EXHIBIT "I-9"
PART N

CHAPTER 6-C

Well Operating Guidelines

On January 31, 1990 the Commission "authorized the Chairperson to reinstitute water management area proceedings and re-evaluation of groundwater status when: a. the static water level of any production well falls below one half of its original level above sea level, or b. any source or any alternative source of supply contained in the Company's water development plan does not materialize and full land development continues."

In 1996, voluntary well operating mangement guidelines (VWOMG)[1] were submitted by CCR to the State Commission on Water Resource Management. Based upon this review the Water Working Group at the time recommended revisions and further recommended that the guidelines, once revised, be made mandatory.

These guidelines set "action levels" as well as specified limits or "lowest allowable levels" of water for each well. When an action level is reached, data on pumping is to receive thorough public and scientific review, with the aim to evaluate whether new source should be developed and pumping on the well reduced.

When the lowest allowable level is reached, pumpage on a given source should stop altogether, pending new source development or recovery. In event that it is not possible to stay within the limitations set for potable wells, LCI will develop new wells and/or outfit Well 7, whichever is most hydrologically appropriate. [2]

1. Lana 'i Water Resources Management Plan, Prepared by Lana 'i Company, Inc., August 1996
2. Resolution 93-42. Relating to the use of non-potable water for the construction of the Manele Golf Course. County of Maui, 1993.

According to these guidelines, pumpage shall be distributed among well sources so as to maintain their water levels within the specified limits delineated in the table below:

TABLE 7-35 Action levels for groundwater sources.

Potable Well	Initial water level (ft elev)	2009 P7 Water level (ft elev)	Action Level* (ft elev)	Lowest allowable level (ft elev)	CWRM Trigger (Half Initial Head, Jan. 31, 1990)
2	1544	1,441	1050	750	772
3	1124	992	750	562	562
4	1589	1,495	1100	750	794.2
*5	1570	1,491	1100	750	735
6	1005	924	750	500	502.5
8	1014	944	750	500	507
Brackish Wells					
1	818	575	550	410	409
9	808	650	550	410	404
14	?	497	400	292	

*Requires public review of all pumpage, water level, and water quality data for possible changes in the resource management procedures, policies, and plans.

** Well 5 is not in operation

CHAPTER 7

Policy Issues

Sustainable Yield

Lana'i has a very low sustainable yield. At 6 MGD, it is less than 1/10 that of any other major island. Unlike the other islands, Lana`i also has no flowing streams or utilizable surface water. Figure 7-3, below, shows the relative sustainable yields of the main inhabited Hawaiian Islands for comparison. Note that the recent update of the State Water Resources Protection Plan reduced sustainable yields from the 1990 estimates on virtually every island but Lana'i, although these reductions were less than initially proposed. In many cases, such decisions resulted from pumpage beginning to approach initial sustainable yield estimates, only to find that such estimates were either overly optimistic, or that distributions of withdrawals had to be increased substantially to realize them. It is not unreasonable to posit that Lana'i might one day find itself in a similar situation.

FIGURE 7-1. Sustainable Yields of Hawaiian Islands

Island	1990 WRPP Sustainable Yield MGD	2007 Draft WRPP Update Sustainable Yield MGD	June 2008 Final WRPP Sustainable Yield MGD
Hawaii	2,431	2,175	2,410
Kauai	388	306	310
Lana'i	6	6	6
Maui	476	386	427
Molokai	81 / 38 Dev	71	79
Oahu	446	419	407

Need for Improved Distribution of Withdrawals

Policy Issues

The document *A Numerical Groundwater Model for the Island of Lana'i, Hawaii* (CWRM-1, Hardy, 1996, pg. 126), "shows that **many more wells** would be necessary to achieve pumpages near the current CWRM sustainable yield estimate of 6 MGD, assuming that long term recharge conditions in the regions above 2,000' remain stable" [emphasis added].

This model assumed withdrawal of water was distributed between thirteen sources, of which two, the Upper and Lower Maunalei Tunnels were passive. Pumping was distributed among eleven sources, as shown in Figure 7-4. Pumping is currently distributed primarily among only six sources, with a seventh contributing an average of only 2,418 GPD.

More than 85% of 2008 water withdrawals on Lana'i, 1,913,310 GPD out of 2,241,222 GPD, came from the Leeward aquifer. All near term plans of LWCI or LHI to develop water are also in the Leeward aquifer. The only pumping well in Windward aquifer is Well 6, with an average 2008 withdrawal of 328,000 GPD. It is unlikely that more pumpage could be distributed to this well, because its water levels are already declining.

FIGURE 7-2. Modeled Distribution of Pumping Versus Present Distribution of Pumping

	AS MODELED IN 1996 CWRM MODEL	CWRM MODEL WELLS IN USE NOW	2008 MAV	* MOST RECENT ACTUAL MAV	* OTHER RECENT ACTUAL MAV	AVG OF NON-ZERO MAVS OVER PUMP RECORD	Comments
Maunalei Shaft 2	500,000	0	0	0	557,385	525,980	*MAV period 13 1994. In the late 1980s, more than 600 KGal came from Maunalei sources. Shaft 2 operated until 1995 with a running MAV of around 526 KGal. Stopped in early 1995.
Well 1	270,000	270,000	393,981	378,074		291,173	*MAV period 7, 2009. Water levels appear to be declining at current pumping rates.
Well 2 / Shaft 3 future "2-A"	300,000		2,418	0	302,468	228,523	*302,468 was MAV period 13, 2006. However, there have not been 13 straight periods of pumping since 1997. Period 8, 1997 MAV was 157,140 GPD.
Well 3	300,000	0	0	0	233,991	191,281	*MAV period 6, 2006. Last 13 period with continuous non-zero pumpage.
Well 4	400,000	400,000	683,867	598,677		532,729	MAV period 7, 2009.
Well 5	400,000	0	0	0	120,030	153,557	*MAV period 12, 1992. This well started in the 200-300 KGal range for 2 years, and then dropped steadily. Period shown is last continuous non-zero MAV use.
Well 6	300,000	300,000	327,912	303,118		432,557	MAV period 7, 2009.
Well 7	200,000	0	0	0			No continuous pumpage record. One monthly number in 1992.
Well 8	300,000	300,000	276,890	255,469		121,459	*MAV period 7, 2009.
Well 9	270,000	270,000	151,440	127,851		224,302	*MAV period 7, 2009.
Well 12	0	0	0	0	14,305	10,316	*MAV period 13, 1995. Started at 17.8 KGal & declined continously. Use stopped in 1997.
Well 14	280,000	280,000	404,714	323,302		336,913	*MAV period 7, 2009.
	---	---	---	---	---	---	
	3,520,000	1,820,000	2,241,222	1,986,491	1,228,179	3,048,790	Average over pump record is high. These wells have not pumped at same time. Difference between 2,238,804 and 2,241,222 is less than 1%, and results from different averaging method.

As modeled in CWRM-1, Hardy, 1996. Modeled scenarios were based on pumpage at the time and various pumpage scenarios that had been proposed at the time.

Declining Water Levels

At 2008 pumpage rates, water levels in several wells are declining (Wells 1, 9, 14, 6 and 8). Pumps have been lowered recently in several wells with Well 9 showing particular stress. Since 2003, the pump in Well 9 has been lowered 442 feet. Water levels are within 48 feet of the "Action Level" in CCR's proposed operating guidelines, and continue to decline. Chlorides have also been rising in the 15 MG reservoir. This is not due to rising chlorides in the wells, but rather to increased use of the higher chloride Well 14 to supplement Wells 1 and 9. However, it does affect the amount of salt that is introduced in irrigation at Manele. LHI is taking action on this situation, by drilling an additional well, Well 15, to distribute withdrawals. How much water and at what quality this well will produce remains an open question. While a certain amount of decline in water levels is to be expected, caution and circumspection would still seem warranted.

Water levels in the wells mentioned are plotted below. In each of these graphs, the green line represents the initial water level. The yellow line is the action level set in the LWCI operating guidelines. The red line is the lowest allowable level in the LWCI operating guidelines. A pink line is plotted, and is the CWRM trigger for designation proceedings, but it is so close to the red line that the two are not distinguishable. The dotted black line is the pump level. The thick blue line is the low water level and the thin blue line is the high water level.

FIGURE 7-3. Water Levels - Well 1

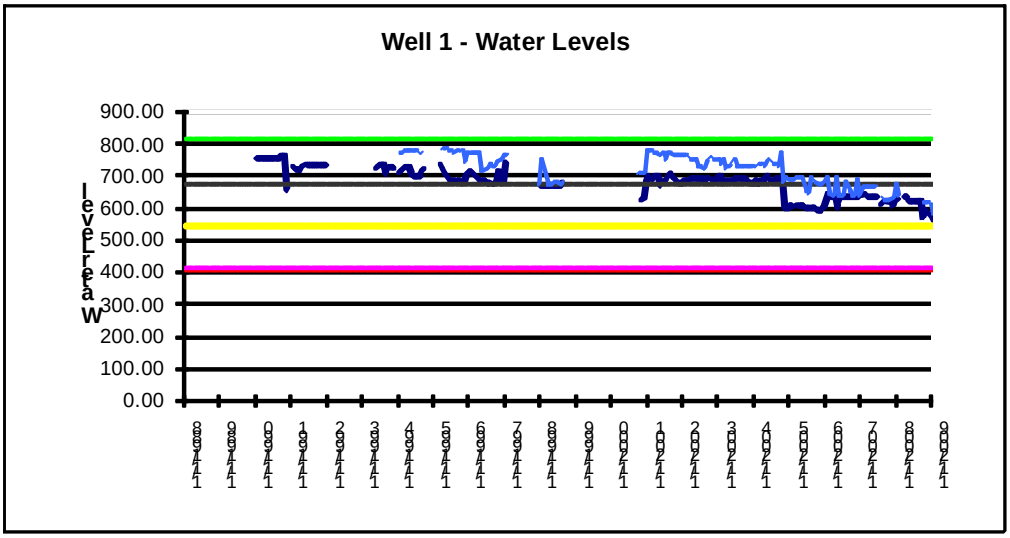


FIGURE 7-4. Water Levels - Well 9

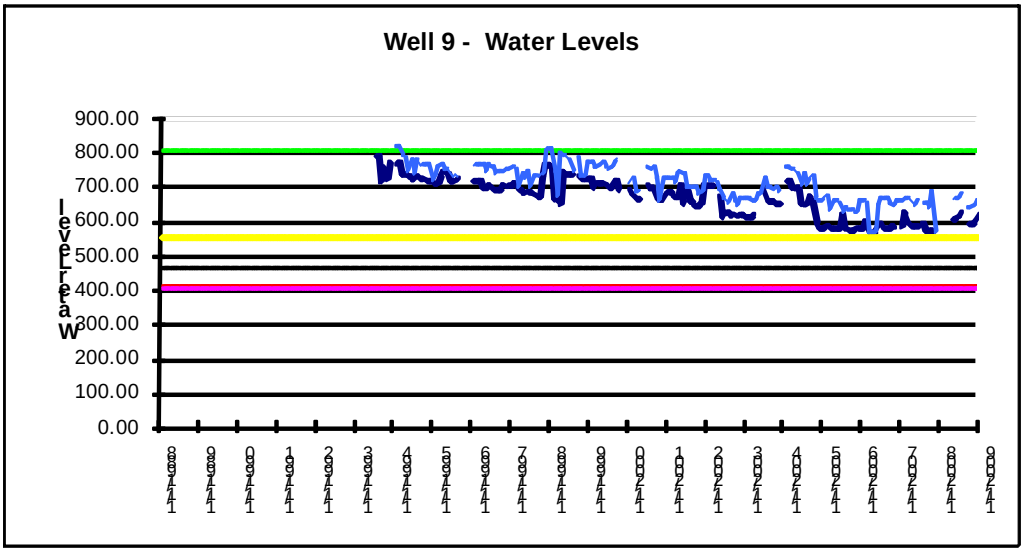


FIGURE 7-5. Water Levels - Well 14

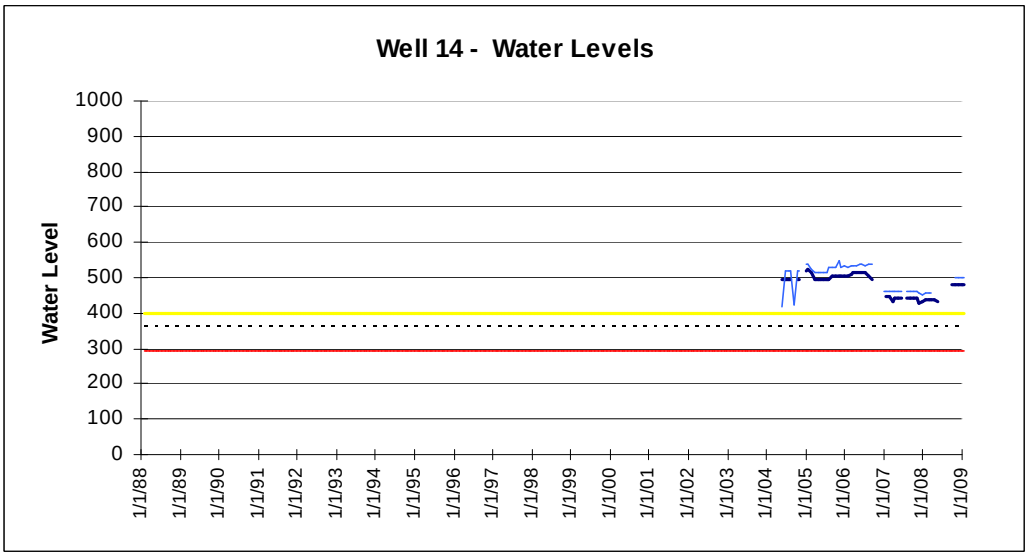


FIGURE 7-6. 15 MG Brackish Reservoir - Chloride Levels

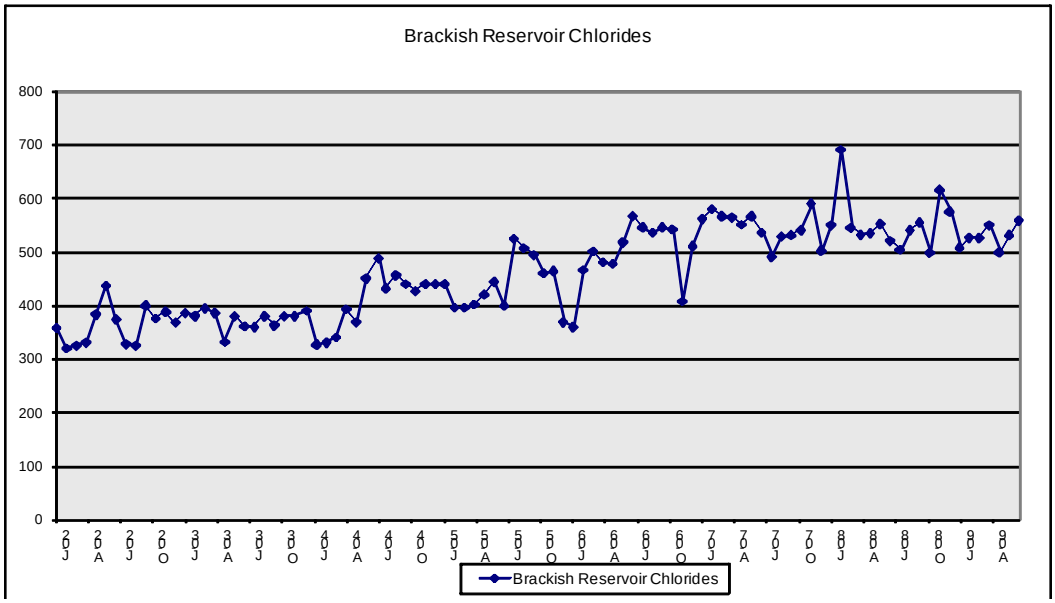


FIGURE 7-7. Well 6 Water Levels

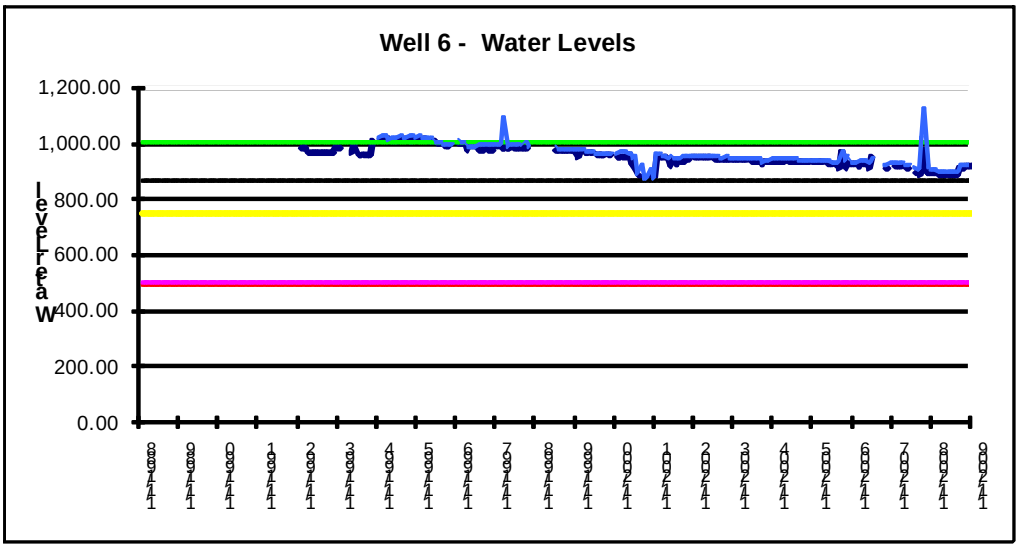
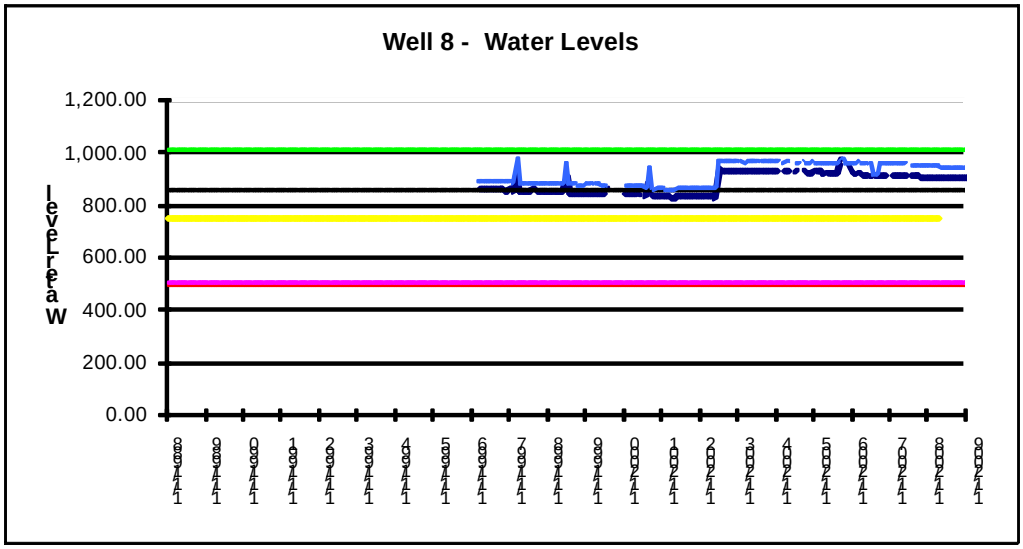


FIGURE 7-8. Well 8 Water Levels



Green - Initial Water Level; Yellow - Action Level; Red - Lowest Allowable Level; Pink - Trigger for Designation Proceedings; Dotted - Pump Level, Thick Blue - Low Water Level; Thin Blue - High Water Level

Importance and Condition of the Mauka Watershed Forest

The *Numerical Groundwater Model for the Island of Lana'i Hawaii* (CWRM-1, Hardy, 1996) "...predicts that the reduction of forest cover would affect ground water levels drastically." (pg. 126) The model indicates that fog drip is a major contributor of recharge to the primary high level aquifer. Fog drip is estimated to contribute 8.87 MGD of a total 13.5 MGD in estimated recharge (65.7%). Loss of fog drip from the forest, even with zero pumpage, would result in a severe drop in water levels, on the order of 25% to 30%. With 6 MGD pumpage, that drop would be even more severe, with water levels dropping 50% within the modeled period. (CWRM-1, Hardy, 1996, pgs. 44, 105 & 112 - described in Chapter 3 of this document).

The mauka watershed forest is exceedingly compromised. By 1993, two thirds of cloud forest vegetation had been lost. (Hobdy, 1993). Despite efforts to install fencing and manage feral ungulates, the Lana'ihale watershed continues to decline. (Hobdy and Penniman, minutes of 5/30/2008 meeting). Increment I of a three-phase project has been completed. However, fencing for the most critical habitat area must wait for Increment III. This is still years away, and funding is uncertain. Whether or not cost recovery for this increment is folded into the final rates of the LWCI, additional major entitlements for CCR should be conditioned upon continuing watershed protection, and most especially upon construction of Increment III of the fence.

Historical Water Allocations

Hawaii Revised Statutes (HRS) §174-C-31 (a)(2) states that the Water Use and Development Plans for each county shall set forth the allocation of water to land use in that county. However, the statute is not prescriptive about how such allocations should be made. Conceivably, allocations could be made in any number of ways, from broad-brush statements about general priorities for each type of water, to accommodating land use forecasts for each sector, to specific and explicit review of every planned use and source. Similarly, such allocations could address the "bottom line" at the end of the planning period and ignore timing, or could address the pace and schedule of resource use.

Regardless of the manner in which allocations are set, they must be set within certain parameters. They must be consistent with Community and General Plans. They must incorporate the current and foreseeable development and use needs of the Department of Hawaiian Homelands. They must reflect the responsibility of the counties set forth in Article XI of the constitution that the State *and its political subdivisions* have the responsibility to protect and conserve resources. In other words, protection of resources is a public trust obligation for which the State has primacy, but from which the counties are not exempt. Given a public trust obligation, a precautionary principle is warranted where applicable in setting water allocations.

1997 Allocation Agreement

Source water use estimates from the 1997 Water Working Group Report are presented in Figure 7-1. These were the starting point for allocation discussions by the Water Advisory Committee for this update. Two key points of the 1997 consensus were:

- Total potable and brackish water use for the Manele Project District should be limited to 1.03 MGD, regardless of any approvals that would result in a higher build-out. High level brackish water use is limited to 650,000 GPD, to be decreased as increasing reclaimed water becomes available. Use of reclaimed water for irrigation should be maximized.

- No high-level water should be utilized to irrigate the Koele Golf Course, with the exception of the special conditions provided for in Ordinances 2515 and 2516, described in Appendix B.

The 1997 allocation agreement remained the consensus agreement of the LWAC until 2002.

Island-wide water use, at 2.24 MGD in 2008, was considerably less than the projected 3.72 for 2010.

Consumption for the Manele Project District area reached 1,082,999 GPD in 2008. Only a small portion of the Project District has been built. Of 282 Single Family units permitted under the Project District Ordinance, only 17 units have been built. Half the hotel units have been built. The project is not even close to full build-out. Similarly, in Koele Project District, only 13 of 535 eventual single family units have been built.

FIGURE 7-9. Water Use Allocations from 1997 Water Working Group Report

LAND USE CATEGORY	Present (97) mgd	2010 mgd	Future mgd	Source of Wate
Residential	0.274	0.414	0.494	Primary
Agriculture	0.219	0.50	1.50	Primary
Commercial & Institutional (10 addditional acres)	0.379	0.439	0.439	Primary
Light Industrial (15 acres)	0	0.09	0.09	Primary
Kaumalapau Harbor	0.009	0.01	0.01	Primary
Lanai Airport	0.004	0.005	0.005	Primary
Manele Project District	0.078	0.68	1.03	Primary & Seco
Manele Golf Course	0.51	0.65	0.65	Secondary
Manele Effluent	0.05*	0.07*	0.14*	Effluent
Koele Project District	0.096	0.20	0.42	Primary
Koele Golf Course	0.25*	0.25*	0.25*	Effluent
Subtotal Groundwater	1.569	2.99	4.64	Primary & Seco
System losses 12% future	0.134	0.41	0.63	
Subotal Groundwater	1.703	3.40	5.28	
Total Effluent	0.3	0.32	0.44	
Total Water Demand	1.73	3.72	5.72	

*Reclaimed wastewater effluent

**Sources of Water:
Primary= Wells 2,3,4,5,6,8, Maunalei

Secondary=Palawai (Wells 1,7,9,10) and beyond

Effluent=reclaimed water

Water Demand Associated with Build-out of Entitled Projects

Build-out of Existing Approvals / Partial Entitlements Could Create Demands Exceeding Sustainable Yields

Absent measures to mitigate withdrawals, existing partial entitlements in the form of Project District approvals, could cause demands to meet or exceed the sustainable yield of one or both aquifers. This is shown in Figures 4-59 and 4-60 of the *Demand Analysis* Chapter. Project Districts plus additional entitlements requested in the CCR proposals, plus non-company projects, would lead total demands to exceed the sustainable yield of the aquifer, as shown in Figures of the *Demand Analysis* Chapter. Build-out of the portions of Project Districts which already have Phase II approvals will lead to a total withdrawal of about 3.66 MGD. This assumes unaccounted-for water could be cut to 15% in the Manele Project District and Palawai Grid areas. At current island-wide unaccounted-for water rates, build out of the Phase II entitled portions of the Project Districts, without additional development in the Windward aquifer, could lead to exceedence of sustainable yield in the Leeward aquifer. These estimates are tallied in Figure 4-76 of the *Demand Analysis* Chapter.

CCR Proposals Include Project Elements Beyond Those In The Approved Project Districts

The CCR proposals indicate additional project elements beyond those already entitled or partially entitled. It also does not include all of the partially entitled project elements in the PD. Differences between build-out of proposals and project district entitlements are delineated in Figure 4-75 of the *Demand Analysis* Chapter. The 2006 proposal for Koele includes 90 Multi-Family units, 425 Single-Family units and 250 Hotel units, while the PD allows for 156 Multi-Family, 535 Single-Family and 253 Hotel units. In Manele, the proposal calls for 200 Single-Family units, 300 Multi-Family, 400 Hotel units, and 10 acres of Commercial area, while the PD allows for 282 Single-Family units, 184 Multi-Family units, 500 Hotel units, and 5.25 acres of commercial. CCR was asked in discussions whether it would be willing to trade additional elements noted above for project elements not included in its proposal. CCR personnel responded that they preferred to reserve the full PD approvals, even though these may not be built-out within the planning time frame. For example, the 2006 proposal raises the count of MF units in the Manele Project District from 184 to 300. At the same time, it omits 82 of the SF units allowed in the Project District. In this scenario, the full count of 200 single family units would still be built, so the net effect would be the addition of 116 MF units. The problem with this logic for Lana'i is that the existing approvals and the proposed approvals both have the ability to render demand higher than sustainable yield. Adding additional entitlement without benefit of clearly identified source raises concerns regarding sustainability of the aquifer. While it is understandable that any business would want to maximize the flexibility of its options, in this case it is recommended that such flexibility be obtained by trading some entitlements for others, rather than by adding more, until more is known about the response of the aquifer to build-out of existing entitlements. This will require interagency coordination. Figure 4-61 is a table of current Project District build-out status. Figures 4-65 and 4-66 are attempts to map this status into Phase I, Phase II and Phase III approvals. Some difficulty was encountered in mapping, as certain unit counts were not tied to specific counts on Project District maps. It is both recommended that this be addressed, and hoped that it may be already being addressed in preparation for the Community Plan process. In any case, discrepancies between proposals and Project Districts as approved, plus the addition of other projects not part of the Project Districts point to the need for both clear allocations and for convenient tracking mechanisms such as the maps described.

Demand Generated From Project Approvals Is Not Immediately Apparent

There is a time lag between when projects are approved and when their full water consumption is reached. Even once projects have been built, there is a time between construction and full occupancy. Therefore, it is possible that additional approvals could be issued before the full impact of already-approved developments is accurately known and gauged. A reviewing governmental body may ask for a comparison of present consumption figures, and incremental additional use represented by the project, without being fully aware of or able to visualize the magnitude of demand still pending. One way to limit the probability of this becoming an issue is to identify sources for each approval, including all existing and planned project elements anticipated to rely on those sources, and to proceed slowly and deliberately with regard to build-out.

Econometric Trends from General Plan Update Data and Time Trends Both Indicate that the Natural Pace of Growth Would Be Slower Than That Proposed

Forecasts range from 2.43 MG to 5.03 MGD, with the base case between 2.6 and 3.5 MGD. Build-out analysis, on the other hand, ranges from 6.08 to 7.13 MGD, or 5.66 MGD for Phase II. The recommended allocation is consistent with the SMS base case forecast at an elasticity of 1.5, allowing slightly

more consumption than the base case and elasticity calculated for other communities on Maui, but not so much as full build-out.

Proposed and Empirical Unit Consumption Are Considerably Higher Than Standards

Both proposed and actual demands in the hot, dry Manele area exceed *System Standard* guidelines. However, in some cases hundreds or even thousands of gallons per day of brackish water are used, even when potable consumption is at or near zero. This and other observations led to the impression that occupancies of these single and multi-family residences can be low, while most of the water goes to irrigation. In turn, this would lead to a lower available return of reclaimed water per unit of build-out. The question was raised by LWAC and discussed at length as to whether per-unit consumption rates exhibited and proposed were reasonable. Water consumption by single family lots in Manele Project District averaged 3,700 GPD in 2008, with a high of over 9,000 GPD. Most of these are half-acre lots. Among the recommended measures are a tiered rate structure and a landscape conservation program with the objective of reducing per-unit consumption.

Conservation Potential

System wide unaccounted-for water averages about 0.633 MGD, or 28.36% of total production. There are several potential sources of such unaccounted-for water. Pipelines in the Palawai Irrigation Grid are old, deteriorated, and subject to high pressures. Leak detection has been performed by visual inspection, "walking the lines", for years. This generally indicates an old system in poor repair. A leak has to be either quite large, or to continue for a long time, or both, before visible signs reach the surface. Other lines are old and sub-standard as well, such as the Kaumalapau line. There is a 15 MG uncovered reservoir where evaporation and other losses are suspected to be high. Also on the brackish system, some unmetered uses were found during the drafting of this document. There is a 1.5 MG covered reservoir which is over fifty years old but lined at the bottom only with old concrete. In addition, end uses demonstrate high per unit consumption, most of which is attributed to landscape. Landscape use is estimated at 1.1 MGD. Per unit consumption rates are high, with much of this going to the landscape. Hotel uses are about 0.27 MGD, roughly half of which is presumed to be outdoor use and included in the 1.1 MGD total. About 485,000 gallons of target savings have been identified in the Supply Options chapter of this document, and are included in the allocation proposal.

Green - Initial Water Level; Yellow - Action Level; Red - Lowest Allowable Level; Pink - Trigger for Designation Proceedings; Dotted - Pump Level, Thick Blue - Low Water Level; Thin Blue - High Water Level

Forest Management and Watershed Protection

Over 65% of the recharge in the primary high level aquifer is attributable to fog drip (Hardy, CWRM, 1996). Forested watershed is critical to maintaining water availability on Lana‘i and yet the native forest on Lana‘ihale is diminishing.

The Lana‘i Water Advisory Committee deemed watershed protection important enough to warrant an entire section of the Water Use and Development Plan. Through several community meetings, a fence alignment and plan to protect the watershed were agreed upon. Other protective recommendations are delineated in the *Source Water Protection* chapter and in the *Implementation Matrix*.

Aside from protective measures identified in that chapter, several policy questions relating to watershed protection were raised in the course of Water Advisory Committee discussions.

Relationship of Forest Protection to Build-out of Entitlements

Continued protection of the watershed, and most particularly construction of Increment III of the Lana‘ihale Fence, were deemed of utmost importance. One way to ensure that such protection continues is to tie continued protection of the watershed forest, and /or specific protective measures, to entitlements. Due to uncertainties as to the timing of construction of Increment III, the enclosure for the best remaining native watershed on the island, it was decided that construction of this fence should be linked to allocation table triggers.

Provision for Forest Protection In Water Utility Rates

Statewide, many utilities have objected to a mandatory provision to address watershed protection in the rates. However, one of the primary reasons has been that drinking water utilities throughout most of the Hawai‘i are not the only, nor even the major users of water, and as such it seemed to be placing an unfair burden on utility customers. On Lana‘i, there are no such complications. All drink from the same source and that source is dependent on the forest. Therefore, the financing plan proposed included watershed protection, specifically construction of the Increment III Fence, deemed crucial to the viability of remaining native watershed.

Aquifer Monitoring and Protection

With a low sustainable yield, declining forest cover, declining water levels and an ambitious build-out proposal, several members of the LWAC expressed concern about extending the life of the aquifer. Such concerns gave rise to the concept of the allocation plan discussed earlier.

In addition to recommended limitations on withdrawals, LWAC members discussed the idea that an allocation plan should include triggers of actions to be taken when pumpage reached certain levels. For instance, total island-wide withdrawals should not exceed those modeled in scenario 6 of Hardy’s numerical groundwater model, without additional distribution of withdrawals or other actions.

The results of Hardy’s numerical groundwater model indicated that the 13 sources modeled should be able to yield 3.52 MGD from the aquifer, without severe water level declines. However, pumpage is currently distributed between only 6 or 7 sources (one source pumps only 2,000 GPD), and, as noted

elsewhere, water levels are declining. Some LWAC members have expressed some concerns about adequate distribution of withdrawals. The implementation chapter lists a schedule of near term, mid term and long term source improvements.

For the planning period, or until new sources can be brought on line to better distribute withdrawals, it is recommended that a minimum 10% resource reserve be maintained in each aquifer. This would enable pumpage impacts on the aquifer to be better evaluated before the full yield is utilized. This recommendation is consistent with other criteria used by the State, such as the criteria for designation of a groundwater management area in §13-171-7 of the State Water Code, which reads, "whether an increase in water use or authorized planned use may cause the maximum withdrawal from the groundwater source to reach ninety percent of the sustainable yield of the proposed water management area." It is also consistent with other CWRM actions, such as the 90% sustainable yield trigger that was set for Iao aquifer. This would limit pumped water to a total of 5.4 MGD, and water pumped from each aquifer to a total of 2.7 MGD during the planning period. A total of 600,000 gallons in resource reserve is included in the allocation plan. However, this amount does not affect other uses within the allocation plan, as each use was escalated separately with the planning time frame.

Key recommendations with regard to source development include:

- New source development should commence at or before the point total pumpage reaches 3 MGD (At current Well 6 pumping rates, this would be 2.7 MGD in the Leeward aquifer).
- Project build-out should take place at a pace that enables continued monitoring of the status of the aquifer and watershed.
- Build-out approvals should be contingent upon continued efforts to protect and preserve the watershed in Lana'ihale.
- Operational guidelines should be followed to avoid over-pumping and ensure adequate distribution of withdrawals.

Wellhead protection was also discussed. Protection of wellheads or potential future wellheads from potential contaminant sources is an important source protection measure. A wellhead protection strategy is presented in Chapter 6 of this document, as well as in Appendix F.

Operational Guidelines

Early LWAC discussions stressed the need for guideposts to help Committee members and water managers know when action must be taken to prevent over pumpage. Guidelines were proposed by CCR and reviewed by CWRM. These are described briefly in the *Source Water Protection* chapter. As stated above, it is recommended that these be followed.

System Monitoring & Maintenance

System monitoring and maintenance was at times a heated topic within the Lana'i Water Advisory Committee. The recommendations here are not strictly policy matters, but arise from the community's desire to have adequate information about the status and condition of the water system.

Maintenance

As demand for water and cost of electricity increase, maintenance will become increasingly important. Unaccounted-for water on Lana'i presents opportunities to provide for demand while still extending the life of the aquifer. Replacement of old degraded pipe, leak detection equipment, pipe repairs, annual unaccounted-for water analysis and other measures are recommended to provide for source availability as well as to save money and resources. These are described in the Supply Options chapter.

Metering and Monitoring

Metering and monitoring have improved in recent years. Previously unmetered uses are now metered, and other improvements have been made. However, LWAC members have raised concerns regarding the Periodic Water Report

Maui County Ordinance 2408 stipulated that the total amount of non-potable water drawn from the high level aquifer that may be used for irrigation of the golf course, driving range, and other associated landscaping, shall not exceed an average of 650,000 gallons per day, expressed as a moving annualized average using 13-28 day periods rather than 12 calendar months, or such other reasonable method as may be determined by the Maui County Council upon advice from its standing committee on water use. This was likely written to enable the company at the time to continue its 28 day reporting without disruption. Since that time the question of monthly reporting has come up repeatedly. The pumpage record goes back to 1926. For most of that record, either reporting was in fact on a monthly basis, or whoever maintained the data at the State reconciled it back to a monthly basis. In any case, the majority of the available record is recorded on a monthly basis. The system of thirteen 28 day periods started in 1981, continued to 1986, stopped for a time, and then resumed from 1987 to the present. Depending on how this is accomplished, there are some advantages to reporting both pumpage and withdrawals on a monthly basis. Today's meters are capable of recording historical flows, such that the flow at any chosen period can be derived. Unaccounted-for water analysis now requires that billing and pumping records be broken down and re-apportioned to the number of days in a month or period, in order to ensure that pumping and billing are examined for the same period. If flows from the same periods were utilized, then this process would be streamlined. However, there appears to be some hesitancy to make this change, because of the outstanding ordinance.

Another issue raised with the Periodic Water Report has been the break down of water service areas. As discussed in the *Demand Analysis* chapter, the periodic water report has a service area subtotal called "Manele, Aoki Diversified, Agriculture and Ag Activities near the Airport." This was apparently intended to maintain consistent data breakdown, but more accurately re-name what was once simply called "Irrigation" (in the days of pineapple). Based upon today's uses and service areas, this breakdown makes little sense. In terms of pumped water, there are two public water systems on Lana'i, and essentially 5 service district areas, distinguished by sources and tanks serving them and by pressure zones. These are the Koele Project District Area, Lana'i City, Kaumalapau, the Palawai Irrigation Grid, and the Manele Project District Area. The Manele Project District Area is further broken into fresh and brackish service. It would seem that the reports could be clarified by distinguishing these areas. Another item repeatedly desired by the committee was a more discernible breakdown of what amount of brackish water goes to the golf course vs. other irrigation, and what amount of potable water goes to irrigation vs. other uses, most especially in Manele.

Current billing user types maintained in the LWCI data base are shown in Figure 7-13.

FIGURE 7-10. Use Types in Current CCR Database

R. Residential						
C-Commercial						
G-Government						
Z-Community Gardens						
L-Non Resorts (Central, Plantation Homes, Iwiole, Commercial Homes, etc.)						
P-Four Seasons						
V-Development						

A further breakdown of residential multi vs. single family use is provided for Manele and Koele in the district code, but no such breakdown is provided for Lana'i City. Current utility personnel are sufficiently familiar with the system to know which meters are which. The data system is clearly useful for internal accounting and operations, which would naturally be of highest concern to the utility. However, an additional field might be useful for auditing and reporting, as well as for rate-setting. Certain meters are classed in ways that are non-intuitive to an outsider - not incorrectly, but based as much on internal company operations as on the actual use class. For an outside analyst, or even an internal one, to go through and reclass each meter, even based upon personal familiarity with each, is a time consuming effort. For purposes of water audit, data reporting and other uses, it may be beneficial to add a field to the data base that breaks user classes out by more conventional use types. This could be done without any change to the primary breakdown and functioning of the database and may prove to be a useful option. It would be especially so, in fact maybe even necessary, if the proposed rate structure, or one like it, were established. Another value of such a change would be the ability to report more clearly on the status of build-out versus any agreed upon allocation. A more practical breakdown for planning purposes might be:

Single Family
Multi-Family
Commercial
Industrial
Hotel
Government
AgriculturalIrrigation
Other Irrigation

Rate Equity

While LWAC members had no objection to the use of desalinization as a major water source, some expressed concern that the expense of new source development to accommodate project district build-outs not burden the existing residents of Lana'i, or that long-time residents not have to experience fees raised to a level to accommodate build-out growth.

The rate and fee structures proposed in the Supply Options chapter are designed to keep rates low for low water users, and to encourage conservation by sending a pricing signal to high water users. New source would be paid for by new meters or by the company.

Conservation Measures and Milestones

The Lana'i Water Advisory Committee spent much time discussing high consumption rates per unit, system losses, unaccounted-for water, and the need for conservation. A few iterations of a draft conservation ordinance have also been presented to the LWAC. The most recent of these is attached as Appendix I. System wide unaccounted-for water in 2008 was roughly 28%, with about 13.5% in Lana'i City, 45% on the potable Manele / Palawai Irrigation Grid system, and 19% on the Brackish system. A target program was developed that included the following measures and targeted savings:

FIGURE 7-11. Targeted Conservation Savings

	Manele & Grid Fresh	Manele Brackish	Lanai City Koele & Kaumalapau	
Palawai Grid	200,000.0			200,000
Landscape	50,000.0	50,000.0	11,000.0	111,000
Fixture Replacement	20,000.0		80,000.0	100,000
Leak Detection & Repair	15,000.0	13,000.0	12,000.0	40,000
Hypalon Cover		14,000.0		14,000
Hotel & Landscape Incentives	12,000.0	6,000.0	2,000.0	20,000
Rate Structure				0

These measures may still fall short of achieving targeted unaccounted for water rates in one or more areas, particularly in the service area of Wells 1, 9 & 14. Additional reductions should be possible through additional landscape savings beyond the modest 10% prescribed or additional leak identification. Metering of previously unmetered services will also help to reduce UAFW, though it may not help to reduce pumpage.

Agricultural Reserve

There is strong conviction among certain community members that preservation of agricultural opportunities should not be lost. LWAC members expressed concern that build-out of the project proposals by CCR could preclude there being enough water for the planned Agricultural Park. Agricultural lands offer many benefits, including increased food security, and economic development opportunities. The recommended allocation plan includes a 500,000 GPD agricultural reserve, which is assumed to be actually withdrawn from the aquifer, as opposed to the resource reserve, which is not assumed to be pumped. Neither reserve affects water allocations to other uses within the planning time frame, as each class of use was escalated separately, and there was adequate water to cover uses and reserves based on the forecast coefficients used.

