-07:009		WR 1780
550 8/26/2003	2-3-03:181		SD
551 9/5/2003	2-3-58:034		WR 1782
552 9/8/2003	2-7-15:004		SD
553 9/8/2003	2-8-09:093		SD
554 9/9/2003	2-8-09:011		SD
555 9/9/2003	2-7-27:012		WR 1783
556 9/9/2003	2-3-34:009		WR 1784
557 9/9/2003	2-4-35:109		WR 1801
558 9/10/2003	2-7-35:033		A 03 2223
559 9/10/2003	2-7-01:078		WR 1785
560 9/12/2003	2-3-60:092		WR 1786
561 9/12/2003	2-7-12:254		WR 1787
562 9/16/2003	2-2-16:006		WR 1979
563 9/18/2003	2-7-36:002		WR 1788
564 9/23/2003	2-2-04:022		WR 1761
565 9/25/2003	2-3-27:009		WR 1789
566 9/26/2003	2-7-12:146		WR 1762
567 9/26/2003	2-3-38:018		WR 1793
568 9/30/2003	2-1-04:008		WR 1790
569 10/1/2003	2-3-22:053		WR 1791
570 10/2/2003	2-3-03:132		SD 03-096
571 10/2/2003	2-4-34:072		WR 1792
572 10/3/2003	2-2-12:062		WR 1794
573 10/7/2003	2-5-07:014		WR 1795
574 10/13/2003	2-7-05:005		WR 1796
575 10/13/2003	2-7-05:023		WR 1797
576 10/13/2003	2-3-57:084		WR 1798
577 10/14/2003	2-7-02:108		WR 1799
578 10/20/2003	2-3-24:006		SD
579 10/20/2003	2-7-13:034		WR 1802
580 10/21/2003	2-7-35:019		WR 1803
581 10/22/2003	2-2-12:004		WR 1807
582 10/23/2003	2-7-08:110		WR 1804
583 10/24/2003	2-3-03:220		SD 03-104
584 10/24/2003	2-7-33:015		WR 1805
585 10/27/2003	2-8-03:041		SD 03-103
586 10/29/2003	2-3-03:041		WR 1779
587 10/29/2003	2-3-62:021		WR 1806
588 10/29/2003	2-3-22:042		WR 1808
589 10/30/2003	2-2-10:012		SD
590 10/31/2003	2-8-02:012		SD 03-107
591 10/31/2003	2-4-07:079		WR 1814
592 11/3/2003	2-3-03:143		WR 1809
593 11/4/2003	2-4-01:019		SD 03-108
594 11/12/2003	2-3-03:172		SD

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595	11/13/2003	2-7-06:019		WR 1810
596	11/13/2003	2-2-04:087		WR 1821
597	11/13/2003	2-2-04:093		WR 1822
598	11/17/2003	2-3-13:029		SD
599	11/18/2003	2-7-02:145		WR 1811
600	11/21/2003	2-2-19:027		WR 1812
601	11/26/2003	2-8-10:013		WR 1815
602	11/26/2003	2-4-13:182		WR 1816
603	11/26/2003	2-2-20:065		WR 1817
604	12/5/2003	2-2-01:020		SD
605	12/5/2003	2-3-22:070		WR 1813
606	12/6/2003	2-2-01:062		WR 1707
607	12/8/2003	2-8-02:012		SD 03-084
608	12/10/2003	2-3-62:034		SD
609	12/16/2003	2-3-17:012		WR 1800
610	12/18/2003	2-3-52:004		WR 1818
611	12/18/2003	2-7-12:238		WR 1819
612	12/22/2003	2-3-49:093		WR 1823
613	12/31/2003	2-4-13:023		SD 04-001
614	1/2/2004	2-3-14:019		WR 1858
615	1/6/2004	2-2-09:058		WR 1826
616	1/7/2004	2-3-16:033		WR 1824
617	1/7/2004	2-7-12:155		WR 1825
618	1/12/2004	2-3-17:039		WR 1827
619	1/16/2004	2-3-19:025		WR 1828
620	1/20/2004	2-7-22:005		SD
621	1/21/2004	2-7-08:120		WR 1829
622	1/26/2004	2-4-03:018		A 04 0150
623	1/26/2004	2-3-26:018		SD
624	1/26/2004	2-7-09:039		SD
625	1/27/2004	2-3-60:010		WR 1845
626	1/30/2004	2-3-44:133		WR 1830
627	2/2/2004	2-4-27:008		WR 1831
628	2/5/2004	2-8-03:006		SD 04-012
629	2/5/2004	2-4-25:012		WR 1833
630	2/12/2004	2-3-22:061		WR 1834
631	2/13/2004	2-4-18:008		WR 1835
632	2/18/2004	2-4-11:014		WR 1836
633	2/18/2004	2-4-11:019		WR 1837
634	2/18/2004	2-8-01:021		WR 1838
635	2/19/2004	2-7-03:092		WR 1875
636	2/20/2004	2-7-13:168		WR 1839
637	2/25/2004	2-3-60:089		WR 1840
638	2/25/2004	2-3-60:028		WR 1841
639	2/26/2004	2-2-14:005		SD
640	2/26/2004	2-7-14:039		WR 1842
641	2/27/2004	2-3-22:013		WR 1843
642	3/4/2004	2-7-29:020		WR 1844
643	3/9/2004	2-7-13:078		SD
644	3/9/2004	2-7-06:077		WR 1847
645	3/10/2004	2-7-22:009		SD
646	3/10/2004	2-8-01:042		WR 1846
647	3/17/2004	2-4-10:001		SD
648	3/23/2004	2-3-03:186		SD

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649 3/30/2004	2-8-02:205		WR 1893
650 4/6/2004	2-3-16:021		WR 1849
651 4/7/2004	2-3-32:010		SD
652 4/7/2004	2-4-13:051		WR 1850
653 4/8/2004	2-2-17:006		SD 04-028
654 4/12/2004	2-8-02:037		SD 04-029
655 4/12/2004	2-7-09:033		WR 1852
656 4/13/2004	2-7-07:006		SD
657 4/13/2004	2-7-05:016		WR 1851
658 4/13/2004	2-3-14:035		WR 1853
659 4/15/2004	2-3-51:017		A 04 0918
660 4/15/2004	2-4-36:044		WR 1854
661 4/20/2004	2-3-03:126		WR 1855
662 4/22/2004	2-4-32:051		WR 1861
663 4/22/2004	2-2-02:004		WR 1862
664 4/26/2004	2-4-07:089		WR 1863
665 4/27/2004	2-2-14:026		WR 1864
666 4/28/2004	2-3-29:027		SD
667 4/28/2004	2-3-29:027		WR 1865
668 4/28/2004	2-7-29:015		WR 1866
669 4/29/2004	2-3-45:028		WR 1867
670 4/30/2004	2-7-24:029		WR 1868
671 4/30/2004	2-4-34:110		WR 1870
672 5/4/2004	2-8-05:025		WR 1860
673 5/5/2004	2-3-40:020		SD
674 5/6/2004	2-3-52:027		WR 1869
675 5/10/2004	2-3-40:002		WR 1871
676 5/11/2004	2-4-09:070		SD
677 5/17/2004	2-4-13:040		WR 1876
678 5/19/2004	2-3-22:005		WR 1872
679 5/20/2004	2-2-15:003		WR 1874
680 5/21/2004	2-3-03:034		SD
681 5/24/2004	2-2-09:024		SD
682 5/24/2004	2-7-12:185		WR 1873
683 5/26/2004	2-7-13:199		WR 1877
684 5/27/2004	2-7-10:079		WR 1878
685 5/27/2004	2-7-36:017		WR 1879
686 6/1/2004	2-7-19:041		A 04 1446
687 6/3/2004	2-4-25:006		SD
688 6/3/2004	2-4-17:018		WR 1880
689 6/4/2004	2-2-09:089		WR 1881
690 6/7/2004	2-4-02:015		WR 1882
691 6/8/2004	2-2-02:004		SD
692 6/10/2004	2-3-02:067		WR 1883
693 6/14/2004	2-8-01:019		WR 1884
694 6/15/2004	2-7-35:012		WR 1885
695 6/15/2004	2-3-03:189		WR 1886
696 6/15/2004	2-2-01:005		WR 1887
697 6/15/2004	2-2-01:024		WR 1913
698 6/15/2004	2-2-01:082		WR 1914
699 6/15/2004	2-2-01:045		WR 1915
700 6/15/2004	2-2-01:069		WR 1916
701 6/17/2004	2-3-07:034		SD 04-048
702 6/22/2004	2-1-05:112		WR 1917

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703 6/25/2004	2-3-18:009		SD
704 6/25/2004	2-3-18:009		WR 1919
705 7/2/2004	2-3-53:033		SD
706 7/2/2004	2-7-21:007		WR 1921
707 7/7/2004	2-2-15:082		SD
708 7/7/2004	2-3-58:005		WR 1923
709 7/7/2004	2-8-01:065		WR 1924
710 7/9/2004	2-7-08:117		SD
711 7/9/2004	2-8-06:036		WR 1925
712 7/12/2004	2-8-06:048		WR 1926
713 7/13/2004	2-2-15:080		WR 1927
714 7/13/2004	2-2-13:011		WR 1928
715 7/13/2004	2-2-13:013		WR 1929
716 7/13/2004	2-2-13:051		WR 1930
717 7/13/2004	2-2-13:052		WR 1931
718 7/14/2004	2-7-12:166		WR 1890
719 7/14/2004	2-7-12:222		WR 1891
720 7/14/2004	2-7-12:223		WR 1892
721 7/21/2004	2-3-03:131		SD
722 7/22/2004	2-3-26:019		SD
723 7/22/2004	2-8-03:049		SD 04-065
724 7/22/2004	2-7-35:002		WR 1898
725 7/22/2004	2-4-06:033		WR 1899
726 7/22/2004	2-2-13:006		WR 1900
727 7/22/2004	2-2-13:004		WR 1901
728 7/22/2004	2-7-19:041		WR 1904
729 7/26/2004	2-7-13:043		SD
730 7/26/2004	2-8-01:023		SD
731 7/27/2004	2-3-14:011		WR 1902
732 7/28/2004	2-4-32:086		WR 1903
733 7/29/2004	2-4-13:147		WR 1905
734 7/29/2004	2-3-15:013		WR 1906
735 8/4/2004	2-3-38:023		WR 1907
736 8/6/2004	2-3-13:066		WR 1909
737 8/6/2004	2-3-43:079		WR 1910
738 8/9/2004	2-7-13:065		SD 04-069
739 8/9/2004	2-2-03:021		WR 1911
740 8/11/2004	2-2-05:100		SD
741 8/11/2004	2-3-20:018		SD
742 8/11/2004	2-7-08:031		SD
743 8/12/2004	2-2-16:102		SD
744 8/12/2004	2-3-10:076		WR 1912
745 8/12/2004	2-3-45:032		WR 1932
746 8/12/2004	2-3-03:016		WR 1933
747 8/12/2004	2-3-03:023		WR 1934
748 8/12/2004	2-3-44:088		WR 1936
749 8/13/2004	2-4-04:015		SD
750 8/16/2004	2-7-05:015		SD
751 8/16/2004	2-3-01:090		WR 1935
752 8/19/2004	2-3-16:014		SD
753 8/19/2004	2-2-15:017		WR 1937
754 8/19/2004	2-3-03:157		WR 1938
755 8/19/2004	2-8-04:032		WR 1939
756 8/23/2004	2-3-52:013		WR 1940

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757 8/23/2004	2-4-17:010		WR 1941
758 8/23/2004	2-3-13:021		WR 1942
759 8/24/2004	2-4-12:021		SD
760 8/24/2004	2-3-60:049		WR 1943
761 8/26/2004	2-4-13:188		WR 1944
762 8/27/2004	2-3-48:108		WR 1945
763 8/30/2004	2-3-53:003		WR 1946
764 9/1/2004	2-3-22:030		WR 1947
765 9/1/2004	2-2-09:011		WR 1948
766 9/3/2004	2-2-04:011		WR 1949
767 9/7/2004	2-2-15:045		SD
768 9/7/2004	2-3-57:066		WR 1950
769 9/8/2004	2-3-42:044		A 04 2515
770 9/9/2004	2-3-37:016		WR 1976
771 9/10/2004	2-3-13:017		WR 1952
772 9/10/2004	2-7-08:145		WR 1953
773 9/14/2004	2-7-25:019		WR 1954
774 9/14/2004	2-3-55:020		WR 1955
775 9/14/2004	2-3-44:037		WR 1956
776 9/15/2004	2-3-38:021		WR 1957
777 9/16/2004	2-3-43:051		SD
778 9/16/2004	2-2-15:001		WR 1958
779 9/17/2004	2-3-03:022		SD 04-079
780 9/20/2004	2-7-22:007		SD
781 9/28/2004	2-3-32:008		SD
782 9/29/2004	2-7-12:127		SD 04-085
783 9/30/2004	2-3-03:044		SD 04-082
784 9/30/2004	2-3-03:228		SD 05-046
785 10/1/2004	2-4-13:075		SD 04-087
786 10/1/2004	2-4-13:075		SD 04-088
787 10/1/2004	2-8-03:059		SD 04-091
788 10/1/2004	2-8-11:004		WR 1959
789 10/4/2004	2-2-20:075		WR 1960
790 10/7/2004	2-2-15:082		SD 04-089
791 10/14/2004	2-2-12:055		WR 1961
792 10/20/2004	2-4-34:075		WR 1962
793 10/20/2004	2-4-07:080		WR 1963
794 10/21/2004	2-3-11:005		WR 1964
795 10/21/2004	2-4-07:078		WR 1965
796 10/25/2004	2-7-33:010		WR 1966
797 10/26/2004	2-4-33:004		WR 1967
798 10/27/2004	2-3-13:053		SD
799 10/27/2004	2-3-13:071		SD
800 10/28/2004	2-4-23:005		WR 1968
801 10/28/2004	2-2-16:023		WR 1994
802 10/29/2004	2-3-02:003		SD 04-095
803 10/29/2004	2-3-01:074		WR 1969
804 11/5/2004	2-3-03:099		SD 04-097
805 11/5/2004	2-8-09:015		WR 1970
806 11/8/2004	2-7-33:002		WR 1971
807 11/9/2004	2-3-03:068		SD
808 11/10/2004	2-2-16:119		SD 04-101
809 11/19/2004	2-4-40:044		SD
810 11/19/2004	2-4-40:045		SD

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811 11/19/2004	2-7-12:086		SD
812 11/23/2004	2-4-38:002		SD 04-104
813 11/24/2004	2-2-03:016		SD
814 12/1/2004	2-4-14:012		WR 1972
815 12/3/2004	2-2-02:034		WR 1973
816 12/7/2004	2-7-02:054		SD
817 12/7/2004	2-4-07:127		WR 1974
818 12/9/2004	2-3-03:203		SD
819 12/9/2004	2-7-09:086		WR 1975
820 12/10/2004	2-3-03:127		SD
821 12/10/2004	2-7-07:003		WR 1982
822 12/14/2004	2-3-14:008		SD
823 12/17/2004	2-2-22:005		WR 1983
824 12/28/2004	2-2-04:095		SD
825 1/5/2005	2-3-42:023		WR 1984
826 1/7/2005	2-7-27:013		SD 05-007
827 1/11/2005	2-2-01:055		SD
828 1/11/2005	2-7-06:074		WR 1985
829 1/12/2005	2-2-15:004		SD
830 1/12/2005	2-2-16:077		WR 1986
831 1/13/2005	2-3-55:043		WR 1987
832 1/13/2005	2-7-35:037		WR 1988
833 1/14/2005	2-3-01:045		SD
834 1/14/2005	2-4-15:018		WR 1989
835 1/18/2005	2-4-31:091		WR 1990
836 1/19/2005	2-2-15:007		SD
837 1/19/2005	2-3-13:039		SD
838 1/19/2005	2-5-07:054		SD
839 1/19/2005	2-2-16:083		WR 1991
840 1/20/2005	2-4-03:062		WR 1992
841 1/21/2005	2-2-02:017		SD
842 1/21/2005	2-3-02:004		SD
843 1/21/2005	2-3-08:001		SD
844 1/21/2005	2-3-08:002		SD
845 1/21/2005	2-3-07:001		WR 1993
846 1/24/2005	2-3-03:167		SD
847 1/24/2005	2-7-13:148		SD
848 1/24/2005	2-4-06:024		WR 2001
849 1/26/2005	2-7-33:031		WR 1995
850 1/26/2005	2-3-45:012		WR 1996
851 1/26/2005	2-3-58:042		WR 1997
852 2/1/2005	2-7-09:041		SD
853 2/4/2005	2-7-03:010		WR 2009
854 2/8/2005	2-5-09:029		WR 2010
855 2/9/2005	2-3-03:069		SD
856 2/9/2005	2-4-10:001		WR 2047
857 2/9/2005	2-4-10:001		WR 2048
858 2/11/2005	2-3-02:058		SD
859 2/13/2005	2-2-10:061		WR 2008
860 2/14/2005	2-3-24:009		SD
861 2/14/2005	2-3-24:008		WR 2006
862 2/18/2005	2-7-12:200		WR 2004
863 2/18/2005	2-8-01:076		WR 2005
864 2/22/2005	2-8-09:014		SD

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865	2/23/2005	2-3-01:105	SD
866	2/23/2005	2-3-44:152	WR 2003
867	2/24/2005	2-7-12:202	SD
868	2/24/2005	2-7-24:008	WR 2039
869	2/25/2005	2-7-13:167	WR 2000
870	2/25/2005	2-3-03:046	WR 2002
871	3/3/2005	2-7-35:010	WR 1999
872	3/7/2005	2-3-36:039	WR 1998
873	3/7/2005	2-7-01:019	WR 2011
874	3/8/2005	2-4-13:009	WR
875	3/16/2005	2-2-16:113	WR 2012
876	3/17/2005	2-4-14:025	WR 2013
877	3/21/2005	2-4-14:014	WR 2014
878	3/28/2005	2-2-16:092	WR 2015
879	3/28/2005	2-3-48:039	WR 2016
880	3/30/2005	2-3-12:063	WR 2017
881	3/31/2005	2-2-11:034	WR 2018
882	4/1/2005	2-7-05:002	WR 2019
883	4/1/2005	2-7-06:002	WR 2021
884	4/4/2005	2-3-03:185	WR 2020
885	4/12/2005	2-7-33:050	WR 2022
886	4/18/2005	2-3-48:022	WR 2023
887	4/18/2005	2-3-48:023	WR 2024
888	4/19/2005	2-8-02:090	WR 2025
889	4/21/2005	2-4-13:166	SD
890	4/22/2005	2-2-02:020	WR 2026
891	4/26/2005	2-3-03:206	SD
892	4/27/2005	2-2-10:061	WR 2007
893	4/28/2005	2-4-17:022	SD
894	4/28/2005	2-4-17:023	SD
895	4/29/2005	2-2-01:064	WR 2028
896	5/2/2005	2-7-12:209	WR 2029
897	5/2/2005	2-4-07:021	WR 2030
898	5/3/2005	2-7-08:173	WR 2031
899	5/5/2005	2-4-05:049	SD 05-053
900	5/6/2005	2-3-38:034	SD
901	5/9/2005	2-3-22:026	WR 2032
902	5/10/2005	2-3-10:068	SD 05-045
903	5/12/2005	2-3-03:205	SD
904	5/13/2005	2-4-13:088	SD
905	5/16/2005	2-7-35:046	WR 2033
906	5/17/2005	2-4-29:027	SD
907	5/20/2005	2-3-03:220	SD 05-039
908	5/25/2005	2-4-25:003	WR 2034
909	5/26/2005	2-5-07:074	WR 2036
910	5/27/2005	2-3-60:051	WR 2037
911	6/1/2005	2-4-12:023	SD
912	6/1/2005	2-8-05:062	WR 2038
913	6/7/2005	2-7-10:057	WR 1980
914	6/7/2005	2-7-10:058	WR 1981
915	6/21/2005	2-3-40:021	SD
916	6/24/2005	2-2-15:004	SD 05-058
917	6/27/2005	2-7-03:023	SD
918	6/27/2005	2-7-03:090	SD

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919 6/27/2005	2-7-03:092		SD
920 6/27/2005	2-4-32:015		WR 2045
921 6/29/2005	2-3-44:008		SD
922 6/29/2005	2-4-13:140		WR 2046
923 6/30/2005	2-2-20:069		WR 2044
924 7/5/2005	2-7-13:038		WR 2042
925 7/5/2005	2-4-14:029		WR 2043
926 7/6/2005	2-8-02:146		WR 2040
927 7/12/2005	2-3-20:071		WR 2041
928 7/14/2005	2-3-03:206		SD
929 7/14/2005	2-3-08:033		SD
930 7/20/2005	2-3-03:110		SD
931 7/20/2005	2-8-05:037		WR 2051
932 7/26/2005	2-3-01:045		SD
933 7/27/2005	2-7-02:043		SD 05-067
934 8/2/2005	2-2-04:094		SD
935 8/3/2005	2-3-13:088		SD
936 8/3/2005	2-3-22:129		SD
937 8/4/2005	2-3-15:002		SD 05-070
938 8/10/2005	2-4-23:016		A 05 2353
939 8/10/2005	2-7-14:036		WR 2053
940 8/10/2005	2-7-14:081		WR 2054
941 8/11/2005	2-7-12:006		SD
942 8/12/2005	2-3-21:003		SD
943 8/26/2005	2-7-33:020		WR 2055
944 8/29/2005	2-2-06:058		WR 2056
945 8/31/2005	2-2-13:048		WR 2057
946 9/13/2005	2-7-13:006		SD
947 9/13/2005	2-3-26:010		WR 2058
948 9/14/2005	2-2-03:060		WR 2059
949 9/14/2005	2-3-31:014		WR 2060
950 9/15/2005	2-7-26:007		WR 2061
951 9/19/2005	2-1-04:008		WR 2362
952 9/20/2005	2-4-19:004		SD
953 9/23/2005	2-2-19:016		SD
954 9/26/2005	2-4-13:188		SD
955 9/28/2005	2-2-15:023		SD
956 9/29/2005	2-4-13:008		SD
957 10/3/2005	2-3-01:072		WR 2063
958 10/3/2005	2-3-01:166		WR 2064
959 10/7/2005	2-4-35:053		WR 2065
960 10/12/2005	2-7-06:057		WR 2068
961 10/20/2005	2-3-56:092		WR 2069
962 10/21/2005	2-8-04:013		SD
963 11/1/2005	2-8-02:134		SD
964 11/1/2005	2-7-09:007		WR 2066
965 11/8/2005	2-3-03:175		SD
966 11/8/2005	2-3-10:035		SD
967 11/8/2005	2-3-15:010		SD
968 11/8/2005	2-2-17:004		WR 2067
969 11/8/2005	2-3-10:066		WR 2101
970 11/9/2005	2-7-02:043		SD 05-012
971 11/11/2005	2-2-04:030		SD
972 11/15/2005	2-3-13:041		SD

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<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
973	11/15/2005	2-2-04:030		WR 2071
974	11/16/2005	2-7-26:022	11	WR 2074
975	11/17/2005	2-4-32:066		WR 2078
976	11/18/2005	2-4-13:036		WR 2121
977	11/18/2005	2-4-13:037		WR 2122
978	11/22/2005	2-2-16:099		SD 05-102
979	11/25/2005	2-7-08:012		SD 05-100
980	11/25/2005	2-3-01:045		SD 05-105
981	11/29/2005	2-3-47:048		WR 2075
982	12/1/2005	2-2-01:026		WR 2076
983	12/19/2005	2-4-40:019		SD
984	12/19/2005	2-7-06:017		WR 2077
985	12/20/2005	2-2-03:007		WR 2072
986	12/29/2005	2-3-68:007		WR 2079
987	1/3/2006	2-7-06:015		SD
988	1/5/2006	2-7-04:021		SD
989	1/5/2006	2-4-12:025		WR 2080
990	1/9/2006	2-3-01:150		WR 2081
991	1/10/2006	2-7-13:175		SD
992	1/12/2006	2-8-02:124		A 06 0077
993	1/12/2006	2-4-32:080		WR 2082
994	1/19/2006	2-7-14:044		WR 2083
995	1/24/2006	2-7-12:167		SD
996	1/24/2006	2-8-04:013		SD 06-013
997	1/25/2006	2-2-03:050		WR 2084
998	1/26/2006	2-7-08:118		SD 06-011
999	1/31/2006	2-2-04:020		SD
1000	1/31/2006	2-2-04:082		SD
1001	1/31/2006	2-2-04:083		SD
1002	2/3/2006	2-3-60:053		WR 2085
1003	2/6/2006	2-3-03:010		SD
1004	2/7/2006	2-3-60:075		WR 2086
1005	2/7/2006	2-3-22:121		WR 2087
1006	2/7/2006	2-3-19:001		WR 2088
1007	2/16/2006	2-4-07:017		WR 2089
1008	2/17/2006	2-7-26:002		WR 2090
1009	2/22/2006	2-8-04:068		SD
1010	2/23/2006	2-4-15:042		SD
1011	2/24/2006	2-3-03:072		WR 2091
1012	2/24/2006	2-8-05:033		WR 2092
1013	3/1/2006	2-5-14:039		WR 2093
1014	3/2/2006	2-4-29:024		WR 2094
1015	3/3/2006	2-2-16:018		SD 06-015
1016	3/6/2006	2-8-04:031		WR 2095
1017	3/9/2006	2-7-30:008		SD 06-017
1018	3/20/2006	2-2-03:051		WR 2096
1019	3/20/2006	2-7-30:012		WR 2097
1020	3/22/2006	2-3-10:006		SD
1021	3/29/2006	2-4-13:006		SD
1022	4/3/2006	2-3-60:029		WR 2098
1023	4/6/2006	2-7-11:031		WR 2099
1024	4/10/2006	2-3-01:174		SD 06-034
1025	4/10/2006	2-8-05:084		WR 2105
1026	4/19/2006	2-3-56:009		WR 2107

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1027	4/21/2006	2-4-27:003	WR 2108
1028	4/26/2006	2-7-05:001	SD
1029	4/28/2006	2-7-34:010	WR 2110
1030	4/28/2006	2-7-13:023	WR 2111
1031	5/2/2006	2-7-12:085	SD 06-037
1032	5/16/2006	2-3-46:015	WR 2113
1033	5/16/2006	2-7-02:025	WR 2114
1034	5/22/2006	2-4-12:001	SD
1035	5/22/2006	2-4-12:001	Grant 318 WR 2162
1036	5/22/2006	2-4-12:001	Grant 602 WR 2164
1037	5/24/2006	2-7-29:017	WR 2100
1038	5/24/2006	2-2-05:041	WR 2115
1039	5/26/2006	2-2-18:008	WR 2116
1040	5/31/2006	2-4-13:009	SD
1041	5/31/2006	2-7-26:007	SD
1042	5/31/2006	2-7-26:006	WR 2117
1043	5/31/2006	2-4-07:017	WR 2123
1044	5/31/2006	2-2-12:020	WR 2167
1045	5/31/2006	2-4-12:005	WR 2170
1046	5/31/2006	2-4-12:039	WR 2171
1047	5/31/2006	2-4-12:042	WR 2172
1048	5/31/2006	2-4-12:043	WR 2173
1049	5/31/2006	2-4-12:044	WR 2174
1050	5/31/2006	2-4-12:041	WR 2175
1051	5/31/2006	2-4-12:040	WR 2176
1052	5/31/2006	2-4-12:045	WR 2177
1053	5/31/2006	2-4-12:046	WR 2178
1054	5/31/2006	2-4-12:047	WR 2179
1055	5/31/2006	2-4-12:048	WR 2180
1056	6/7/2006	2-5-10:003	SD
1057	6/7/2006	2-7-08:106	SD
1058	6/8/2006	2-3-32:014	SD
1059	6/9/2006	2-3-32:002	SD
1060	6/9/2006	2-3-32:015	SD
1061	6/27/2006	2-5-03:010	SD 06-049
1062	6/27/2006	2-2-20:063	WR 2118
1063	6/28/2006	2-2-08:004	SD 06-054
1064	7/3/2006	2-3-19:025	hpr 1 WR 2119
1065	7/5/2006	2-8-13:183	A 06 1885
1066	7/10/2006	2-3-03:086	SD
1067	7/10/2006	2-3-03:086	WR 2124
1068	7/11/2006	2-2-14:005	SD 06-053
1069	7/17/2006	2-2-04:008	SD
1070	7/17/2006	2-4-40:027	WR 2125
1071	7/18/2006	2-3-02:122	SD 06-055
1072	7/19/2006	2-3-02:009	SD
1073	7/19/2006	2-3-62:034	SD 06-056
1074	7/26/2006	2-2-09:026	SD 06-063
1075	7/27/2006	2-8-02:133	WR 2126
1076	7/31/2006	2-2-04:004	SD 06-060
1077	8/3/2006	2-3-03:041	SD
1078	8/7/2006	2-3-03:106	SD
1079	8/11/2006	2-7-13:094	A 06 2285
1080	8/15/2006	2-7-35:041	WR 2127

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<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1081	8/21/2006	2-4-02:007		SD 06-069
1082	8/22/2006	2-7-13:086		SD 06-073
1083	8/22/2006	2-3-13:045		WR 2128
1084	8/23/2006	2-3-19:014		SD
1085	8/23/2006	2-4-06:030		WR 2129
1086	8/23/2006	2-7-08:157		WR 2130
1087	8/28/2006	2-2-09:004		SD
1088	8/28/2006	2-3-08:001		SD 06-082
1089	8/29/2006	2-2-09:080		WR 2131
1090	8/31/2006	2-3-60:031		WR 2132
1091	9/6/2006	2-3-02:009		WR 2133
1092	9/7/2006	2-7-02:074		WR 2103
1093	9/15/2006	2-2-02:047		WR 2134
1094	9/18/2006	2-2-22:026		WR 2135
1095	9/20/2006	2-3-01:023		SD
1096	9/20/2006	2-3-01:174		SD
1097	9/21/2006	2-3-10:057		SD 06-083
1098	9/22/2006	2-8-02:132		WR 2136
1099	9/25/2006	2-3-33:019		SD
1100	9/26/2006	2-3-40:007		WR 2137
1101	10/3/2006	2-3-60:018		WR 2138
1102	10/4/2006	2-3-08:014		SD 06-089
1103	10/4/2006	2-4-23:006		WR 2139
1104	10/6/2006	2-3-40:019		WR 2140
1105	10/6/2006	2-4-11:005		WR 2141
1106	10/9/2006	2-3-02:004		SD 06-090
1107	10/10/2006	2-3-03:026		SD 06-101
1108	10/18/2006	2-2-15:081		WR 2142
1109	10/19/2006	2-4-29:041		WR 2143
1110	10/19/2006	2-4-15:046		WR 2144
1111	10/26/2006	2-3-35:009		WR 2145
1112	10/27/2006	2-3-35:016		SD
1113	10/30/2006	2-2-15:003	14-A	WR 2146
1114	11/1/2006	2-7-13:089		WR 2147
1115	11/2/2006	2-8-10:016		WR 2148
1116	11/8/2006	2-2-16:037		WR 2149
1117	11/16/2006	2-2-12:001		SD
1118	11/20/2006	2-3-53:011		WR 2151
1119	11/20/2006	2-2-16:102		WR 2169
1120	11/24/2006	2-2-15:073		WR 2152
1121	12/4/2006	2-3-03:188		WR 2153
1122	12/4/2006	2-3-03:189		WR 2154
1123	12/4/2006	2-3-47:042		WR 2155
1124	12/5/2006	2-7-03:008		SD
1125	12/5/2006	2-7-03:008		WR 2156
1126	12/12/2006	2-4-07:017		SD 06-115
1127	12/13/2006	2-4-32:088		WR 2157
1128	12/19/2006	2-2-11:027		SD
1129	12/19/2006	2-3-46:002		WR 2158
1130	12/26/2006	2-2-11:010		WR 2159
1131	12/27/2006	2-3-13:068		WR 2160
1132	12/29/2006	2-7-08:105		SD
1133	1/5/2007	2-8-02:090		A 07 0041
1134	1/5/2007	2-3-03:215		SD

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<u>Priority Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1135	1/8/2007		2-8-04:066 WR 2161
1136	1/25/2007		2-2-10:017 SD 07-006
1137	1/25/2007		2-5-04:050 WR 2182
1138	2/5/2007		2-3-07:026 SD
1139	2/5/2007		2-3-09:034 SD
1140	2/5/2007	5	2-3-07:023 WR 2183
1141	2/5/2007	6	2-3-07:022 WR 2184
1142	2/5/2007	7	2-3-07:018 WR 2185
1143	2/5/2007		2-3-09:034 WR 2186
1144	2/5/2007		2-3-07:026 WR 2187
1145	2/6/2007		2-3-07:027 SD
1146	2/6/2007	1	2-3-27:027 WR 2188
1147	2/9/2007		2-3-13:011 WR 2189
1148	2/12/2007		2-7-25:026 SD
1149	2/13/2007		2-2-20:084 WR 2190
1150	2/15/2007		2-4-13:031 WR 2191
1151	2/15/2007		2-3-42:051 WR 2192
1152	2/16/2007	4	2-3-07:024 WR 2193
1153	2/20/2007		2-2-03:038 SD 07-009
1154	2/23/2007		2-7-12:275 WR 2194
1155	2/23/2007		2-7-12:276 WR 2195
1156	2/23/2007		2-7-12:277 WR 2196
1157	2/27/2007		2-3-32:013 SD
1158	2/28/2007		2-7-11:055 SD
1159	3/2/2007		2-7-07:003 SD
1160	3/6/2007		2-3-51:007 WR 2197
1161	3/7/2007		2-3-14:013 WR 2198
1162	3/7/2007		2-3-16:002 WR 2199
1163	3/13/2007		2-7-03:010 SD 07-016
1164	3/14/2007		2-7-13:064 WR 2200
1165	3/15/2007		2-7-12:055 WR 2201
1166	3/16/2007		2-3-01:029 WR 2202
1167	3/22/2007		2-3-03:223 WR 2203
1168	3/22/2007		2-8-01:018 WR 2205
1169	3/27/2007		2-7-12:178 SD
1170	4/2/2007		2-3-03:067 SD
1171	4/2/2007		2-2-14:010 WR 2206
1172	4/4/2007		2-4-07:010 WR 2207
1173	4/11/2007		2-8-01:096 WR 2208
1174	4/16/2007		2-2-04:101 WR 2209
1175	4/18/2007		2-4-09:010 SD 07-025
1176	4/20/2007		2-7-11:022 SD
1177	4/20/2007		2-7-09:051 WR 2210
1178	4/24/2007		2-3-36:007 WR 2212
1179	5/30/2007		2-4-07:066 SD
1180	6/12/2007	34-B	2-2-06:108 WR 2214
1181	6/22/2007		2-3-60:002 WR 2215
1182	6/29/2007		2-2-13:009 WR 2216
1183	7/3/2007		2-3-10:050 WR 2217
1184	7/5/2007		2-3-01:058 SD
1185	7/5/2007		2-3-01:173 SD
1186	7/13/2007		2-5-07:002 WR 2218
1187	8/6/2007		2-3-03:168 SD
1188	8/15/2007		2-4-28:011 WR 2220

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<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1189	8/20/2007	2-4-35:106		WR 2221
1190	8/23/2007	2-3-08:034		SD 07-052
1191	8/31/2007	2-3-02:008		SD 07-053
1192	8/31/2007	2-7-18:019		WR 2222
1193	9/6/2007	2-3-60:036		WR 2223
1194	9/13/2007	2-4-03:012		WR 2224
1195	9/25/2007	2-3-15:009		WR 2228
1196	9/27/2007	2-5-10:018		WR 2227
1197	10/3/2007	2-4-13:070		SD 07-056
1198	10/17/2007	2-7-01:032		SD 07-058
1199	10/19/2007	2-1-04:089		WR 2225
1200	10/19/2007	2-3-59:019		WR 2226
1201	11/7/2007	2-2-06:038		SD
1202	11/7/2007	2-2-06:104		SD
1203	11/8/2007	2-4-12:006		SD
1204	11/13/2007	2-3-03:016		SD 07-061
1205	11/13/2007	2-2-11:029		WR 2230
1206	11/29/2007	2-3-03:012		SD
1207	11/29/2007	2-7-01:105		SD
1208	11/29/2007	2-3-03:031		SD 07-076
1209	12/5/2007	2-7-12:049		WR 2231
1210	12/6/2007	2-3-14:008		SD
1211	1/2/2008	2-3-60:002		SD
1212	1/17/2008	2-2-11:003		SD
1213	1/18/2008	2-2-15:029		WR 2232
1214	1/24/2008	2-2-04:101		SD
1215	1/28/2008	2-2-05:003		SD
1216	2/1/2008	2-3-01:023		SD 08-008
1217	2/11/2008	2-7-19:039	Unit B cpr	WR 2233
1218	2/20/2008	2-4-22:015		WR 2234
1219	3/19/2008	2-3-44:038		WR 2235
1220	4/2/2008	2-7-08:021		SD 08-016
1221	4/8/2008	2-3-03:050		SD 08-018
1222	4/21/2008	2-7-08:111		WR 2237
1223	4/23/2008	2-4-36:083		WR 2238
1224	4/29/2008	2-3-28:011		WR 2239
1225	5/5/2008	2-3-37:005		SD
1226	5/16/2008	2-9-03:012		WR 2242
1227	5/30/2008	2-3-52:008		WR 2243
1228	6/13/2008	2-3-14:014		SD
1229	6/17/2008	2-4-13:185		SD
1230	6/26/2008	2-4-26:001		WR 2244
1231	6/30/2008	2-8-01:025		WR 2245
1232	7/1/2008	2-7-08:047		SD
1233	7/8/2008	2-3-08:019		SD 08-033
1234	7/8/2008	2-4-13:060		WR 2246
1235	7/14/2008	2-8-05:045		WR 2247
1236	7/15/2008	2-3-03:066		SD 08-046
1237	7/17/2008	2-3-08:020		SD 08-048
1238	7/17/2008	2-8-01:034		WR 2248
1239	7/17/2008	2-8-01:036		WR 2249
1240	7/17/2008	2-8-01:038		WR 2250
1241	7/17/2008	2-8-01:078		WR 2251
1242	7/30/2008	2-2-06:115		SD

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1243 8/8/2008	2-3-08:035		SD 08-050
1244 8/12/2008	2-3-07:042		SD 08-051
1245 8/14/2008	2-7-14:044		SD 08-053
1246 9/3/2008	2-3-03:072		SD
1247 9/15/2008	2-2-20:032		WR 2252
1248 9/16/2008	2-2-12:049		SD
1249 9/16/2008	2-7-06:061		SD
1250 9/17/2008	2-7-26:005		SD
1251 9/26/2008	2-7-08:035		WR 2253
1252 9/30/2008	2-7-09:057		WR 2254
1253 10/6/2008	2-4-37:014		WR 2255
1254 10/28/2008	2-5-04:076		WR 2256
1255 10/28/2008	2-7-05:014		WR 2257
1256 10/31/2008	2-7-01:072		SD
1257 11/7/2008	2-8-04:099		WR 2229
1258 11/10/2008	2-9-07:022		WR 2258
1259 11/10/2008	2-9-07:084		WR 2259
1260 11/20/2008	2-2-05:055		SD
1261 11/21/2008	2-2-06:116		SD 08-062
1262 12/10/2008	2-7-14:037		WR 2260
1263 12/17/2008	2-3-32:012		SD
1264 12/30/2008	2-3-50:037		WR 2261
1265 1/2/2009	2-2-03:047		SD
1266 1/2/2009	2-7-03:006		WR 2262
1267 1/9/2009	2-7-07:053		WR 2263
1268 1/13/2009	2-7-13:203		SD
1269 1/21/2009	2-7-13:197		WR 2264
1270 2/9/2009	2-3-12:086		SD 09-009
1271 2/13/2009	2-3-08:031		SD
1272 3/12/2009	2-4-27:012		WR 2265
1273 3/23/2009	2-2-08:009		SD 09-014
1274 3/23/2009	2-8-09:008		WR 2266
1275 3/30/2009	2-4-30:040		WR 2267
1276 4/2/2009	2-2-15:087		SD 09-016
1277 4/14/2009	2-3-68:001		WR 2268
1278 6/15/2009	2-2-20:066		SD
1279 6/22/2009	2-4-09:052		SD
1280 7/13/2009	2-2-03:004		SD 09-025
1281 8/4/2009	2-8-01:014		WR 2271
1282 8/5/2009	2-3-02:086		WR 2272
1283 9/3/2009	2-3-16:024		WR 2273
1284 9/8/2009	2-4-40:030		SD
1285 9/11/2009	2-4-40:032		SD
1286 9/28/2009	2-7-22:023		WR 2274
1287 10/6/2009	2-7-12:166		WR 2294
1288 10/6/2009	2-7-12:222		WR 2295
1289 10/6/2009	2-7-12:223		WR 2296
1290 10/13/2009	2-8-10:025		WR 2275
1291 10/23/2009	2-4-07:031		WR 2276
1292 10/23/2009	2-3-14:086		WR 2277
1293 10/29/2009	2-2-13:007		SD 09-046
1294 11/10/2009	2-2-12:072		SD
1295 11/12/2009	2-3-45:054		WR 2278
1296 11/13/2009	2-3-43:002		WR 2279

Reference Prefix
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1297	12/11/2009	2-4-13:050	SD 09-049
1298	1/12/2010	2-8-02:255	SD 10-003
1299	2/3/2010	2-4-13:075	WR 2281
1300	2/3/2010	2-4-13:219	WR 2282
1301	2/3/2010	2-4-13:220	WR 2283
1302	2/11/2010	2-3-05:002	SD 10-006
1303	2/12/2010	2-7-14:081	WR 2297
1304	2/12/2010	2-7-14:036	WR 2298
1305	3/18/2010	2-1-08:024	SD
1306	3/19/2010	2-4-26:010	WR 2284
1307	3/19/2010	2-4-10:017	WR 2285
1308	3/19/2010	2-4-10:018	WR 2286
1309	3/19/2010	2-4-10:019	WR 2287
1310	4/15/2010	2-2-09:049	WR 2288
1311	4/22/2010	2-7-13:097	SD
1312	4/30/2010	2-4-13:040	SD 10-018
1313	5/14/2010	2-2-01:063	WR 2299
1314	6/7/2010	2-4-13:089	WR 2289
1315	6/9/2010	2-3-14:072	WR 2292
1316	7/15/2010	2-4-13:218	WR 2290
1317	7/23/2010	2-7-27:012	SD
1318	7/30/2010	2-8-02:121	WR 2291
1319	8/6/2010	2-7-04:035	WR 2293
1320	8/27/2010	2-8-04:058	SD
1321	8/27/2010	2-8-04:059	SD
1322	8/27/2010	2-8-04:061	SD
1323	8/27/2010	2-8-04:066	SD
1324	8/31/2010	2-2-06:031	WR 2301
1325	9/3/2010	2-4-11:012	SD
1326	9/7/2010	2-7-22:005	SD
1327	9/21/2010	2-7-14:037	WR 2302
1328	9/27/2010	2-2-02:039	SD
1329	10/1/2010	2-7-08:122	WR 2303
1330	10/4/2010	2-4-18:006	WR 2304
1331	10/12/2010	2-3-08:016	SD 10-035
1332	10/12/2010	2-3-08:025	SD 10-037
1333	10/14/2010	2-1-04:080	SD
1334	10/15/2010	2-3-19:001	WR 2306
1335	10/15/2010	2-1-08:111	WR 2307
1336	11/1/2010	2-4-13:151	WR 2308
1337	11/1/2010	2-7-01:072	WR 2314
1338	11/3/2010	2-8-04:058	WR 2309
1339	11/4/2010	2-4-36:061	WR 2315
1340	11/12/2010	2-7-02:158	SD 10-039
1341	11/19/2010	2-7-14:077	WR 2310
1342	11/23/2010	2-7-06:052	WR 2311
1343	11/26/2010	2-3-03:155	SD
1344	11/30/2010	2-4-13:093	WR 2312
1345	12/1/2010	2-7-08:040	SD
1346	12/8/2010	2-3-38:030	SD
1347	12/9/2010	2-3-19:002	SD
1348	12/9/2010	2-7-28:004	WR 2316
1349	12/22/2010	2-3-07:038	SD
1350	12/22/2010	2-4-13:021	WR 2317

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1351 2/4/2011	2-5-04:001		SD
1352 2/7/2011	2-3-16:012		SD
1353 2/7/2011	2-7-07:076		WR 2319
1354 2/7/2011	2-7-07:077		WR 2320
1355 2/14/2011	2-7-09:014		WR 2321
1356 2/18/2011	2-1-03:035		WR 2323
1357 3/2/2011	2-8-04:061	4	SD 11-002
1358 3/14/2011	2-7-26:005		WR 2325
1359 3/22/2011	2-4-36:120		WR 2326
1360 4/19/2011	2-1-04:125		WR 2328
1361 4/29/2011	2-2-16:069		WR 2329
1362 5/12/2011	2-7-28:004		WR 2330
1363 5/13/2011	2-5-04:039		SD
1364 5/24/2011	2-3-08:036		SD
1365 5/24/2011	2-3-09:039		SD
1366 7/5/2011	2-7-07:078		SD
1367 7/12/2011	2-1-04:116		WR 2551
1368 7/12/2011	2-1-04:095	Por Lot 2	WR 2552
1369 7/22/2011	2-8-09:101		WR 2332
1370 8/15/2011	2-3-01:133		WR 2365
1371 8/25/2011	2-8-004:043	109	SD 11-026
1372 9/6/2011	2-7-13:046		WR 2334
1373 9/9/2011	2-4-01:003	2-A	SD 11-029
1374 9/14/2011	2-2-12:004		SD
1375 9/19/2011	2-3-09:039		WR 2350
1376 9/22/2011	2-2-15:004		SD
1377 9/27/2011	2-3-41:074		SD
1378 9/27/2011	2-7-12:112		WR 2348
1379 10/3/2011	2-4-32:072		WR 2335
1380 11/4/2011	2-1-03:018		WR 2337
1381 11/7/2011	2-5-03:005		WR 2338
1382 11/7/2011	2-5-03:018		WR 2339
1383 11/7/2011	2-3-09:008		WR 2340
1384 11/7/2011	2-4-01:023		WR 2341
1385 11/7/2011	2-4-01:022		WR 2342
1386 11/17/2011	2-8-02:046		WR 2343
1387 11/29/2011	2-3-13:086		WR 2344
1388 12/2/2011	2-8-04:017		WR 2345
1389 12/19/2011	2-4-12:030		WR 2346
1390 12/30/2011	2-2-12:013		WR 2347
1391 1/4/2012	2-2-16:042		WR 2349
1392 1/9/2012	2-7-12:173		SD 12-002
1393 1/10/2012	2-7-08:071		SD
1394 1/10/2012	2-4-25:054	2-A	WR 2351
1395 1/13/2012	2-3-07:042		SD
1396 1/26/2012	2-8-02:046		SD
1397 2/7/2012	2-4-29:062	6	WR 2352
1398 2/8/2012	2-3-08:004	1	WR 2353
1399 2/8/2012	2-3-08:004	2	WR 2354
1400 2/8/2012	2-3-08:030		WR 2355
1401 3/5/2012	2-8-03:040	B-3	WR 2356
1402 3/13/2012	2-3-40:011	1-A	WR 2357
1403 3/24/2012	2-4-05:027	4	WR 2360
1404 3/27/2012	2-3-03:051		SD