Issues Pertaining to Specific Supply Options

Selecting new source options always involves some trade-offs. Lana‘i is no exception.

Several good Leeward locations have been identified for new source, but at some point, these will start to provide only distribution of withdrawals, rather than additional source.

Development of a windward well is recommended, but this is not without challenges either. On the windward side, whether Maunalei or Kehewai are chosen, the transmission route will be long and expensive. The transmission route to Kehewai was designed in such a way to avoid damage to crucial habitat.

On the other hand, both the Maunalei and Kauiki options are in the greater ahupua‘a of Maunalei. During the Mahele of 1848, 19 individuals made 20 claims for property rights in the ahupua‘a of Maunalei. The entire ahupuaa was granted to Pane Kekelaokalani, a chiefly awardee (who filed two separate claims). At the close of the Mahele in 1855, at least 11 commoners claims were also granted. The clustering of kuleana lands deep in the valley of Maunalei include the claims for lo`i kalo (taro pond fields) and the associated water rights as protected by the Kuleana Act of 1850. At the time of this writing, it is unclear if any native claims remain to kuleana lands and water resources in Maunalei. It is noted that company maps dating from 1929 to 1993 still identify possible lots in the valley to which such water rights might appertain. It is suggested that a definitive study on the native tenant rights and disposition of land ownership be determined prior to final settling of water usage in Maunalei.

Desalinization is still expensive, and proper disposal of brines can prove difficult. CCR will need to accommodate the fact that marine waters surrounding Lana‘i are Classed AA under HAR §11-54-3. The objective of Class AA waters is that they remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused sources or actions. To the extent practicable, the wilderness character of these areas must be protected. No zones of mixing are permitted in this class.

Community Plan Consistency

The Maui County Charter, §8-11.2(3) requires that the Water Department’s Long Range Plan conform with the County’s general and community plans. The last version of the Lana`i Community Plan was adopted by the Maui County Council on December 8th, 1998. An update of the plan is expected shortly, However, some of the goals, objectives, policies and implementing actions that pertain to water issues within the old plan are attached as an Appendix J, with comments as to how this WUDP addresses those items.

CHAPTER 8

Implementation

The Matrix below identifies a categorized list of impelementing actions that could further the intent of the Lana‘i Water Use and Development Plan

Abbreviations used in the Implemenation Matrix are as follows:

CCR	Castle & Cooke Resorts, LLC.
DOE	Department of Education
DOFAW	DLNR - Division of Forestry and Wildlife
DOT	State Department of Transportation
DWS	Department of Water Supply
LF&WP	Lana‘i Forest and Watershed Partnership
LWAC	Lana‘i Water Advisory Committee
LWCI	Lana‘i Water Company Inc
MCC	Maui Community College
USDA	United States Department of Agriculture
US F&WS	United States Fish & Wildlife Service

FIGURE 8-1. Implementation Matrix

Implementation Matrix

Goal	Action Item	Key Parties	Time Frame Near Term Mid term Long Term or Ongoing
I. INFRASTRUCTUREMAINTENANCE, OPTIMIZATION & SUPPLY-SIDE MANAGEMENT STEPS			
	Develop or update storage inventory. Size, volume, geometry, age, materials, condition, fill cycle issues, leaks, estimated remaining useful life, potable or reclaimed, service zones, controls and call levels, inside lining, existing maintenance schedules, etc.	LWCI	Annual Update
	Evaluate costs and create or update ongoing tank and reservoir refurbishment schedule -annual, 5 year, Longer. 5 year storage CIP.	LWCI	Annual Update
	Develop or Update Pump Facilities Inventory. Model, Speed, Rated Head, Motor HP, Performance against manufacturers curves (efficiency), Control Configurations, Well or Booster, On-Off calls, Chemical Feeds (chlorine, corrosion control, other), Backup Power source, land use for source pumps, chlorides, water level fluctuations, etc. Last Replacement, Next scheduled maintenance, etc.	LWCI	Annual Update
	Compile 5 year pump maintenance & replacement schedule, including updated pump efficiency curves and calibrated efficiencies.	LWCI	Annual Update.
	Develop and /or update inventory of transmission and distribution lines in the system; from and to points, diameter, material, install dates, leakage or breakage problems, pressure and flow status, etc. leak or breakage history, etc.	LWCI	Near. Ongoing.
	Identify replacement and upgrade priorities for line repair and replacement and compile 5 year schedule	LWCI	Regular Updates

Implementation Matrix

Goal	Action Item	Key Parties	Time Frame Near Term Mid term Long Term or Ongoing
	Implement hydrant maintenance program: operate, flush periodically, check drain rate, lubricate when needed, check, pressure, replace older hydrants as needed	LWCI	Annual Update.
	Perform or maintain similar inventory and maintenance schedule development for all system elements as well: valves, meters, treatment facilities, generators, etc.	LWCI	Annual Update
	Acquire leak detection equipment and or borrow/ rent same. Perform& document regular leak detection on system.	LWCI	Near
	Perform annual unaccounted-for water audit.	LWCI / Possibly help from DWS.	Near
II. INFRASTRUCTURE & CAPITAL & MAINTENANCE PROJECTS			
	Replace Deteriorated Palawai Grid Pipeline	LWCI	Near
	Install Floating or Hypalon Ball Cover on 15 MG Brackish Reservoir	LWCI	Near
	Replace old asbestos segments in Lana‘i City	LWCI	Near to Mid
	Replace deteriorated Hi‘i Tank and 50 year old concrete lined Hi‘i Reservoir with new 2 MG Tank	LWCI	Near to Mid
	Replace Old Substandard Pipeline to Kaumalapau	LWCI	Mid
	Replace Old Steel Line Segments in Lana‘i City	LWCI	Mid
	Drill Well 15 to distribute brackish withdrawals	LWCI	Near term
	Replace Well 2-A to increase ease of operability and for better reliability.	LWCI	Near to Mid

Implementation Matrix

Goal	Action Item	Key Parties	Time Frame Near Term Mid term Long Term or Ongoing
	Replace Well 3 or drill new well that will serve same purpose for improved reliability and distribution of withdrawals.	LWCI / LHI	Near Term
	Replace Old Line Segments in Northwest End of Irrigation Grid	LWCI	Mid-Long
	Improve pump system to reclaimed reservoir especially around lower 9 at Koele. (can't pump out of reservoir as needed)	CCR	Mid
	Evaluate possible improvements to reclaimed water treatment facility and storage. Make any necessary improvements	CCR	Mid to Long
	Install additional wells for distribution to prevent declining water levels or over-use of either aquifer. Options identified in Chap 5.	LHI	Near, Mid & Ongoing
III. DEMAND-SIDE MANAGEMENT STEPS			
	Retrofit indoor fixtures including but not limited to 1.28 GPF toilets, showerheads, faucets, efficient clothes washers.	LWCI	Replacement in Proposed rate structure. Near to Mid term.
	Implement water conservation measures aimed at reducing outdoor usage (Conservation measures are more cost effective the earlier they get done.)	CCR; LWAC	Near and Ongoing
	Establish additional ET/weather stations for improved drought prediction, fire prevention and conservation.	LWCI, CCR, DLNR	Some existing. Additions Near and Mid.
	Review & update design guidelines and plant list	CCR; Planning Dept.	Near to Mid term
	Support establishment of certification program, and of certified source of native stock to protect existing communities of appropriate plants	CCR LWCI;	As Appropriate

Implementation Matrix

Goal	Action Item	Key Parties	Time Frame Near Term Mid term Long Term or Ongoing
	Identify and map areas where turf or other high-water-use plants are featured, and prioritizing them for retrofit - i.e. seeking places that can be converted to less thirsty plants.	CCR; Hotels, LWCI,	Near to Mid term included in rates
	Maintain and expand native plant nurseries; possibly with grant funding assistance -also establish or help other "certified" nurseries - as may be established, for example by Hui Malama, MCC or others.	CCR, LFWSP, DLNR, FWS	Increase focus on native & drought-tolerant non-invasive plants. Near to Mid term.
	Annually examine "per-unit" water use information; by customer class, location, size of meter, end uses; etc. Develop targets for reduction.	CCR;	Near to Long
	Develop tiered rate structure to encourage conservation, leave rates low for base "life-line" amount; increased rates for excessive use.	LWCI, LHI, CCR, PUC, Public	Proposed in Plan, PUC case in Near term.
	Revisit and consider conservation ordinance; including county-wide public review;	LWAC, LWCI, Public, Council	Near to Mid term
	Offer incentives and assistance to local hotels and businesses. Assist with pre-rinse spray nozzles, incentives for cooling efficiency improvements, efficient laundries, and other measures mentioned in Chapter 5.	LWCI	Included in proposed rate structure. Near to Mid term.
IV. WATER CONSERVATION OUTREACH & EDUCATION			
	Develop a "walking tour" of native/demonstration landscapes: identifying projects that have been well-landscaped with native plants;	Cultural Center, Conservation Dept., Community Groups, possibly Hotels, Schools	Mid

Implementation Matrix

Goal	Action Item	Key Parties	Time Frame Near Term Mid term Long Term or Ongoing
	Partner with other Community Resources to provide well-rounded education and outreach for landscape and other conservation opportunities.	Conservation, Cultural Center, MCC, Hui Malama and others.	Near Term and Ongoing
	For new developments, utilize native or non-invasive non-native plants to the maximum extent possible in landscaping	CCR other developers incl. government	Near, Mid and Long, Ongoing
	Re-plant selected hotel properties with native plants - secondary to restoring natives on the hale	CCR; Hotels, LWCI assistance program, Conservation Dept., help from Community Groups & Cultural Center as applicable.	Near to Mid and Long term. (should commence near term, and continue).
	Demonstration projects: community gardens, plantings etc. establish demonstration gardens at various sites. Note that the last community plan also stated that this be should done at government sites.	CCR; Conservation Dept., DOE County/State govt., Cultural Center, Community Groups as applicable.	Near and continuing
	Establish set of qualified speakers on various conservation topics. Visit schools & community groups, offer classes.	LWCI; CCR, MCC, Conservation Dept. Partner with others as applicable.	Near
	Conservation ads in Lana‘i newspaper(s).	LWCI, CCR, Other co-sponsors as available.	Near

Implementation Matrix

Goal	Action Item	Key Parties	Time Frame Near Term Mid term Long Term or Ongoing
	Ads for radio, movie screen, other venues	LWCI, DWS	Near. DWS has Many Ads, can share.
	Ads for movie-screen	DWS; CCR	Optional
	Posters	DWS; CCR	Mid
	Information on and periodic distribution of appropriate plant types	CCR, BWS	ongoing arbor day upgrade with nursery Near to Mid & ongoing
	Maintain list of appropriate plant species. Review and update Urban Design Guidelines accordingly.	DWS; Planning Department; DLNR, HEAR Lana`i Planning Commission	Ongoing. Needs improvement. Near
V. SOURCE WATER PROTECTION			
	Conduct additional fog drip studies in order to refine recharge estimates. Update Lana`i Water Model accordingly.	CWRM; UH; USGS; CCR, DWS?	Study on Cooke Pine throughfall completed. No review of native forest.
	Adopt the well operating management guidelines in the plan; monitor performance against same.	CWRM, LWCI CCR	Included in Plan. Implementation Near, Mid & Long.
	Draft wellhead protection strategy and ordinance discussed with LWAC, needs broader community presentation and discussion.	DWS, LWCI, CCR, Public	Near
	Distribute withdrawals such that no more than 2.7 MGD each are pumped from Leeward and Windward Aquifers during plan period.	LWCI, LHI	Near to Long Term

Goal	Action Item	Key Parties	Time Frame Near Term Mid term Long Term or Ongoing
	Establish an ongoing watershed management program with special emphasis on preserving native ecosystems and maximizing the fog drip component of the watershed	LFWP, DWS, US F&WS, DOFAW, County CCR, CWRM, NRCS,	Ongoing Long-term
	Continue to Identify Potential Sources of Funding, Including Appropriations, Assessments, Contributions, Grants, Donations from Public and Private Sources, and Recommend Funding Sources	CCR Conservation, LF&WP	Near term and Ongoing
FENCING			
	Monitor the integrity of existing fences	CCR, LF&WP, USF&WS	Ongoing and Near
	Select appropriate fence materials for new fences or fence segment replacements, such as triple dip galvanized with welded seams, treated against corrosion, alloy, even plastic fence, consider fence materials researched at Kalaupapa, consider increase in height or visual barrier to deter deer	CCR; LF&WP, USF&W	Increment 1 Completed Increment II in Progress Increment III still pending.
	Ground and aerial survey of new Increment III alignment & surrounding areas; set proper alignment vis a vis terrain and rare species communities; survey area to insure that populations of important snail, insect or plant species are not disturbed, or that such disturbance is minimal & mitigated	CCR; LF&WP, USF&W	Increment I completed Increment II Near Increment III Near.
	Resolve access issues. Additional gates needed. Gates at Hi‘i Bench, East and West Hauola. Koolanai and Waiwaiku need gates. Vandalism could lead to more animals in Hale.	CCR; Community	Mid Term.

Goal	Action Item	Key Parties	Time Frame Near Term Mid term Long Term or Ongoing
	Maintain fence regularly	CCR Conservation, with help from other forest partnerships as needed.	Mid to ongoing
	Maintain buffer zones around fence	CCR	Mid to ongoing
FERAL UNGULATE MANAGEMENT			
	Inside Fence		
	Herding effort to move deer out of each new increment of fenced area - foot, helicopter, etc.	CCR, DOFAW	Increment I - Done. Increment II - Near Increment III Near.
	Allow residents to hunt within fence first - ongoing staffed hunts if needed	CCR, DOFAW	Increment I - Done Increment II - Near Increment III - Near to Mid
	Hunting to elimination within fence for protection of watershed,	CCR, DOFAW, LFWP, Community	Mid to ongoing
	IF NECESSARY - Aerial hunts, spotlighting, snares, or traps if necessary in designated elimination areas -esp. remote areas, or where animal numbers are not dropping	CCR, DLNR	last resort only
	Outside Fence		
	Manage populations outside of fence	CCR, DLNR	Near term & continuing
	Investigate use of repellents, non-forage distasteful plants, other methods along buffer strip / corridor on outside of fence to discourage deer from approaching or trying fence	DLNR, USF&WS, CCR Conservation	Mid to Long

	Implementation		
	Continue to investigate other "non-kill" options that may be used with hunting: catch & transport; repellents, sterilizers, habitat alteration, etc.	DLNR, USF&WS CCR Conservation	Mid & continuing
	Provide training or review, as appropriate and necessary for certified volunteer hunters.	DLNR - license CCR - forest entry etc.	ongoing & continue
	Improve harvest reporting protocols and data. Harvest report should go to one central repository, such as DLNR-DOFAW	DLNR, Hunter Advisory Group, CCR	Near
OTHER ANIMAL MANAGEMENT			
RODENTS			
	Survey area to determine priority locations for treatments highly susceptible plant, bird or snail communities signs of excessive rodent activity	DLNR, USF&WS; LF&WP, CCR	Ongoing DLNR Conservation as needed
	Determine appropriate treatment schedule all year, or at least during fruiting/seeding of target native plants?	DLNR, USF&WS; LF&WP, CCR	As appropriate
	Eliminate rodents using traps, bait, other methods	DLNR, USF&WS; LF&WP; CCR	As needed
	Perform follow-up documentation and monitoring to evaluate usefulness	DLNR, USF&WS; LF&WP; CCR	Mid & continue as needed
INSECTS			
	Survey as needed to determine priority pests for removal based on threat to remaining target communities: mosquitoes, chinese rose beetle, chinese leaf hopper, others	DLNR, USF&WS; LF&WP; CCR	Mid & continue
	Research other removal experience with target insect pests determine protocols, spraying, equip needed, etc.	DLNR, USF&WS; LF&WP; CCR	Mid & continue as needed

	Implement removal protocols	DLNR, USF&WS; LF&WP; CCR	Mid & continue as needed
	Perform follow-up documentation and monitoring to evaluate usefulness	DLNR, USF&WS; LF&WP; CCR	Mid & continue as needed

FIRE PROTECTION

	This is especially. important on Lana`ihale, since the native Hale plants are not well adapted to fire. Efforts should also address management of surrounding lands, including those taken out of pineapple.		
	Consult with other fire management agencies to review existing fire plan as related to Lana‘i Hale protection.	DLNR, Fire Dept.; CCR	ongoing, re-evaluate Near to Mid
	Survey plant communities in pristine areas, fire prone areas	CCR	Mid
	Map & prioritize fire prone areas.	DLNR, Fire Dept.; CCR	ongoing, re-evaluate Near to Mid
	Inventory response crews, response times, etc.	DLNR, Fire Dept.; CCR	ongoing, re-evaluate Near to Mid
	Inventory/ obtain as needed emergency equip (helicopters/strategically placed reservoirs, water trucks, etc.)	DLNR, Fire Dept.; CCR	ongoing? re-evaluate? Near to Mid?
	Develop improved access as necessary (careful not to spread weeds).	DLNR, Fire Dept.; CCR	Mid
	Develop and conduct regular training, and/or joint training programs for fire fighting crews.	DLNR, Fire Dept.; CCR	ongoing & continue? or Mid?
	Review and update prioritized response plan as appropriate.	DLNR, Fire Dept.; CCR	ongoing, re-evaluate Near to Mid

	Implementation		
	Construct fire breaks or buffer zones as appropriate	CCR	Mid to Long
	Remove/ eradicate fire-inducing or fire-carrying weed species, especially in areas where small populations mean that a single catastrophic fire could eliminate the entire remaining population of a species. (Ex. Tetramolopium remyi)	CCR	Mid to Long
	Establish "fire-free" use zones	CCR	Mid to Long
	Heighten public awareness of dangers	CCR	Mid
REMOVAL OF NON-DESIRABLE PLANT SPECIES			
	Survey area to locate and prioritize weeds for removal, based on aggressiveness of weed species; extent of spread; proximity to rare species; etc. - (ex.guava, eucalyptus, christmas berry, ironwood)	LF&WP; CCR; DLNR	Mid (after fence Phase I completion)
	Remove target weeds from selected areas by hand or mechanical removal; possibly with selective use of herbicides or bio-controls where appropriate	LF&WP; CCR; DLNR	Mid (after fence Phase I completion) to Long & continue
	Follow/up to remove re-germination	LF&WP; CCR; DLNR	Mid to Long and continue
PROTECTION FROM PATHOGENS, DISEASES			
	Identify pathogens of concern to Lana`i watershed species communities. Possible examples include but are not limited to: _"Spike disease"- harmful to sandalwoods in India, believed to be in HI _Santalum seed fungus - destructive to viability of seeds (sandalwood) _Santalum heart rot _Others~~?~~	LF&WP; DLNR US F&W	Mid to Long term and continue

	inventory disease problems affecting key species, known management strategies	LF&WP; CCR; DLNR	Long
	enhance quarantine & inspection to prevent further introduction	LF&WP; CCR; DLNR, DOT	Long
	implement treatment options where identified	LF&WP; CCR; DLNR	Long

EROSION MANAGEMENT & REFORESTATION

	Survey & select realistic / effective areas for management	CCR; LF&WP	Mid & continue
	Eliminate animal stresses that perpetuate erosion cycle	CCR; LF&WP	Mid & continue
	Strategic planting	CCR; LF&WP	Mid & continue
	Mycorrhizal inoculants can aid the establishment of outplanted seeds (down side?)	CCR; LF&WP	Mid to Long as appropriate
	Wattles and other soil trapping devices. silt basins?	CCR; LF&WP	Long
	Establish native plants on newly trapped soil	CCR; LF&WP	Long
	Outplant species grown ex situ.	CCR; LF&WP	Mid
	Seed broadcast	CCR; LF&WP	Mid to Long as appropriate

	Perform complimentary actions aimed at restoration of native populations of insects, forest birds, sea birds, snails, etc. These will also help to restore and improve the nutrient cycle of the soil, healthy litter layer, etc. For example, Snails and insects provided important quantities of biomass & nutrients; Sea-birds provided nutrients such as nitrogen, phosphorous, etc. Insects helped to break down fallen trees, aided in decomposition and soil amendment. and provided biomass. restoration of these populations will also improve the health of the soil.		
MONITORING AND EVALUATION			
	Establish & Maintain Monitoring Transects Using Standard Accepted Methodologies (point-line intercept or etc.)	CCR; with help from LF&WP	Mid to Long as appropriate
	Collect Data on Soils, Stream Flows, Rainfall & Other parameters	CCR; with help from LF&WP	Long & continue as appropriate
	Perform aerial and field survey, photography and mapping to inventory and characterize resource health	CCR; with help from LF&WP	ongoing & continue periodically
	Monitor, map and inventory on a regular basis to keep track of changes in plant communities, animal communities, ungulate activity, erosion, etc.	CCR; with help from LF&WP	Mid to Long & continue
	Survey and map major communities, threats, measures	CCR; with help from LF&WP	Mid to Long & continue
	Map monitoring plots, size and class of plants inside (desirable and non-desirable)	CCR	Mid to Long & continue
	Perform scheduled field checks	CCR	Mid & continue
	Perform additional checks after unusual events, catastrophes, etc.	CCR	Mid & continue
	Photo plots - especially plant communities - to monitor recovery / loss	CCR	Mid for baseline & continue

	Water / soil gauges other special equipment for monitoring fog drip, etc.	CCR, LHFWP DLNR/ CWRM, USGS. UH	Mid to Long
	Provide report of quantitative and qualitative data w/ photos and maps	CCR	Mid for base-line & continue

	Implementation		

CONTROL OF INCOMING SPECIES

	Adequate screening and quarantine for incoming agricultural goods and plants	DOT, DLNR, USDA; CCR	Long
	Education of public / landowners on dangers of bringing in exotic species, potential contaminants	LF&WP; CCR; DLNR, DOT, USDA	Mid to Long
	Set up procedures to avoid introduction of non-desirable plants OR plant pathogens	LF&WP; USDA CCR; DLNR, DOT	Long
	Set up procedures to avoid introduction of non-desirable insects or insect pathogens	LF&WP; CCR; DLNR, DOT	Long

PROTECTION FROM HUMAN ACTIVITY

	Protect species prone to gathering by humans. For example, Sandal-wood has been subject to removal by individuals seeking the heart wood, due to its high economic value.	CCR LFF	Long
	Develop and enforce protective measures: no collection of special species limit forest entry in selected areas such as exclosures, etc. proper forest entry practices, maintain a regulatory presence in the watershed, post signs for limited entry or special access concerns manage public activities and education interagency cooperation for these	CCR with help from members of LF&WP	Long
	Develop a recreational use plan for human activities in the watershed	CCR with help from members of LF&WP	Long

	Insure that existing protections are followed, and continue to evaluate the need for and support additional measures as appropriate Existing Legal & Regulatory Protections include the following: "It is illegal to remove, cut dig up, damage or destroy an endangered plant in areas not under Federal jurisdiction in knowing violation of any State law or regulation or in the course of any violation of a State criminal trespass law. (ESA §9(a)(2)) Hawaii State Law prohibits taking of endangered flora and encourages conservation by State government agencies. "Take" means to harass, harm, collect, uproot, destroy, injure or possess endangered species of land plants, or to attempt to engage in any such conduct (HRS 195D-5(d))	CCR with help from members of LF&WP DLNR	Long

	Implementation		
PEER REVIEW MANAGEMENT PLANS & IMPLEMENTATION TO AVOID MANAGEMENT ERRORS			
	Establish a regular system of inter-agency review to help avoid and /or correct errors such as the following: fencing without adequate monitoring, fencing without weed removal over-collection of seeds damage or spread of pathogens by incorrect collection of tissue cultures, careless management on part of humans (human trampling, unmonitored actions, etc.)	LF&WP	ongoing and continue
MANAGEMENT RECOMMENDATIONS TO PRESERVE NATIVE BIRDS Benefits of protecting remaining bird species and possibly restoring bird populations: Birds serve(d) various beneficial functions in the watershed, including: direct pollination of native plant species seed dispersal (ex: amakihi ate fruit and insects, spread seeds in feces) source of nutrients (esp from sea-bird feces) possible additional non-identified roles, as birds were integral part of ecosystem rare native plants may benefit from having native birds that served to pollinate and spread seeds restored. nutrient cycles, as affected by seabirds may effect soil and plant health by returning nutrients to soil			
	Protect habitat - including steps to preserve plant communities, snails, insects, etc.	CCR with help from members of LF&WP	ongoing as part of other plan elements.
	Prevent predator entry - fencing (*fencing will not keep out chief bird predators, but may reduce spread of weeds that attract them, reduce disruption of habitat, etc.*) adequate quarantine baiting predators	; LF&WP CCR	 fence ongoing quarantine, Long term baiting, Long term
	Remove rats and cats from native bird habitats - catch, bait, etc.	CCR; LF&WP	Long

	Prevent entry of non-native birds - (avoid disease, competition)	CCR; DLNR, DOT	Long
	Prevent entry of mosquitoes and other problem insects	CCR; DLNR; DOAg; DOT	Long
	Control mosquitoes at breeding sites - insecticides, sterilizers, introduction of sterile or non-carrier mosquitoes	CCR; DLNR, Dof Ag; DOT	Long
	Specific strategic management of existing seabird colonies for enhanced protection	CCR; DLNR, DOT	Long
	Appropriate adjustments to fencing, such as flagging or etc. Fence must be visible to prevent birds from crashing during night landing. white flagging on top can help.	CCR; LFWP DLNR	Mid to Long
	Intensive rat & cat control	CCR; DLNR,	Long
	Consider carefully managed re-introduction programs for amakihi, i`iwi, maui creeper, others	CCR; DLNR, USF&WS	Long
	Preserve Lana`i specific genetic material.	CCR; DLNR, Bishop, NTBG, USF&WS	ongoing, continue and Long
	Consider minimum habitat size for sustainability of bird populations in deciding on deer fence option	CCR; DLNR, USF&WS	Mid to Long with Phases II and III
	Encourage sea birds to return by establishing safe, predator-free sites for them	CCR; DLNR, USF&WS	Long - as part of general plan elements

Implementation

	In order to successfully maintain existing apapane and seabird populations, and /or to restore previously existing species with close approximations (Maui equivalents) - adequate disease free habitat extent will be required.		
MANAGEMENT RECOMMENDATIONS TO PRESERVE NATIVE SNAILS			
	Preserve habitat, esp. upper elevation wet forest.	CCR with help from members of LF&WP	ongoing as part of other plan elements.
	Encourage reforestation with native species. Many non-natives, including Cook Pines and Eucalyptus, are not good hosts for native snails...(although snails have been found on some non-native plants where they are intermixed with natives).	CCR with help from members of LF&WP	ongoing as part of other plan elements Cook Pine area will be preserved, but extent of Cook Pine area will not be extended
	Enforce ban on collecting	CCR w/ LF&WP members	Long
	Educate public on damage caused by collecting	CCR w/ LF&WP members	Long
	Eliminate rat predation *(see also rodent control section)*	CCR w/ LF&WP members	Long
	Eliminate predatory snails, if applicable	CCR w/ LF&WP members	Long

	Prevent entry of non-native snails & slugs to avoid possible intro of diseases. CARE MUST BE EXERCISED in designing control of slugs. poisons designed to eliminate slugs would also be likely to affect snails. Slugs don't generally hurt snails, but there are no native slugs in Hawaii, and there is some chance that they could be a source of introduced disease, competition or habitat loss. slugs do appear to damage certain native plants If any poison or bait were used to control snails, it should be limited to extremely LOCAL applications in areas where it was fairly certain no native snails were present.	CCR w/ LF&WP members	Long
	Captive rearing and reintroduction as appropriate	DLNR, Bishop, USF&WS,	Long
	Construct and maintain exclosures for snails There are various means of constructing snail exclosures. one example is described here, but the design would be selected by the UH, USF&WS, DLNR or others as appropriate. this exclosure is roughly waist high. they are constructed of painted, corrugated aluminum roofing. a trench is dug, and in that trench the fence is installed with its foot buried about 6" into the ground, at the top of the fence is a shed-like "roof" that protrudes to either side. under that "roof" are two additional barriers, a trough of large crystal salt, and a 2-wire electric fence, constructed of two thin wires spaced 8mm apart. The electric wires are powered by solar panels mounted on the inside of the exclosure. the largest such exclosure currently existing is about 40x25 meters. Rat bait boxes may be placed on the outside of the exclosures for further protection. Tree limbs and other branches should be prevented from touching the fence exclosure structure, as they may provide a path for predators.	DLNR, Bishop, USF&WS, UH, others	Long
	Consider careful removal of non-native plant species where appropriate, and replacement with native species. (again, this measure requires exercise of care to insure that no snails are sitting on the plants to be removed)	CCR with help from members of LF&WP	ongoing

	In cases where native snails seem to be adapting to introduced plants, selective use of these non-native plants may be considered. Snails that seem to be exhibiting adaptation according to Severns (conversation) include: Partulina variabilis, and Partulina semicarinata		
MANAGEMENT RECOMMENDATIONS TO PRESERVE NATIVE INSECTS			
	Protect native habitat on which native insects rely, especially host plants	CCR with help from members of LF&WP	ongoing as part of other plan elements.
	Eliminate non-native predator insects, especially yellow-jackets and ants. Possible methods include: pheromone traps; find and destroy nests with freezing or insecticides; bait as appropriate	CCR w/ LF&WP members	Long
	Develop improved quarantine measures and other controls to prevent entry of non-native insects	CCR; DLNR, Dof Ag; DOT	Long
	Monitor native insect populations to determine species requirements, critical habitat, population size, etc.	CCR; DLNR, USF&WS, others	Long
COLLECTION AND MAINTENANCE OF GENETIC MATERIAL			
	Inventory existing ex-situ populations & identify needs for more, if any	CCR; DLNR, USF&WS, others	Mid to Long
	Involve experts in collection of seeds, live plants, plant tissue	DLNR, Bishop, USF&WS, UH, others	Long
	Maintain ex-situ seeds, live plants, plant tissue, plant populations	DLNR, Bishop, USF&WS, UH, others	Long

	Note: Ex situ collections must be managed with care to avoid in-breeding, collection of genetically weakened specimens, cross-contamination of genetic material with other variations of the species Should be handled by outside experts such as NTBG, Bishop Museum, University, or other qualified organizations.

SELECTIVE AUGMENTATION / RE-INTRODUCTION OF SPECIES

	See cautions above. It is important that such projects be carried out with close attention to proper collection and identification of appropriate seed sources, as well as care to avoid contamination in nurseries, germination media, plant materials		
	Identify priorities for restoration efforts. Rare species, important species, etc. Restoration of certain plant, bird and insect species may help to restore and improve pollination opportunities. plants provided food for birds and insects, forest birds and insects provided important pollinators. Restoration of these components will help support a healthy ecosystem.	DLNR, Bishop, USF&WS, UH, others	Mid to Long
	Identify appropriate sources (seed collection, ex-situ collections, etc.)	DLNR, Bishop, USF&WS, UH, others	Long
	Identify and obtain necessary equipment	DLNR, Bishop, USF&WS, UH, others	Long
	Survey and prepare out-planting sites	CCR w / DLNR, LFWP Bishop, USF&WS, UH, others	Long
	Protect, monitor and maintain out-plantings. (consider smaller exclosures)	CCR w / DLNR, LFWP Bishop, USF&WS, UH, others	Long

Implementation			
PREVENTION & EARLY DETECTION			
	Through wind dispersion and other means, plants introduced in only a few sites well outside the watershed can and do spread to the watershed. Through active identification efforts, plants may be detected at earlier stages of naturalization, or even prior to naturalization, avoiding widespread damage.		
	Develop a database of cultivated and naturalized non-native species on the island of Lana`i through survey of nurseries, botanical gardens, parks, hotel and other public landscape and other likely introduction sites.	CCR w / DLNR, LF&WP DOT	Long
	Cross check data on naturalized species in Lana‘i with databases of historically invasive plants in similar climates elsewhere. The best predictor of invasiveness for most taxonomic groups is a record of invasiveness in similar climates elsewhere in the world. Cross-checking these lists may help to identify species of concern.	CCR w / DLNR, LF&WP DOT	Long
	Develop and/or refer to existing species reports for targeted species, summarizing both literature and field research, and include results from gps data collection and distributional mapping, as well as information on attributes of other invaded ecosystems, control data, and so forth. A potential protocol for obtaining and structuring such information has been developed and implemented in Maui.	CCR w / DLNR, LF&WP DOT	Long
	Monitor likely routes of introduction, such as roadsides, parks, refuse sites, vacant lots, harbors, airports and residential areas for new communities of potentially invasive species. Many of the key corridors by which invasive alien species are introduced are not the same areas where active management transects are located.	CCR w / DLNR, LF&WP DOT	Long

	ADDITIONAL RESEARCH ON TARGETED PLANT COMMUNITIES **The following have been identified as research items which may help the project over the Longer term. This research may not be performed as part of Lana'ihale management. However, funding of such research would be consistent with WUDP watershed goals.**		
	Associated ecosystem components	DLNR, Bishop, USF&WS, UH, others?	Long
	Relations between native plant communities / birds / insects (pollination, feeding, etc.)	DLNR, Bishop, USF&WS, UH, others	Long
	Critical habitat size / population size for species viability	DLNR, Bishop, USF&WS, UH, others	Long
	Growth and mortality at various stages of plant life, seasonal changes	DLNR, Bishop, USF&WS, UH, others	Long
	Optimum conditions for reproductive vitality, flowering/seeding conditions	DLNR, Bishop, USF&WS, UH, others	Long
	Light requirements at various stages of life	DLNR, Bishop, USF&WS, UH, others	Long
	Water, soil & nutrient requirements at various stages	DLNR, Bishop, USF&WS, UH, others	Long

Implementation

	Pollination vectors, seed dispersal	DLNR, Bishop, USF&WS, UH, others	Long
	Means to compensate for missing pollination vectors or other key-stone habitat concerns	DLNR, Bishop, USF&WS, UH, others	Long
	Minimum numbers needed for populations to be stable susceptibility to inbreeding	DLNR, Bishop, USF&WS, UH, others	Long
EDUCATION AND COMMUNITY OUTREACH			
	Rare plants and their value Importance of watershed / importance of biodiversity Non-desirable plants and the threats posed by them How to enter forest / other areas while causing minimal risk of doing harm Dangers of open flames, esp. in certain areas Plant walks outside critical areas Deer impacts to environment / water resource Importance of watershed / biodiversity Plants of concern Appropriate forest entry practices	CCR w / DLNR, LF&WP members	Near & continuing upgrade
	Create pool of docents Field volunteer training Recruiting Reporting	CCR w / DLNR, LF&WP members	Near & continuing upgrade
	Workshop and lecture series Uses of plants in native culture Value of native resources Importance of watershed and connection with native vegetation Plant, animal and bird identification Threats & Long term effects of unabated threats (Rapa Nui lesson)	CCR w / DLNR, LF&WP members	Near & continuing upgrade

	Solicit community input and contributions to educational efforts Link w/ other environmental agencies / develop partnerships	CCR w / DLNR, LF&WP members	Near & continuing upgrade
	Develop guided hike program / field trips to biological and cultural sites Trained docents as leaders Prepared informational materials Vehicles and logistical support	CCR w / DLNR, LF&WP members	Long
	Prepare interpretive materials for use in both community and by visitors Booklets, pamphlets Web sites Public access programs	CCR w / DLNR, LF&WP members	Mid & continuing upgrade
	Identify and implement volunteer projects Weed control Restoration activities - outplanting, nursery, maintenance, erosion control Fence building and repair Hunting	CCR w / DLNR, LF&WP members	Mid to Long
	Develop native resources curriculum for the schools	CCR w / DLNR, LF&WP members	Near & continuing upgrade
	Develop and implement Long-term alien species awareness and prevention program Seek grant funding to develop a video Develop a tie-in with the local business community	CCR w / DLNR, LF&WP members	Long
	Establish media contacts for coverage of projects both local and statewide dissemination Regular means of communicating relevant information to the community	CCR w / DLNR, LF&WP members	as appropriate

Implementation

	Utilize existing community special events as venue for promoting education and increasing viability of projects: Aloha Festival Health Fairs Pineapple Festival Other Cultural Events	CCR w / DLNR, LF&WP members	Long
	Provide update on status of watershed and protection activities to LWAC and or to the Lana‘i Planning Commission twice per year.	CCR Conservation	Near and Ongoing

February 25, 2011 DWS Amended Draft

LANA'I ISLAND WATER USE & DEVELOPMENT PLAN

APPENDICES

Appendices

APPENDIX A

Final Report of the Lana'i Water Working Group

The *Final Report of the Lana'i Water Working Group*, also known as the *1997 Draft Water Use & Development Plan for Lana'i* is attached and incorporated in its entirety.

DRAFT
WATER USE
AND
DEVELOPMENT PLAN
FOR
LANA'I

Prepared by:
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P.O. Box 86
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February 1997

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The Group also expresses its appreciation to Ms. Rae Loui, Deputy Director, Commission on Water Resource Management for the assistance and encouragement given to the group to pursue the work for updating the Water Use and Development Plan for Lana 'i.

DRAFT
2/10/97

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List of Acronyms

BWS	Board of Water Supply, County of Maui
CWRM	Commission on Water Resource Management, State of Hawaii
DHHL	Department of Hawaiian Home Lands, State of Hawaii
DOA	Department of Agriculture, State of Hawaii
ET	Evapotranspiration
LCI	Lana'i Company, Inc.
LEGS	Lanaians for Economic Growth and Stability
LSG	Lanaians for Sensible Growth
LWG	Lana'i Water Working Group. Includes LWS members and additional members from the community. Members are listed as authors of this report.
LWS	Lana'i Water Subcommittee. First established by Council Resolution 93-42, May 7, 1993.
MG/L, mg/l	Milligrams per liter. In water supply, this is equivalent to ppm, parts per million.
MGD, mgd	Million Gallons per Day
MSL	Mean sea level. Reference point used for groundwater levels.
SFR	Single Family Residential. Term used in county zoning actions.
USGS	United States Geological Survey, Department of Interior
VWOMG	Voluntary Well Operating Management Guideline. Part of the procedures proposed by Lana'i Company to monitor performance of groundwater aquifer.
WUDP	Water Use and Development Plan. Part of the State Water Code.

Introduction

Lana'i has been in transition from pineapple to resort economy for several years. The demographics and land use pattern of the island have been changing. While actual use has declined in the short term, the projected water demand for the resort economy exceeds what was experienced in the pineapple economy. Lana'i's officially recognized sustainable yield of 6 million gallons per day (mgd) is much smaller than any other inhabited island, and the anticipated demand of the resort economy presses closer to the sustainable yield than any other island.

Because the island's water resource planning must be more precise, the community has little tolerance for uncertainty. The adequacy of the water resources of the island is a concern for both company and community leaders. In addition, they are beginning to recognize the importance of a sound watershed management program to protect their groundwater resource.

Planning History of the Lana'i WUDP

This planning effort is the third iteration under the state water code. Two Water Use and Development Plans (WUDP) have been prepared before. The 1990 plan was completed by the Maui BWS and adopted by county ordinance. That plan was subsequently adopted by the Commission on Water Resource Management (CWRM) as part of the Hawaii Water Plan. The plan was revised in 1992, but it remained in draft form with no further action by the BWS, the County Council, and the CWRM. Lana'i Company disagreed with the projections of the task force utilized in the plan and opposed its adoption despite the participation of company officials in the process.

Moloka'i started revising its plan in 1993. Moloka'i has been designated as a water management area by the CWRM, and Lana'i is currently under consideration for designation. The proposed community plan update is incomplete for both Lana'i and Moloka'i.

The 1990 WUDP dealt with the critical issue of resort development competing with pineapple for the limited water resources of the island. The WUDP recommended a strategy of developing alternate sources of water outside the high level aquifer as it was defined at that time. However, the company decided to phase out pineapple altogether and focus its effort entirely to developing the Koele and Manele Hotels and the two golf courses, thus avoiding that competition.

In 1992, the draft WUDP identified the major issue as water supply management and control. Construction was booming and resort was starting up operations. The plan recommended a strategy of a tighter organizational control and the use of dual systems in Manele for potable and nonpotable water.

The projections of future demand for water made in the 1990 and in 1992 plan are different, and both projections are substantially different from the demand experienced in

the pineapple economy. Water use in the previous pineapple economy on Lana'i is shown in Table 1.

Table 1. Water consumption in a pineapple economy.

Water Use	Annual average* (mgd)	% of total
Domestic and Commercial	0.38	13.7
Pineapple irrigation	2.40	86.3
Total	2.78	100.0

***The peak demand periods are in the summer months when daily averages were often greater than 6 mgd and as high as 8 mgd. Domestic and Commercial consumption is the average over 1950 to 1988. Pineapple irrigation is the average over 1983 to 1987.**

The prospect of resort development and the added demand especially during the summer months was a serious concern to the plantation. The strategy of alternate sources of water for golf course irrigation was proposed in the 1990 WUDP to alleviate demand on the high level water resource.

The future demand projected in the 1990 and 1992 planning projects are compared in Table 2 below. Projections were made using different assumptions for the same category and new categories of use were added in the 1992 WUDP.

In the 12-month period of 1990-1991, the average annual consumption was 3.01 mgd. Koele golf course used 0.49 mgd of that amount in its start-up phase with wide swings in consumption over the year. The range was 0.15 mgd to 0.78 mgd as 4-week averages with standard deviation of 0.18 mgd, or 37 percent of the average.

The 1992 plan addressed management issues. There were wide swings in water consumption without explanation. Water losses were high, on the order of 23 percent. Consumers were drawing water without being billed for it. Faucets were leaking without any effort to repair them. Landscaping was irrigated in the rain. Conservation measures were not evident in the community. The 1992 WUDP concluded that tighter management control and a strong conservation ethic were needed to minimize the risk of over-extending the limited water resource on the island. The WUDP recommended a tighter organization and management of the water supply. The WUDP also recommended dual water systems for potable and nonpotable supply for Manele, including the reuse of water.