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1405	3/27/2012	2-5-03:030	3	SD 12-007
1406	3/27/2012	2-5-03:038	11	SD 12-008
1407	4/11/2012	2-3-03:141		SD
1408	4/11/2012	2-1-03:008		WR 2359
1409	4/16/2012	2-2-06:082	D	SD 12-011
1410	5/23/2012	2-7-28:001		SD
1411	5/24/2012	2-2-04:099	35A	WR 2361
1412	6/15/2012	2-7-06:053		WR 2363
1413	6/27/2012	2-7-13:210		WR 2364
1414	7/31/2012	2-8-04:050	2	WR 2366
1415	8/1/2012	2-3-03:210		WR 2367
1416	8/6/2012	2-3-18:012		SD
1417	8/24/2012	2-4-02:001		WR 2368
1418	9/10/2012	2-2-08:003	33	SD 12-028
1419	9/13/2012	2-3-60:079		WR 2369
1420	9/17/2012	2-8-05:098		WR 2370
1421	9/20/2012	2-7-12:202		WR 2371
1422	9/20/2012	2-3-66:024	1	WR 2372
1423	9/20/2012	2-3-66:007		WR 2373
1424	9/20/2012	2-3-66:004	2	WR 2374
1425	9/20/2012	2-3-66:003	3	WR 2375
1426	9/20/2012	2-3-66:002	4	WR 2376
1427	9/20/2012	2-3-08:043	4-A-3	WR 2377
1428	9/20/2012	2-3-66:020		WR 2379
1429	9/20/2012	2-3-66:019		WR 2380
1430	9/20/2012	2-3-66:017		WR 2381
1431	9/20/2012	2-3-66:039	8	WR 2382
1432	9/21/2012	2-3-60:075		SD
1433	9/21/2012	2-4-13:153		SD
1434	9/21/2012	2-7-13:011	2	WR 2383
1435	9/21/2012	2-2-04:100	32-B	WR 2384
1436	9/21/2012	2-3-47:075	294	WR 2386
1437	9/25/2012	2-2-06:023		SD
1438	9/25/2012	2-2-12:028	D-2	WR 2387
1439	9/27/2012	2-3-07:043		SD
1440	9/27/2012	2-3-07:043	2	WR 2388
1441	9/27/2012	2-3-52:024		WR 2389
1442	10/1/2012	2-8-04:063		SD
1443	10/1/2012	2-8-04:062		SD
1444	10/1/2012	2-8-06:058		SD
1445	10/1/2012	2-8-06:054		SD
1446	10/1/2012	2-5-03:038		SD
1447	10/1/2012	2-5-03:030		SD
1448	10/1/2012	2-5-01:012		SD
1449	10/1/2012	2-7-03:084		SD
1450	10/1/2012	2-7-03:083		SD
1451	10/1/2012	2-7-03:001		SD
1452	10/1/2012	2-7-08:049		SD
1453	10/1/2012	2-8-01:051		SD
1454	10/1/2012	2-8-01:044		SD
1455	10/1/2012	2-8-01:041		SD
1456	10/1/2012	2-8-01:040		SD
1457	10/1/2012	2-8-04:034		SD
1458	10/1/2012	2-8-06:057		WR 2390

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1459	10/1/2012	2-8-04:064		WR 2391
1460	10/1/2012	2-8-04:065		WR 2392
1461	10/3/2012	2-7-04:001		SD
1462	10/3/2012	2-7-04:007		SD
1463	10/3/2012	2-7-15:006		SD
1464	10/3/2012	2-7-07:004		SD
1465	10/3/2012	2-5-04:068		WR 2393
1466	10/3/2012	2-5-04:069		WR 2394
1467	10/3/2012	2-5-04:070		WR 2395
1468	10/3/2012	2-5-04:055		WR 2396
1469	10/3/2012	2-7-04:050		WR 2397
1470	10/3/2012	2-7-04:057		WR 2398
1471	10/3/2012	2-7-04:059		WR 2399
1472	10/3/2012	2-7-04:003		WR 2400
1473	10/3/2012	2-7-04:054		WR 2401
1474	10/3/2012	2-7-04:055		WR 2402
1475	10/3/2012	2-7-04:056		WR 2403
1476	10/3/2012	2-7-04:058		WR 2404
1477	10/3/2012	2-7-04:005		WR 2405
1478	10/3/2012	2-7-04:013		WR 2406
1479	10/3/2012	2-7-04:053		WR 2407
1480	10/3/2012	2-7-04:048		WR 2408
1481	10/3/2012	2-7-04:049		WR 2409
1482	10/3/2012	2-7-04:052		WR 2410
1483	10/3/2012	2-7-15:015		WR 2411
1484	10/3/2012	2-7-15:032		WR 2412
1485	10/3/2012	2-7-15:039		WR 2413
1486	10/3/2012	2-7-15:037		WR 2414
1487	10/3/2012	2-7-15:034		WR 2415
1488	10/5/2012	2-2-13:025		WR 2416
1489	10/5/2012	2-2-20:076	57	WR 2417
1490	10/10/2012	2-3-32:008	13	SD 12-032
1491	10/12/2012	2-3-03:228		SD
1492	10/12/2012	2-2-15:049		SD
1493	10/12/2012	2-1-03:019		WR 2418
1494	10/12/2012	2-1-03:008	n/a	WR 2419
1495	10/12/2012	2-1-03:027		WR 2420
1496	10/12/2012	2-2-15:049		WR 2421
1497	10/15/2012	2-3-58:041	41	WR 2423
1498	10/16/2012	2-7-01:056		SD
1499	10/16/2012	2-3-41:028		WR 2424
1500	10/17/2012	2-8-04:098	2-B	WR 2425
1501	10/17/2012	2-1-04:128	3	WR 2426
1502	10/18/2012	2-4-10:010		WR 2427
1503	10/18/2012	2-3-02:007		WR 2428
1504	10/18/2012	2-3-08:003		WR 2429
1505	10/18/2012	2-3-04:013	Grant 3515	WR 2430
1506	10/18/2012	2-3-04:013	Grant 966	WR 2431
1507	10/18/2012	2-3-04:013	Grant 2812	WR 2432
1508	10/18/2012	2-3-04:013	LCA 7124	WR 2433
1509	10/18/2012	2-3-07:011		WR 2434
1510	10/18/2012	2-3-07:012	Grant 2782	WR 2435
1511	10/18/2012	2-3-07:012	LCA 8452:7	WR 2436
1512	10/18/2012	2-3-06:008		WR 2437

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<u>Priority Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1513	10/18/2012	2-4-11:004	Grnt6802:3 WR 2438
1514	10/18/2012	2-4-10:003	WR 2439
1515	10/18/2012	2-4-10:004	WR 2440
1516	10/18/2012	2-4-10:021	WR 2441
1517	10/18/2012	2-3-07:037	B-2 WR 2442
1518	10/18/2012	2-4-10:008	C WR 2443
1519	10/18/2012	2-4-10:009	B WR 2444
1520	10/18/2012	2-4-10:005	WR 2445
1521	10/18/2012	2-4-10:020	WR 2446
1522	10/18/2012	2-4-10:001	WR 2447
1523	10/18/2012	2-2-02:001	Grant 2480 WR 2448
1524	10/18/2012	2-2-02:001	Grant 548 WR 2449
1525	10/18/2012	2-2-02:001	Grant 3369 WR 2450
1526	10/18/2012	2-2-02:001	Grant 3450 WR 2451
1527	10/18/2012	2-2-02:001	Grant 3529 WR 2452
1528	10/18/2012	2-2-02:001	Grant 3366 WR 2453
1529	10/18/2012	2-2-02:050	WR 2454
1530	10/18/2012	2-5-01:004	WR 2455
1531	10/18/2012	2-3-05:003	WR 2456
1532	10/18/2012	2-5-01:003	WR 2457
1533	10/23/2012	2-2-12:034	SD
1534	10/23/2012	2-2-12:012	WR 2459
1535	10/23/2012	2-2-12:034	WR 2460
1536	10/29/2012	2-3-19:023	75 WR 2462
1537	10/29/2012	2-3-03:165	WR 2463
1538	10/30/2012	2-4-25:055	2-B WR 2464
1539	11/1/2012	2-3-15:013	SD
1540	11/1/2012	2-2-11:024	SD
1541	11/1/2012	2-2-15:086	SD
1542	11/1/2012	2-3-60:084	5-B-2 WR 2465
1543	11/1/2012	2-3-39:010	WR 2467
1544	11/1/2012	2-3-39:012	WR 2472
1545	11/2/2012	2-7-24:019	SD
1546	11/2/2012	2-4-24:062	SD
1547	11/2/2012	2-7-25:008	SD
1548	11/2/2012	2-4-17:011	SD
1549	11/2/2012	2-4-18:012	WR 2468
1550	11/5/2012	2-4-11:006	7 WR 2470
1551	11/5/2012	2-3-33:215	8-B WR 2471
1552	11/5/2012	2-3-03:200	WR 2473
1553	11/5/2012	2-2-12:031	WR 2475
1554	11/7/2012	2-2-13:046	SD
1555	11/7/2012	2-2-03:032	WR 2476
1556	11/8/2012	2-2-03:042	WR 2477
1557	11/9/2012	2-8-02:013	WR 2479
1558	11/9/2012	2-8-02:249	2-E WR 2480
1559	11/13/2012	2-3-03:159	SD
1560	11/13/2012	2-4-02:007	B SD 12-037
1561	11/15/2012	2-4-07:034	28 WR 2483
1562	11/15/2012	2-3-12:079	WR 2484
1563	11/19/2012	2-3-13:005	SD
1564	11/19/2012	2-3-22:130	SD
1565	11/19/2012	2-2-13:014	WR 2485
1566	11/19/2012	2-3-20:015	90 WR 2486

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1567	11/23/2012	2-3-14:017	11-A	WR 2491
1568	11/23/2012	2-2-09:033		WR 2492
1569	11/23/2012	2-3-60:038		WR 2493
1570	11/23/2012	2-3-03:165		WR 2494
1571	11/26/2012	2-3-13:021		SD
1572	11/27/2012	2-4-06:024		SD
1573	11/27/2012	2-3-13:013		SD
1574	11/27/2012	2-3-07:039		SD
1575	11/27/2012	2-5-04:079		SD
1576	11/27/2012	2-4-07:045	5	WR 2496
1577	11/27/2012	2-7-33:042	42	WR 2498
1578	11/28/2012	2-4-06:066		SD
1579	11/28/2012	2-4-06:021		SD
1580	11/28/2012	2-4-21:026	36	WR 2499
1581	11/28/2012	2-2-20:071		WR 2500
1582	11/29/2012	2-3-13:040		SD
1583	11/29/2012	2-3-08:004		SD
1584	11/29/2012	2-5-03:018		SD
1585	11/29/2012	2-4-01:023		SD
1586	11/29/2012	2-7-01:056	1	WR 2501
1587	11/29/2012	2-4-36:132	1517	WR 2502
1588	11/29/2012	2-5-08:006		WR 2504
1589	11/29/2012	2-3-33:017		WR 2505
1590	11/29/2012	2-4-01:003		WR 2506
1591	11/29/2012	2-5-08:002		WR 2507
1592	11/29/2012	2-5-03:005	1	WR 2508
1593	11/29/2012	2-5-03:005	2	WR 2509
1594	11/29/2012	2-5-03:005	4	WR 2510
1595	11/30/2012	2-3-19:001		SD
1596	11/30/2012	2-3-07:001		SD
1597	12/3/2012	2-2-16:061		SD
1598	12/3/2012	2-3-03:189		SD
1599	12/3/2012	2-3-03:188		SD
1600	12/3/2012	2-7-26:001	Por Lot 2	WR 2512
1601	12/3/2012	2-3-13:016	17-A	WR 2514
1602	12/3/2012	2-4-12:035	4	WR 2515
1603	12/4/2012	2-3-13:025		SD
1604	12/4/2012	2-3-19:056		WR 2520
1605	12/4/2012	2-3-19:057		WR 2521
1606	12/4/2012	2-2-13:037		WR 2522
1607	12/4/2012	2-2-15:087	14-E	WR 2523
1608	12/5/2012	2-3-60:094		SD
1609	12/5/2012	2-4-13:226	Unit 1	WR 2536
1610	12/5/2012	2-3-46:012		WR 2537
1611	12/6/2012	2-7-12:086		SD
1612	12/6/2012	2-3-40:026		SD
1613	12/6/2012	2-7-12:085		SD
1614	12/6/2012	2-2-15:063	14	WR 2525
1615	12/6/2012	2-3-40:026	10-A-1	WR 2526
1616	12/7/2012	2-2-06:011		SD
1617	12/7/2012	2-4-13:166	109-A-2	WR 2527
1618	12/7/2012	2-2-06:011		WR 2528
1619	12/7/2012	2-1-09:003		WR 2529
1620	12/7/2012	2-1-09:004		WR 2530

Reference Prefix
A = bldg. permit application
SD = subdivision
WR = water service request

June 30, 2014

SUBJECT TO CHANGEUPCOUNTRY WATER SERVICEPriority List for Building Permit Applications,
Subdivisions & Water Service Requests

<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1621	12/7/2012	2-1-09:012		WR 2531
1622	12/7/2012	2-1-09:014		WR 2532
1623	12/7/2012	2-1-09:027		WR 2533
1624	12/10/2012	2-7-09:060	32-A-1	WR 2534
1625	12/11/2012	2-7-04:051		SD
1626	12/11/2012	2-2-15:015		SD
1627	12/11/2012	2-2-15:019		SD
1628	12/11/2012	2-2-04:054		SD
1629	12/12/2012	2-2-11:004		SD
1630	12/12/2012	2-3-12:028		WR 2538
1631	12/12/2012	2-3-14:078	290	WR 2539
1632	12/12/2012	2-1-04:105		WR 2540
1633	12/12/2012	2-1-04:104		WR 2541
1634	12/12/2012	2-1-04:103		WR 2542
1635	12/13/2012	2-7-13:056		SD
1636	12/13/2012	2-7-01:089		WR 2543
1637	12/17/2012	2-3-33:218		SD
1638	12/17/2012	2-3-08:034	3-A	WR 2544
1639	12/17/2012	2-3-33:019	18-B-1	WR 2592
1640	12/18/2012	2-2-16:017		SD
1641	12/18/2012	2-7-10:020		WR 2545
1642	12/18/2012	2-7-08:093		WR 2547
1643	12/18/2012	2-4-12:036		WR 2548
1644	12/19/2012	2-7-09:061		WR 2549
1645	12/19/2012	2-2-15:010	42-A	WR 2550
1646	12/19/2012	2-7-21:011		WR 2553
1647	12/20/2012	2-3-01:130		SD
1648	12/20/2012	2-3-08:022		SD
1649	12/20/2012	2-3-08:024		SD
1650	12/20/2012	2-3-08:023		SD
1651	12/20/2012	2-7-09:044	68	WR 2554
1652	12/20/2012	2-7-09:028		WR 2555
1653	12/20/2012	2-3-32:014	7	WR 2556
1654	12/20/2012	2-3-08:022		WR 2558
1655	12/20/2012	2-3-08:024	2-A-9	WR 2561
1656	12/20/2012	2-3-32:002		WR 2563
1657	12/20/2012	2-3-32:015		WR 2565
1658	12/20/2012	2-3-08:023		WR 2567
1659	12/20/2012	2-4-13:101	E-1	WR 2569
1660	12/20/2012	2-8-03:012		WR 2570
1661	12/21/2012	2-7-08:199		SD
1662	12/21/2012	2-4-31:001		SD
1663	12/21/2012	2-4-31:001		WR 2572
1664	12/24/2012	2-4-40:032	15-C	WR 2575
1665	12/24/2012	2-3-08:017		WR 2577
1666	12/24/2012	2-3-22:029		WR 2578
1667	12/24/2012	2-3-03:142		WR 2579
1668	12/26/2012	2-3-59:021		SD
1669	12/26/2012	2-2-06:022		SD
1670	12/26/2012	2-3-08:021		SD
1671	12/26/2012	2-7-12:256		SD
1672	12/26/2012	2-7-12:257		SD
1673	12/26/2012	2-3-13:089		WR 2580
1674	12/26/2012	2-3-24:004		WR 2581

Reference Prefix
A = bldg. permit application
SD = subdivision
WR = water service request

June 30, 2014

SUBJECT TO CHANGE**UPCOUNTRY WATER SERVICE**Priority List for Building Permit Applications,
Subdivisions & Water Service Requests

<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1675	12/27/2012	2-3-07:026		SD
1676	12/27/2012	2-2-06:037		SD
1677	12/27/2012	2-3-07:035		SD
1678	12/27/2012	2-3-09:013		SD
1679	12/27/2012	2-3-07:004		WR 2582
1680	12/27/2012	2-3-08:031		WR 2583
1681	12/27/2012	2-4-02:011	2-A-1-A	WR 2585
1682	12/27/2012	2-8-05:020		WR 2588
1683	12/27/2012	2-2-11:019		WR 2589
1684	12/28/2012	2-7-02:135		SD
1685	12/28/2012	2-3-37:009		SD
1686	12/28/2012	2-7-07:077		SD
1687	12/28/2012	2-7-07:076		SD
1688	12/28/2012	2-3-13:036		SD
1689	12/28/2012	2-3-13:038		SD
1690	12/28/2012	2-3-08:018	2-A-3	WR 2590
1691	12/28/2012	2-7-12:148		WR 2591
1692	12/28/2012	2-2-15:011		WR 2594
1693	12/28/2012	2-2-02:082	LCA8452.19	WR 2597
1694	12/28/2012	2-2-02:082	LG9325.5	WR 2598
1695	12/28/2012	2-2-06:032	LCA8452.20	WR 2601
1696	12/28/2012	2-2-06:032	LCA9021.2	WR 2602
1697	12/28/2012	2-2-06:032		WR 2603
1698	12/28/2012	2-2-06:009	LCA3237	WR 2604
1699	12/28/2012	2-2-06:033		WR 2605
1700	12/28/2012	2-2-06:009	LCA8452.19	WR 2606
1701	12/28/2012	2-3-03:197	A-1-A-1-A	WR 2607
1702	12/28/2012	2-2-06:052		WR 2608
1703	12/28/2012	2-2-06:051		WR 2609
1704	12/28/2012	2-4-08:009		WR 2610
1705	12/28/2012	2-7-15:022		WR 2611
1706	12/28/2012	2-4-12:004	LG 68	WR 2612
1707	12/28/2012	2-4-12:004	LG 67	WR 2613
1708	12/28/2012	2-4-12:004	LG 833	WR 2614
1709	12/28/2012	2-2-02:082	LCA8452.20	WR 2615
1710	12/28/2012	2-2-02:082	LCA 3237	WR 2616
1711	12/28/2012	2-2-01:001		WR 2617
1712	12/28/2012	2-1-04:006		WR 2618
1713	12/28/2012	2-1-08:054		WR 2619
1714	12/28/2012	2-1-04:035		WR 2620
1715	12/28/2012	2-1-09:022		WR 2621
1716	12/28/2012	2-1-08:063		WR 2622
1717	12/28/2012	2-1-04:027		WR 2623
1718	12/28/2012	2-1-04:023		WR 2624
1719	12/28/2012	2-1-02:021		WR 2625
1720	12/28/2012	2-1-04:029		WR 2627
1721	12/28/2012	2-1-05:030		WR 2628
1722	12/28/2012	2-1-03:009		WR 2629
1723	12/28/2012	2-1-05:018		WR 2630
1724	12/28/2012	2-1-04:018		WR 2631
1725	12/28/2012	2-1-03:026		WR 2632
1726	12/28/2012	2-1-03:030		WR 2633
1727	12/28/2012	2-1-05:095		WR 2634
1728	12/28/2012	2-1-02:018		WR 2635

Reference Prefix
A = bldg. permit application
SD = subdivision
WR = water service request

June 30, 2014

SUBJECT TO CHANGE**UPCOUNTRY WATER SERVICE**Priority List for Building Permit Applications,
Subdivisions & Water Service Requests

<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1729	12/28/2012	2-1-04:071		WR 2636
1730	12/28/2012	2-1-04:038		WR 2637
1731	12/28/2012	2-1-04:034		WR 2638
1732	12/28/2012	2-1-05:057		WR 2640
1733	12/28/2012	2-1-05:031		WR 2641
1734	12/28/2012	2-1-04:021		WR 2642
1735	12/28/2012	2-1-05:102		WR 2643
1736	12/28/2012	2-1-05:029		WR 2644
1737	12/28/2012	2-1-05:041		WR 2645
1738	12/28/2012	2-1-04:022		WR 2646
1739	12/28/2012	2-1-04:028		WR 2647
1740	12/28/2012	2-1-03:032		WR 2648
1741	12/28/2012	2-1-05:015		WR 2649
1742	12/28/2012	2-1-09:002		WR 2650
1743	12/28/2012	2-1-05:047		WR 2651
1744	12/28/2012	2-1-05:106		WR 2652
1745	12/28/2012	2-1-05:043		WR 2653
1746	12/28/2012	2-1-05:104		WR 2654
1747	12/28/2012	2-1-09:006		WR 2655
1748	12/28/2012	2-1-05:114		WR 2656
1749	12/28/2012	2-1-05:028		WR 2657
1750	12/28/2012	2-1-03:031		WR 2658
1751	12/28/2012	2-1-05:045		WR 2659
1752	12/28/2012	2-1-04:024		WR 2660
1753	12/28/2012	2-1-04:040		WR 2661
1754	12/28/2012	2-1-05:038		WR 2662
1755	12/28/2012	2-1-05:037		WR 2663
1756	12/28/2012	2-1-05:101		WR 2664
1757	12/28/2012	2-1-05:105		WR 2666
1758	12/28/2012	2-1-05:107		WR 2668
1759	12/28/2012	2-1-05:096		WR 2669
1760	12/28/2012	2-1-05:098		WR 2671
1761	12/28/2012	2-1-09:025		WR 2672
1762	12/28/2012	2-1-05:039		WR 2673
1763	12/28/2012	2-1-05:019		WR 2674
1764	12/28/2012	2-1-05:046		WR 2675
1765	12/28/2012	2-1-05:048		WR 2676
1766	12/28/2012	2-1-04:017		WR 2677
1767	12/28/2012	2-1-05:113		WR 2678
1768	12/28/2012	2-1-05:056		WR 2679
1769	12/28/2012	2-1-05:100		WR 2680
1770	12/28/2012	2-1-05:027		WR 2681
1771	12/28/2012	2-1-09:024		WR 2682
1772	12/28/2012	2-1-05:040		WR 2683
1773	12/28/2012	2-1-09:023		WR 2684
1774	12/28/2012	2-1-05:042		WR 2685
1775	12/28/2012	2-1-05:021		WR 2686
1776	12/28/2012	2-1-05:035		WR 2687
1777	12/28/2012	2-1-05:099		WR 2688
1778	12/28/2012	2-1-04:020		WR 2689
1779	12/28/2012	2-1-05:036		WR 2690
1780	12/28/2012	2-1-05:051		WR 2692
1781	12/28/2012	2-1-05:103		WR 2693
1782	12/28/2012	2-1-05:097		WR 2694

<u>Reference Prefix</u>
A = bldg. permit application
SD = subdivision
WR = water service request

June 30, 2014

SUBJECT TO CHANGE**UPCOUNTRY WATER SERVICE**Priority List for Building Permit Applications,
Subdivisions & Water Service Requests

	<u>Priority Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1783	12/28/2012	2-1-04:053		WR 2695
1784	12/28/2012	2-1-09:020		WR 2696
1785	12/28/2012	2-1-03:036		WR 2697
1786	12/28/2012	2-1-04:016		WR 2698
1787	12/28/2012	2-1-02:024		WR 2699
1788	12/28/2012	2-1-04:012		WR 2700
1789	12/28/2012	2-1-03:038		WR 2701
1790	12/28/2012	2-1-05:054		WR 2702
1791	12/28/2012	2-1-03:046		WR 2703
1792	12/28/2012	2-3-58:043		WR 2704
1793	12/28/2012	2-7-01:051		WR 2705
1794	12/28/2012	2-3-49:053	496	WR 2706
1795	12/31/2012	2-3-18:009		SD
1796	12/31/2012	2-7-12:114		SD
1797	12/31/2012	2-4-28:034		SD
1798	12/31/2012	2-2-05:102		SD
1799	12/31/2012	2-7-01:112		SD
1800	12/31/2012	2-3-18:020		SD
1801	12/31/2012	2-3-03:227		SD
1802	12/31/2012	2-3-03:050		SD
1803	12/31/2012	2-3-43:044		SD
1804	12/31/2012	2-2-03:057		SD
1805	12/31/2012	2-2-03:057		SD
1806	12/31/2012	2-8-04:114		SD
1807	12/31/2012	2-7-12:020		SD
1808	12/31/2012	2-8-02:223		SD
1809	12/31/2012	2-4-04:010		SD
1810	12/31/2012	2-9-02:001		SD
1811	12/31/2012	2-7-12:042	Por 54	WR 2707
1812	12/31/2012	2-7-12:136	D	WR 2708
1813	12/31/2012	2-7-13:041		WR 2709
1814	12/31/2012	2-3-01:159	1	WR 2714
1815	12/31/2012	2-3-13:026		WR 2715
1816	12/31/2012	2-3-13:027		WR 2716
1817	12/31/2012	2-3-13:042		WR 2717
1818	12/31/2012	2-3-60:048	33	WR 2718
1819	12/31/2012	2-2-02:036		WR 2719
1820	12/31/2012	2-2-03:059		WR 2722
1821	12/31/2012	2-7-12:153	51-D-3	WR 2723
1822	12/31/2012	2-4-14:028		WR 2724
1823	12/31/2012	2-3-03:227		WR 2725
1824	12/31/2012	2-3-03:050		WR 2726
1825	12/31/2012	2-3-03:245	3	WR 2727
1826	12/31/2012	2-3-03:246	4	WR 2728
1827	12/31/2012	2-3-03:247	5	WR 2729
1828	12/31/2012	2-3-03:248	6	WR 2730
1829	12/31/2012	2-3-37:022	8	WR 2731
1830	12/31/2012	2-2-06:021		WR 2735
1831	12/31/2012	2-3-26:022		WR 2736
1832	12/31/2012	2-3-01:184	14-B	WR 2737
1833	12/31/2012	2-3-01:185	14-C	WR 2738
1834	12/31/2012	2-2-17:013	43-F	WR 2739
1835	12/31/2012	2-3-03:196	B	WR 2740
1836	12/31/2012	2-3-13:084		WR 2742

Reference Prefix
A = bldg. permit application
SD = subdivision
WR = water service request

June 30, 2014

SUBJECT TO CHANGEUPCOUNTRY WATER SERVICEPriority List for Building Permit Applications,
Subdivisions & Water Service Requests

<u>Priority</u>	<u>Date</u>	<u>TMK</u>	<u>Lot No.</u>	<u>Ref. No.</u>
1837	12/31/2012	2-1-05:050		WR 2743
1838	12/31/2012	2-3-42:048		WR 2744
1839	12/31/2012	2-7-09:010		WR 2745
1840	12/31/2012	2-2-03:032		WR 2747
1841	12/31/2012	2-7-14:057		WR 2748
1842	12/31/2012	2-3-05:003		WR 2749
1843	12/31/2012	2-3-05:004		WR 2750
1844	12/31/2012	2-2-05:004		WR 2751
1845	12/31/2012	2-8-02:002		WR 2754
1846	12/31/2012	2-3-34:071		WR 2755
1847	12/31/2012	2-7-05:015		WR 2756
1848	12/31/2012	2-3-52:015	38	WR 2757
1849	12/31/2012	2-8-02:259		WR 2759
1850	12/31/2012	2-3-15:021	39-D	WR 2760
1851	12/31/2012	2-9-05:029		WR 2761
1852	12/31/2012	2-2-12:043		WR 2762

Reference Prefix A = bldg. permit application SD = subdivision WR = water service request
--



**MauI Island
Plan
Directed
Growth
Map**
Spreckelsville / Pa'ia
N1

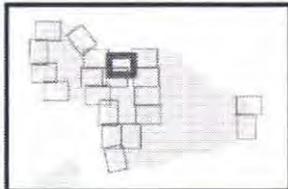
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Growth Boundaries

- Urban
- Small Town
- Rural

Reference

- 2011 Parcels
- Primary Roads

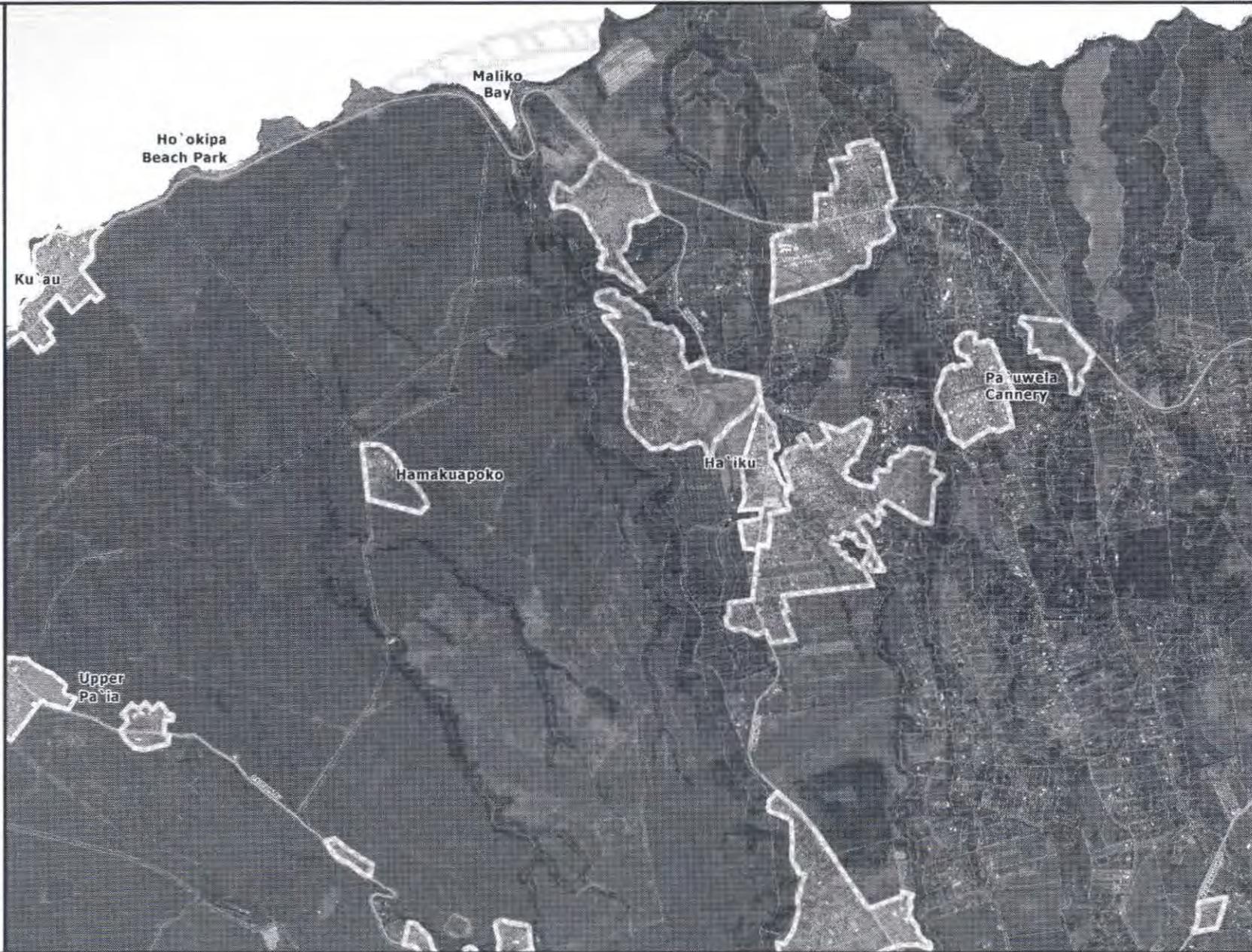


Scale: 0 0.5 1 1.5 2 Miles

Background Image: Worldview 2 - 2010
This is not a zoning map. Please contact the Planning Department for Zoning confirmation.

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Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793





**MauI Island
Plan
Directed
Growth
Map**
Ku'au / Ha'iku
N2

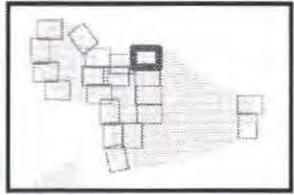
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Growth Boundaries

-  Urban
-  Small Town
-  Rural

Reference

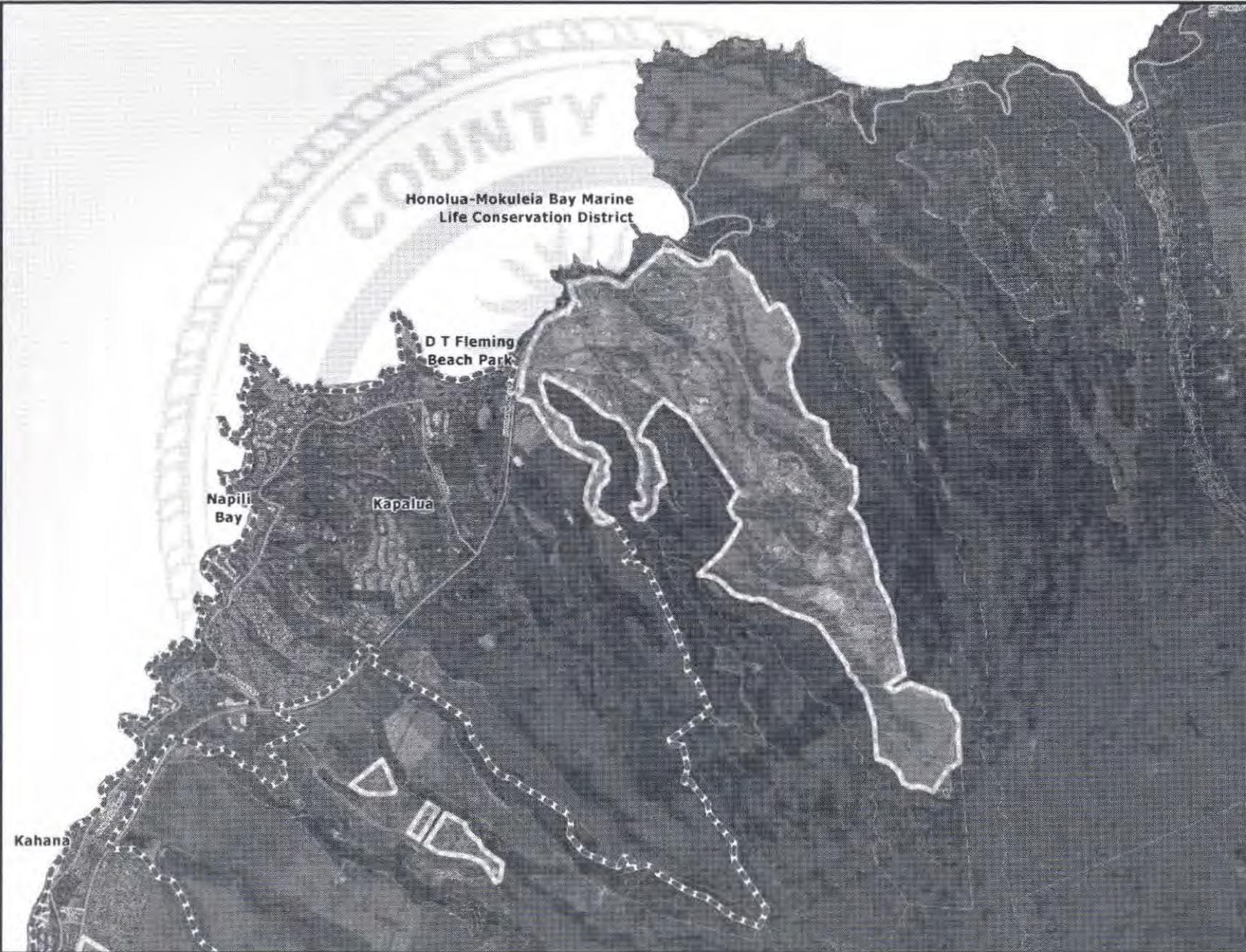
-  2011 Parcels
-  Primary Roads




 Datum Code: NAD83, 2011, EPSG:3100
 Viewport: 10/20/2012
 Background Image: Worldview 2 - 2010
 This is not a zoning map. Please contact the Planning Department for Zoning confirmation.

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 Department of Planning
 County of Maui
 250 South High Street
 Wailuku, Hawaii 96793





**Maui Island
Plan
Directed
Growth
Map
Kapalua
W1**

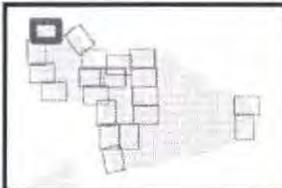
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Growth Boundaries

-  Urban
-  Small Town
-  Rural

Reference

-  2011 Parcels
-  Primary Roads



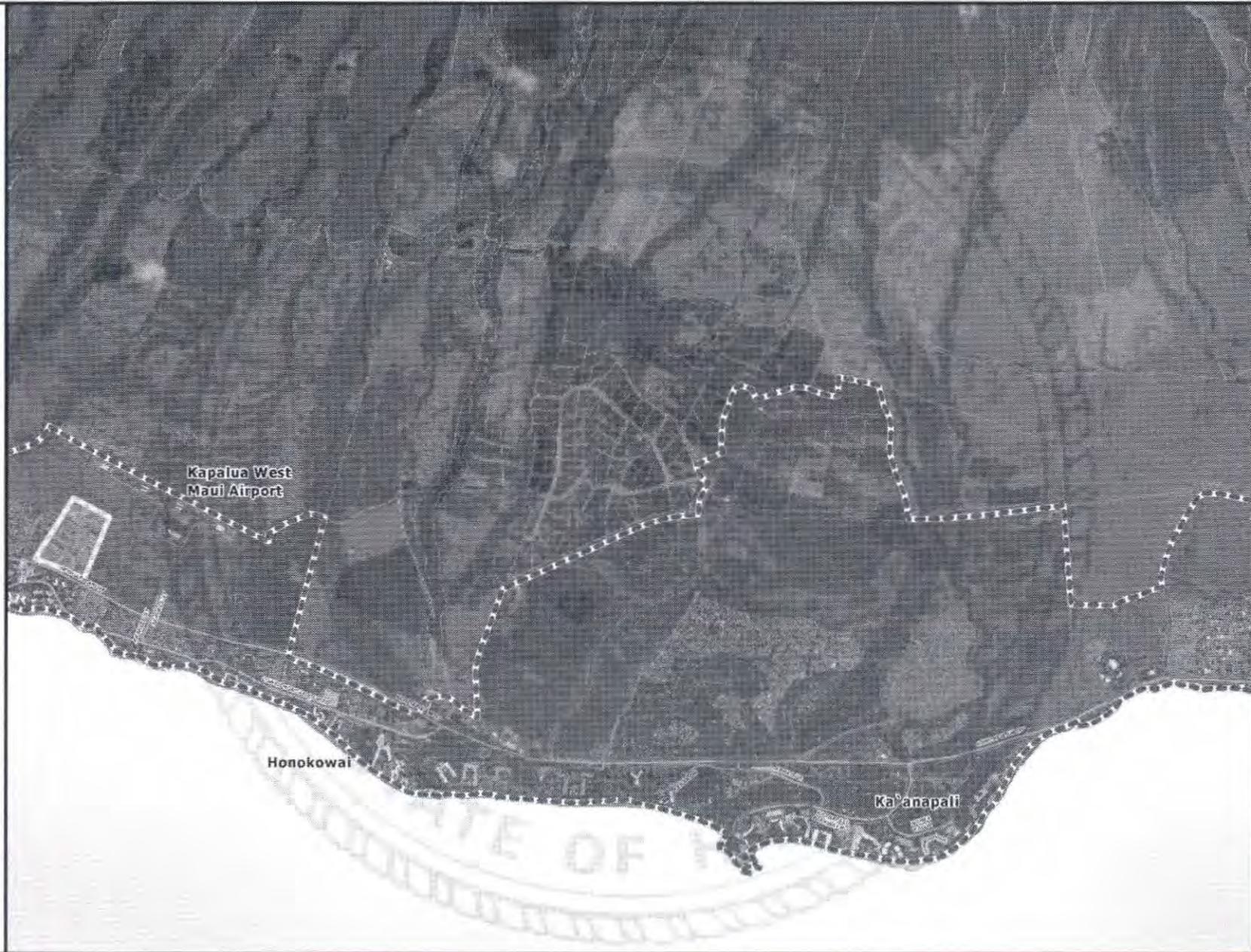
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**Maui Island
Plan
Directed
Growth
Map**
**Ka'anapali
W2**

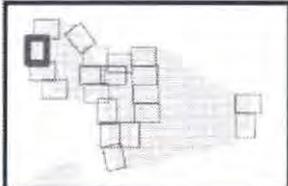
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Growth Boundaries

- Urban
- Small Town
- Rural

Reference

- 2011 Parcels
- Primary Roads

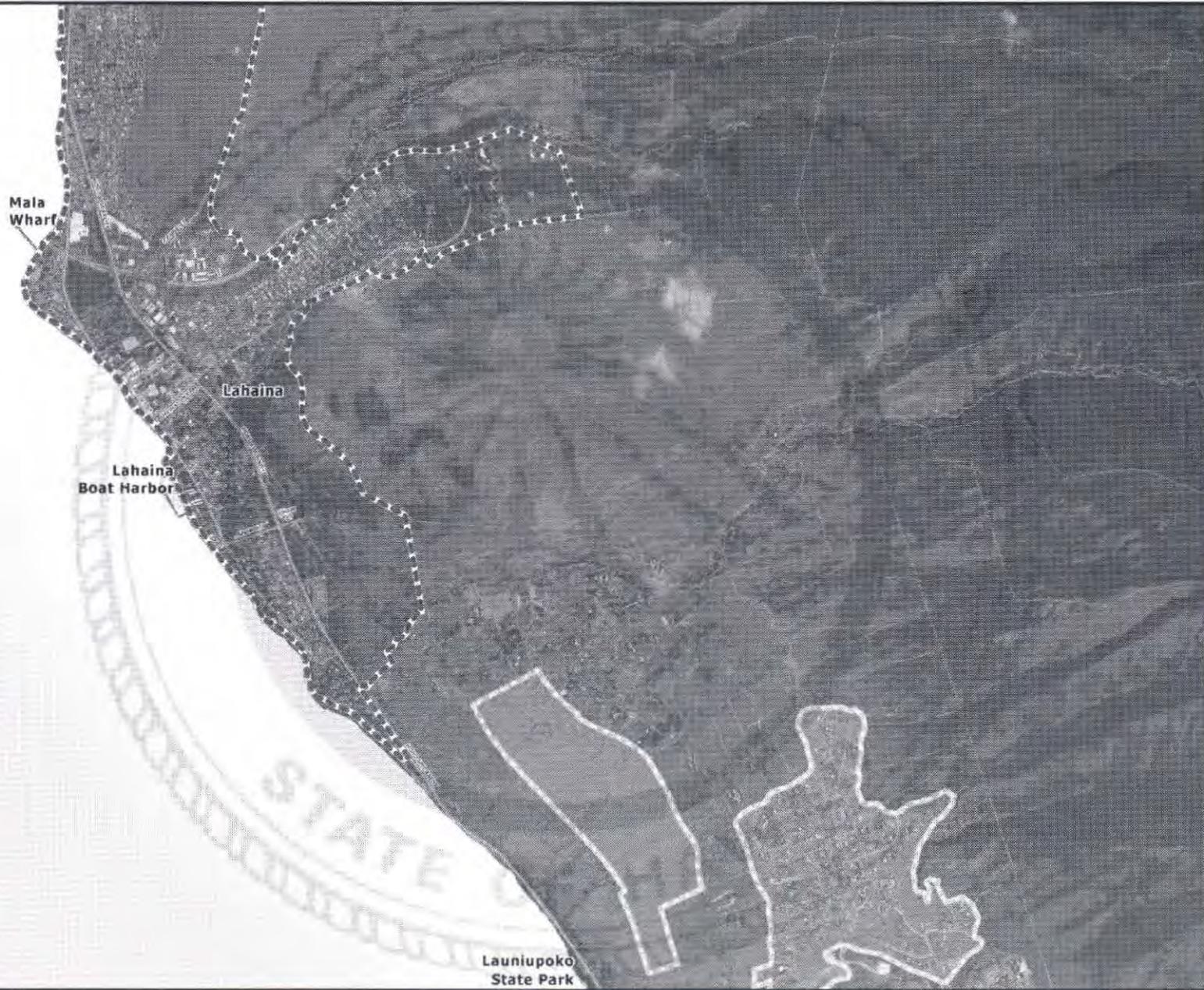


Scale: 0 1000 2000 Feet

Product Code: M CET 2011 0255-02
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Background Image: Worldview 2 - 2010
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County of Maui
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Wailuku, Hawaii 96793



**MauI Island
Plan
Directed
Growth
Map**
**Lahaina Town
W3**

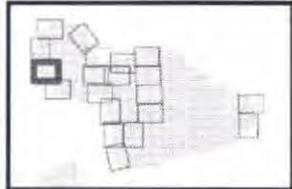
Legend

Growth Boundaries

- Urban
- Small Town
- Rural

Reference

- 2011 Parcels
- Primary Roads



Product Code: MCEI_2012050-02
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Launiupoko State Park

Olowalu
Olowalu Wharf

Ukumehame

STATE OF HAWAII

Maui Island Plan Directed Growth Map Olowalu W4

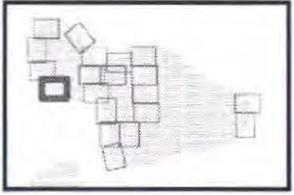
Legend

Growth Boundaries

-  Urban
-  Small Town
-  Rural

Reference

-  2011 Parcels
-  Primary Roads



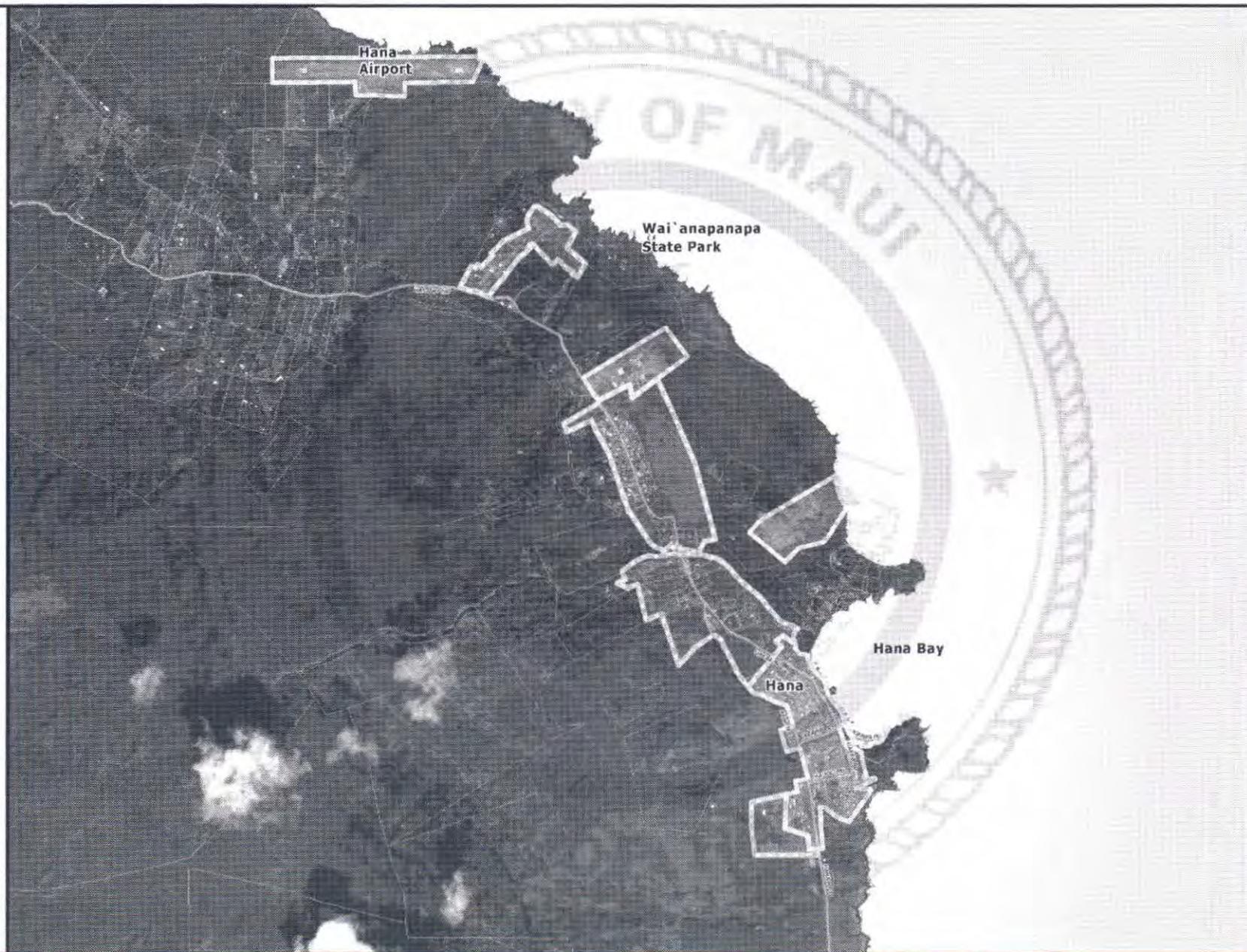
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County of Maui
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Wailuku, Hawaii 96793





**Maui Island Plan
Directed Growth Map
Hana
E1**

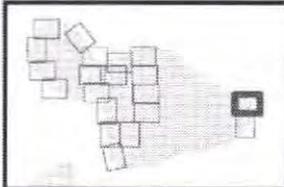
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Growth Boundaries

- Urban
- Small Town
- Rural

Reference

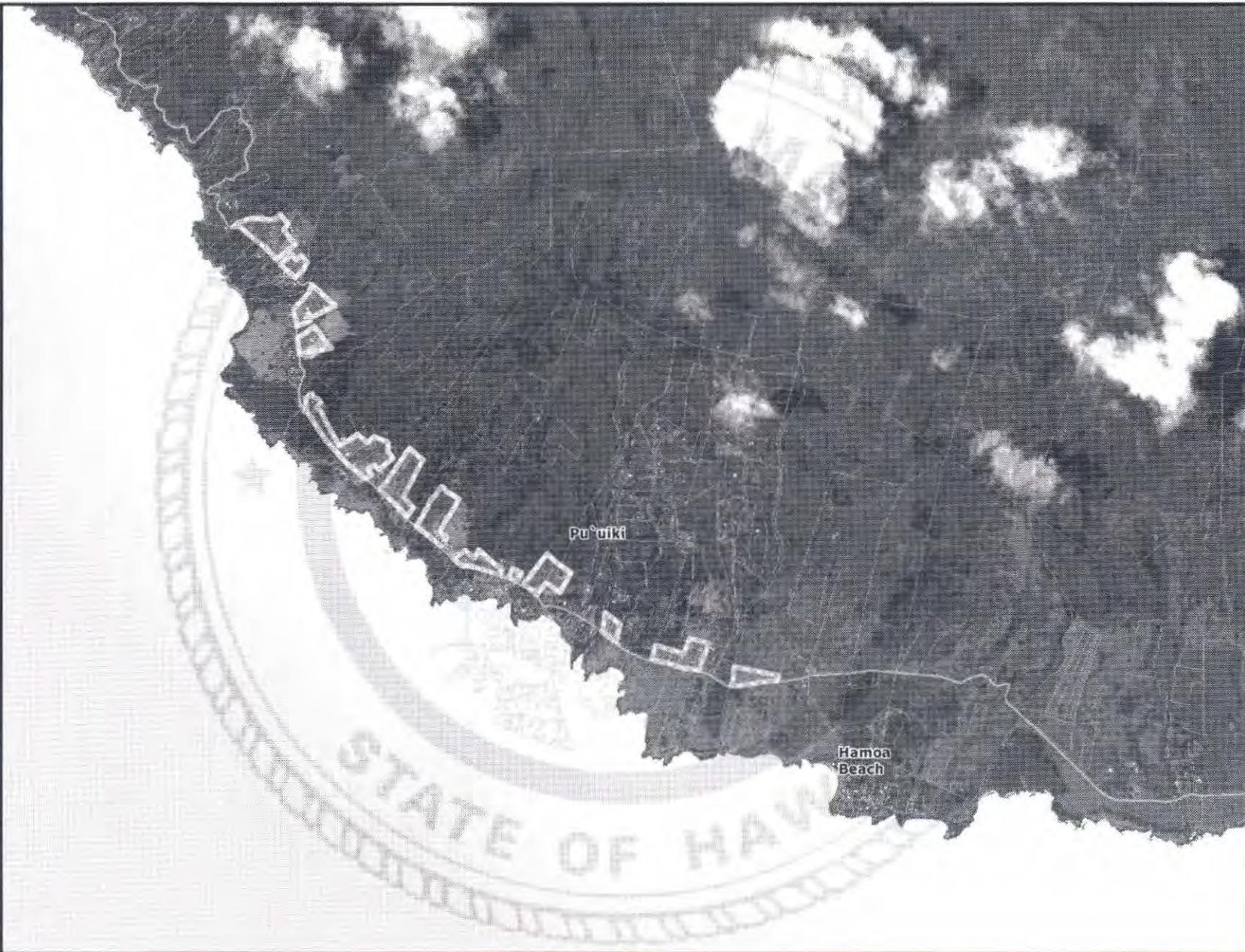
- 2011 Parcels
- Primary Roads



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**Maui Island
Plan
Directed
Growth
Map**
Pu'uiki
E2

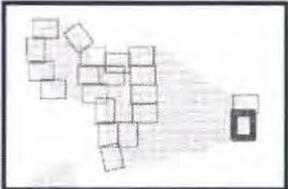
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Growth Boundaries

-  Urban
-  Small Town
-  Rural

Reference

-  2011 Parcels
-  Primary Roads



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**Maui Island Plan
Protected Areas
Diagram
Lahaina-Waihee
NW-1**

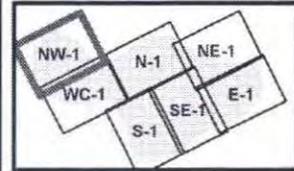
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Protected Areas

- Greenbelt
- Greenway
- Park
- Preservation
- Sensitive Lands

Reference

- Primary Roads
- 2011 Parcels
- State Land Use Conservation
- Urban Growth Boundary
- Small Town Growth Boundary
- Rural Growth Boundary



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**MauI Island Plan
Protected Areas
Diagram
Lahaina-Central
WC-1**

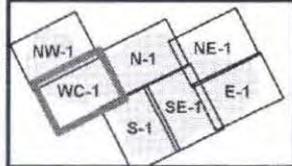
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Protected Areas

- Greenbelt
- Greenway
- Park
- Preservation
- Sensitive Lands

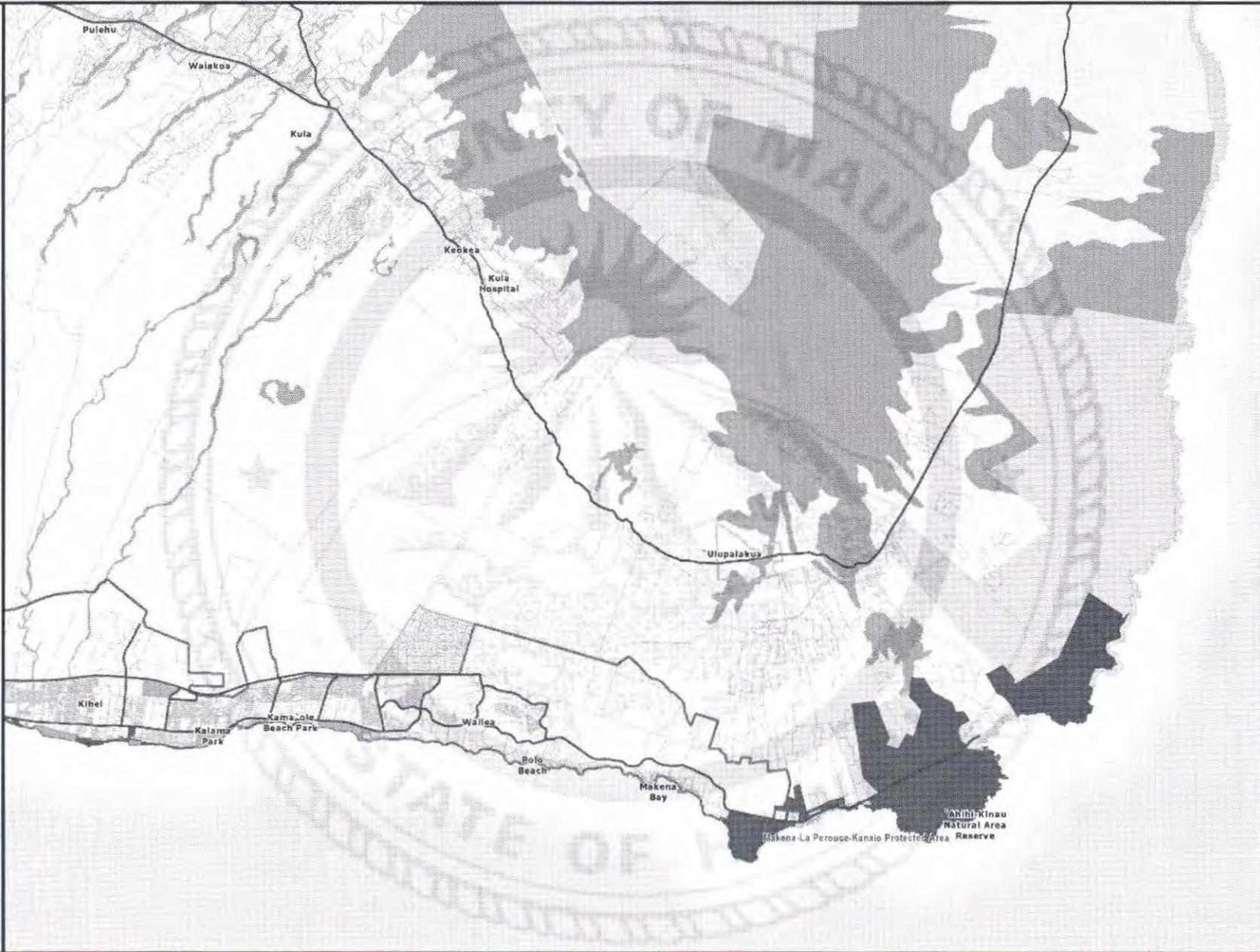
Reference

- Primary Roads
- 2011 Parcels
- State Land Use Conservation
- Urban Growth Boundary
- Small Town Growth Boundary
- Rural Growth Boundary



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**Maui Island Plan
Protected Areas
Diagram
Kihei-Makena
S-1**

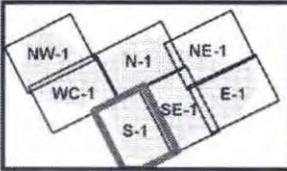
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Protected Areas

- Greenbelt
- Greenway
- Park
- Preservation
- Sensitive Lands

Reference

- Primary Roads
- 2011 Parcels
- State Land Use Conservation
- Urban Growth Boundary
- Small Town Growth Boundary
- Rural Growth Boundary



Miles
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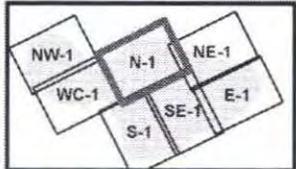
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**Maui Island Plan
Protected Areas
Diagram
Kahului-Huelo
N-1**

Legend

- Protected Areas**
- Greenbelt
 - Greenway
 - Park
 - Preservation
 - Sensitive Lands
- Reference**
- Primary Roads
 - 2011 Parcels
 - State Land Use Conservation
 - Urban Growth Boundary
 - Small Town Growth Boundary
 - Rural Growth Boundary

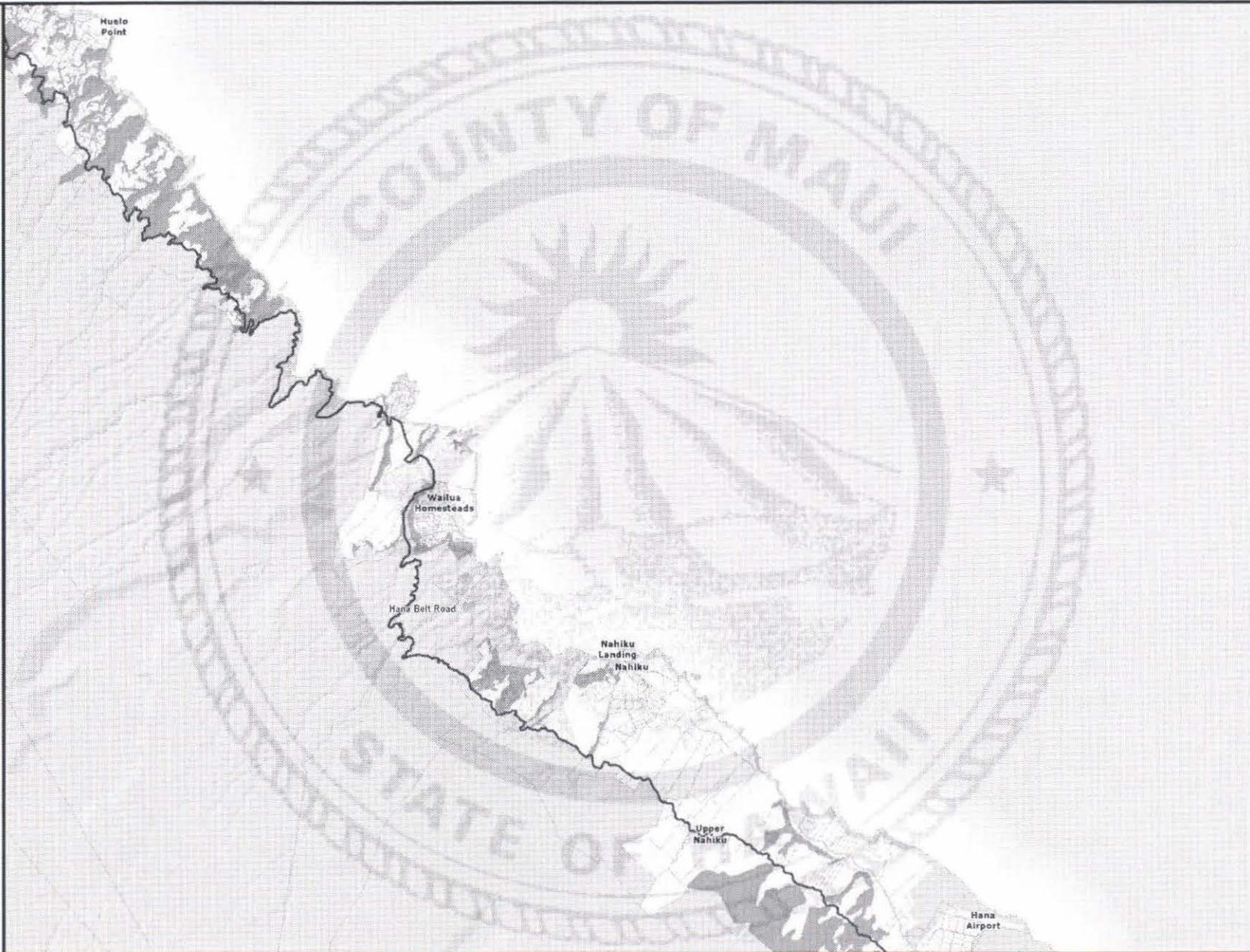


Miles
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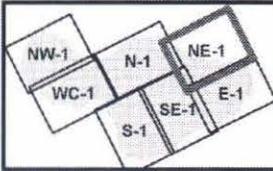
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**Maui Island
Plan
Protected Areas
Diagram
Huelo-Hana
NE-1**

Legend

- Protected Areas**
- Greenbelt
 - Greenway
 - Park
 - Preservation
 - Sensitive Lands
- Reference**
- Primary Roads
 - 2011 Parcels
 - State Land Use Conservation
 - Urban Growth Boundary
 - Small Town Growth Boundary
 - Rural Growth Boundary

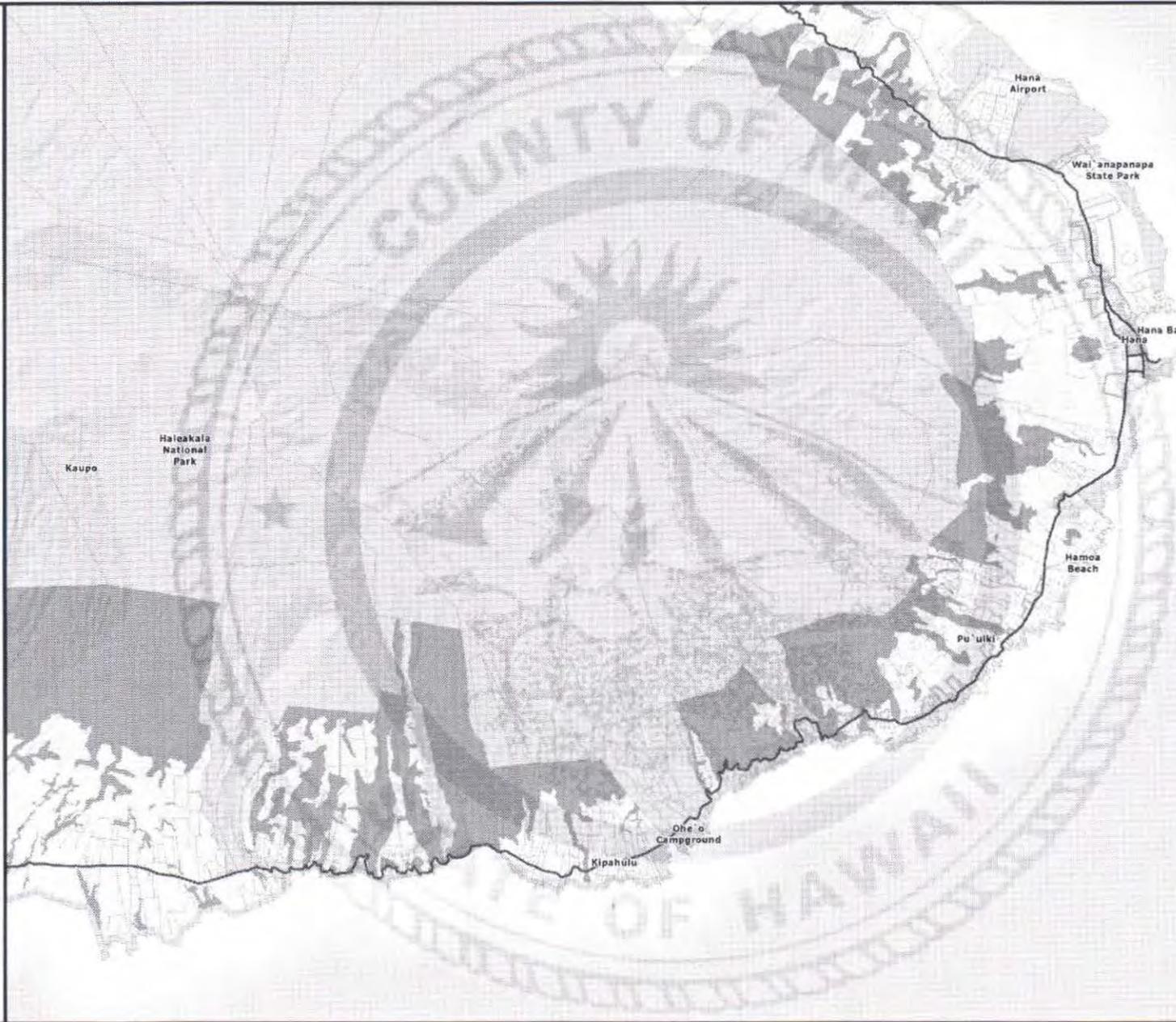


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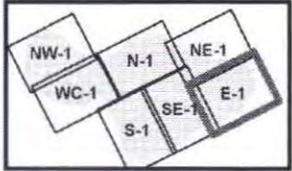




**Maui Island
Plan
Protected Areas
Diagram
Kaupo-Hana
E-1**

Legend

- Protected Areas**
- Greenbelt
 - Greenway
 - Park
 - Preservation
 - Sensitive Lands
- Reference**
- Primary Roads
 - 2011 Parcels
 - State Land Use Conservation
 - Urban Growth Boundary
 - Small Town Growth Boundary
 - Rural Growth Boundary



Miles
0 0.25 0.5 1 1.5 2

Project Date: M-CEP_2012030-E2
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**Maui Island
Plan
Protected Areas
Diagram
Kula-Kaupo
SE-1**

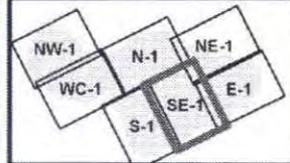
Legend

Protected Areas

- Greenbelt
- Greenway
- Park
- Preservation
- Sensitive Lands

Reference

- Primary Roads
- 2011 Parcels
- State Land Use Conservation
- Urban Growth Boundary
- Small Town Growth Boundary
- Rural Growth Boundary



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Directed Growth Plan

Wailuku are characterized by a rich mix of housing types, older homes, and a variety of lot sizes, generally laid out in a traditional street-pattern grid. Commercial areas are composed of smaller, older buildings primarily near the Main and Market Street intersection with some businesses intermixed with residential neighborhoods.

Beginning in the 1950s, Wailuku experienced a period of transition and decline as the resident population became more dispersed throughout the region, and Kahului grew into the commercial center of the island. As residents and businesses left Wailuku, the area began to deteriorate and blight conditions persisted. In the last decade, Wailuku has been undergoing revitalization initiated by community groups, the County, and local businesses.

Kahului. Kahului is the island's major commercial and industrial center. Shopping and community facilities, such as Queen Ka'ahumanu Shopping Center, Maui Arts and Cultural Center, and the University of Hawai'i Maui College, draw residents from all regions of the island. Kahului is also Maui's only shipping center with the island's major seaport and airport. Kahului first came to life in the modern era after World War II as Maui's population became decentralized and major projects such as "Dream City" and the Kahului Shopping Center were completed. Kahului's residential neighborhoods are separated from commercial uses and composed of larger suburban lots and wide curvilinear streets.

Waikapū. Waikapū is a small rural town between Wailuku and Mā'alaea on Honoapi'ilani Highway. The town is primarily residential with a small commercial component. Historically, Waikapū has been surrounded by sugarcane fields, providing a clear distinction between the town and other nearby communities. As Wailuku and Kahului grow southward, the separation between these sub-regions and Waikapū is being diminished.

Waihe'e. Waihe'e is another small rural town in the Wailuku-Kahului Community Plan region. It is the last town in the region along Kahekili Highway and serves as the eastern gateway to Northwest Maui. The sub-region is primarily residential with small-scale agriculture and family cultivated taro patches in the vicinity of Waihe'e Stream. Managing urbanization on the fallow agricultural lands south of the town will be important for maintaining the rural identity of the town.

CHALLENGES AND OPPORTUNITIES

The Wailuku-Kahului community plan region has several key land use issues which must be considered when planning future development in the region. Some issues apply to the region as a whole while others are specific to a sub-region. Major land use threats and opportunities include:

***Loss of
Community
Identity and
Boundaries***

The Wailuku-Kahului community plan region is one of the fastest growing regions on Maui. The majority of the region's growth is occurring on vacant agricultural land at the edges of the sub-regions, particularly south of Wailuku and Kahului, with isolated areas of redevelopment opportunities. As these lands become urbanized, the region's individual towns begin to blend together and lose their unique identities. To prevent the creation of one large, sprawling urban mass, clear separation must be maintained between the area's four sub-regions through the use of regional parks, greenways and protected areas.

***Auto-
Dependency
and Traffic
Congestion***

The region's land use pattern and street layout, particularly in Kahului, has led to strong auto-dependency and traffic congestion. While a public bus system services the region, it is relatively new and is making steady progress in becoming a part of everyday life for residents. Adequate bike and pedestrian infrastructure are also lacking within the region, limiting the opportunity for multimodal transportation. Clear and distinct separation of

Directed Growth Plan

land uses also significantly contributes to poor mobility and the need for a high number of private automobile trips.

Lack of Housing Choices

While the Wailuku-Kahului community plan region has the largest supply of residential units on Maui, only about 12 percent of the units are multifamily. This marked disparity between single-family and multifamily residential units provides residents with limited housing options in the Central Maui region. More multifamily units for purchase and rental are needed in the region to provide for a mix of housing prices and types.

Lack of Kahului Downtown Core

A major land use issue in the region is the lack of a downtown core in Kahului; the sub-region does not have an identifiable center or core with a pedestrian-friendly mix of land uses where people can gather and interact. A downtown core in Kahului will strengthen the sub-region and provide it with a unique identity. Infill and redevelopment projects, such as the Kahului Town Center Redevelopment and harbor revitalization efforts provide a unique opportunity to revitalize the area.

Revitalization of Wailuku Civic Center District

A key land use opportunity in the region is the revitalization of the Wailuku downtown and Civic Center District. Maintaining the identity of Wailuku as the County's Civic Center is an important land use goal. The *Wailuku Redevelopment Plan* (December 2000), prepared by the Maui County Department of Planning, offers key strategies for revitalizing the area. As part of the revitalization, increased mixed-use development, activity generators, streetscape beautification, additional public parking, and build out of the abutting Civic Center District with additional government office space is necessary.

Wailuku – Kahului – Planned Growth Areas

Urban infill will be a major source of additional housing units in the Wailuku-Kahului community plan region. In addition, four new planned growth areas have been identified: Wai`ale, Pu`unani, Kāhili Rural Residential, and Waikapū Tropical Plantation Town. Planned growth areas are depicted in Figure 8-1 and on Directed Growth Map #C3 and #C4.

New Regional Facilities Recommended – Wailuku-Kahului

- Maui Lani Parkway extension
- Regional Park
- Central Fire Training Facility
- Dedicated County Fairgrounds
- Water Treatment Facilities
- Intermediate School
- Elementary School
- Relocation of the County Jail from Wailuku to an appropriate location in Pulehunui (Pu`unēnē).

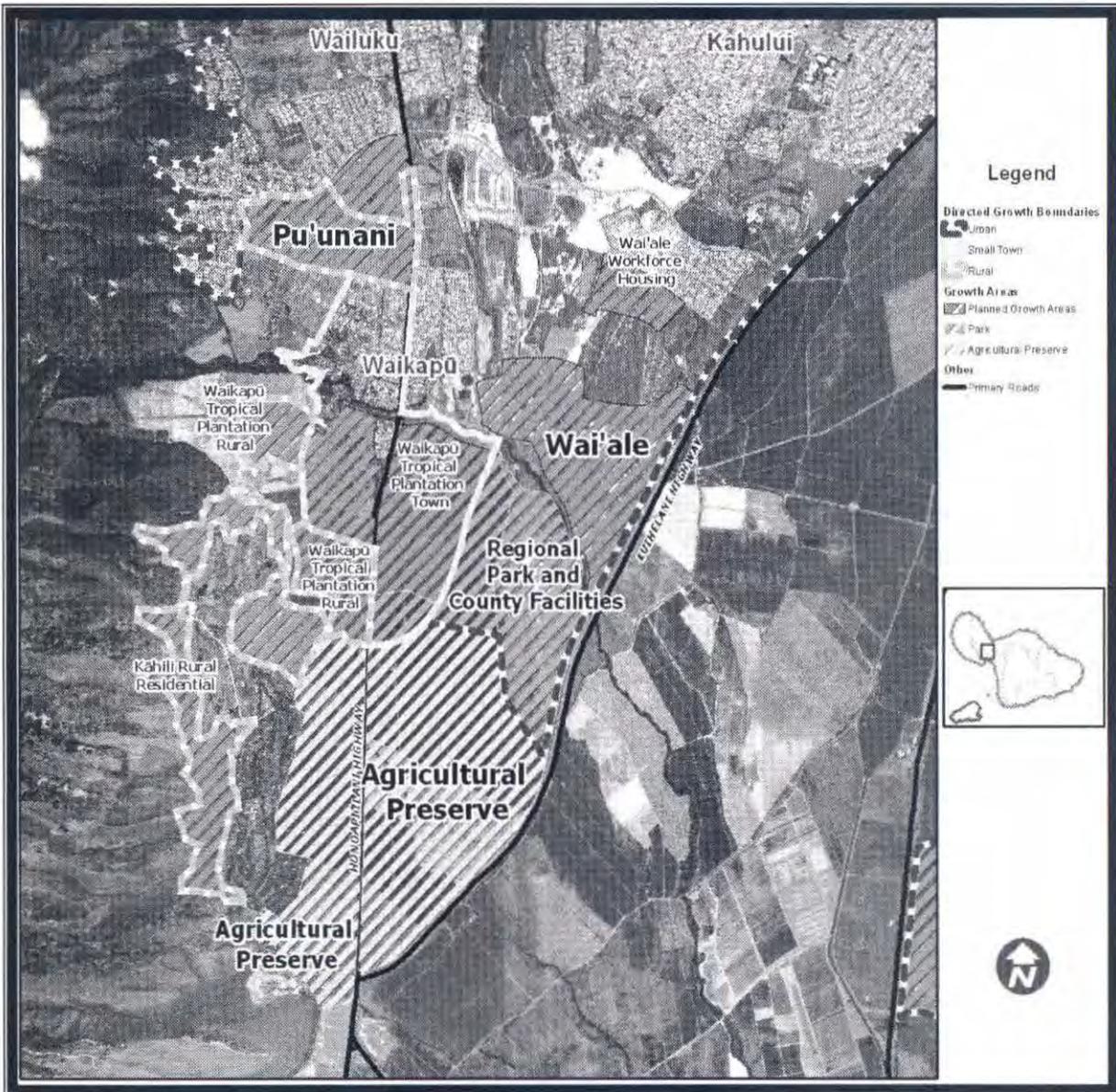


Figure 8-1: Wailuku-Kahului Planned Growth Areas.

Kahului Infill and Redevelopment and Revitalization of Wailuku Town

The plan proposes infill and redevelopment within Kahului. Much of Kahului is significantly underutilized and redevelopment will strengthen the economy, provide diverse housing opportunities within close proximity to jobs and services, and protect agricultural lands and the character of Maui’s rural communities by making higher and better use of our existing urban areas. Redevelopment will also strengthen Kahului’s identity, promote urban beautification and livability, and breathe vitality and life into the area.

The County should work with area landowners and the community to prepare the following studies: 1) Risk and Vulnerability Assessments (RVA); 2) specific area plans; and 3) supporting model development

Directed Growth Plan

ordinances. The RVA is necessary prior to redevelopment because much of urban Kahului is within the tsunami inundation area. This study will further define the areas and magnitude of potential flooding and necessary mitigation measures to protect life and property. The specific area plans and model development ordinances will further define the character of redevelopment and geographic boundaries where infill and redevelopment is feasible. The specific area plans should emphasize the opportunity for higher-density mixed-use development, pedestrian and vehicular circulation patterns, and urban beautification. A system of sidewalks, greenways, and bike lanes should be developed to reduce community reliance on the automobile.

Infill and redevelopment within Kahului on entitled urban lands could produce hundreds of new residential units. An example of this is the closed pineapple cannery behind the Queen Ka'ahumanu Shopping Center. New multifamily units at this location could be built at an urban density of at least 18 to 25 units per acre in a mixed-use design such as that of the Kahului Town Center project.

The continued revitalization of the Wailuku Redevelopment Area and the Wailuku Civic Center District also provides the opportunity to provide infill housing close to jobs and services in a manner that will strengthen the economic vitality of Wailuku Town, provide diverse housing options and shorter commuting times, and maintain Wailuku Town as the County seat of government and Civic Center.

An analysis of infill opportunities in Wailuku Town indicates significant opportunities to develop housing on vacant or underutilized lands currently entitled for development. These units would be in areas of higher density such as Lower Main Street and Happy Valley, as well as new units in Piihāna and Waiehu along Kahekili Highway. The net densities of multifamily housing should be at least 15 to 25 units per acre which is compatible with existing densities of complexes such as 'Īao Parkside and Parkview Square in Wailuku.

Wai`ale

The Wai`ale planned growth area is recommended to be a compact, mixed-use town with park land, open space, a county fair grounds, an elementary or intermediate school developed in coordination with the Waikapū Tropical Plantation Project, and commercial uses. Wai`ale will be located south of Maui Lani, and it is bounded to the west by Honoapi`ilani Highway and to the east by Kūihelani Highway. While proximate to Kahului, Wailuku, and Waikapū, the Wai`ale town should be a distinct community, clearly separate from existing towns. Wai`ale is the largest proposed town on the island, and the largest planned growth area proposed for the Wailuku-Kahului community plan region.

Planned Growth Area Rationale

At build-out, the Wai`ale planned growth area is intended to provide roughly 50 percent of the additional residential units needed in the Central Maui region and address the housing needs of Maui residents. With a balance of single-family and multifamily housing units, low to moderate average lot size, and strong capacity to provide affordable housing, Wai`ale will provide housing options to address resident housing demand. The Wai`ale planned growth area is proximate to Wailuku employment opportunities and infrastructure, has adequate highway access and transit connectivity, and has favorable topography.

To prevent sprawl and further urbanization of prime agricultural resource land, a hard edge must be maintained around Wai`ale Town. A network of greenbelts, open space, and parks will be utilized to contain urban development, maintain a clear distinction between existing communities and the new town, and to prevent urbanization of agricultural lands south of the site. The planned growth area is currently bounded on at least two sides by roads which will help to contain the new community. The north portion

Directed Growth Plan

of the Wai`ale area is identified as Wai`ale Workforce Housing on Figure 8.1, and is intended to be an affordable housing complex of roughly 300 multifamily units on 50 acres.

It is intended that Wai`ale's infrastructure development be coordinated with neighboring developments including Maui Lani, Kehalani, Pu`unani, and Waikapū Tropical Plantation Town. A community park is also planned for the Wai`ale area to provide a clear separation between the new community and Maui Lani. A regional park will be provided to the South of Wai`ale to provide a clear separation between the new community and Ma`alaea, and to allow for the placement of active and passive recreational opportunities, County baseyards and like County facilities. Preservation areas will be established to protect Hawaiian Burials and intact sand dunes. The Wai`ale project can also include lands to house the offices of the County Department of Parks and Recreation, a community center, and a County fair grounds. (Please see Figure 8-2, Central Maui Regional Park, Community Park, Preservation, and County Facility Area.) The Wai`ale growth boundaries are located on Directed Growth Map #C3. Tables 8-5 and 8-6 provide planning guidelines for this planned growth area:

Table 8 - 5: Wai`ale Workforce Housing Planned Growth Area

Background Information:			
Project Name:	Wai`ale Workforce Housing	Directed Growth Map #:	C3
Type of Growth:	Urban Expansion	Gross Site Acreage:	50 Acres
Planning Guidelines			
Dwelling Unit Count:	Approximately 300 Units ⁴	Residential Product Mix:	100% MF
Net Residential Density:	At least 10 du/acre	Parks and Open Space% ⁵ :	≥ 20%
		Commercial:	Neighborhood serving

Table 8 - 6: Wai`ale Planned Growth Area

Background Information:			
Project Name:	Wai`ale	Directed Growth Map #:	C3
Type of Growth:	Urban Expansion	Gross Site Acreage:	495 Acres (includes the Central Maui Community Park)
Planning Guidelines			
Dwelling Unit Count:	Approximately 2,254 Units ⁶	Residential Product Mix:	Balance of SF and MF
Net Residential Density:	10 – 20 du/acre	Parks and Open Space% ⁷ :	≥ 30%
		Commercial:	Convenience Shopping Region Serving

⁴ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

⁵ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Wailuku – Kahului Community Plan update and the project review and approval process.

⁶ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

⁷ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Wailuku – Kahului Community Plan Update and the project review and approval process.

Directed Growth Plan

Pu`unani

The Pu`unani planned growth area is intended to be a mixed-use project located at the southwest edge of Wailuku. This urban and rural expansion is located south of Kehalani below Wailuku Heights and is bounded to the east by Honoapi`ilani Highway. The growth area will be buffered by a 200-foot greenbelt along its eastern edge and adjacent to Honoapi`ilani Highway. Additionally, a 500-foot greenbelt along the area's southern extent shall provide a separation between the Waiolani community and Wailuku. The greenbelt, greenway, and rural lands are intended to provide separation between Wailuku and Waikapu, and to provide a visual relief by creating a lower-density residential pattern than surrounding communities. This planned growth area will mark the southern boundary of Wailuku.

Planned Growth Area Rationale

Pu`unani is a residential expansion of the existing southern boundary of Wailuku Town. It is intended that infrastructure development be coordinated with neighboring developments including Kehalani, Wai`ale and Waikapū Tropical Plantation Town. The urban portion of the growth area will be comprised primarily of approximately 450 multifamily units and commercial and public/quasi-public uses. The rural component will be comprised of low-density residential lots that will provide for a transitional zone from the high-density, multifamily component of the growth area as well as Wailuku to the north. The precise rural residential densities and unit count for the rural component of the project will be determined at the time of zoning.

The area is currently zoned for agricultural use, and water and wastewater infrastructure, as well as transit access are in place. The Pu`unani planned growth area is depicted on Figure 8-1. Table 8-7 provides planning guidelines for this planned growth area:

Table 8 - 7: Pu`unani Planned Growth Area

Background Information:			
Project Name:	Pu`unani	Directed Growth Map #:	C3
Type of Growth:	Urban & Rural Expansion	Gross Site Acreage:	209 Acres
Planning Guidelines			
Dwelling Unit Count:	Approximately Urban - 450 Units Rural - To be determined ⁸	Residential Product Mix:	MF/VMX - 64 Acres Rural - 143 Acres
Net Residential Density:	Urban - 9-12 du/acre Rural - To be determined	Parks and Open Space ⁹ :	≥ 36%
		Commercial:	Neighborhood Serving

⁸ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

⁹ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Wailuku - Kahului Community Plan Update and the project review and approval process.

Directed Growth Plan

Kāhili Rural Residential

The Kāhili Rural Residential planned growth area is approximately 218 acres and located mauka of the Kāhili Golf course at Waikapū in the foothills of the West Maui Mountains. Access will be provided by a connecting roadway from the Honoapiʻilani Highway. The area is bounded by Rural and Park (Golf Course) Community plan designations. The goal of the Kāhili Rural Residential planned growth area is to provide low-density rural residential lots with a minimum lot size of 2 acres.

Planned Growth Area Rationale

It is intended that the area will be sensitively developed to address stormwater runoff and drainage, and to restrict development on slopes. The Kāhili Rural Residential planned growth area is located on Directed Growth Map #C3 and #C4. Table 8-8 provides planning guidelines for this planned growth area:

Table 8 - 8: Kāhili Rural Residential Planned Growth Area

Background Information:			
Project Name:	Kāhili Rural Residential	Directed Growth Map #:	C3/C4
Type of Growth:	Rural Expansion	Gross Site Acreage:	218 Acres
Planning Guidelines			
Dwelling Unit Count:	Approximately Rural – To be determined ¹⁰	Residential Product Mix:	Rural - Residential
Net Residential Density:	Rural – 2-acre min. lot size	Parks & Open Space%:	N/A
		Commercial:	N/A

Waikapū Tropical Plantation Town

The Waikapū Tropical Plantation Town planned growth area is situated in the vicinity of the Maui Tropical Plantation, and includes lands on both the mauka and makai sides of Honoapiʻilani Highway. Providing the urban character of a traditional small town, this area will have a mix of single-family and multifamily rural residences, park land, open space, commercial uses, and an elementary or intermediate school developed in coordination with the Waiʻale project. The area is located south of Waikapū along Honoapiʻilani Highway, and it will incorporate the integrated agricultural and commercial uses of the existing tropical plantation complex. This area is proximate to the Waiʻale planned growth area, providing additional housing in central Maui within the Wailuku-Kahului Community plan region. As part of this project, parcels to the south of the project (identified as Agricultural Preserve on Figure 8-1) shall be protected in perpetuity for agricultural use through a conservation easement. A portion of this area may be dedicated to the County as an agricultural park administered pursuant to County regulations. Alternatively, this area can be developed as a private agricultural park available to Maui farmers, and executed through a unilateral agreement between the landowner and Maui County. The rural lots mauka of Honoapiʻilani Highway are intended to be developed using a Conservation Subdivision Design (CSD) plan. The CSD plan shall provide access to uninterrupted walking and bicycling trails and will preserve mauka and makai views while protecting environmentally sensitive lands both along Waikapū Stream and mauka of the subdivision.

¹⁰ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

Planned Growth Area Rationale

Keeping the Waikapū Tropical Plantation as its town core, this area will become a self-sufficient small town with a mix of single-family and multifamily housing units in a walkable community that includes affordable housing in close proximity to Wailuku’s employment centers. Schools, parks, police and fire facilities, transit infrastructure, wastewater, water supply resources, and other infrastructure should be developed efficiently, in coordination with neighboring developments including Maui Lani, Kehalani, Pu’unani and Wai’ale. The Waikapū Tropical Plantation Town planned growth area is located on Directed Growth Map #C3. Table 8-9 provides planning guidelines for this planned growth area:

Table 8 - 9: Tropical Plantation Town Planned Growth Area

Background Information:			
Project Name:	Tropical Plantation Town	Directed Growth Map #:	C3
Type of Growth:	Small Town/Rural Expansion	Gross Site Acreage:	Small Town - 360 Acres Rural - 142 Acres
Planning Guidelines			
Dwelling Unit Count:	Approximately 1,433 Units (Up to 80 of these units can be rural residences. Ohana units do not count towards the total units. ¹¹)	Residential Product Mix:	Balance of SF and MF units The rural residential units are on the mauka side of the project. Small Town – 360 Acres Rural – 142 Acres
Net Residential Density:	9 – 12 du/acre	Parks and Open Space% ¹² :	≥ 30%
		Commercial:	Convenience Shopping

¹¹ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

¹² The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Wailuku – Kahului Community Plan Update and the project review and approval process.

Wailuku – Kahului – Planned Protected Areas

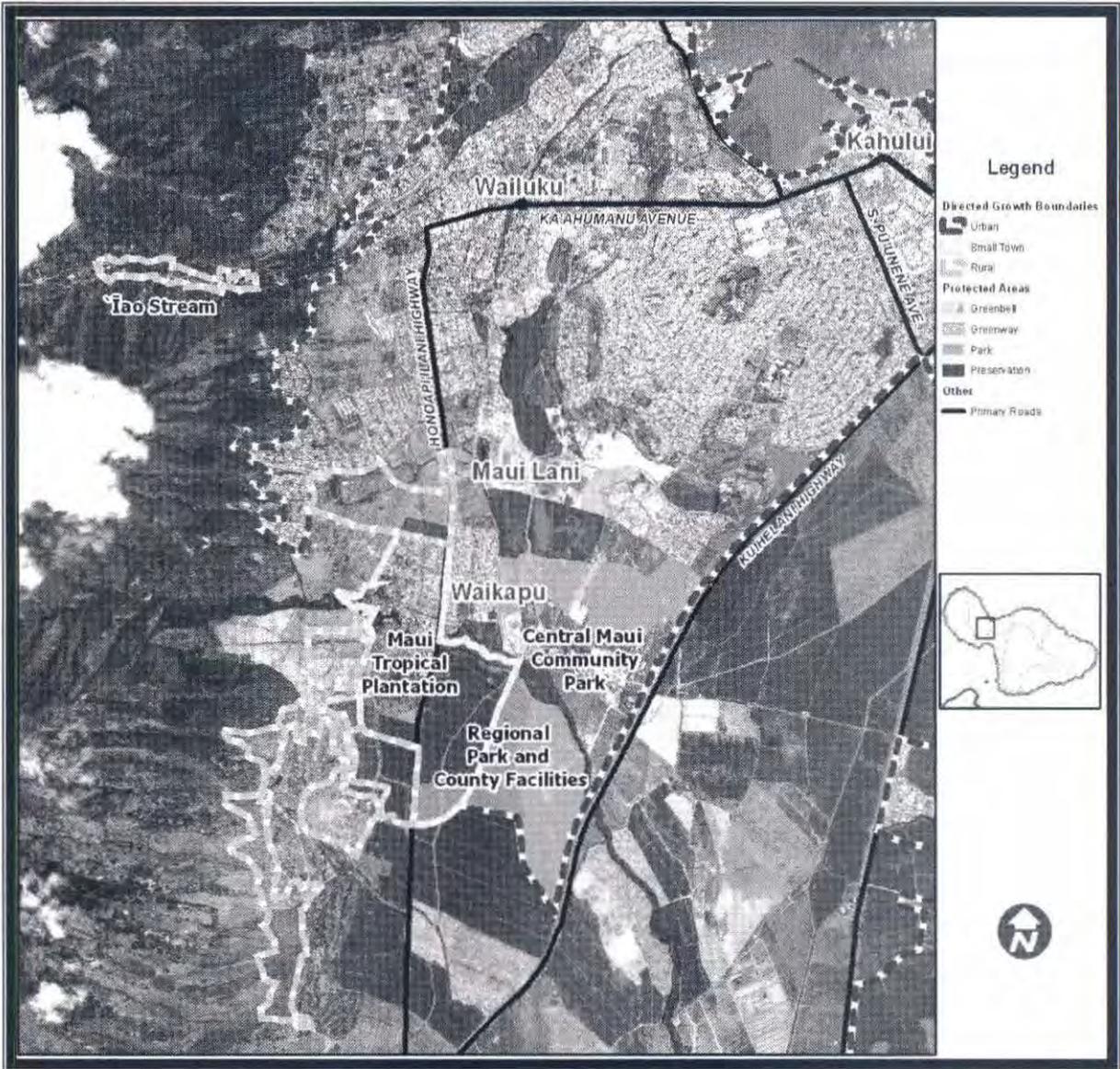


Figure 8-2: Central Maui Regional Park, Community Park, Preservation, and County Facility Area

Central Maui Regional Park, Community Park, Preservation, and County Facility Area

The Wailuku-Kahului community plan region includes two planned protected areas. The region contains the largest resident population of all community plan regions, has dramatic views of the West Maui Mountains, and includes rural towns and rich cultural resources. Creating opportunities for recreational amenities will continue to be a priority as the area grows. Both planned protected areas are described, in brief, below.

The Central Maui Regional Park, Community Park, Preservation, and County Facility Area is bordered by Kūihelani Highway, Wai`ale, and Waikapū Stream.

Directed Growth Plan

The Central Maui Regional Park, Community Park, Preservation, and County Facility Area is a planned open-space area within and adjacent to the Wai`ale mixed-use new town (see Figure 8-2). It is envisioned that the parks and preservation areas will be comprised of both passive and active park uses, including a network of pedestrian and bicycle pathways. The parks are intended to maintain a significant amount of open space and provide a distinct separation between the communities of Waikapū and Mā`alaea, Kahului, and Waikapū. The regional park's design should allow for the placement of sports fields with suitable topography for sports usage and may include an agricultural park and community gardens. The Protected Area will also include a preserve that will protect rich historical and cultural resources which are spread throughout the Central Maui Sand Dune system. The Central Maui community park will be established north of the Wai`ale planned growth area, proximate to a high concentration of existing and proposed residential and industrial uses, Pomaika`i Elementary School, and the primary employment center on the island. The Central Maui Regional Park may provide an area for the offices of the County Department of Parks and Recreation, a community center, County baseyards and like County facilities, and a location for the annual County Fair. The distinct boundaries of the park, specific location of the recreational uses, and the precise amenities will be further defined during the Wailuku – Kahului Community Plan update and the Wai`ale project review and approval process.

ʻĪao Stream Cultural Corridor Park



Figure 8 - 3: ʻĪao Cultural Corridor Park Protected Area.

The ʻĪao Stream Cultural Corridor Park is a linear open-space corridor intended to protect the remains of the Pihana Kalani heiau and other important cultural resources. The park extends from the makai portions of ʻĪao Stream and runs approximately 3/4 miles upstream from Waiehu Beach Road, flanking ʻĪao Stream (see Figure 8-3).

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The planned protected area is adjacent to Wailuku's residential and industrial areas. It is envisioned that the protected area will incorporate trail systems, restroom facilities and pedestrian linkages to provide lateral and mauka-makai access to surrounding neighborhoods and business districts.

Kīhei-Mākena

The Kīhei-Mākena Community plan region is characterized by a lineal urbanization pattern, primarily makai of Pi'ilani Highway. The region has the second highest resident population with over 27,000 people in 2010. The region currently has the third highest number of jobs on the island. The region has four distinct urban sub-regions: Mā'alaea, Kīhei, Wailea, and Mākena. A brief discussion of each sub-region is provided below.

Mā'alaea. Mā'alaea is located at the northernmost end of the Kīhei-Mākena community plan region. Primary land uses in the sub-region are multifamily residential, vacation rental, and commercial. Major resident and visitor attractions in the area include the Maui Ocean Center and Mā'alaea Harbor.

Kīhei. The Kīhei sub-region houses the largest resident population in the region. Kīhei is a linear community lying along Maui's south shore and can be further divided into North and South Kīhei. Land uses in the sub-region include residential, commercial, and visitor amenities. The visitor industry, along with the Maui Research and Technology Park (MRTP), are major job generators in the sub-region.

Wailea. Wailea is a master-planned resort area located in the southern portion of the Kīhei-Mākena community plan region. Primary land uses are resort and commercial with most employment in the area related to the visitor industry. The off-shore real estate market plays a dominant role in the Wailea housing market.

Mākena. Mākena is the southernmost sub-region in South Maui. The area is characterized by a rugged volcanic landscape and important Hawaiian cultural sites. Mākena is distant from commercial services and infrastructure systems within the region. Resort accommodations and luxury homes are dispersed along the shoreline.