In summary, the 1990 issue was the competing economic interests. The 1992 issue was management.

Table 2. Summary of projected demand from the 1990 and 1992 WUDP for Lana'i. Note the difference between pineapple and resort economy versus resort only. Note also the difference in terminology which reflects changing description of the water resource.

	Projected Demand (mgd) 1990 WUDP with Pineapple		Projected Demand (mgd) 1992 WUDP without Pineapple	
	High Level	Alternate	Potable	Non-potable
Domestic and Commercial	1.25		1.869	
Pineapple	1.80		0	
Koele Hotel	0.18			
Koele Golf Course	0.25			0.4
Koele Project District			0.255	
Manele Golf Course		0.8		0.8
Manele Hotel & Hulupoe	0.38		0.405	0.1
Manele Project district			0.338	0.3
Community gardens and landscape		0.4		
Agricultural Park			0.5	
Diversified Agriculture			1.0	
Total	3.86	1.2	4.4	1.6

Scope of this report

This report is intended to provide consensus recommendations for a new draft of the WUDP. The Water Code requires the County to prepare the WUDP and adopt it by ordinance. Once adopted by the CWRM as part of the Hawaii Water Plan, the Code specifies that the WUDP shall serve as a continuing long-range guide for water resource management. The Lana'i Water Group is also considering recommendations for the implementing ordinance itself.

The Lana'i Water Working Group (LWG) was formed from the Water Subcommittee of the County Council's Committee on Human Services, Water, and Agriculture, with the addition of two Lana'i residents. The CWRM provided the facilitator and technical support.

The Group addressed various issues that have been the subject of conflicting views, and proceeded by consensus to recommendations intended to resolve those issues where possible, and to lay the groundwork for future discussions of the more complex issues.

The specific parameters and actions undertaken by the Working Group are as follows:

1. Develop data on present water use according to land use categories.
2. Evaluate system losses through an input-output model.
3. Develop projections of future water demand by identifying specific projects affecting future land use.
4. Identify issues in water use and development and recommend alternative strategies for resolving conflicts and disputes.
5. Prepare draft WUDP for adoption by the county council and the CWRM.

Summary and Recommendations

RECOMMENDED LANAI WATER PLAN ACTION ITEMS			
	ACTION ITEM	KEY AGENCIES	TIME FRAME
LEGISLATIVE MANDATE AND FORMULATION OF ADMINISTRATIVE POLICY	Create a permanent Lanai Water Committee by ordinance. Define its makeup.	County Council	1997
	Appoint and confirm members of the committee.	Mayor's Office; County Council	1997
	~~Designate a lead agency~~ and define its role in staffing the Lanai Water Committee and in the development, monitoring and implementation of the Lanai Water Use and Development Plan (WUDP).	County Council	1997
	Provide appropriate levels of staffing and funding.	County Council; Mayor's Office	1997
	Develop, adopt, and update the WUDP on a regular planning cycle.	LWG; Lead agency; County Council	1997
	Establish rules for the operation of the committee.	LWG; Lead agency	1997
MONITORING AND ENFORCEMENT	Requirements and Conditions of WUDP.	Lead agency CWRM	1998

RECOMMENDED LANAI WATER PLAN ACTION ITEMS (CONT'D)			
INFRASTRUCTURE	Implement and maintain a dual water system at Manele.	LCI	1997
	Submit to County Council comprehensive storage plan for Koele Golf Course. Pursue action to cover open reservoirs for Manele golf course and landscape.	LCI	1999
COMMUNITY EDUCATION AND OUTREACH	Water conservation and education program.	LWG; Lead agency; LCI	1998
	Distribution of low flow devices.	LCI; Lead agency	1999
	Information and distribution of appropriate plant types.	LCI; Lead agency	1997
SUPPLY-SIDE RESOURCE MANAGEMENT	Establish a watershed management program as an on-going program with special emphasis on preserving native ecosystems and maximizing the fog drip component of recharge in the watershed.	LCI; DLNR;	1998
	Consider desalination when necessary to meet future demand for new hotels and resort facilities at no cost to the residents.	LCI	
RESOURCE PLANNING, RESEARCH AND MODELING	Link Community Plan and WUDP review processes.	Lead agency	1998
	Conduct fog drip studies in order to refine recharge estimates. Update Lana'i Water Model.	LCI; CWRM; Lead agency	1999

RECOMMENDED LANAI WATER PLAN ACTION ITEMS (CONT'D)			
DEMAND-SIDE RESOURCE MANAGEMENT	Adopt the revised well operating management guidelines as mandatory.	LCI	1998
	Implement water conservation measures aimed at reducing outdoor usage as the strategy for meeting future demand.	LCI; LWG; Lead agency	1998
	Retrofit and plan for recycling and reusing water from water features within the resort complex, particularly for landscape irrigation.	LCI	1998
	Establish inventory of all irrigated acreage and monitor appropriate irrigation standards and practices.	LCI; Lead agency	1998
	Maintain list of appropriate plant species.	LWG; LCI; Lead agency	1998
	Continue to reduce system losses.	LCI	1997
	Establish "per unit" water use targets and pricing structure.	LWG; Lead agency; LCI	1998

Present water demand

The base year selected for evaluation is calendar year 1995. It is the latest complete year of record available at the time of this report preparation. Data on present water use are shown in Table 3.

The 1995 consumption determined from billing records was 1.57 mgd. The corresponding pumping (supply) rate was 1.70 mgd. System loss is the amount unaccounted. This was 7.89 percent of the pumping rate. This is a significant improvement over the 23 percent loss in 1993. Lana'i Water Company improved its management of the water system.

The unit consumption for residential units in Lana'i City averages 316 gpd/unit. The unit consumption rate is equivalent to Paia, Maui. This rate appears to be normal for this community that is predominantly of old plantation architecture without extensive landscape development. (See Appendix for typical unit consumption rates for Maui County.)

Koele and Manele Hotel water usage appear low compared to projections, but essential information is not available to fully evaluate demand. The occupancy rates for the year are not available. The hotels will not release that information. Instead, occupancy rates are available for specific periods. They are evaluated and extrapolated over the year.

Manele golf course consumption shown in Table 3 does not include the reuse of wastewater effluent. Manele golf course used less water in 1995 than projected in earlier plans. The long term rate is the key, and it has not been yet been demonstrated by experience.

Koele golf course is currently irrigating with reclaimed water only. However, potable water usage may be allowed under unanticipated conditions defined in ordinance 2515.[1] The director of the Department of Public Works and Waste Management reviews requests and authorizes usage according to law. Ordinance 2516[2] also provides for potable water usage for re-seeding and re-grassing fairways. The maximum allowed is 27,000 gallons per day per fairway. The County Council approves by council resolution. Ordinance 2514[3] requires Lana'i Company to present to the Maui County Council within two years of the effective date, a report detailing the following:

1. a comprehensive plan to develop additional storage of water for Koele golf course irrigation;
2. the time frame within which the plan will be implemented; and
3. steps taken to implement the plan at the time the plan is submitted.

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[1] Effective date: October 17, 1996
[2] Same effective date.
[3] Same effective date.

While ordinances allow potable water usage under prescribed conditions, but they require a plan for additional water storage which serves to minimize reliance on potable water.

Projected Water Demand

The water demand for the future is shown in Table 4. The derivation of the demand figures is given in Appendix A. Line item quantities for the Manele and Koele project districts are combined into one figure. This report is not intended to show approval or disapproval of specific projects within the project districts listed for future development. However, it is expected that adjustments will be allowed within the line item categories shown in Table 4.

Residential water demand.

The present population of Lana 'i is 2,800 residents. Population growth on Lana 'i is expected to be driven by the two resort developments. Secondary jobs will be created in the service sector as a result of the resort growth. Population projection in the draft community plan indicates a population of 4,968 by the year 2010, a 77 percent increase averaging 5 to 6 percent per year. This increase of 2,168 residents would require approximately 1,019 additional housing units. It was the consensus of the working group that the population projected by the draft community plan is too high. The projection in the draft plan came from the socio-economic forecast model done in 1992[4] and has not been formally adopted as policy by the Council.

The various population projections reviewed by the group are presented in Appendix A. From 1980 to 1990, the population growth rate was approximately one percent per year. From 1990 to 1996, the growth rate was approximately two percent per year. The Working Group concluded that a growth rate of two percent per year until the year 2010 is the most realistic estimate. This results in a total population of 3,695 in the 2010, representing an increase of approximately 407 additional housing units.

It is very difficult to determine several years in advance where the additional housing will be constructed and what form it will take. The Working Group agrees that new housing should include a mix of multi-family and single family units. At present, there are several potential projects which may arise for the residents of Lana'i. The potential projects include the affordable housing property (115 acres), Department of Hawaiian Home Lands (DHHL) property (50 acres), Kaumalapau Subdivision (45 units), and the redevelopment portion of the Koele Project District (75 acres or 280 units). Assuming a density of 4.5 units per acre, the total number of housing units that can be constructed is more than 1000 units which is far more than needed for the year 2010.

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[4] Community Resources, Inc., Maui Community Plan Update Program. Socio-Economic Forecast Report, August 1992.

Table 3. Present water demand (1995 data).

Category	Present demand gpd	Number of Meters	gpd/unit	Remarks
Residential	274,200	867	316	Predominantly Lana'i City
Commercial	91,695	46	1993	Inventory irrigated acreage
Government	58,600	20	2930	Inventory irrigated acreage
Lana'i Company	229,015	86	2663	Inventory irrigated acreage
Koele Hotel	37,754	4	*	102 units. 1995 occupancy unknown.
Koele Hotel landscape	48,646	1	*	
Cavendish	9,393	1	*	
Manele maintenance	8,279	2	*	
Manele Hotel	39,847	2	*	250 units, 1995 occupancy unknown. Refer to calculations in appendix.
Manele Landscape	30,227	1	*	
Keumalepau	9,223	1	*	Meter at reservoir
Lana'i airport	4,239	1	*	
Diversified Agr	219,123	32	*	Approximate number of meters
Manele Golf	505,710	1	*	Does not include effluent reuse: 49,737 gpd ave for 1995.
Total consumption	1,565,949			
Total Pumped	1,700,000			
System Loss	134,051			
Percent	7.89%			Improvement. System loss was 23% in 1993.

*This report recommends that all irrigated acreage associated with existing uses be inventoried and evaluated in the water conservation program described later in this report.

Table 4. Present and Projected Water Demand for Lana'i. Manele and Koele Project Districts include all water demand within those boundaries.

(Refer to Appendices for assumptions and details)

CATEGORY	Present mgd	2010 mgd	Total Future mgd	Source of Water**
Residential	0.274	0.414	0.494	Groundwater
Agriculture	0.219	0.5	1.5	Groundwater
Commercial & Institutional	0.379	0.439	0.439	Groundwater
Light Industrial	0	0.09	0.09	Groundwater
Kaumalapau Harbor	0.009	0.01	0.01	Groundwater
Lanai Airport	0.004	0.005	0.005	Groundwater
Manele Project District	0.078	0.68	1.03	Groundwater
Manele Golf Course	0.51	0.65	0.65	Groundwater
Manele Effluent	0.05*	0.07*	0.14*	Effluent
Koele Project District	0.096	0.20	0.42	Groundwater
Koele Golf Course	0.17*	0.25*	0.25*	Effluent
Subtotal Groundwater	1.569	2.99	4.64	Groundwater
System losses***	0.134	0.41	0.63	
Total Groundwater	1.703	3.40	5.28	
Total Effluent	0.22	0.32	0.44	
Total Water Demand	1.92	3.72	5.72	

*Reclaimed wastewater effluent
**Sources of Water:
Groundwater=all wells
Secondary=Palawai (Wells 1,7,8,10) and beyond
Effluent=reclaimed water
***System losses=7.89% for 1995, 12% for future years

The housing requirement for the DHHL shown in the Appendices is based on an assumption of residential development density. It is possible that the property would instead be developed as agricultural homesteads. DHHL has no plans at this time. The agricultural alternative could result in a smaller domestic water demand. Potential agricultural demand has been included in the overall agricultural allotment in this plan.

Plans for the future housing are uncertain at this time. Lana 'i Company, the major landowner, is concentrating its housing efforts on the Lana 'i City Redevelopment Project. State and County agencies are currently waiting to gain a better understanding of the need for future housing prior to proceeding with development of their projects. Therefore, housing densities are flexible and may change. Attention should be given to providing the residents different types of housing.

Rather than attempt to allocate water to each of the potential projects, the working group agreed to provide an allocation of water for the increased population in general. The future homes for these residents will be built on one or more of these potential projects, depending upon the home purchase preference of the community at the time.

The key variable in the population projections is the timing of projected expansion of the hotels allowed under current zoning. The expansion of the hotels will have an impact on the job growth on the Island and will affect the population figures accordingly. The group agreed that the long term average population growth estimate of two percent per year is sufficient including the future of the hotel expansion impact.

Agriculture

Agriculture as defined in this WUDP is all activities including corporate farming, farming in the 100-acre state agricultural park, and subsistence farming that DHHL residents might undertake. The water set aside in this plan for agriculture is 1.5 mgd.

The Lana'i Water Working Group invited the Chair[5], State Board of Agriculture to brief the group on the potential for agriculture on the island. A briefing paper was prepared for the Chair prior to his visit (Appendix B). His comments and conclusions given orally to the working group are summarized as follows:

1. DOA has received no requests from members of the community for land in the 100-acre agricultural park. The high cost of water on Lana 'i compared to other parts of the state is a disadvantage.

[5] James Nakatani, Chair of State Board of Agriculture and Director, Department of Agriculture, State of Hawaii. August 1, 1996.

2. DOA does not intend to develop the park unless there is community interest.
3. The economically viable options include high value niche crops, for example, for the hotels and for papaya in a fruit-fly free zone. Papaya is also disease free.
4. Focus efforts on supplying on-island demand for fresh produce.
5. Consumptive uses depend on the crop, but 3500 gpd/ac can be an average.

While there is no specific proposal for agriculture on Lana'i, the working group agreed that 1.5 mgd should be set aside for agriculture. Allocating water for agriculture is also a specific recommendation of the draft community plan for Lana'i.

Strategy for water use and development

Supply-side Factors

The protection of the island's water resources is a principal concern of the WUDP. The Working Group reviewed background information shown in Figures 1 to 6 and Table 5.

Watershed Management

Watershed management is critical to assure continued recharge of the aquifers. The Working Group has expressed concern for two major issues: fog drip and protection of the native ecosystem.

Fog drip is a particularly sensitive element in recharging the aquifer on Lana 'i, due to limited rainfall and the low sustainable yield. The Group is very concerned that loss of fog-drip vegetation could reduce the available groundwater. The focus of attention is the high elevation area recharging the potable aquifer. Fog-drip first came to the attention of the Lana 'i Ranch manager in 1927, as the ranch sought ways to maximize its land use activities, and subsequent studies have confirmed its significance in augmenting rainfall.

The introduction of pigs, goats, axis deer, and mouflon sheep in successive periods has been detrimental to the vegetation. Pigs and goats have been eradicated and sheep seem to be self-limiting, but the deer population has expanded significantly, contributing to vegetative damage and erosion that has undermined the health of the high elevation native habitat that contributes to recharge of the aquifer. Trees that were planted in the 1920s and 1930s and that contribute to the recharge capacity are reaching old age and are susceptible to the current long-term period of low rainfall. Invasive plant and insect species are adversely affecting native species that are significant in retaining moisture. As elsewhere in the islands, native species have been exterminated or are in retreat.

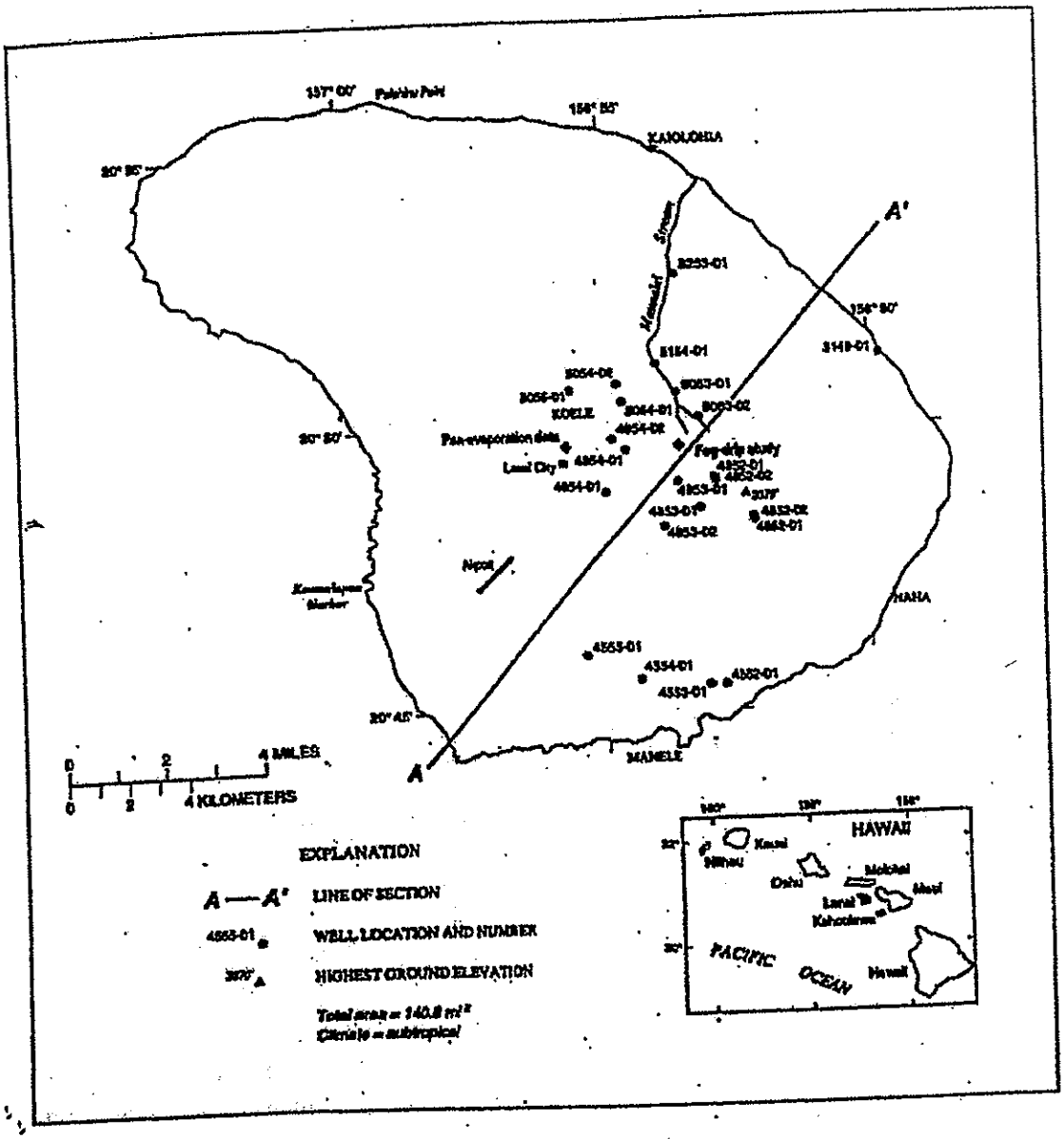


Figure 1. Regional setting for water resources on Lana'i (CWRM, 19 April 96).

Well No.	Well Name	Year Initially Drilled	Initial Water Level Elevation (ft. msl)	Initial Bottom of Well Elevation (ft. msl)
4454-01	Manele	[g]na	2.5	na
4552-01	Well 12	1990	5	-25
4553-01	Well 13	1990.	0	-25
4555-01	Well 10	1989	208	208
4852-01	MH Tunnel	1918	Dry	2,700
4852-02	Well 5	1950	1,570	1174
4852-03	USGS T-2	na	na	na
4853-01	Gay Tunnel	1920	Dry	1,920
4853-02	Well 1	1945	initial head → 818	-3
4854-01	Well 9	1990	[f]806	446
4952-01	Walapaa Tun.	1924	Dry	2,220
4952-02	Well 4	1950	1,589	1,149
4953-01	Well 2	1946	1,544	903
4953-02	Shaft 3	1954	1,553	[i]1,510
4954-01	Well 3	1950	[h]1,124	651
4954-02	Well 8	1990	1,014	412
5053-01	Lower Tunnel	1911	1,103	1,103
5053-02	Upper Tunnel	1911	1,500	1,500
5054-01	USGS T-3	1950	[k]1,064	ground-928.6
5054-02	Well 6	1986	1,005	600
5055-01	Well 7	1987	650	450
5148-01	Gay Well A	1900	2	-44
5154-01	Shaft 2	1936	735	479
5253-01	Shaft 1	1936	2.4	1.4
TOTAL Data	24 wells	na	22	20
AVERAGE	na	na	na	na

Table 5. Identification of wells and characteristics by CWRM code and common name (CWRM 19 April 1996).

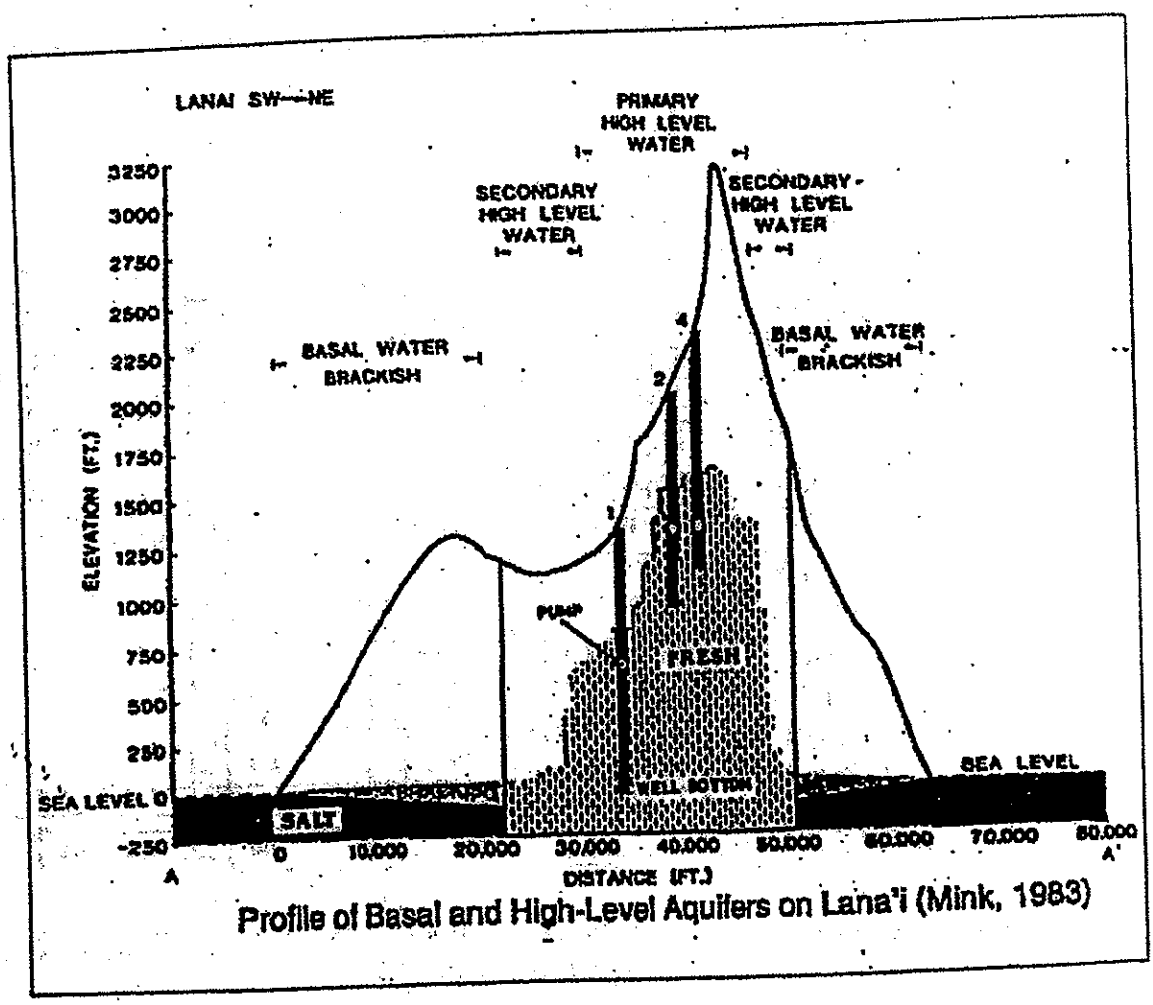


Figure 2. Idealized cross-section of groundwater on Lana'i (CWRM, 19 April 1996).

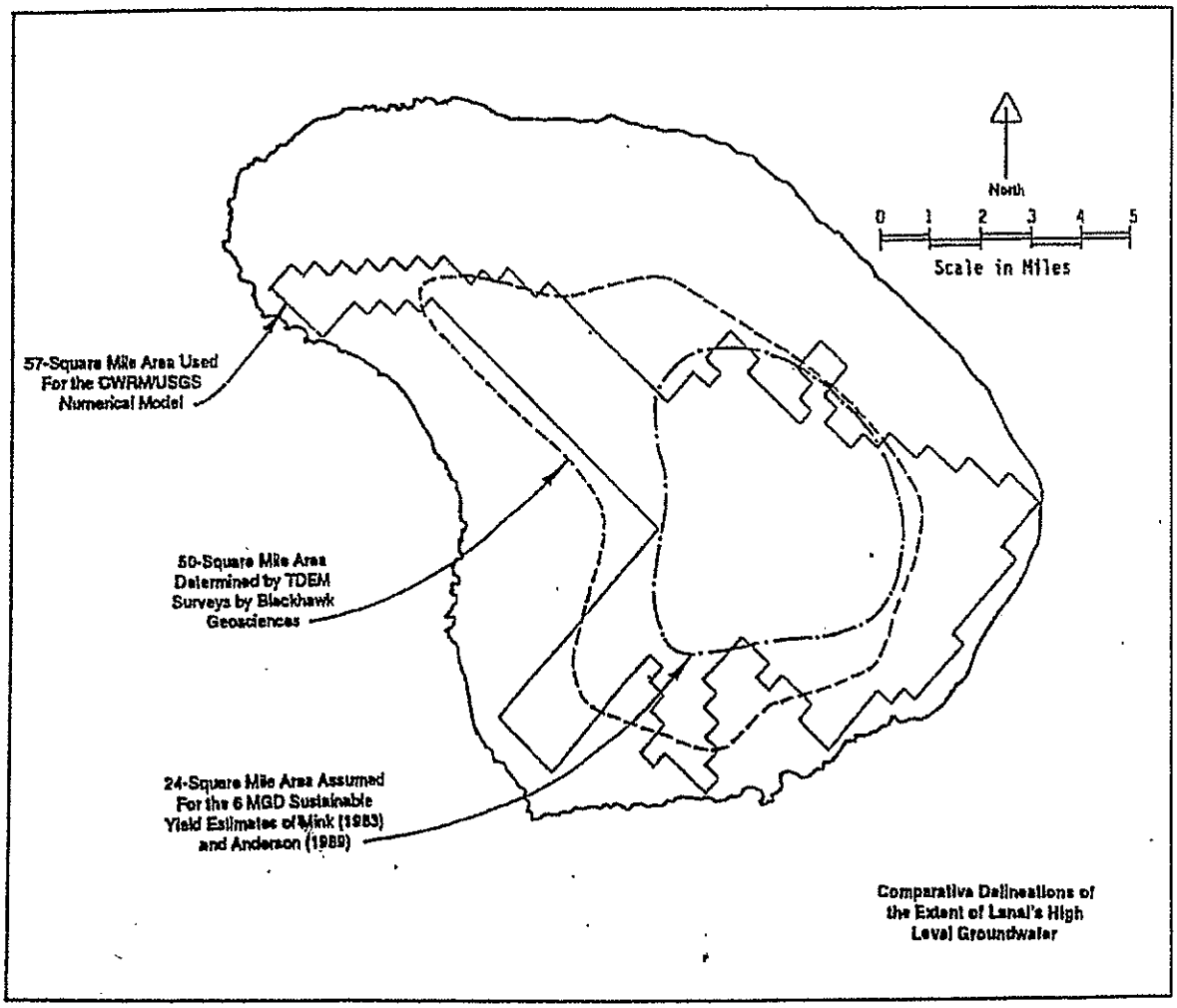


Figure 1. Comparison of different high level areas used in the analysis for recharge and sustainable yield by different investigators (after LCI, Aug 1996). The sustainable yield remains the same at 6.0 mgd for the different recharge scenarios. Water quality is a factor that must be accounted for in each scenario.

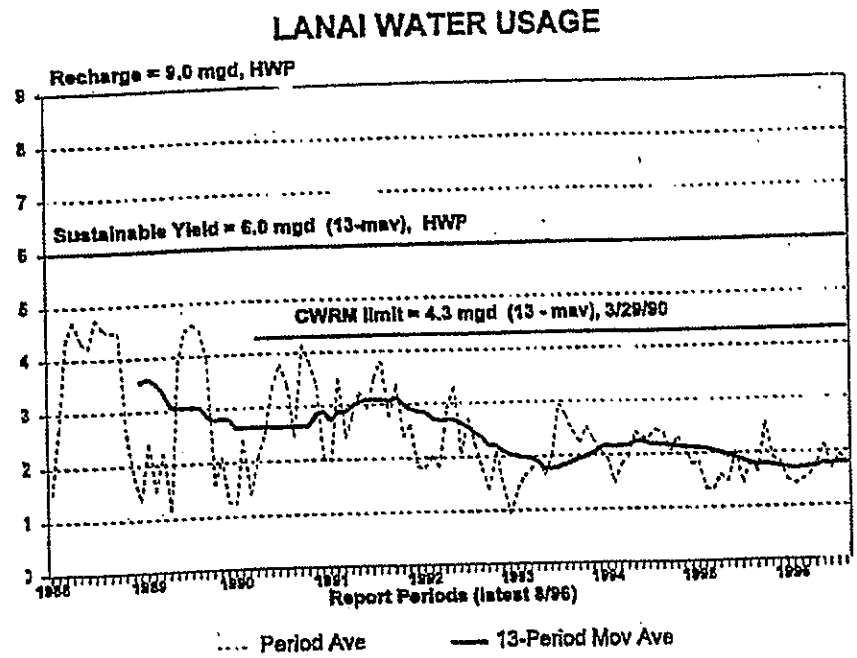


Figure 2. Trend in water usage compared to sustainable yield and CWRM limit (18 Oct 96).

Note the wide swings in water consumption in the different periods prior to 1994. Water consumption steadily declined from 1989 to 1995. Resort construction tapered off and LCI exerted better water supply management. Also, there was a change in water use.

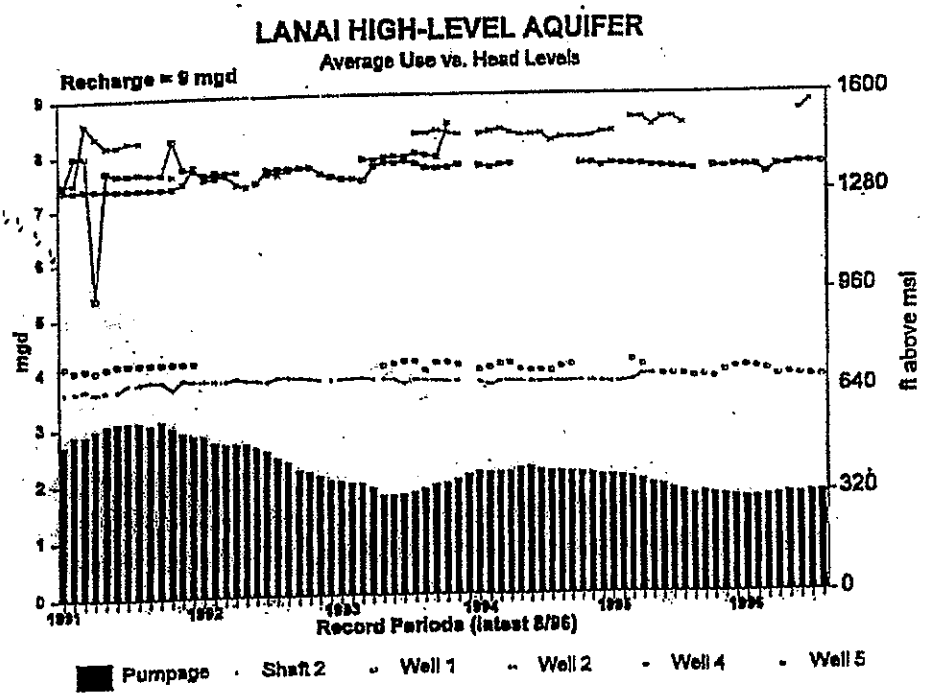


Figure 3. Water levels from 1991 to 1996 (CWRM 18 Oct 96).

Water levels have remained relatively stable since 1991. Well 4 show increase in water level. Pumping has been reduced or stopped in Wells 4 and 5.

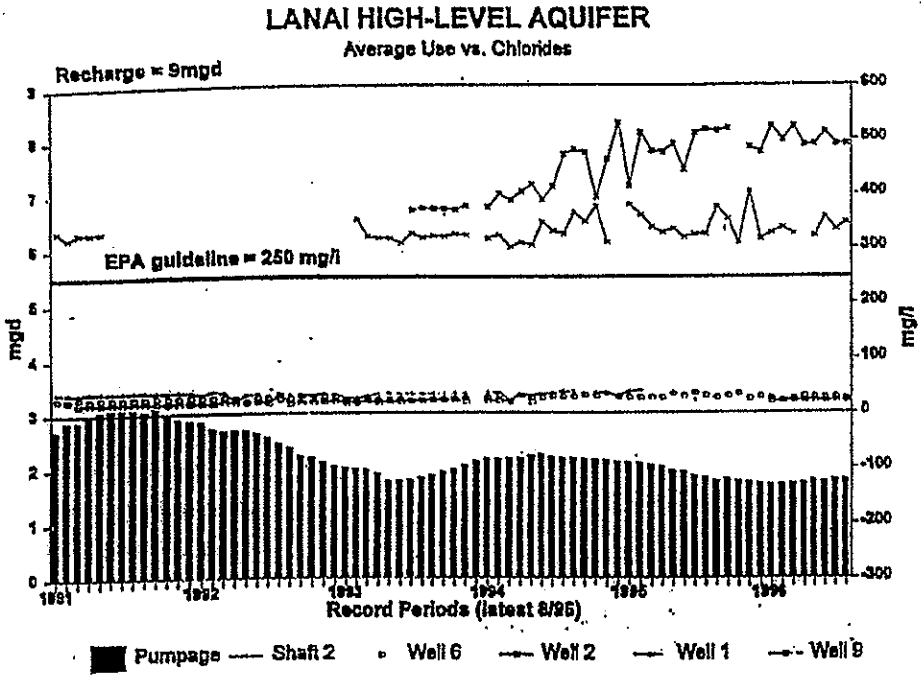


Figure 4. Chloride levels in wells in the Palawai basin compared to other wells (CWRM 18 Oct 96).

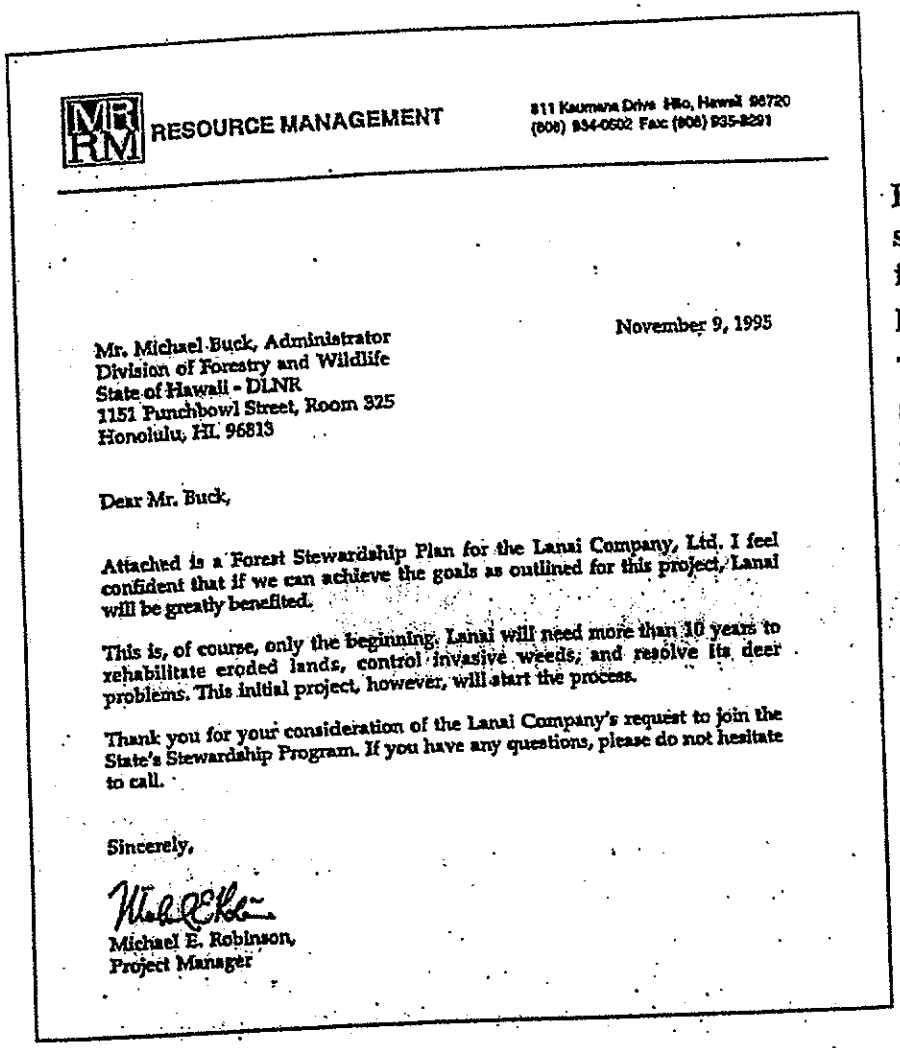
Groundwater in the Palawai basin is brackish. Chloride levels appear to be stable in Wells 1 and 9 at their current pumping rates.

The Working Group agrees that a strong watershed management program is essential to its water resources. There are at least three ways that this matter may be approached. The Tri-Isle (Maui County) Resource Conservation and Development District (RC&D) is a channel for federal-state-landowner cooperative cost-sharing and technical support programs sponsored by the federal natural Resources and Conservation Service (NRCS, formerly Soil Conservation Service); its focus is agricultural land, but it can apply to watershed lands that contribute water resources to the agricultural land. The Forest Stewardship Program is a separate federal-state-landowner cooperative cost-sharing and technical program sponsored by the U. S. Forest Service and administered through the State Division of Forestry and Wildlife. Thirdly, private efforts are a time-honored approach in Hawaii evidenced on Lana 'i by years of volunteer reforestation.

The Group feels that it is imperitive that this plan be implemented and its effectiveness be monitored and the plan be revisted as appropriate. To serve this end, the Group recommends that the CWRM appoint a steering committee to set objectives for a fog-drip study and watershed management program.

A forest stewardship plan[6] has been prepared for LCI.

[6] Forest Stewardship Plan for The Lana'i Company, Prepared by: Resource Management, 811 Kaumana Drive, Hilo, Hawaii 96720, November 8, 1996.



RESOURCE MANAGEMENT

811 Kaumana Drive Hilo, Hawaii 96720
(808) 934-0502 Fax: (808) 935-8291

November 9, 1995

Mr. Michael Buck, Administrator
Division of Forestry and Wildlife
State of Hawaii - DLNR
1151 Punchbowl Street, Room 325
Honolulu, HI. 96813

Dear Mr. Buck,

Attached is a Forest Stewardship Plan for the Lanai Company, Ltd. I feel confident that if we can achieve the goals as outlined for this project, Lanai will be greatly benefited.

This is, of course, only the beginning. Lanai will need more than 10 years to rehabilitate eroded lands, control invasive weeds, and resolve its deer problems. This initial project, however, will start the process.

Thank you for your consideration of the Lanai Company's request to join the State's Stewardship Program. If you have any questions, please do not hesitate to call.

Sincerely,

Michael E. Robinson,
Project Manager

Figure 5. Summary statement of the forest stewardship plan for Lana'i.

This plan is but the start of an on-going process. The goal is to preserve the native ecosystem that fosters groundwater recharge of high water quality.

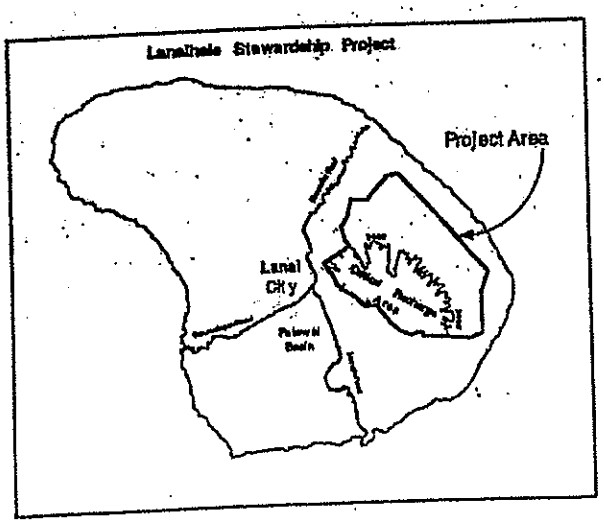


Figure 6. Project area for forest stewardship plan (after Resource Management, 1995).