CHALLENGES AND OPPORTUNITIES

Major land use challenges and opportunities in the Kīhei-Mākena Community plan region include:

**Job-rich
recreationally
diverse** The Kīhei-Mākena Community plan region continues to develop as a tourism-based coastal community that provides a high number of jobs within its primary visitor and related sub-industries. The region is well-known for its favorable climate and diverse recreational opportunities where newcomers are accepted readily into a wide spectrum of social and economic arrangements.

**Design
Matters** The region is a major contributor to the island's economy and has the potential to reshape itself into a more attractive, thriving, and progressive community. It is positioned to diversify its economy through high-technology and other knowledge-based sectors that can foster resiliency during economic downturns. One key challenge towards that end will be to integrate civic, commercial, residential, and recreational uses into vibrant, walkable, urban nodes. The incorporation of progressive urban design principles that link traditional neighborhoods will be instrumental in enhancing the region's built environment.

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Auto-Dependency and Traffic Congestion

The 1998 Kīhei-Mākena Community Plan identifies poor circulation and mobility as the most significant problem within the Community Plan area. Limited intra- and inter-regional mobility, separation of land uses, and traffic congestion have become major issues in the region due to the linear design of the community. Efficient land use patterns, bicycle and pedestrian pathways, additional public transportation options, and alternate travel routes are needed to address circulation and mobility challenges.

Lack of Mixed-Use Neighborhood Centers

Residential and commercial land uses are predominantly segregated within the Kīhei-Mākena Community plan region. Mixed-use neighborhood centers are needed to provide services and jobs within close proximity to where people live and provide a more efficient land use pattern. The region has numerous infill opportunities that should be utilized to create more self-sufficient and sustainable communities that can meet resident housing demand. These infill areas include, but are not limited to, the Azeka, Kalama, and Kama`ole areas.

Land-based Nonpoint Source Pollution

From Mā`alaea south to Mākena, the South Maui coastline has experienced unprecedented growth in both tourism and residential development activity. Similar to West Maui, the Kīhei shoreline offers a narrow strip of land available for construction. Much of the construction along the shoreline has been done in an environmentally-insensitive manner, allowing for NPS pollution to affect the marine environment.

NPSP has been killing reefs and increasing the incidence of algae blooms. Algae and sedimentation from runoff is slowly smothering the remaining healthy reef, and will eventually destroy the very habitat and fish stock that the tourism industry depends on. In addition to grading and increased impervious surfaces, South Maui relies on septic systems, cesspools, and injection wells for wastewater treatment. Wastewater seepage, combined with other nonpoint source pollution, has the potential to destroy the region's nearshore water quality.

Sea Level Rise, storm run-off, flooding and Tsunami Inundation

Throughout Kīhei a significant amount of development has occurred along the coastline in areas that is threatened by stormwater runoff, flooding from other regions, tsunami inundation, and sea-level rise. Future planning must carefully consider these threats, and to the extent possible, development should be directed mauka to areas not threatened by coastal hazards. Future planning should also ensure that adequate routes exist for safe evacuation of area residents in the event of a tsunami or hurricane (see Chapter 3, Natural Hazards).

Urban Design Review

Projects proposed mauka of Pi`ilani Highway are not required to receive any formal urban design review. This may be problematic because major projects can have a significant impact on the character of a community and on scenic resources along roadways, as well as from residential and commercial neighborhoods. Proposed projects within the Kīhei-Mākena community plan region could benefit greatly from strengthened design review measures.

Kīhei – Mākena – Planned Growth Areas

Urban infill will be a major source of additional housing units in the Kīhei-Mākena community plan region. Four new planned urban growth areas have been identified in the Kīhei-Mākena community plan region: North Kīhei Residential, Kīhei Mauka, Maui Research and Technology Park (MRTP), and Pulehunui. No new rural growth areas are planned for South Maui. Planned growth areas are depicted in Figures 8-4 and 8-5 and on Directed Growth Map #S1, #C4, and #C5.

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New Regional Facilities Recommended – South Maui

- North-South Collector Road
- Kīhei High School
- South Maui Regional Park
- Kīhei mauka transportation corridor (mauka of Pi`ilani Highway)
- Regional drainage master plan and related improvements
- Kīhei Police Station
- Mā`alaea-Keālia bypass highway

Kīhei Infill and Revitalization

The MIP calls for significant revitalization and redevelopment of Kīhei. Kīhei experienced significant development in the 1970s and 1980s, and the existing urban form mimics the design notions that prevailed during that period. Kīhei's development pattern during this period was guided by the "701 Plan" which laid the foundation for the linear development pattern we see today. More importantly, land uses in the area are very separated, with few examples of mixed-use development patterns.

Particular potential exists for redevelopment of aging commercial and retail centers into more vibrant mixed-use projects integrating commercial, retail, office, residential, and open-space uses within a single project. Many of the existing commercial areas, which include expansive parking areas along street frontages, may redevelop during the life of the MIP. An example of this is the Kīhei Krausz Project which is a 320,000-square-foot sustainable, mixed-use community that will create a walkable and vibrant downtown district for Kīhei. This, and similar projects, present an opportunity to redefine Kīhei into a network of individual towns within a larger town. Town and neighborhood commercial centers can become focal points of the community, strengthen civic pride, and foster economic vitality. To do this, mixed uses (residential, commercial and civic uses) need to be directly related and be proximate to employment. Future planning should create spaces that are human in scale, that reduce the dependence on the automobile, and strengthen the region's identity.

The Kīhei-Mākena Community Plan update process is the appropriate forum to begin defining the future of Kīhei and to lay the foundation for these areas to encourage their redevelopment. One constraint that must be overcome is the historical practice of adjacent land owners developing projects independently of one another. The planning process should encourage cooperation between property owners in reaching the common goal of transforming Kīhei into a place with a wide variety of housing types within close proximity of jobs, services and open space.

Extreme care should be taken to avoid development on existing wetlands in order to mitigate excessive flooding. Where possible and practicable, old wetlands should be restored.

North Kīhei Residential

The North Kīhei Residential planned growth area is envisioned as an urban expansion project along Waiakoa Gulch in North Kīhei mauka of Pi`ilani Highway. The residential housing project will incorporate traditional neighborhood design principles and provide approximately 600 single and multifamily homes, neighborhood-serving commercial uses, a park, a network of trails and bike paths, as well as open green space. The project is bounded by the existing Hale Pi`ilani residential subdivision along Kaiolohia and North Kīhei Residential Streets, and by active seed corn operations on the West side.

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Planned Growth Area Rationale

The North Kīhei Residential planned growth area is situated in close proximity to the commercial areas of Kīhei, major roadways, and schools. The growth area will provide needed housing in close proximity to the commercial, recreational, and employment centers of Kīhei. The project will also provide affordable workforce housing units for Maui residents. Located in North Kīhei, this planned growth area will provide access to Pi'ilani Highway. Internal roadways should support traditional neighborhood design to the extent practicable, particularly within the multifamily component. Traditional neighborhood design concepts typically provide walkable neighborhoods, small neighborhood parks, and a tight interconnected multimodal grid for enhanced pedestrian and automobile mobility. Efforts should be made to provide safe pedestrian walkways that connect the planned growth area to the existing Hale Pi'ilani neighborhood, the Kaiwahine Villages affordable-housing project, parks and commercial areas, and along the new collector road that will serve the project. The development of infrastructure shall be coordinated with the projects to the south, including the Kīhei Mauka and the MRTP growth areas. The North Kīhei Residential planned growth area is located on Directed Growth Map #S1. Table 8-10 provides a summary of the planned growth area.

Table 8 - 10 : North Kīhei Residential Planned Growth Area

Background Information:				
Project Name:	North Kīhei Residential		Directed Growth Map #:	S1
Type of Growth:	Residential		Gross Site Acreage:	95 Acres
Planning Guidelines				
Dwelling Unit Count:	Approximately 600 Units ¹³		Residential Product Mix:	Balance of SF and MF units
Net Residential Density:	9-12 du/acre		Parks and Open Space% ¹⁴ :	≥ 10%
			Commercial:	Neighborhood and Convenience Shopping

¹³ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

¹⁴ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Kīhei – Mākena Community Plan Update and the project review and approval process.



Figure 8-4: Kīhei- Mākena Planned Growth Areas.

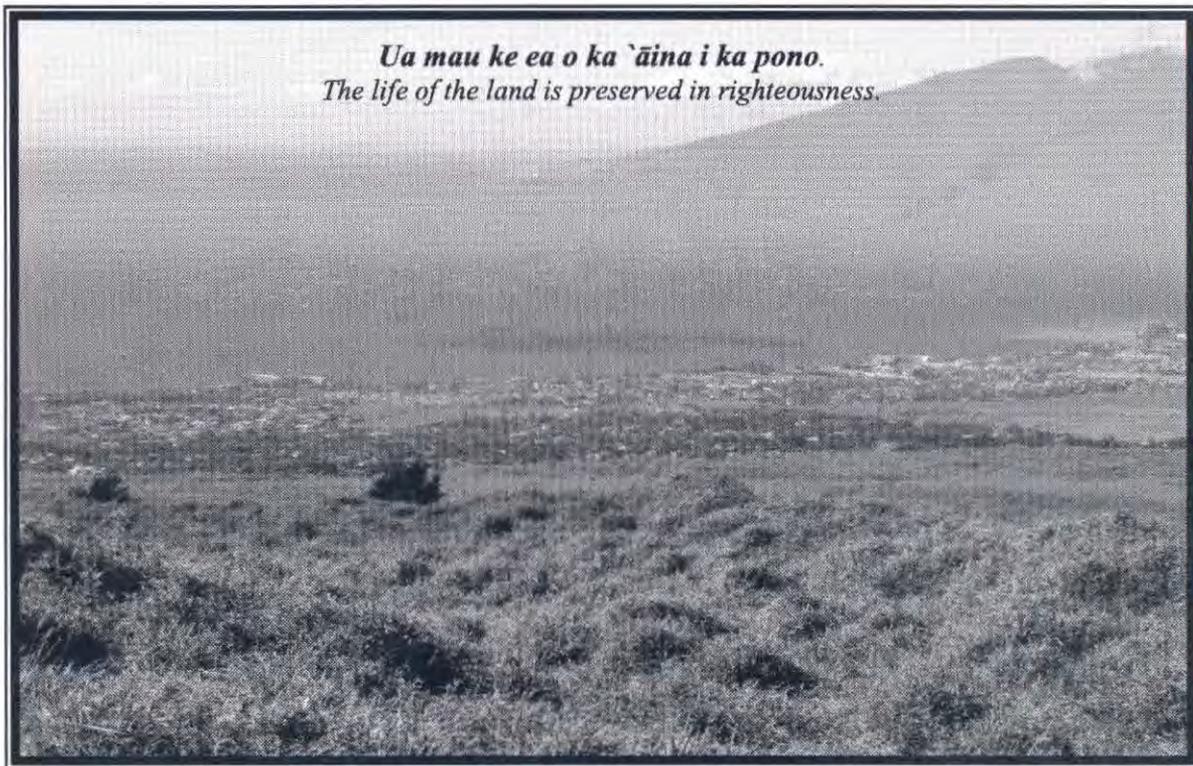
Kīhei Mauka

Kīhei Mauka is located in North Kīhei, mauka of the Pi'ilani Highway and north of the Waipu'ilani Gulch. Kīhei Mauka will encompass more than 583 acres and be comprised of a mix of land uses, housing types, lot sizes, open space, parks, and other public facilities to create an interconnected network of walkable communities that together will create a self-sufficient town.

Planned Growth Area Rationale

The Kīhei Mauka planned growth area offers suitable topography for a new community, and is located outside of the tsunami inundation zone. Although the site is within the County's agricultural zoning district, the lands have low-agricultural suitability. Relatively few development and infrastructure constraints at the Kīhei Mauka site make it possible to provide significant quantities of workforce housing for Maui residents. Located in North Kīhei, this planned growth area will have connections to the

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An expansive view of Maui's Southern Coast, Kula.

Throughout the island, Maui's residents made it abundantly clear they had a determined desire to maintain, protect and preserve open land and the green vistas, and the rural character of Maui. This vision requires a unified commitment to the island and to future generations of Maui residents. The path we must tread to reach our desired destination cannot be traveled in total ease – it is a task that will require hard choices and individual sacrifices for our common and future good. The goal is not impossible to achieve, even in the face of population growth, but it will require the careful management and control of development so that growth can be a positive and enduring force that will enrich our residents.

DIRECTED GROWTH PLAN

The Directed Growth Plan is the backbone of the Maui Island Plan (MIP). Taking into account population projections, it prescribes and outlines how Maui will grow over the next two decades, including the location and general character of new development. The Directed Growth Plan accommodates growth in a manner that provides for economic development, yet protects environmental, agricultural, scenic and cultural resources; economizes on infrastructure and public services; meets the needs of residents; and protects community character.

Chapter 2.80B, MCC, requires the adoption of urban and rural growth areas for the island of Maui. This is the first time Maui County has established growth boundaries, and it represents a significant shift towards a more orderly and predictable development pattern. Communities throughout Hawai'i and the country have used growth boundaries as part of a comprehensive directed growth plan to preserve agricultural lands, protect environmental resources, and create a more predictable land use planning process. Directed growth strategies use population projections and density assumptions to ensure an adequate supply of land is available for future growth, to limit sprawl, and to focus infrastructure investment to areas within the growth boundaries.

The Directed Growth Plan uses MIP goals, objectives, and policies as well as guiding land use principles as a foundation for establishing urban and rural growth boundaries. This chapter describes the types of growth boundary designations and the methodology applied in the identification of these designations. In addition, this section identifies planned protected areas.

This chapter contains figures to be used for illustrative purposes only. In the event a figure is inconsistent with a diagram or map of this chapter, the diagram or map shall control.

Background Information

The following technical studies and reports provide base information for the Directed Growth Plan:

1. *Land Use Forecast (November 2006);*
2. *The Socio-Economic Forecast (June 2006);*
3. *Maui Island Housing Issue Paper, December 2006;*
4. *Infrastructure and Public Facilities Assessment Update (March and September 2007);*
5. *Maui Island Roadway Capacity Assessment (January 2007);*
6. *Scenic and Historic Resources Inventory & Mapping Study (June 2006);*
7. *WalkStory and PlanStory, A Report on the Response of Participants (December 2006);*
8. *Maui Island Plan Site Evaluation Methodology Memorandum (August 2007); and*
9. *Population and Economic Projections for the State of Hawai'i to 2040 (March 2012).*

The Department of Planning also conducted numerous regional design workshops and held meetings with State and County agencies, stakeholder groups, and the General Plan Advisory Committee to understand the perspectives of residents from all areas of the island on future growth and protected areas (see Introduction for additional information).

The Purpose of the Directed Growth Plan

The primary purpose of the MIP is to establish a managed and directed growth plan to accommodate population and employment growth in a manner that is fiscally prudent, safeguards the island's natural and cultural resources, enhances the built environment, and preserves land use opportunities for future generations. The Directed Growth Plan is based on sound planning practices and principles and utilizes

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information gathered from public outreach events, the General Plan Advisory Committee, and technical studies.

The Directed Growth Plan, which is grounded on the recommendations found throughout the MIP, establishes the location and general character of future development. The Directed Growth Plan will provide the framework for future community plan and zoning changes and guide the development of the County's short-term and long-term capital improvement plan budgets.

Planning for Future Growth

As part of the *Land Use Forecast*, the demand for additional residential lands was determined by comparing build-out of existing residential land supply to the 2030 forecasted demand for residential units. The existing supply of residential land includes all lands that are community planned and zoned for either single-family or multifamily residential use. The forecasted demand for residential units takes into account both resident and nonresident demand to 2030. While an important goal of the General Plan update is to provide housing for Maui residents, the demand for housing from the offshore market cannot be ignored. If only resident demand was factored into the future need for residential units, competition between residents and nonresidents for the limited supply of residential units would likely lead to a worsening of the current high-priced housing situation, with residents being outbid by nonresidents. Therefore, both resident and nonresident demands are used to determine total future demand for residential housing. According to the land use forecast and the most recent DBEDT forecasts, an additional 10,845 residential units are needed to accommodate projected 2030 housing demand.¹ This demand was then allocated to each community plan region based on the land use forecast model output that predicts regional population and employment growth. Table 8-1 depicts total forecasted housing demand, the supply of existing housing units, and projected housing needs to 2030.

Table 8 - 1: Projected Maui Housing Needs, 2010 - 2030

Total Needed Housing Units During 2010-2030 Planning Period	
Projected 2030 Housing Demand	83,659
Minus the existing housing stock	54,070
Minus currently entitled housing units	<u>-18,744</u>
Equals approximate unmet housing demand	10,845

Types of Growth Boundaries and Protected Areas

Urban and Rural Growth Boundaries

Chapter 2.80B, MCC, requires the identification of both urban and rural growth boundaries (which can include small towns, rural residential, rural villages, and other community plan designations). The characteristics used to identify these boundaries and the policy intent for each of these areas is described in Table 8-2.

¹ The 2030 demand has been adjusted to reflect updated population forecasts released by the DBEDT (March, 2012).

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Protected Areas

Part of the Directed Growth Plan is to ensure that future development patterns do not compromise Maui's unique and fragile natural resources. One tool to promote the protection and availability of passive and active recreational amenities and other environmentally sensitive areas is the identification of preservation areas, regional parks, greenways, greenbelts, and sensitive lands. Each type of protected area is described in Table 8-2. It is not the intent of the Protected Areas to regulate lands within the State Conservation District. In some instances, Conservation lands are included to provide context.

Urban, Small Town, and Rural Growth Areas

The MIP is the first comprehensive plan to establish urban, small town, and rural growth boundaries in Maui County. These boundaries will encompass approximately 5,389 acres of new planned urban and small town growth areas. The Directed Growth Maps show Urban, Small Town, and Rural Growth Boundaries (UGB, STB, and RGB) - the space inside these boundaries is referred to as Urban, Small Town, and Rural Growth Areas respectively. These boundaries are depicted with lines on the Directed Growth Maps. The growth boundary line separates a growth area from a nongrowth area.

- The UGB denotes the areas within which urban-density development requiring a full range of services, such as new multi-user sewer and water, is supported in accordance with applicable land use laws. Growth boundaries are a long-range planning tool that will be used on Maui to evaluate proposals involving community plan amendments, changes in zoning, development proposals or utility extensions.
- The STB denotes areas that are less intensely developed than urban areas with fewer services and a lower level of infrastructure. These areas may be more self-sufficient than Rural Villages. Primary employment opportunities are often in nearby urban areas.
- The RGB is intended to identify and protect the character of our rural communities. It identifies an existing or future land use pattern that includes a mixture of small farms, low density residential housing, and a limited amount of urban uses consistent with the character and scale of our country towns. The intent of this boundary is to provide a framework for further and more detailed long-range rural planning during the community plan update process. Rural areas inherently possess a lower set of standards for infrastructure and public services than urban areas. As such, it is also the intent to apply lower level-of-service standards in RGBs.

The UGBs, STBs, and RGBs are used to identify and protect farms and natural areas from sprawl and to promote the efficient use of land, and the efficient provision of public facilities and services inside the boundary.

The UGBs, STBs, and RGBs take into account future growth projections through 2030, the availability of infrastructure and services, environmental constraints, and an approximate density of land development to determine the placement of the boundary. Land outside of the UGB is intended to remain rural in character with a strong agricultural and natural-resource presence. These boundaries are intended to be static "lines in the sand" until the time at which job and housing growth cannot be accommodated within the boundaries, which, if not addressed, could exacerbate the affordable housing problems facing Maui and have a negative impact on the overall quality of life. To ensure that an adequate supply of land is available, the MIP will be updated every ten years to provide for appropriate expansion to meet new

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Table 8 - 2: Growth Boundaries and Protected Area Types

GROWTH BOUNDARIES (See Maps C-1 to C-5, S-1 to S-3, L-1 to L-4, N-1 to N-2, W-1 to W-4, E-1 to E-2)		CHARACTERISTICS	PURPOSE	IMPLEMENTATION STRATEGY
GROWTH BOUNDARY TYPES	Urban	Urban areas contain a greater variety of land use types, including various housing types and densities, commercial, retail, industrial uses, and resort destination areas. Infrastructure is more complete and reflects the need to serve higher-density land uses.	Ensure that future development occurs in an orderly fashion; allows in-fill and revitalization opportunities and encourages "new urbanism" and "neo-traditional design" techniques.	Protect separation between communities through the use of Urban Growth Boundaries. Require community-based design processes and require design guidelines for future major development. Identify and promote redevelopment and in-fill opportunities. Encourage a mix of housing types and higher-density residential development to encourage resident housing opportunities.
	Small Town	Small Towns are less intensely developed than urban areas with fewer services and a lower level of infrastructure. They may be more self-sufficient than Rural Villages. Primary employment opportunities are usually in nearby urban areas.	Protect the integrity, unique sense of place, and economic viability of Maui's traditional small towns.	Protect separation between communities through the use of Small Town Boundaries. Allow for expansion where appropriate. Utilize design guidelines and rural infrastructure standards to protect Small Town character.
	Rural	Rural Areas contain a mixture of agricultural activities, low-density residential areas, and small villages. Rural Villages may contain limited amounts of State and County urban designated lands including residential and small clusters of businesses and civic uses mostly to support surrounding rural residential uses and agricultural activities. Level of government services is generally limited and many essential goods and services are located in a larger town. The level of infrastructure may be lower than Small Towns. Employment is generally a function of nearby Urban Areas or Small Towns. Rural Residential Areas are primarily a residential development pattern with lower residential densities (0.5 to 10 ACRE/du), agricultural activities, and few services or employment opportunities. Limited commercial and civic uses (churches, schools) may be allowed in accordance with applicable community plan and zoning.	Provide a transition between Urban Areas and Small Towns and those areas in need of protection, including agricultural lands. Contain the spread of residential uses into prime agricultural lands and provide a tool for designing villages with a mix of lots and lifestyle choices.	Minimize expansion of infrastructure that could lead to urbanization. Define areas appropriate for additional rural development patterns. Promote an equitable tax/water rate structure that reflects actual land use. Adopt appropriate infrastructure and subdivision standards to protect rural character. Maintain the separation of communities through the use of boundaries. Allow for Rural Villages where appropriate. Utilize rural design guidelines and appropriate infrastructure and subdivision standards to protect rural character.
PROTECTED AREA TYPES (See Diagrams NW-1, WC-1, S-1, N-1, NE-1, E-1, SE-1)				
PROTECTED AREA TYPES	Preservation	Areas with significant natural and environmental resources, scenic, open space, and recreational resources, historic resources and other important assets that warrant additional protection. Preservation areas may include accessory structures such as public restrooms, structures related to a cultural or historical resource, and other structures and ancillary uses consistent with the purpose and intent of the preservation area.	Permanent protection of areas on the island that have significant environmental, ecological, cultural and recreational value and the degradation of the resource would result in an irretrievable loss.	Protection using regulation, easements, Transfer of Development Rights (TDR) program or fee-simple purchase in cooperation with land trusts, environmental organizations, the County of Maui, State of Hawai'i and the Federal government. The appropriate community plan designation for this protected area type is park or open space as determined during a community plan update or the entitlement process.
	Park	Land areas devoted to passive (picnic facilities and gathering areas) and/or active (including, but not limited to, bike paths, hiking trails, ball fields, and tennis courts) uses that serve recreational needs.	Ensure that recreational and open space needs keep pace with future growth and are appropriately located consistent with the Maui Island Plan's Directed Growth Plan.	Acquisition, Transfer of Development Rights (TDR) program, and/or cooperative efforts with the development community during the design, project review and approval process. The appropriate community plan designation for this protected area type is park or open space as determined during a community plan update or the entitlement process.
	Greenbelt	Extensive area of largely undeveloped or sparsely occupied land established along natural corridors to protect environmental resources and to separate distinct communities. Greenbelts may include accessory structures and ancillary uses consistent with the purpose and intent of the greenbelt area.	Ensure natural and undisturbed separation between communities and protect environmentally sensitive lands.	Acquisition, Transfer of Development Rights (TDR) program, and/or cooperative efforts with the development community during the design, project review and approval process. Also implemented through the subdivision review process. The appropriate community plan designation for this protected area type is park or open space as determined during a community plan update or the entitlement process.
	Greenway	Typically a long, narrow piece of land, often times used for recreation, pedestrian, and bicycle traffic. Greenways can include community gardens and can be used to link community amenities (e.g. parks, shoreline). Greenways may include accessory structures and ancillary uses consistent with the purpose and intent of the greenway area.	Provide opportunities to inter-connect communities, ensure adequate recreational amenities, protect scenic resources, and link residential projects with service areas. Greenways may be improved to accommodate pedestrian, bicycle, equestrian and other similar uses.	Acquisition, Transfer of Development Rights (TDR) program, and/or cooperative efforts with the development community during the design, project review and approval process. Also implemented through the subdivision review process. The appropriate community plan designation for this protected area type is park or open space as determined during a community plan update or the entitlement process.
	Sensitive Land	Lands that contain development constraints including steep slopes greater than 35 percent, floodplains, significant drainage features, and adjacent intact forested areas.	Protect areas with significant development constraints and ensure sensitive areas are taken into consideration during site design.	An area that may require site design review and approval to ensure that areas with significant development constraints are avoided or appropriate mitigation measures are incorporated into projects.

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housing demand. In short, the boundaries will typically include at least a 10-year surplus of urban, small town, and rural lands.

In some cases the UGBs, STBs, and RGBs split ownership parcels and vary from the owners' suggested development project boundary. This was done for a variety of reasons, some of which are to protect valuable agricultural lands, natural resources, or limit susceptibility to hazards. Generally, however, specific areas were identified throughout the island to promote balanced growth at appropriate urban or rural densities. Altogether, the growth boundaries provide sufficient land supply to meet the needs of the County to 2030.

Maui's growth boundaries are one component of Maui's land use planning and regulatory system. State land use districts, community plan designations, zoning districts, and the growth boundaries work in concert to effectively manage land use. Table 8-3 portrays the Growth Boundary Types and the Corresponding State Land Use Districts.

Table 8 - 3: Growth Boundary Types and Corresponding State Land Use Districts

GROWTH BOUNDARY TYPE	STATE LAND USE DISTRICT
Urban	Urban
Small Town	Urban/Rural
Rural	Urban (limited amounts), Rural, and Agriculture

URBAN AND SMALL TOWN GROWTH AREA GOAL AND POLICIES

The following goal and policies address Urban Growth Boundaries (UGBs) and Small Town Boundaries (STBs), and the development of land within and outside of these boundaries. They are broad in scope, and address the design intent of these areas, amendments to the boundaries, and infrastructure expansion within and outside of the boundaries. The policies set forth below establish the regulatory effect of the UGBs and STBs.

Goal:

- 8.1** Maui will have well-serviced, complete, and vibrant urban communities and traditional small towns through sound planning and clearly defined development expectations.

Policies:

- 8.1.a** The County, with public input, will be responsible for designating new growth areas where infrastructure and public facilities will be provided, consistent with the policies of the MIP and in accordance with State and County infrastructure plans.
- 8.1.b** Amendments to a UGB or STB shall be reviewed as a MIP amendment. A UGB or STB shall only be expanded if the island-wide inventory (maintained by the Department of Planning) of existing land uses (residential, commercial, industrial) indicates that additional urban density land is necessary to provide for the needs of the projected population growth within ten years of that inventory; or, during the decennial update of the MIP.

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- 8.1.c** Community plans shall provide for urban density land use designations only within UGBs and Small Towns. The County may only support and approve State Urban Land Use Designations for areas within UGBs, STBs, and Rural Villages.
- 8.1.d** The unique character and function of existing small towns shall be protected to retain and preserve their sense of place.
- 8.1.e** New development shall be consistent with the UGBs, STBs, and all other applicable policies of the MIP. New urban-density development shall not be allowed outside of a UGB or STB.
- 8.1.f** The County, as a condition of development approval, shall require developers of privately owned infrastructure systems to provide financial insurance (bonding, etc.) for the operation and maintenance of these systems.
- 8.1.g** The County shall implement a zoning program to comprehensively redistrict and rezone lands within UGBs according to updated community plan policies and map designations.
- 8.1.h** The County will seek to focus capital improvements (schools, libraries, roads, and other infrastructure and public facilities) within the UGBs and STBs in accordance with the MIP.
- 8.1.i** The County will promote (through incentives, financial participation, expedited project review, infrastructure/public facilities support, etc.) appropriate urban infill, redevelopment and the efficient use of buildable land within UGBs to avoid the need to expand the UGBs.
- 8.1.j** The MIP's UGBs and STBs shall not be construed or implemented to prohibit the construction of a single-family dwelling on any existing parcel where otherwise permitted by law.

RURAL GROWTH AREA GOAL AND POLICIES

The following goal and policies address Rural Growth Boundaries (RGBs) and the development of land within and outside of these boundaries. They are broad in scope, and address the design intent of these areas, amendments to the boundaries, and infrastructure expansion both within and outside of the boundaries. The policies set forth below establish the regulatory effect of the RGBs.

Goal:

- 8.2** Maui will maintain opportunities for agriculture and rural communities through sound planning and clearly defined development expectations.

Policies:

- 8.2.a** Amendments to a RGB shall be reviewed as an MIP amendment. A RGB shall only be expanded if an island-wide inventory of existing land uses (residential, commercial, industrial) indicates that additional lands are necessary to provide for the needs of the projected population growth within ten years of that inventory; or, during the decennial update of the MIP.

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- 8.2.b** New development shall be consistent with RGB and all other applicable policies and requirements of the MIP. Public, quasi-public, civic, and limited commercial or industrial uses may be allowed in the RGB when the proposed uses demonstrate a public need and are consistent with the Community Plan and zoning.
- 8.2.c** Environmental protection and compatibility will be a top priority in rural growth areas.
- 8.2.d** All development within rural growth areas should avoid encroachment upon prime agricultural land.
- 8.2.e** Rural growth areas include Rural Residential Areas and Rural Villages. Rural residential areas may be designated when they are located in association with or on the border of urban growth areas or Small Towns; and/or when they provide for complete, self-sufficient rural communities with a range of uses to be developed at densities that do not require urban infrastructure.
- 8.2.f** Community plans shall provide for rural density land use designations only within RGBs; provided that limited community plan urban designations may be allowed within Rural Villages. New rural growth areas shall not be located where urban expansion may ultimately become necessary or desirable. New rural-density development shall not be allowed outside of a RGB.
- 8.2.g** New rural growth areas intended to be complete, self-sufficient rural communities must be located a significant distance from existing urban areas, distinctly separated by agricultural or open lands.
- 8.2.h** Urban-scale infrastructure and public facilities shall not be provided in rural areas except as described in the defined Level-of-Service (LOS) standards. There should be no expectations of urban services in rural areas.
- 8.2.i** Urban development standards shall not be required within RGBs except in fulfillment of Federal law.
- 8.2.j** The unique character and function of existing small towns and rural communities shall be protected to retain and preserve their sense of place.
- 8.2.k** Preserve rural landscapes in which natural systems, cultural resources, and agricultural lands are protected and development compliments rural character and contributes to the viability of communities and small towns.
- 8.2.l** The MIP's RGBs shall not be construed or implemented to prohibit the construction of a single family dwelling on any existing parcel where otherwise permitted by law.
- 8.2.m** The County shall implement a zoning program to comprehensively redistrict and rezone lands within RGBs, and to implement community plan policies and map designations.
- 8.2.n** At the time of zoning from agricultural to rural, Council will consider prohibiting restrictions on agricultural activity.

PROTECTED AREA POLICY

- 8.3.a** The Protected Areas in Diagrams E-1, NW-1, N-1, NE-1, S-1, SE-1, and WC-1 should be concurrently reviewed with Table 8-2 and with any proposed land uses that may result in an adverse impact on a Protected Area. The County Council and the Administration should be notified if a Protected Area may be compromised by a development proposal.

Exceptions to Development Outside of Growth Boundaries

During the life of the MIP, there will be a need for certain land uses that may have unique impacts or requirements due to the nature of the use, and would be more appropriately located outside of identified growth boundaries. These land uses may include heavy industrial operations, such as but not limited to, infrastructure facilities, baseyards, quarries, transfer stations, landfills, and uses generating noise or odor that are undesirable for an urban environment. In addition, there may be public/quasi-public, or nonprofit uses that enhance community services and well-being that are most appropriately located outside of urban and rural areas. These uses may include parks, campgrounds, educational centers, arts and cultural facilities, communication facilities, and health and safety related facilities. Alternative energy systems and other land uses related to emerging industries may also be suitable outside of urban, small town, and rural growth boundaries when consistent with community plans and zoning. Commercial uses may also be permitted when appropriate. These uses may be approved, pursuant to the County's special or conditional use permit process contained in Title 19, MCC, or the State Land Use Commission's special use permit process contained in Chapter 205, HRS, and Chapter 15-15, Hawai'i Administrative Rules, without an amendment to the MIP. The Maui Island Plan shall not be construed or implemented to prohibit existing, legally permitted uses or structures. Any dwelling or structure that was constructed with a building permit that was approved prior to the enactment of this Plan may be reconstructed as permitted by the original building permit(s), and such dwellings or structures may be expanded or modified with a building permit, subject to the provisions of the Maui County Code and applicable laws.

Methodology for Identifying Growth Boundaries

To formulate the Directed Growth Plan, the County first developed a set of Guiding Land Use Principles. These are generally philosophical in nature, and were derived from the Focus Maui Nui WalkStory and PlanStory public outreach events; various community workshops; planning literature; public facilities, and infrastructure studies; and heritage resource, scenic and cultural resource studies.

GUIDING LAND USE PRINCIPLES

- 1. Respect and encourage island lifestyles, cultures, and Hawaiian traditions:** The culture and lifestyle of Maui's residents is closely tied to the island's beauty and natural resources. Maintaining access to shoreline and mountain resources and protecting culturally significant sites and regions perpetuates the island lifestyle and protects Maui's unique identity. One of the most vital components of the island lifestyle and culture is Maui's people. In an island environment where resources are finite, future growth must give priority to the needs of residents in a way that perpetuates island lifestyles.
- 2. Promote sustainable land use planning and livable communities:** Managing and directing future growth on Maui should promote the concept of sustainability, and the establishment of livable communities. Sustainable practices include: 1) Focusing growth into existing communities; 2) Taking advantage of infill and redevelopment opportunities; 3) Promoting compact, walkable, mixed-use development; 4) Revitalizing urban and town centers; 5) Providing

Directed Growth Plan

transportation connectivity and multimodal opportunities; 6) Protecting and enhancing natural and environmental resources; 7) Protecting, enhancing, and expanding communities and small towns, where appropriate; and 8) Encouraging energy and water-efficient design and renewable energy technology.

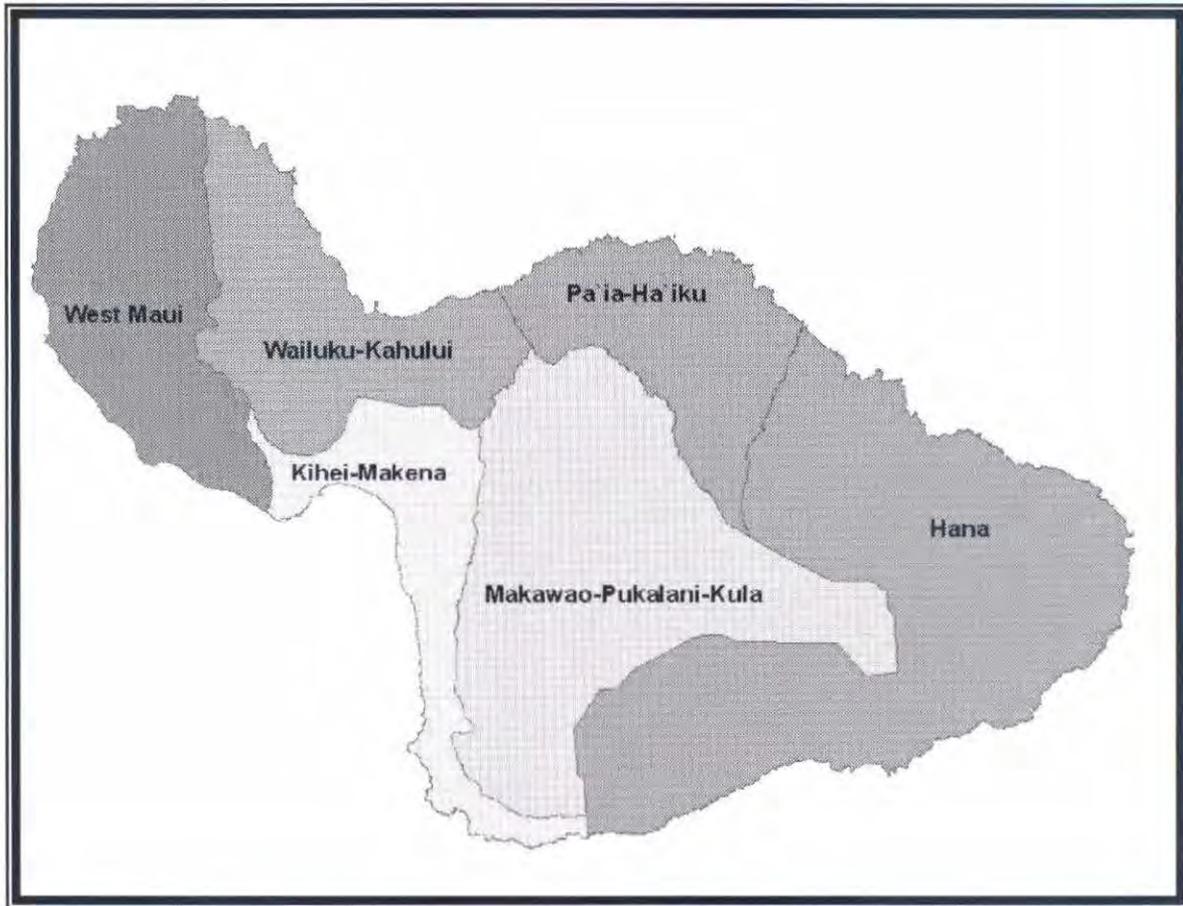
3. **Keep “urban-urban” and keep “country-country”:** Given the high cost of developing public infrastructure and facilities to service remote areas, the significant environmental and social impacts associated with long vehicle commutes, and the desire to “keep the country-side country” it is preferable to develop compact communities and to locate development within or as close as possible to existing urban areas and employment centers.
4. **Protect traditional small towns:** Development within and adjacent to Maui’s traditional towns should be compatible with and perpetuate their unique character. Hard edges should be maintained around new and existing communities through the use of greenbelts and significant open space.
5. **Protect open space and working agricultural landscapes:** In light of continuing urbanization, the protection of agricultural and open-space resources will depend on a healthy agricultural industry and progressive planning and regulation. Planning should utilize agricultural lands as a tool to define the edges of existing and planned urban communities, apply innovative site design, create buffers along roadways, provide visual relief, and preserve scenic views.
6. **Protect environmentally sensitive lands and natural resources:** Environmentally sensitive lands, natural areas, and valued open spaces should be preserved. Native habitat, floodways, and steep slopes should be identified so future growth can be directed away from these areas. It will be important to plan growth on Maui in a manner that preserves habitat connectivity, watersheds, undeveloped shoreline areas, and other environmentally sensitive lands.
7. **Promote equitable development that meets the needs of each community:** Each region of the island should have a mix of housing types, convenient public transit, and employment centers. Where appropriate, all neighborhoods should have adequate parks, community centers, greenways, libraries, and other public facilities. No community should have a disproportionate share of noxious activities. Additionally, a fair, efficient, and predictable planning and regulatory process must be provided. A cornerstone of equitable development should reflect a focus on providing affordable housing for all of Maui’s residents over developing nonresident housing.
8. **Plan for and provide efficient and effective public facilities and infrastructure:** Many of Maui’s public infrastructure systems and facilities were constructed decades ago and are in need of repairs and upgrades to meet current and future demand. Growth should be planned for areas with existing infrastructure, or where infrastructure can be expanded with minimal financial burden to the public. Transportation infrastructure should be designed to be in harmony with the surrounding area.
9. **Support sustainable economic development and the needs of small business:** Land use decisions should promote and support sustainable business activities.
10. **Promote community responsibility, empowerment, and uniqueness:** The development of community plans should be a broad-based, inclusive process. The community plans shall be reviewed by the Community Plan Advisory Committees, the planning commissions, and approved by the Council. The MIP shall provide a framework for the updated community plans. Subsequent proposed community plan amendments should be subject, as much as possible, to local community input.

Following the development of these guiding principles, a more analytically rigorous list of evaluation criteria were developed to assist in the identification of areas appropriate for both development and

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protection. This approach included the application of a technique called “Suitability Analysis.” The process, also referred to as “McHargian Analysis” was refined by Ian McHarg at the University of Pennsylvania in the 1960s, and has been widely applied throughout the United States. The McHargian Analysis involves layered maps of geographic information superimposed on one another to identify areas that provide, first, opportunities for particular land uses, and second, constraints to development. With the advent of Geographic Information System (GIS) technology, it is now possible to understand the relationships between vast datasets and apply weighting derived by the community to prioritize growth areas and those areas appropriate for preservation.²

² A more complete discussion of the methodology used to develop the Plan’s growth boundaries can be found in: *Directed Growth Plan, Site Evaluation Methodology Memorandum*. Chris Hart & Partners, September 2007.



Community plan regions.

MAUI'S DIRECTED GROWTH PLAN

A primary objective of the Directed Growth Plan is to ensure that our urban and rural communities offer a high quality of life. Designing pedestrian-oriented communities, with a mix of uses to sustain daily needs, and close to places of employment makes for a more sustainable, vibrant, and livable environment. Providing parks and open space, tree-lined roadways, and easy connections to the natural and built environment promotes health and well-being. Beyond our urban boundaries, working agricultural landscapes, natural wildland areas, and undeveloped shorelines and beaches are vitally necessary to provide a sense of refuge and escape from the stresses of daily life.

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This section identifies planned growth areas to meet the housing, employment, and recreational needs of Maui's residents to 2030. Planned growth on Maui is largely directed to Wailuku-Kahului, Kīhei, and West Maui to protect the character of the existing small towns, rural areas, agricultural lands, and open space and to allow for more dynamic urban settlements with efficient public service delivery. For the next 20 years these three regions will serve as the island's primary urban centers. Development through the planning horizon will largely take place through infill and redevelopment, urban expansion, and new towns. Every effort is made to maximize the use of urban infill and redevelopment opportunities, to avoid the need to expand the urban, small town, and rural growth areas.

How to Read this Section

For organizational purposes, the section is divided into regions that roughly correspond to the island's community plan areas. However, the regions and corresponding Directed Growth Maps do not always follow the community plan area map boundaries and may overlap with an adjacent community plan area. The section includes a brief description of the community plan region, challenges and opportunities affecting the region, growth anticipated in the region along with the new regional facilities needed to accommodate that growth. Next, each planned growth area is described in narrative followed by a table that includes background information, and planning guidelines for the planned growth area. This table, in most cases, indicates the net residential density³, number of dwelling units, the desired mix of dwelling unit types, and the type of commercial node that will be expected within the planned growth area. Commercial nodes are classified as "neighborhood serving", "convenience shopping", and "region serving". Table 8-4 describes the characteristics of these commercial nodes.

Table 8 - 4: Characteristics of Commercial Nodes

TYPE	CHARACTERISTICS
Neighborhood Serving	Small scale commercial activities that primarily serve the needs of the immediate neighborhood. Examples include, but are not limited to, the corner grocery store, bake shop, and shave ice stand.
Convenience Shopping	Commercial activities that serve the adjacent community. Examples include, but are not limited to, a small-to-mid size supermarket, bank, barber shop, and internet cafe.
Region Serving	Commercial activities that may serve the community plan region. Examples include, but are not limited to, large supermarkets, hardware and plumbing stores, and sporting goods stores.

The planning guidelines are not meant to be prescribed requirements; rather, they identify the intent of the planned growth area. Development of the planned growth area may reasonably vary slightly from the planning guidelines provided that the overall intent of the Planning guidelines is achieved.

This section also includes a summary of the significant planned protected areas identified in each community plan region. Planned protected areas include some of the island's most treasured cultural, environmental, and recreational resources. These resources can come in the form of a coastal ridge, a burial ground, or an urban park. The planned protected area can be for the public's benefit and use, or to allow the natural habitat to exist in an unaltered state. The intent of the Protected Area is to provide one additional layer of protection to those areas that contain any number of irretrievable resources. The purpose and intent of each planned protected area is described after each planned growth area section.

³ Net Residential Density means the total number of dwelling units to be developed at a specific site divided by the Net Residential Acres. Net Residential Acres means the gross area of a site intended for residential development minus the area of wetlands and waterbodies, parks and open space, roads and right-of-way, and other undevelopable land within the site.

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Planned protected areas were identified through the Plan's public involvement process. Several of the planned protected areas draw from the following plans and studies: 1. *Pali to Puamana Parkway Master Plan* (February 2005); 2. *North Shore Corridor Report* (Fall, 2006); 3. *Infrastructure and Public Facilities Assessment Update* (March and September 2007); 4. *Scenic and Historic Resources Inventory & Mapping Study* (June 2006); and 5. *Focus Maui Nui's WalkStory and PlanStory* public outreach events (December 2006). Each planned protected area shall be incorporated into appropriate community plan updates, green infrastructure plans, capital improvement plans, special district plans, related functional plans, and urban beautification efforts.



View of Pi'ilani Highway.

A REGIONAL FRAMEWORK

In consideration of the guiding land use principles discussed above, the following four themes provide a broad island-wide framework for the identification of areas that are appropriate for future growth, the identification of areas that should be preserved, and the implementation of the directed growth plan.

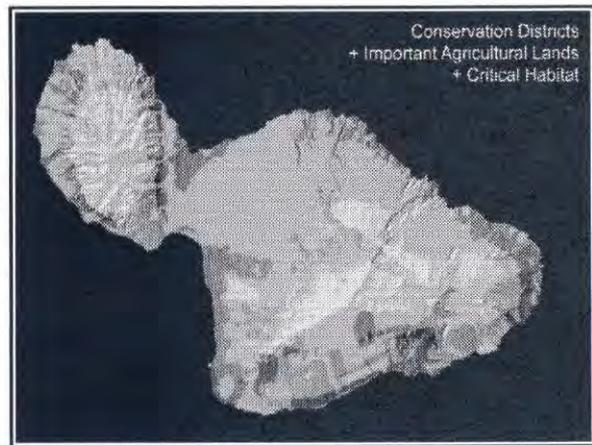
Theme One: Limit Development in Northwest and East Maui.

East and Northwest Maui are the most remote, inaccessible, and undeveloped regions on Maui. Both regions possess rugged physical beauty, agricultural landscapes, and culturally-rich communities. The island's largest intact watersheds, and natural wildland areas, including Haleakalā National Park and the West Maui Mountains, are located in Northwest and East Maui.

Development in both areas is largely dispersed, employment is limited, and infrastructure and public facility capacity is restricted. Maui residents have a strong desire to protect the natural and cultural resources of these regions.

Theme Two: Protect Maui's agricultural resource lands, especially prime and productive agricultural lands.

Maui's agricultural lands are an important resource for both current and future generations of island residents. Agricultural lands provide the opportunity for greater economic diversification; food and energy security; and better stewardship of land, water, and open space resources. Maui residents have expressed a strong desire to support the agricultural economy and protect the island's agricultural lands for both present and future generations.



Example of overlay analysis.

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Theme Three: *Direct growth to areas proximate to existing employment centers, where infrastructure and public facility capacity can be cost-effectively provided, and where housing can be affordably constructed.*

Traffic congestion, affordable housing, and convenience are major quality of life issues that Maui residents care deeply about. The same is true for quality education, public safety, and a clean environment.

Given the high cost of developing public infrastructure and facilities to service remote areas, the significant environmental and social impacts associated with long vehicle commutes, and the broad desire to “keep the country-side country” it is preferable to locate development as close as possible to existing employment centers.

There currently exists undeveloped land that is within close proximity to Wailuku-Kahului, Kīhei Town, and Lahaina-Kā’anapali-Kapalua that is feasible for development. These lands are close to existing public facilities and major centers of employment.

Theme Four: *Within the Urban Growth Boundaries, promote livable, mixed-use communities, defined by a high quality of life.*

Maui’s future growth will be accommodated largely within UGBs. These boundaries will encompass higher density mixed-use infill development, planned urban expansion, and the creation of new, self-sufficient towns.



Sketch of human-scale development.

A primary objective of the Directed Growth Plan is to ensure that our urban communities offer a high quality of life. Designing pedestrian-oriented communities with a mix of uses to sustain daily needs and close to places of employment makes for a more vibrant and livable environment. Providing parks and open space, tree lined roadways, and easy connections to the natural and built environment are necessary to promote health and well-being.

Beyond our urban boundaries, working agricultural landscapes, natural wildland areas, and undeveloped shorelines and beaches are vitally necessary to provide a sense of refuge and escape from the stresses of urban life.

WAILUKU-KAHULUI

The Wailuku-Kahului community plan region encompasses the island’s Civic Center, major commercial-industrial and shipping center, and the largest resident population of all community plan regions with 54,433 people in 2010. The community plan region also has the largest employment center with 32,898 jobs in 2010. The region is comprised of four distinct sub-regions: Wailuku, Kahului, Waikapū, and Waihe’e. A brief discussion of each sub-region is provided below.

Wailuku. Wailuku serves as the Civic Center for Maui and the seat of Maui County government. Wailuku is a culturally diverse town with strong ties to Maui’s Hawaiian missionary and plantation history, and serves as the gateway to ‘Īao Valley. Residential neighborhoods in

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planned Kīhei-Upcountry Highway and Mokulele Highway, and will generate less of an impact on Pi'ilani Highway, the North-South Collector Road, and South Kīhei Road than a comparable project located further south. The Kīhei Mauka planned growth area is adjacent to the proposed Kīhei High School and the MRTP. Kīhei Mauka will provide public facilities, commercial land uses, parks and an open space network to serve the new and existing communities. The development of infrastructure will be coordinated with the North Kīhei Residential project, the continued expansion of the MRTP, and the Honua'ula and Mākena resort developments located to the south. Kīhei Mauka's proximity to large employment centers within the Kīhei-Mākena community plan region offers an ideal location for several self-sufficient villages that, together, will comprise a new town.

The expansion area should be developed based on the concept of a network of compact, walkable neighborhoods with neighborhood commercial nodes concentrated in the village centers of Kīhei Mauka. Projects proposed within this growth area should receive urban design review to ensure multimodal connectivity, and the incorporation of progressive-design treatments. A range of housing types should be provided with a significant percentage of multifamily units, and an emphasis on housing that is intended to meet resident needs. Due to the existing transportation challenges in the region and the size of the Kīhei Mauka planned growth area, progressively designed and safe pedestrian, bicycle, and ground-transportation corridors will need to connect the project to the Kīhei High School, MRTP, and the rest of Kīhei. Enhanced north-south mobility mauka of Pi'ilani Highway will be key to ensuring efficient intra- and inter-regional connectivity. Convenient public transit access should be provided to improve regional mobility. Drainage and sedimentation control systems will need to be constructed to mitigate the potential for flooding makai of the project and to prevent nonpoint source pollution from entering coastal waters. These measures can be combined with the growth area's planned park, open space, and greenbelt and greenway systems. Finally, since the site is a considerable expansion of the North Kīhei area, the project will need to be developed in phases. Each phase should be planned with adequate public facilities and commercial services to meet resident needs. The Kīhei Mauka planned growth area is located on Directed Growth Map #S1. Table 8-11 provides a summary of the planned growth area.

Table 8 - 11: Kīhei Mauka Planned Growth Area

Background Information:			
Project Name:	Kīhei Mauka	Directed Growth Map #:	S1
Type of Growth:	Urban Expansion	Gross Site Acreage:	583 Acres
Planning Guidelines			
Dwelling Unit Count:	Approximately 1,500 ¹⁴ Units	Residential Product Mix:	Balance of SF and MF units
Net Residential Density:	9-12 du/acre	Parks and Open Space% ¹⁵ : Commercial:	≥ 30% Neighborhood Convenience Shopping Region Serving

Maui Research and Technology Park

The MRTP was the vision of a core group of community leaders in the early 1980s who sought to diversify the economic and employment base on Maui beyond tourism and agriculture. Today, the MRTP

¹⁴ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

¹⁵ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Kīhei – Mākena Community Plan Update and the project review and approval process.

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is home to a diverse range of companies and government projects that together employ approximately 400 persons in high-technology and related industries. The MRTP is envisioned to continue to be a major employment generator for Maui. The Park's mission of job creation and diversification of the island's economy remains one of vital importance.

Planned Growth Area Rationale

Since the opening of the MRTP, experts in the field of economic development have gained a better understanding of innovation clusters and the needs of knowledge workers and businesses. Technology businesses thrive in areas of diversity and activity. A diversity of businesses and workers, and the availability of a variety of commercial and industrial spaces, enhance the viability and success of individual businesses. The intent of the MRTP planned growth area is to create opportunities for a broader range of desirable knowledge-based and emerging industries,¹⁶ which will provide high-skilled and well-paying jobs for Maui residents.

As the MRTP develops, it should utilize the principles of new urbanism, smart growth, and the Association of University Research Park's "Power of Place" study to create a community of innovation. This includes providing diverse housing options within close proximity of the MRTP's employment, and integrating neighborhood-serving retail, civic, and commercial uses in a manner that encourages bicycling, walking, and public transport. The growth area may also include exhibit halls and meeting space to support the development of the research and technology sector, and to serve the broader needs of South and Central Maui. Build-out of the MRTP should be coordinated with the development of the neighboring Kīhei Mauka planned growth area to ensure efficient intra- and inter-regional transportation connectivity for both motorized and non-motorized transportation. The MRTP should also develop pedestrian and bicycle linkages between the future Kīhei High School and the core commercial and civic uses within Central Kīhei. The MRTP planned growth area is located on Directed Growth Map #S1. Table 8-12 provides a summary of the planned growth area.

Table 8 - 12 : MRTP Planned Growth Area

Background Information:			
Project Name:	Maui Research and Technology Park	Directed Growth Map #:	S1
Type of Growth:	Urban Expansion	Gross Site Acreage:	437 Acres
Planning Guidelines			
Dwelling Unit Count:	Approximately 1,250 ¹⁷ Units	Residential Product Mix:	Balance of SF and MF units
Net Residential Density:	9-20 du/acre	Commercial:	Neighborhood serving retail and commercial
Net acres dedicated to non knowledge-based employment (parks, civic, residential, commercial)	Approximately 35%	Knowledge based employment:	Up to 2 million sq. ft.

¹⁶ Industries characterized by highly-skilled workers in fields such as science and research, biotechnology, clean technology, information technology, disaster mitigation, education, healthcare and medicine, media production as well as other industries supported in the Emerging Sector's Subelement, Chapter 4, MIP.

¹⁷ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

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Pulehunui

The Pulehunui planned growth area encompasses just over 639 acres and is located in the ahupua`a of Pulehunui and to the east of Mokulele Highway (see Figure 8-5). The planned growth area will be used primarily for heavy industrial, public/quasi-public, and recreational purposes. Commercial uses should be limited.

Planned Growth Area Rationale

The Pulehunui planned growth area envisions land uses that are compatible with surrounding agricultural operations. The planned growth area represents a logical expansion of industrial land use in the area. The area's location, midway between Kīhei and Kahului, makes it an ideal site to serve the island's long-term heavy industrial land use needs. Development of the area must ensure the protection of view corridors along Mokulele Highway as well as mauka and makai view planes. Linear-strip development along Mokulele Highway is strongly discouraged. Buildings should be setback significantly from the highway, and all traffic-light timing along Mokulele Highway should be coordinated for optimum traffic flow. The Pulehunui planned growth area is located on Directed Growth Map #C4 and #C5. Table 8-13 provides a summary of the planned growth area:

Table 8 - 13: Pulehunui Planned Growth Area

Background Information:		
Project Name:	Pulehunui Industrial	Directed Growth Map #: C4, C5
Type of Growth:	Urban Expansion	Gross Site Acreage: Approximately 639 Acres



Figure 8-5: Pulehunui Planned Growth Area.

Kīhei – Mākena – Planned Protected Areas

The Kīhei-Mākena community plan region has the second highest resident population with over 27,000 people in 2010. Two planned protected areas have been identified in the Kīhei-Mākena community plan region within Mā`alaea and Mākena; the Mākena – La Perouse – Kanaio Protected Area and the Keālia National Wildlife Refuge. A brief discussion of each protected area is provided below.

Mākena-La Perouse-Kanaio Protected Area

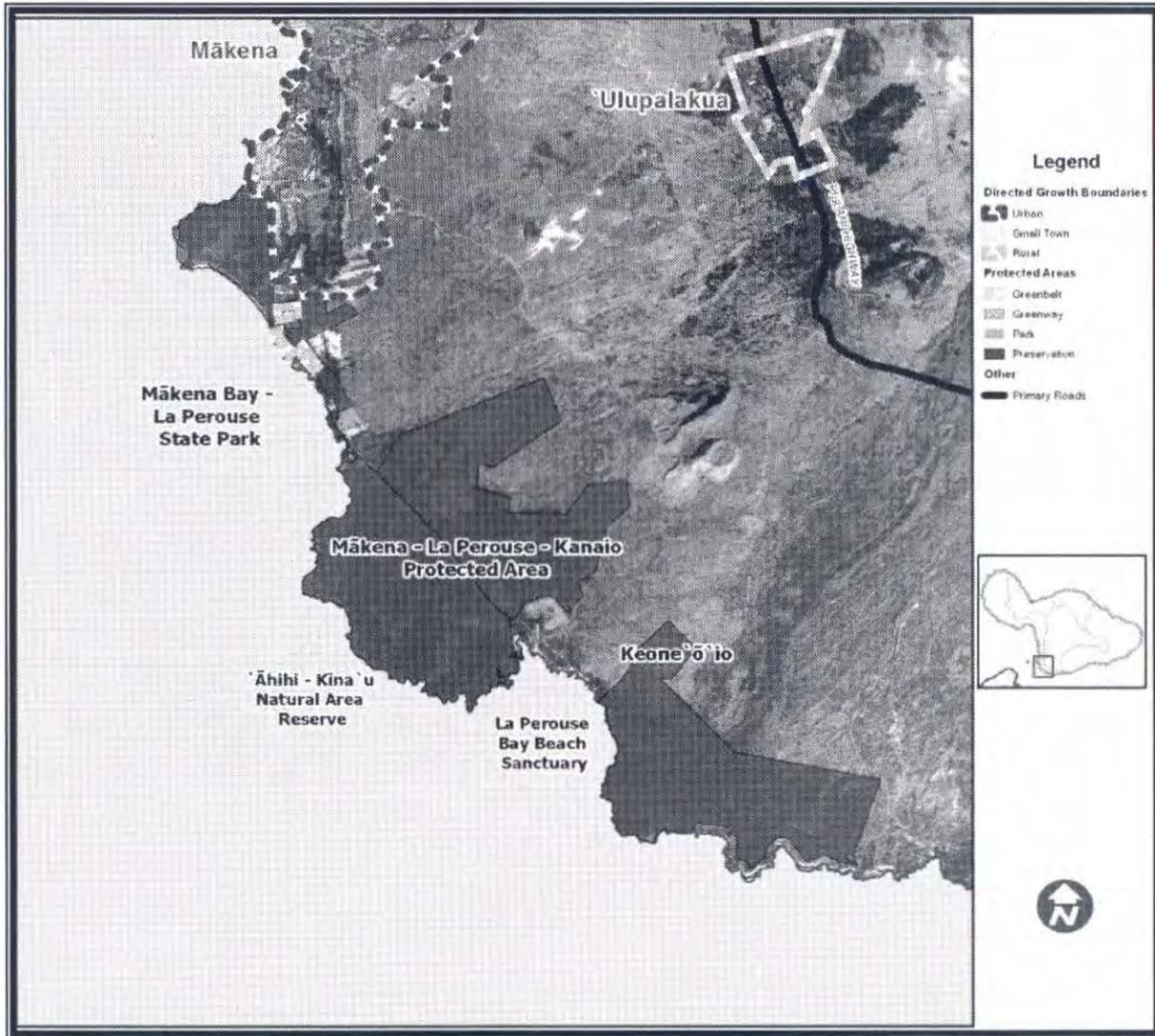


Figure 8 - 6: Mākena-La Perouse-Kanaio Protected Area.

The Mākena - La Perouse - Kanaio Protected Area is located on the southwest corner of the island and stretches from the edge of Mākena from Pu`u Ōla`i Point, along Mākena Alanui Road, Mākena Road, and extends approximately 6 miles southeast of La Perouse Bay (see Figure 8-6). This expanse of land includes a plethora of significant archaeological and cultural resources including the La Perouse Historic and Recreational Complex and the Hoapili Trail (King's Highway). The numerous environmental resources include sensitive lands, rare habitats, and the `Āhihi Kīna`u Natural Area Reserve, a marine protected area.

The Mākena-La Perouse-Kanaio Protected Area is intended to set aside and protect a series of shoreline lands with high natural and cultural resource value. The proposed design philosophy of the protected area is to create recreational access while not detracting from the inherent value of its natural condition and historic resources.

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Keālia National Wildlife Refuge

The Keālia National Wildlife Refuge is a 700-acre refuge that was established in 1992 and encompasses one of the last remaining natural wetland habitats in Hawai'i (see Figure 8-7). Located along the south-central coast of Maui, between the towns of Kīhei and Mā'alaea, it is a natural basin for a 56-square mile watershed from the West Maui Mountains. The 200-acre open pond seasonally floods to 450 acres in winter months. The wetland preserve is home to 31 species of birds and migrant waterfowl, including species that are listed as endangered and threatened. In addition to providing a vital habitat, the pond serves as a sedimentation basin that protects the nearby coastal waters from sedimentation runoff that would otherwise cause reef and water quality damage.

The pond is located east of Mā'alaea and is adjacent to Sugar Beach ("Kanaio", "Palalau", and "Kale'ia"), one of the longest remaining uninterrupted beaches on the island. Public access to the refuge area is limited. However, recent efforts to improve access have allowed for the development of visitor amenities, such as a parking area, educational boardwalk, and visitor center.

The following items shall be addressed to ensure the preservation and enhancement of the Keālia National Wildlife Refuge Protected Area: 1) Optimize habitat size to accommodate seasonal flooding and a healthy wetland floodplain by constructing the Mā'alaea-Keālia bypass highway and reclassifying the existing Highway 30 as a scenic roadway; 2) Develop a master plan for recreational coastal access along North Kīhei Road; 3) Strategically locate managed access points to the refuge to include viewing stations,

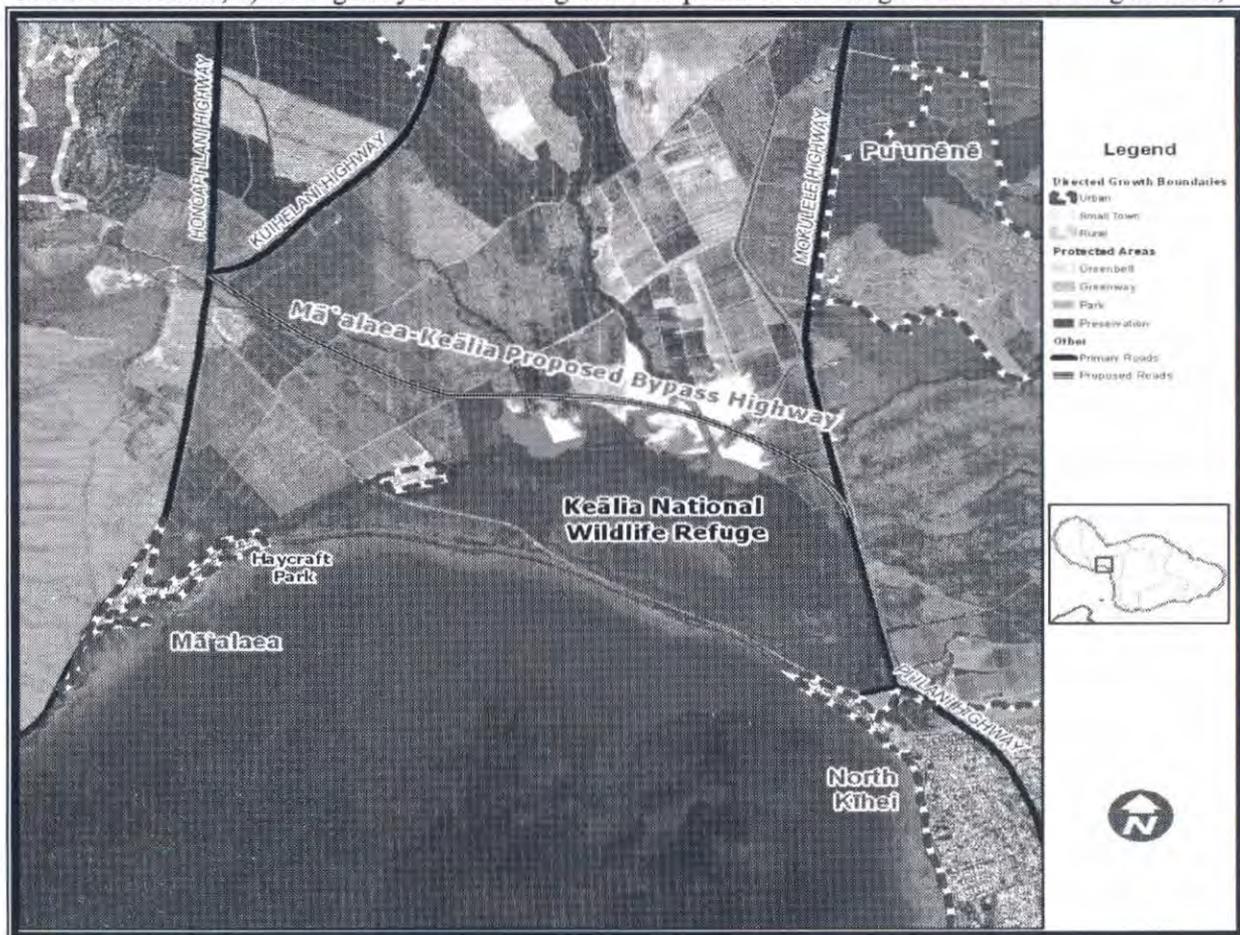


Figure 8 - 7: Keālia National Wildlife Refuge Planned Protected Area.

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visual aids, and educational opportunities for visitors; 4) Provide safe vehicular access to the site and nearby shoreline resources; and 5) Maintain or construct drift fencing to promote beach stabilization and nourishment. The refuge shall be developed based on best management practices intended for wetland bird sanctuaries.

Makawao – Pukalani – Kula

The Makawao-Pukalani-Kula community plan region, also commonly referred to as Upcountry, is characterized by abundant open space, agricultural lands, and rural towns. Because of the region's cool climate, spectacular views, and country lifestyle, its popularity as a place to live on the island has grown. The region has the third largest population with just over 25,000 people in 2010. With less than 4,370 jobs in the region in 2010, the area is primarily a bedroom community for the Wailuku-Kahului employment center. The region has four distinct sub-regions; Makawao, Pukalani, Kula, and Hāli`imaile. A brief discussion of each sub-region is provided below:

Makawao. Makawao is one of the region's two main settlement areas. Makawao has a strong historic connection to cattle ranching and is traditionally known as the last "paniolo town". Commercial land uses in the sub-region are concentrated in the area of the Baldwin Avenue and Makawao Avenue intersection. Recreational and civic uses such as the Eddie Tam Memorial Center sports complex, the Makawao post office and the Makawao public library are located within or adjacent to the town center. Residential areas are composed of suburban and rural subdivisions and the town is surrounded by ranch land and pineapple fields.

Pukalani. Pukalani is the second main settlement in the Upcountry region. Land use patterns in Pukalani include a main commercial center, the Pukalani post office, the Motor Vehicles and Licensing Office (Pukalani Office), Hannibal Tavares Community Center, and suburban and rural subdivisions. Commercial services in Pukalani cater to both neighborhood and regional customers. Recently, Kulamalu, a mixed-use commercial center has been developed along Kula Highway.

Kula. The Kula sub-region is characterized by a mixture of rural residential and agricultural uses. Diversified agriculture is an important industry and land use in the region. Small rural service centers are sprinkled throughout the Kula region. Several of these service centers, including the communities of Waiakoa and Kēōkea and the Kula Ace Hardware store, serve as community focal points.

Hāli`imaile. Hāli`imaile is a small community makai of Makawao town which was originally developed to house workers associated with the pineapple industry. The community is primarily residential, has a park and gym, and is surrounded by pineapple and sugarcane fields.

CHALLENGES AND OPPORTUNITIES

Major land use challenges and opportunities in the Makawao-Pukalani-Kula community plan region include:

Protecting Agricultural Lands Preserving rural character, protecting prime and productive agricultural lands, and maintaining a separation between communities are significant challenges. The region contains some of the most productive agricultural lands for diversified agriculture and thus contributes an important supply of agricultural produce to local markets. The County should enhance efforts to support bona fide farms to help keep agricultural operations a viable endeavor.

Maintaining a If the region continues to grow as it has in the last two decades, separation between

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Separation Between Communities communities will become blurred and each community will lose its unique identity. Future development must be focused within existing communities or be adjunct to existing urban areas, and provide, as much as possible, that large areas of open space are maintained between communities.

Rural Development Standards and Planning Tools Appropriate development and infrastructure standards are needed to preserve the region's character. Reduced level-of-service standards are not only a key characteristic of the rural lifestyle, they are important to the aesthetic and environmental objectives of the countryside. Planning tools, such as conservation subdivision design, can enable innovative site planning that will better protect natural resources and rural character.

Lack of Walkable Town Centers The Upcountry region is noted for its beauty; therefore, developments should evolve in harmony with the surrounding landscape, and minimize their urban footprint when possible. Ideally, small towns should continue to develop as small, compact commercial nodes that provide local jobs, goods, and services to immediate neighborhoods.

Limited Housing Choices: Except for Makawao, the Upcountry region lacks pedestrian-oriented town centers that are integrated with surrounding residential neighborhoods. Town and village centers should be enhanced to provide daily services and job opportunities for Upcountry residents.

Jobs/Housing Imbalance Only 2 percent of Upcountry housing units are multifamily. The lack of multifamily housing limits the housing options for residents. Future development in the region should provide a mix of single-family and multifamily housing units close to services, and in balance with employment opportunities to avoid bedroom communities

Makawao – Pukalani – Kula Planned Growth Areas

Nine planned growth areas have been identified for the Makawao – Pukalani – Kula community plan region: Makawao Makai, Makawao Town Expansion, Makawao Affordable Residential, Seabury Hall, Pukalani Expansion, Pukalani Makai, Hāli`imaile, Anuhea Place, and Ulupalakua Ranch. Planned growth areas are depicted in Figure 8-8 and on Directed Growth Maps #U1, #U2, #U3, and #U4.

New Regional Facilities Recommended – Upcountry Maui

- Network of greenways and pedestrian Pathways
- Paniolo Connector Road
- New water source development and water storage
- Solid waste baseyard

It is not the intent of the RGBs for agricultural subdivisions to rezone lands within the boundary to higher densities than is already permitted, but to apply a County Rural zoning district (2-, 5-, 10-acre minimum lot sizes) that reflects existing conditions or that is directed by the Community Plan. The Community Plan shall determine the appropriate densities and standards to apply within the Upcountry RGBs. Any restrictions on agricultural activity are prohibited. The exception to the density standard is the Anuhea Place planned growth area where the minimum lot size is one acre.

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Makawao Makai

Makawao Makai is a 39-acre planned growth area south of the Makawao Veterans Cemetery on the south side of Baldwin Avenue. The site has historically been used for pineapple production.

Planned Growth Area Rationale

Makawao Makai provides a logical expansion of the existing community and provides a hard edge for the existing Makawao Town. Access will be provided from both Baldwin Avenue and 'A'ala Place. The planned growth area is intended as a small town expansion with housing types and densities similar to existing Makawao Town. Parks and open space should be incorporated into the project. It will also be important to create pedestrian linkages between the town core and the expansion area to facilitate mobility. The Makawao Makai planned growth area is located on Directed Growth Map U1. Table 8-14 provides a summary of the planned growth area.

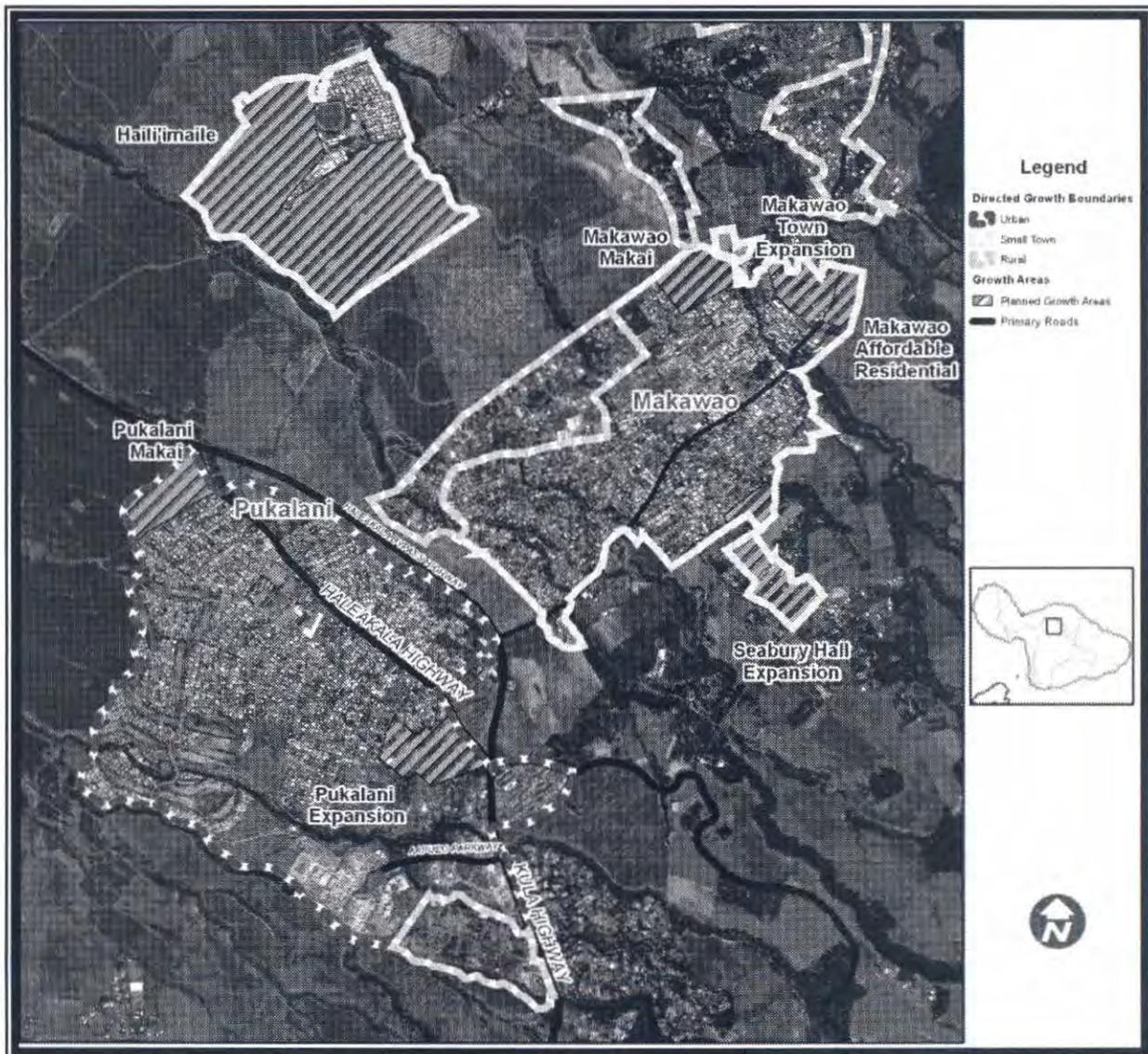


Figure 8 - 8: Makawao - Pukalani - Kula Planned Growth Areas.

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Table 8 – 14: Makawao Makai Planned Growth Area

Background Information:			
Project Name:	Makawao Makai	Directed Growth Map #:	U1
Type of Growth:	Small Town Expansion	Gross Site Acreage:	39 Acres
Planning Guidelines:			
Dwelling Unit Count:	Approximately 90 Units ¹⁸	Residential Product Mix:	100% SF
Net Residential Density:	4-6 du/acre	Parks and Open Space%	≥ 30% ¹⁹
		Commercial:	N/A

Makawao Town Expansion

The Makawao Town Expansion planned growth area provides an approximately 38-acre addition of land to the Makawao STB extending to the south-side of Kee Road. The growth area is intended to be developed in a manner that complements the existing Makawao Town and should preserve the existing rural character of the area as much as possible.

Makawao Affordable Residential

The Makawao Affordable Residential planned growth area is located mauka of Makawao Avenue at the intersection of Makawao Avenue and Pi`iholo Road. The area is bounded by Agricultural, Single-Family, and Public/Quasi-Public Community Plan designations. The goal of the Makawao Affordable Residential growth area is to provide affordable housing within walking distance of Makawao Town. The expansion area includes an approximately 20-acre linear growth area mauka of Makawao Avenue that begins at Pi`iholo Road and extends approximately 1,350 feet along the mauka side of Makawao Avenue and approximately 550 feet deep from Makawao Avenue.

Planned Growth Area Rationale

It is intended that the area will be developed with affordable housing. Access will be provided from Pi`iholo Road so as not to impede circulation patterns along Makawao Avenue. The purpose and intent of the Makawao Affordable Residential growth area may be further defined during the Makawao-Pukalani-Kula Community Plan update.

Seabury Hall

The Seabury Hall planned growth area adjacent to the Seabury campus is approximately 68 acres in size. The majority of the site is occupied by Seabury Hall facilities and undeveloped pasture lands. The entire growth boundary is comprised of lands owned by Seabury Hall.

Planned Growth Area Rationale

This area is included to provide for the gradual expansion of Seabury Hall and its support facilities. Limited residential facilities are planned for faculty housing. The development of employee or student housing may be appropriate as accessory uses for the school and a small number of accommodations may

¹⁸ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

¹⁹ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Makawao-Pukalani-Kula Community Plan update and the project review and approval process.

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be developed as accessory uses to the Seabury Hall campus for visiting professors, guest speakers, or campus visitors. Rural sprawl shall be avoided along Olinda Road between Makawao Town and Seabury Hall. The Seabury Hall planned growth area is located on Directed Growth Map #U1. Table 8-15 provides a summary of the growth area.

Table 8 - 15: Seabury Hall Planned Growth

Background Information:			
Project Name: Seabury Hall		Directed Growth Map #: U1	
Type of Growth: Small Town Expansion		Gross Site Acreage: 63 Acres	
Planning Guidelines:			
Dwelling Unit Count: N/A ₂₀		Residential Product Mix: N/A	
Net Residential Density: N/A		Parks and Open Space% ²¹ : ≥ 30%	
		Commercial: N/A	

Pukalani Expansion

The Pukalani Expansion planned growth area includes areas southwest of the Pukalani Triangle across Old Haleakalā Highway on vacant agricultural land. The expansion will be primarily residential with neighborhood parks and a small commercial component. The site is surrounded by urban, rural, and agricultural lots.

Planned Growth Area Rationale

The Pukalani Expansion is compatible with existing development in the area and is bounded by existing residential land uses, Old Haleakalā Highway, and Kalialinui Gulch, which creates containment for the new community. Agricultural, rural, and residential County zoning, as well as a linear corridor of commercial uses along Makawao Avenue, surround the expansion area. Considering development and infrastructure costs and the provision of a mix of lot sizes for single-family and multifamily units, the urban expansion site has the potential to provide affordable-resident housing for the Upcountry area. Like the Pukalani Makai planned growth area on the lower slope of the Old Haleakalā Highway, this area has good transit access and is proximate to existing public facilities, including elementary and high schools, as well as the Mayor Hannibal Tavares Community Center. Linkages should be developed between the town's activity centers and neighboring communities with an emphasis on providing safe pedestrian pathways. Multimodal linkages should also be developed to connect the Pukalani Expansion area to Makawao Town, the Pukalani Shopping Center, King Kekaulike High School and Kulamalu. The Pukalani Expansion is located on Directed Growth Maps #U1 and U2. Table 8-16 provides a summary of the planned growth area.

²⁰ A small number of teacher cottages may be developed as accessory uses to the Seabury Hall campus to provide accommodations for visiting professors, guest speakers, campus visitors, or other lecturers. the specific location of accessory educational uses, and the precise amenities will be further defined during the Makawao-Pukalani-Kula Community Plan Update and the project review and approval process.

²¹ The distinct boundaries of open space areas will be further defined during the Makawao-Pukalani-Kula Community Plan Update and the project review and approval process.

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Table 8 - 16: Pukalani Expansion Planned Growth Area

Background Information:					
Project Name: Pukalani Expansion			Directed Growth Map #: U1 & U2		
Type of Growth: Urban Expansion			Gross Site Acreage: 56 Acres		
Planning Guidelines:					
Dwelling Unit Count:	Approximately 311 Units ²²	Residential Mix:	Product A	Balance of SF and MF	
Net Residential Density:	9-11 du/acre	Parks and Open Space ²³ :	and	Open ≥ 20%	
Commercial: Neighborhood Serving					

Pukalani Makai

The Pukalani Makai planned growth area encompasses 45 acres of vacant agricultural land, and is located at the makai entrance of Pukalani town at the intersection of the Old Haleakalā Highway and the newer Pukalani Bypass. Along with the remnant 38-acre parcel that runs along the Pukalani Bypass between the turnoff to the Old Haleakalā Highway and Kua`āina Ridge, this area was once in pineapple cultivation and then briefly planted with papaya. This area is planned for residential single-family housing to include affordable workforce housing.

Planned Growth Area Rationale

The Pukalani Makai planned growth area will complete the makai corner of Pukalani, as it was intended in recent community plans. The area borders the existing residential land use of Pukalani Terrace above Old Haleakalā Highway on the north side, and Hāmākua Ditch below. Residential growth and a neighborhood park are intended for this area. Pukalani Makai has convenient highway access and is adjacent to the Pukalani Elementary School and the Mayor Hannibal Tavares Community Center, thus it is an appropriate location for residential growth. Parks and open space should be incorporated into the project to meet the long-term needs of the community. The Pukalani Makai planned growth area is located on Directed Growth Map #U1. Table 8-17 provides a summary of the planned growth area.

Table 8 - 17: Pukalani Makai Planned Growth Area

Background Information:					
Project Name: Pukalani Makai			Directed Growth Map #: U1		
Type of Growth: Urban Expansion			Gross Site Acreage: 45 Acres		
Planning Guidelines:					
Dwelling Unit Count:	Approx. 250 Units ²⁴	Residential Product Mix:	Single Family Dwellings		
Net Residential Density:	8-11 du/acre	Parks and Open Space ²⁵ :	≥ 15%		
Commercial: Neighborhood Serving					

²² Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

²³ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Makawao-Pukalani-Kula Community Plan Update and the project review and approval process.

²⁴ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

²⁵ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Makawao-Pukalani-Kula Community Plan Update and the project review and approval process.

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Hāli`imaile

The Hāli`imaile planned growth area is an expansion of the existing Hāli`imaile community. The site comprises approximately 330 acres both mauka and makai of Hāli`imaile Road. The communities will be compact with a mix of land uses, neighborhood commercial nodes, schools, parks, and open space integrated into residential areas.

Planned Growth Area Rationale

Although the expansion of Hāli`imaile will add growth to an existing town, it will be planned and designed as a new town with a town center, neighborhood commercial nodes, and public services built at the scale of the pedestrian to enhance the existing residential area and to create a complete community. The community should be designed to provide a range of affordable housing types for Maui residents. Clear edges should be established around the community to prevent sprawl, protect agricultural land, and maintain separation between Hāli`imaile and Makawao. The design and development of the Hāli`imaile planned growth area shall respect and complement the existing town and its historic precedent. Future developments shall incorporate pedestrian linkages to the existing community and minimize impacts to view planes from Baldwin Avenue towards the Hāli`imaile expansion area. Currently, the town is not visible from any roadways. The Hāli`imaile planned growth area is located on directed Growth Map #U1. Table 8-18 provides a summary of the planned growth area.

Table 8 - 18: Hāli`imaile Planned Growth Area

Background Information:			
Project Name: Hāli`imaile Expansion		Directed Growth Map #: U1	
Type of Growth: Small Town Expansion		Gross Site Acreage: 330 Acres	
Planning Guidelines:			
Dwelling Unit Count:	Approximately 825 Units ²⁶	Residential Product Mix:	Single Family Dwellings
Net Residential Density:	9-11 du/acre	Parks and Open Space% ²⁷ :	≥ 30%
		Commercial:	Neighborhood Serving

Anuheha Place

Anuheha Place is a planned rural growth area makai and on the south side of Kula Highway. It is comprised of approximately 111 acres along Anuheha Place, and 15 lots at 5 acres each. A portion of these lots are developed with residential homes, and the remaining portion is currently undeveloped. Hale O Kāula Church also lies within the subdivision.

Planned Growth Area Rationale

The Anuheha Place planned rural growth area provides for a low-density residential expansion of the existing Pukalani community. It is located along the southern edge of the existing Pukalani Community with access provided from Anuheha Place via Kula Highway. The planned rural growth area is intended to be developed consistent with the RU-1 County zoning district and shall have minimum lot sizes of no less

²⁶ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

²⁷ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Makawao-Pukalani-Kula Community Plan Update and the project review and approval process.

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than one acre. No prohibitions on agricultural uses and activities shall be allowed within this rural growth boundary. The Anuhea Place planned rural growth area is located on Directed Growth Map U2.

ʻUlupalakua Ranch

The ʻUlupalakua Ranch planned growth area is located on the southwestern slopes of Haleakalā. The ʻUlupalakua Ranch planned rural growth area encompasses the existing Ranch Store, Maui’s Winery ~ Tedeschi Vineyards, and widely-scattered employee housing within close vicinity to the ʻUlupalakua Ranch Store outpost on the mauka and makai sides of Kula Highway. Currently the 223-acre growth area includes employee houses and the village core.

Planned Growth Area Rationale

The Ulupalakua Ranch planned rural growth area identifies the location of ranch-owned homes and the existing small rural outpost within the heart of ʻUlupalakua. Access is provided from Kula Highway. The planned rural growth area is intended to identify the boundaries of the Ranch’s existing employee housing and provide limited opportunities for expansion of employee housing. It is not the intent of the RGB to develop lands for traditional nonemployee housing development. The ʻUlupalakua village core is located within the rural growth area and is within easy access to existing residences. The ʻUlupalakua Ranch planned rural growth area is located on Directed Growth Map #U4. Table 8-19 provides a summary of the planned growth area.

Table 8 - 19: ʻUlupalakua Ranch Planned Rural Growth Area

Background Information:			
Project Name:	ʻUlupalakua Ranch	Directed Growth Map #:	U4
Type of Growth:	Rural Expansion	Gross Site Acreage:	223 Acres
Planning Guidelines:			
Dwelling Unit Count:	N/A ²⁸	Residential Product Mix:	Single Family Dwellings
Net Residential Density:	N/A	Parks and Open Space%:	N/A
		Commercial:	Neighborhood and Visitor-related

Makawao-Pukalani-Kula – Planned Protected Areas

Upcountry Maui is characterized by abundant open space and conservation lands that provide for a diverse number of recreational outdoor activities. The region offers opportunities for biking, hiking, hunting, swimming, and organized outdoor activities in four distinct residential sub-regions; Makawao, Pukalani, Hāli’imaile, and Kula-ʻUlupalakua. There are two planned protected areas in the Makawao-Pukalani-Kula community plan region: Corn Mill Camp and the Upcountry Greenway.

Corn Mill Camp

Corn was successfully grown in Hawai’i for a century from 1851 to 1951. On Maui, corn operations helped Hawai’i achieve self-sufficiency and build the ranching and agricultural industries. In 1892, Louis von Tempsky founded the Makawao Corn Mill Company with partners Randall von Tempsky and Llewellyn F. Hughes. The new company originally operated on two acres of land in Makawao known then as “David Crowningburg pasture,” owned by Haleakala Ranch Company. By 1892, 4,000 acres of

²⁸ The growth boundary is intended to accommodate upgrades to existing employee housing within the ʻUlupalakua Ranch planned growth area, and to provide for a limited expansion of future employee housing.

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corn were being grown in Kula with all corn ground and processed at the Makawao Corn Mill camp. During the 1900s, Hawai'i had a good market and excellent prices for corn, with local production unable to keep up with demand. By 1909, 3,200 acres of corn were planted statewide, and Kula was known as a "corn-raising region." During the war, over 9,000 acres of corn were being grown, reflecting the plantation's response to the call to aid in the war effort. After 1920, corn production dropped quickly to less than 1,900 acres as a result of bad agricultural practices and the rise of pineapple as a profitable commodity.

The remains of the former historic Corn Mill Camp site are identified as the Corn Mill Camp Protected Area located in Pukalani. The intent of the preservation boundary shall be to protect and preserve Corn Mill Camp's historic resources, which may include the adaptive reuse of the existing Corn Mill Camp historic complex. The Secretary of the Interior's Standards shall be utilized for rehabilitating historic structures.

Upcountry Greenway

The Upcountry Greenway planned protection area is within the Makawao-Pukalani-Kula community plan region. Portions of Upcountry Greenway planned protected area are also within the Pā'ia-Ha'ikū Community plan region (*Upcountry Greenway Master Plan, 2004*). The goal of the Upcountry Greenway is to provide an integrated system of nonmotorized transportation facilities and recreation multi-user routes, trails and paths that are compatible with existing and future land uses in the region. A brief discussion of the protected area is provided below.

The Upcountry Greenway is envisioned as a regional network of bikeways, equestrian trails and pedestrian paths that provide linkages between three geographic sub-areas: Pā'ia-Ha'ikū; Makawao-Pukalani; and Kula-'Ulupalakua. Transportation components of the system will establish inter- and intra-community linkages and satisfy the origin-destination objectives of potential users. Greenway facilities may also provide transportation connections between the communities of Makawao and Pukalani or Waiakoa and Kēōkea. The trails will serve as a multifunctional regional system of nonmotorized travel ways physically separated from roadways. Ancillary facilities such as restrooms, trail guidance facilities, parking areas, and signage are also envisioned.

The following general planning principles shall be addressed during route and alignment selection and development of the trail system:

1. Off-road facilities shall be integrated with existing State and County roadway systems with consideration given to connection point safety. In integrating off-road facilities with existing State and County roadways, consideration shall be given to providing connection locations which facilitate greenway system continuity.
2. Both transportation and recreational facilities shall be limited to non-motorized uses. Thus, design of the greenway system shall at a minimum, address the needs of pedestrians (walkers, joggers, hikers, skaters) horseback riders and bicyclists.
3. The definition of trail routing and alignments shall respect existing uses, existing property boundaries, and man-made and natural physical barriers (i.e. fences, walls, topographic features, etc.) and conservation goals. Particular attention shall be given to the relationship between greenway-facility use and agricultural requirements.
4. The greenway shall be developed based on best practices for interconnected trailway systems.

Pā`ia-Ha`ikū

The Pā`ia-Ha`ikū community plan region has the second smallest population and projected average annual rate of population increase of all community plan regions on the island. Even though the region's population of about 13,000 people as of 2010 is not expected to increase significantly by 2030, the manner in which the region grows is an important land use issue. The region has two sub-regions; Pā`ia and Ha`ikū. A brief discussion of each sub-region is provided below.

Pā`ia. Pā`ia is the primary service center for the region. Although it is close to the commercial, industrial, and employment centers of the Wailuku-Kahului Community Plan region, Pā`ia has maintained its country town scale and character. Commercial land uses are primarily located at the intersection of Hāna Highway and Baldwin Avenue and residential areas stretch along both of those roads. Pā`ia has a strong connection to Maui's plantation history and is the major tourist destination along the north shore.

Ha`ikū. The land use pattern in the Ha`ikū sub-region is predominantly low-density agricultural subdivisions with a few small pockets of urban settlement at Ha`ikū town, Pa`uwela and Kuiaha. Limited commercial services and jobs exist in the Ha`ikū area, concentrated in the vicinity of Ha`ikū Marketplace. A large number of cottage industries operate within this region with a proportion of businesses operating out of residences. Agricultural activities include nursery operations and other forms of diversified agriculture.

CHALLENGES AND OPPORTUNITIES

Major land use issues in the Pā`ia-Ha`ikū community plan region include:

Protecting Rural Character & Sense of Place

Maui's North Shore contains a diverse number of exceptional natural resources and landscapes, including productive agricultural lands, dense forest lands, scenic vistas, marine resources, and other environmental resources that could become fragmented and irreversibly degraded by unmanaged growth. In particular, insensitively-designed subdivisions could degrade the quality of life in this area and as such, the primary challenge will be to protect the mixture of large and small lots that give this region its unique charm and landscape. Protecting the distinctive character and natural beauty of the area can be achieved through the development of tools such as conservation subdivision design which enables innovative site planning.

Inefficient Land Use Patterns

The dominant pattern of development within the Pā`ia-Ha`ikū region is low density residential development, frequently in the form of agricultural subdivisions. This dispersed pattern of land use is inefficient and can stress regional infrastructure systems and public services. Future development in the area should be focused in existing communities and should provide a mix of uses to support area residents. Investments should be focused on providing green infrastructure throughout the region with an emphasis on providing interconnections between adjacent communities.

Protecting the North Shore's Sense of Place

Maui's North Shore has remained relatively pristine, even during periods of significant development on the rest of the island. Maui's North Shore provides a growing number of small-scale entrepreneurial opportunities, such as diversified agriculture, alternative tourism, world-class ocean and land recreational activities, and health and wellness. It is imperative that future development doesn't compromise the area's rural character and scenic and environmental resources.

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Tsunami Inundation

Portions of historic Pā`ia and the community of Ku`au lie within the tsunami inundation zone. Future planning must carefully consider these threats, and to the extent possible, development should be thoughtfully directed mauka to areas not threatened by coastal hazards. Future planning should also ensure that adequate routes exist for safe evacuation of area residents in the event of a tsunami or hurricane (see Chapter 3, Natural Hazards).

Poorly Defined Ha`ikū Commercial Center

Ha`ikū Cannery is the primary commercial node for the Ha`ikū region and continues to evolve rapidly. The Ha`ikū urban core should utilize the available urban zoned land in a more efficient manner to develop a vibrant town core. Future revitalization efforts should focus on creating a safe, walkable town as well as ensuring the safety and welfare of the community. Business should strive to create a diverse range of jobs for local residents, and should offer a variety of basic goods and services to help reduce interregional trips.

Pā`ia – Ha`ikū – Planned Growth Areas

Three new planned growth areas have been identified in the region: Pā`ia Expansion, Pā`ia Mauka, and Old Maui High School Campus Revitalization. Planned growth areas are depicted in Figure 8-9 and on Directed Growth Maps #N1 and #N2.

New Regional Facilities Recommended – North Maui

- Pā`ia Bypass Road
- Connect new planned growth areas to public wastewater
- North Shore preservation corridor, bikeway and pedestrian paths

It is not the intent of the RGB for agricultural subdivisions to rezone lands within the boundary to higher densities than is already permitted, but to apply a County Rural zoning district (2-, 5-, 10-acre minimum lot sizes) that reflects existing conditions or that is directed by the Community Plan. The Community Plan shall determine the appropriate densities and standards that shall apply within the Pā`ia- Ha`ikū growth boundaries. Any restrictions on agricultural activity are prohibited.