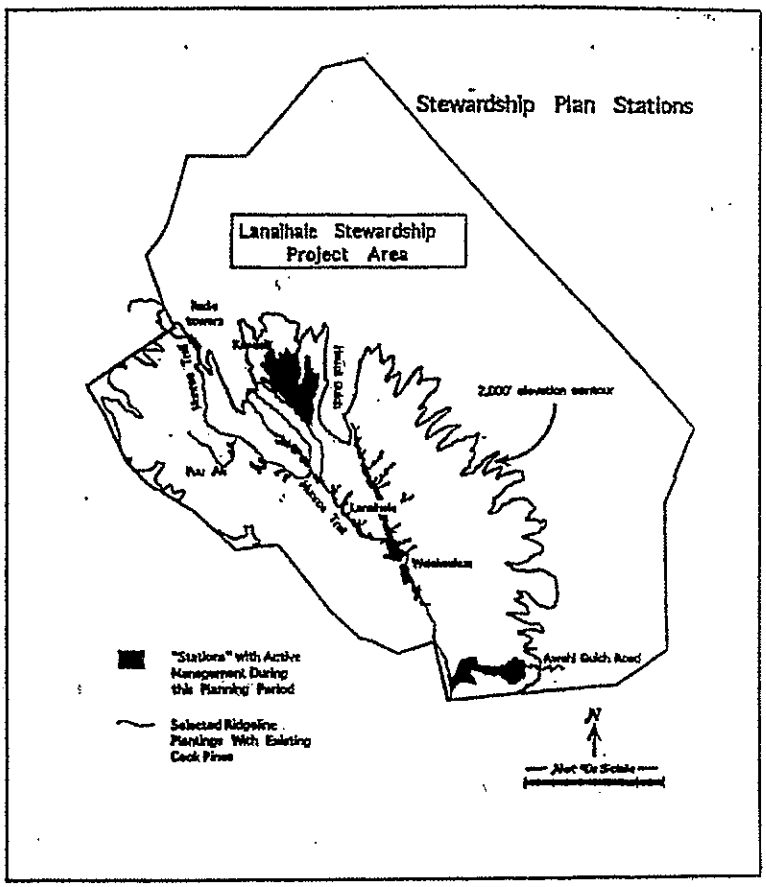


Figure 7. Stations for stewardship plan (after Resource Management, 1995).

Objectives of the plan:

1. Enter into State's Forest Stewardship Program.
2. Improve fog drip, subsurface water quantity, and surface water quality via tree plantings on critical and non-critical planting areas.
3. Protect new and existing plantings from wildlife browsing.
4. Establish vegetative cover which controls erosion.
5. Control undesirable non-native vegetation.

Well Operating Management Guidelines.

LCI developed guidelines for managing groundwater resources and described them as voluntary well operating mangement guidelines (VWOMG).[7] The Working Group recommended revisions and further recommended that the revised guidelines be made mandatory.

1. The moving 12-month average pumpage of high level brackish wells in Palawai Basin which are used to irrigate Manele Golf Course, shall not exceed 650,000 gpd. If other non-potable water becomes available, such as sewage effluent or other brackish

[7] Lana 'i Water Resources Management Plan, Prepared by Lana 'i Company, Inc., August 1996

water, the amount withdrawn from the high level aquifer shall be reduced proportionately.[8]

2. Pumpage shall be distributed among well sources so as to maintain their water levels within the following specified limits:

Table 6. Action levels for groundwater sources.

Potable Well	Initial water level (ft elev)	Current water level (ft elev)	Action Level* (ft elev)	Lowest allowable level (ft elev)
2	1544	1390	1050	750
3	1124	992	750	562
4	1589	1573	1100	750
5	1570	(Not operating)	1100	750
6	1005	998	750	500
8	1014	893	750	500
Brackish Wells				
1	818	748	550	410
9	808	755	550	410
14	?	?	400	292

***Requires public review of all pumpage, water level, and water quality data for possible changes in the resource management procedures, policies, and plans.**

3. In event that it is not possible to stay within the limitations set for potable wells, LCI will develop new wells and/or outfit Well 7, whichever is most hydrologically appropriate.

Desalination and Future Water Development

LCI made a significant commitment to implement desalination for the irrigation of Manele Golf Course in the event the 12-month moving average of total pumpage from the high level aquifer exceeds 70 percent of the sustainable yield for six consecutive months. Desalination incurs a substantial cost in present-day terms, and it will continue to do so in the future despite cost-cutting advances being made in technology. The Working Group understands that the cost for this alternative is to be borne by LCI and not the community. Nevetheless, the Group feels that there are other more cost-effective alternatives to meeting the water demands in the future than desalinating golf course irrigation water. For this reason, the Group does not support the guideline for desalinating irrigation water. This issue will be discussed more fully in the following sections of this report.

[8] Resolution 93-42. Relating to the use of non-potable water for the construction of the Manele Golf Course. County of Maui, 1993.

Demand-side Factors

The consumer-oriented factors are considered here to reduce demand and increase efficiency of water use.

Dual Systems

The 1992 Draft WUDP recommended dual water systems especially for Manele project district for potable and non-potable water. This is a recommendation of this report. It is anticipated that water quality will become a more significant factor in resource management as urbanization progresses in the future.

Conservation measures

There are two basic alternatives to meeting future demand. One is to increase supply. The other is to improve efficiency. Reducing the future demand is often the more cost-effective engineering solution, but it requires changes in habits of people and in traditional uses of water.

The major categories of consumers evaluated here are residential, landscape, and resort. Commercial consumers are specific and require more study to fully evaluate.

Residential (single family units)

The unit consumption averaged 316 gpd/unit in 1995. By comparison, Paia, Maui had 342 gpd/unit in 1991. Both communities started as plantation camps with similar architecture and layout. It is reasonable to expect similar consumption patterns in this case.

However, there are wide differences in average water consumption in Maui County. Climate appears to be a significant factor. The range of values for 1991 in Maui County is shown in Appendix C.

The pattern of residential water use is measurable in terms of indoor and outdoor use. Data developed in the 1992 WUDP[9] show this relationship for the Kihei and Kahului. The result is shown in Table 7. For Kihei, outdoor use is 57 percent. For Kahului, it is 32 percent.

[9] M&E Pacific, Inc., Draft WUDP, Maui, 1992, Prepared for Department of Water Supply, County of Maui, 1992, Table 1.41, p 1-10.

Table 7. Difference in residential water consumption in Kihei and Kahului. The major use in Kihei is outside the dwelling units.

(Draft WUDP,1992)

District	Number of SFR Units	Consumption ave gpd/unit	Outside use* % of ave
Kihei	2520	841	57
Kahului	3404	519	32

*Outside use = [(Potable water in) - (Sewage flow out)]/(Potable water in)
SFR= single family residential

The sewage flow (1995) averaged 0.27 mgd from Lana'i City and 0.05 mgd from Manele Hotel. Therefore, inside usage was 0.32 mgd. That was the total for the island. By comparison, groundwater pumped for delivery island-wide was 1.70 mgd.

Therefore, inside use is a minor part of the overall water use. Table 8 summarizes this situation. Greater returns would be possible by focusing conservation efforts on outside usage instead.

Table 8. Summary of inside and outside uses of water on Lana'i (1995).

Catergory	mgd	Remarks
Water pumped	1.70	Refer to Table 3. Figure includes losses at 7.89% and Manele Golf course irrigation at 0.51 mgd. Koele Golf course uses reclaimed water exclusively.
Lana'i City and Manele Wastewater flows	0.32	This represents inside use of water. Most can be reclaimed for reuse. Current amount reclaimed is about 0.22 mgd.
Outside use, mainly landscape irrigation	1.38	This is 81% which is the predominant use of groundwater on Lana'i. It should be the main focus of conservation efforts on Lana'i.

Landscape

Landscape irrigation is the major water use on Lana'i. Irrigation requirement is fairly predictable based on type of plant or grass, climate, and irrigation efficiency. Turf grass consumes water equivalent to pan evaporation. In contrast, pineapple consumes

substantially less water, about one-tenth of turf grass.[10] Plant type and irrigation efficiency are matters of choice, and they are manageable. Climate is not.

Data on pan evaporation for Lana'i are sparse. Hardy[11] estimated pan evaporation for areas on Lana'i below elevation 2000 feet by extrapolation.[12] Measured pan evaporation data at Lana'ihale was used along with other observations. Pan evaporation for Lana'ihale was 25.63 inches per year. Below elevation 2000 feet, pan evaporation was estimated to be 95.00 inches per year. Details are summarized in Table 9 below.

Table 9. Estimates of pan evaporation (ET) and irrigation application rate for turf grass on Lana'i (after Report CWRM-1).

Characteristic	ET inches	ET gpd/acre	Irrigate* gpd/acre
Areas below Elev 2000 ft (annual)	95	7067	9425
Minimum month (Nov)	3.80	3439	4585
Maximum month (Jul)	9.50	8320	11,093

***Application rate is based on 75% irrigation efficiency and on optimum growth.**

Irrigation of turf grass is greater than 9000 gpd/acre for optimum growth at 75 percent efficiency. By comparison, pineapple cultivation on Lana'i used 240 gpd/acre (2.40 mgd, Table 1, for 10,000 acres).

Drought tolerant plants and grasses can reduce water consumption. Xeriscaping is recommended for Manele. The impact can be significant. For example, the projection for single family residential units in Manele is 1600 gpd/unit. Of that amount, 600 gpd/unit is the estimate for domestic use and 1000 gpd/unit is for outside use such as landscape irrigation. These rates can be reduced with conservation measures. A target of 400 gpd/unit for domestic usage is reasonable. Perhaps more can be done with conservation to reduce total consumption even further.

The projection for Manele project district is 1.03 mgd (Table 4). A likely target for Manele project district is to reduce future demand to 0.53 mgd, a savings of 0.5 mgd.

Resort

Water features are part of the amenities common to hotel-resorts. Swimming pools and ornamental ponds require back-wash, water treatment of some sort, and make-up water. They represent a water demand. Water from these features can and should be reused for irrigation. Some work has already been start to retrofit water saving devices and facilities.

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[10] Ekern, Paul C. and Jen-Hu Chang, Pan Evaporation: State of Hawaii, 1894-1983, Prepared in Cooperation with Hawaiian Sugar Planters' Association, Report R74, Department of Land and Natural Resources, Division of Water and Land Development, State of Hawaii, August 1985, p2.

[11] Hardy, Roy, Numerical Ground-Water Model for the Island of Lana'i, Hawaii, Report No. CWRM-1, Commission on Water Resource Management, State of Hawaii

[12] Eckern, Ibid.

At present, backwash water at the hotels from water features are disposed of in the sewer system. Consumptive use would be a fraction of the total water delivered. However, as in the case of Manele, water reuse from these features is unplanned. It is being discharged to the sewer system, pumped to the treatment plant, and then to the reuse system. With prior planning, it could have been diverted to the irrigation system directly for reuse with minimum effort and cost. Therefore, the issue here is mainly on economics of reuse.

It is recommended that that recycling and reuse of water within the resort be added as a retrofit where possible in existing systems and as a designed feature in future systems.

Recommended Conservation Strategy

Outside usage of water (landscape irrigation) is and will continue to be the predominant demand. Water conservation is a significant alternative to meeting future demand. Therefore, the Working Group recommends the following actions:

1. Reuse water from water features for irrigation within the resort complex to save water and avoid treatment costs.
2. Prepare a plan for a conservation program with the following scope of work:
    - Develop an inventory of current irrigated acreage with type of plant and/or ground cover.
    - Develop a system of monitoring water application rates by month.
    - Set up climatological stations in strategic locations for measuring rainfall, temperature, humidity, evapotranspiration (ET), and other parameters to assist in establishing reasonable irrigation rates.
    - Adjust irrigation application rates according to evapotranspiration rate and type of plant.
    - Develop water pricing system as incentive for water conservation, that is, penalize excessive use based on ET and type of plants.
    - Develop library of drought resistant and salt-tolerant plants and ground cover that can be used in landscaping at Manele.
    - Incorporate drought resistent and non-invasive plants in all landscapes.
    - Set annual targets for adjusting irrigation application rates for different areas based on climatological data and type of plants and ground cover.
    - Set water allocation for each future development.
    - Adjust projections of future demand based on monitoring results and performance of this conservation program.
    - Adjust criteria and procedures for the water conservation plan as part of the WUDP update.
    - Pursue action to cover all open reservoirs.

- Provide additional storage capacity in the water systems as part of the conservation program.

Conclusion

The major issue is community involvement and participation in total water management. What is sorely needed is a company-community partnership in the truest sense of the word, based on trust and cooperation. To serve this end, an on-going organization and forum is recommended.

Recommendations

1. Establish the Working Group by ordinance.
2. Establish watershed management program as an on-going basis with special emphasis on preserving native ecosystem and the fog drip component of recharge in the watershed.
3. Adopt the revised well operating management guidelines as mandatory.
4. Implement water conservation measures aimed at reducing outside use as the strategy for meeting future demand, then consider desalination as required specifically to meet future demand for new hotels and resort facilities. The cost of desalination for hotel and resort activities shall not be passed on to the residential and agricultural consumers on the island.
5. Develop inventory of all irrigated acreage and water application rates as part of the program aimed at water conservation.
6. Retrofit and plan for recycling and reusing water from water features within the resort complex, particularly for landscape irrigation.
7. Implement and maintain dual water systems in Manele.
8. Establish a forum for community involvement and participation in planning for total water management, including the updating of the WUDP and monitoring implementation.

Glossary

Sustainable Yield	A management parameter indicating the amount of water that can be withdrawn without impairing the beneficial use of that source.
Brackish Water	Water that is too salty to drink, generally defined by US EPA as having 250 mg/l of chlorides.
Chloride Levels	Concentration of chlorides which is used as the indicator of salts in the water.
Hawaii State Water Plan	Plan required under the State Water Code.
Recharge	The replenishment of a groundwater source. It occurs naturally from rainfall.
Potable	Water that can be drunk without noticeable salty taste or without being bad to public health.
Desal	Desalination, the process of desalting or removing minerals from water.
Project District	A concept in land use zoning in Maui County which identifies the boundaries of a particular tract of land where development occurs according to Council approved standards and criteria.
Lana'i Water Group	A community group representing the company, government, and the citizens of Lana'i who have volunteered to develop a consensus document for resolving conflicts in water resource issues.
Aquifer	The geologic medium which stores and transports water underground ultimately to the sea.
Fog Drip	The condensation of moisture on plants and other objects like dew drops in sufficient quantity to infiltrate into the ground to groundwater.
Pan Evaporation	The amount of water that vaporizes from a standard container exposed to the weather in the same way that plants and vegetation are. There is a correlation between pan evaporation and the amount plants consume in their life cycle.
Forest Stewardship Progam	This is a cooperative program among federal and state agencies with the land-owners to preserve forestry resources and ecosystem. It is a cost-sharing program sponsored by the U. S. Forestry Service and administered by the State Division of Forestry and Wildlife, Department of Land and Natural Resources.

APPENDICES

Calculation of Projected Water Demand

Note: "Future" water demand represents the fully built-out condition according to authorized zoning. The time period for attainment is unspecified. The "2010" demand represents the foreseeable future.

Table A1. This is Table 4 in report.

LAND USE CATEGORY	Present mgd	2010 mgd	Future mgd	Source of Water**
Residential	0.274	0.414	0.494	Primary
Agriculture	0.219	0.50	1.50	Primary
Commercial & Institutional (10 addditional acres)	0.379	0.439	0.439	Primary
Light Industrial (15 acres)	0	0.09	0.09	Primary
Kaumalapau Harbor	0.009	0.01	0.01	Primary
Lanai Airport	0.004	0.005	0.005	Primary
Manele Project District	0.078	0.68	1.03	Primary & Secondary
Manele Golf Course	0.51	0.65	0.65	Secondary
Manele Effluent	0.05*	0.07*	0.14*	Effluent
Koele Project District	0.096	0.20	0.42	Primary
Koele Golf Course	0.25*	0.25*	0.25*	Effluent
Subtotal Groundwater	1.569	2.99	4.64	Primary & Secondary
System losses 12% future	0.134	0.41	0.63	
Subotal Groundwater	1.703	3.40	5.28	
Total Effluent	0.3	0.32	0.44	
Total Water Demand	1.73	3.72	5.72	
*Reclaimed wastewater effluent				
**Sources of Water:				
Primary= Wells 2,3,4,5,6,8, Maunalei				
Secondary=Palawai (Wells 1,7,9,10) and beyond				
Effluent=reclaimed water				

Table A2. Calculation of projected water demand in Manele Project District

Project	Acres	Reference	Remarks	2010	Future
Manele Hotel Existing		Increased occupancy	250 units, 600 gpd/unit, less exist	0.18	0.18
Manele Hotel II	25	Lanai Co., Feb 1990	150 units, 600 gpd/unit	0.09	0.09
Manele II Landscape	20	Draft WUDP	Ave irrigation 7000 gpd/ac	0.14	0.14
Manele PD SFR	248	Lanai Co. 3/1/90	325 units, 600 gpd/unit	0.08	0.20
			325 units, 1000 gpd/unit	0.12	0.32
Manele PD MFR	27	Lanai Co. 3/1/90	100 units, 300 gpd/unit	0.015	0.03
			100 units, 300 gpd/unit	0.015	0.03
Manele Commercial	5.25	1985 Project District	6000 gpd/ac	0.04	0.04
Manele Golf Course	100	Council Resolution	Included in present usage		
			Total	0.68	1.03

Table A3. Calculation of projected water demand for Koele Project District

				2010	Future
Project	Acres	Reference	Remarks	mgd	mgd
Koele Hotel Existing		Increased occupancy	102 units, 500 gpd/unit, less e	0.01	0.01
Koele PD SFR	138.35	Lanai Co. 6/28/96	254 units, 600 gpd/unit	0.05	0.15
Koele PD MFR	18.46	Lanai Co. 6/28/96	90 units, 400 gpd/unit	0.04	0.04
Koele PD Hotel	21.1	Lanai Co. 6/28/96	250 units, 500 gpd/unit		0.13
			Present Demand	0.096	0.096
			Total	0.20	0.42
Koele Golf Course			Reclaimed water use	0.25	0.25

Table A4. Population and demographic data used in analyzing population and residential water demand.

Parameter	Value	Remarks
1980 Census Population	2119	
1990 Census Population	2426	Approximately 1% growth rate from 1980
1990 Housing units	1007	1990 census
1990 Household size	2.86	1990 census
1988 Total number of Jobs	845	State DLIR
1988 Dole Pineapple	560	
1988 Lanai Company	30	
1988 Koele	8	
1996 Population	2800	LCI
1996 Housing Units	1273	
1996 Household size	2.2	
1996 Total Jobs	1400	State DLIR
1996 Hotel Workers	750	
1996 Other Service	100	
1996 Hotel units	362	Manele=250, Koele=102, Lana'i=10
Population / total job	2.0	Computed values
Service job/hotel job	1.13	Computed
Hotel jobs/hotel unit	2.07	Computed
Population/hotel job	2.27	Computed

Table A5. Projection of residential demand based on different scenarios. New hotel construction is the key driver for population growth.

Scenario (1996 population = 2800)	2010 Population	Population increase	New housing Needed	New Acres needed at 4.5/ac	Increased demand mgd
Community Plan Projection	4968	2168	638	142	0.22
1% Growth Rate (1980 to 1990 growth on Lana'i)	3219	419	190	42	0.07
1% Growth Rate with New Manele Hotel	3672	872	396	88	0.14
2% Growth Rate	3695	895	407	90	0.14
1% Growth Rate with New Manele and Koele Hotels	4805	2005	912	203	0.32

Table A6. Computation of the number of housing units that can be constructed on the land being considered for future housing. DHHL and the County have no plans for development at this time.

Project	Acres**	Remarks	Assumption on maximum density	Units*
In-fill housing		Lanai Co. Feb 96	Net 53 units	53
DHHL Housing	50	LUC Condition. Assuming	4.5 units/ac	225
County Housing	115	LUC Condition	4.5 units/ac	518
			Total	796

*The number of residential housing units possible from the density assumed is more than projected need. A lower density can be considered for future housing developments.
**Refer to Figure A1 for proposed locations of the 115 acres. The County has no definite plans for development. DHHL has no plans for the 50 acres at this time. The site has not been selected.

Table A7. Projection of future commercial demand in Lana'i City.

New Commercial Acres = 10
Reference OSP
Standard = 6000 gpd/acre (County)
2010 additonal demand = 0.06 mgd
Future demand =0.06 mgd No further increase anticipated over 2010 demand/

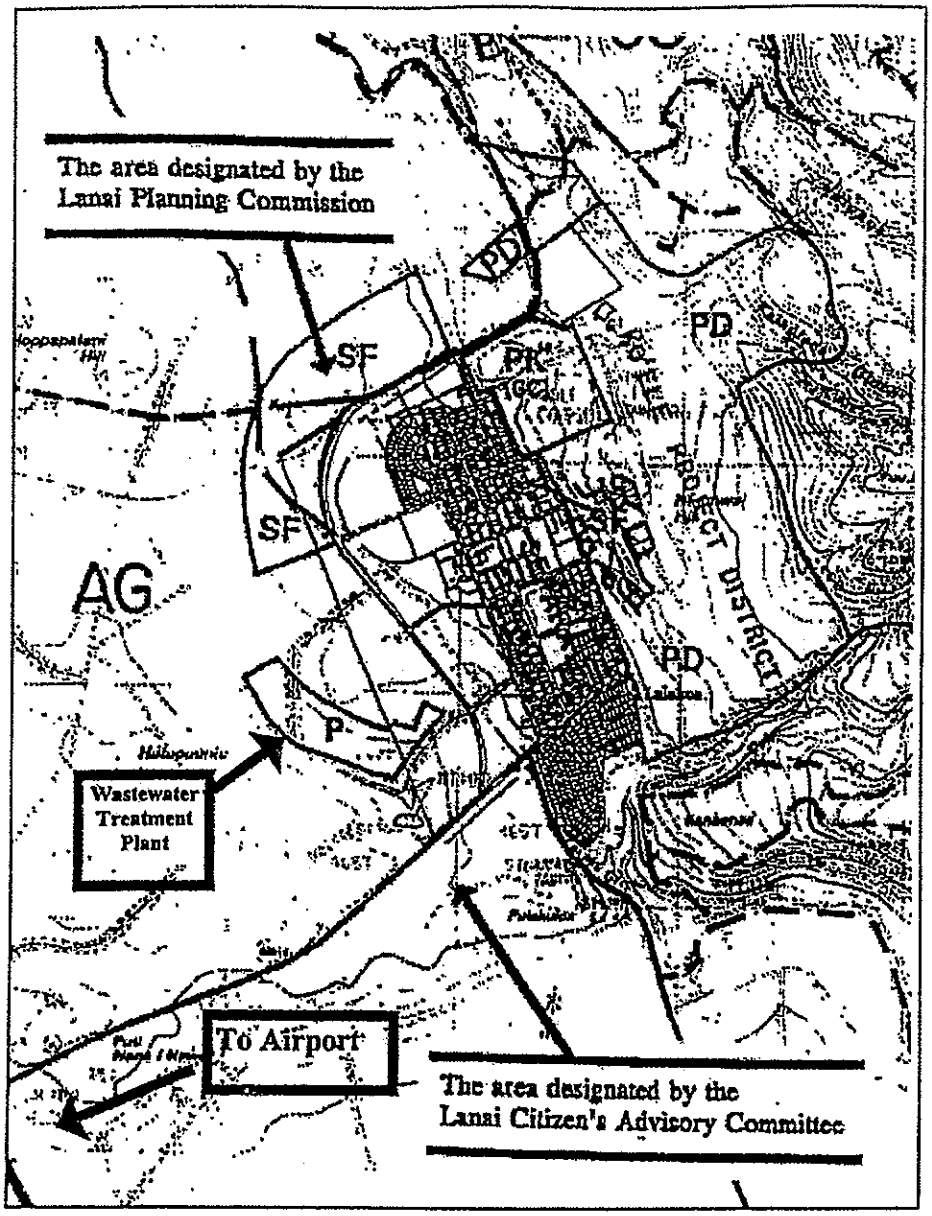

Figure A1. Different sites have been considered for the 115-acre residential development intended for County housing projects. The County has no projects planned. DHHL has no plans at this time for developing the 50 acres. The site has not yet been selected.

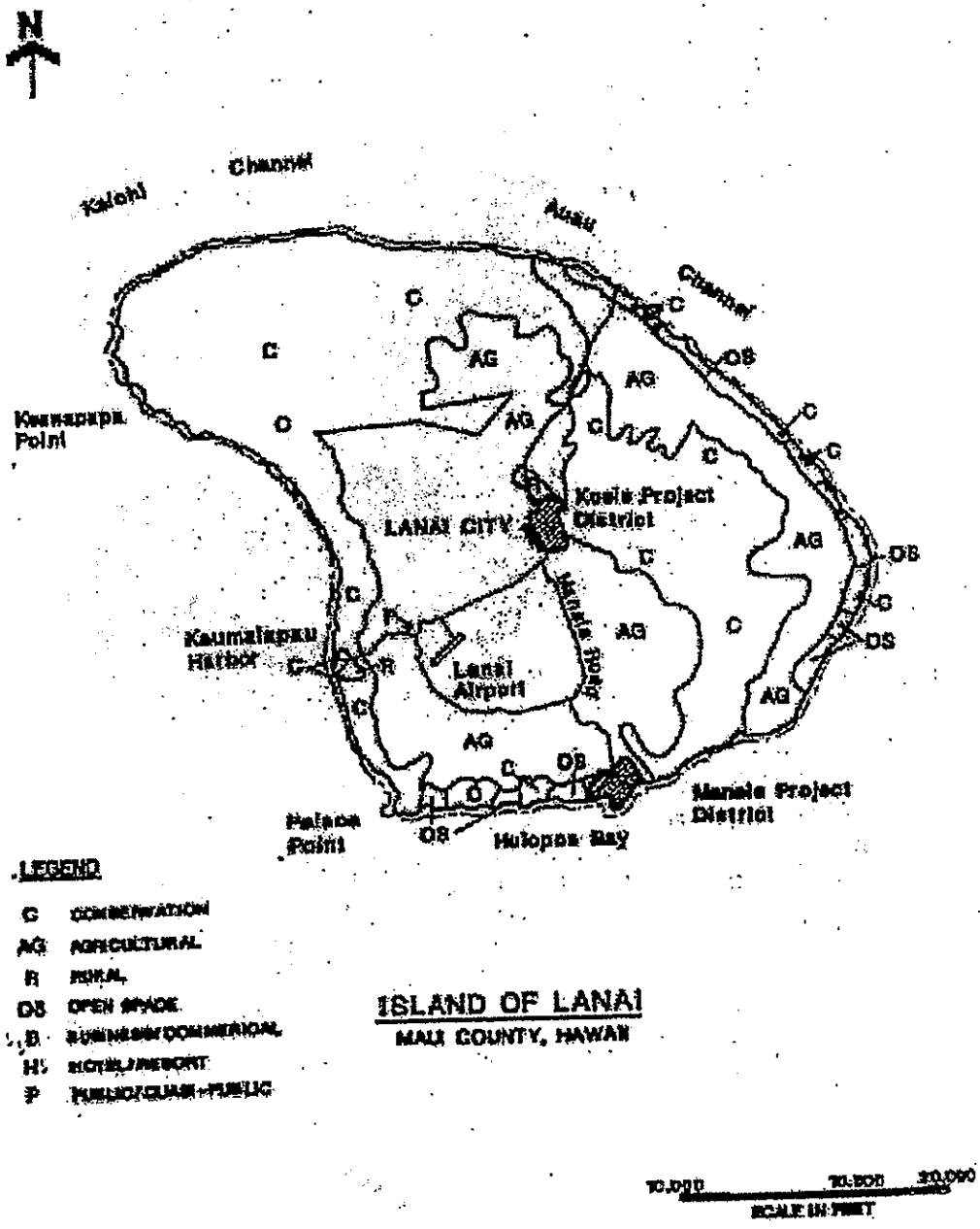

Figure A2. Land use designation for the island of Lana'i. The two major developments planned for the future are the Koele and Manele project districts.

Briefing Memorandum for Chair, State Board of Agriculture

July 22, 1996

MEMORANDUM

To: James Nakatani, Chair
Board of Agriculture
State of Hawaii

From: James Kumagai

RE: Briefing for your meeting on Lanai agriculture

Your meeting with the Lanai Water Working Group (WG) on August 1, 1996, will focus on the potential for diversified agriculture on Lanai. It is a sensitive and controversial issue. You will hear different viewpoints on what agriculture means to Lanai. It is a business. It is a way of life. It is a hope for diversifying a vulnerable economic base. In the end, the WG must pull it all together and decide how much water to recommend as the allocation to diversified agriculture. You can help them decide.

Lanai has a history of change. It has gone from sugar, to ranching, and then to pineapple in this century. Now, Lanai is going out of pineapple altogether and phasing into a resort economy.

Pineapple provided a narrow economic base. It made Lanai citizens feel vulnerable, and they have been calling on government and industry for over two decades to diversify agriculture on the island. The community could do nothing on its own. It had no land and no resources. Lanai Company owned all the land and the infrastructure. Government could help, and the Department of Agriculture tried to create opportunity for the community. It negotiated a 100-acre site with Lanai Company for an agricultural park, but it did not develop it.

Lanai Company tried several ventures, but none proved to be attractive as a business. Data on company projects are given below in this memo.

The Water Use and Development Plan

The WG is dealing with the issue of agricultural water as part of the Water Use and Development Plan (WUDP). The planning process comes under the State Water Code. Ultimately, the County Council and the Commission on Water Resource Management (CWRM) will decide the issue of allocation.

Council must adopt the WUDP by ordinance. CWRM must accept it as part of the state plan.

The process is a bottom-up effort. The WUDP starts at the county level under the principle of home rule. For Lanai, the WG is the planning group. It is made up of county officials, Lanai Company officials, and community members. The WG is an outgrowth of the Water Subcommittee created by the county council.

The WUDP process gives the community a chance to work out its differences in water use and development. In this sense, the community has the means to control its own destiny if it chooses to do so.

The Community Plan is the starting point.

The Community Plan is intended as the starting point for the WUDP. It reflects what the community wants for its future. The 1983 Plan is being revised and a draft is now before the council for action.

There is a problem with the process. Revision to the 1983 Plan is overdue. Therefore, all other plans being developed now are either out of sequence or are being delayed. Because of the practical problems of sequencing, more people now are saying that the Community Plan and the WUDP should be developed together. It makes sense when it comes to water. Decisions on land use and water allocation should be made together, not one over the other. Of course, that is only my opinion.

The 1983 Community Plan and the draft of the revised plan both envision agriculture as part of the economy of the island. There are subtle differences in philosophy and expectations of the community.

The 1983 Community Plan for Lanai recommended the following:

1. *Keep pineapple as the primary economic activity and add tourism as the secondary activity.*

2. *Develop diversified agriculture as an economic activity and a source of local food products for the island.*

The 1995 draft currently before the Council for action has these recommendations:

1. *Promote diversified agriculture as a means of establishing job and income stability.*

2. *Establish and reserve a minimum water allocation to meet the needs of diversified agriculture.*

3. *Ensure the long-term availability of low-cost water for agricultural purposes.*

Lanai Company Initiatives

The information presented here came from Steve Snow, the person in charge of diversified agriculture for the company. The date is November 1994. Steve Snow is no longer in charge. More current information should be available from the company when we meet on August 1.

Data on agriculture is summarized below:

Land available for diversified agriculture	14,000 acres
Planned Use (Nov 1994)	
Pasture lands	12,000 acres
Dryland forage crops	2,000 acres
Planned Livestock (Nov 1994)	
Cattle for mainland shipment	800 to 1000 head
Hogs (300 sows)	4,000 hogs/year
Dairy heifers	No estimate
1994 Crops	
Banana	5.5 acres
Papaya	20 acres
Pineapple and herbs	50 acres
Barge Schedule	Once/week
Water consumption (1994 approx)	200,000 gpd
Cost of agricultural water (1994)	$0.96/1000 gal

Lanai is at a disadvantage when competing in the state agricultural market. Barging is only once a week. The shipping schedules and cost are problems to marketing products outside the island.

Cost of agricultural water is higher here than anywhere else. For example, DOA water sells for $0.16/1000 gal. Large users on Maui pay $0.64/1000 gal. I believe farmers using Waiahole water will be paying around $0.35/1000 gal. That was the number being tossed around in discussions among the farmers there. Lanai farmer pays $0.96/1000 gal or greater.

Recent Proposals for Agricultural Water

The community is going through the third iteration of the WUDP. The first was in 1990. It was prepared by the Maui BWS. The second was the 1992 WUDP that remained in draft form. Now, the WG is working on the 1996 WUDP. The agricultural components of the projected water demand are as follows:

Plan	Agricultural Use	Mgd	Remarks
1990 Maui BWS	Pineapple	1.8	1988 usage was 2.4 mgd. Reduction in pineapple.
1992 Draft Maui BWS	Diversified Agriculture (No pineapple)	1.5	Lanai Company disagreed. Company proposed 1.0 mgd.
Present Maui Council	Diversified Agriculture	??	

The decision to phase out pineapple was made public sometime in 1991. The company proposed that diversified agriculture would be somewhere around 1.0 mgd operation. The Department of Agriculture proposed the creation of a 100-acre agricultural park, requiring 0.5 mgd of irrigation water. The water task force recommended adding the 0.5 mgd to 1.0 mgd to get 1.5 mgd as the amount of water to be set aside for diversified agriculture. Lanai Company disagreed, claiming that the 1.0 mgd includes the 0.5 mgd demand for the agricultural park. Besides, the company said, DOA agreed to a lower number of 0.2 mgd for agricultural demand.

There was a problem over the agricultural park water demand. DOA reported to the CWRM in the state projects plan that the demand for the agricultural park of 0.5 mgd. At the same time, it agreed with Lanai Company that it should be lower, at around 0.2 mgd, without telling the WUDP task force or the CWRM about it.

The issue in the 1992 draft boiled down to whether diversified agriculture should be 1.0 mgd or 1.5 mgd operation, a difference of 0.5 mgd. Obviously, there are different philosophies and criteria involved here. That is not surprising. As I mentioned before in this memo, agriculture means different things to different people.

Conclusion

There is no doubt that the issue is complex. I sense that agriculture on Lanai means more than growing crops and getting them to market. You can help the WG and other members of the community sort through the complexities and gain insight into the issue of agriculture on Lanai. In the end, it will be their decision to make.

Call if you have questions.

cc: Members, Lanai Water Working Group

UNIT WATER CONSUMPTION FOR SFR, MAUI COUNTY WATER DISTRICTS.							
(Ref: Water Use and Development Plan, County of Maui, 1992)							
AREA	District	Class	Number Served	Max, gpd/serv	10%-tile gpd/serv	Median gpd/serv	Average gpd/serv
Makena	155	SFR	36	12789	5403	903	2090
Wailea	151w	SFR	93	4512	2496	1334	1455
Maalaea	153	SFR	21	7518	2055	921	1289
Maui Meadows	151m	SFR	561	5559	2151	1153	1229
Ulupalakua	335	SFR	31	6104	1458	342	841
Kihei	151	SFR	2520	6814	1312	655	841
Spreckelsville	173	SFR	88	5126	1521	599	809
Honokowai	513	SFR	209	6405	1310	614	641
Lahaina	511	SFR	1805	4499	1044	501	630
Alaeloa	515	SFR	207	3173	1101	434	556
Lower Kula	333	SFR	577	64888	6767	381	537
Kahului	131	SFR	3404	3290	915	458	519
Kawela-Kaunakakai	711	SFR	533	3036	800	405	454
Ualapue	713	SFR	273	6219	904	290	452
Pukalani	316	SFR	1569	8874	762	359	442
Haliimaile	317	SFR	188	1762	797	374	430
Waihee	113	SFR	142	7112	682	322	428
Upper Kula	331	SFR	1138	6784	789	293	413
Wailuku	111	SFR	3121	4693	759	342	407
Kuiaha	312	SFR	187	6893	707	260	392
Waikapu	115	SFR	202	3178	718	296	391
Lanai	Private	SFR	899	1970	654	333	373
Wailuku Heights	117	SFR	380	0.15	1855	833	367
Kokomo-Kaupakalua	311	SFR	611	2874	712	279	365
Hana	911	SFR	252	3129	707	274	351
Paia-Kuau	171	SFR	634	3323	773	344	342
Makawao	315	SFR	1657	3773	619	279	339
Haiku-Pauwela	313	SFR	514	3416	614	255	334
Honokohau	517	SFR	10	1370	285	217	303
Kalae	715	SFR	88	1058	466	227	251
Halawa	717	SFR	5	562	123	71	174
Makena	155	MFR	6	864	NA	NA	629
Wailea	151w	MFR	4	779	535	476	493
Kahului	131	MFR	26	568	431	415	426
Maalaea	153	MFR	12	408	350	308	293
Lahaina	511	MFR	47	2553	813	309	273
Wailuku	111	MFR	70	16899	448	223	266
Kawela-Kaunakakai	711	MFR	18	530	375	274	261
Kihei	151	MFR	4970units	1345	1191	352	259
Makawao	315	MFR	4	311	288	245	253
Pukalani	316	MFR	6	319	259	164	203
Paia-Kuau	171	MFR	3	348		279	203

UNIT WATER CONSUMPTION FOR SFR, MAUI COUNTY WATER DISTRICTS.							
(Ref: Water Use and Development Plan, County of Maui, 1992)							
AREA	District	Class	Number Served	Max, gpd/serv	10%-tile gpd/serv	Median gpd/serv	Average gpd/serv
Pukalani	316	MFR	6		259	164	203
Honokowai	513	MFR	90	4849	770	113	179
Alaeloa	515	MFR	23	570	405	279	172
Puunene	141	COM	9	76825	33433	14701	21262
Wailea	151w	COM	43	134076	24301	3222	8542
Kihei	151	COM	160	78500	15083	1982	7423
Wailuku Heights	117	COM	7	24066	8230	4112	6842
Honokowai	513	COM	70	31279	19956	1807	5711
Waihee	113	COM	7	38411	463	378	5700
Makawao	315	COM	27		8666	2433	4086
Maalaea	153	COM	6	17153	3499	907	3756
Alaeloa	515	COM	35	12877	9170	2964	3691
Spreckelsville	173	COM	16	9337	7077	1759	3133
Kahului	131	COM	354	55395	7364	818	2918
Lahaina	511	COM	170	25055	8756	438	2173
Wailuku	111	COM	400	34008	3915	449	1675
Upper Kula	331	COM	45	13381	1603	334	1214
Pukalani	316	COM	23	9285	2321	471	1076
Paia-Kuau	171	COM	44	15762	1978	254	1053
Kokomo-Kaupakalua	311	COM	12	4373	4132	462	1041
Haiku-Pauwela	313	COM	13	6181	899	249	755
Kawela-Kaunakakai	711	COM	67	12548	1638	233	740
Lower Kula	333	COM	18	3274	1510	331	678
Waikapu	115	COM	15	2323	696	342	505
Ualapue	713	COM	18	893	532	82	188
Lahaina	511	HOTEL	7	14748	4356	638	3260
Makena	155	HOTEL	4	NA	NA	NA	609
Wailea	151w	HOTEL	4	6836	1389	1449	531
Kihei	151	HOTEL	170units	NA	NA	NA	458
Honokowai	513	HOTEL	960	708		456	392
Alaeloa	515	HOTEL	7	340		310	267
Kahului	131	HOTEL	450 units	NA	NA	NA	206
Kawela-Kaunakakai	711	HOTEL	1	0	0	0	0
Kahului	131	IND	58	90058	25348	3134	8527
Kihei	151	IND	26	33337	18071	4137	6905
Lahaina	511	IND	43	41060	17088	3532	6678
Waikapu	115	IND	3	5764		5769	4829
Honokowai	513	IND	2	6775			4819
Wailuku	111	IND	71	23710	5918	100	2307
Kawela-Kaunakakai	711	IND	7	5844	2688	964	1638
Paia-Kuau	171	IND	10	6836	1452	930	1446

APPENDIX B

Water Conditions of Project Approvals

Ordinances Pertaining to Project District I - Manele

Ordinance #1578(1986) – A Bill for an Ordinance Relating to the Standards for the Project District At Manele, Lanai, and the Procedures for Project Districts

Slopes

12 to <15% slope – No more than 40 % of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

15 to <30% slope – No more than 30 % of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

30% slope or more – No more than 15 % of such shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

Wetlands –

Areas such as swamps, marshes, bogs, or other similar lands shall remain as permanent undisturbed open space

Woodlands

No more than 60% of existing woodland area shall be cleared. The remaining 40 % shall be maintained as permanent open space that may be enhanced by landscape planting as approved by the Planning Director.

Landscape Planting

Landscape planting is to be considered as an integral element to be utilized for visual screening, shade definition, and environmental control. The use of recycled water is to be considered for irrigation purposes.

Ordinance #2066(1991) – A Bill for an Ordinance Pertaining to the Use of Potable Water for Golf Courses - Restrictions on the Use of Potable Water for Golf Courses

Restrictions:

Permit application shall be transmitted to Department of Water Supply for its review and recommendations. The department shall consider whether potable water will be used for irrigation and other non-domestic purposes.

No permits shall be approved for any new golf course if potable water is to be used for irrigation and other non-domestic purposes.

If the State Commission on Water Resources Management designates as water management are pursuant to Chapter 174C, Hawaii Revised Statutes, withdrawals or diversions shall be pursuant to that chapter.

Ordinance #2132 – A Bill for an Ordinance Amending Title 19 of the Maui County Code, Pertaining to the PD –L-/1 Project District for the Property Situated at Manele, Lanai, Hawaii

Irrigation

No high level ground water aquifer will be used for golf course maintenance or operation (other than as water for human consumption) and that all irrigation of the golf course shall be through alternative non potable water sources.

Slopes

12 to < 15% slope – No more than 40% of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of (Public Works) Planning .

15 to < 30% slope – No more than 30% of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of (Public Works) Planning .

30% slope or more – No more than 40% of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of (Public Works) Planning .

Wetlands

Areas such as swamps, marshes, bogs, or other similar lands shall remain as permanent undisturbed open space

Woodlands

No more than 60% of existing woodland area shall be cleared. The remaining 40% shall be maintained as permanent open space that may be enhanced by landscape planting as approved by the Planning Director.

Landscape Planting

Landscape planting is to be considered as an integral element to be utilized for visual screening, shade definition, and environmental control. The use of recycled water is to be considered for irrigation purposes.

Ordinance #2133(1992) – A Bill for an Ordinance to Establish Zoning in PD-L/1 (Manele) Project District (Conditional Zoning) for Property Situated at Manele, Lanai, Hawaii

Conditions: (Declarant)

Establish a loan fund of $1M to be administered and managed by the Bank of Hawaii, in consultation with Lanai Resort Partners for the purpose of assisting current Lanai City merchants with improvements of their commercial facilities.

On a fee simple basis, donate at no cost and free and clear of all mortgage and lien encumbrances, 115 acres of land adjacent to the Lower Waialua SF site to the County.

On a fee simple basis, donate at no cost and free and clear of all mortgage and lien cumbrances, a minimum of an acre of land on Lanai to the County for use as a veterans' cemetery.

Consummate a land exchange with the County for new police station upon terms and conditions acceptable to the declarant and the County.

Use only non-potable water as defined in Ordinance #2066 enacted by the county on 12/17/91, for the irrigation of the golf course in the Manele PD.

Make the Manele Golf course available for play to Lanai residents at a Kamaaina rate of 50% of the standard rate and for Hawaii residents at 60% of the standard rate.

Take appropriate preventive measures so that is development, construction, operation, and maintenance activities in the Manele PD do not cause any deterioration in the Class AA water quality standards currently in existence at Hulopoe Bay and the coastal waters adjacent to the Manele Bay Hotel and the Manele Golf Course.

Provide additional non-potable sources of water as may be needed for Manele Golf Course irrigation after consultation with the State CWRM and DOH.

Comply with the environmental health concerns addressed, entitled "Twelve (12) Conditions Applicable to All New Golf Course Development dtd 1/92 issued by the State DOH. (copy attached)

Ordinance #2408(1995) – A Bill for an Ordinance Amending Chapter 19.70 of the Maui County Code, Pertaining to Irrigation in Lanai Project District I Manele

Effective 1/1/95, no potable water drawn from the high level aquifer may be used for irrigation of the golf course, driving range, and other associated landscaping. The total amount of non-potable water drawn from the high level aquifer that may be used for irrigation of the golf course, driving range, and other associated landscaping shall not exceed an average 650,000 gallons per day expressed as a moving annualized average using 13-28 day period rather an 12 calendar months or such other reasonable withdrawal as may be determined by the Maui County Council upon advice from its standing committee on water use.

Ordinance #2411(1995) – A Bill for an Ordinance to Establish the Project District Zoning (Conditional Zoning) in PD-L/1 (Manele) – Project District for Property Situated at Manele, Lanai

Conditions:

Water Resource Management Program be developed for the island and the Manele/Koele resorts and be submitted to the Planning Dept. and CWRM. Essential elements of the program shall include:

Study of the water resource which may include monitor wells, electromagnetic resistivity testing, complete and accurate records of the water budgets, rainfall, pan evaporation, consumptive use and pumping from each well source, in order to increase baseline data in regards to the island's geomorphology and the sustainable yield and delineation of high level (potable) and alternative (brackish) sources.

Plan for the use of effluent and desalinized water within the resort.

Greater metering and monitoring of specific water uses in order to establish an island-wide pattern of consumption and to control incidents of unreasonable uses and leakage fro m the storage and distribution system.

A detailed study of the projected water consumption patterns in the Manele Resort along with a detailed management scheme to reduce consumption within the resort, including the use of low-flow devices and offering guidelines for landscaping with salinity and drought tolerant plants and grasses.

Covenants for limits on water consumption and irrigated areas for dwelling units and restrictions on other uses to be included as legally binding instruments on the property owners; and a management program established to administer and enforce the covenants.

The applicant shall request a cooperative monitoring agreement with the USGS, through either DWS of CWRM to enhance data gathering and analysis for the islands water resources.

The commercial use area designated in the project district shall be deleted from the Hulopoe Bay Park shoreline area.

A conceptual archeological preservation interpretation plan, including buffer zones and setbacks shall be reviewed by the Maui County Cultural Resources Commission and the Lanai Archeology Committee, before the Phase 2 Project District approval.

All SF dwelling units shall be used only for long-term residential use. At such time additional hotel units are constructed or provided within the project district, the use of MF units for short-term vacation use shall be discontinued.

The applicant shall provide to the State CWRM its 28 day water usage report of potable and non-potable water for the Manele Project District and shall immediately inform said commission of any withdrawal of potable and non-potable water from the high level aquifer in excess of 70% of the sustainable yield as determined by said commission for the island of Lanai.

The applicant shall defer all applications for any approvals for the development of residential units (SF/MF) in the Puupehe Peninsula and the area east of Manele Road in the Manele Project District until the appropriate use of the peninsula and the area east of Manele Road is determined by the enactment of the pending Lanai Community Plan by the Maui County Council.

The applicant may subdivide the agricultural classified lands in the additional area of the Manele PD pursuant to Section 18.16.270 (large lots) and shall defer all applications for any approvals for the development of the Ag classified area in the Manele PD that have not yet been reclassified to urban by the state Land Use Commission in its decision and order dtd Oct. 24, 1994, except that infrastructural improvements necessary to the residential subdivision in the urbanized area, such as but not limited to, drainage and erosion control, sewer force main, water main and roadways, are permitted until said areas are reclassified to urbanized area by the state Land Use Commission pursuant to the said decision and order and any amendment thereof. In the event of an amendment wherein a portion of the Ag area is reclassified to rural, the applicant shall be permitted to develop the newly reclassified urban area and

shall defer all applications for any approvals for the development of the newly reclassified rural area established by said amendment until said rural area is reclassified as heretofore stated in this condition.

Ordinance #2743(1998) – A Bill for an Ordinance Pertaining to the PD-L/1 Project District Situated at Manele, Lanai, Hawaii

Conditions: numbers 1 though 8 – same as in Ordinance #2411

No dwellings (residential units) on any kind shall be permitted within the open space designation in the Puupehe Peninsula. However, structures to promote cultural resources and preserve archaeological resources, based upon resource management plan for the area developed by the Cultural Resources Commission and the Hui Malama Pono O Lanai, shall be permitted.

Work with the Cultural Resources Commission and the Hui Malama Pono O Lanai organization to limit impacts of the MF project east of Manele Road to achieve the following:

Cultural protection of archeological sites at the Manele area proper.

Creation of a buffer zone at least 200 feet between the closest building the nearest heiau.

Completion of a drainage plan prior to construction, which would include addressing the adequacy of the siltation basin currently used to protect the small boat harbor

Hiring of Kupuna form Lanai to monitor the project's development during construction consistent with the current agreement with the Lanai Archeological Committee.

The designation of the6.6 acre site from SF to hotel use shall not increase the total number of hotel units within the PD in accordance with the density standards provided in the PD ordinance.

Current Manele PD

Land Use Type	Acres	Max Density (units/ac)	= Max Units	Water or Density Conditions in Ordinance
SF - Residential	328.8	0.8576 net units /acre 6,000 sq. ft. lot minimum min width 60'	282	setbacks front 15, side 8, rear 10 for single story <7,500 sq. ft. ; front 20 for lots greater than 7,500 sq. ft.; side and rear 15' for second story of structure.
Multi-family	55	3.34 net units / acre min lot area 1 acre min lot width 120'	184	front 25', side and rear 15' for one story, side and rear 20' for 2 story.
Commercial	5.25	0.5 acres 75' wide min. max 60% coverage structures min 6' setback +		+ setbacks per requirement of adjacent land-use, but not less than 6'
Hotel	56.6	10 units per acre 5 acres 250' wide min. max 50% coverage	500*	front 50', side 30', rear 30' *Ordinance 2743 (1998) stipulated that additional 6.6 acres added to the hotel site should not be construed to mean that more hotel units were allowed.
Park	66.33	10 acres 350' wide min max lot coverage 2% structures min 50' setback		dedication of park required
Open Space	152.02			
Golf Course	172	50 ac. 9 hole, 110 ac. 18 hole structures min 50' setback		No potable water drawn from the high level aquifer to be used for irrigation of golf course, driving range and other associated landscaping. Non-potable water from the high level aquifer not to exceed 0.65 MGD, annualized avg. basis (13, 28-day periods)..except as allowed by Maui County Council upon advice of standing committee on water use.
Roads	32			
OTHER				no more than 60% of existing woodland area in project area shall be cleared. Rest shall remain as permanent undisturbed open space. Also 95% dunes OS, 95% ravines, all wetlands, all bluffs - permanent open space
				xeriscaping “encouraged”, use of recycled water “considered” for irrigation purposes.

Ordinances Pertaining to Manele Land Use - Density and Acreage

	ORDINANCE 1578 1986 DENSITY*			ORDINANCE 2132 1992 DENSITY*			ORDINANCE 2410 1995 DENSITY*			ORDINANCE 2743 1998 DENSITY*		
	= UNITS	(units per acre)	= UNITS	= UNITS	(units per acre)	= UNITS	= UNITS	(units per acre)	= UNITS	= UNITS	(units per acre)	= UNITS
SF RESIDENTIAL	137.00	2.50	342.50	121.00	2.84	343.64	379.00	0.86	325.03	328.80	0.86	281.98
MF RESIDENTIAL	18.60	4.00	74.40	18.60	4.00	74.40	30.00	3.34	100.20	55.00	3.34	183.70
COMMERCIAL	5.25	min area 0.5 ac max lot cov 60%		5.25	min area 0.5 ac max lot cov 60%		5.25	min area 0.5 ac max lot cov 60%		5.25	min area 0.5 ac max lot cov 60%	
HOTEL	50.00	10.00	500.00	50.00	10.00	500.00	50.00	10.00	500.00	56.60	10.00	500*
PARK	66.33	min 10 acs. 350' wide		66.33	min 10 acs. 350' wide		66.33	min 10 acs. 350' wide		66.33	min 10 acs. 350' wide	
GOLF COURSE	0.00			201.00	min 110 ac 18-hole		172.00	min 110 ac 18-hole		172.00	min 50 ac 9-hole min 110 ac 18-hole	
PUBLIC	4.25	min 2 acs. 50' setbacks		4.25	min 2 acs. 50' setbacks		4.25				min 2 acs. 50' setbacks	
OPEN SPACE	113.91			89.91			133.42			152.02		
ROADS							32.00			32.00		
TOTALS:												
Acreage	**395.34**			**556.34**			**872.25**			**868.00**		
Units:												
SFR			**342.50**			**343.64**			**325.03**			**281.98**
MFR			**74.40**			**74.40**			**100.20**			**183.70**
HOTEL			**500.00**			**500.00**			**500.00**			**500***
Increases:				**161.00**			**315.91**			**-4.25**		
Notes:				although total acreage change reflected is 161, ord. #2133 added only 138.577 acres. zoning map 2607 reason for discrepancy not clear.			although acreage change reflected is 315.91, ord # 2411 established zoning for 319.447 acres. zoning map L26-10 reason for discrepancy not clear.			* ordinance states that addition of 6.6 acres to hotel site shall not increase total # of units land zoning map L-2613. Ord also lists total ac as 868, though sum seems to be 836.		

* for all conditions, see ordinance, units per acre only given here except where noted otherwise

Ordinances Pertaining to Project District 2 - Koele

Ordinance #1580(1986) – A Bill for an Ordinance Relating to Standards for the Project District at Koele, Lanai

Slopes

12 to <15% of Slope – No more than 40 % of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

15 to <30% of slope – No more than 30 % of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

30% slope or more – No more than 15 % of such shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

Wetlands

Areas such as swamps, marshes, bogs, or other similar lands shall remain as permanent undisturbed open space

Woodlands

No more than 60% of existing woodland area shall be cleared. The remaining 40 % shall be maintained as permanent open space that may be enhanced by landscape planting as approved by the Planning Director.

Landscape Planting

Landscape planting is to be considered as an integral element to be utilized for visual screening, shade definition, and environmental control.

Required Agreements:

A Bilateral agreement requiring the applicant to develop and coordinate a training program for all phases of hotel operations; provided that development other than hotel development within the PD may proceed before the agreement has been executed and

A bilateral agreement requiring the applicant to develop and coordinate an affordable housing program for residents of Lanai; provided that development other than hotel development within the PD may proceed before the agreement has been executed

Ordinance #2066(1991) – A Bill for an Ordinance Pertaining to the Use of Potable Water for Golf Courses

Restrictions:

Permit application shall be transmitted to Department of Water Supply for its review and recommendations. The department shall consider whether potable water will be used for irrigation and other non-domestic purposes.

No permits shall be approved for any new golf course if potable water is to be used for irrigation and other non-domestic purposes.

If the State Commission on Water Resources Management designates as water management are pursuant to Chapter 174C, Hawaii Revised Statutes, withdrawals or diversions shall be pursuant to that chapter.

This ordinance shall not be construed to prevent the use of reclaimed water for irrigation and other non-domestic purposes.

Ordinance #2139(1992) – A Bill for an Ordinance Amending Title 19 of the Maui County Code Pertaining to the PD-L/2 Project District for Property Situated at Koele, Lanai, Hawaii

Irrigation

No high level ground water aquifer will be used for golf course maintenance or operation (other than as water for human consumption) and that all irrigation of the golf course shall be through alternative non-potable water sources.

Slopes

12 to <15% of Slope – No more than 40 % of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

15 to <30% of slope – No more than 30 % of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

30% slope or more – No more than 15 % of such shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

Wetlands

Areas such as swamps, marshes, bogs, or other similar lands shall remain as permanent undisturbed open space

Woodlands

No more than 60% of existing woodland area shall be cleared. The remaining 40 % shall be maintained as permanent open space that may be enhanced by landscape planting as approved by the Planning Director.

Landscape Planting

Landscape planting is to be considered as an integral element to be utilized for visual screening, shade definition, and environmental control.

Ordinance #2407(1995) – A Bill for an Ordinance Amending Section 19.71.090 Koele Project District Standards Ordinance, Maui County Code

Slopes

12 to <15% of Slope – No more than 40 % of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

15 to <30% of slope – No more than 30 % of such are shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

30% slope or more – No more than 15 % of such shall be developed, re-graded, or stripped of vegetation unless approved by the Director of Public Works

Plans

A tract master plan shall be provided showing the building envelope, required setbacks and preliminary drainage plan for each lot within the given tract and shall be reviewed and approved by the Planning Department during Phase III PD review. The Planning Dept. may impose mitigative measures to ensure minimum subsidence and erosion on slopes exceeding 30% and on portions of the tract that are immediately adjacent to ravines. The tract master plan may include all or any part of the given tract, however, Phase III approval shall only apply to that part. Prior to the issuance of a building permit for a dwelling on a lot, the grading and erosion control plan for that lot shall be submitted to and approved by the Department of Public Works and Waste Management, which shall review the final grading plan in accordance with the following criteria:

Drainage

Individual lot drainage shall conform with the approved Phase III preliminary drainage plan

Erosion Control

Erosion control measures to prevent erosion and sedimentation into the adjoining natural drainage way during construction of the home and exterior improvements shall be specified

A plan shall be submitted for re vegetation of all disturbed and exposed slopes. This plan shall show how exposed surfaces will be planted and covered after construction to prevent erosion and sedimentation into the adjoining drainage way; and

The Planning Dept. may require additional information if deemed necessary to support any request for Phase III approval.

Wetlands

Areas such as swamps, marshes, bogs, or other similar lands shall remain as permanent undisturbed open space

Woodlands

No more than 60% of existing woodland area shall be cleared. The remaining 40 % shall be maintained as permanent open space that may be enhanced by landscape planting as approved by the Planning Director.

Landscape Planting

Landscape planting is to be considered as an integral element to be utilized for visual screening, shade definition, and environmental control. Furthermore, the use of recycled water is to be considered for irrigation purposes.

Ordinance #2514(1996) – A Bill for an Ordinance Amending Ordinance #2140 Pertaining to a Condition of the Establishment of Zoning (Conditional Zoning) in PD-L/2 (Koele) Project District for Property Situated at Koele, Lanai, Hawaii

The Declarant shall irrigate the Koele golf course with non-potable water, as defined in Ordinance #2066 enacted by the County on 12/7/91 (after the golf course has been operating for 5 years as provided by the Planning Commission on 11/28/89), except as may otherwise be provided by the provisions of the Maui County Code. Within 2 years of the effective date of this ordinance Lanai Company shall present to the Maui County council a report detailing:

A comprehensive plan to develop additional storage of water for Koele golf course irrigation.

The time frame within which the plan will be implemented.

Steps taken to implement the plan at the time the plan is submitted.

Ordinance #2515(1996) – A Bill for an Ordinance Amending Section 19.71.055 of the Maui County Code, Relating to Irrigation of the Koele Golf course (Lanai Project District PD-L/2) Located at Koele, Lanai, Hawaii

Irrigation

No high level ground water aquifer will be used for golf course maintenance or operation (other than as water for human consumption) and that all irrigation of the golf course shall be through alternative non-potable water sources, except as may be allowed from time to time as follows:

The director of the Dept. of Public Works and Waste Management, after notification of the chairperson and the deputy director of the CWRM, the chair of the Maui County Council, any appropriate subcommittee established under one of the Maui County Council's standing committees to review water related issues on Lanai, the chair of the Lanai Planning Commission, and other state and/or county officials as appropriate, may authorize the use of potable ground water from the high level aquifer if the director finds, in writing, there is an occurrence of an unanticipated even, including but not limited to:

- Chemical contamination of a non-potable source by chemicals not approved for application to golf courses in accordance with the Golf Course Superintendents Association of America standards; or
- Chemical contamination of a non-potable source resulting in chemical concentrations not approved for golf course application by the Golf Course Superintendents Association of America, excluding however, naturally occurring concentrations of chemicals or minerals; or
- A water transmission line break resulting in the interruption in the delivery of non-potable water for golf course irrigation; or
- Failure of the pumping system used to pump non-potable water; or
- A failure in the sewage reclamation systems which provide irrigation water for the golf course; or
- Draw-down of various lakes or reservoirs due to use of that water to fight fires or other similar emergencies; or
- Due to the failure of the main electrical power feed to facilities used to irrigate the golf course with non-potable water; and

Under no circumstances shall drought be deemed in an unanticipated event, such tat a permit may be issued.

Prior to the director approving the use of potable high level aquifer ground water for golf course irrigation, the golf course owner shall have provided to the director:

- Materials, reports and other supporting document setting forth the facts and/or circumstances which gave rise to the immediate need for golf course irrigation with potable high level aquifer ground water;

- A plan showing that no continuous physical connection will be made between potable and non-potable water systems;
- The remedial plan to restore the use of non-potable water in as short a time as possible, and shall include manufacturing and/or shipping times of various items needed for the restoration, as appropriate, and shall further indicate those items will be obtained and/or shipped by the most expeditious means available; and
- A plan detailing how the following uses will be accommodated, including all sources from which water will be obtained (specifically addressing the use of existing reservoirs and lake water) and a watering/distribution plan, with the priority of uses as follows, such as being bases on a daily average of the historical record use over the prior 12 month period immediately preceding the unanticipated event:
    - Residential/domestic consumption (excluding irrigation uses);
    - Commercial, business, and resort consumption where potable water is necessarily used;
    - Agricultural consumption; and
    - Irrigation (including residential and large scale uses such as golf course). This part of the plan shall address the order in which the portions of the golf course shall cease to be watered as the situation continues.

The permit issued by the director shall:

Be issued only one time for any single unanticipated event and shall be valid for a period not to exceed 30 calendar days. The director may propose a longer period to the council and the council, by resolution, may indicate its concurrence with the director's determination that the permit should be issued for a period greater than 30 days. If the council does not concur, the permit shall be valid for a period not to exceed 30 days. The golf course owner is prohibited from applying for a new permit for the same unanticipated event where the original permit has expired and the remedial action has not been completed, and the director is prohibited from issuing any further permits for the same unanticipated event where the original permit has expired and the remedial action has not been completed;

Require the golf course owner to submit weekly reports to the director and the council regarding the status of the situation, efforts made to address the situation, and the amount of potable ground water used for the high level aquifer for that week. Meter readings shall be physically verified by the Dept of Public Works and Waste Management;

Include any condition or restrictions appropriate and reasonably related to the circumstances surrounding the use of high level aquifer potable ground water and the remedial work to be done, and also including the authority to impose a cap on the use of such water based on the historical monthly average of use on non-potable water, in an amount not to exceed 250,000 gpd.

A copy of the permit shall be transmitted to all persons notified pursuant to subsection D.1, above the same day it is issued.

Ordinance #2516(1996) – A Bill for an Ordinance Amending Title 19 of the Maui County Code, Pertaining to the Re-seeding or Re-grassing of the Golf Course Located in the PD-L/2 Project District for Property Situated at Koele, Lanai, Hawaii

Re-seeding or Re-grassing

Notwithstanding Ordinance #2066, at such time as the fairways at the golf course are to be re-seeded for re-grassed so as to provide the golf course with more efficient or better quality grass, the golf course owner may make a request of the County Council for the use of potable ground water from the high level aquifer in an amount up to 27,000 gpd to supplement irrigation water from alternative non-potable water sources, Such approval, shall be by resolution of the Council. Such additional water may be used for a period not to exceed 28 days per fairway. Only 1 fairway shall be irrigated with the additional water at any given time. No more than 4 fairways shall be re-seeded or re-grassed during any calendar year. Fairways shall only be re-seeded one time only under the provisions of this section. No continuous physical connection will be made between the potable and non-potable water systems. In determining whether or not to approve the golf course owner's request, the Council shall ensure that an adequate supply of water shall be available for golf course irrigation in accordance with the priority of uses as follows:

- Residential/domestic consumption (excluding irrigation uses);
- Commercial, business and resort consumption where potable water is necessarily used;
- Agricultural consumption; and
- Irrigation (including residential and large scale uses such as the golf course).

If during the re-seeding or re-grassing of a fairway, an unanticipated event occurs for which a permit is issued pursuant to Section D above, the golf course owner may continue to use potable water for re-seeding or re-grassing, but only to the extent that such cumulative total of potable water permitted to be used pursuant to Section D and this section does not exceed 250,000 gpd.

Resolution #01-146(9/7/2001) – Approving the Use of Potable Water from the High Level Aquifer for Re-seeding and Re-grassing Koele Golf Course during September and October 2001, Pursuant to Subsection 19.71.55(E), Maui County Code

Conditions: Castle & Cooke Resorts, LLC shall:

- promptly file with the County Clerk a completion bond for the repair of the sewage-treatment plant that serves the Koele golf course;
- repair the sewage-treatment plant that serves the Koele golf course within one year of this resolution's adoption;
- submit a water-storage master plan to the Council by March 1, 2002;
- install a separate water meter, as approved by the Department of Water Supply, prior to the use of potable water approved by this resolution to gauge such use; and
- allow for meter readings to be conducted and verified by two designated members of the Lanai Water Advisory Committee who are not employees of the Castle & Cooke Resorts, LLC or affiliated entities.

Koele PD History		
Year	**Ordinance/ Approval #**	**Comment**
1985	CIZ for Koele PD	Interim Urban to PD Requirements Included ♦ Resource Study ♦ Maintenance of accurate records ♦ Plans for effluent use & desalinized water ♦ Conservation Plan ♦ Legally binding covenants to limit water consumption ♦ Cooperative aquiifer monitoring with USGS ♦ 28 day periodic water reports ♦ Detailed demand study
1986	1580	Established Koele PD - 468.3 Acres
1991	2066	Prohibits the Use of Potable Water on All Golf Courses
1992	2139	Increased Koele PD from 468.3 to 618 acres Added 332.4 acre golf course Deleted 201.5 acres of open space
1992	Phase II PD	Requirements Prior to Phase III Approval ♦ Detailed monitoring plan for metering - common areas to be metered seperately ♦ Dual system for the GC to be submitted to DWS ♦ Approved xeriscape plan ♦ Use of low flow devices
1995	2407	Amends ordinance for tract master plan requirements Limits density of development on slopes of various grades Use of recycled water for irrigation to be considered No more than 60% of woodland to be cleared Cleared area shld be open space Retain minimum of 35% of tree canopy
1996	2514	Sets conditions in which potable water may be utilized on golf course Requires a comprehensive plan to develop additional storage for the GC Storage plan to include time frame and implementation steps
1996	2515	High level water not to be used for irrigation except as defined Sets triggers & requirements to allow 30 day permits for potable water use Un--anticipated events can be part of a trigger, but it is specified that Drought does NOT meet the criteria for un-anticipated event, Nor does it warrant use of the high level aquifer for GC irrigation
1996	2516	Enables GC owner to aply for up to 27,000 GPD per fairway to supplement non potable irrigation to establish new plantings Stipulates that only one fairway may be watered in this manner No more than four fairways per year to be watered this way Combined use of new fairway establishment and emergencies defined in 2515 should not exceed a total of 250,000 GPD
2001	Res 01-146	Issues temporary permit for use of high level water for re-grassing. Requirements: ♦ Bond repairs to wastewater treatment facility ♦ Implement repairs to WWTF within one year ♦ Submit water storage master plan by March of 2002 ♦ Install separate meter to monitor use of high level water and coordinate with LWAC so that LWAC members can monitor/read it

APPENDIX C

Public Process

Documentation of Public Participation and Partial History of Community Water Committees on Lanai

03/03/89 Petition from concerned citizens on Lana`i to the State Commission on Water Resource Management (CWRM) to designate the aquifer as a groundwater management area.

08/29/89 Public hearing held on Lana`i. CWRM staff recommended not to designate.

03/29/90 CWRM decided not to designate any of the aquifer systems on Lana`i as groundwater management areas. However, in lieu of designation, the Commission required data monitoring, submittal of a water shortage plan, and annual October information status hearings. CWRM also retained the authority to re-institute designation proceedings if specified conditions were met.

10/23/90 First annual public informational meeting held on Lana`i.

01/17/91 Lana`i Company Water Shortage Plan approved. *(by whom? staff has not seen it.)*

02/17/93 Council Chair requests stop-work at Manele golf course pursuant to violation of condition of county code §19.70.085 prohibiting the use of water from the high level aquifer for Manele golf course.

05/7/93 Council Resolution 93-42 defers enforcement of county code §19.70.085 given certain conditions. Allows use of 750,000 gpd for the interim, with restrictions. Establishes Lana`I Water Subcommittee until 12/31/93 “to monitor the use of water from Lana`I’s high level aquifer. Subcommittee has 9 members:

1 from CWRM
1 from Lanai Planning Commission
1 Lanai Council Member
3 Lanai Company
3 Lana`ians for Sensible Growth

06/17/94 Proposed bill amending §19.70.085 to allow withdrawal of 650,000 gpd considered by Planning Commission.

09/22/94 Planning Director recommends a total allowance of 650,000 gpd MAN of 13-28 day monitoring periods, to be monitored by council standing committee. Recommends that subcommittee be impaneled as subcommittee of Human Service, Water & AG committee. Proposed subcommittee composition:

3 Lanai Company
3 Lana`ians for Sensible Growth
1 Lanai Council Member
1 Lanai Planning Commission Director
Pubic Works Director
BWS Director
CWRM Representative

09/28/94 Referred to council. Hearing deferred until 4/17/95

10/07/94 State Commission on Water Resource Management (CWRM) receives request from Lanaians for Sensible Growth to "reconsider its initial refusal to designate Lanai as a water management area in view of the serious disputes that have arisen over the future use of the islands's very limited water resource."

01/25/95 CWRM defers action on the petition to designate Lana`i until it can meet on Lana`i in October. Requests quarterly status updates on community plan and Water Use & Development Plan.

05/15/95 Council Subcommittee Established (Bill #13, 1995, Committee Rpt 95-79) Membership:

2 LSG
2 Lanai Co

1 Lanai Council Member
1 Lanai Planning Commission Chair
Planning Director
Public Works Director
1 LEGS - Non Voting
BWS Director - Non Voting

9/13/95 *A Numerical Groundwater Model for the Island of Lana`i, Hawaii* approved by CWRM.

10/24/95
01/10/96 On both these dates, CWRM defers action on petition to designate to allow more time for public and peer review of the document *A Numerical Groundwater Model for the Island of Lana`i Hawaii*.

04/96 CWRM Establishes Lanai Water Working Group as successor of Subcommittee. CWRM adopts final draft of *A Numerical Groundwater Model for the Island of Lana`i, Hawaii* CWRM defers action on the petition to designate until October 1996.

06/27/96 Water Subcommittee Meeting. Concluded that the housing projection of 1,019 additional units by 2010 was unrealistic. Discussion of per-unit allocations at Manele and Koele. Recommended 1,600 gpd per unit - with 600 potable and 1,000 non-potable. 600 gpd for hotel. Higher than generally used per-unit standards and should be reviewed further. For Koele, 1000 gpd / unit was questioned. As per 1992 Draft WUDP, dual system under construction for Manele. Committee elected to add “Agricultural Reserve” as a line item and to discuss further with Dept. of Ag. Discussion of Working Group Report / Draft WUDP policy document - using 1995 data as base year. Mechanism for home rule and to forge consensus on resource issues.

08/01/96 Water Subcommittee Meeting. Discussion of diversified agriculture on Lanai. Introduction of James Nakatani, Chair of the Board of Agriculture. Background: Workiing Group Report in progress based on last approved community plan from 1983. With community plan overdue, other plans are out of sequence. 1983 Community Plan recommended that pineabple continue to be primary economic activity and tourism secondary. Not consistent with what’s happening now. Draft 1995 Community Plan recomends promotion of diversified agriculture, establishing a reserve for agriculture, and ensuring the long-term availability of low cost water for

agriculture. 14,000 acres available for diversified agriculture per document form Steve Snow, who was in charge of diversified agriculture for the company in November 1994. At that time planned acreages were: 12,000 ac pasture, 2,000 ac dryland forage, 5.5 acres banana, 20 acres papaya, 50 acres pineapple and herbs, with an estimate of 200,000 gpd at 96 cents per 1000 gallons. 1990 WUDP proposed 1.8 MGD for ag. The end of pineapple was announced in 1991. The 1992 Draft WUDP proposed 1.5 MGD for diversified ag. At that time, the Dept of Ag had proposed the creationof a 100 acre agricultural park to use 500,000 gpd. The water task force at the time recommended increasing that set-aside to 1.5 MGD, although the company was initially in disagreement, recommending an Ag reserve of 1.0 MGD. Issue still under discussion for Working Group Report. DOA has as yet received no proposals for Ag park. Will develop only if there is community interest. Suggests focus on high-value niche crops. Waiahole consumptive use about 3,500 gp acre. More discussion on development proposals, criteria, projections and analysis, 1995 demand data and plans for Working Group Report. Lana'i Co. suggested 2% per year growth projection as more realistic than Community Plan. Committee to consider. Roy Hardy summary: 9 MGD recharge, 6 MGD sustainable yield, 4.3 MGD 13-MAV limit for designation proceedings, 3.6 13-MAV trigger for deepening wells, declining water levels to 50% also trigger for CWRM action. Company reports working on watershed plan as recommended previously. Conservation - largest potential savings in Manele PD area. Hotel water features, landscaping, leak detection, improved monitoring, promotion of conservation. Committee to discuss timelines for demand.

08/29/06 Water Subcommittee Meeting. Discussed alternate projections of water demand for residential, agricultural and other sectors. Discussion on alternative startegies, supply and demand side management, public participation, etc.

9/26/96 Water Subcommittee Meeting. Reviewed allocations proposal for Working Group Report. More discussion on alternative strategies, demand-side and supply-side management, conservation, watershed protection, governance and public participation.

10/18/96 CWRM Public Informational Meeting on Lana'i. Commission votes to proceed with designation process based upon the prospect of serious disputes. Instructs Lana'i Water Company and Workiing Group to prepare

a Working Group Final Report, prepare a schedule nd procedure or adoption, and identify any differences between teh consensus report and the company's findings in their Water Resources Management Plan, and to attend the public hearing in February.

10/31/96 Letter from Lanai Subcommittee Chair, requesting to extend subcommittee to 02/97

11/29/96 First Draft Subcommittee / Working Group Report - Working Draft and Policy Core of WUDP Update.

12/17/96 Water Subcommittee / Working Group Meeting. Discussion - Nov 96 Draft Report was submitted to CWRM in lieu of a final report. Discussion centered on comments and review of draft. Also discussed Ordinance 2408, Bill 13 1995 - the ordinance allowing withdrawal of 650,000 gpd from high levvel aquifer and Council Resolution 93-42 clarification of high level water and conditions for withdraawal of high level water for Manele Golf Course, dated May 7, 1993.

12/31/96 Council Subcommittee dissolved - continued under CWRM as Lanai Working Group until 02/97

01/21/97 BWS moves that Lanai Water Use & Development Plan is part of County Water Use & Development Plan, and properly handled by Board. At the request of the Water Working Group, BWS moves to continue working with the Lanai Committee/Working Group until completion of the Water Use and Development Plan.

01/28/97 Board communicates its decision to the Lanai Working Group in a letter from the Director, that the Lanai Working Group shall continue as an advisory committee to the Board for the Development of the Lanai Water Use and Development Plan, that the working group will not sunset until the entire Water Use and Development Plan is finalized and approved, (even though that would be substantially later than completion of the Lanai chapter), that the Board may also be willing to continue to staff an on-going group, but wanted further clarification from the committee as to the purpose, function and role of this group.

02/10/97 Lanai Water Working Group Meeting - Final Report of the Lana`i Water Working Group, also known as the 1997 Draft Water Use & Development Plan, is completed and adopted by the Lana'i Water Working Group. Although this was the last meeting of the LWG under the auspices of the State Commission on Water Resources Management, the Department of Water Supply continued to work with this group until the Lana`i Water Advisory Committee could be established. At this point, LWG begins being referred to as LWG/LWAC. Discusson at the meeting also focused on distribution, implementation and next steps. Notes that at this point the update to the Community Plan is still awaiting review and adoption by the County Council.

02/18/97 CWRM hearing on designation of Lana'i. Elects not to designate subject primarily to continuing efforts to systematize community involvement, continuing efforts to protect the watershed, remaining within the previously established triggers : pumpage less then 4.3 MGD, water level declines not exceeding 50% and wells within approved operational guidelines, continued efforts to conserve.

04/15/97 Board approves Director's report 97-21, resolves again to continue to work with community advisory committees for the completion of the Water Use and Development Plan, and adds to this a resolution to develop and propose to Council an ordinance to County Code §2.88A pertaining to the Water Use and Development Plan, to be submitted upon completion of the WUDP update, and including provision for ongoing community participation in water use and development planning. Board also approves contract with M&E for update of Water Use & Development Plan. Committee now referred to as LWG/LWAC.

04/30/97 LWG/LWAC Meeting. Discussion of Board decision, and proposed Lana`i Company Stewardship Plan. Decides to hold skybridge conference to obtain expert advice on management and protection of the watershed. Committee also agrees that additional capital proposals are needed prior to finalization of the WUDP.

05/20/97 Board received an ordinance proposal, after some discussion, it seemed that Board was more inclined to establish committee by rule than by ordinance. Instructed staff to discuss this idea with committee, and to

draft rule, but deferred further discussion and action to August Tech&Planning Committee meeting. Director's Report 97-36.

06/03/97 Pursuant to committee request, Deputy Director of DOFAW Mike Buck assigns Bob Hobdy to represent the DOFAW as resource person for the Lana`i Water Advisory Committee.

06/09/97 LWG/LWAC continues discussion of establishment of Lana`i Water Advisory Committee. Also discusses company's proposed operational guidelines. Agrees to approve them, and recommends that these be placed in the WUDP and function as mandatory limits. Additional items desired by the committee in the WUDP update as discussed include a capital plan for source development, updated implementation matrix, updated community plan analysis and better system schematics and information.

08/26/97& 09/16/97 Rule drafted but not placed on Board agenda.

10/21/97 Board discussed proposal for a rule and determined that a resolution was a more appropriate vehicle for establishing on-going committee. Instructed staff to discuss resolution with committee and draft resolution.

11/18/97 & 12/9/97 Resolution drafted but not placed on Board agenda. However, testimony received from members of Lanai Water Advisory Committee that establishment of on-going committee is very important to community members and that before deciding on whether to use a rule or a resolution, committee members would appreciate written guidance from corporation council as to what the legal implications would be for such a group were it established by resolution vs. rule.

12/15/97 Letter from Corporation Counsel regarding differences in establishing Lanai Water Advisory Committee by rule vs. by resolution. Paraphrasing: " A Board resolution may be adopted or changed by the Board at any time with proper notice, is non-binding and does not have the force & effect of law.....A Board rule, on the other hand, can only be adopted and changed by going through the rule making process as set forth in HRS Chapter 91. When adopted it is legally binding and has the force and effect of law....."

12/17/97 LWG/LWAC Meeting. Committee reviews letter from Corporation Counsel. Staff reports Board instructions to sound committee out on whether a resolution would be acceptable rather than a rule, and relayed information from Board that if necessary a skybridge meeting would be considered. Committee voted for skybridge and more discussion with Board. Resolution wording also discussed. Status of Lana`i Co. stewardship plan proposal - not funded.

02/17/98 Staff requests permission to schedule skybridge meeting for Board to discuss issues with Lanai Committee re: rule vs. resolution. Board moves that "Lanai Committee to submit a letter to the Board stating exactly what they want to discuss with them. Matter will be placed back on the agenda once the letter is received."

02/25/98 LWG/LWAC Meeting. Decision of Board discussed with Lanai Working Group/Future Lana`i Water Advisory Committee. Group votes that preference is still to be established by rule over resolution. Rather than press for skybridge meeting, decides to reiterate preference for rule and send request to be established by rule.

03/10/98 Letter from Lanai Water Working Group confirming request to have a rule established by BWS pertaining to the establishment of A Lanai Water Advisory Committee. Committee's preference is to be established by rule, because (paraphrasing): resolution can be changed at any time and does not have force and effect of law, whereas rule has force and effect of law and can only be undone through the rule making process.

05/09/98 Skybridge meeting held to discuss protection of Lanaihale watershed. Most important item according to all experts was to construct fence and eliminate feral ungulates in key recharge areas. Hunting to be maintained outside the fence.

06/29/98 LWG/LWAC Meeting. Committee reviews minutes of skybridge and suggestions for watershed. Begins discussion of possible fence alignment proposals. Determines that broader community involvement is needed in fencing decisions.

08/07/98 LWG/LWAC meeting. Attendance list but no minutes. Given date, discussion topics were probably establishment of water advisory committee and fence options.

10/29/98 LWG/LWAC Meeting. Discussed Planning Department projections and other community plan items as they related to the WUDP update. Planning Dept. estimated that 1,019 new housing units would be needed to accommodate a projected population of 4,968 over the next 20 years. Committee members agreed that this seemed a bit high, and did not recommend growing at this pace. (Although per-unit analysis is about 600,000 gallon increase - total build-out would reflect more), and recommended lower values. Also discussed objectives noted in the plan.

Objective: Ensure long term availability of low cost water for agricultural purposes

Objective: Establish and reserve a minimum water allocaiton for diversified agriculture consistent with the WUDP

LWG/LWAC elected to combine set-asides for DHHL and Ag to one large reserve of 1.5 MGD

LWG/LWAC noted the need to re-visit needs for Ag Park, Community Gardens, HHL, Horse Paddock and other potential agricultural efforts.

Objective: Protect, preserve, restore and enhance Lana`i's existing potential recharge areas.

Objective: Forest Management

LWG/LWAC re-confirmed its decision to include a watershed protection chapter in the WUDP update.

Objective: Prohibit the use of the high level aquifer water for golf course irrigation, consistent with the WUDP

Objective: Use recycled and brackish water for irrigation

LWG/LWAC deterimined that there was a need for improved inventory of irrigated acreage and that sources and destinations of irrigation water should be better delineated for the WUDP. Company to provide improved information.

LWG/LWAC made the caveat that the CP should be clarified on prohibiting the use of brackish water and limiting the use of reclaimed water over fresh potable aquifers. Brackish and reclaimed water best considered for Manele Harbor, Kamalapau, other down-gradient

areas where possible.

Objective: Comprehensive planning and management of water resoruces consistent with the WUDP.

LWG/LWAC elected to re-visit allocations for agricultural park, HHL, lands designated for affordable housing, community gardens & Lana`i Horse Owner Associations Paddock to insure that these needs are met.

Objective: Develop alternate sources, xeriscape landscaping, and strict conservation enforcement, especially for Manele Project District area.

LWG/LWAC suggested that alternate sources be considered in the WUDP update, and that the company include these in its capital proposals.

Objective: Develop and utilize a hydrologic model

LWG/LWAC suggested that data for this model might need updating, especially relating to fog drip.

12/04/98 LWG/LWAC discussed LWAC membership and preparations for presentation of fence discussion to community.

12/21/98 Lana`i Community Plan update adopted.

01/21/99 First public presentation and informational meeting regarding fence proposal held at Public Library.

03/16/99 Lana`i Water Advisory Committee Established - from here on committee is referred to as LWAC.

11/19/99 LWAC meets - discusses committee objectives and priorities for WUDP, voting, rules of conduct, agendas, handling of disagreements, rotating chair, etc. Also discussed biodiversity committee and possible formation of partnership to work together for watershed protection, lobbying for fence and other protective funding etc.

01/28/00 LWAC meeting. No minutes. “Rehearsal” / review by LWAC of draft presentation for “fence summit”, large, jointly-sponsored public meeting to be held on fence options.

02/00 State Commission on Water Resource Management approves *Framework for Updating the Hawaii Water Plan* - guidelines on WUDP update.

03/??/00 LWAC discussed watershed management, pumpage report and monitoring & reporting. Certain areas in the reports need clarification. Committee members also discussed regularity of reports.

04/11/00 LWAC Meeting / "Fence Summit" - jointly sponsored meeting (LWAC, biodiversity committee, & company) and company-catered event / meeting to discuss options for fencing the Hale. Afternoon and evening meetings. In afternoon, Manele Spa permit was main topic of discussion. Also discussed Miki Basin, watershed status and periodic water reports. Evening meeting included dinner and presentation on fence proposals to more than 50 community members.