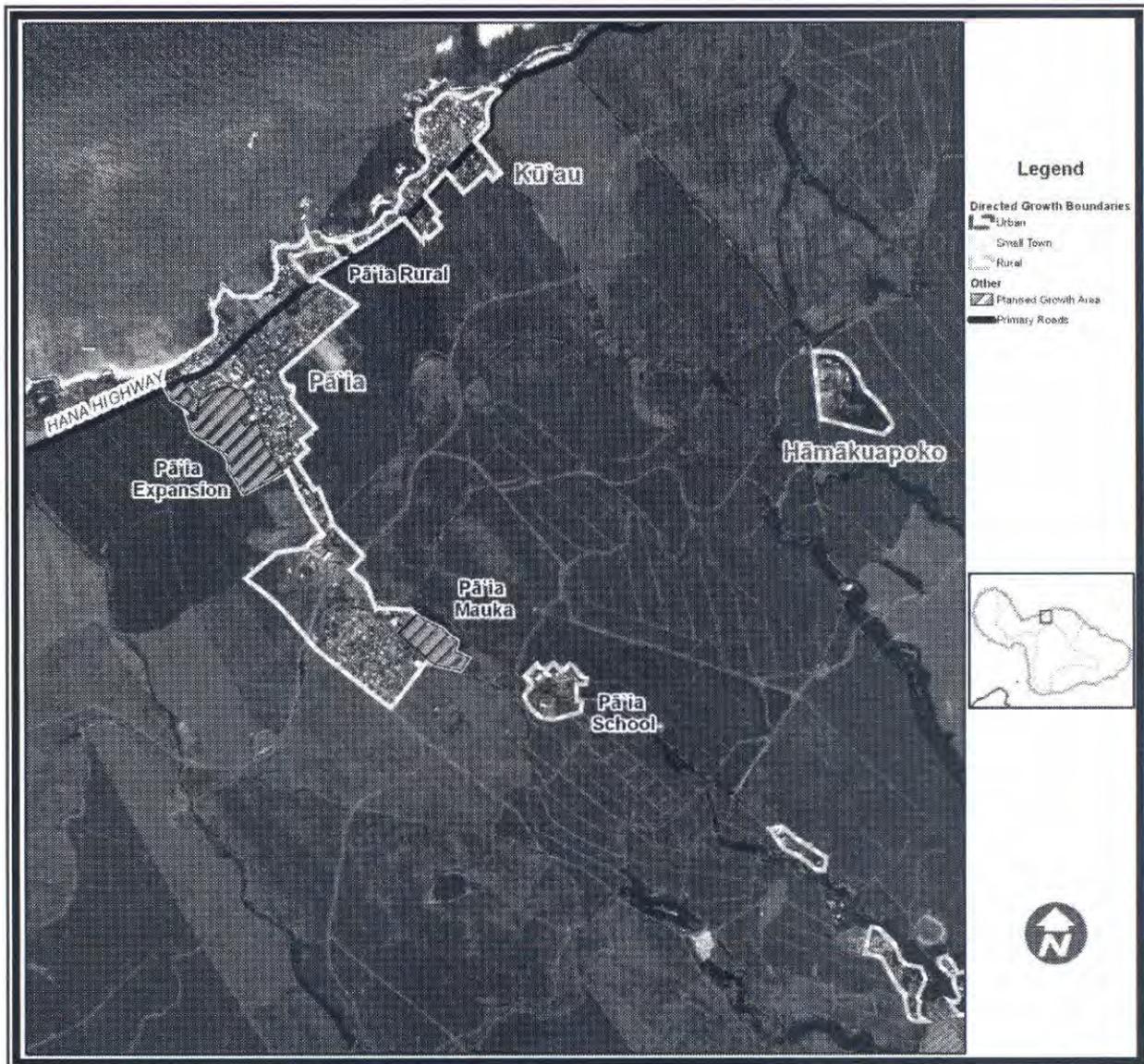


Figure 8 - 9: Pā'ia-Ha'ikū Planned Growth Areas.

Pā'ia Expansion

The Pā'ia Expansion planned growth area is approximately 41 acres and encompasses agricultural land west of Baldwin Avenue in Lower Pā'ia. The expansion is makai of the Pā'ia Post Office. The site is envisioned as a compact, mixed-use small town expansion that replicates the authentic architectural styles and design vocabulary of the business country towns of Maui.

Planned Growth Area Rationale

The Pā'ia Expansion accommodates projected growth within the Pā'ia-Ha'ikū Community Plan region with minimal impact on agricultural lands and existing infrastructure and services. Although the site is located on prime agricultural-resource land, directing regional growth to this site and requiring compact country town design will help preserve other agricultural lands and open space, and prevent the

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continuation of the current trend of low-density development across the region's landscape. Additionally, urbanization of the site will provide residential housing in a location that is adjacent to Pā'ia Town's employment opportunities. The site should be developed as a dense, mixed-use expansion of the adjacent Pā'ia Town that complements the existing community. The expansion should be designed to provide multimodal connections between the existing and new community, and to other areas of the island. Development within the expansion area should include a mix of residential and commercial uses, lot sizes, and single-family and multifamily housing units. The area should also include appropriate public facilities, services, parks, a medical clinic, civic and open spaces, as well as neighborhood-serving transit stops. A hard edge will need to be maintained around the expansion to prevent urban sprawl. It will also be important to expand the study area of the existing Pā'ia-Ha'ikū Country Town Design Guidelines to include the new growth area. This will ensure that new developments complement rather than detract from Pā'ia's unique historic character. The Pā'ia Expansion planned growth area is located on Directed Growth Maps #N1 and #N2. Table 8-20 provides a summary of the planned growth area.

Table 8 - 20: Pā'ia Expansion Planned Growth Area

Background Information:			
Project Name: Pā'ia Expansion		Directed Growth Map #: N1 and N2	
Type of Growth: Small Town Expansion		Gross Site Acreage: 41 Acres	
Planning Guidelines:			
Dwelling Unit Count:	Approximately 207 Units ²⁹	Residential Product Mix:	A Balance of SF and MF units
Net Residential Density:	7-10 du/acre	Parks and Open Space% ³⁰	≥ 30%
		Commercial:	Neighborhood Serving

Pā'ia Mauka

The Pā'ia Mauka planned growth area is on the east side of Baldwin Avenue, mauka of the Doris Todd Memorial School campus. This 15-acre residential area is planned for an expansion of Skill Village. This growth area has a view corridor to the ocean and is directly adjacent to existing infrastructure. The Pā'ia Mauka planned growth areas is located on Directed Growth Map #N2. Table 8-21 provides a summary of the planned growth area.

Table 8 - 21: Pā'ia Mauka Planned Growth Area

Background Information:			
Project Name: Pā'ia Mauka Expansion		Directed Growth Map #: N2	
Type of Growth: Small Town Expansion		Gross Site Acreage: 15 Acres	
Planning Guidelines			
Dwelling Unit Count:	Approximately 68 Units ³¹	Residential Product Mix:	100% SF
Net Residential Density:	6-10 du/acre	Parks and Open Space% ³²	≥ 20%
		Commercial:	NA

²⁹ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

³⁰ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Pā'ia - Ha'ikū Community Plan update and the project review and approval process.

³¹ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

³² The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the Pā'ia - Ha'ikū Community Plan Update and the project review and approval process.

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Old Maui High School Campus Revitalization Area

The Old Maui High School Campus Revitalization planned growth area is located in the Hāmākuapoko region. The region is comprised of fertile agricultural lands with a long history of sugarcane production. The project site is the last remaining vestige of Hāmākuapoko camp, which was once a vibrant plantation camp community. The Old Maui High School campus is comprised of three parcels totaling roughly 24 acres. The project site contains several reusable buildings, an abundance of mature landscaping, concrete walkways, open space, and approximately 15 acres of vacant land for expansion.

Planned Growth Area Rationale

Since the closure of the Old Maui High School in 1972, the campus has slowly fallen into disrepair. Efforts to restore the historic campus began in 2003 with the portion of the school designed by Charles William “C.W.” Dickey, an American architect famous for developing a distinctive Hawaiian architectural style. The purpose of the planned growth area is to facilitate the preservation and rehabilitation of the site and structures at the historic school, giving the campus a new life and purpose as an educational facility. The revitalization and reuse of the Old Maui High School campus may include the development of the Patsy T. Mink Center, a youth-educational camp, an adult retreat, a conference center, a farmer’s market, and campus facilities for private functions and special events. The project may also include classrooms, meeting rooms, teacher’s cottages, youth-guest facilities, agricultural activities, and other similar uses.

The Old Maui High School Campus Revitalization planned rural growth area is located on Directed Growth Map #N2. Table 8-22 provides a summary of the planned rural growth area.

Table 8 - 22: Old Maui High School Campus Revitalization Planned Growth Area

Background Information:			
Project Name: Old Maui High School		Directed Growth Map #: N2	
Type of Growth: Rural Expansion		Gross Site Acreage: 24 Acres	
Planning Guidelines:			
Dwelling Unit Count:	N/A	Residential Product Mix:	Single Family Dwellings
Net Residential Density:	N/A	Parks and Open Space%:	N/A
		Commercial:	Educational

Pā`ia – Ha`ikū – Planned Protected Areas

The Pā`ia-Ha`ikū community plan region is known as a world class wind, kite, and wave surfing destination. Ocean sports and a string of beaches draw a large transient population to the region, infusing the community with periods of high economic activity during surfing season. Along Hāna Highway, historic Pā`ia attracts a significant visitor population for its proximity to Hāna, and its shopping and restaurants. Pā`ia is the primary small commercial town of the North Shore region. Ho`okipa Beach Park, which currently attracts professional surfing competitions, has been identified for a major expansion in the Pā`ia-Ha`ikū Community Plan. Four planned protected areas have been identified in the Pā`ia-Ha`ikū community plan region: The North Shore Preservation Corridor, the North Shore Bikeway, portions of the Upcountry Greenway, and Giggie Hill. The Upcountry Greenway is comprised of three subareas, one of which falls within the Pā`ia-Ha`ikū community plan region (see “Makawao – Pukalani – Kula Planned Protected Areas”). The North Shore Bikeway also crosses into the Wailuku-Kahului

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Community plan region. A brief discussion of each of the four planned protected areas is provided below.

The North Shore Preservation Corridor

The North Shore Preservation Corridor is a protected area that encompasses a string of shoreline lands with high scenic and recreational value. The coastal preservation corridor begins at the eastern boundaries of Kanahā Pond Natural Wildlife Preserve and extends to Pa'uwela Point (see Figures 8-10a and 8-10b).

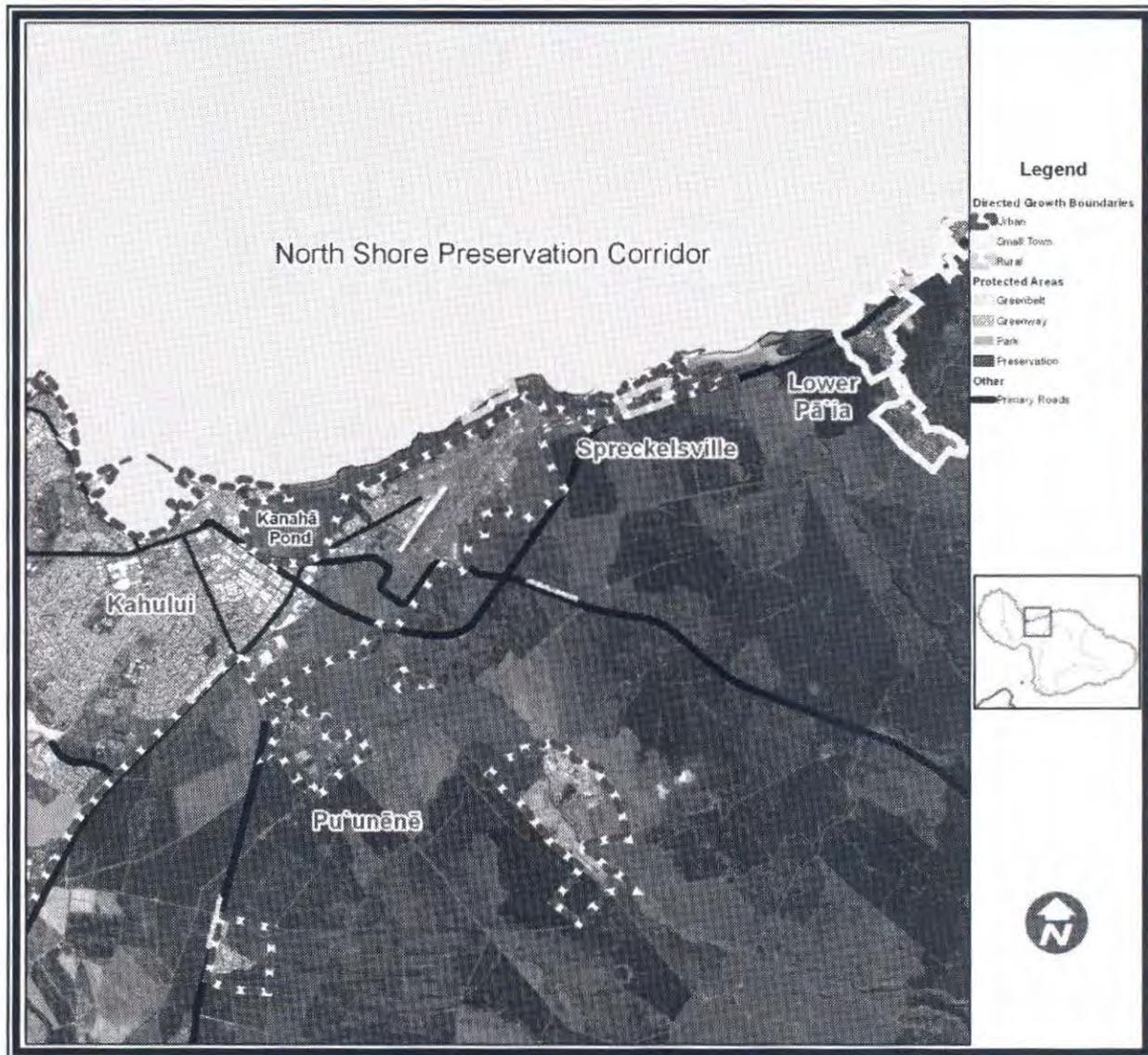


Figure 8 – 10a: North Shore Preservation Corridor.

Multiple beaches and shoreline properties are identified as part of the corridor with some inland lands also included. Numerous shoreline public access points dot the various beaches from Kanahā to the Māliko Gulch small-boat launch. The corridor also includes various isolated sites from Ho'okipa Beach Park to

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Māliko Gulch, and a greenway trail from Spreckelsville to Makaiwa. The corridor also includes lands appropriate for flood control, parking, and cultural and historic interpretation.

The area will provide access to coastal lands for fishing, surfing, and swimming through multiple beach access points, and walking and biking routes. According to the North Shore Corridor Report (2006), linkages to each designated protected sub-area are intended to provide an opportunity to interpret the area's significant cultural and historic sites. The County should seek to preserve land for the establishment of a trail system along the Hāmākua Coast area, and, where possible, preserve existing sections of the Old King's Highway (Ke Ala Loa O Maui/Pi'ilani Trail). Accurate mapping of old trails and government roads for future use as public access routes will also need to be developed.

Access points to and along beaches such as Airport Beach, Baby and Baldwin Beach, Pā'ia Bay, Tavares Bay, Ho'okipa Beach Park, will be identified during the design phases.

The North Shore beaches serve thousands of residents and visitors every day. The project envisions the acquisition of shorefront sites for future parks and lands focusing on the following areas:

- a. Adoption of a mauka/makai access dedication ordinance to acquire accesses through purchase, dedication, condemnation, or land exchange;
- b. Development of a regional beach park between Baldwin Park and "Small Park";
- c. Establishment of a community park near Ha'ikū School on Pa'uwela Road, as identified within the Community Plan map;
- d. Expansion of Ho'okipa Park and the establishment of parks at Māliko Bay and Pa'uwela Point; and
- e. Preservation of rodeo grounds at Māliko.

The following general planning principles shall be addressed during the design and development phases of the North Shore Preservation Corridor:

1. Access points shall be integrated with existing State and County public facilities and shall respect private property rights with consideration given to connection-point safety. In integrating access ways with existing State and County roadways, consideration shall be given to providing connection locations which facilitate greenway-system continuity.
2. The design of the greenway system should, at a minimum, maintain the existing character of the area, and address the needs of pedestrians (walkers, joggers, hikers, skaters), horseback riders, and bicyclists.
3. The definition of trail routing and alignments shall respect existing uses, existing property boundaries, manmade and natural physical barriers (i.e. fences, walls, topographic features, etc.), and conservation goals. Particular attention shall be given to the relationship between recreational uses and private property uses.
4. Shoreline resources and some inland areas shall be designated based upon their high scenic, natural resource, cultural resource, or recreational value.

The North Shore Bikeway and Upcountry Greenway System

The North Shore Bikeway is a continuous non-motorized transportation route between the coastal communities of the North Shore and Central Maui. The Bikeway serves as a recreational outlet for pedestrians, bicyclists, skaters, and other types of recreational users that is separated from the roadway, and links to various shoreline recreational resources, coastal towns, and the Upcountry Greenway system.

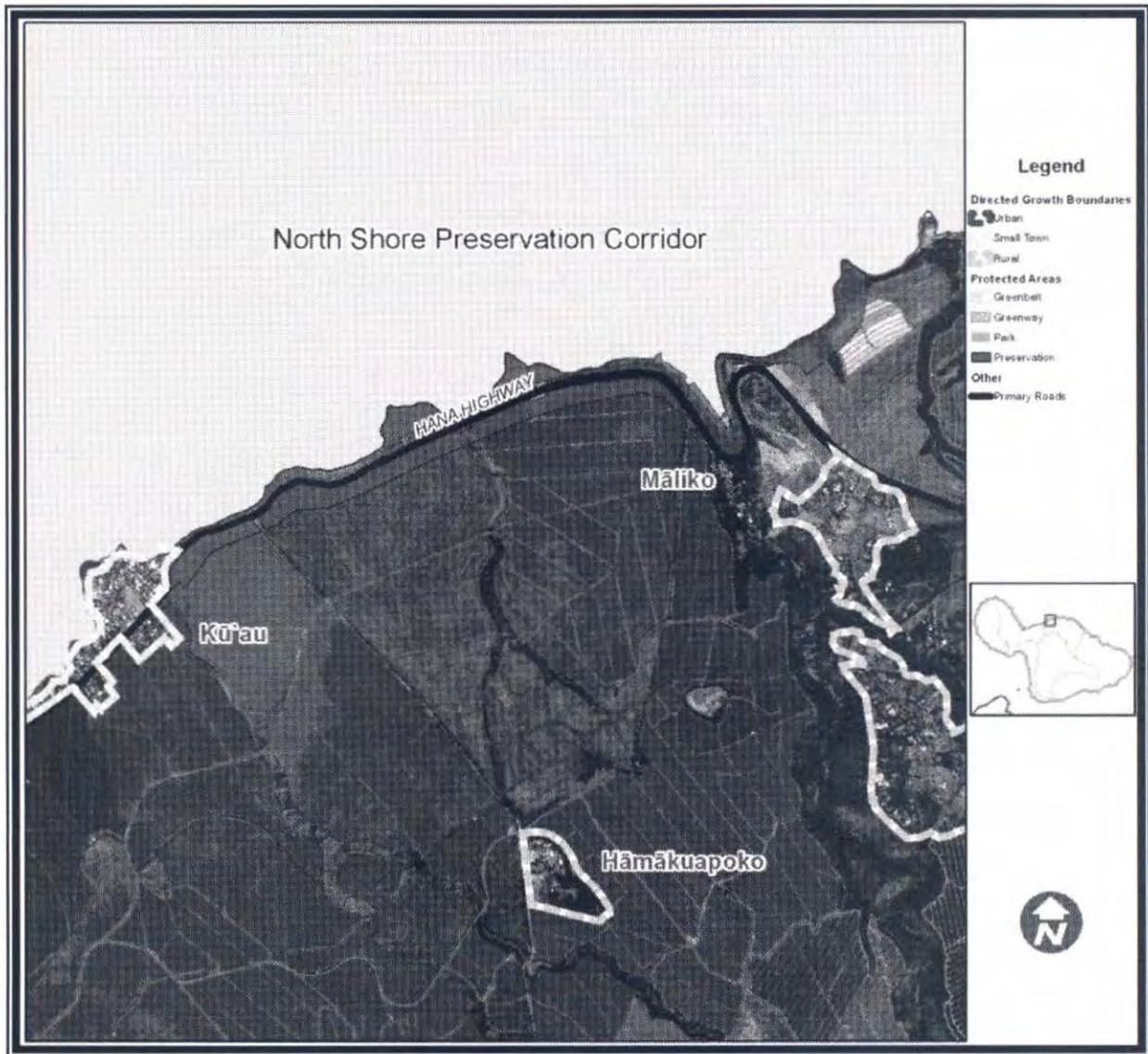


Figure 8 – 10b: North Shore Preservation Corridor.

Giggle Hill Recreational Area

Giggle Hill Recreational Area is a 95-acre regional park within the Pā'ia-Ha'ikū community plan region that encompasses the iconic Giggle Hill and provides a primary connection to the Upcountry Greenway system. It is located adjacent to the Fourth Marine Division Memorial Park, a 40-acre community park

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that commemorates the site of the Fourth Marine Division camp, a military encampment that was at this location from February 1944 to November 1945. The park is used for a variety of active and passive recreational uses, including a sporting field, playgrounds, park facilities, parking, and a network of hiking and equestrian trails. Expansion of the park to include Giggle Hill will provide for public access and use of the trail system around and on top of the hill.

The Giggle Hill Recreational Area will also provide continuous non-motorized connections to the Upcountry Greenway system, which links the coastal communities of the North Shore and Upcountry. The park serves as a recreational resource for many hikers, equestrians, and other types of recreational users seeking trail systems and open-space resources that are separated from automobile roadways. Future design and planning for the area should seek to increase access for equestrians and hikers, and should maintain separation from motorized corridors as much as is practicable.

West Maui

The West Maui community plan region is somewhat isolated from the rest of the island due to topography and limited highway access. The region has the fourth largest population with over 22,000 people in 2010, and the largest visitor population. The region has four distinct sub-regions: Ukumehame, Olowalu, Lahaina, and the band of urban settlements along the shoreline from Kā'anapali to Kapalua. A brief discussion of each sub-region is provided below:

Ukumehame. Ukumehame is the southernmost settlement in the West Maui community plan region. It is a low-density agricultural subdivision that still contains vacant undeveloped lots. Today, the community consists of small agricultural lots with residential and small scale agricultural uses. The community is surrounded by fallow sugarcane fields and significant cultural resources.

Olowalu. Olowalu is north of Ukumehame in the West Maui community plan region. It is the site of an old Hawaiian settlement and the former Olowalu Sugar Company. Today the community is very small, consisting of limited commercial services and sparse residential uses. The community is surrounded by fallow sugarcane fields and significant cultural resources.

Lahaina. Lahaina Town serves as the region's visitor, service, commercial, and residential center. The area is rich with history and culture, and possesses a unique character and charm that draws residents and visitors alike. Urban development exists along the coastline and also extends mauka along Lahainaluna Road. Fallow sugarcane fields lie to the north and south of Lahaina town.

Kā'anapali to Kapalua. North of Lahaina is a band of urban settlement encompassing the communities of Kā'anapali, Kahana, Honokōwai, Nāpili, and Kapalua. The majority of the development in this sub-region is centered on the visitor industry, although limited resident housing does exist. The settlements are primarily along the shoreline with some development mauka of Honoapi'ilani Highway.

CHALLENGES AND OPPORTUNITIES

Major land use challenges and opportunities in the West Maui community plan region include:

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Regional Isolation

West Maui is one of the fastest growing regions on Maui and is geographically isolated from the rest of the island. Honoapiʻilani Highway is currently the primary regional transportation corridor that connects West Maui to the rest of the island. During emergencies, traffic conditions are exacerbated and residents can become dangerously cut off from the rest of the island.

Self-Sufficiency

West Maui's visitor industry is a significant source of jobs and economic activity. Although West Maui contains large employment centers in Kapalua, Ka'anapali, Lahaina, and dispersed job opportunities in Kahana and Napili, the region lacks housing for employees. As the region grows, there is an opportunity to develop workforce housing and services near existing employment centers to create more self-sufficient and sustainable communities. Furthermore, the development of regional services and public facilities, such as a community hospital, would make the entire region more self-sufficient. This strategy should reduce the need for many interregional trips and provide convenience to the local residents.

Auto-Dependency and Traffic Congestion

The West Maui community plan region is a predominantly linear community dependent on one major highway. Resident and visitor population growth have surpassed the capacity of the Honoapiʻilani Highway, and traffic congestion has become an everyday problem. The Lahaina Bypass project and the realignment of the highway South of Lahaina Town (in accordance with the *Pali to Puamana Parkway Master Plan*) is necessary to alleviate this congestion, accommodate future growth, and mitigate the impact of flooding and erosion on the highway. Highway realignment also presents an important opportunity to create recreational and open space on the makai side of the highway. Efforts should also be made to increase the number of intraregional transportation linkages to increase mobility. Additional pedestrian and bike pathways, traffic calming measures, as well as public transit access are also needed to provide alternative mobility options and decrease dependency on the automobile.

Tsunami, Sea Level Rise and Fire Hazards

Tsunami, sea-level rise, and fire hazards also pose a significant threat in West Maui. Miles of developed coastline lie within the tsunami inundation zone and in the path of sea-level rise. Moving development away from these threats will be a significant challenge, particularly in the resort areas. Several times a year, forest and brush fires block highway access to the region, and threaten lives and property.

Inadequate Infrastructure

Inadequate infrastructure is a major land use problem in West Maui. Infrastructure improvements are not occurring concurrent with new development, which stresses existing public systems and services and decreases the quality of life in the region.

Loss of Agricultural Land and Open Space

With the closure of Pioneer Mill and Maui Pineapple Company, West Maui has vast acres of vacant agricultural land that are proposed for development. Agricultural land and open space are important to the region's visitor industry, and they are vital components of maintaining separation between West Maui's individual communities. Agricultural lands and natural features, such as gulches, should be used as boundaries between communities to prevent urban sprawl mauka of the existing Honoapiʻilani Highway.

Lack of Affordable Resident

Offshore buyers are a predominant force in the West Maui housing market. Affordable resident housing is scarce, leaving local families with limited housing options and long commutes to employment. Future growth in the region should be in locations conducive to providing affordable housing, and should offer a mix of housing types within close proximity to commercial services, public facilities, employment opportunities and transit.

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Housing

The coastline that stretches along West Maui is famous for its white sandy beaches and scenic beauty. The last five decades have brought rapid growth and development to the region, particularly near the shoreline. This development has generated nonpoint source pollution that has degraded the region's coral reefs, fish stocks, and water quality.

Impact of Development on Marine and Shoreline Resources

There are limited development possibilities in the narrow stretch of land that surrounds the West Maui Mountains. This, combined with the inclination to build close to the shoreline, has caused a great deal of grading and paving near environmentally-sensitive shoreline areas. Unfortunately, past construction projects have resulted in the runoff of sedimentation, fertilizers, and stormwater into the area's nearshore waters. Future planned projects risk committing the same detrimental mistake.

As the population has increased, so has the number of people who spend leisure time snorkeling, boating, surfing, fishing, and swimming in the area's marine environment. The increased use of the area along with development-related nonpoint source pollution, has stressed some of the healthiest reefs left on the island.

Protection of Important Historic Landmarks and Resources

Lahaina contains a rich history and many historically significant resources deserving protection. Lahaina was established as the first capital of the Kingdom of Hawai'i circa 1798 by Kamehameha I and remained so through 1846 when it was moved to Honolulu by Kamehameha III. The site of the royal compound was Moku'ula. West Maui contains many other significant resources, including Maui County Historic Districts 1 and 2 and the Lahaina National Historic Landmark District. These and other resources are currently at risk due to neglect, inaccurate restorations, and demolitions. The County would benefit by increased efforts to protect and preserve West Maui's living and historic resources.

West Maui – Planned Growth Areas

According to the Land Use Forecast, approximately 4,000 additional residential units are needed to accommodate projected growth in the West Maui region. Seven planned growth areas have been identified within the region; Kā'anapali Town, Lahaina Town North, Lahaina Infill, Lahaina Town South, Kahoma Infill, Makila, and Olowalu Town. Planned growth areas in West Maui are depicted on Figures 8-11, 8-12, and 8-13 and on Directed Growth Maps #W2, W3, and W4.

New Regional Facilities Recommended – West Maui

- Lahaina bypass
- Honoapi'ilani Highway (Pali to Mā'alaea) bypass
- Honoapi'ilani Highway Realignment (Pali to Puamana Parkway)
- Lahaina Flood Control Project
- Move fire station
- New police station
- Recycling center
- Elementary and intermediate schools
- Cemetery
- Regional park
- Lahaina Harbor Improvements
- Additional park and ride facilities
- Expanded transit service
- West Maui acute care hospital
- Wastewater reuse
- Cesspool retirement – connection to sewer
- West Maui Watershed Restoration Project



Figure 8 - 11: Kā'anapali Town – Planned Growth Area.

Except as otherwise provided for this region, it is not the intent of the RGBs for agricultural subdivisions to rezone lands within the boundary to higher densities than is already permitted, but to apply a County Rural zoning district (2-, 5-, 10-acre minimum lot sizes) that reflects existing conditions or that is directed by the Community Plan. The Community Plan shall determine the appropriate densities and standards to apply within the West Maui RGBs. Any restrictions on agricultural activity are prohibited.

Kā'anapali Town

Located on the mauka side of the Kā'anapali Resort and Golf Course, Kā'anapali Town consists of the Kā'anapali 2020 planned development located between the Lahaina Civic Center at the south end of the planned growth area and the Honokōwai Gulch on the north end of the planned growth area. The growth area follows the proposed West Maui Highway Realignment transit corridor on the mauka slope up to the Pu'ukoli'i Village area and Kā'anapali Coffee Farms.

Planned Growth Area Rationale

Kā'anapali Town consists of three distinct pieces: lower North Honokōwai, lower East Honokōwai, and lower South Honokōwai. The Kā'anapali Town planned growth area is 840 acres. Kā'anapali Town is intended to be a self-sufficient community with a relatively even split of single-family and multifamily dwelling units, commercial uses, an interconnected network of parks and open spaces, schools and other

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public facilities. A network of trails and bikeways will integrate Kā'anapali Town with Kā'anapali Resort and the Pu'ukoli'i Village community. The north piece may contain an acute-care facility. The northern portion has a proposed veterans' memorial cemetery. The project is intended to provide an opportunity for more resident housing in close proximity to employment at Kā'anapali Resort. Due to existing traffic congestion in West Maui, improvements to the regional highway system are needed to accommodate the population at Kā'anapali Town. The existing highway and implementation of the proposed Lahaina Bypass will provide transportation connectivity and hard edges to contain the planned growth area. Table 8-23 provides planning standards and guidelines for this planned growth area.

The Kā'anapali Town planned growth area is depicted on Figure 8-11 and on Directed Growth Map #W2.

Table 8-23 provides a summary of the planned growth area:

Table 8 - 23: Kā'anapali Town Planned Growth Area

Background Information:			
Project Name:	Kā'anapali Town	Directed Growth Map #:	W2
Type of Growth:	Urban Expansion	Gross Site Acreage:	840 Acres
Planning Guidelines:			
Dwelling Unit Count:	Approximately 1,800 Units ³³	Residential Product Mix:	Balance of SF and MF units
Net Residential Density:	6-9 du/acre	Parks and Open Space ³⁴ :	≥ 25%
		Commercial:	Convenience Shopping; Region Serving

Lahaina Town North

Lahaina Town North is a portion of the master planned project known as "Villages of Leiali'i". Lahaina Town North is a moderate-sized urban expansion located north of Lahaina Town. It is a Hawai'i Housing Finance Development Corporation (HHFDC) project. The planned growth area is intended to be compact, and contain a mix of uses, and have a relatively even split of single-family and multifamily housing units.

Planned Growth Area Rationale

Lahaina Town North is a logical expansion of the existing Lahaina community. Being an HHFDC project with a mix of housing types and moderate single-family lot sizes, the project will address the need for additional affordable resident housing in West Maui in close proximity to Lahaina's employment opportunities. The project should include a mix of land uses, park land, and open space, and will be proximate to public facilities such as the Lahaina Civic Center. Thus, the project is intended to evolve into a livable community based on sustainable land use planning. The Lahaina Town North planned growth area is depicted on Figure 8-12, and on Directed Growth Map #W2 and W3. Table 8-24 provides a summary of the planned growth area:

Table 8-24: Lahaina Town North

³³ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

³⁴ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the West Maui Community Plan update and the project review and approval process.

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Background Information:			
Project Name:	Lahaina Town North	Directed Growth Map #:	W2 and W3
Type of Growth:	Urban Expansion	Gross Site Acreage:	245 Acres
Planning Guidelines:			
Dwelling Unit Count:	Approximately 1200 Units ³⁵	Residential Product Mix:	Balance of SF and MF units
Net Residential Density	10-12 du/acre	Parks and Open Space% ³⁶ :	≥ 30%
		Commercial:	Convenience Shopping

Lahaina Infill

The Lahaina Infill planned growth area is approximately 22 acres and is bounded by Kahoma Stream, Front Street, Kenuei Street, and Honoapiʻilani Highway. It is an infill site that will contain a mixture of single-family and multifamily residential units, and parks and open space.

Planned Growth Area Rationale

The Lahaina Infill project provides an efficient use of vacant land within Lahaina’s urban area. The project takes advantage of existing infrastructure and does not expand Lahaina’s urban boundary. The Lahaina Infill site will have single-family and multifamily residential uses and park land to service the new and existing community. Innovative site planning shall be incorporated into the housing project to create a compact and walkable community. Creating a pedestrian-friendly project with transit access points should be a priority to meet senior citizen needs. The Lahaina Infill planned growth area is depicted on Figure 8-12 and on Directed Growth Map #W3. Table 8-25 provides a summary of the project.

Table 8 - 25: Lahaina Infill Planned Growth Area

Background Information:			
Project Name:	Lahaina Infill	Directed Growth Map #:	W3
Type of Growth:	Urban Infill	Gross Site Acreage:	22 Acres
Planning Guidelines:			
Dwelling Unit Count:	Approx. 214 Units ³⁷	Residential Product Mix:	Balance of SF / MF units
Net Residential Density:	13-20 du/acre	Parks and Open Space% ³⁸	+/- 2 acres
		Commercial:	N/A

Lahaina Town South

³⁵ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

³⁶ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the West Maui Community Plan Update and the project review and approval process.

³⁷ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

³⁸ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the West Maui Community Plan Update and the project review and approval process.

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The Lahaina Town South planned growth area is located mauka of Honoapiʻilani Highway, surrounding the Lahaina Aquatic and Recreation Center. The development will be a compact, mixed-use urban expansion with approximately 1,100 residential units.



Figure 8 - 12: Lahaina Town North – Planned Growth Area.

Planned Growth Area Rationale

The site is contiguous with Lahaina Town and is a logical area for urban expansion to accommodate growth to 2030. The site is approximately 269 acres and is close to existing public facilities and infrastructure and West Maui employment. The planned growth area will provide a mix of commercial uses, housing types, and lot sizes. Given the growth area location and characteristics, it is likely to provide housing for Maui residents rather than off-island second home buyers. There should be a sufficient proportion of multi-family units developed to meet local needs.

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Due to the existing traffic congestion in Lahaina Town, it will be paramount to ensure adequate highway access and develop multi-modal transportation options. The proposed Lahaina Bypass realignment should be completed prior to the growth site's build-out. Highway improvements should respect the surrounding land uses, view corridors and environmental conditions as much as possible. The Lahaina Town South planned growth area is depicted on Figure 8-12 and on Directed Growth Map #W3. Table 8-26 provides a summary of the project.

Table 8 - 26: Lahaina Town South Planned Growth Area

Background Information:			
Project Name:	Lahaina Town South	Directed Growth Map #:	W3
Type of Growth:	Urban Expansion	Gross Site Acreage:	269 Acres
Planning Guidelines:			
Dwelling Unit Count:	Approximately 1,100 Units ³⁹	Residential Product Mix:	Mix of SF and MF
Net Residential Density:	10-12 du/acre	Parks and Open Space% ⁴⁰ :	≥ 20%
		Commercial:	Convenience Shopping

Kahoma Infill

The Kahoma Infill planned growth area is bordered by Honoapi`ilani Highway at the west bottom of the hill makai of the stormwater diversion structure. The project is an affordable housing project on approximately 18 acres.

Planned Growth Area Rationale

The Kahoma Infill planned growth area is intended to meet the needs of Maui residents and is surrounded by previously developed lands. Greenways are planned for the area and should include a bike trail and linkages to Lahaina Town. An open-space buffer is planned to accommodate a stormwater diversion structure. Table 8-27 provides a summary of the project. The Kahoma Infill planned growth area is depicted on Figure 8-12 and on Directed Growth Map #W3.

³⁹ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

⁴⁰ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the West Maui Community Plan update and the project review and approval process.

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Table 8 - 27: Kahoma Planned Growth Area

Background Information:			
Project Name:	Kahoma Infill	Directed Growth Map #:	W3
Type of Growth:	Urban Infill	Gross Site Acreage:	18 Acres
Planning Guidelines:			
Dwelling Unit Count:	Approximately 68 Units ⁴¹	Residential Product Mix:	100% SF
Net Residential Density:	7-10 du/acre	Parks and Open Space ⁴² :	NA
		Commercial:	NA

Makila

The Makila planned rural growth area is located east of Lahaina Town on the mauka side of Honoapi`ilani Highway. The rural project shall be developed using a CSD plan that is intended to preserve open space; maximize the efficient use of infrastructure; and protect natural, agricultural, and scenic resources. The CSD plan shall cluster development within portion(s) of the site to keep the remainder of the land undeveloped and protected. The project may include limited neighborhood facilities and services to support the Makila community. The site is surrounded by agricultural lands.

Planned Growth Area Rationale

The Makila project is a rural subdivision adjacent to agricultural subdivisions that have occurred in and around Launiupoko. Linkages should be developed between the Makila project and neighboring communities including Launiupoko and Lahaina Town. An emphasis should be placed on providing safe pedestrian pathways and supporting regional-greenway systems. A 500-foot greenbelt shall be provided along the makai side of the project to ensure an open space buffer within the growth area and between the Honoapi`ilani Highway Bypass and future rural development. The project should utilize Low Impact Development techniques, such as drainage sedimentation control systems, to mitigate the potential for flooding makai of the project and to prevent nonpoint source pollution from entering coastal waters. The Makila planned growth area is depicted on Figure 8-13 and Directed Growth Map #W3. Table 8-28 provides a summary of the planned growth area.

Table 8 - 28: Makila Planned Growth Area

Background Information:			
Project Name:	Makila	Directed Growth Map #:	W3
Type of Growth:	Rural Growth	Gross Site Acreage:	270 Acres
Planning Guidelines:			
Dwelling Unit Count:	Approximately 200 Units ⁴³	Residential Product Mix:	SF – CSD
Net Residential Density:	1-2 du/acre	Parks and Open Space ⁴⁴ :	≥ 50%
		Commercial:	Neighborhood Serving

⁴¹ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

⁴² The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the West Maui Community Plan Update and the project review and approval process.

⁴³ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

⁴⁴ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the West Maui Community Plan Update and the project review and approval process.

Olowalu Town

The Olowalu Town planned growth area is located approximately four miles south of Lahaina Town on the southwestern foothills of the West Maui Mountains. Olowalu is rich in cultural, scenic, natural, and marine resources. The area's coral reefs are among the healthiest in the main Hawaiian Islands. Olowalu is known for its small plantation village environs, supported by small neighborhood-commercial uses along Honoapi'ilani Highway with convenient access to the ocean.

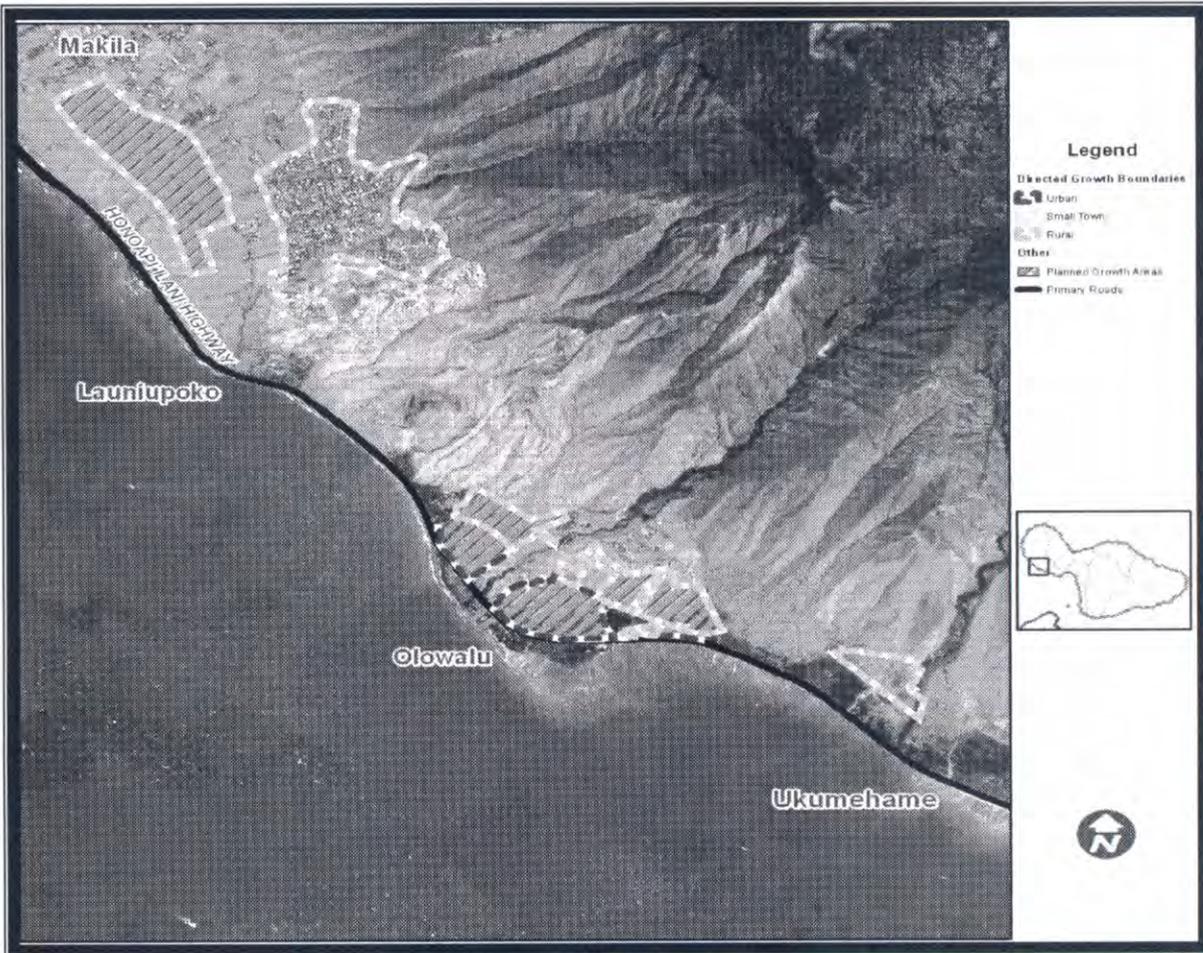


Figure 8-13: Olowalu Town – Planned Growth Area.

Planned Growth Area Rationale

The project is intended to meet the needs of Maui residents as a revitalized and sustainable Olowalu community. Olowalu Town will provide housing, employment, recreational, and cultural opportunities in the context of a mixed-use sustainable community that preserves the area's natural, cultural, and historic resources. Olowalu Town is envisioned as a pedestrian-friendly community that integrates a variety of housing types with employment opportunities, commercial, and recreational uses developed concurrently with public services and infrastructure.

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Olowalu Town will be designed to recognize and perpetuate the land and resource management system of ahupua`a. As such, the town will provide public access between the ocean and the mountains; protect the natural environment, particularly Olowalu Stream, the shoreline, and coral reefs and marine resources; preserve mauka and makai view corridors; and perpetuate the Olowalu Cultural Reserve. Table 8-29 provides a summary of the Olowalu Town planned growth area.

Table 8 - 29: Olowalu Town Planned Growth Area

Background Information:			
Project Name:	Olowalu Town	Directed Growth Map #:	W4 ⁴⁵
Type of Growth:	New Town	Gross Site Acreage:	613 Acres
Planning Guidelines:			
Dwelling Unit Count:	Approx. 1,500 Units ⁴⁶	Residential Product Mix:	Balance of SF and MF
Net Residential Density:	8-12 du/acre	Parks and Open Space ⁴⁷ :	≥ 30%
		Commercial:	Convenience Shopping; Region Serving

West Maui – Planned Protected Areas

The West Maui community plan region has the fourth largest population with over 22,000 people in 2010, and the largest visitor population. The region contains Kā`anapali and Lahaina, which draws large numbers of tourists to its historic districts, particularly on days when cruise ships anchor off of the Lahaina Harbor. Since the closing of the Pioneer Mill, agricultural activities have declined and the conversion of agricultural land to residential uses has dramatically increased. Many cherished open-space landscapes are currently at risk of being lost forever to real estate development. A brief discussion of each protected area is provided below. Two planned protected areas have been identified within the region:



Figure 8-14: Moku`ula, Loko o Mokuhinia Preservation Area.

⁴⁵ The future delineation of potential urban growth areas makai of the existing Honoapiilani Highway may be undertaken in conjunction with updates or amendments to the West Maui Community Plan. Such delineation may consider the need to: protect adjacent coastal and marine ecosystems (including the reefs at Olowalu), enhance public shoreline access and open space, and implement the proposed Pali to Puamana Parkway plan.

⁴⁶ Additional units may be permitted through a transfer of development rights program or to provide affordable housing in excess of what is required by law. Unit counts may be further defined through the entitlement process in response to infrastructure and environmental constraints.

⁴⁷ The distinct boundaries of the parks and open space, specific location of the recreational uses, and the precise amenities will be further defined during the West Maui Community Plan Update and the project review and approval process.

Directed Growth Plan

Moku`ula Preservation Area and the Pali to Puamana Parkway.

Moku`ula, Loko o Mokuhinia

The Moku`ula, Loko o Mokuhinia Preservation Area is envisioned as an environmental and cultural restoration project that will reconstruct the royal compound and “redevelop the site as a cultural park/preserve.” The site is located on Front Street in Lahaina Historic District No. 1 and is proximate to the commercial core of Lahaina Town (see Figure 8-14). The project will include restoration of the wetland, including indigenous plants, and reconstruction of the buildings that originally comprised the royal compound. The rebuilding of Moku`ula and the restoration of the freshwater pond called Loko o Mokuhinia that surrounded the island, will provide Maui with an opportunity to learn about Hawaiian spirituality, values, ancient technology and traditions, and will perpetuate a renewed appreciation for indigenous culture. The restoration of the property will also represent an important contribution to the Lahaina National Historic Landmark, because it will be the largest historical site in the district when completed.

Moku`ula was an island sited on a 7-acre, spring-fed freshwater pond called Loko o Mokuhinia. It was established sometime in the 1500s by Pi`ilani (1570-1600) as a royal compound from which he ruled a unified Kingdom of Maui. It served as a political and religious center from ancient times in Hawai`i through the emergence of the ancient Maui Kingdom, the unification of the islands, the introduction of Christianity, and the period when Lahaina was the capital of the Hawaiian Kingdom. This sacred island was also the home of King Kamehameha III from 1837 to 1845, who resided in the hale pili and in other structures that were a part of the royal compound on Moku`ula. A coral block palace called Hale Piula was erected for him fronting the beach, makai of Moku`ula. The pond, royal taro patches near the beach, a pond on Chapel Street, and the entire site was buried in 1916 when Loko o Mokuhinia was filled in by Pioneer Mill Company.

For many Native Hawaiians, Lahaina remains a sacred place because of Moku`ula. It is considered an axis mundi (the point between heaven and earth) of the Hawaiian world where political rule and religious ritual operated in concert. The mauka portion of the site, consisting of roughly 4.7 acres, is used as Malu `Ulu `Olele Park. The 1.8-acre makai property adjacent to the ocean encompasses the existing Kamehameha Iki Park. Both parks are under the management of the County of Maui, Parks and Recreation Department.

Pali to Puamana Parkway

The Pali to Puamana Parkway is envisioned as a series of passive and active recreational areas that tie together the existing beach parks between Pāpalaua Wayside Park and Puamana Beach Park (see Figure 8-15). The creation of this eight mile long coastal park and open space resource is a byproduct of a visionary effort to realign the Honoapi`ilani Highway inland. Honoapi`ilani Highway is the principal link between the west side of Maui and the rest of the island. Honoapi`ilani Highway traverses through the ahupua`a of (east to west) Ukumehame, Olowalu, and Launiupoko. At Launiupoko, the realigned highway will join with the proposed Lahaina Bypass. The total distance of the proposed re-alignment is 8 miles. The West Maui Community Plan (1996) stipulates that the Honoapi`ilani Highway shall be relocated south of Puamana to reduce potential inundation and disruption of service due to storm-generated wave action. Where the highway is relocated, lands makai of the new alignment will be designated Open Space or Park. The Open Space and Park portions of the project will include a mix of beach park amenities, camping, passive recreational areas, and pedestrian and bicycle facilities. The specific alignment of the new highway corridor shown in Figure 8-15 (Pali to Puamana Parkway) will be finalized through environmental review processes administered by the State of Hawai`i Department of Transportation in consultation with the County. Thus, the route shown on Figure 8-15 may be adjusted.

Directed Growth Plan

Furthermore, it is anticipated that the final route of the Lahaina By-Pass Phase 1B-2 will be accommodated within the area designated as Park on Diagram WC-1 (Lahaina-Central), south of Kai Hele Ku Street to the vicinity of the former Olowalu landfill. The Park designation shall not apply to the final route selected for the Lahaina Bypass Phase 1B-2.