05/26/00 LWAC Meeting. Company presentation on Terraces at Manele project. Maximum allocation for Manele Project overall remains 1.03, regardless of changes to sub-components of that project. . Difficult to separate actual PD use in water reports. Company proposes planning and allocation deduction estimates of 400 GPD potable and 400 GPD non-potable for irrigation, based on irrigation calculations of company consultant. Committee concerns whether estimated estimates are consistent with empirical data for the area. Asked DWS staff to obtain empirical data for similar elevation and climate regions on Maui. Committee also wanted requirement that brackish or reclaimed water be used for irrigation and other non-potable uses, and asked that company provide better documentation of reasons for potable and non-potable estimates. Committee also noted that prohibition on pools should have been included in CC&Rs for the luxury homes. More discussion on pumpage reports, watershed status, possible funding sources. More in-depth introduction of biodiversity committee and LWAC - discussions of jointly sponsored "fence summit meeting" , common goals and of possible formation of "Forest and Watershed Partnership". Draft of watershed chapter handed out to committee members. Also handed out State adopted - Framework for Updating the Hawaii Water Plan, which was approved by the State Commission on Water Resource Management in February, 2000.

09/22/2000 LWAC Meeting. Review of draft response on Manele Terraces based on previous meeting. Presentation on overall Manele Project District status by company. Company consultants explained water use and irrigation calculations. Proposal was still 400 GPD potable and 400 GPD non-potable for MF units. Nothing in CC&Rs of units sold to date indicates any restrictions on water use. Each unit will have two potable hose bibbs. Committee recommended that approval re-iterate 1.03 total limit on Manele PD, set allocation of 400 GPD potable and 400 GPD non-potable water, include these quantities in the CC&Rs for the project - specifically wording the covenant to indicate that potable water use not exceed 400 gpd, the applicant shold be requied to utilize reclaimed and or brackish water for irrigation to the fullest extent possible, and the applicant should implement conservation measures including limits to turf and use of appropriate plants, rain-shutoff devices, regular maintenance, low flow fixtures, etc. DWS staff handed out table on PD densities, units and other conditions of the PD, as well as the empirical data on similar areas in Maui requested at prior meeting. Discussion of re-grassing/re-seeding of Koele GC - result was to recommend filing of the application since rainfall had increased and the question could always be re-opened when necessary. Discussion on grant funding applications for watershed. Pumpage report discussed. Committee member Hokama requested that bulkhead pressure readings at Shaft 3 be included in the reports again. Committee member McOmber requestee an independent non-company entity monitor water levels, chlorides and pumpage. Discussion on status of aquifers and on impacts if water levels should fall. Consultant Dr. Kumagai noted that existing infrastructure not appropriate to deliver 6 MGD and that it should not exceed 3.52 MGD with the current configuration of withdrawals. Also that hydrologists in the past had estimated practical yields more conservatively in past (3.5 Anderson; 4.3 Takasaki).

01/18/2001 Joint CWRM Public Informational Meeting with LWAC meeting. Aquifer status report from CWRM & discussion served as annual Public Informational meeting. Also discussed WUDP - Committee wants to include conditions of approvals section. Staff asked for more data on system infrastructure and conservation measures from company. Committee discussed additional monitoring and reporting requested:

Monitoring
• drive exposed pipelines monthly
• leak detection on old pipes at least once per year
• meter testing sizing and replacement
Reporting
• tank and reservoir levels and pumpage from large storage
• source to use reporting of water - especially better break down of irrigation water use
• status of system - liners, leaks, broken/repaired pumps, etc.
Committee discussed difficulty of including financial plan without company data - but that need to consider realistic factors in capital or other proposals. Need to consider do-ability. DWS staff requested PUC submittal from company. Later received two pages from company staff. Had someone copy additional info at PUC.
Discussion of brackish wells in high level aquifer that could freshen, and company's inability to use those if that occurred.
Discussion of new source development vs. demand. Committee set policy that additional distribution of withdrawals be required by 3.2 MGD total pumpage.
Discussion of possible conservation measures -
• Cover large storage such as 10 MG Koele and 15 MG Manele holding ponds?
• Landscape retrofit at projects to save more water.
• Upgrade irrigation systems to include rain-shutoffs, soil-moisture sensors, etc.
• Need for systematic, reportable maintenance program discussed.
Implementation matrix needs rework w/ tracking items for each measure.
Future Mtg.

05/31/01 LWAC Meeting. Company gave powerpoint presentation on re-seeding and re-grassing of fairways at Koele GC. Requested LWAC support for requets to use high level aquifer for this project and amendment to ordinance to allow it. Customers dissatisfied with status of GC. Committee did not vote. Staff distributed data, referred to in minutes of subsequent meeting. Update that Stewardship plan as revised had been approved for funding.

07/26/01 LWAC Meeting. Discussed proposed ordinance amendment regarding irrigation of Koele and re-seeding re-grassing efforts. Flouridation also discussed. Questions on periodic water report. Committee still not happy with monitoring and reporting.

09/25/01 LWAC Meeting. Presentations by Lana`i Company hydrologists on use of water from the high level aquifer for Koele Golf Course. Reviewed updated implementation matrix. More discussion on pumpage report.

10/10/01 Meeting of LWAC, Biodiversity committee, and other future Lana`i Forest & Watershed Partnership members to prepare for MOU signing.

10/11/01 Formal signing of the Lana`i Forest and Watershed Partnership Memorandum of Understanding. Celebration.

10/26/01 LWAC Meeting / CWRM Annual Public Informational update. Handouts were provided but chair did not call on CWRM staff to speak. DWS staff passed out to committee members for review, ahupuaa map, community plan map, wellhead protection area maps, draft map of Lana`i systems - needs further input and information from company, graph of 50 years pumpage on Lana`i, minutes of 01/18/01 meeting, proposed implementation matrix edits, draft community plan consistency section, chronology of water, biodiversity and land use on Lana`i, reclaimed water production graphs and tables, draft section on conditions of approvals, minutes of May meeting. Committee discussed findings of TDEM studies by Blackhawk GeoSciences. No additional water identified. Committee discussed “borrowing” from potable allocation until additional reclaimed water is available. Opted against it on the theory that it would be hard to actually replace the water once used - that once allowed, it would probably continue until there were other new potable uses proposed for the same water...thereby hastening the pace of the use. Corp counsel indicated that e-mail is acceptable method of notification for LWAC meetings. However, committee wished to continue to have agendas posted. Committee noted that meeting needs to be scheduled to discuss systematic changes to periodic reporting. Discussed WUDP status and data needs. Some of the items passed out for discussion today had been passed out previously (in May), and still needed committee review,

discussion & input. Also needed is better data on company systems and consumption by class and area, GIS layer from Planning for community plan still not finalized, and capital proposals/costs of operations still not provided by company.

12/07/01 Presentations by Dr. Aly El Kadi and Robert Whittier on research for wellhead protection section. Modeling, model parameters and purpose discussed. Discussion of request to utilize high level aquifer for Koele Golf Course irrigation. Committee not yet ready to vote. Discussion again re-iterating need for group review of certain draft elements as well as for additional data under the guidelines. Demand and capital planning data not adequate.

02/20/02 Discussion on proposal to use high level water to irrigate the Koele golf course and proposed amendment to Koele PD to enable that. DWS staff passed out Allocation references, implementation matrix and community plan consistency section passed out for discussion, list of all wells, tunnels and shafts on Lana`i, and conservation materials prepared in Tagalog language. Company passed out proposed revisions to allocation table and SMART plan for Koele GC management. Issues raised included condition of aquifer, effects of drought, relation of forest condition, existing ordinance, agreements and past representations, maintenance issues and island economics. Conditions of approval if the request were granted were discussed. LWAC was unable to reach consensus. A summary of the discussion and both sides to be presented to the Planning Commission. Committee reviewed implementation matrix section of WUDP.

08/01/02 Scheduled workshop between LWAC and Lana`i Planning Commission on Koele PD, status of aquifers, WUDP, etc. - cancelled?

09/27/02 LWAC Meeting. DWS staff passed out updated project-based demand anaylsis tables, and updated population projections based on SMS data for review. Also updated demand regressions, well pumpage,chlorides and water levels and reclaimed water use graphs. Committee agreed not to make any further changes to allocations other than those agreed upon in previous meetings. Suggested 5 year incremental demand projections required under Framework for Updating the Hawaii Water Plan be done proportionally. Did not review project build-out analysis passed out. Also did not comment on

draft pump facilities inventory provided by company. Discussed problems with periodic water reports. Agreed to put 3.5 as the trigger for distribution of withdrawal projects. Not clear whether group realized they had previously set 3.2. at 01/18/01 meeting. In any case - discussed that design for distribution of withdrawal projects to commence at 3 MGD, to be sure it is accomplished in timely fashion.

10/??/02 Rescheduled Workshop between LWAC and Lana`i Planning Commission on Koele PD, status of aquifers, WUDP, etc (need to verify which date this actually occurred).

02/27/03 Passed out draft wellhead protection ordinance for committee review. Discussion on pumpage report design and on wells 1, 9 and 14.

08/01/03 Ground rules reviewed. Committee to meet independently. Agreed to rotating facilitation with Chair to handle agendas. Minutes to rotate as well. DWS staff not present. C&CR presented system status handout and indicated that three new master meters would be installed at Manele, one for residential and two for golf course use. Indicated that once well 14 was up, they planned to pull and repair well 1. Noted that new plans were in progress for storage upgrade at Koele, and that bids had been obtained for floating covers for the 10 & 15 MG reservoirs. Discussed using two rather than four holding ponds at the auxilliary wastewater treatment plant, and converting the other two to storage.

09/05/03 ?

12/ /03 ? Minutes of Jan meeting include review of Dec minutes, but missing.

01/09/04 LWAC Meeting. Low attendance. Discussed primarily system issues and periodic water report. Reservoirs full, Wells 9 & 14 awaiting repairs. RM Towill consultants to work on periodic water report. Fence material for hale fences beginning to arrrive.

02/13/04 LWAC Meeting. RM Towill working on supply and demand data. not yet finalized. Collins Lam recently assigned to run water company. Anticiapates well 14 pump to be re-installed the following week.

Determined that tying together the lakes at the Experience at Koele would not be cost effective. Discussion 20 MG storage pond for overflow and drainage. SCADA budget allocation increased. Will work on standardizing and calibrating to improve data. In the development arena, Manele spa and keiki center to be set aside in favor of a “well being” center.

03/05/04 Reviewed procedures of committee. Committee wants work to date submitted to CWRM as working document to be continually under updated. Staff points out missing elements, including certain requested demand data from company, better capital plan enunciation, certain policy questions. Discussion on revised long term build-out demand proposal from company, still in draft. Discussed system status and ongoing projects. DWS staff repeated request for assistance with completion of meter map that DWS had started for company. Discussed how this map was put together, and gaps in data.

4/2/2004

05/07/04 No minutes

07/14/04 LWAC Meeting. Discussed revised demand criteria and project analysis proposals from Castle & Cooke Resorts. DWS staff reviewed changes in assumptions reflected in these proposals. 1997 WGR allocation tables as amended by subsequent minutes to be included in WUDP as well as regressions and other projections, including revised demand proposals. Framework for Updating the Hawaii Water Plan, as well as earlier contracts stipulate that multiple demand forecasts be considered. LWAC will ultimately need to select allocations as policy matter, and may consider any or all of the demand forecasts.

08/04 LWAC Meeting. First Draft handed out to committee

09/20/04 LWAC Meeting. Review first draft. Various suggestions for content, format and clarification.

02/25/05 LWAC Meeting. Discussedpublic notification and minutes. Need protocol. Lanai Water Company working on verifying and calibrating its meters. All accuratre so far except for the one on Well 4. Plan to change meter. Also working on some safety improvements for Well 2 / Shaft 3. Well 14 having

some startup problems. Residential meter beteween the 15 MG reservoir and Manele Project District installed and operational. Golf Course meter installation pending. Periodic water report discussed. new meters and SCADA should improve some previous inaccuracies. Collins Lam to leave Lanai Water Co. after April 05. Committee disappointed as he seemed to work well with them. Phase I of fence complete. Phase II pending, will be more expensive and slower due to steeper terrain. LWAC made request to Corporation Counsel after January Meeting to clarify ordinance 2408. Awaiting word.

07/28/05 LWAC Meeting. Discussed system status leaks and water loss. Breaker tanks project to start soon. Request for proposal for 2 MG tank has been issued. Initial SCADA field work complete. Constructin 11 buildings with 48 units on 10th and Lanai Ave. Contract issued for water hyacinth removal.

10/25/05 LWAC Meetiing. Low attendance. Discussed need for Fog Drip study, establishing ordinance, and how to use the WUDP. Should be reference for applicatons, determine if application conforms to the plan, if not discuss revisions either to plan or project prior to approvals. Amendments to WUDP to be reviewed by LWAC.

11/22/05 LWAC Meeting. More discussion on how to use WUDP, revisited goals of plan, discussion on various tables within draft.

1/26/06 LWAC Meeting. Discussed the use of R-1 water on the Golf Course at Koele, Draft ordinance to establish LWAC by ordinance, periodic water resport, letter from C&CR attorney on WUDP and allocations. C&CR proposed to use potable water on the golf course. DWS staff agreed that potable water over a wellhead protection area would be a nice idea, and suggested trade-off of equivalent amount of potable water to non-potable water elsewhere in same system area but outside wellhead protection area. C&CR proposes trading off for more reclaimed water use in Manele. Committee members do not agree. DWS staff would agree if trade-off were in area with same mix of potable sources, such as irrigated area immediately makai of Lanai City and surrounds. LSG points out that company has made agreement not to use potable water on Koele GC. Committee concludes that this should not be proposed to council without further discussion within committee. Company opposes ordinance to establish LWAC. Other committee members recall that C&CR initially expressed support for the idea and voted for it. C&CR does not want to

be held to that, nor does it want this incuded in the WUDP. Discussion on periodic report. Committee members have questions on the discrepancies between pumpage at wells 1, 9 and 14 vs. use from the potable reservoir. C&CR says this is natural evaporative loss. Committee expresses concern that it is too much. Discussion on C&CR letter opposing plan. C&CR wrote long letter with many items, including opposition to elements of plan, various policies and statements within plan, and some corrections. Committee points out that C&CR representatives were present for and voted in concurrence on all elements of plan, including ordinance proposal. C&CR wants to know if entire plan becomes ordinance, or what becomes ordinance. Committee points to implementation matrix and policy section. Segways into primary concern of C&CR which all agree is allocation table. Committee agrees unanimously to work together to re-visit allocation table. Discussion on allocation - need agreement on unit factors, C&CR updated proposal not based on system standards, but has some empirical basis. Needs further review. Need better breakdown of existing and proposed uses. Need to spacify allocation to project and to system area. Need explicit allocation for ag park. Need individual information per project distrct.

02/06/06 LWAC Meeting. Discussed agricultural allocation. Brackish wter for residential landscape irrigation at MPD, Project analysis tables in Chapter 4, per unit consumption, consucmption classes. Also posting for new at-large member.

4/06/06 LWAC Meeting. Discussed pubic notice, project build out proposal from C&CR and analysis, allocation table and C&CR attorney correspondence. Also discussed data still missing to enable assignment of location and subdistrict for each meter. Value of disaggregated data in system analysis, conservation planning, etc. Corp Counsel memo indicates tthat sunshine law notification not requried, but does recommend good public notification. DWS points out that since it is no longer creating agendas or schedule it would be better to have someone else do the posting. However, agrees that public notice is important. Chair will post notice at post office and committee member volunteers to inform Lanaʻi councilmember's office. DWS to prepare ad for Lanaʻi Times to recruit new at-large member. Allocation table - proposals should be broken down to indicate 5, 10, 15, 20, 25, 30 year anticipated build-out levels. Committee wants triggers defined for when "alternate water source" is requried - so that it can be clear with glance at final allocation table. Discussion of "alternative" water sources, increased wastewater use, desalinaization, run-off, conservation. DWS points out that table 6-2 weighs the cost benefits of some demand and supply side options, while desalt is found in 6-1. Increased wastewater use option not costed as "source" -

existing plants large enough to accommodate additional flow , but it may still be good to add. Discussion of C&CR attorney letter - Committee members express that it goes against the spirit of working with the group to vote one way in a meeting, and then have subsequent representation for the same entity raise these concerns outside the group to a higher body. Lack of continuity in C&CR representation and views is a problem. CWRM reports that fog drip study should begin in late summer of 06.

5/05/06 LWAC Meeting. Reviewed updated demand chapter and policy chapter allocation table. C&CR requests provision to be able to maneuver within a project district allocation, provided that the total remains same. Committee concurs in principple with hte caveat that such allocations be discussed at an LWAC meeting before being finalized. Vote will come when table and associated text are finalized. Discussed 650,000 gallon limit on the use of wells 1, 9 and 14. LSG still interprets this as applying to all use of high level water for Manele. C&CR interprets it as applying only to the Golf Course. Discussed results on the Well 6 oil sheen. C&CR reports that water is safe. Regarding ag reserve, given low sustainable yield, should some additional reserve be set aside to protect aquifer in event of uncertainty ? Committee members note that chlorides in well 1 seem to be decreasing. If this goes fresh, will impact irrigation source for Manele PD. Water levels dropping. Trees on Hale dying. C&CR doesn't think additional reserve is needed. Gradual development, slow development, ag reserve & gradually increasing conservation are adequate. In future de-salt may prove cost effective.

7/ /06 LWAC Meeting. Discussed ordinance establishing LWAC, demand analysis tables and company plans. Company now opposing ordinance. Other committee members want review vis a vis WUDP prior to Planning Commission decisions. Want to be sure Planning Commission receives their comments on water issues. C&CR does not want another layer of bureaucracy or added review time. C&CR confirmed that it had not yet given DWS staff its final table 4-21 (company's proposal), so staff therefore could not complete analysis and comparison. C&CR is revisiting its MF and SF plans for Manele. Considering Increasing MF and decreasing SF.

8/11/06

9/08/06

10/20/06

11/16/06 LWAC Meeting. DWS staff has C&CR final proposal. To make "straw man" revised allocation table using 10, 15, 20, 15, 30 year and build-out.

1/18/07 LWAC Meeting. Two "straw man" allocation tables presented. One based on project build-outs proposed by C&CR with some adjustments based on committee discussions, the other based on econometric forecast numbers - for comparison. Discussed. Some areas in table need clarification.

2/15/07 LWAC Meeting. DWS staff out. Discussed tables, Chair presented alternate format. No votes taken.

4/19/07 LWAC Meeting. Discussed C&CR objection to moving WUDP meetings forward pending results of LUC proceding. Committee members reiterated that it went against spirit of collaboration to present legal challenges rather than raising and discussing concerns in the group. Given disparate positions, difficult to progress. Nevertheless, discussed allocation table. DWS staff wanted some changes to revised allocation table format, to facilitate internal data review - consistent breakdowns by system and region. More work needed to resolve discrepancies between the three tables. DWS noted that assumption for straw-man tables was that build-out would be beyond 2030, but C&CR stated that it intended to build-out by 2027, although this would not be consistent with forecasts.

5/17/07 LWAC Meeting. Discussed membership. Voted to appoint a fourth "alternate" at-large member, to be invited to all meetings and to vote in the even that one of the other at-large members are absent. Discussed Challenge at Manele. Discussed fog-drip study. Dr. Juvick collecting data at eight stations on the Hale. At 6 months of a 2 years study. Progress report scheduled at 12 months. Committee requested C&CR to bring map of Hale showing fog drip stations. Discussed Groundwater study. Tom Nance will formulate parameters for updated model, scope to be reviewed by CWRM and implemented by Howard Endo. Time table of fog drip study may be such that updated data won't get into model update. Model itself won't change sustainable yield estimates, but may provide info on when additional measures might be needed to accommodate various pumping scenarios. Discussed Periodic Water Report. Committee members would like effluent / influent to auxilliary plant included in report. Committee would like monthly vs. 28 day reporting. Need to check with corp counsel re: reporting period under 19.70.085. Discussed period of inconsistent measurement in PWR. Discussed Water

Use & Development Plan. CWRM staff noted that capital plan should be further fleshed out for WUDP. Committee suggested consideration of lining reservoirs. County staff discussed exchange in which reclaimed water would be used for irrigation rather than potable water somewhere outside high level aquifer, enough to enable use of potable water on Koele GC where potable water underlies. Discussed table 5-1. Went from 9 to 13 categories on table and discussed adding subtotals by system area, type of water and pumped vs. other. Discussed controversy over ordinance 2408. CWRM staff asked for Unit Quantity Analysis of assumptions used to determine allocations in C&CR proposal, others. Discussed buildout analysis of C&CR proposal. Discrepancy between proposal and existing project entitlement in that proposal lists fewer units. Either PD should be amended to allow fewer units, or analysis should include all units. First Cut Pace of Resource Use policy proposed by committee member. 2010 3.5, 2015 4.0, 2020 4.5, 2025 5.0 , 2030 5.25 Buildout 5.5. Trigger for new source development 3 and 3.52 reiterated. System status discussed. Committee supports replacement of well #3.

07/12/2007 LWAC Meeting. Discussed Corp Counsel response re: reporting period. Reporting methodology could probably be changed without ordinance, but by a resolution of council. Resolution drafted and presented, as per previous meeting discussion. However, company said it does not support shift from 28-day to monthly cycle. Regarding other changes, company willing but wants clearly delineated list of all changes desired, vs. piecemeal. Discussed Unaccounted-for water. Some committee members concerned re: system losses, particularly from 15 MG reservoir. Some committee members also want more accounting of where water comes from and goes to. Company indicated that systematic leak detection program may be more efficient than revisions to PWR for identifying problems. DWS staff agreed. Started discussion of Unit Quantity Analysis requested at May meeting. C&CR proposal differs from Statewide Standards and existing entitlements in several areas: some items are requested that are not in existing PDs or proposals currently under review, build-out for some items represents less than all entitled units, in some cases consumption estimates are not explained but merely listed as lump sum. These tend to be small, but since there are 13 out of 40 line items in this category, they add up. Finally, some items are adjusted from standards based on empirical data for the area. In some cases these changes are reasonable or allow for more flexibility or even more realistic assessment of demands, but in others they allow for the potential of padding - room for additional approvals not listed. Also, if

entitled projects are not traded or un-entitled in exchange for new proposals, then build-out is likely to be higher than proposal indicates. Minutes include more details of discussion of first page of 5 page unit quantity analysis table.

1/25/2008 (have notes, still have to type up) LWAC Meeting. Presentation from Gordon Tribble of USGS pertaining to the uncertainties of high level dike confined water. (more, need to find).

2/28/2008 LWAC Meeting. Discussed lack of data for forecast. Staff handed out letter from consultant stating that data provided was inadequate to prepare good forecast. Discussed well construction and pump installation permits for New Lanaʻi Well 3 - 4954-03, and for Lanaʻi Well 11 - 4753-01. No vote was taken but committee expressed support for the replacement of well 3 in particular. and slightly more guarded support for distribution of withdrawals with well 11. The concern was expressed that well 11 not be used to further increase pumping of brackish water from the high level aquifer. Discused the need for resource reserve.

4/25/2008 LWAC Meeting. Discussed 8 different scenarios for buildout and pace of resource use policy. Discussed line-item allocations for conservation and “alternate source”. Discussed pros and cons of resource reserve. Discussed triggers for additional distrubution of withdrawal. 3.0 to start 3.52 to be completed. Discussed status of water levels in wells 1,9 & 14 as well as in wells 6 & 8. All declining. Also status of pumps 2 and 3 - both down. Permits for well 3 replacement and for distribution of non-potable withdrawals well 11 have been submitted to CWRM and are being reviewed. were passed out to group at 2/28/08 meeting.

5/30/08 LWAC Meeting. Presantations by Bob Hobdy and Jay Penniman regarding history and status of watershed, concerns re: Increment III alignment, and description of work to preserve Hawaiian petrels. Had been t hought extinct or nearly extinct until about 2001. Now it is believed that several thousand birds remain. The biggest threats to the birds right now are invasive plants that over-run natural habitat and form impenetrable thickets where the birds can not nest. Examples of such problem plants are waiowi (strawberry guava), manuka and tibouchina. Other threats include predation, and flying into the deer fence and meteorological towers. Suggested that white fiberglass eelctric fence tape be woven into the top of the fence wire to enable the birds to see and go over the fence. Also described was a three acre habitat restoration project around the fog drip station. This restoration will make a corridor to Maunalei breeding grounds. . CCR is providing funding as

part of its Habitat Conservation Plan for its potential wind farm. There was strong support for watershed protection by some of the LWAC members. CCR staff agreed to consider the fence line proposed by Hobdy. Discussion of the Implementation Matrix.

06/27/08 Discussion of fence increments. All phases surveyed. However as it may be a while before Increment III is actually constructed, additional survey may be done. CCR outlined the expected timeline for completion of the fencing project; they are currently 2-3 years behind schedule. The costs of materials have almost doubled over the last 4 years. CCR emphasized that it will get completed. Initial results from the 2-year study by Jim Juvik are showing that fog drip is significant on Lanaihale. The new alignment will incorporate suggestions made by Robert Hobdy at the last meeting and in discussions with Conservation personnel. Discucssed capital projects of CCR. Lanaʻi City 2 MG tank done. Improvements made to Well 2/Shaft 3 main from Hiʻi to the bottom of the slope. Other plans include replacement of Well 3 and drilling of Well 15. Anticipated yield on Well 7 was small. Discussion of allocation table.

07/25/08 LWAC Meeting. The pace-of-resource proposal was reviewed. Some billing data is still missing. Also discussed were problems / inconsistencies in the Periodic Water Report. A tiered pricing proposal has been filed with the PUC. Some LWAC members requested that the justification prepared by DWS for the proposed Allocation be included in the WUDP, possibly as part of the Policy chapter as an explanation. The LWAC discussed the status of wells. CCR explained its plans for industrial use development at Miki Basin. Concerns were expressed that the line is very leaky and suggestions to condition approval for the project on fixing the line. CCR said it would be too expensive to put in new line. LWAC members requested continued updates on plans. The group continued discussion on the Implementation Matrix, including tiered rate structure, low flow devices, use of water audits, and importance of education. LWAC members requested that someone from the Fire Department attend the next meeting to address the threat fire poses to the Watershed.

08/22/08 Discussion of whether or not to shut down water source on the west end. Fire Department representative came to discuss concerns. Concerns and possible solutions discussed. Miles of old 10” pipe sitting. Pipe is old, with frequent breaks. Area is fire prone, and water source is needed to be able to fight brush fire. Helicopters alone not enough. Lanaʻi has two fire

engines, one tanker and 6 firefighters. It takes about an hour to get additional manpower. Water is also needed for the Kanepuu project. Discussed cost of Lanaihale fence. No funding yet Discussed breaks in Palawai Grid. Discussed allocation table. Some thought too generous. Raised precautionary principle. One suggested alternate, more stringent proposal. Others thought not generous enough, that LWAC had been close to agreement on CCR proposal. Still others said that regardless of final numbers, setting allocation amounts would not be enough in itself, triggers and actions needed to ensure adequate distribution of withdrawals. Discussed triggers in proposal. Also some discussion of per unit consumption. The group discussed the issues of identifying alternate sources, including a resource reserve, including triggers for future action, applying the precautionary principle.

10/24/08 LWAC Meeting. The group discussed whether the meetings could or should be recorded (video-taped). CCR said it was a public meeting. Others expressed concern about that recording the meeting might limit participants' willingness to speak freely. The group agreed to allow video-taping by CCR, but only if two free copies were made available for the group. CCR has a proposal for an additional swimming pool at Manele. The group agreed to inform the Planning Commission that there was not an opportunity to have a presentation from the Company on the proposal, so request Commission defer action on it. LWAC reviewed what conditions trigger review by the LWAC of major development projects. Also the Planning Commission can request LWAC input on a proposal. The group continued discussion on Table 5-1 (Pace of Resource Use) and the overall timeline for WUDP.

1/30/2009 LWAC meeting. Discussed status of wells, fire protection issues, periodic water report. Discussed allocation table. Discussion included need for a precautionary approach and the need to avoid “paper water”. Additional monitors put in wells 3, 5 and 7. Discussed breaks in Palawai Grid.

2/27/09 LWAC Meeting. Those present discussed possible approaches for when there is no CCR representative at the meeting and suggested sending a letter requesting their regular participation. Agreed to move forward with or without CCR, given need to make progress. The group discussed whether LWAC should take a position on CCR Miki Basin heavy industrial permit application. This involves infrastructure only, not an increase in use; concerns relate to maintenance and fire protection (when draining the lines). LWAC agreed that it wants issues relevant Table 5-1 to come before it. The group discussed CCR's PUC rate case and whether LWAC should take a position. It was

	agreed that given the timing and the inability to discuss with CCR, that no formal letter would be written; individuals could testify on their own about concerns discussed (e.g. lack of conformity with existing covenants). The group discussed the issue of whether the existing water system and rates is fiscally viable. Current rates are estimated to be ¼ of the actual cost. The group also discussed inconsistency of water use with existing covenants and the possibility of a "conservation rate." CCR informed the group that reporting of water use is up to date now and will be current in the future. CCR reported on the status of repairs to the Palawai Basin system
3/27/09	LWAC Meeting. The group reviewed Chapter 2 (Regulatory Framework) and Chapter 3 (Resources) and made some general organizational suggestions. It was noted that Lanai is not currently meeting System Standards in terms of needed resources, but this should reflect more of a Call to Action vs. a panic. CCR said it has plans to move toward meeting those standards. Some wells are closer than others to action levels. LWAC agreed it should watch trends and if approaching action level, do a test. One request was for clear criteria for action level and CWRM designation. Regarding Water Reports and use, CCR presented revised format for reporting. On the PUC rate case for brackish water, there were concerns about how it was costed and whether there was adequate consideration of operating and maintenance costs.
7/31/09	LWAC Meeting. The group was informed that the WUDP needs to be approved by the Board of Water Supply before it is sent to County Council, which then has only 45 days to approve it or reject it. However, Council was looking at amendments to the County Code to change that schedule. DWS reviewed the status of the chapters, with an in-depth review of Chapter 4. The previous calculations were updated with information from 2008. It was suggested that information about Miki Basin should be included in Table 4-23 (4-21), but that it did not equal an "imprimatur" for planning approval. The group also reviewed and discussed the allocation table. A number of LWAC members stated a desire to take a more conservative approach, given the current economy and actual building activity. LWAC also discussed the issue of reporting water use on a 13-period basis and that it would be preferable to have it on a monthly basis.
12/11/09 & 12/21/09	LWAC Meetings. Reviewed 10/19/2009 Review Draft of WUDP for Lanaʻi. Presentation and discussion of review draft.

APPENDIX D Lana'i Species

HAWAIIAN ISLANDS ANIMALS: Updated September 10, 2009

LISTED SPECIES, AS DESIGNATED UNDER THE U.S. ENDANGERED SPECIES ACT

Species status by island: E=endangered; T=threatened; (CH)=critical habitat designated; P=proposed.
N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes

		DISTRIBUTION						
	STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands, Kaho'olawe, Ni'ihau, or Oceanic
VERTEBRATES (39 Endangered + 4 Threatened = 43 taxa)								
LISTED MAMMALS (4 Endangered taxa)								
Lasiurus cinereus semotus	Bat, Hawaiian hoary; 'Ope'ape'a	E	x	x			x	x	
Megaptera novaeangliae	Whale, humpback; Kohola	E	x	x	x	x	x	x	O
Monachus schauinslandi (CH)	Hawaiian monk seal; 'Ilio-holo-i-ka-uaua	E	x	x	x	x	x	x	N.W. islands
Physeter macrocephalus	Whale, sperm; Palaoa (uncommon)	E							O
LISTED BIRDS (33 Endangered + 1 Threatened = 34 taxa; 2 Proposed Endangered)									
Acrocephalus familiaris kingi	Millerbird, Nihoa	E							Nihoa
Anas laysanensis	Duck, Laysan	E							M, L
Anas wyvilliana	Duck, Hawaiian; Koloa maoli	E	x	x			x	x	
Branta sandvicensis	Goose, Hawaiian; Nēnē	E	x	x		x		x	
Buteo solitarius	Hawk, Hawaiian; 'Io	E	x						
Chasiempis sandwichensis ibidis (CH)	'Elepaio, O'ahu	E					x		
Corvus hawaiiensis	Crow, Hawaiian; 'Alalā	E	x						
Fulica alai	Coot, Hawaiian; 'Alae ke'oke'o	E	x	x	x	x	x	x	
Gallinula chloropus sandvicensis	Moorhen, Common; Hawiian gallinule; 'Alae 'ula	E	x	x		x	x	x	
Hemignathus lucidus affinus	Nuku pu'u, Maui	E		x					
Hemignathus lucidus hanapepe	Nuku pu'u, Kaua'i	E						x	
Hemignathus munroi	Akia pōlā'au	E	x						
Hemignathus procerus	'Akia loa, Kaua'i	E						x	
Himantopus mexicanus knudseni	Stilt, Black-necked; Hawaiian stilt; Ae'o	E	x	x	x	x	x	x	Ni'ihau
Loxioides bailleui (CH)	Palila	E	x						
Loxops caeruleirostris (pCH)	'Ākepa, Kauai; Akekee	PE						x	
Loxops coccineus coccineus	'Ākepa, Hawai'i	E	x						
Loxops coccineus ochraceus	'Ākepa, Maui	E		x					

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N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes

			DISTRIBUTION						
		STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands, Kaho'olawe, Ni'ihau, or Oceanic
Melamprosops phaeosoma	Po'ouli	E		x					
Moho braccatus	Ō'ō, Kaua'i; 'Ō'ō 'ā'ā	E						x	
Myadesxes lanaiensis rwxha	Thrush, Moloka'i; Oloma'o	E				x			
Myadestes myadestinus	Thrush, Large Kaua'i; Kāma'o	E						x	
Myadestes palmeri	Thrush, Small Kaua'i; Puaiohi	E						x	
Oeromystis bairdi (pCH)	Creeper, Kauai; Akikiki	PE						x	
Oreomystis mana	Creeper, Hawai'i	E	x						
Palmeria dolei	Honeycreeper, Crested; 'Ākohekohe	E		x					
Paroreomyza flammea	Creeper, Moloka'i; Kākāwahie	E				x			
Phoebastria albatrus	Albatross, Short-tailed	E							M
Paroreomyza maculata	Creeper, O'ahu; O'ahu 'Alauahio	E					x		
Pseudonestor xanthophrys	Parrotbill, Maui	E		x					
Psittirostra psittacea	Ō'ū	E	x					x	
Pterodroma phaeopygia sandwichensis	Petrel, Dark-rumped; Hawaiian Petrel; 'Ua'u	E	x	x	x			x	
Puffinus auricularis	Shearwater, Newell's	T	x				x	x	
Telespyza cantans	Finch, Laysan	E							L
Telespyza ultima	Finch, Nihoa	E							Nihoa

LISTED REPTILES (2 Endangered + 3 Threatened = 5 taxa)

Caretta caretta	Turtle, Loggerhead sea; (incidental in Hawai'i)	T	x	x	x	x	x	x	O+all islands
Chelonia mydas	Turtle, Green sea; Honu	T	x	x	x	x	x	x	O+all islands
Dermochelys coriaceae	Turtle, Leatherback sea; (incidental in Hawai'i)	E	x	x	x	x	x	x	O+all islands
Eretmochelys imbricata	Turtle, Hawksbill; 'Ea	E	x	x	x	x	x	x	O+all islands
Lepidochelys olivacea	Turtle, Olive ridley sea; (incidental in Hawai'i)	T	x	x	x	x	x	x	O+all islands

INVERTEBRATES (55 Endangered +2 Threatened = 57 taxa)

LISTED SNAILS (41 Endangered + 1 Threatened = 42 taxa)

Achatinella abbreviata	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella apexfulva	Snail, O'ahu tree; Pupu kani oe	E					x		

HAWAIIAN ISLANDS ANIMALS: Updated September 10, 2009

LISTED SPECIES, AS DESIGNATED UNDER THE U.S. ENDANGERED SPECIES ACT

Species status by island: E=endangered; T=threatened; **(CH)**=critical habitat designated; P=proposed.
N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes

			DISTRIBUTION						
		STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands, Kaho'olawe, Ni'ihau, or Oceanic
Achatinella bellula	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella buddii	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella bulimoides	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella byronii	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella caesia	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella casta	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella cestus	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella concavospira	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella curta	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella decipiens	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella decora	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella dimorpha	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella elegans	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella fulgens	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella fuscobasis	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella juddii	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella juncea	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella lehuiensis	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella leucorrhaphe	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella lila	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella livida	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella lorata	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella mustelina	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella papyracea	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella phaeozona	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella pulcherrima	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella pupukanioe	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella rosea	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella sowerbyana	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella spaldingi	Snail, O'ahu tree; Pupu kani oe	E					x		

HAWAIIAN ISLANDS ANIMALS: Updated September 10, 2009

LISTED SPECIES, AS DESIGNATED UNDER THE U.S. ENDANGERED SPECIES ACT

Species status by island: E=endangered; T=threatened; **(CH)**=critical habitat designated; P=proposed.
N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes

			DISTRIBUTION						
		STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands, Kaho'olawe, Ni'ihau, or Oceanic
Achatinella stewartii	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella swiftii	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella taeniolata	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella thaanumi	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella turgida	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella valida	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella viridans	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella vittata	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella vulpina	Snail, O'ahu tree; Pupu kani oe	E					x		
Erinna newcombi **(CH)**	Snail, Newcomb's; Pupu wai lani	T						x	

LISTED ARTHROPODS (14 Endangerd + 1 Threatened = 15 taxa; 3 proposed Endangered)

Adelocosa anops **(CH)**	Wolf spider, Kaua'i cave	E						x	
Manduca blackburni **(CH)**	Moth, Blackburn's sphinx	E	x	x					Ka
Drosophila aglaia (CH)	Picture-wing fly, Oahu	E					x		
Drosophila attigua (pCH) (syn.w/D. sharpi)	Picture-wing fly, Kauai	PE						x	
Drosophila differens (CH)	Picture-wing fly, Molokai	E				x			
Drosophila hemipeza (CH)	Picture-wing fly, Oahu	E					x		
Drosophila heteroneura (CH)	Picture-wing fly, Hawaii	E	x						
Drosophila montgomeryi (CH)	Picture-wing fly, Oahu	E					x		
Drosophila mulli (CH)	Picture-wing fly, Hawaii	T	x						
Drosophila musaphila (CH)	Picture-wing fly, Kauai	E						x	
Drosophila neoclavisetae (CH)	Picture-wing fly, Maui	E		x					
Drosophila obatai (CH)	Picture-wing fly, Oahu	E					x		
Drosophila ochrobasis (CH)	Picture-wing fly, Hawaii	E	x						
Drosophila substenoptera (CH)	Picture-wing fly, Oahu	E					x		
Drosophila tarphytrichia (CH)	Picture-wing fly, Oahu	E					x		
Megalagrion nesiotes	Flying earwig Hawaiian damselfly	PE	x	x					
Megalagrion pacificum	Pacific Hawaiian damselfly	PE	x	x	x	x	x	x	
Spelaeorchestia [illegible]na (CH)	Amphipod, Kaua'i cave	E						x	

HAWAIIAN ISLANDS PLANTS: Updated April 9, 2009
LISTED SPECIES, AS DESIGNATED UNDER THE U.S. ENDANGERED SPECIES ACT

Species status by island: **E**= endangered; **T**= threatened; **P**= formally proposed as E or T; (CH)=critical habitat designated; pCH=critical habitat proposed ;*=possibly extirpated in the wild. ‡=N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes.