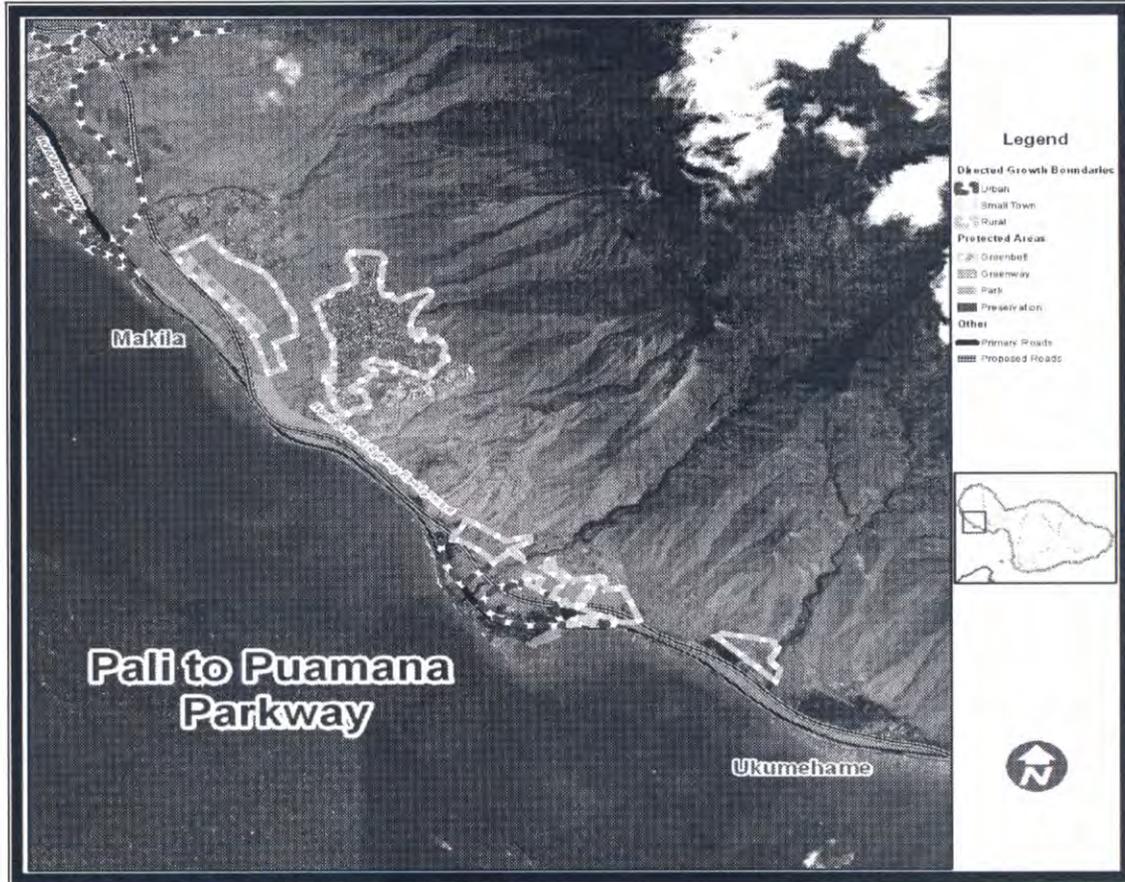


Figure 8-15: Pali to Puamana Parkway.

Hāna

The Hāna community plan region encompasses the eastern-most area of the island. The boundary of the region, from the northern shoreline of Makaiwa Bay, runs mauka along 'O'opulua and Waikamoi Streams, then along the boundaries of Haleakalā National Park and the Kahikinui Forest Reserve and finally makai along the boundary between Auahi and Kanaio to Kanaloa point on the southern shoreline of the region. The region is rich in natural, scenic and cultural resources. Of Hawai'i's rare, threatened and endangered species, one third are found only on Maui, and many of them within the Hāna community plan region. Some of the most intact and extensive native forests left in Hawai'i today occur in the East Maui watershed.⁴⁸

The population of the community plan region was 2,291 in 2010, but the area's population is expected to grow to nearly 2,800 by 2030. This represents an average annual growth rate of 1.5 percent.

⁴⁸ Myers, R.L., and Cory, C., Gon III, S. (August 1997). *Monitoring Strangers in Paradise: A Multi-Scale Study of Native Hawaiian Rainforest*.

Directed Growth Plan

Hāna Town is located on the easternmost shoreline of Maui, and the region includes the dispersed small rural settlements of Ko`olau, Hāna, Kīpahulu and Kaupō. A brief discussion of each of these sub-regions is provided below.

Ko`olau. Located at the northern portion of East Maui, this area experiences significant rainfall and its many streams provide water for the taro growers of Ke`anae and Wailua. Taro lo`i blanket the region, and many are still in active cultivation. There are 20 recorded heiau in Ko`olau.

Hāna. Hāna is steeped in legend and was a major center of population and political power in ancient Hawai`i. Plantation sugar was cultivated here through the mid-twentieth century, destroying many traditional structures. The ruggedness of the land and the persistence of a large Hawaiian population have contributed to significant preservation efforts. Hāna has 32 recorded heiau, including Pi`ilani Hale, the largest heiau in the state.

Kīpahulu. Kīpahulu also experienced plantation agriculture for a period of approximately 40 years during which countless taro terraces, traditional housing sites and heiau were destroyed. However, at least six heiau still exist and others are still intact in the more rugged areas not suitable for cane production.

Kaupō. Kaupō supported a large population before an earthquake modified the hydrology and altered springs that once provided irrigation to Manawainui and Naholoku. Numerous agricultural terraces and traditional housing sites are spread throughout the landscape. Lo`alo`a heiau is a National Landmark, one of 30 heiau in the district.

CHALLENGES AND OPPORTUNITIES

The Hāna community plan region has several key land use issues which must be considered when planning future development in the region. Some issues apply to the region as a whole while others are specific to a sub-region. The major land use challenges, or threats, and opportunities include:

The Protection and Preservation of Cultural Resources Protecting the vast array of cultural resources in the Hāna District is important to not only the people of Hāna, but to the entire Island of Maui and the Hawaiian people. The district's historic sites provide evidence of Hāna's history and serve as tools for conveying the heritage of the region to its youth as a legacy for the future. Great care must be given to ensure that future development is done in a culturally sensitive manner. The Hāna Belt Road, designated as a National Historic District, is one such resource deserving protection.

Environmental Protection The Hāna region's native rainforests are among the most imperiled in the world. The forests that remain contain a high concentration of threatened and endangered species and are in serious danger of being destroyed by introduced feral animals and aggressive weeds. Habitat destruction is considered the most pressing threat facing the region in terms of minimizing species loss. Native plants and animals are vulnerable to displacement by alien species invasions.⁴⁹ Recognizing that many residents depend upon the region's natural environment, it is essential to ensure the sustainability of these resources as well as the Hawaiian lifestyle of the area's residents. Through

⁴⁹ Myers, R.L., and Cory, C., Gon III, S. (August 1997). *Monitoring Strangers in Paradise: A Multi-Scale Study of Native Hawaiian Rainforest.*

Directed Growth Plan

respect for and proper management of Hāna's natural resources, future generations of residents and visitors will continue to enjoy all that makes Hāna – "Hāna."

- Lack of Defined Town Core*** Hāna Town has a small handful of neighborhood serving commercial areas and public facilities that cater to local residents and visitors. Tourists traveling along the Hāna Highway, often stop along their way to Hāna Town and again within Hāna Town, for goods and supplies. Most civic activity occurs in and around the town's focal points (i.e., Hāna Bay). If supported by the community, the town could identify additional opportunities for public spaces, civic centers, and commercial areas. This would provide residents with more opportunities for interaction and commerce.
- Affordable Housing Opportunities*** Hāna has felt significant pressure and competition from the offshore housing market. This pressure has had significant social and cultural impacts, and has created an affordable housing problem for the area's residents. Identification of affordable housing solutions to meet the needs of existing and future residents is a fundamental community need.
- Develop Future Economic Opportunities*** The relative isolation of Hāna from the rest of the island has created significant constraints to meaningful employment opportunities for area residents. It will be a significant challenge to diversify and grow the region's economy while ensuring such growth doesn't compromise the area's rural character and treasured resources.

Hāna Affordable Residential

The Hāna Affordable Residential planned growth area is located mauka of the Hāna Highway at the forked intersection of Uakea Road and Hāna Highway. The area is bounded by Agricultural, Single-Family, and Public/Quasi-Public Community Plan designations. The first phase of the project is 15 acres and is currently designated Single-Family within the Hāna Community Plan. The precise boundaries and location can be determined during the Hāna Community Plan update, or in coordination with the community, and the project review and approval process. At full build-out, the development will be comprised of approximately 200 affordable residential units and community facilities.

Planned Growth Area Rationale

The Hāna Affordable Residential planned growth area is intended to meet the needs of Hāna's residents. Although the Land Use Forecast (2006) indicates that the Hāna region has available supply of buildable vacant lands in agricultural and rural subdivisions, as well as significant areas of vacant planned single-family residential lands, the price of these potential housing units may not be affordable to the community. The project is intended to meet Hāna's affordable housing needs.

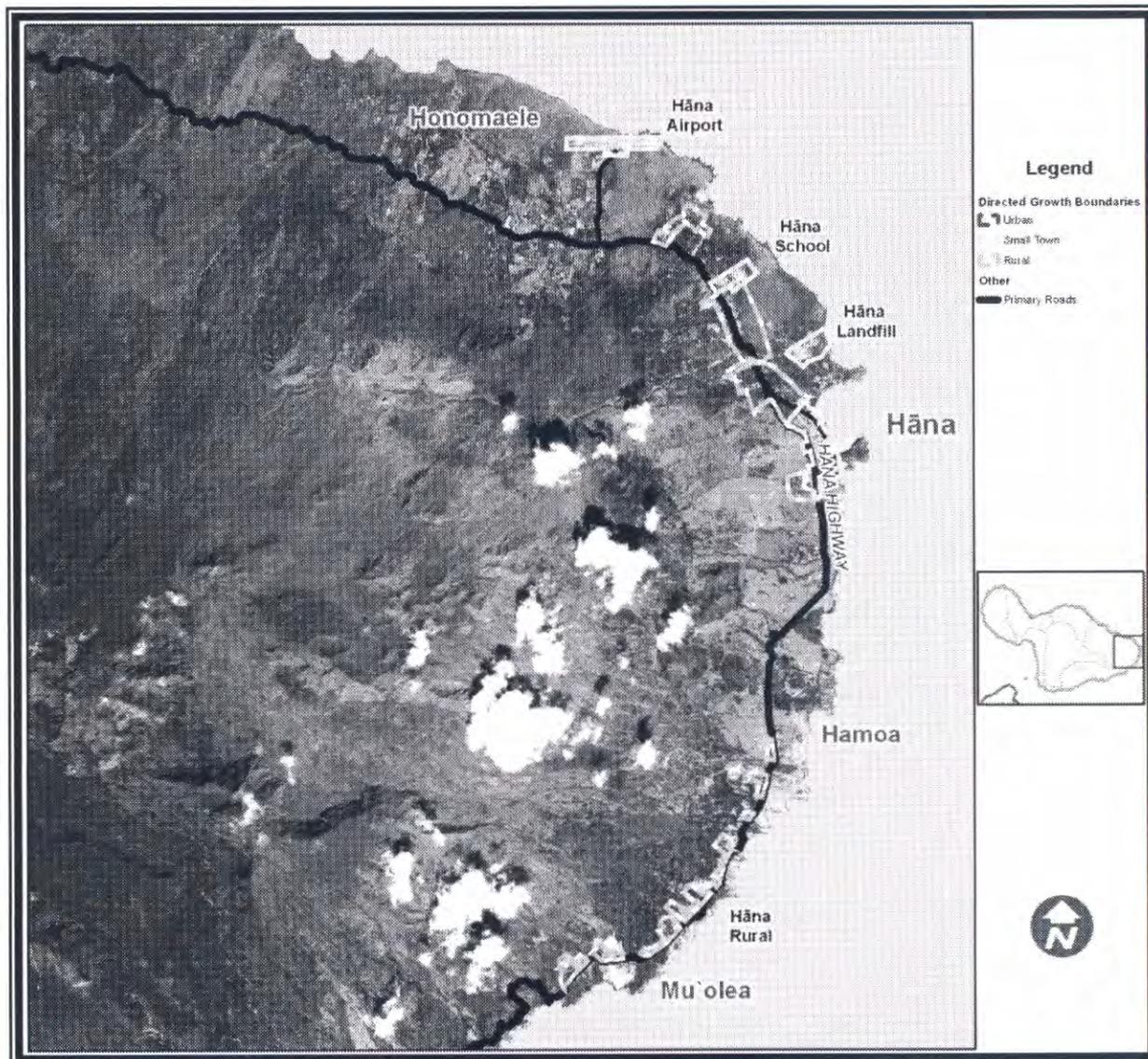


Figure 8-16: Hāna – Planned Rural Growth Area.

East Maui – Planned Protected Area

The Hāna region contains the island’s largest inventory of environmentally and culturally intact resources. Many rich and diverse ecosystems thrive in East Maui. The 51-mile scenic route along Hāna Highway enjoys a reputation as one of the world’s ultimate driving tours. While en route to Hāna Town, visitors enjoy spectacular vistas and verdant landscapes, and historic landmarks. A brief discussion of the protected area is provided below.

One planned protected area has been identified within the region: the Hāna Belt Road.

Hāna Belt Road

The Hāna Belt Road encompasses portions of Hāna Highway that retain the greatest historic integrity and character. This section of the roadway, beginning at Huelo and extending to Kīpahulu, is relatively unaltered and is the most spectacular portion of Maui's historic belt road system both in its scenery and its historic character. The protected area will duplicate the boundaries of the 1999 National Register of Historic Places district and National Millennium Legacy Trail. The Hāna Highway includes the highest concentration of stylistically consistent historic bridges in the State of Hawai'i built from circa 1900 to 1947. The boundaries of the protected area are coterminous with its historic right-of-way. The right-of-way varies but is approximately 40 feet wide for the portion of the road under the jurisdiction of the State of Hawai'i. The historic district begins near Mile Marker 3 on the Hāna Highway, State Route 360, near Huelo, and ends on the south end of Koukou'ai Bridge near Kīpahulu on Route 31.

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SECOND JUDICIAL CIRCUIT
STATE OF HAWAII

Attorney for Plaintiffs
The Coalition to Protect East Maui
Water Resources, Hui Alanui o Makena,
The Sierra Club, Mark Sheehan

IN THE CIRCUIT COURT OF THE SECOND CIRCUIT
STATE OF HAWAII

THE COALITION TO PROTECT EAST)
MAUI WATER RESOURCES, an)
unincorporated association; HUI)
ALANUI O MAKENA, a Hawaii non-)
profit corporation; THE SIERRA CLUB,)
a California non-profit corporation)
registered to do business in the State of)
Hawaii; MARK SHEEHAN;)
)
Plaintiffs,)

Civil No. 03-1-0008(3)
(Declaratory Judgment and
Other Civil Action)

CONSENT DECREE; ORDER;
EXHIBITS "A" AND "B"

vs.)

THE BOARD OF WATER SUPPLY,)
COUNTY OF MAUI; DEPARTMENT OF)
WATER SUPPLY, COUNTY OF MAUI;)
COUNTY OF MAUI; GEORGE TENGAN,)
in his capacity as Director of the Water)
Department, County of Maui; and)
JOHN DOES 1-100;)
)
Defendants.)

emc/consentdecreefinal

CONSENT DECREE

RECITALS

WHEREAS, the Maui County Department of Water Supply has prepared
a Final Supplemental Environmental Impact Statement ("FSEIS") for the East

EXHIBIT "B-019"

Maui Water Development Plan ("EM Plan"), required by Court Orders entered in The Coalition to Protect East Maui Water Resources, et al. v. The Board of Water Supply, et al., Civil No. 93-0734(3), in the Second Circuit Court of the State of Hawaii;

WHEREAS, the FSEIS was accepted by the Board of Water Supply on October 15, 2002 and notice of this acceptance was published in the November 8, 2002 issue of *The Environmental Notice*;

WHEREAS, Plaintiffs the Coalition to Protect East Maui Water Resources, an unincorporated association; Hui Alanui o Makena, a Hawaii non-profit corporation; The Sierra Club, a California non-profit corporation registered to do business in the State of Hawaii; and Mark Sheehan, as Plaintiffs (hereafter collectively "Plaintiffs") filed a Complaint, on January 6, 2003 and an Amended Complaint, on January 7, 2003, for Declaratory and Injunctive Relief, to Enforce Court Orders and For Other Relief against Defendants the Board of Water Supply, County of Maui; the Department of Water Supply, County of Maui; County of Maui; and George Tengan, in his capacity as Director of the Water Department, County of Maui (hereafter collectively the "County Defendants") challenging, *inter alia*, the preparation of the SEIS and the acceptance of the FSEIS, the construction and implementation of the test program for the test well, the alleged failure to modify minimum stream flow standards prior to implementing the project, the alleged failure to establish correlative water rights prior to transferring groundwater out of the area and the alleged breach of the Public Trust Doctrine, among other claims;

WHEREAS, the County Defendants have denied the foregoing allegations in their pleadings;

WHEREAS, to avoid the expense, uncertainty and acrimony of further litigation, Plaintiffs and the County Defendants have determined that it is in the best interest of all concerned to resolve their differences amicably on the terms and conditions to follow;

NOW, THEREFORE, in consideration of the mutual promises, agreement and obligations hereinafter set forth, Plaintiffs and the County Defendants agree to the terms and conditions set forth in this Consent Decree, as follows:

TERMS AND CONDITIONS

1. Acceptance of the SEIS Limited to Phase I of the EM Plan

1.1 The acceptance of the SEIS for the EM Plan shall be valid for Phase I only of the EM Plan. "Phase I" of the EM Plan means Hamakuapoko Well No. 1 (State Well No. 5420-02) and Hamakuapoko Well No. 2 (State Well No. 5320-01), with an approximate installed capacity of 2 million gallons per day ("mgd") located in the Hamakuapoko region of the Paia Aquifer System, together with associated treatment facilities and transmission line extended to Paia, to carry the groundwater produced by these two wells, as safe drinking water, as part of the County water system.

2. Withdrawal of the Acceptance of the SEIS for the Remainder of the EM Plan

2.1 The acceptance of the SEIS for the remainder of the EM Plan (all Phases beyond Phase I, namely Phases II through VI) is hereby withdrawn and shall have no legal force or effect. The County shall publish in *The Environmental Notice* the withdrawal of any acceptance of the FEIS or FSEIS for the remainder (all phases beyond Phase I, namely Phases II through VI) of the EM Plan.

3. Phase I is Redefined as the EM Plan and the Remainder of the EM Plan is Withdrawn

3.1 Phase I of the EM Plan shall be redefined as the EM Plan in its totality or entirety. The County agrees to withdraw as a plan, project or program what are now known as the remaining Phases of the EM Plan, namely Phases II through VI.

4. Studies to be Conducted Before Any Further Effort is Made to Develop Groundwater Resources in the Agreed-Upon Portion of the East Maui Region

4.1 Any further efforts by the County Defendants to develop groundwater resources in the agreed-upon portion of the East Maui Region (described in Exhibit "A" attached hereto, which is a map delineating clearly the area referenced, hereafter, the "agreed-upon portion of the East Maui Region") will be treated as a completely new County project, commenced with a new planning process, new plans and, at the appropriate time, with the preparation of a new Environmental Assessment ("EA") or Environmental Impact Statement ("EIS") pursuant to Chapter 343, HRS. The parties expressly agree that neither this provision, nor any other part of this Consent Decree, refers or relates to the Haiku Well (State Well No. 5419-01), the Kulamalu Well (State Well No. 5317-01) or the Pookela Well (State Well No. 5118-02).

4.2 Before any new project is planned by the County of Maui to develop groundwater in the agreed-upon portion of the East Maui Region, the County will undertake a Cost/Benefit Study of the surface and groundwater resources available in the Central Maui Region, Upcountry Maui Region and East Maui Region and conduct a rigorous Cost/Benefit analysis, including the evaluation of economic and environmental factors, of developing and

transmitting these water resources. This Study shall address planning for stream restoration in the agreed-upon portion of the East Maui Region.

4.3 Before any new project is planned by the County of Maui to develop groundwater in the agreed-upon portion of the East Maui Region, the County will vigorously investigate and pursue the availability of surface water from the Waikapu (60101), Iao (60102) and/or Waihee (60103) hydrologic units for public use by preparing a report which shall include a rigorous analysis of the costs and benefits of making these water resources part of Maui's public water system.

4.4 If the report on the availability of surface waters in West Maui, referenced in § 4.3 above, does not result in a determination that a sufficient supply of water can be made available from these sources to meet the needs of County residents who can be served by these waters and should the Cost/Benefit Studies, referenced in §§ 4.2 and 4.3 above, not result in a determination that it would be more cost/beneficial to develop water resources outside the agreed-upon portion of the East Maui Region, then the County may re-commence planning for a project to develop groundwater resources within the agreed-upon portion of the East Maui Region.

4.5 Any new project planned by the County of Maui to develop groundwater in the agreed-upon portion of the East Maui Region shall be consistent with the Water Use and Development Plan for the Island of Maui and the State Water Code.

4.6 Copies of the reports, studies and analyses referenced in §§ 4.2, 4.3 and 4.4 above shall be provided to Plaintiffs upon their completion.

5. Consultation With East Maui Coalition and Other Plaintiffs

5.1 The County agrees to consult with representatives or designees of Plaintiffs with respect to any future plan to develop water resources in the agreed-upon portion of the East Maui Region, including but not limited to on the studies, reports, analyses referenced above, any new plan to develop groundwater in the agreed-upon portion of the East Maui Region and any new EA or EIS for this new plan. To facilitate this consultation, Plaintiffs agree to provide the Director of the Department of Water Supply with the name, current address and telephone number of one person through whom all of Plaintiffs may be deemed to have been contacted for the purposes of initiating this consultation.

6. Use of 36" Diameter Transmission Line

6.1 The County has represented that the 36" in diameter transmission line between Paia and the two Hamakuapoko Wells has been selected because of a prior contractual commitment to purchase the 36" pipes. The County, therefore, agrees as follows:

(a) the use of the 36" transmission line is not to be considered as a commitment to develop or transmit water resources more than can be produced by the two Hamakuapoko Wells in the agreed-upon portion of the East Maui Region;

(b) the 36" transmission line shall be used solely in connection with Phase I of the project, as described in § 1.1 above. Any other use of this Hamakuapoko to Paia 36" transmission line to transmit water shall require a new EA or EIS;

(c) for the first 200 yards of the transmission line after both of the Hamakuapoko Wells, in the Paia direction, 24" in diameter pipes shall be used in constructing the transmission line instead of pipes 36" in diameter, as a means of assuring that the capacity of the transmission line is limited to the approximate amount intended by Phase I of the EM Plan.

7. Future Use of EIS and SEIS for EM Plan

7.1 Should the County, at some time in the future decide to develop additional groundwater resources in the agreed-upon portion of the East Maui Region, the County shall not resubmit or incorporate by reference the EIS or the SEIS prepared for the former EM Plan. The County shall, at the appropriate time, prepare a new EIS for any new plan to develop groundwater resources within the agreed-upon portion of the East Maui Region. In any EIS prepared by the County, the County shall comply with Chapter 343 and the regulations promulgated thereto. The County shall not, without considerable pre-examination and comparison, use the EIS or SEIS prepared for the former EM Plan, or the studies or analysis prepared for these documents, in any new EA or EIS. Among the studies within the FSEIS which the County Defendants may reference in any further EA or EIS are (a) laboratory report test results for contaminants from former SEIS test well (State Well No. 5418-08); and (b) USGS studies and reports. Among the studies and research conclusions within the FSEIS which shall not be relied upon or used in any further EA or EIS are (a) the test results from the testing of the former SEIS test well (State Well No. 5418-08) with respect to the impacts of groundwater pumping on stream flows in the agreed-upon region; (b) the study of alternatives and the

costs and benefits of developing alternative water resources; (c) the costs and benefits of relocating the proposed EM Plan wellfield further mauka; (d) the study of the impact of the EM Plan on marine resources throughout the region; (e) the study of the impact of groundwater pumping on streams and existing wells; and (f) the study of the impact of agricultural contaminants on groundwater quality. The County shall consider factors such as: existing aquifers, groundwater resources, streams, diversions, wells, private and public water systems, location of cesspools, socio-economic impacts, the impact of groundwater pumping on marine resources throughout the region, and plans for stream restoration.

8. Use of the Test Well, the Test Well Data and Further Testing

8.1 The County Defendants and Plaintiffs have disagreed, with respect to the former SEIS test well (State Well No. 5418-01) located on Hogback Road in Haiku, about its construction, drilling and testing.

8.2 The County will work with the USGS and a representative of Plaintiffs to develop an additional test well in the agreed-upon portion of the East Maui Region to investigate whether developing additional wells in the agreed-upon portion of the East Maui Region and placing State Well No. 5418-01 into production may adversely impact stream flows in streams, in the agreed-upon portion of the East Maui Region. The County is authorized to construct an additional well in the agreed-upon portion of the East Maui Region, within one of the crosshatched areas shown on the maps attached hereto as Exhibit "B". This additional well shall only be used for the test purposes of gathering data and information. During the drilling of this well, a test protocol, agreed to by the parties hereto and the USGS, shall be

implemented, the purpose of which shall be to determine whether or not pumping groundwater by wells located in the agreed-upon portion of the East Maui Region may have an impact upon streamflow in streams in the agreed-upon portion of the East Maui Region. Thereafter, this test well shall be dedicated for use by the County Defendants as a monitoring or observation well to monitor or observe the performance of the aquifer in the agreed-upon portion of the East Maui Region. This additional well shall not be used for production purposes.

8.3 The former SEIS test well located on Hogback Road (State Well No. 5418-01) shall not be used for production purposes or for anything other than testing, monitoring or observation purposes unless and until the additional test well, referenced in § 8.2 above, has been drilled, a test protocol agreed upon by the parties hereto has been implemented, the results of this testing demonstrate that pumping of State Well No. 5418-01 will not have an adverse impact upon stream flow in streams in the region and the additional test well is dedicated for monitoring and observation of the performance of the aquifer in the agreed-upon portion of the East Maui Region.

9. Use of Data From Pumping of Two Hamakuapoko Wells

9.1 Actual data obtained from the pumping of the two Hamakuapoko Wells shall be employed in preparing the Cost/Benefit analysis referenced above and in deciding whether to begin planning any further project to develop groundwater resources in the agreed-upon portion of the East Maui Region.

10. Stream Restoration Shall Be a Component of any East Maui Water Development Plan

10.1 The County agrees that as long term agricultural water needs are reduced, a stream restoration program will be studied, developed and initiated by the County. As such, the County agrees that one component of any plan or program to develop further water resources in the agreed-upon portion of the East Maui Region must include the study, development and initiation, as may be applicable, of a stream restoration program in the agreed-upon portion of the East Maui Region.

11. Effect of This Consent Decree

11.1 This Consent Decree is entered into by the parties in order to resolve genuinely disputed issues. It is not intended to, and shall not, preclude any party from taking any position in the future, with respect to any legal or factual issues, claims, or defenses raised in the course of this litigation, including, but not limited to, the following issues: the adequacy of the EIS or SEIS for the former EM Plan, correlative water rights, stream flow, in-stream resources, ocean or marine resources, or out-of-aquifer transfer of groundwater from a non-designated management area.

11.2 This Consent Decree shall not be deemed as an admission of wrongdoing by any party. Neither the construction of the transmission line between the two Hamakuapoko Wells and Baldwin Park nor the transmission of water in this transmission line shall be deemed a waiver of Plaintiffs' or Defendants' claims or an admission, with respect to any future water developed by the County in the agreed-upon portion of the East Maui Region. Instead, the Consent Decree is the result of settlement negotiations, entered into in

good faith by all parties, for the purpose of ending the litigation and securing peace.

12. Dismissal of All Actions

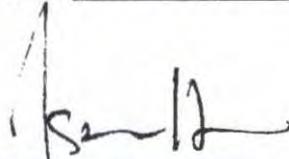
12.1 Within ten (10) days of the entry of this Consent Decree by the Court, the Plaintiffs agree to dismiss, with prejudice, Civil Action No. 03-1-0008(3) and Civil Action No. 93-0734(3) subject to the Terms and Conditions of this Consent Decree and the preservation of the ability of any party to this Consent Decree to seek the enforcement of these Terms and Conditions in this Court.

12.2 All parties shall bear their own costs and attorneys' fees.

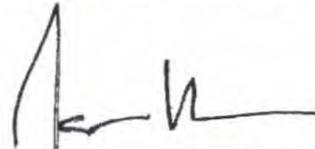
13. Press Release

The parties agree that they will work together on a joint press release to announce the conclusion of the litigation and the re-configuration of the EM Plan. The Sierra Club may issue its own press release if it so desires.

DATED: Wailuku, Maui, Hawaii 12.2.03

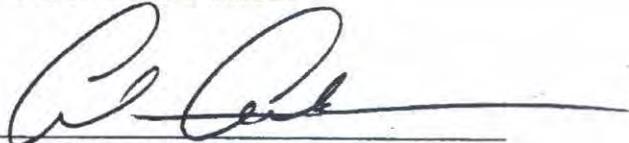


Isaac Hall, Esq.
Attorney for Plaintiffs
The Coalition to Protect East Maui
Water Resources, Hui Alanui o Makena,
and Mark Sheehan

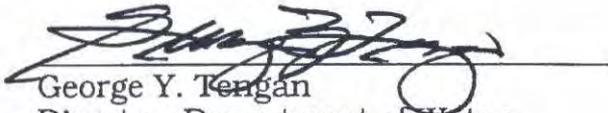


Isaac Hall, Esq.
Attorney for Plaintiff
The Sierra Club

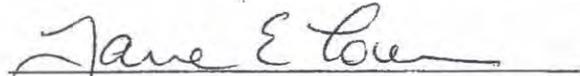
THE COUNTY OF MAUI

By: 
ALAN M. ARAKAWA
Its Mayor

APPROVAL RECOMMENDED:


George Y. Tengan
Director, Department of Water
Supply

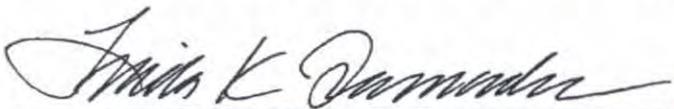
APPROVED AS TO FORM AND LEGALITY:


Jane E. Lovell, Esq.
Deputy Corporation Counsel
Attorney for Defendants
The Board of Water Supply;
Department of Water Supply, County
of Maui; County of Maui; George
Tengan, in his capacity as Director
of the Water Department, County of Maui

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 3rd day of November, 2003, before me personally appeared ALAN M. ARAKAWA, to me personally known, who being by me duly sworn, did say that he is the Mayor of the County of Maui, a political subdivision of the State of Hawaii, and that the seal affixed to the foregoing instrument is the lawful seal of the said County of Maui, and that the instrument was signed and sealed on behalf of said County of Maui pursuant to Section 7-5.11 and Section 9-18 of the Charter of the County of Maui, and the said ALAN M. ARAKAWA acknowledged the said instrument to be the free act and deed of said County of Maui.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.



Notary Public, State of Hawaii
Second Judicial Circuit
Print/Type name: **LINDA K. TANASHIRO**
My commission expires: 10/19/06

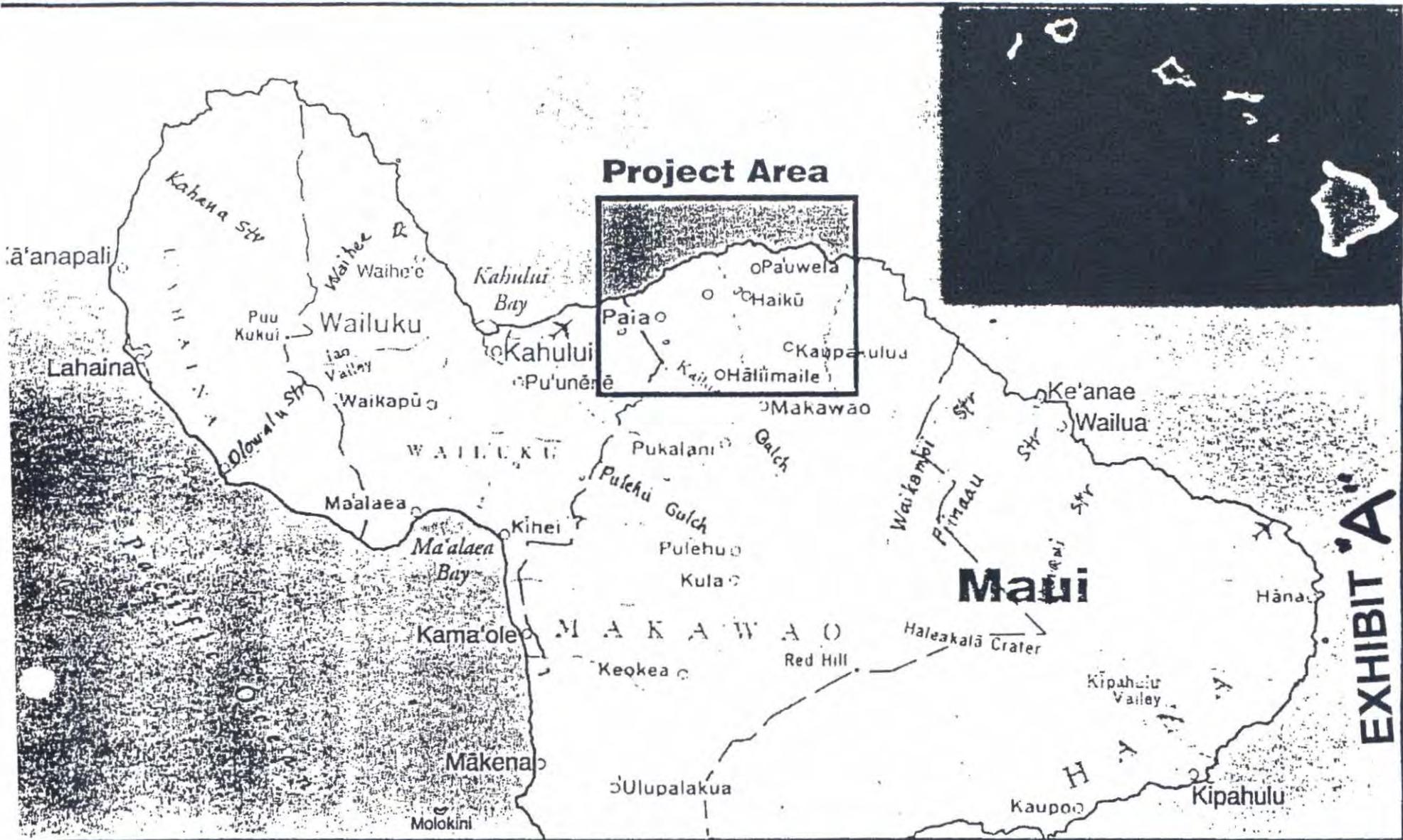
ls

APPROVED AND SO ORDERED:

/s/ JOSEPH E. CARDOZA (SEAL)

Judge of the above-entitled court

Coalition to Protect East Maui Water Resources, et al. v. Board of Water Supply, et al., Civil No. 03-1-0008(3); Consent Decree; Order; Exhibits "A" and "B"



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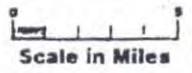
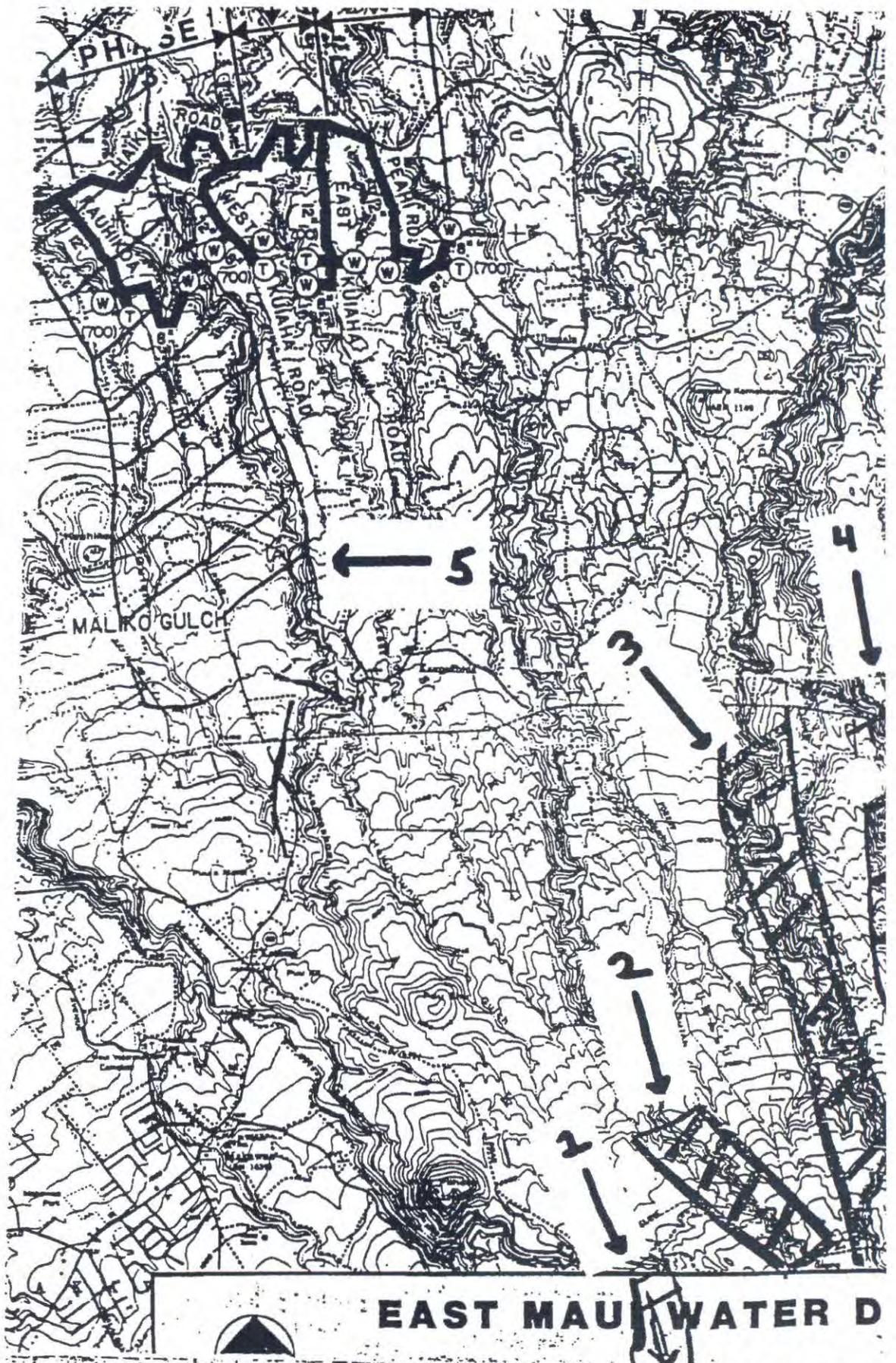


FIGURE 1:
Location Map

**Supplemental EIS: East Maui Water
Development Plan**



EAST MAUI WATER DISTRICT

EXHIBIT

EXHIBIT "B"

ISAAC HALL #2238
2087 Wells Street
Wailuku, Maui, Hawaii 96793
Telephone: (808) 244-9017

RECEIVED
CORPORATION COUNSEL

2013 NOV 20 PM 2: 29

FILED

2013 NOV 14 PM 1: 16

Attorney for Plaintiffs
The Coalition to Protect East Maui
Water Resources, The Sierra Club
and Mark Sheehan

J. KAYA, CLERK
SECOND CIRCUIT COURT
STATE OF HAWAII

IN THE CIRCUIT COURT OF THE SECOND CIRCUIT

STATE OF HAWAII

THE COALITION TO PROTECT EAST
MAUI WATER RESOURCES, an
unincorporated association; HUI
ALANUI O MAKENA, a Hawaii non-
profit corporation; THE SIERRA CLUB,
a California non-profit corporation
registered to do business in the State of
Hawaii; MARK SHEEHAN;

Plaintiffs,

vs.

THE BOARD OF WATER SUPPLY,
COUNTY OF MAUI; DEPARTMENT OF
WATER SUPPLY, COUNTY OF MAUI;
COUNTY OF MAUI; GEORGE TENGAN,
in his capacity as Director of the Water
Department, County of Maui; and
JOHN DOES 1-100;

Defendants.

Civil No. 03-1-0008(3)
(Declaratory Judgment and
Other Civil Action)

ORDER GRANTING PLAINTIFFS'
MOTION TO ENFORCE
CONSENT DECREE, FOR
DECLARATORY RELIEF, FOR
TEMPORARY, PRELIMINARY
AND PERMANENT INJUNCTION
AND OTHER RELIEF

Hearing Date: April 24, 2013
Ruling Date: October 2, 2013
Time; 8:30 a.m.
Judge: Hon. Joseph E. Cardoza

No Trial Date Set

I hereby certify that this is a full, true and
correct copy of the Original.



J. Kaya, Clerk

emc/motenf2

**ORDER GRANTING
PLAINTIFFS' MOTION TO ENFORCE CONSENT DECREE,
FOR DECLARATORY RELIEF, FOR TEMPORARY, PRELIMINARY
AND PERMANENT INJUNCTION AND OTHER RELIEF**

EXHIBIT "B-020"

The Court's ruling on "Plaintiffs' Motion to Enforce Consent Decree, for Declaratory Relief, for Temporary, Preliminary and Permanent Injunction and Other Relief" filed in the above-captioned case was scheduled for and took place on Wednesday, October 2, 2013 at 8:30 a.m. in the Second Circuit Courts before the Honorable Joseph E. Cardoza. Plaintiffs The Coalition to Protect East Maui Water Resources, The Sierra Club and Mark Sheehan (hereafter simply "Plaintiffs") were represented by Isaac Hall, Esq. Defendants The Board of Water Supply, County of Maui, The Department of Water Supply, County of Maui, The County of Maui and David Taylor, in his capacity as Director of the Water Department, County of Maui ¹, (hereafter simply "Defendants") were represented by Deputy Corporation Counsel Caleb P. Rowe, Esq.

The Court has carefully considered the pleadings filed by the parties, the record and file to date, as well as the oral argument presented by the parties.

IT IS HEREBY ORDERED, ADJUDGED AND DECREED that "Plaintiffs' Motion to Enforce Consent Decree, for Declaratory Relief, for Temporary, Preliminary and Permanent Injunction and Other Relief" is hereby granted, pursuant to Rules 7, 52 and 65 of the Hawaii Rules of Civil Procedure, as follows:

¹ Pursuant to Hawai'i Rules of Civil Procedure ("HRCP") Rule 25(c), David Taylor, the current Director of the Department of Water Supply, may be substituted for George Tengan, who previously held that position.

I.

1. This Court, in this Section I., enters the following findings of fact in support of this Order, as follows.

2. Plaintiffs and Defendants agreed to comply with the terms and conditions contained within the Consent Decree entered in this case on December 22, 2003 as the Orders of this Court.

3. Defendants, on February 19, 2013, put out to bid the “Construction of Two Monitor Wells at the Kaupakalua Well Site” project, involving the construction of two test and monitoring wells in Kaupakalua, East Maui, on county-owned land, to be paid for with county funds, constituting the “test well” referenced in paragraph 8.2 of the Consent Decree (hereafter simply “the project”).

4. Plaintiffs’ Motion to Enforce Consent Decree, for Declaratory Relief, for Temporary, Preliminary and Permanent Injunction and Other Relief (hereafter simply “Plaintiffs’ Motion”) was filed on February 28, 2013 asserting, *inter alia*, that by putting out to bid the “Construction of Two Monitor Wells at the Kaupakalua Well Site” project, Defendants were violating terms and conditions contained within the Consent Decree and that Defendants must be prohibited or restrained from violating the Consent Decree, as explained in more detail as follows.

5. Defendants filed their “Memorandum in Opposition to Plaintiffs’ Motion to Enforce Consent Decree, for Declaratory Relief, for Temporary, Preliminary and Permanent Injunction and Other Relief on April 16, 2013.

6. Plaintiffs filed their Reply Memorandum in Support of Motion to Enforce Consent Decree, for Declaratory Relief, for Temporary, Preliminary and Permanent Injunction and Other Relief on April 19, 2013.

7. No evidentiary hearing on Plaintiffs' Motion was requested by Plaintiffs or Defendants.

8. A hearing on Plaintiffs' Motion was scheduled for and took place on April 24, 2013, during which oral argument was presented in favor of Plaintiffs' Motion by counsel for Plaintiffs and in opposition to Plaintiffs' Motion by counsel for Defendants.

9. Before the conclusion of the April 24, 2013 hearing the Court scheduled Friday, May 3, 2013 at 9:30 a.m. as the date and time at which the Court would issue its ruling on Plaintiffs' Motion.

10. Plaintiffs and Defendants thereafter entered five stipulations, approved by the Court, continuing the date and time for the Court's ruling on Plaintiffs' Motion, to allow the parties to consult with each other, ultimately until Wednesday, October 2, 2013 at 8:30 a.m., all on the condition that Defendants agree that they will not notify any bidder of the issuance of an award of any contract or execute any contract for the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project.

11. The parties informed the Court that, in the period of time that had elapsed, they had not been able to resolve the issues raised in Plaintiffs' Motion and were therefore ready to proceed with the Court's ruling on Wednesday, October 2, 2013 at 8:30 a.m.

12. Plaintiffs have presented clear and convincing evidence within “Plaintiffs’ Motion to Enforce Consent Decree, for Declaratory Relief, for Temporary, Preliminary and Permanent Injunction and Other Relief” that in putting out to bid the “Construction of Two Monitor Wells at the Kaupakalua Well Site” project on February 19, 2013, Defendants are violating unambiguous terms contained within the Consent Decree for reasons including, but not limited to:

a. The test wells proposed by Defendants are not located “within one of the crosshatched areas shown on the maps” attached to the Consent Decree as Exhibit “B,” as is required by paragraph 8.2 of the Consent Decree.

b. The parties to the Consent Decree and the USGS have not agreed upon a test protocol to be implemented during the drilling of the test wells, as is required by paragraph 8.2 of the Consent Decree.

c. The Defendants have not prepared or delivered to Plaintiffs studies which, after rigorous analysis, conclude that it would be Cost-Beneficial to return to East Maui to plan the development of groundwater resources, as is required by paragraphs 4, 4.2, 4.3 and 4.4 of the Consent Decree. Only after this pre-condition is satisfied can planning by the Defendants to develop East Maui water resources “re-commence” including, but not limited to, the planning for and construction of the two test and monitoring wells.

d. The Defendants have re-commenced planning for the development of water resources in East Maui, for examples, through statements contained in the United States Geological Survey Phase 2 "test well study" to the effect that the Haiku, Honopou and Makawao Aquifers are potential source areas for meeting the asserted additional demand for water, with the Haiku Aquifer System being the most desirable (Exhibit "4", p. 2 attached to Plaintiffs' Motion), through the Defendants' proposed well field located within the Haiku Aquifer in East Maui (Exhibits "9a" and "9b" attached to Plaintiffs' Motion) and through the inclusion of funding for Haiku Wells 1, 2 and 3 in the East Maui area in the Maui County Council approved six year County CIP Budget beginning in Fiscal Year 2013 (Exhibit "8" attached to Plaintiffs' Motion).

e. The "test wells", as described in paragraph 8.2 of the Consent Decree as a two phased project, cannot be put out to bid or constructed until the EIS process has been initiated and completed pursuant to Chapter 343, as is required by paragraph 7 of the Consent Decree.

13. Plaintiffs request the following relief from this Court:

a. That this Court issue declaratory relief by ruling that the County Defendants are violating the Consent Decree in the manners described above and by issuing further Orders prohibiting Defendants, and all those acting by and through them, from taking the actions in the procurement to construction process regarding the "Construction of Two Monitor Wells at the

Kaupakalua Well Site” project or the two monitoring wells, which actions are described with particularity in paragraph 14. below.

b. That this Court issue an Order cancelling or voiding, because undertaken in violation of the Consent Decree, the actions in the procurement to construction process regarding the “Construction of Two Monitor Wells at the Kaupakalua Well Site” project or the two monitoring wells, which actions are described with particularity in paragraph 14. below; and/or

c. That this Court issue temporary, preliminary and permanent injunctive relief enjoining the County Defendants, and all those acting by and through them, from taking any of the actions in the procurement to construction process regarding the “Construction of Two Monitor Wells at the Kaupakalua Well Site” project or the two monitoring wells, which actions are described with particularity in paragraph 14. below.