	STATUS	DISTRIBUTION						
		Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and Ni'ihau

LISTED PLANTS (285 Endangered, 10 Threatened; 45 proposed Endangered)

Abutilon eremitopetalum	No common name	E			✓				
Abutilon menziesii	Ko`oloa`ula	E	✓	✓	✓		✓		
Abutilon sandwicense **(CH)**	No common name	E					✓ CH		
Acaena exigua	Liliwai	E		✓*				✓*	
Achyranthes mutica **(CH)**	No common name	E	✓ CH					✓*	
Achyranthes splendens var. *rotundata*	Hinahina ewa	E			✓*	✓*	✓		
Adenophorus periens **(CH)**	No common name	E	✓CH		✓*	✓CH	✓*CH	✓CH	
Alectryon macrococcus var. *auwahiensis* **(CH)**	Mahoe	E		✓CH					
Alectryon macrococcus var. *macrococcus* **(CH)**	Mahoe	E		✓CH		✓CH	✓CH	✓CH	
Amaranthus brownii **(CH)**	No common name	E							Nihoa CH
Argyroxiphium kauense **(CH)**	`Ahinahina, Ka`u silversword	E	✓CH						
Argyroxiphium sandwicense ssp. *macrocephalum* **(CH)**	`Ahinahina, Haleakala silversword	T		✓CH					
Argyroxiphium sandwicense ssp. *sandwicense*	`Ahinahina, Mauna Kea	E	✓						
Asplenium peruvianum var. *insulare* **(CH)** (listed as Asplenium fragile var. insulare)	No common name	E	✓CH	✓CH					
Astelia waialealae	painiu	PE						pCH	
Bidens micrantha ssp. *kalealaha* **(CH)**	Ko`oko`olau	E		✓CH	✓CH				
Bidens wiebkei **(CH)**	Ko`oko`olau	E				✓CH			
Bonamia menziesii **(CH)**	No common name	E	✓CH	✓CH	✓	✓*	✓CH	✓CH	
Brighamia insignis **(CH)**	`Olulu	E						✓CH	Niihau*CH
Brighamia rockii **(CH)**	Pua `ala	E		✓*CH	✓*	✓CH			
Caesalpinia kavaiensis	Uhiuhi	E	✓	✓*	✓*		✓	✓*	
Canavalia molokaiensis **(CH)**	`Awikiwiki	E				✓CH			
Canavalia napaliensis	Awikiwiki	PE						pCH	
Cenchrus agrimonioides var. *agrimonioides* **(CH)**	Kamanomano	E	✓*	✓CH	✓*		✓CH		
Cenchrus agrimonioides var. *laysanensis*	Kamanomano	E							L*, K*, M*
Centaurium sebaeoides **(CH)**	`Awiwi	E		✓CH	✓	✓CH	✓CH	✓CH	
Chamaesyce celastroides var. *kaenana* **(CH)**	`Akoko	E					✓CH		
Chamaesyce deppeana **(CH)**	`Akoko	E					✓CH		
Chamaesyce eleanoriae	`Akoko	PE						pCH	
Chamaesyce halemanui **(CH)**	`Akoko	E						✓CH	
Chamaesyce herbstii **(CH)**	`Akoko	E					✓CH		

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			Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and Ni'ihau
Chamaesyce kuwaleana **(CH)**	'Akoko	E					✓CH		
Chamaesyce remyi var. kauaiensis	'Akoko	PE						pCH	
Chamaesyce remyi var. remyi	'Akoko	PE						pCH	
Chamaesyce rockii **(CH)**	'Akoko	E					✓CH		
Chamaesyce skottsbergii var. *kalaeloana* (listed as *Euphorbia skottsbergii* var. *kalaeloana*)	'Akoko	E					✓		
Charpentiera densiflora	Papala	PE						pCH	
Clermontia drepanomorpha **(CH)**	'Oha wai	E	✓CH						
Clermontia lindseyana **(CH)**	'Oha wai	E	✓CH	✓CH					
Clermontia oblongifolia ssp. *brevipes* **(CH)**	'Oha wai	E				✓CH			
Clermontia oblongifolia ssp. mauiensis **(CH)**	'Oha wai	E		✓CH	✓*				
Clermontia peleana ssp. *peleana* **(CH)**	'Oha wai	E	✓CH						
Clermontia peleana ssp. *singuliflora* **(CH)**	'Oha wai	E	✓*CH	✓*					
Clermontia pyrularia **(CH)**	'Oha wai	E	✓CH						
Clermontia samuelii ssp. *hanaensis* **(CH)**	'Oha wai	E		✓CH					
Clermontia samuelliii ssp. *samuelii* **(CH)**	'Oha wai	E		✓CH					
Colubrina oppositifolia **(CH)**	Kauila	E	✓CH	✓CH			✓CH		
Ctenitis squamigera **(CH)**	Pauoa	E		✓CH	✓	✓CH	✓CH	✓*CH	
Cyanea acuminata **(CH)**	Haha	E					✓CH		
Cyanea asarifolia **(CH)**	Haha	E						✓CH	
Cyanea copelandii ssp. *copelandii*	Haha	E	✓*						
Cyanea copelandii ssp. *haleakalaensis* **(CH)**	Haha	E		✓CH					
Cyanea crispa **(CH)**	Haha	E					✓CH		
Cyanea dolichopoda	Haha	PE						pCH	
Cyanea dunbariae **(CH)**	Haha	E				✓CH			
Cyanea eleeleensis	Haha	PE						pCH*	
Cyanea glabra **(CH)**	Haha	E		✓CH					
Cyanea grimesiana ssp. *grimesiana* **(CH)**	Haha	E				✓*CH	✓*CH		
Cyanea grimesiana ssp. *obatae* **(CH)**	Haha	E					✓CH		
Cyanea hamatiflora ssp. *carlsonii* **(CH)**	Haha	E	✓CH						
Cyanea hamatiflora ssp. *hamatiflora* **(CH)**	Haha	E		✓CH					
Cyanea humboldtiana **(CH)**	Haha	E					✓CH		
Cyanea kolekoleensis	Haha	PE						pCH*	
Cyanea koolauensis **(CH)**	Haha	E					✓CH		
Cyanea kuhihewa	Haha	PE						pCH*	
Cyanea lobata ssp. *lobata* (listed as *Cyanea lobata*)	Haha	E			✓				

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Cyanea lobata ssp. *lobata* (listed as *Cyanea lobata*) **(CH)**	Haha	E		✓ CH					
Cyanea longiflora **(CH)**	Haha	E					✓CH		
Cyanea macrostegia ssp. gibsonii	Haha	E			✓				
Cyanea magnicalyx (listed as *Cyanea grimesiana* ssp. *grimesiana*) **(CH)**	Haha	E		✓CH					
Cyanea mannii **(CH)**	Haha	E				✓CH			
Cyanea mauiensis (listed as *Cyanea grimesiana* ssp. *grimesiana*)	Haha	E		✓*					
Cyanea mceldowney **(CH)**	Haha	E		✓CH					
Cyanea munroi (listed as *Cyanea grimesiana* ssp. *grimesiana*) **(CH)**	Haha	E			✓	✓CH			
Cyanea pinnatifida **(CH)**	Haha	E					✓CH		
Cyanea platyphylla **(CH)**	'Aku'aku	E	✓CH						
Cyanea procera **(CH)**	Haha	E				✓CH			
Cyanea recta **(CH)**	Haha	T						✓CH	
Cyanea remyi **(CH)**	Haha	E						✓CH	
Cyanea rivularis (listed as *Delissea rivularis*) **(CH)**	No common name?	E						✓CH	
Cyanea sulcina (listed as *Cyanea recta*) **(CH)**	Haha	T						✓CH	
Cyanea shipmanii **(CH)**	Haha	E	✓CH						
Cyanea st.-johnii **(CH)**	Haha	E					✓CH		
Cyanea stictophylla **(CH)**	Haha	E	✓CH						
Cyanea superba ssp. *regina* **(CH)**	Haha	E					✓*CH		
Cyanea superba ssp. *superba* **(CH)**	Haha	E					✓CH		
Cyanea truncata **(CH)**	Haha	E					✓CH		
Cyanea undulata **(CH)**	Haha	E						✓CH	
Cyperus fauriei **(CH)**	No common name	E	✓CH		✓*	✓CH			
Cyperus pennatiformis ssp. *bryanii* **(CH)** (listed as Mariscus pennatiformis)	No common name	E							L CH
Cyperus pennatiformis ssp. *pennatiformis* **(CH)** (listed as Mariscus pennatiformis)	No common name	E		✓CH			✓*CH	✓*CH	
Cyperus trachysanthos **(CH)**	Pu'uka'a	E			✓*	✓*	✓CH	✓CH	Niihau *
Cyrtandra crenata	Ha'iwale	E					✓*		
Cyrtandra cyaneoides **(CH)**	Mapele	E						✓CH	
Cyrtandra dentata **(CH)**	Ha'iwale	E					✓CH		
Cyrtandra giffardii **(CH)**	Ha'iwale	E	✓CH						
Cyrtandra kealiae ssp. *kealiae* (listed as *Cyrtandra limahuliensis*)**(CH)**	Ha'iwale	T						✓CH	
Cyrtandra munroi **(CH)**	Ha'iwale	E		✓CH	✓				
Cyrtandra oenobarba	Ha'iwale	PE						pCH	
Cyrtandra paliku	Ha'iwale	PE						pCH	
Cyrtandra polyantha **(CH)**	Ha'iwale	E					✓CH		

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			Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and Ni'ihau
Cyrtandra subumbellata **(CH)**	Ha'iwale	E					✓CH		
Cyrtandra tintinnabula **(CH)**	Ha'iwale	E	✓CH						
Cyrtandra viridiflora **(CH)**	Ha'iwale	E					✓CH		
Delissea argutidentata (listed as *Delissea undulata*) **(CH)**	No common name	E	✓*CH						
Delissea kauaiensis (listed as *Delissea undulata*) **(CH)**	No common name	E						✓CH	
Delissea niihauensis (listed as *Delissea undulata*)	No common name	E							Niihau*
Delissea rhytidosperma **(CH)**	No common name	E						✓CH	
Delissea subcordata **(CH)**	No common name	E					✓*CH		
Delissea takeuchii (listed as *Delissea subcordata*) **(CH)**	No common name	E					✓*CH		
Delissea undulata	No common name	E		✓*					
Delissea waianaeensis (listed as *Delissea subcordata*) **(CH)**	No common name	E					✓CH		
Diellia erecta **(CH)**	No common name	E	✓CH	✓CH	✓*	✓CH	✓CH	✓*CH	
Diellia falcata **(CH)**	No common name	E					✓CH		
Diellia mannii	No common name	PE						pCH	
Diellia pallida **(CH)**	No common name	E						✓CH	
Diellia unisora **(CH)**	No common name	E					✓CH		
Diplazium molokaiense **(CH)**	No common name	E		✓CH	✓*	✓*CH	✓*CH	✓*CH	
Doryopteris angelica	No common name	PE						pCH	
Dryopteris crinalis var. *podosorus*	Palapalai aumakua	PE						pCH	
Dubautia herbstobatae **(CH)**	Na'ena'e	E					✓CH		
Dubautia imbricata ssp. imbricata	Na'ena'e	PE						pCH	
Dubautia kalalauensis	Na'ena'e	PE						pCH	
Dubautia kenwoodii	Na'ena'e	PE						pCH	
Dubautia latifolia **(CH)**	Koholapehu	E						✓CH	
Dubautia pauciflorula **(CH)**	Na'ena'e	E						✓CH	
Dubautia plantaginea ssp. *humilis* **(CH)**	Na'ena'e	E		✓CH					
Dubautia plantaginea ssp. magnifolia	Na'ena'e	PE						pCH	
Dubautia waialealae	Na'ena'e	PE						pCH	
Eragrostis fosbergii **(CH)**	No common name	E					✓*CH		
Eugenia koolauensis **(CH)**	Nioi	E				✓*CH	✓CH		
Euphorbia haeleeleana **(CH)**	No common name	E					✓CH	✓CH	
Exocarpos luteolus **(CH)**	Heau	E						✓CH	
Flueggea neowawraea **(CH)**	Mehamehame	E	✓CH	✓CH		✓*CH	✓CH	✓CH	
Galinia lanaiensis	No common name	E			✓				
Gardenia brighamii	Nanu	E	✓*	✓*	✓	✓*	✓		

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			Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and Ni'ihau
Gardenia mannii **(CH)**	Nanu	E					✓CH		
Geranium arboreum **(CH)**	Nohoanu	E		✓CH					
Geranium kauaiense	Nohoanu	PE						pCH	
Geranium multiflorum **(CH)**	Nohoanu	E		✓CH					
Gouania hillebrandii **(CH)**	No common name	E		✓CH	✓*	✓			K*
Gouania meyenii **(CH)**	No common name	E					✓CH	✓CH	
Gouania vitifolia **(CH)**	No common name	E	✓CH	✓*CH			✓CH		
Haplostachys haplostachya	No common name	E	✓	✓*				✓*	
Hedyotis cookiana **(CH)**	'Awiwi	E	✓*					✓CH	
Hedyotis coriacea **(CH)**	Kio'ele	E	✓CH	✓CH			✓*CH		
Hedyotis degeneri var. *coprosmifolia* **(CH)**	No common name	E					✓*CH		
Hedyotis degeneri var. *degeneri* **(CH)**	No common name	E					✓CH		
Hedyotis mannii **(CH)**	Pilo	E		✓CH	✓	✓			
Hedyotis parvula **(CH)**	No common name	E					✓CH		
Hedyotis schlechtendahliana var. *remyi*	Kopa	E			✓*				
Hedyotis st.-johnii **(CH)**	No common name	E						✓CH	
Hesperomannia arborescens **(CH)**	No common name	E		✓	✓*	✓CH	✓CH		
Hesperomannia arbuscula **(CH)**	No common name	E		✓CH			✓CH		
Hesperomannia lydgatei **(CH)**	No common name	E						✓CH	
Hibiscadelphus distans	Hau kuahiwi	E						✓	
Hibiscadelphus giffardianus **(CH)**	Hau kuahiwi	E	✓CH						
Hibiscadelphus hualalaiensis **(CH)**	Hau kuahiwi	E	✓CH						
Hibiscadelphus woodii **(CH)**	Hau kuahiwi	E						✓CH	
Hibiscus arnottianus ssp. *immaculatus* **(CH)**	Koki'o ke'oke'o	E				✓			
Hibiscus brackenridgei ssp. *brackenridgei* **(CH)**	Ma'o hau hele	E	✓CH	✓CH	✓				
Hibiscus brackenridgei ssp. *mokuleianus* **(CH)**	Ma'o hau hele	E				✓CH	✓*CH		
Hibiscus brackenridgei ssp. *molokaianus* **(CH)**	Ma'o hau hele	E				✓*CH	✓CH		
Hibiscus clayi **(CH)**	Koki'o 'ula'ula	E						✓CH	
Hibiscus waimeae ssp. *hannerae* **(CH)**	Koki'o ke'oke'o	E						✓CH	
Huperzia mannii **(CH)**	Wawae'iole	E	✓*	✓				✓*	
Huperzia mutans **(CH)**	Wawae'iole	E					✓	✓*	
Ischaemum byrone **(CH)**	Hilo ischaemum	E	✓CH	✓CH		✓CH	✓	✓CH	
Isodendrion hosakae **(CH)**	Aupaka	E	✓CH						
Isodendrion laurifolium **(CH)**	Aupaka	E					✓CH	✓CH	
Isodendrion longifolium **(CH)**	Aupaka	T					✓CH	✓CH	

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Isodendrion pyrifolium **(CH)**	Wahine noho kula	E	✓	✓*CH	✓*	✓*CH	✓*CH		Niihau*
Kanaloa kahoolawensis **(CH)**	Kohe malama malama o Kanaloa	E							K CH
Keysseria erici	No common name	PE						pCH	
Keysseria helenae	No common name	PE						pCH	
Kokia cookei	Koki`o	E				✓*			
Kokia drynarioides **(CH)**	Hau hele 'ula; koki`o	E	✓CH						
Kokia kauaiensis **(CH)**	Koki'o	E						✓CH	
Labordia cyrtandrae **(CH)**	Kamakahala	E					✓CH		
Labordia helleri	Kamakahala	PE						pCH	
Labordia lydgatei **(CH)**	Kamakahala	E						✓CH	
Labordia pumila	Kamakahala	PE						pCH	
Labordia tinifolia var. *lanaiensis*	Kamakahala	E			✓				
Labordia tinifolia var. *wahiawaensis* **(CH)**	Kamakahala	E						✓CH	
Labordia triflora **(CH)**	Kamakahala	E				✓CH			
Lepidium arbuscula **(CH)**	'Anaunau	E					✓CH		
Lipochaeta lobata var. *leptophylla* **(CH)**	Nehe	E					✓CH		
Lobelia gaudichaudii ssp. *koolauensis* **(CH)**	No common name	E					✓CH		
Lobelia monostachya **(CH)**	No common name	E					✓CH		
Lobelia niihauensis **(CH)**	No common name	E					✓CH	✓CH	Niihau*
Lobelia oahuensis **(CH)**	No common name	E					✓CH		
Lysimachia daphnoides	Lehua makanoe	PE						pCH	
Lysimachia filifolia **(CH)**	No common name	E					✓CH	✓CH	
Lysimachia iniki	No common name	PE						pCH	
Lysimachia lydgatei **(CH)**	No common name	E		✓CH					
Lysimachia maxima **(CH)**	No common name	E				✓CH			
Lysimachia pendens	No common name	PE						pCH	
Lysimachia scopulensis	No common name	PE						pCH	
Lysimachia venosa	No common name	PE						pCH	
Marsilea villosa **(CH)**	'Ihi'ihi	E				✓	✓CH		Niihau
Melanthera fauriei **(CH)** (listed as *Lipochaeta fauriei*)	Nehe	E						✓CH	
Melanthera kamolensis **(CH)** (listed as *Lipochaeta kamolensis*)	Nehe	E		✓CH					
Melanthera micrantha ssp. *exigua* **(CH)** (listed as *Lipochaeta micrantha*)	Nehe	E						✓CH	
Melanthera micrantha ssp. *micrantha* **(CH)** (listed as *Lipochaeta micrantha*)	Nehe	E						✓CH	
Melanthera tenuifolia **(CH)** (listed as *Lipochaeta tenuifolia*)	Nehe	E					✓CH		
Melanthera venosa (listed as *Lipochaeta venosa*)	Nehe	E	✓						

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			Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and Ni'ihau
Melanthera waimeaensis **(CH)** (listed as *Lipochaeta waimeaensis*)	Nehe	E					✓CH		
Melicope adscendens **(CH)**	Alani	E		✓CH					
Melicope balloui **(CH)**	Alani	E		✓CH					
Melicope degeneri	Alani	PE						pCH	
Melicope haupuensis **(CH)**	Alani	E						✓CH	
Melicope knudsenii **(CH)**	Alani	E		✓CH				✓CH	
Melicope lydgatei **(CH)**	Alani	E					✓CH		
Melicope mucronulata **(CH)**	Alani	E		✓*CH		✓CH			
Melicope munroi	Alani	E			✓	✓			
Melicope ovalis **(CH)**	Alani	E		✓CH					
Melicope pallida **(CH)**	Alani	E					✓*CH	✓CH	
Melicope paniculata	Alani	PE						pCH	
Melicope pubertula	Alani	PE						pCH	
Melicope quadrangularis	Alani	E						✓*	
Melicope reflexa **(CH)**	Alani	E				✓CH			
Melicope saint-johnii **(CH)**	Alani	E					✓CH		
Melicope zahlbruckneri **(CH)**	Alani	E	✓CH						
Munroidendron racemosum **(CH)**	No common name	E						✓CH	
Myrsine juddii **(CH)**	Kolea	E					✓CH		
Myrsine knudsenii	Kolea	PE						pCH	
Myrsine linearifolia **(CH)**	Kolea	T						✓CH	
Myrsine mezii	Kolea	PE						pCH	
Neraudia angulata var. *angulata* **(CH)**	No common name	E					✓CH		
Neraudia angulata var. *dentata* **(CH)**	No common name	E					✓CH		
Neraudia ovata **(CH)**	No common name	E	✓CH						
Neraudia sericea **(CH)**	No common name	E		✓CH	✓	✓CH			K*
Nothocestrum breviflorum **(CH)**	'Aiea	E	✓CH						
Nothocestrum peltatum **(CH)**	'Aiea	E						✓CH	
Nototrichium humile **(CH)**	Kulu'i	E		✓*CH			✓CH		
Ochrosia kilaueaensis	Holei	E	✓*						
Panicum fauriei var. *carteri* **(CH)**	Carter's panic grass	E		✓	✓	✓	✓CH		
Panicum niihauense **(CH)**	Lau'ehu	E						✓CH	Niihau*
Peucedanum sandwicense **(CH)**	Makou	T		✓CH		✓CH	✓CH	✓CH	
Phyllostegia glabra var. *lanaiensis*	Ulihi	E			✓*				
Phyllostegia haliakalae (listed as *Phyllostegia mollis*) **(CH)**	No common name	E		✓CH		✓*	✓*CH		

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Phyllostegia hirsuta (CH)	No common name	E					✓CH		
Phyllostegia hispida	No common name	E				✓			
Phyllostegia kaalaensis (CH)	No common name	E					✓CH		
Phyllostegia knudsenii (CH)	No common name	E						✓CH	
Phyllostegia mannii (CH)	No common name	E		✓*CH		✓CH			
Phyllostegia mollis	No common name	E					✓CH		
Phyllostegia parviflora var. *glabriuscula*	No common name	E	✓						
Phylostegia parviflora var. *lydgatei* (CH)	No common name	E					✓CH		
Phyllostegia parviflora var. *parviflora* (CH)	No common name	E		✓*			✓CH		
Phyllostegia pilosa (listed as *Phyllostegia mollis*)	No common name	E		✓CH		✓*CH			
Phyllostegia racemosa (CH)	Kiponapona	E	✓CH						
Phyllostegia renovans	No common name	PE						pCH	
Phyllostegia velutina (CH)	No common name	E	✓CH						
Phyllostegia waimeae (CH)	No common name	E						✓CH	
Phyllostegia warshaueri (CH)	No common name	E	✓CH						
Phyllostegia wawrana (CH)	No common name	E						✓CH	
Pittosporum napaliense	Hoawa	PE						pCH	
Plantago hawaiensis (CH)	Laukahi kuahiwi	E	✓CH						
Plantago princeps var. *anomala* (CH)	Laukahi kuahiwi	E						✓CH	
Plantago princeps var. *laxiflora* (CH)	Laukahi kuahiwi	E	✓*	✓CH		✓CH			
Plantago princeps var. longibracteata (CH)	Laukahi kuahiwi	E					✓CH	✓CH	
Plantago princeps var. princeps (CH)	Laukahi kuahiwi	E					✓CH		
Platanthera holochila (CH)	No common name	E		✓*CH		✓	✓*CH	✓CH	
Platydesma rostrata	Pilo kea lau lii	PE						pCH	
Pleomele hawaiiensis (CH)	Hala pepe	E	✓CH						
Poa mannii (CH)	No common name	E						✓CH	
Poa sandvicensis (CH)	No common name	E						✓CH	
Poa siphonoglossa (CH)	No common name	E						✓CH	
Portulaca sclerocarpa (CH)	Po`e	E	✓CH		✓CH				
Pritchardia affinis	Loulu	E	✓						
Pritchardia aylmer-robinsonii	Wahane	E							Niihau
Pritchardia hardyi	Loulu	PE						pCH	
Pritchardia kaalae	Loulu	E					✓		
Pritchardia munroi	Loulu	E				✓			
Pritchardia napaliei	Loulu	E						✓	

HAWAIIAN ISLANDS PLANTS: Updated April 9, 2009
LISTED SPECIES, AS DESIGNATED UNDER THE U.S. ENDANGERED SPECIES ACT

Species status by island: E= endangered; T= threatened; P= formally proposed as E or T;
(CH)=critical habitat designated; pCH=critical habitat proposed ;*=possibly extirpated in the wild.
‡=N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes.

		STATUS	DISTRIBUTION						
			Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and Ni'ihau
Pritchardia remota **(CH)**	Loulu	E							Nihoa CH
Pritchardia schattaueri	Loulu	E	✓						
Pritchardia viscosa	Loulu	E						✓	
Psychotria grandiflora	Kopiko	PE						pCH	
Psychotria hobdyi	Kopiko	PE						pCH	
Pteralyxia kauaiensis **(CH)**	Kaulu	E						✓CH	
Pteris lidgatei **(CH)**	No common name	E		✓CH		✓*CH	✓CH		
Remya kauaiensis **(CH)**	No common name	E						✓CH	
Remya mauiensis **(CH)**	No common name	E		✓CH					
Remya montgomeryi **(CH)**	No common name	E						✓CH	
Sanicula mariversa **(CH)**	No common name	E					✓CH		
Sanicula purpurea **(CH)**	No common name	E		✓CH			✓CH		
Santalum freycinetianum var. *lanaiense*	'Iliahi	E		✓	✓				
Scaevola coriacea	Dwarf naupaka	E	✓*	✓	✓*	✓	✓*	✓*	Niihau*
Schiedea adamantis	No common name	E					✓		
Schiedea apokremnos **(CH)**	No common name	E						✓CH	
Schiedea attenuata	No common name	PE						pCH	
Schiedea haleakalensis **(CH)**	No common name	E		✓CH					
Schiedea helleri **(CH)**	No common name	E						✓CH	
Schiedea hookeri **(CH)**	No common name	E		✓*			✓CH		
Schiedea kaalae **(CH)**	No common name	E					✓CH		
Schiedea kauaiensis **(CH)**	No common name	E						✓CH	
Schiedea kealiae **(CH)**	No common name	E					✓CH		
Schiedea lanii	No common name	E				✓CH			
Schiedea lychnoides (listed as *Alsinidendron lychnoides*) **(CH)**	Kuawawaenohu	E						✓CH	
Schiedea lydgatei **(CH)**	No common name	E				✓CH			
Schiedea membranacea **(CH)**	No common name	E						✓CH	
Schiedea nuttallii **(CH)**	No common name	E		✓*		✓	✓CH		
Schiedea obovata (listed as *Alsinidendron obovatum*) **(CH)**	No common name	E					✓CH		
Schiedea perlmanii (listed as *Schiedea nuttallii*) **(CH)**	No common name	E						✓CH	
Schiedea sarmentosa **(CH)**	No common name	E				✓CH			
Schiedea spergulina var. *leiopoda* (listed as *Schiedea spergulina*) **(CH)**	No common name	E						✓CH	
Schiedea spergulina var. *spergulina* (listed as *Schiedea spergulina*) **(CH)**	No common name	T						✓CH	
Schiedea stellarioides **(CH)**	Laulihilihi	E						✓CH	
Schiedea trinervis (listed as *Alsinidendron trinerve*) **(CH)**	No common name	E					✓CH		

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		STATUS	DISTRIBUTION						
			Hawai'i	Maui	Läna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and Ni'ihau
Schiedea verticillata **(CH)**	No common name	E							Nihoa CH
Schiedea viscosa (listed as *Alsinidendron viscosum*) **(CH)**	No common name	E						✓CH	
Sesbania tomentosa **(CH)**	'Ohai	E	✓CH	✓CH	✓	✓CH	✓CH	✓CH	K, Niihau*, Nc.
Sicyos alba **(CH)**	'Anunu	E	✓CH						
Silene alexandri **(CH)**	No common name	E				✓CH			
Silene hawaiiensis **(CH)**	No common name	T	✓CH						
Silene lanceolata **(CH)**	No common name	E	✓CH		✓*	✓CH	✓CH	✓*	
Silene perlmanii **(CH)**	No common name	E					✓*CH		
Solanum incompletum **(CH)**	Popolo ku mai	E	✓CH	✓*	✓*	✓*		✓*	
Solanum sandwicense **(CH)**	Popolo 'aiakeakua	E					✓*CH	✓CH	
Spermolepis hawaiiensis **(CH)**	No common name	E	✓CH	✓CH	✓	✓*CH	✓CH	✓CH	
Stenogyne angustifolia (listed as *Stenogyne angustifolia var. angustifolia*)	No common name	E	✓	✓*		✓*			
Stenogyne bifida **(CH)**	No common name	E				✓*CH			
Stenogyne campanulata **(CH)**	No common name	E						✓CH	
Stenogyne kanehoana **(CH)**	No common name	E					✓CH		
Stenogyne kealiae	No common name	PE						pCH	
Tetramolopium arenarium ssp. *arenarium* (listed as *Tetramolopium arenarium*)	No common name	E	✓	✓*					
Tetramolopium arenarium ssp. *laxum* (listed as *Tetramolopium arenarium*)	No common name	E		✓*					
Tetramolopium arenarium var. *arenarium* (listed as *Tetramolopium arenarium*)	No common name	E	✓	✓*					
Tetramolopium arenarium var. *confertum (listed as Tetramolopium arenarium)*	No common name	E	✓						
Tetramolopium capillare **(CH)**	No common name	E		✓*CH					
Tetramolopium filiforme var. *filiforme* (listed as *Tetramolopium filiforme*) **(CH)**	No common name	E					✓CH		
Tetramolopium filiforme var. *polyphyllum* (listed as *T. filiforme*) **(CH)**	No common name	E					✓CH		
Tetramolopium lepidotum ssp. *lepidotum* **(CH)**	No common name	E			✓*		✓CH		
Tetramolopium remyi **(CH)**	No common name	E		✓*CH	✓CH				
Tetramolopium rockii var. *calcisabulorum* (listed as *Tetramolopium rockii*) **(CH)**	No common name	T				✓CH			
Tetramolopium rockii var. *rockii* (listed as *Tetramolopium rockii*) **(CH)**	No common name	T				✓CH			
Tetraplasandra bisattenuata	No common name	PE						pCH	
Tetraplasandra flynnii	No common name	PE						pCH	
Tetraplasandra gymnocarpa **(CH)**	'Ohe'ohe	E					✓CH		
Trematolobelia singularis **(CH)**	No common name	E					✓CH		
Urera kaalae **(CH)**	Opuhe	E					✓CH		
Vicia menziesii	Hawaiian vetch	E	✓						
Viola chamissoniana	No common name	E	✓CH	✓CH	✓	✓	✓*CH		K, Niihau*
Viola chamissoniana **(CH)**	'olopu; pamakani	E					✓CH		

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		STATUS	DISTRIBUTION						
			Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and Ni'ihau
Viola helenae **(CH)**	No common name	E						✓CH	
Viola kauaensis var. *wahiawaensis* **(CH)**	Nani wai'ale'ale	E						✓CH	
Viola lanaiensis	No common name	E			✓				
Viola oahuensis **(CH)**	No common name	E					✓CH		
Wilkesia hobdyi **(CH)**	Iliau	E						✓CH	
Xylosma crenatum **(CH)**	No common name	E						✓CH	
Zanthoxylum dipetalum var. *tomentosum* **(CH)**	A'e	E	✓CH						
Zanthoxylum hawaiiense **(CH)**	A'e	E	✓CH	✓CH	✓*	✓CH		✓CH	

APPENDIX E Conservation

ORDINANCE NO. _____

BILL NO. _____

A BILL FOR AN ORDINANCE AMENDING TITLE 14
MAUI COUNTY CODE, RELATING TO WATER CONSERVATION

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI

SECTION 1. Section 14.03., Maui County Code, is amended to read as follows:

DRAFT

Chapter 14.03

WATER CONSERVATION

Sections:

14.03.10 Policy Statement

I. 1. Findings

The Maui County Council has found that:

A. The limited supply of County waters are subject to ever increasing demands

B. Maui County is growing in population, and it is important to implement water conservation measures now in order to stretch supplies as long as possible.

C. Maui County's economic prosperity depends upon adequate water supply.

D. Studies have shown that landscape accounts for about fifty percent of all water used in urban areas. Water conserving landscapes can use as little as one third of the water of a traditional non-water-conserving landscape. These savings can be substantial, if projected through the life of a development.

E. Water conservation will save money and can be accomplished without degradation of aesthetic values.

F. State and County policy and Community Plans promote conservation and efficient use of water.

G. Landscapes provide recreation areas, cleaner air and water, prevent erosion, offer fire protection and help to partially replace ecosystems where these have been displaced by development

H. Landscape design, installation and maintenance can and should be water efficient.

I. The high cost of living in Hawaii and the even higher cost of living in Maui leaves our community with less capital for development of new water resources. Water conservation can reduce competition for capital which could otherwise be spent on proper system maintenance and other priorities.

J. Proper landscape conservation prevents waste of drinking water by inefficient use in the landscape.

II. Purpose and Intent

A. Promote the values and benefits of landscapes while recognizing the need to invest water and other resources as efficiently as possible;

B. Establish a structure for designing, installing and maintaining water efficient landscapes in new and refurbished projects;

C. Establish provisions for water management practices and water waste prevention for established landscapes.

D. Reduce supplemental water use through climate-based plant material choices, design, irrigation scheduling, and soil management.

E. Promote the conservation of potable and non-potable water by encouraging the preservation of appropriate native plant communities, the use of site-specific

plant materials and to establish techniques for installation and maintenance of landscape materials and irrigation systems.

F. Improve the aesthetic appearance of commercial, industrial and residential areas through the incorporation of appropriate landscape features into development in ways that harmonize and enhance the built environment.

G. Preserve the native and endemic vegetation of the island while encouraging the removal and discouraging the use of species which can damage the watershed or cause other nuisance.

H. Encourage the utilization of readily available water conserving technology to maximize resource efficiency.

D. This Chapter shall be known as the Water Conservation Plan Ordinance

E. The Director of Water Supply shall adopt rules as appropriate to implement the provisions of this section.

14.03.020 Water Conservation Plan *(from council)*

A. The Department of Water Supply shall maintain and periodically update a water conservation plan and program. This plan include regulatory and non-regulatory elements such as prevention of water waste, measures to reduce outdoor water use, measures to insure efficient use of water within the distribution system, measures to maximize plumbing efficiency and other measures as deemed appropriate. The council shall enact regulatory elements of the water conservation plan by ordinance.

B. The regulatory elements of the water conservation plan shall include as a minimum water use regulations relating to outdoor watering, provisions for prevention of water waste, plumbing efficiency and water reuse, as well as provisions to enable budgeting and implementation for non-regulatory measures as deemed appropriate.

C. The Department of Water Supply shall provide to council an annual report on the implementation and effectiveness of its conservation program.

D. The Department's Water Use, Development and Protection Plan shall include analysis of the costs and benefits of implementing various demand and supply side measures, and the conservation program shall be updated accordingly.

E. Private purveyors of water utilizing or conveying more than ½ MGD (500,000 gallons per day) shall be required to maintain and periodically update a water conservation plan and program, to include as a minimum provision for maximizing efficiency and minimizing water waste. A summary of this conservation plan and program shall be submitted and held on file with the Department of Water Supply.

F. Operators of facilities or large landscapes requiring the use of 250,000 gallons per day or more shall also be required to maintain and periodically update a water conservation plan and program, which shall include a description of the water use, and measures instituted to maximize

efficiency and minimize waste. A summary of this conservation plan and program shall be submitted and held on file with the Department of Water Supply.

14.03.030 Landscape Conservation

A. General Provisions

1. Periodic Update of Regulations

The Department of Water Supply, after consulting with and considering the recommendations of interested agencies, may from time to time propose to the Administration, Board and Council regulations to establish additional or revised procedures to implement this chapter, and to make more specific the standards and guidelines prescribed in this chapter. Such regulations as are approved by resolution of the Council shall have the force and effect of law unless otherwise indicated.

2. Definitions

The words used in this ordinance have the meaning set forth below:

Agricultural Operation	A business venture in which crops are grown for the purposes of earning a livelihood, as represented and claimed on federal and state tax forms, or a subsistence operation of sufficient size and scope to support the residents of the property on which the agricultural activities take place. A few orchard trees or a vegetable garden do not constitute an agricultural operation.
Amendment	Materials added to the soil, such as compost, leaf mold, peat moss, ground bark or other materials, which improve aeration and percolation of clay soils and may help hold water in sandy soils.
Anti-drain Valve or Check Valve	A valve located under a sprinkler head to hold water in the system so it minimizes drainage from lower elevation sprinkler heads.
Application Rate	The depth of water applied to a given area, usually measured in inches per hour.
Athletic Field	A turf area used primarily for organized sports.
Automatic Control Valve	A device used to control the flow of water at a particular section of the irrigation system.
Automatic Controller	A mechanical or solid state timer, capable of operating valve stations to set the days and length of time of a water application.

Backflow Prevention Device	A safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system.
Bubblers	Irrigation heads which deliver water to the soil adjacent to the heads.
Check Valve	A valve located under a sprinkler head to hold water in the system so it minimizes drainage from the lower elevation sprinkler heads.
Controller	A device that operates each irrigation zone for a determined time and frequency, based upon irrigation schedule or in some cases feedback of soil moisture content or climatic conditions.
Covenants	Agreements entered into by property owners, leaseholders and renters, which set conditions for the use, maintenance and or sale of property.
Damaged Land Reclamation Project	A parcel or parcels of land which are the subject of plans or efforts to restore or reclaim ecological or other values after that land has been quarried, mined or used for other purposes disruptive to the natural landscape. Such project may have the goals of restoring a site to a condition similar to or compatible with that which existed prior to such use, or to develop the site to some other productive use of the land; to restore forests, pasture, crops, wildlife area, or etc. However, exemptions under this ordinance, shall not apply to projects or efforts to develop a site for subsequent development/construction.
Development	The construction, erection or emplacement of one or more buildings, structures, or surface improvements on land which is a premise in order to establish or expand a principal residential or non-residential use.
Distribution Uniformity	Measure of the uniformity of irrigation water applied over a given area. Sometimes calculated based on the ratio of the average low quarter depth of irrigation water compared to the average depth of irrigation water applied.
Drip Emitter	An irrigation emission device that delivers a measured reduced quantity of water at a consistent rate of discharge.

Drip Irrigation	Low pressure, low volume irrigation applied slowly near or at ground level to minimize runoff and loss to evaporation.
Ecological Restoration Project	A project intended for the restoration of a native ecosystem or area, and not intended for continued irrigation.
Emitter	Drip irrigation fittings that deliver water slowly from the system to the soil.
Established Landscape	The point at which plants in the landscape have developed roots into the soil adjacent to the root ball.
Establishment Period	The period until the plants in the landscape have developed roots in the soil adjacent to the root ball. Generally the first year after installing a plant in the landscape.
ET Controller	Controller that automatically adjusts the watering time and frequency based on local weather conditions such as rain, wind, heat, or estimated evaporation and transpiration rates.
Evapotranspiration	The quantity of water evaporated from adjacent soil surfaces and transpired by plants during a specific time.
Flow Rate	The rate at which water flows through pipes and valves.
Flow Restriction Device	Device applied by the water utility to the customer's meter that restricts the volume of flow to the customer.
Fugitive Water	The pumping, flow, release, escape or leakage of any water from any pipe, valve, faucet, connection, diversion, well or any facility for the purpose of water supply, transport, storage, disposal or delivery to adjacent property or the public right-of-way.
Hand Watering	The application of water for irrigation purposes through a hand-held hose, including hoses moved into position by hand and left to flow freely or through a shut-off nozzle.

Heritage Plants	Any plant or group of plants which meet one or more of the following criteria: 1) having a relationship to an event of cultural or historical significance, 2) is deemed of public interest or special interest by the County's Arborist Committee ? ; 3) a tree having a circumference of 72"; 4) a native species which is classified as rare, endangered , threatened or species of concern, 5) other criteria?
High Water Use Turf	A surface layer of earth containing regularly mowed grass, with its roots, which requires large volumes and or frequent application of water throughout its life. High water use grasses include but are not limited to varieties of bluegrass, varieties of ryegrass, varieties of fescue and bent grass.
High Water Use Plants	High-water-using plants are characterized by high transpiration rates, shallow rooting, and the need for frequent watering. Refer to the Maui County Planting Plan and/or DWS list of plants.
Hydrozone	A portion of the landscaped area having plants with similar water needs that are served by a valve or set of valves with the same schedule. A hydrozone may be irrigated or non-irrigated, but should have similar characteristics in terms of water needs of the plants, precipitation rate of irrigation devices, solar radiation, wind conditions, soil type and slope. A naturalized area planted with native vegetation that will not need supplemental irrigation once established is a non-irrigated hydrozone.
Irrigation Audit	Procedure to collect and present information concerning the design, maintenance, uniformity of application rate, precipitation rate, efficiency, and general condition of an irrigation system and its components.
Infiltration Rate	The rate of water entry into the soil expressed as a depth of water per unit of time in inches per hour.
Irrigation	Intentional application of water for purposes of sustained plant growth and/or optimized production.
Irrigation Efficiency	The measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices.
Landscape Irrigation	A process to perform site inspections, evaluate irrigation systems,

Audit	and develop efficient irrigation schedules.
Landscaped Area	The entire parcel less the building footprint, driveways, non-irrigated portions of parking lots, hardscapes (such as decks and patios), and other non-porous areas. Includes the public right-of-way. Water features are included in the calculation of the landscaped area.
Lateral Line	The water delivery pipeline that supplies water to the emitters or sprinklers from the valve. (this definition applies to landscape irrigation only)
Low Head Drainage	A condition in which water siphons out of the lowest head in a sprinkler zone after watering is completed. When the water flow to the zone has been shut off at the end of its cycle, the remaining water in the lines will drain downhill to the lowest point. If a sprinkler head is located in the lowest part of the system, water will flow out of that head until an equilibrium has been reached or all of the water has emptied out of that zone's pipes. This can usually be corrected by adjustments to the system or installation of devices, called drain check valves, that can prevent low head drainage
Low Water Use Plants	Plants which are able to survive without supplemental water once established as specified in _____ plant list.
Main Line	The pressurized pipeline that delivers water from the water source to the valve or outlet. (this definition applies to landscape irrigation only)
Mature Landscape	The point at which plants in the landscape have developed roots into the soil adjacent to the root and are somewhat self-sufficient.
Mister	A device that produces a cooling effect by emitting fine particles of water into the air in the form of a mist.
Moisture Sensing Device	A device that measures the amount of water in the soil
Model Home	A dwelling built first by a developer to allow potential purchasers to see what the finished product will look like once the other homes in the development are completed.

Mulch	Any material such as leaves, bark, straw, wood chips or other materials applied to the soil surface to reduce evaporation.
New Development	Any development approved by Maui County after the effective date of this ordinance, including those developments which have received some approvals prior to the effective date of this ordinance but which have not aleady submitted all construction plans or constructed landscape improvements.
Operating Pressure	The pressure at which a system of sprinklers operates, usually indicated at the base of a sprinkler.
Overhead Sprinkler Irrigation System	A system in which water is distributed by overhead high-pressure sprinklers or guns or by lower-pressure sprays. A system utilizing sprinklers, sprays, or guns mounted overhead on permanently installed risers is often referred to as a solid-set irrigation system.
Overspray	Water which is delivered beyond the landscaped area, wetting pavements, walks, structures, or other non-target landscaped areas.
Percolation	The movement of water through the soil
Practical Turf Areas	The use of turf only in those areas of active play or recreation such as sports fields, school yards, picnic grounds, other areas with intense foot traffic, etc. These shall be planted with drought tolerant and non-invasive varieties of turf. Native grasses are encouraged.
Rain Sensing or Shut-off Device	A system which automatically shuts off the irrigation system when it rains
Recreational Area	An area devoted to active sports, play or picnicking, or to facilities and equipment for recreational purposes, swimming pools, tennis courts, playgrounds, community clubhouses, and other similar uses.
Recycled Water, Reclaimed Water, or Treated Effluent Water	Treated or recycled water of a quality suitable for nonpotable uses such as landscape irrigation, not intended for drinking.