14. Plaintiffs seek declaratory relief prohibiting Defendants and/or injunctive relief enjoining Defendants, and all those acting by and through them, from (1) putting the construction of the two monitoring wells out to bid at this point in time, (2) awarding any Contract for the construction of the two monitoring wells, (3) expending any County funds upon or encumbering any County funds for the two test or monitoring wells, (4) using County lands for the two test or monitoring wells, (5) executing any Contract for the construction of the two monitoring wells, (6) issuing any Notice to Proceed for the construction of the two monitoring wells and/or (7) commencing construction upon or constructing either or both of the monitoring wells, all without first

fully complying with the terms and conditions contained within the Consent Decree.

II.

1. This Court, in this Section II., enters the following conclusions of law, in support of this Order, as follows.

2. In paragraph 12.1 of the Consent Decree, Plaintiffs and Defendants reserved their respective rights to seek in this Court the enforcement of the terms and conditions contained within the Consent Decree and, therefore, this Court has jurisdiction over these matters.

3. Defendants have had adequate notice of Plaintiffs' Motion and the opportunity to respond to Plaintiffs' Motion.

4. Plaintiffs have met their burden of demonstrating that the Defendants are in violation of the Consent Decree by putting out to bid the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project on February 19, 2013.

5. The Court therefore declares that the Defendants are in clear violation of the Consent Decree in the manners described in Section I., paragraph 12 above, by putting out to bid the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project on February 19, 2013.

6. This Court has the inherent power to enforce its decrees, including this Consent Decree, and to make and award such orders, writs or decrees, including issuing injunctions, as may be necessary, in aid of its original

jurisdiction, to render its decrees and orders effective. HRS §§ 603-21.9(1) and (6).

7. Because the Court finds, determines and declares that the Defendants are in violation of the Consent Decree the injunctive relief requested by Plaintiffs shall issue to prevent violations of the Consent Decree as Orders of this Court and to maintain the status quo until compliance with the Consent Decree is achieved by Defendants.

8. Plaintiffs have satisfied the tests for injunctive relief to maintain the status quo as demonstrated in Plaintiffs' Motion: (1) Plaintiffs have prevailed on the merits of Plaintiffs' Motion, as determined herein; (2) the balance of irreparable damage favors the issuance of injunctive relief in that Plaintiffs have demonstrated procedural harm, as in *Sierra Club v. Department of Transportation of the State of Hawai'i* ("*Sierra Club I*"), 115 Hawai'i 299, 167 P.3d 292 (2007) and (3) the public interest supports granting an injunction because protecting Plaintiffs' public participation rights is in the public interest; *KSOA v. County of Maui*, 86 Hawai'i 66, 947 P.2d 378 (1997). *Life of the Land v. Ariyoshi*, 59 Haw. 156, 158, 577 P.2d 1116 (1978); *Office of Hawaiian Affairs v. Housing & Community Development Corp. of Hawaii*, 117 Hawai'i 174, 212, 177 P.3d 884, 922 (2008).

III.

1. This Court, in this Section III., enters its Decision and Order in support of this Order, granting injunctive relief, as follows.

2. An injunction is hereby entered enjoining the Defendants, and their subordinates, agents, attorneys, and all other persons acting in concert or participation with them who have actual knowledge of this Order, from taking any of the following actions in the procurement to construction process regarding the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project or the two monitoring wells:

a. Putting the construction of the two test or monitoring wells or the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project out to bid at this point in time;

b. Awarding any Contract for the two test or monitoring wells or the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project;

c. Expending any County funds upon or encumbering any County funds for the two test or monitoring wells or the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project;

d. Using County lands for the two test or monitoring wells or the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project;

e. Executing any Contract for the two test or monitoring wells or the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project;

f. Issuing any Notice to Proceed for the two test or monitoring wells or the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project; and/or

g. Commencing construction upon or constructing either or both of the two test or monitoring wells or the "Construction of Two Monitor Wells at the Kaupakalua Well Site" project.

3. This injunction shall remain in effect until Defendants establish to this Court that they are in full compliance with the terms and conditions contained within the Consent Decree entered in this case on December 22, 2003 as the Orders of this Court.

NOV 14 2013

DATED: Wailuku, Maui, Hawaii _____.

APPROVED AND SO ORDERED:

/S/ JOSEPH E. CARDOZA (SEAL)

Judge of the Above-Entitled Court

APPROVED AS TO FORM:

Patrick K. Wong
Corporation Counsel
Edward S. Kushi, Jr.
First Deputy Corporation Counsel
Moana M. Lutey
Richard B. Rost
Caleb P. Rowe
Deputies Corporation Counsel
Attorneys for Defendants
The Board of Water Supply, County of Maui, Department of Water Supply
County of Maui, David Taylor, in his capacity as Director of the Water
Department, County of Maui

The Coalition to Protect East Maui Water Resources et.al. v. The Board of
Water Supply, County of Maui et.al.;
Civil No. 03-1-0008(3)
Order Granting
Plaintiffs' Motion to Enforce Consent Decree,
For Declaratory Relief, For Temporary, Preliminary
and Permanent Injunction and Other Relief

Testimony of Paul H. Brewbaker, Ph.D.
Economist, TZ Economics
on behalf of the Maui County Department of Water Supply

Re: Petition to Amend Interim Instream Flow Standards for Waikamoi, Puohokamoa, Haipuaena,
Punalau/Kolea, Honomanu, West Wailuaiki, East Wailuaiki, Kopiliula, Puakea, Waiohue,
Paakea, Kapaula & Hanawi Streams (Case No. CCH-MA13-01)

December 27, 2014

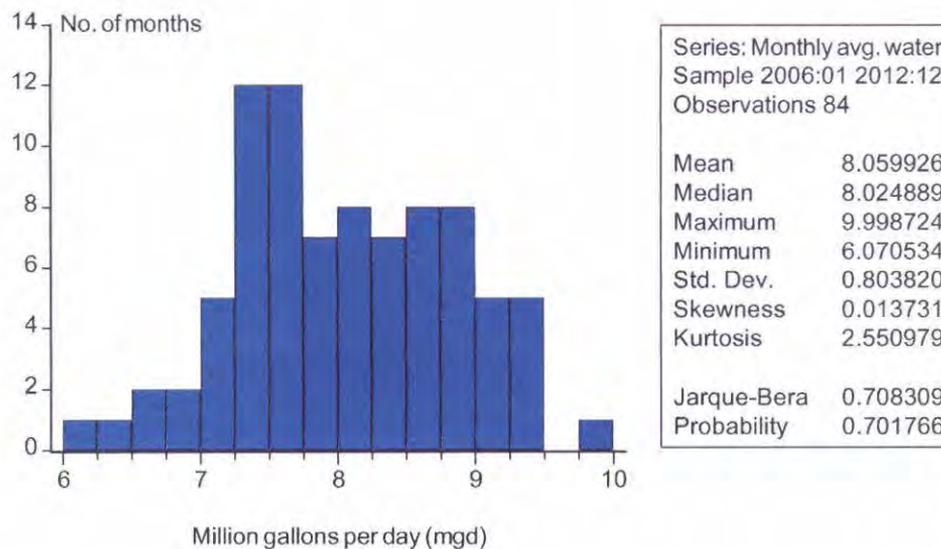
My name is Paul H. Brewbaker and I am the principal of TZ Economics, a Hawaii economics consultancy. I am a consultant to the Maui County Department of Water Supply in the East Maui stream contested case on the establishment of instream flow standards. I have previously testified on similar issues in the Na Wai Eha case on Maui. My professional experience is in research and economic analysis of the Hawaii economy and related fields, and in financial risk analytics from 25 years as a commercial bank economist and executive. I received a Ph.D. in economics from the University of Hawaii, and an A.B. in economics from Stanford University, and also did graduate work at the University of Wisconsin, where I taught economics at the Milwaukee and Madison campuses. I have also lectured in economics at the University of Hawaii at Manoa, and around the UH system, as well as at Hawaii Pacific University. In graduate school in economics my major and minor fields were in economic development and international economics, and my third field was natural resource economics. I am certified as an expert economist in Hawaii District Court.

This testimony reports results of econometric analysis of Upcountry Maui water consumption, both agricultural and nonagricultural, and implications for water supply risk management. It also suggests additional methods of evaluating benefits and costs of a water reallocation associated with the imposition of instream flow standards that reduce Upcountry Maui water availability. My conclusion is that such diversions and reductions would not be social welfare-enhancing and would impair water supply risk management to the detriment of household consumption and agricultural production. This conclusion is developed in the first section of this report. An appendix comprising subsequent analytical sections includes statistical detail from monthly and annual Upcountry Maui water consumption data.

1. Economic impacts of three water allocation reductions

The distribution of monthly Upcountry Maui water consumption for 2006-2011 is depicted below. The statistics reported below are analyzed in greater detail in the appendix, in sections enumerated consecutively along with this impact discussion. Roughly 8 million gallons per day (mgd) of water use is observed on average, plus or minus about 10 percent (one standard deviation, 0.8 mgd). (Approximately 60 percent of Upcountry water use is residential, 40 percent agricultural.) The distribution is slightly positively skewed: there are frequent months below the average of 8 mgd (around 7.5 mgd), but a bulge “above average” is associated with drought conditions, requiring higher water use. These monthly data are seasonally-adjusted, correcting for higher summer use and lower winter use: dryer conditions cause the tilt. There are also more extreme high (dry) *and* extreme low (wet) months in the sample than normal, as indicated by kurtosis. Informally, this is a “fat-tailed distribution,” not a normal distribution. There is only a 70 percent chance of it being normal (Jarque-Bera probability): extreme conditions matter more than they “normally” would in Upcountry Water consumption.

Figure 1. Monthly average Upcountry Maui water consumption
(in million gallons per day, monthly averages)

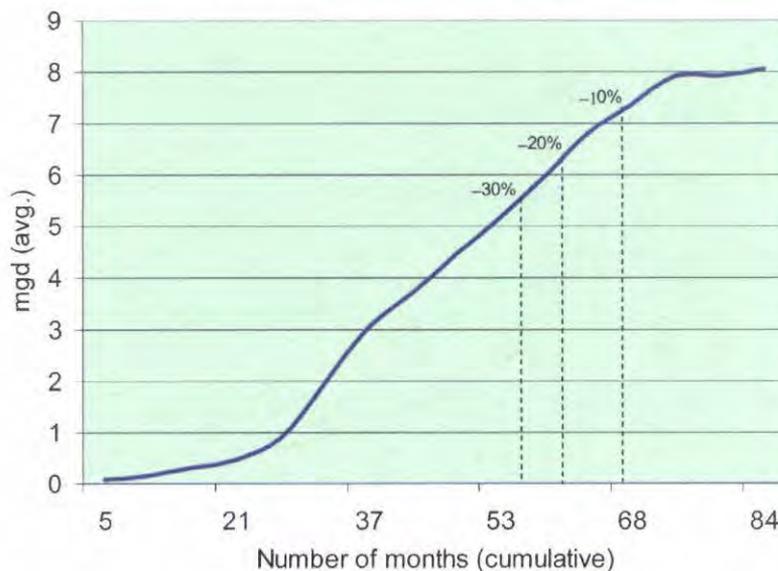


Again, analytical details are left to the appendix. However, an indication of the economic cost of water allocation reductions can be motivated using Figure 1. A water allocation reduction of 10 percent from 8.0 mgd to 7.2 mgd—again, roughly the equivalent of one standard deviation (0.8 mgd)—would “cut off” the upper tail of the distribution. To see this, assume that the Maui County Department of Water Supply (DWS) could not *systematically* deliver more than an average of 7.2 mgd under a new allocation 10 percent less than original consumption. Assume also that the range of monthly water use, from wet to dry conditions, remained about 2.0

mgd or 2.5 standard deviations from the original average (the original range from 8 to 10 mgd, and from 8 to 6 mgd). That's because the range of variation is *consumption*-driven and determined by actual water use in mgd, up to ± 2 mgd, rather than as a percentage of use.

Therefore, reducing supply (to 7.2 mgd) when demand is well-established (at 8.0 mgd over 84 monthly observations) means that there will be some months with excess demand under the new allocation. During rainy months a reduced allocation is not a binding constraint, but in dryer than usual months (adjusting for the heavier use in summertime by seasonally-adjusting the underlying monthly data), a lower allocation *will* be a binding constraint. That is, the cost of an allocation reduction is *asymmetric*: it is borne during the dry periods when water is most needed. It is superfluous when there is greater than customary rainfall. *Only* in drought or drought-like conditions does an allocation reduction have an impact, and it is an unambiguously negative impact. There is *never* a positive impact.

Figure 2: Cumulative distribution of monthly Upcountry Maui water consumption (in average mgd, 2006-2011)



As illustrated above, the *cumulative* distribution of water use reveals that in about 15 of the 84 months illustrated in the sample above, water use would have to be reduced to nil, cut off absolutely, in order for the remaining months' water consumption *not* to exceed a 7.2 million mgd allocation (reading off the vertical axis). That's for a 10 percent allocation reduction. For a 20 percent reduction, in more than 20 of 84 months water would have to be cut off completely. For a 30 percent reduction, in 25 months of 84 months of water could have to be cut off. Roughly speaking, for a 10 percent allocation reduction, water would have to be cut off about 18 percent of the time; for a 20 percent allocation reduction, water would have to be cut off about 24 percent of the time; and for a 30 percent allocation reduction, water would have to be cut off about 30 percent of the time.

Why are the magnitudes of these implied reductions, in terms of proportions of time originally associated with 8 mgd in average consumption—from 18 to 24 to 30 percent of the months—seemingly such large proportions of the total? The answers have to do with our assumptions, that DWS strictly adheres to its allocation on average, and that the range of variation between wet and dry periods *taking into account seasonality* is ± 2 mgd. An allocation of 8 mgd under those conditions we already know has two consequences.

First, farming in Upcountry Maui already suffers not infrequently from drought and drought-like conditions that are adverse to commercial viability. To be sure, these operations' annual farm gate receipts are small in the grand scheme of things, but the data set used here includes periods of challenging drought conditions and is therefore representative.¹ Those drought conditions are part of the variation around 8 mgd, the +2 mgd of water consumption observed in dryer months (adjusted for seasonality) that comprise the upper tail of the ± 2 mgd variation in water use.

Second, these monthly water consumption extremes are more prevalent than if the distribution were normal. Literally, when one says that there are “normally” such-and-such numbers, the average height of adult females or average public school achievement test scores, one means that the outcomes are normally distributed. In such circumstances the mean informs us about average outcomes and the standard deviation informs us about representative variation in those outcomes. As developed in greater detail in the appendix, Upcountry Maui water consumption is *not* normally distributed. In practice the implication of this finding is that extreme outcomes of drought and drought-like conditions are much more likely to occur “than normal.” Furthermore, it's only the dry extremes that matter: during more rainy months than customary water supply is not a problem. Therefore, all of the adjustment to a water allocation reduction must be borne by the extreme dry times which are significantly more probable than normal.

In estimating *economic* impacts of these essentially hydrological changes, it is important to identify what we can include and what we have to ignore. For example, nearly 6,000 new residences with applications for building permits—compared to roughly 10,000 existing metered water users in Upcountry Maui—currently are denied access to water, but we ignore this opportunity cost of the *existing* water allocation.² Similarly, agriculture output in Upcountry Maui is of second-order smallness relative to existing Upcountry residential real estate valuations (an annual flow of less than \$50 million compared to a stock in a range of \$6-8 billion), but one can argue that the value of the lifestyle and local subculture associated with these agricultural

¹ The Hawaii Agricultural Statistics Service reports that in 2010 Kula received only about 48 percent of its annual average rainfall, an average of 10.7 inches of rain per month compared to 22.3 inches under normal conditions. Data are hard to come by, particularly for Maui's vast Upcountry ranching acreages, because data are not published to avoid disclosure of individual operations, but sugarcane acreage on Maui customarily has absorbed only 34,500 of the 230,000 acres actively in agriculture on Maui Island, including around 1,150 farm operations and more than \$100 million in receipts (excluding those of one sugarcane-growing operation).

² At \$564,000 for the median Maui existing single-family home sale price in October 2014, this is approximately \$3.38 billion in foregone real wealth. Realtors Association of Maui median existing home sales prices year-to-date through October 2014 range in Pukalani from around \$567,500 to as much as \$807,500 in areas such as Kula/Ulupalakua/Kanaio. Note that medians are *not* moments of the home price distribution.

activities is a substantial unobservable value approximated by a portion of peoples' willingness to pay to inhabit Upcountry Maui. Again, we ignore this attribution of value, but recognize that (in any event) the distribution of existing home prices is a representative sample of the housing inventory which is consistent with modern synthetic asset valuation models' estimates of tax assessed values.

Estimated costs of prospective water allocation reductions are presented in Table 1, below, which enumerates estimates discussed above and includes the value of residential wealth foregone by presumed housing abandonment. In principle, a one-quarter reduction in water supply could be effected simply by vacating one-quarter of households. The value of such abandonment, pro-rated to reflect the 60 percent proportion of Upcountry Maui water use that is residential, is calculated based on the weighted average value of recent average existing home prices of a selection of relevant neighborhoods.³ Equivalently, one could assume that water pricing was adjusted to induce the same residential consumption reductions, which would differ marginally but primarily in terms of the distribution of outcomes (rich households would stay). The point is that reductions in water availability on these orders of magnitude—10, 20, and 30 percent—nontrivially impair habitation and agricultural activity. These effects are exacerbated by more frequently than normally observed drought and drought-like conditions in Upcountry Maui, along with the integer constraint that going without water is cause for abandonment.

Table 1 Economic impact matrix of Upcountry Maui water allocation reductions

Water allocation reduction	Millions of gallons per day (avg.)	Proportion of time (months) denied water relative to customary 8 mgd	Residential losses from abandonment (\$ bil)
10%	7.2	18%	\$0.770
20%	6.4	24%	\$1.027
30%	5.6	30%	\$1.283

Notes: Water allocation reductions are calculated as a percentage of 8 mgd. Proportions of time denied water are based on the cumulative distribution illustrated in Figure 2. The same proportions of an estimated 10,000 housing units (which number about 71,000 in Maui County) are assumed to represent the fractions rendered uninhabitable for lack of water, about 60 percent of the incidence of which allocation reductions are imposed on residential users.

3

<i>Data through October 2014</i>	Year-to-date sales	Mean prices
Haiku	63	\$708,859
Kula/Ulupalakua/Kanaio	62	\$885,694
Makawao/Olinda/Haliimaile	47	\$564,755
Pukalani	46	\$627,162
Sum	218	
Weighted average		\$710,844

Source: Realtors Association of Maui

Appendix

2. Annual Upcountry Maui water consumption

Upcountry Maui water consumption on an annual average basis had only a slight upward trend over the period 1994-2011, with no obvious macroeconomic procyclicality. Variations around trend dominate. Measured on a de-trended basis in terms of annual changes in the logarithms of annual water consumption, normalized standard deviations of nonpotable water use (all of which is agricultural), 22.7 percent, is more than two and a half times that of potable water use, 8.5 percent. Normalized standard deviations of agricultural potable water use, 13.5 percent, is almost twice that of non-agricultural potable water use, 7.1 percent. Because volatility dominates over the trend, risk-management is the chief resilience mechanism and is available, in principle, only through storage (precautionary savings) or on-demand access (streamflow diversion). Water provision is superficially the Department of Water Supply's primary social function, but risk-management (resilience) is at least as important an *economic* function.

Figure 3: Average annual Upcountry Maui water consumption

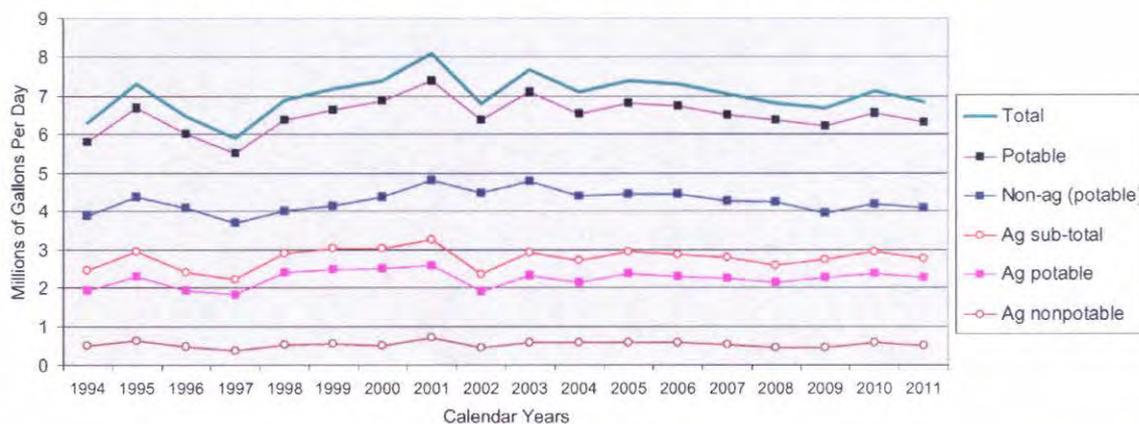
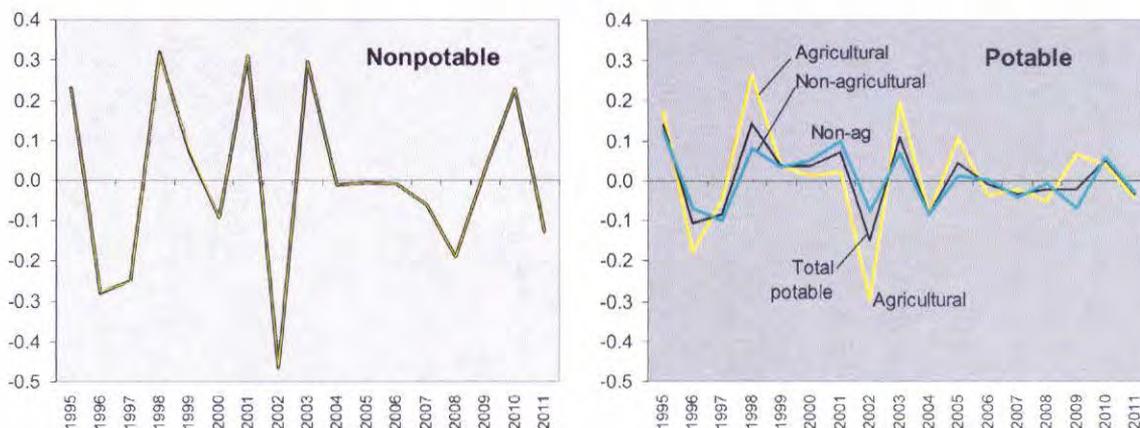


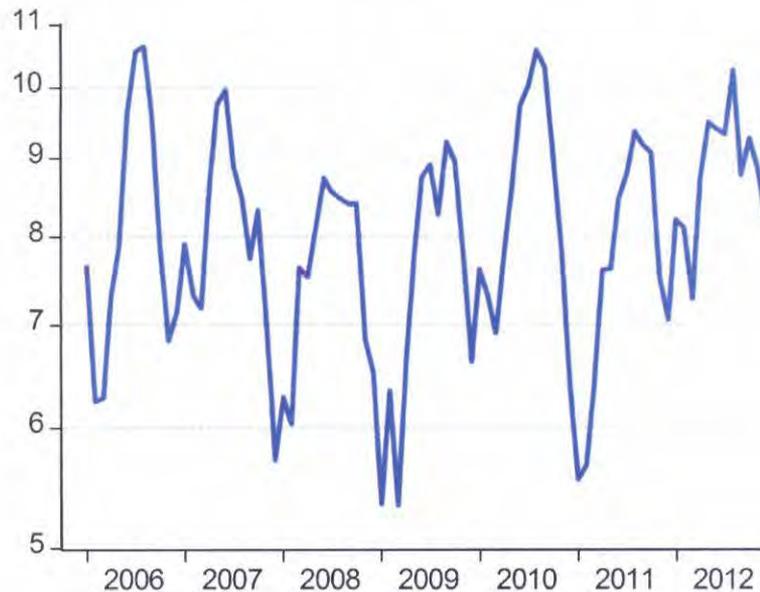
Figure 4: Annual changes in natural logarithms of Upcountry Maui water consumption



3. Monthly Upcountry Maui water consumption

Monthly Upcountry Maui water consumption is illustrated below in Figure 5. It exhibits three characteristics into which the time series can be disaggregated to distinguish trend, seasonal, and irregular components. The procedure here is to use the U.S. Census Bureau X-12 ARIMA seasonal adjustment filter to remove seasonal variation, to apply a Hodrick-Prescott filter to the seasonally-adjusted monthly data to extract the trend component from the data, and to characterize variability with higher-order moments of the distribution of monthly changes in the natural logarithm of the monthly, seasonally-adjusted water consumption data. These transformations highlight the wave-like motion, its trend motion, already visually apparent in the monthly data even before seasonal adjustment (as below). Seasonality is a regular component that should be distinguished from trend variation over time. Variability that remains in the monthly water consumption data, after de-seasonalizing and de-trending the data, is important for understanding the nature of risk exposure (volatility), reasons for managing risk, and consequences of mismanagement.

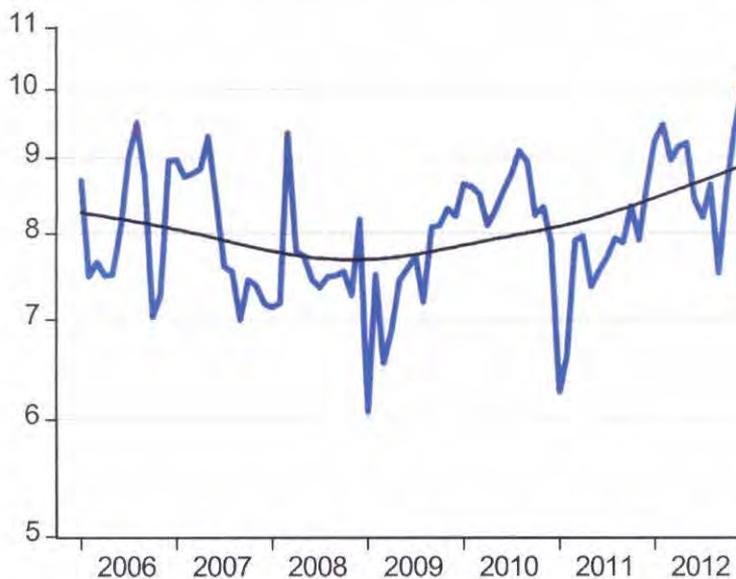
Figure 5: Monthly Upcountry Maui water consumption
(in million gallons per day, monthly averages, log scale)



4. Seasonally-adjusted monthly Upcountry Maui water consumption

Seasonal adjustment reduces the scale of variation in the monthly water consumption data (compare Figure 6, below, to Figure 5, above). The trend component is illustrated as the smooth black line.⁴ Two potential sources of trend motion are changes in macroeconomic circumstances and evolving weather conditions. Since the Great Recession (December 2007-June 2009) is *out-of-synch* with trend variation, rainfall and drought are more likely factors, particularly given large agricultural water use. Drought requires more water consumption in farming. While economic recovery may be associated with trend water consumption growth 2010-2012, water consumption does not synch with the cyclical peak of Maui economic activity in 2007-2008. At the economic peak, water consumption was at a low ebb.

Figure 6: Seasonally-adjusted monthly Upcountry Maui water consumption
(monthly in millions of gallons per day, monthly averages, log scale;
trend component depicted as smooth line)



⁴ Seasonality doesn't affect the trend much:

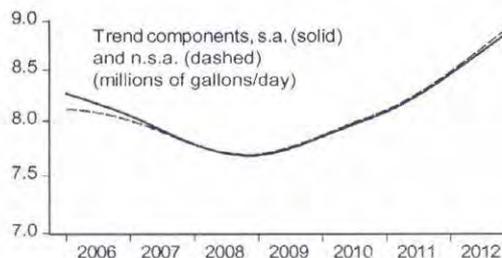
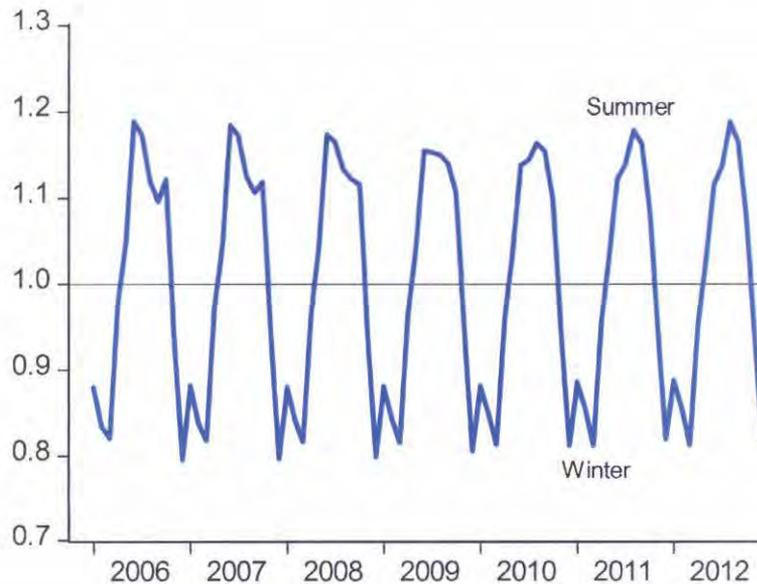


Figure 7: Seasonal-adjustment factors for Upcountry Maui water consumption

(Index: monthly average for each year = 1.00;
e.g. summertime requires 10-20% more water use than the annual average)

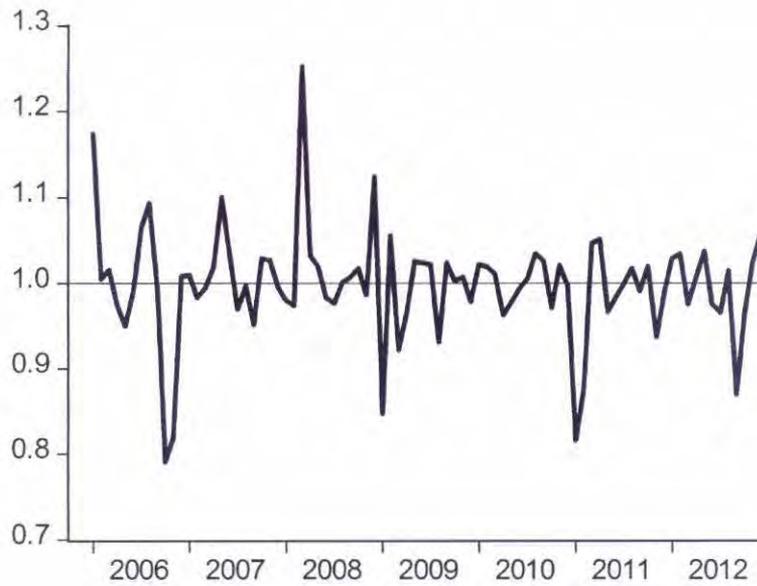


As illustrated in Figure 7, above, while there are slight variations from year to year, the dominant seasonal cycle is heavier water use in the summer than in the winter. Again, given the scale of agricultural use, this is understandable. Solar exposure is greater in the summer when days are longer, so even if rainfall were perfectly constant year-round agricultural water use would be greater during the longer growing days of summer. Since winter is a comparatively wet season, however, the variation in rainfall from winter to summer complements the growing season influence. Variations of plus or minus 20 percent in water use relative to the annual average are apparent in the monthly seasonal adjustment factors illustrated above. This implies that summer water use regularly is nearly 50 percent higher than in winter ($1.2/0.8 = 1.5$). A dryer than normal summer, in turn, or a sequence of dry summers, will produce unusually large increases in water consumption, as will the odd rainy month in winter produce large decreases.

Finally, in Figure 8, below, the irregular variation in water consumption, extracted with the same X-12 filter used to remove seasonal variation, is illustrated (but only for completeness).⁵

⁵ Extraction of trend, seasonal, and irregular components are three elements of a traditional disaggregation associated with the work of Box and Jenkins, culminating in their 1976 publication of *Time Series Analysis*. However, to characterize volatility of water consumption in time-varying terms, as is done in the next section, this analysis draws on the introduction of autoregressive conditional heteroskedasticity models by Robert Engle (1982) and their generalization by Tim Bollerslev (1986) and others, for which Engle received the Nobel Prize in 2003.

Figure 8: Irregular component of monthly Upcountry Maui water consumption
*(after seasonality and trend components have been extracted from the data;
the irregular component is an indication of shocks and random motion)*



5. Distribution characteristics of Upcountry Maui water consumption

The distribution of the monthly log changes of Upcountry Maui water consumption confirms the approximate trendlessness in the monthly data for the sample period 2006-2012, with a mean near zero. The distribution has slightly larger extreme decreases than extreme increases, but has more clusters of positive changes, so it is negatively skewed. It is skinny in the middle and has fat tails, so it is leptokurtotic. Skewness and kurtosis imply that the distribution of log changes is not normal. The Jarque-Bera statistic for the test of normality of the distribution suggests, with probability 99.9 percent (“almost certainly”), that the distribution of log changes is *not* normal. This significant departure from normality implies that the mean and standard deviation of the distribution (first and second moments of the distribution, respectively) are *not* sufficient statistics to characterize the distribution, as would be true in the case of the conventional “bell-shaped curve.” In this instance, especially because of the relatively large extreme changes, so-called higher-order moments of the distribution matter. The mean (first moment), and standard deviation (second) aren’t enough. The third moment matters because positive changes cluster somewhat above the mean (skewness). The fourth moment matters because extremes are, literally, greater than normal (kurtosis).

Figure 9: Distribution of the change in the natural logarithm of seasonally-adjusted monthly Upcountry Maui water consumption; a non-normal, “fat-tailed” distribution
(underlying data are in millions of gallons per day, monthly averages)

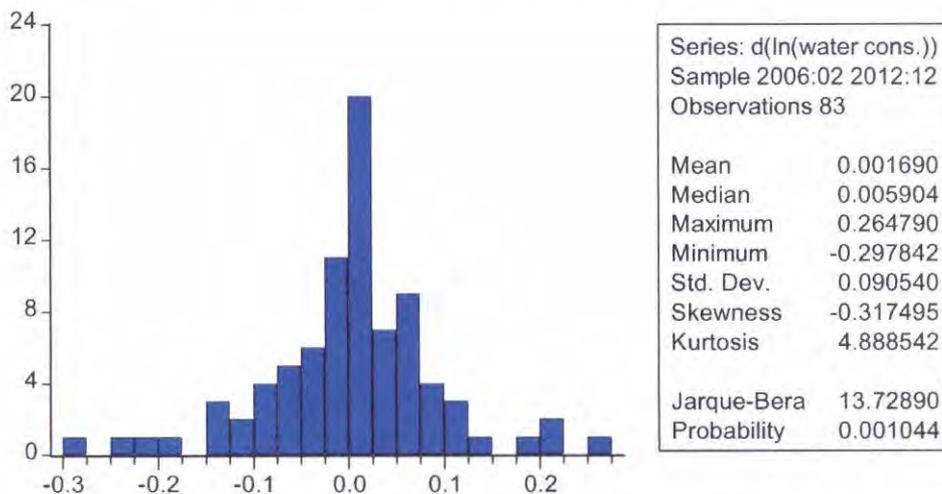
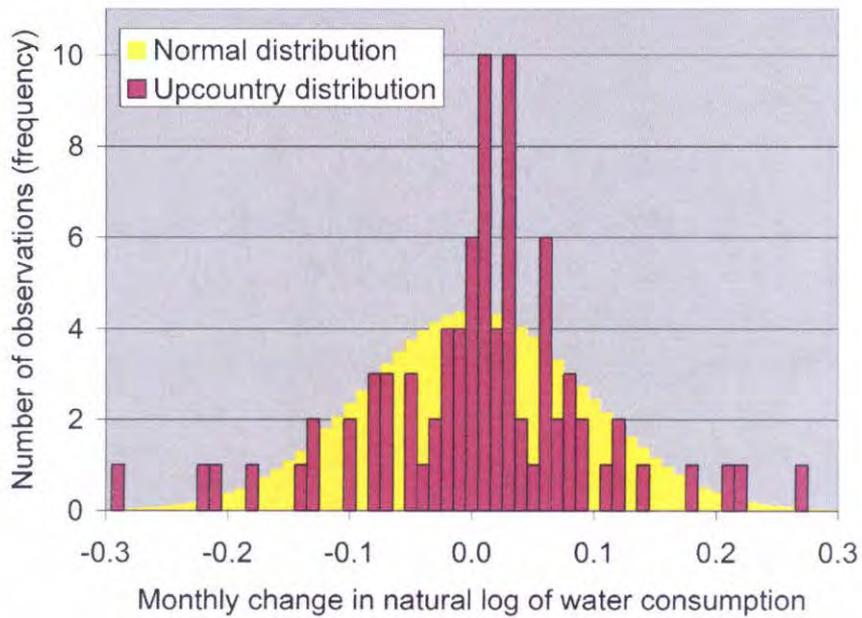


Figure 10: Comparison of actual distribution of monthly changes in the natural logarithm of Upcountry Maui water consumption with a normal distribution calibrated to the actual mean and standard deviation

(if the actual distribution were normal, the mean and standard deviation—first and second moments—would suffice to characterize the entire distribution and it would neither have “fat tails,” nor a “skinny middle,” nor a “tilt” from higher outcomes)

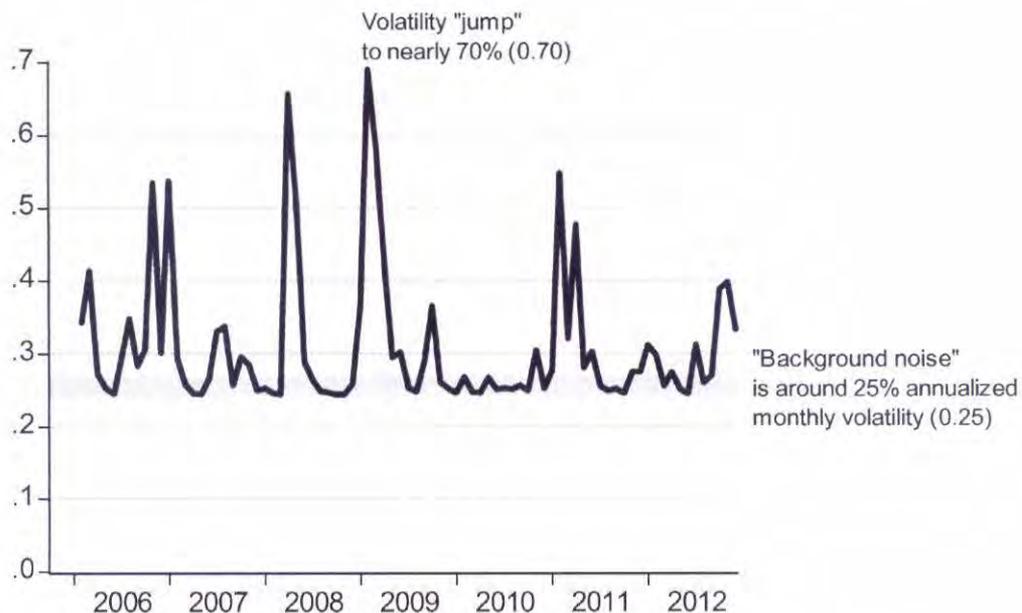


6. Conditional volatility of monthly Upcountry Maui water consumption

The distribution of log changes of monthly Maui Upcountry water consumption is not normal, so its standard deviation insufficiently characterizes its volatility. Actual water consumption changes have a leptokurtotic or “fat-tailed” distribution. Rare extreme events are more common than normal (literally). There are larger numbers of outcomes clustered around the mean *as well as* larger numbers than would normally be present at extreme values of the distribution (see Figure 10). These characteristics are problematic from a risk-management standpoint. On an annualized basis the *unconditional* (constant) volatility is 31.4 percent,⁶ but annualized *conditional*—time-varying—volatility is only about 25 percent. Improbable extreme events cause conditional volatility *jumps* more frequently than normally should be observed. That is, under the usual conditions outcomes may be closer to zero than normal, but in some months (more frequently than normal), conditions of extreme drought or rainfall yield corresponding jumps (up and down) in water consumption. To render the system resilient, any risk management strategy must be able to handle these conditional volatility jumps.

Figure 11: Conditional volatility of monthly Upcountry Maui water consumption is characterized by large, infrequent, unpredictable jumps

(Threshold autoregressive conditional heteroskedasticity (TARCH) estimates of the annualized monthly standard deviations of changes in the natural logarithms of seasonally-adjusted monthly Upcountry Maui water consumption)



⁶ The unconditional standard deviation of monthly log changes times the square root of 12 (months).

7. Dynamic consequences of reduced water availability in Upcountry Maui

The volatility of water consumption makes it hard to extract signals from the noise in the data: is water use rising because there are more households, more crops, more drought, or none of the above and something else? In fact, Upcountry Maui water consumption has been nearly trend-less for more than a decade, yet an examination of volatility suggests why instream flow standards should not be imposed that impair water uses in Upcountry Maui. Reduced water availability dramatically increases exposure to the risk of extreme water shortages.

Simply put, the availability of instream diversions “on demand” provides a mechanism for managing the inherently unpredictable variation in water availability and water consumption in Upcountry Maui. Instream access acts the way a buffer stock would, if a bottomless reservoir were available. Within-year variations from as little as 5 million gallons/day to as much as 10 million gallons/day are evident, a 5 million gallon/day within-year swing from top to bottom, in the monthly averages analyzed in sections 4 and 5 of this report. Even *after* taking into account seasonal variation from greater water use in summer to less in winter, within-year swings of 3 million gallons per day are documented in the monthly sample subset (2006-2012) that provides a snapshot from the longer annual sample (1994-2011) separately analyzed.⁷

In round numbers, average monthly seasonally-adjusted Upcountry Maui water consumption is about 8 million gallons per day, with a standard deviation of about 1.3 million gallons per day. Normally, one might conjecture that 95 percent of the variation in water consumption was two of these standard deviations, but as noted earlier even a low-magnitude growth trend undermines this inference. The average of annual log changes is small 0.5 percent, but its nonzero value suggests that measures of volatility are best estimated by de-trending the data.⁸ As this analysis showed, the distribution of monthly log changes is *not* normal, so the customary inferences about risk gained from a couple standard deviations around average consumption are potentially misleading.

In fact, the seasonally-adjusted monthly variations in Upcountry Maui water consumption are leptokurtotic: they have what are informally known as a fat-tailed distribution. After taking into account seasonality *and* de-trending, the monthly changes in water consumption tend to cluster around but just above zero, more than normal (so that the middle of the distribution is “skinnier”). This might fool an observer into thinking that “on average” things cluster around a stationary central tendency, but the skewness of the distribution of log changes means that there is a slight tilt towards more “up” months than down, *even after* removing the slight upward

⁷ Annual volatility metrics demonstrated that most of the variation is from agricultural use. Monthly data were only available for the six-year subset. Monthly data for 2012 were *not* aggregated for inclusion in the annual totals, which were provided for this analysis through 2011 by the Maui County Department of Water Supply.

⁸ Conventional statistical tests to see if the underlying time series is stationary do not obligate first-differencing of the data (in natural logarithms), but such a transformation does improve the associated test statistics. Because the small sample properties of these tests are make interpretation of these tests tricky, first-differencing was undertaken anyway. The idea here is to remove even a low-order trend or, in this case, the swoosh illustrated in footnote 4, to calculate volatility without inclusion of this smooth, medium- to long-term movement over time.

growth trend. This implies that drought or drought-like conditions tend to an already more pernicious presence than “normal,” in the statistical sense.

Furthermore, beyond the “skinniness” and “tilt” of the distribution of the monthly log changes of Upcountry Maui water consumption, the “fat-tails” of the distribution are particularly worrisome. They imply that improbable extreme events—extreme drought or extreme rainfall events that induce wide variations in water consumption, especially agricultural water consumption—are *more likely* to be observed than in the statistically normal sense. Literally, one should expect more extreme water use outcomes than normal. Such surprises, however more frequent, are inherently unpredictable. Worse yet, other months’ outcomes cluster disproportionately frequently close to the average (than if they bounced around normally along the lines of the typical “bell-shaped curve”). This could falsely convey a sense of tranquility when in fact the situation is one of greater and more pernicious volatility. There are more severe jumps “up” and “down” in seasonally-adjusted monthly water consumption, and there are more months with increases in water use than decreases, beyond what might be attributed to a slight upward trend. So, the reality of Upcountry Maui water consumption, statistically, is that drought and drought-like conditions are more prevalent than normal. In spite of a seeming gravitation to central tendencies in typical monthly outcomes, unpredictable, improbably high-loss events are more likely than normal. Extreme drought outcomes, or extreme rainfall events, are more common than normal.

Therefore the potential flow of Upcountry Maui water supplies must systematically exceed, by a significant extent, both the normal usage (e.g. average consumption) and, literally, must be able to accommodate more than the normal variation (measured in terms of standard deviations). Given that the available monthly data for six recent years do not provide the full texture of the more extensive eighteen year-long annual data, it is likely that the leptokurtotic characteristics of the higher-frequency data available for the shorter interval would be confirmed in a longer monthly sample.⁹ Occasional water use increase—after adjusting for seasonal and trend variation—are more common than decreases, and both extremely if improbably large water use increases and decreases are significantly more common than normal.

There is an asymmetry of costs associated with a tendency towards drought and drought-like conditions. Having too little water is more costly than having too much of it in the same proportions. Under improbable but more frequently than normally observed drought extremes of high water consumption, a water allocation decision that *reduced* the existing availability of Upcountry Maui water supplies would have a significant adverse affects on household consumption and on agricultural production. The impacts could be irreversible and potentially catastrophic in terms of falling real estate valuations and losses of agricultural economic activity. Existing streamflow diversions, combined with storage capacity and the water distribution infrastructure endowment extant, already are often—more often than “normal”—vulnerable to the costs associated with volatile water consumption outcomes. Being constrained from having water when it is necessary is an invitation to such binary outcomes as resident outmigration and business shutdown. Curtailing the availability of on-demand instream diversions as a risk

⁹ For eighteen years of monthly data to render the distribution statistically normal would require implausibly that the remaining twelve years’ monthly data were leptokurtotic enough and oppositely skewed precisely to offset the leptokurtotic data from the available six years.

management device to sustain household consumption and agricultural production will risk elimination of both.

Furthermore, reducing the water allocation available from East Maui streams for Upcountry Maui water use might even limit the potential accumulation of excess waters during the infrequent but extreme rainfall events associated with lower water consumption, when reservoirs and water storage could be replenished at zero marginal cost. Thus, risk management for extreme water consumption events would be impaired both in the most costly circumstances of extreme drought and the more common than normal drought-like conditions, *as well as* under conditions of extreme rainfall where the potential to accumulate “precautionary savings” as a buffer against future extreme water consumption needs is least costly to effect.

Summarizing: the existing Upcountry Maui water consumption pattern is characterized by more extreme changes than normal and a greater tendency to drought and drought-like conditions than normal. Reducing instream diversions would undermine the ability to manage impacts of dry weather conditions, leading to greater agricultural production losses and impairing household consumption more than normally, raising the probability of catastrophic losses. The risk exposures to agriculture are, measurably, multiples of those to households, but neither adverse impact should be trivialized. Costs almost certainly exceed benefits of streamflow restoration, and the potentially pernicious distribution consequences of such a water reallocation decision cannot be ignored. Worst of all, the ability to manage risks associated with future drought would be impaired in the very circumstances of heavy rainfall that offer a nearly costless opportunity to do so. Over time, technological improvements that increase the efficiency of water utilization and enlightened investments in water resource development, delivery, and household and agricultural water use creatively can achieve much of what allocation reductions target through brute force. Both technological progress and infrastructure investment are necessary for win-win outcomes that enhance natural resource and cultural stewardship while enabling economic growth. Both take time. Instantaneously reducing Upcountry Maui water availability embraces the false concept that the economic possibilities in this instance are a zero-sum game: that something must be lost for something to be gained. Water reductions raise the risk that the outcome will be negative sum. If volatile swings in water cannot be accommodated on demand from instream diversion, crops will fail and household use will have to be rationed.