Rotary Nozzle	A rotating, multi-stream, multi-trajectory rotating (MSMTR) sprinkler which distributes water in a number of individual streams of varying trajectories. This helps to uniformly distribute water throughout the radius range. Rotary nozzles are generally the size of the nozzles in fixed spray heads and thread onto pop-up heads just as spray nozzles do. They can also be threaded onto shrub adapters for installation onto risers. Rotary nozzles have variously cut nozzle openings that rotate during use to distribute the water more evenly throughout the watering pattern than spray heads. Rotary nozzles are designed to be installed on the risers of some of the most commonly used spray heads. They can be easily installed by simply unscrewing the existing spray nozzle and screwing on the rotary nozzle. Nozzle adjustment for radius or arc is a simple screw adjustment. The irrigation schedule can then be adjusted to reflect the lower precipitation rate and higher distribution uniformity. Rotary nozzles offer a low cost opportunity to improve the efficiency of many existing systems, particularly on smaller turf areas (approximately half an acre), which are among the highest water using (and wasting) sites. Water turns a small turbine (water wheel or fan) in the base of the unit which drives a series of gears that cause the head to rotate. The gear drive mechanism is sealed from dirt and debris. The nozzle can be installed on a spray head which normally uses conventional fixed pattern and variable arc spray nozzles. The rotary nozzle distributes the water in a pattern similar to a rotor head in the way that it rotates, compared to a normal spray nozzle which does not rotate. Due to their low precipitation rate, highly uniform distribution, and increased radius range, rotary nozzles can use less water than spray nozzles if the irrigation system is designed and installed properly. Rotary nozzles may be inserted into the body of the head after it has been installed. However, uniform and complete coverage depends selection of the appropriate nozzle for the area to be covered. Two different nozzles will cause the same rotary head to vary the distance of throw by 10 feet or more and increase water use by factors of two or three.
Run-off	Water which is not absorbed by the soils or landscape to which it is applied. For example, run-off may result from water that it applied at too great a rate (application rate exceeds infiltration rate) or when there is a severe slope. This section does not apply to stormwater run-off which is created by natural precipitation rather than human-caused or applied water use.
Shut-off Nozzle	Device attached to the end of a hose that completely shuts off the flow, even if left unattended.
Single Family	A lot or premise upon which is established one dwelling only. Of

Residential	the allowable principal uses, such use shall be the only use on that lot or premise.
Smart Controller	Controller that automatically adjusts the watering time and frequency based on soil moisture, rain, wind, evaporation and transpiration rates or plant type.
Soil Moisture Sensing Device	A device, usually either a tensiometer or conductivity based device, used for sensing moisture in soils, and for controlling irrigation systems based on soil moisture. By sensing actual moisture levels in soils, such devices can save water in systems which have been over-irrigating. Preventing over irrigation can increase turf health. The use of automated soil moisture sensors also save labor by eliminating the need for re-programming and temporary rain shut-offs thereby reducing both water and labor costs for owners.
Soil Texture	The classification of soil based on the percentage of sand, silt and clay in the soil
Spray Irrigation	The application of water to landscaping by means of a device that projects water through the air in the form of small particles or droplets.
Sprinkler Head	A device which discharges water through a nozzle.
Static Water Pressure	The pipeline or municipal water supply pressure when water is not flowing.
Station, Circuit or Zone	An area served by one valve or by a set of valves that operate simultaneously.
Temporary Irrigation System	Irrigation systems which are installed and permanently disabled within a period of 36 contiguous months.
Turf	A surface layer of earth containing mowed grass with its roots. Annual bluegrass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and Tall fescue are cool-season grasses. Bermuda grass, Kikuyu grass, Seashore paspallum, St. Augustine grass, Zoysia grass, and Buffalo grass are warm-season grasses.
Uniformity	Describes how evenly water is applied over a given area.

Useable Precipitation or Effective Rainfall	The amount of precipitation that contributes to the water needs of plants. Irrigation scheduling should be adjusted to reflect useable precipitation.
Valve	A device used to control the flow of water in the irrigation system.
Water Conservation Concept Statement	A one page checklist and narrative summary of the project as shown in section _____.
Warm Season Turf	Turf grasses which need warm weather to germinate and grow. Warm season grasses can generally tolerate drought conditions due to root systems which tend to be deeper and more extensive than the root systems of cool season grasses. Zoysia grass, Bermuda grass, St. Augustine grass and other grasses are examples of warm season grasses. See also Turf, above.
Water Waste	The non-beneficial use of water. Non beneficial uses include but are not limited to: 1) landscape water which is applied in such a manner rate and or quantity that it overflows the landscaped area being watered and runs onto adjacent property or public right-of-way; 2) landscape water which leaves a sprinkler, sprinkler system or other application device in such a manner or direction as to spray onto adjacent property or public right-of-way; 3) washing of vehicles, equipment or hard surfaces such as parking lots, aprons, pads, driveways or other surfaced areas when water is applied in sufficient quantity to flow from that surface onto adjacent property or the public right of way; 4) water applied in sufficient quantity to cause ponding on impervious surfaces.

3. Applicability

a.. This section shall apply to:

1. Water conservation landscape requirements shall apply to all new developments, excluding individual single family homes with irrigated area of less than 3,000 square feet.
2. New development or refurbishment projects involving more than two homes.
3. Common areas in new and retrofitted developments
4. Commercial, residential and industrial developments.
5. New development applications shall include landscape documentation packages which require final approval at the time of final project approval. Public parks, with the exception of turf requirements
6. Golf Courses, with the exception of turf requirements.
7. Cemeteries, with the exception of turf requirements.
8. School Grounds, with the exception of turf requirements.

b. This section shall not apply to

1. Non-irrigated landscapes, with the exception that provisions for prevention of run-off, overspray or other water waste shall still apply.
2. Landscapes that are irrigated entirely with reclaimed water.
3. Individual Home-owner provided landscaping of less than 3,000 square feet.
4. Home-owner provided landscaping of individual homes in areas where rainfall exceeds 50"/year.
5. Ecological restoration projects which do not require a permanent irrigation system
6. Damaged-land reclamation projects that do not require a permanent irrigation system.
7. Commercial or subsistence agricultural operations are exempt from provisions of this ordinance except that provisions for prevention of water waste and prohibition of nuisance plants still apply.

14.03.031 Site Design & Plant Selection

A. Hydrozones

1. Plants having similar water use shall be grouped together in different hydrozones.
2. Fire prevention shall be addressed in areas that are fire prone. Information about fire prone areas and appropriate landscaping for fire safety is available from <the Fire Department?

B. Turf Restrictions

1. The maximum allowed turf and or decorative water area (expressed as percent of planted area) shall be 20% for new industrial, commercial, institutional, and public or quasi-public developments, residential developments with common areas, residential lots greater than ¼ acre or located in areas that receive less than 50" of rain per year
2. If turf is an essential part of the development, such as playing fields for schools or public parks, a higher percentage will be allowed, and will be evaluated on an individual basis.
3. No turf shall be allowed in median strips or in areas less than 8' wide.
4. Turf grass perimeters shall be minimized to improve irrigation efficiency. Long narrow strips of turfgrass such as traffic medians and areas between curbs and sidewalks are not permitted, unless the turf selected requires no more water than a low-water use groundcover.
5. No turf shall be allowed in median strips less than 8 feet wide.
6. To minimize runoff, turf shall not be utilized on slopes exceeding 10%.
7. Public parks, golf courses, cemeteries, school grounds and playing fields are exempted from turf limitations.
8. Parks, golf courses, cemeteries, school grounds, and sports fields, though exempt from turf limitations, shall in no circumstance have water requirements that exceed those which would result if the area were planted in 100% warm season turf.

C. Plant Materials

1. Plants shall be selected appropriately based upon their adaptability to the climatic,

geologic and topographical conditions of the site.

2. The planting of trees is encouraged wherever it is consistent with other provisions of this ordinance.
3. Protection and preservation of native species and natural vegetation are encouraged. Wherever practical, native species adapted to the natural rainfall of the area should be selected. Guidance may be found in the Maui County Planting Plan, list additional sites ??, the Department of Water Supply's (landscape brochure, website - or list sites hear, UH, Maui Nui Botanical Garden etc. ?)
4. 85% of the plants in non-turf areas shall be well suited to the natural climatic conditions of the subject area, and require little additional water.
5. No more than ten percent of the plants selected for non-turf areas may be considered high-water use plants.
6. Nothing in this or any other section of this ordinance shall compel removal of heritage plants.
7. Parks, Golf Courses, Cemeteries, and School Grounds, though exempt from turf restrictions applying to other landscapes, shall use drought tolerant turf species and shall use low-water use plants as much as possible.
8. The use of plants listed as nuisance species in either the Maui County Planting Plan, DWS Plant Brochure, Hawaiian Ecosystems At Risk, list of priority species for removal by the Maui Invasive Species Committee, or other list of nuisance species is prohibited. Landscapes shall conform with the provisions of under HRS chapter 152 and HAR Title 4 Subtitle 6 Chapter 68 referring to noxious weeds.
9. Groundcovers other than lawns shall be used on slopes exceeding 10% to reduce runoff

D. Ornamental Water Features (Fountains, Ponds, Pools, Others)

1. Water bodies that are part of the landscaping for new and rehabilitated developments shall be restricted and subject to permit, except where such water bodies are integral to the operations of the development.
2. Decorative water bodies in which potable water is sprayed into the air shall be discouraged.
3. Recirculating water shall be used for decorative water features.
4. Outdoor fountains shall be equipped with wind shutoff valves.
5. Outdoor fountains shall be equipped with rain shutoff controls.
6. Outdoor fountains shall be equipped with automated timers.
7. All ornamental uses of water in the common areas of projects - such as ponds, lakes and fountains - shall be supplied, operated and maintained with alternative sources of water, such as reclaimed water, brackish water, or cooling tower water if they are available.
8. Natural water features are not restricted, but should be clearly identified in the landscape design.
9. Covers for pools and spas are encouraged.

E. Soils & Grading

1. Soil types and infiltration rates shall be considered when designing irrigation systems.
2. Design should include soil analysis to determine
    a. Soil texture, indicating the percentage of organic matter
    b. Approximate soil infiltration rate (measured or derived from soil infiltration rate tables)
    c. pH
    d. Measure of total soluble salts
    e. Grading shall be minimized to avoid soil compaction
    f. Where topsoil layers are thin, mulch shall be added to the soil surface after planting.
    g. Non-porous material shall not be placed under mulch amendments.

14.03.033 Water Source Selection

A. Recycled Water

1. The installation of recycled water irrigation systems shall be required for new developments wherever a reclaimed water distribution system has been installed and can be used in compliance with regulatory requirements, in accordance with 20.30.010 or 14. (reclaimed water provisions) unless a written exemption has been granted and signed by the Departments of Public Works and Water Supply. (revise to match current reclaimed water code)
2. Recycled water irrigation systems shall be designed and operated in accordance with all State and County codes.

B Irrigation systems in commercial, industrial, hotel and motel developments shall make use of recycled or brackish water unless a written exemption has been granted by the County Department of Public Works & Waste Management, stating that non-potable water meeting all health standards is not available and will not be available in the foreseeable future.

C. Notwithstanding other provisions of this section, non-potable water shall be used for irrigation of Golf Courses, according to the provisions of Maui County Code §20.24 or §14.08(reserved).

14.03.034 Equipment

A. . Automatic irrigation systems shall be used for landscapes in which the irrigated area exceeds 2 acres.

B. All irrigation systems shall be equipped with a controller capable of dual or multiple programming for separation of turf and non-turf areas, multiple cycle capabilities and flexible calendar programming.

C. All irrigation controllers shall be equipped with a water percent adjustment feature.

D. Irrigation controllers shall be equipped with a rain shutoff device.

E. All automatically controlled irrigation systems shall utilize SMART controllers capable of responding appropriately for each lawn circuit.

F. Drip systems shall be constructed of non-corrosive materials.

G. Drip irrigation systems shall be utilized wherever trees, shrubs or groundcovers are irrigated

H. Drip and bubbler irrigation systems shall not discharge water in excess of 1.5 gallons per minute per device.

I Irrigation systems shall be designed and equipment selected and maintained to provide a distribution uniformity not less than 85% for drip irrigation, 70% for rotors, and 60% for spray heads.

J Sprinkler heads shall be selected for proper area coverage, application rate, operating pressure, adjustment capability, and ease of maintenance.

K Sprinkler heads which are used on slopes exceeding 10% and which are located within 10 feet of any hardscape shall have a precipitation rate that does not exceed 0.85 inches per hour

L Pop-up sprinklers in turf areas shall be at least 4" high.

M Sprinkler head orientation and throw shall be designed to minimize run-off and overspray into non-irrigated areas.

N Large sprinkler zones shall be equipped with high uniformity rotary nozzles.

O Serviceable check valves are required where elevation differential may cause low head drainage.

P Any irrigation equipment located within 12" of pedestrian and vehicular use shall be located entirely below grade or otherwise adequately protected from potential damage.

Q Where pressure exceeds manufacturers recommendations, pressure regulating nozzles are required on spray heads.

14.03.035 Irrigation Scheduling

A. Irrigation scheduling shall incorporate the use of evapotranspiration data or soil moisture data to apply the appropriate levels of water for different climates and regions.

B. Landscape irrigation shall be scheduled between 7:00 P.M. and 10:00 A.M. to reduce evaporation losses.

C. Irrigation schedules shall be set according to plants actual water needs.

14.03.036 Prevention of Runoff, Overspray or Other Water Waste

A. Irrigation systems shall be designed, installed, operated and maintained so as to prevent run-off, overspray, or low-head-drainage, including but not limited to1 landscape water which is applied in such a manner rate and or quantity that it overflows or sprays the landscaped area being watered and runs onto adjacent property or public right-of-way; 2 washing of vehicles, equipment or hard surfaces such as parking lots, aprons, pads, driveways or other surfaced areas when water is applied in sufficient quantity to flow from that surface onto adjacent property or the public right of way; 3 water applied in sufficient quantity to cause ponding on impervious surfaces.

B. Proper irrigation equipment and schedules, including features such as repeat cycles, shall be used to closely match application rates to infiltration rates thereby minimizing runoff.

C. Sprays shall not be used in areas less than eight feet wide.

D. Water application per cycle shall match soil absorption rates. Avoid runoff by discontinuing the application of water as soon as it occurs. Watering in stages can allow water to soak in between applications, thus improving the efficiency of water use.

E. Conventional sprinklers shall not be used where the perimeter to area ratio (P/A) exceeds 0.25.

F. Drip, low volume spray, or high uniformity rotary nozzles should be used to minimize run-off.

G. Sprinkler heads with a precipitation rate of 0.85" per hour or less shall be used on slopes exceeding 15% to minimize run-off, or exceeding 10% within 8 feet of hardscape.

H. Turf grass perimeters shall be minimized to improve irrigation efficiency. Long narrow strips of turf grass such as traffic medians and areas between curbs and sidewalks are not permitted.

I. This ordinance is intended to prevent water waste, and is not intended to supersede existing County provisions regarding prohibition of Water Waste.

J. No property holder's association may establish criteria for landscaping that prohibit owners from removing turf grass and installing water-efficient landscape plants in compliance with these provisions.

K. Even where hand watering is employed, over-watering as evidenced by soggy soils, continually wet pavement, standing water, run-off into streets or other hardscape shall be prevented and shall be considered a violation of this ordinance.

14.03.037 Maintenance

A. . Landscapes shall be maintained to insure water efficiency. A regular maintenance schedule shall include but not be limited to checking, adjusting and repairing irrigation equipment; resetting or adjusting automatic controllers, aerating and dethatching turf areas, replenishing mulch, soil amending, fertilizing, pruning and weeding in all landscape areas.

B. Whenever possible, repair of irrigation equipment shall be done with the originally specified materials, their equivalents, or compatible materials of greater efficiency.

C. Repairs of leaks, breaks or malfunctioning equipment shall be made promptly. It shall be unlawful to allow leakage or other inefficient condition caused by equipment malfunction to continue beyond a reasonable time. For purposes of this section, a reasonable time shall not exceed 48 hours.

D. Leaking or faulty system elements shall be shut off until repairs can be made.

14.03.038 Monitoring, Meters, Audits, Certification

A Meters

1. Separate landscape water meters shall be installed for all projects except for single family homes or projects with a landscaped area of less than 10,000 square feet.

B Landscape Irrigation Audits & Certification

1. All new non-residential developments, or residential developments with common with landscaped and irrigated areas greater than 10,000 square feet are required to

have a landscape audit prior to (release of bond and) close of sale in which a certified irrigation designer or certified auditor shall conduct a final field observation and certify that the landscape has been designed in accordance with the provisions of this section. The certified irrigation designer or auditor shall specifically indicate that plants were installed as specified, that the irrigation system was installed as designed, that an irrigation audit has been performed, and provide a list of any observed deficiencies.

2. All existing landscaped and irrigated areas which exceed 10,000 square feet , and to which the County provides water including green belts, common areas, multi-family housing, schools, businesses, parks, cemeteries, hotels, motels, golf courses and publicly owned landscapes shall have a landscape irrigation audit at least once every five years. These audits shall reference and be in accordance with the standards set by the Irrigation Association.

14.03.039 Education, Incentives and Enforcement

A. Public Education

1. Information on conservation which is provided by County agencies during the permit process shall be provided by consultants and representatives to each affected applicant.
2. New development shall provide information to all buyers or long-term leaseholders regarding the design, installation and maintenance of water efficient landscapes.
3. If a residential development utilizes model homes during marketing, model homes must abide by the provisions of this section, including the use of non-invasive drought tolerant plants and a maximum of 20% turf or water area..
4. Signs shall be used to identify the water efficient landscape and featuring elements such as hydrozones, irrigation equipment and others which contribute to the overall water efficient theme.
5. Developers shall provide buyers with sample landscape plans using non-invasive plants adapted to the natural rainfall of the area.
6. The developer shall also provide information about water conservation by distributing pamphlets to buyers regarding this subject. Such pamphlets are now available from the Maui County Department of Water Supply and other agencies.

B Incentives

1. The Department of Water Supply may adjust its rate and fee structure as necessary to provide for landscape conservation incentives where these are anticipated to result in economically viable conservation savings.
2. The Department of Water Supply may withdraw incentive programs when these are deemed no longer effective or cost-beneficial.

C Enforcement

1. Inspection
    a. The County shall have the right to inspect new developments for compliance prior to granting final approvals.
    b. Inspection for new development or other inspection shall be carried out with due regard for the convenience and schedule of the owners, the privacy of the occupants, and shall be during business hours unless requested otherwise by the landscape owner and approved by the Department Director.
    c. Where consent to an inspection has been refused, or has been unobtainable within a reasonable period of time, OR where a report of violation has been made to the County, the County shall have the right to make un-announced inspection. Such inspection shall be during normal business hours and shall be conducted with due regard for the privacy of occupants.

2. Penalties
    a. Any responsible party found to violate the provisions of this ordinance shall be subject to progressively higher fees, leading to to County-installed flow restriction and ultimately to meter removal.
    b. In lieu of paying fees for first and second violations only, the responsible party may elect to have a landscape water audit performed by an authorized landscape irrigation auditor, (to be conducted in accordance with the current edition of the landscape auditors handbook). The audit must be performed within 30 days of the violation notice, and the recommendations of the audit must be implemented within 60 days of the violation notice. If these deadlines are met, the fees for violation will be waived. As of the third violation on a premise, the responsible party will be required to have an audit, implement the audit AND pay the fees.
    c. For the purposes of assessing fees or flow restriction for violations, any previous violation shall not be considered if a period of five years has elapsed since the last violation was incurred, or the property is acquired by a new owner.

14.03.040 Leak Detection and Prevention

A.. The Department shall monitor consumers' water consumption and issue high consumption notices to customers when warranted.

B. The Department shall maintain a leak detection program.

C. The Department shall prioritize the replacement of old and leak-prone mains

D. The Department shall assist residents and businesses in detection and prevention of leaks through education, distribution of tablets to detect toilet leaks, or other measures as approrpriate.The department shall encourage members of the public to report water leaks.

14.03.050 Water Waste Prohibitions

A. No person, firm, corporation or government agency shall waste, cause or permit to be wasted any water.

B. No person, firm, corporation or government agency shall cause or permit the flow of fugitive water onto adjacent property or public right of way, except as resulting from fire-fighting, system flushing or other public need or public facilities maintenance need.

C. No person, firm, corporation or government agency shall utilize potable water for construction dust control.

D. No person, firm, corporation or government agency shall utilize misters except as specifically permitted.

E. Washing of sidewalks, walkways, driveways, parking lots and other hard-surfaced areas by direct hosing of potable water is hereby prohibited, except as may be necessary and appropriate under other regulations specifically to dispose of flammable or otherwise dangerous liquids or substances, or otherwise necessary to prevent or eliminate dangers to public health and safety.

F. The escape of water through breaks or leaks within the customer's plumbing or distribution system for any substantial period of time within which the break or leak should reasonably have been discovered and corrected. It shall be presumed that a period of 48 hours after the customer discovers the break or leak is a reasonable time within which to correct the break or leak.

G. Use of any irrigation in a manner that does not comply with 14.03.030-039 of this chapter is hereby prohibited.

H. Other provisions of this section notwithstanding, the use of water for required flushing to maintain water quality, and for fire training operations as needed is allowed.

14.03.060 Fixture & Facility Performance Standards

14.03.061 General

A. Purpose

The purpose of this section is to reduce unnecessary water consumption, sewer flows and energy use by establishing water conserving standards for plumbing fixtures. Several types of fixtures and appliances for bathroom, kitchen, laundry, cooling and other uses can reduce water consumption and hot water heating needs. The purpose of this section is to provide minimum standards for such appliances, to insure efficient use of water in accordance with the national energy policy act and chapter 16.2 of the Maui County Code.

B. Applicability

1. This section shall apply to
    a. All new structures

b. Retrofit or renovation of existing structures
c. Structures which are undergoing transfer of ownership

2. This section shall not apply to showers faucets or other fixtures which require a higher flow for safety reasons, such as safety showers for hazardous materials removal or etc.

C. Periodic Update

The Department of Water Supply, Department of Environmental Management or Planning Department DSA, after consulting with and considering the recommendations of interested agencies, may from time to time propose to the Administration, Board and Council updates to standards and guidelines prescribed in this chapter. Such regulations as are approved by resolution of the Council shall have the force and effect of law unless otherwise indicated.

D. Conformance with Maui County Code Chapter 16.2 and Uniform Plumbing Code Chapter 10

Low flow fixtures in accordance with Maui County Code 16.20 and chapter 10 of the Uniform Plumbing Code, are hereby required.

14.04.062 Performance Standards

The following performance standards shall apply to all new construction and to replacement of fixtures.

A. The flow rate of toilets shall not be greater than 1.6 gallons per flush.

(US Energy Policy Act) Toilets with a flow rate equal to or less than 1.28 gallons per flush are encouraged, and rebate programs will not be issued for toilet replacement over the 1.28 gpf average recommended by LEED. (US Green Building Council Leadership in Energy and Environmental Design, as well as by EPA Water Sense)

B. The flow rate of showerheads shall not exceed 2.5 gpm at 80 psi or 2.2 gpm at 60 psi (or 1.5)

C. The flow rate of Kitchen Faucets shall not exceed 2.5 gpm at 80 psi, nor 2.2 gpm at 60 psi

D. The flow rate of Bathroom Faucets shall not exceed 2.5 gpm at 80 psi, nor 2.2 gpm at 60 psi (1.5, 1.2, 1 also available and rquired in some places)

E. The flow rate of Urinals shall not exceed 1 gpm (waterless urinals are also available and encouraged ?)

F. Residential Dishwashers shall require no more than 7 gallons per load (? 6.5 by 2011, 6.25 by 2016, 6 by 2025 ?) (Oregon rebates 6.5 or less now) (National Appliance Energy Conservation - Vickers 2001 - check ref- 4.5)

G. Commercial Dish Washers

1. Pre-Rinse Spray Valves on new Commercial dishwashers shall have a flow rate of equal to or less than 1.6 gpm at 60 psi. (Calif code Ttle 20 division 2 chapter 4 article 4 §1605.3) (1.6 - 2.65 at 80 available per a different article)

2. Ware Washing units shall have flow rates of less than 1 gallon per rack

H. Residential Clothes Washers shall have a water factor of 5 or less, and use no more than 27 gallons per load.

(Old washers use4d 32-59 gallons per load, current efficient washers can use 18-25 gallons per load) (Calif code 8.5 effective jan 1, 07)

I. Commercial Clothes Washers shall have a maximum water factor of 9.5 (Effective in California code Jan 1, 2007) (now can be less - 6 or lower)

J. Tunnel washers should have a maximum water factor of 2.

K. Cooling

1. In accordance with §14.25A.040 of the Maui County Code, discharge of cooling system water to the public wastewater system is prohibited, except in cases where reclaimed water is used, or when cooling water is utilized in another on-site process.
2. New water cooling systems must recirculate water. Installing a new non-recirculating (also known as single-pass or once-through) cooling system is prohibited.
3. Commercial Ice makers shall either utilize air or if water is utilized, shall be equipped with re-circulating closed loop chilled water.
4. Evaporative coolers and other cooling systems shall be maintained properly so as to prevent un-necessary overflow into drain lines.

L. Process Water

1. All uses of water for cooling, irrigation, or commercial or industrial processes that exceed 20,000 gallons per day shall be separately metered.
2. New commercial car wash facilities shall recirculate and reuse a minimum of seventy five percent of wash and rinse water.

14.03.063 Submetering Multi-family and Multi-use buildings

All new multifamily and multi-use commercial structures shall be constructed so as to provide for the measurement of water use in each unit through submeters (owned by the property owner) or individual meters (owned by the Utility).

14.03.070 Retrofit on Resale Provisions

A. Definitions

The following definitions are applicable to this section only

Bathroom Alteration	means any alteration of or addition to a bathroom in any structure which would require a plumbing permit for replacement of a toilet.
Bathroom Alteration Retrofit Certificate	means a certificate that certifies that any responsible person who has completed a bathroom alteration has replaced any existing plumbing fixture in the altered bathroom with a water-conserving plumbing fixture.

Change of Ownership	means a transfer, sale, or exchange of the fee interest in any real property.
Existing Plumbing Fixture	means the following: (1) any toilet manufactured to use more than 1.6 gallons of water per flush; (2) any urinal manufactured to use more than one gallon of water per flush; (3) any showerhead manufactured to have a flow capacity of more than 2.5 gallons of water per minute; (4) any faucet that emits more than 2.2 gallons of water per minute; or (5) any residential reverse osmosis system that does not have a shutoff valve.
Existing Structure	means either of the following: (1) any structure served by the County of Maui and equipped with toilets manufactured to use more than 1.6 gallons of water per flush, or urinals manufactured to use more than 1 gallon of water per flush; or (2) any structure served by the County of Maui and equipped with showerheads that have a flow capacity of more than 2.5 gallons of water per minute, faucets that emit more than 2.2 gallons of water per minute, or residential reverse osmosis systems that do not have a shutoff valves.
Retrofit	means to replace any existing plumbing fixture in an exiting structure with a water-conserving plumbing fixture.
Transfer of Responsibility Certificate to Retrofit	means a certificate filed by a transferor of any existing structure before a change of ownership that certifies that the transferor and the transferee mutually agree that responsibility for compliance with this Section is assumed by the transferee of the existing structure.
Low Flush Toilet Rebate Program	means a County-sponsored water conservation program that offers a financial incentive to water customers who replace a toilet that is manufactured to use more than or equal to 1.6 gallons of water per flush with a toilet manufactured to use less than 1.6 gallons of water per flush.
Water Conservation Certificate	means a certificate filed by a transferor or transferee of any structure or existing structurebefore a change of ownership that certifies any structure or existing structure is equipped or retrofitted only with water-conserving plumbing fixtures or toilets manufactured to use no more than 1.6 gallons of water per flush.
Water Conserving Plumbing Fixture	means: (1) any toilet manufactured to use no more than 1.6 gallons of water per flush, tha meets performance standards established by American Societyof Mechanical Engineers Standards A112.19.2-1990 and A112.19.6-1990;

(2) any urinal manufactured to use no more than 1 gallon of water per flush, that meets performance standards established by American Society of Mechanical Engineers Standards A112.19.2-1990 and A112.19.6-1990;
(3) any showerhead manufactured to have a flow capacity of no more than 2.5 gallons of water per minute;
(4) any faucet that emits no more than 2.2 gallons of water per minute; or
(5) any residential reverse osmosis system that has a shutoff valve.

B. Requirements for Retrofit upon Change of Ownership

1. Before a change of ownership, the transferor of any existing structure shall replace any existing plumbing fixture with a water-conserving plumbing fixture.
2. Before a change of ownership, the transferor and the transferee of any existing structure may agree to transfer responsibility for compliance with this section to the transferee. If the transferee assumes responsibility for retrofitting, the transferee shall complete the retrofit within at least 90 calendar days of the change of ownership.
3 The transferor and the transferee of any existing structure may agree to have compliance with this section included as a condition of escrow, have the responsibility for retrofitting assumed by the transferee, and have the retrofit paid for from the proceeds of the sale of the existing structure.
4. If the transferor and the transferee agree to have compliance with this section included as a condition of escrow, the escrow agent shall retain a sufficient sum of money, agreed upon by the transferor and the transferee, to be retained from the proceeds of the sale to complete the retrofit.
5. The transferee shall complete the retrofit within at least 90 calendar days of the close of escrow.
6. After the transferee has completed the retrofit, the transferee shall submit proof of completion of the retrofit to the escrow agent. The escrow agent may release the retained funds from the proceeds of the sale upon receiving reasonable, satisfactory proof of completion of the retrofit from the transferee.
7. The Department of Water Supply / DSA ? shall establish administrative regulations for the procedures to be followed by the transferor, the transferee, and the escrow agent for complying with this section.

.C. The transferor of any existing structure shall not be required to retrofit when a change of ownership occurs as a result of the following.

a. A court order, including an order by a probate court in the administration of an estate;
b. A foreclosure or voluntary or involuntary bankruptcy;
c. The exercise of eminent domain;
d. The administration of a deceased person's estate, guardianship, conservatorship, or trust;

e. One title co-holder of real property transferring, selling, or exchanging with one or more other title co- holders;

f. A transfer, without consideration, from one family member to another family member; or

g. A decree of dissolution of marriage, a decree of legal separation, or from a property settlement agreement incidental to such a decree.

D. Retrofit upon Bathroom Alteration

Upon bathroom alteration, the responsible person shall replace any existing plumbing fixture in the bathroom being altered with a water-conserving plumbing fixture.

E. Retrofit Exemptions

An exemption to the provisions of this section may be granted if under the following conditions :

1. A water-conserving plumbing fixture would be installed in an existing structure that has been identified by a local, state, or federal government entity as an historical site, and an historically accurate water-conserving plumbing fixture is not available;
2. Installation of a water-conserving plumbing fixture would require modifications to plumbing system components located beneath a finished wall or surface; or
3. The unique configuration of a building drainage system or portions of a public sewer, or both, require a greater quantity of water to flush the system in a manner consistent with public health.

F. Self-verification

1. Before a change of ownership, the transferor and the transferee of any structure or any existing structure shall complete the following procedures:
2. The transferor shall sign a Water Conservation Certificate certifying that the transferor has complied with the requirements of this section or is exempt from retrofitting as defined in _ above
3. After signing the Water Conservation Certificate, the transferor shall forward the Water Conservation Certificate to the transferee for review and signature.
4. .The transferee shall sign the Water Conservation Certificate, thereby acknowledging awareness and understanding of the requirements of this section.
5. . After the transferee has signed the Water Conservation Certificate, the transferor shall file the Water Conservation Certificate with the Department of Water Supply.
6. . If the structure or existing structure goes through escrow, the transferor also shall file a copy of the Water Conservation Certificate with the escrow agent before the close of escrow.

G. In the event the transferor and transferee of an existing structure agree that the transferee shall have responsibility for the retrofit upon change of ownership pursuant to this section, before the change of ownership, the transferor and the transferee shall complete the following procedures:

1. The transferor and the transferee shall sign a Transfer of Responsibility to Retrofit

Certificate certifying that the transferee has assumed responsibility for the retrofit.

2. After the transferor and the transferee have signed the Transfer of Responsibility to Retrofit Certificate, the transferor shall file the Transfer of Responsibility to Retrofit Certificate with the Department of Water Supply.
3. If the existing structure goes through escrow, the transferor also shall file a copy of the Transfer of Responsibility to Retrofit Certificate with the escrow agent before the close of escrow.
4. Upon completing the retrofit, the transferee shall sign a Water Conservation Certificate certifying that the transferee has complied with the requirements of this section.
5. Within at least 30 calendar days of the completion of the retrofit, the transferee shall file the signed Water Conservation Certificate with the Department of Water Supply.

F. If the transferor and the transferee have agreed to have compliance with this section included as a condition of escrow, have the responsibility for retrofitting assumed by the transferee, and have the retrofit paid for from the proceeds of the sale of the existing structure, then the transferor and the transferee shall complete the following procedures:

1. The transferor and the transferee shall sign a Transfer of Responsibility to Retrofit Certificate certifying that the transferee has assumed responsibility for the retrofit.
2. After the transferor and the transferee have signed the Transfer of Responsibility to Retrofit Certificate, and before the close of escrow, the transferor shall file the Transfer of Responsibility to Retrofit Certificate with the Building Official and a copy thereof with the escrow agent.
3. Upon completing the retrofit, the transferee shall sign a Water Conservation Certificate certifying that the transferee has complied with the requirements of this division.
4. Within at least 30 calendar days of the completion of the retrofit, the transferee, or the escrow agent on the transferee's behalf, shall file the signed Water Conservation Certificate with the Building Official.
5. The transferor of any structure that is in compliance with the requirements of this divisionshall not be required to file a Water Conservation Certificate with the Building Official before a change of ownership if a Water Conservation Certificate has been filed with the Water Department / DSA ? by a previous owner of the structure.

G.. Upon completing the retrofit of a bathroom, the responsible person shall complete the following procedures:

1. The responsible person shall sign a Bathroom Alteration Retrofit Certificate certifying that the responsible person has complied with the requirements of this section.

2. Within at least 30 calendar days following completion of any bathroom alteration, the responsible person shall file the signed Bathroom Alteration Retrofit Certificate with the Building Official.

H.. Agent

Nothing in this division is intended to create any duty upon the agent of a transferor or a transferee of any structure or any existing structure, unless otherwise mutually agreed to in writing.

14.03.080 Water Re-use

A. Commercial properties within 100' of R-1 distribution systems are required to provide for use of reclaimed water in irrigation as prescribed in chapter §20.30 of the Maui County Code.

14.03.090 Reserved

APPENDIX F

Draft Wellhead Protection Ordinance

Draft Wellhead Protection Ordinance, County of Maui, Hawaii

1. PURPOSE AND INTENT

The jurisdiction of Maui County recognizes that many residents rely on groundwater for their safe drinking water supply, and that certain land uses can contaminate groundwater. To ensure the protection of these drinking water supplies, this ordinance establishes a zoning overlay district to be known as the Wellhead Protection Overlay District.

The purpose of the Wellhead Protection Overlay District is to protect public health and safety by minimizing contamination of aquifers and preserving and protecting existing and potential sources of drinking water supplies. It is the intent to accomplish this through both public education and public cooperation, as well as by creating appropriate land use regulations that may be imposed in addition to those currently imposed by existing zoning districts or other county regulations.

The Wellhead Protection Overlay District is superimposed on current zoning districts and shall apply to all new construction, reconstruction, or expansion of existing buildings and new or expanded uses. Applicable activities/ uses allowed in a portion of one of the underlying zoning districts which fall within the

Wellhead Protection Overlay District must additionally comply with the requirements of this district. Uses prohibited in the underlying zoning districts shall not be permitted in the Wellhead Protection Overlay District.

2. DEFINITIONS

For the purposes of this section, the following terms are defined below:

AQUIFER. A geological formation, group of formations or part of a formation composed of rock, sand or gravel capable of storing and yielding groundwater to wells and springs.

CONTAMINATION. An impairment of water quality by chemicals, radionuclides, biologic organisms, or other extraneous matter whether or not it affects the potential or intended beneficial use of water.

DEVELOPMENT. The carrying out of any construction, reconstruction, alteration of surface or structure or change of land use or intensity of use.

FACILITY. Something that is built, installed, or established for a particular purpose.

HAZARDOUS MATERIAL. A material which is defined in one or more of the following categories:

Ignitable: A gas, liquid or solid which may cause fires through friction, absorption of moisture, or which has low flash points. Examples: white phosphorous and gasoline.

Carcinogenic: A gas, liquid, or solid which is normally considered to be cancer causing or mutagenic. Examples: PCB's in some waste oils.

Explosive: A reactive gas, liquid or solid which will vigorously and energetically react uncontrollably if exposed to heat, shock, pressure or combinations thereof. Examples: dynamite, organic peroxides and ammonium nitrate.

Highly Toxic: A gas, liquid, or solid so dangerous to man as to afford an unusual hazard to life. Example: chlorine gas.

Moderately Toxic: A gas, liquid or solid which through repeated exposure or in a single large dose can be hazardous to man.

Corrosive: Any material, whether acid or alkaline, which will cause severe damage to human tissue, or in case of leakage might damage or destroy other containers of hazardous materials and cause the release of their contents. Examples: battery acid and phosphoric acid

PRIMARY CONTAINMENT FACILITY. A tank, pit, container, pipe or vessel of first containment of a liquid or chemical.

RELEASE. Any unplanned or improper discharge, leak, or spill of a potential contaminant including a hazardous material.

SECONDARY CONTAINMENT FACILITY. A second tank, catchment pit, pipe, or vessel that limits and contains liquid or chemical leaking or leaching from a primary containment area; monitoring and recovery are required,

TIME-OF-TRAVEL DISTANCE. The distance that groundwater will travel in a specified time. This distance is generally a function of the permeability and slope of the aquifer.

WELLHEAD PROTECTION AREA. The surface and subsurface area surrounding a water well or wellfield, that supplies a public water supply system, through which contaminants are reasonably likely to move toward and reach the water well or wellfield.

WELLHEAD PROTECTION OVERLAY DISTRICT: The zoning district defined to overlay other zoning districts in Maui County. This district may includes the designated wellhead protection areas as identified on Land Zoning Maps.

3. ZONES WITHIN THE WELLHEAD PROTECTION OVERLAY DISTRICT

3.1 ZONE A1 – 50 FEET DIRECT CHEMICAL CONTAMINATION ZONE.

Zone A1 is defined as the fixed 50 feet radius around each well. The purpose of this zone is to provide protection from vandalism, tampering, or other threats at the well site.

a. Permitted Uses.
The following uses are allowed within Zone A1 provided they meet the appropriate performance standards outlined in 3.1.b below and are designed so as to prevent any groundwater contamination.

Necessary public utilities/facilities including the construction, maintenance, repair, and enlargement of drinking water supply related facilities such as, but not limited to, wells, pipelines, aqueducts, and tunnels.

b. Performance Standards:
Vehicles shall not be parked in the immediate well area, even when working on well maintenance or repair, unless required for power supply

Motor oil, fuel, paints, and any maintenance chemicals shall not be stored in the pump house or Zone A1.

Any underground storage tanks, hazardous materials, and septic systems shall be removed or relocated from this zone, where possible

Hazardous materials shall be stored in a secure building on an impermeable surface with adequate spill containment

Propane gas shall be used for power pumps

Any non-water supply activities shall be kept out of the Zone A1 area

3.2 ZONE A2 – 1,000 FEET DIRECT CHEMICAL CONTAMINATION ZONE.

Zone A2 is defined as the intersection of the modeled Wellhead Protection Area and the fixed 1,000 feet radius around each well. The purpose of this zone is to provide minimum distance from sources of pollution consistent with Hawaii Well Construction and Pump Installation Standards.

a. Prohibited Uses:
The following uses are prohibited within Zone A2:

Cesspool, septic tank, or subsurface sewage leaching field

Hazardous waste landfills and ponds, or chemical storage

Treated effluent injection well

3.3 ZONE B – INDIRECT MICROBIAL CONTAMINATION ZONE: 2 YEAR TRAVEL TIME.

Zone B consists of the surface area overlying the portion of the aquifer(s) that contributes water to the well within a two-year time-of-travel.

a. Permitted Uses:
All other uses permitted in the underlying zoning districts, unless prohibited under 3.3 b. provided that they can meet the Performance Standards as outlined for the Wellhead Protection Overlay District under 3.3.e.

Minimum lot size for unsewered residential uses shall be two acres, except for; a) existing lots of record on the effective date of this Ordinance and b) developments which will be served by municipal sewer within five years of the approval of the development. In order to provide for efficiently serving these developments with municipal sewer, lots smaller than two acres can be approved, provided that sufficient land area will be maintained in an undeveloped state such that no more than one residence is allowed for each two acres of the overall development.

New development construction shall implement best management practices described in 3.3.e.

b. Prohibited Uses.
The following uses are prohibited within Zone B, the two-year time-of-travel zone.

Electrical/electronic manufacturing facility;

Funeral services/graveyards

Golf courses

Metal plating/finishing/fabricating facility;

Chemical processing/storage facility;

Plastics/synthetic production facility;

Junk/scrap/salvage yard;

Major transportation corridors/highways/freeways/turnpikes;

Mines/gravel pit

Landfills/dumps

Injection wells/dry wells/sumps;

Artificial recharge projects (non-potable water)

Reclaimed wastewater irrigation class R2 and R3

Sewage sludge land application

Underground storage tanks, (except those with spill, overfill, and corrosion protection requirements in place);

All uses not permitted in the underlying zone district

c. Prohibited Uses Subject To Exception:
The following uses, unless granted an exception under 3.3.d., are prohibited within Zone B, the two-year time-of-travel zone.

Automobile body/repair shop;

Car washes;

Cement/concrete plants;

Gas station;

Fleet/trucking/bus terminal;

Dry cleaner;

Irrigated crops using soil fumigants (> 50 acres) or pesticides with high leachability;

Land divisions resulting in high density (>1 unit/2 acre) septic systems;

Machine shop;

Wood preserving/treating facility;

Confined animal feeding operations

Equipment maintenance/fueling areas;

Hospitals;

Parking lots/malls (>50 spaces);

Reclaimed wastewater irrigation R1 or better;

Waste transfer/recycling stations;

Above ground storage tanks;

All other facilities involving collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste having potentially harmful impact on groundwater quality;

d. Exceptions:
Where the underlying zoning permits a use that would be prohibited by this ordinance, a wellhead area exception may be granted by the County Department of Water Supply, provided that the use conforms to provisions of the underlying zoning district as certified by the County Department of Planning, meets the performance standards outlined in 3.3.e below, follows design guidelines outlined in section 4, that any concerns of the State Department of Health have been addressed, and that adequate information to evaluate the project has been provided.

Exception may be approved by the County Department of Water Supply for expansion of existing non-conforming uses to the extent allowed by the underlying district. The applicant should consult the local zoning plan to confirm nonconforming uses. The County Department of Water Supply reserves the right to review all applications and shall not grant approval unless it finds such expansion does not pose greater potential contamination of groundwater than the existing use.

e. Performance Standards:
The following standards shall apply to uses in Zones B and C of the Wellhead Protection Overlay District:

Any facility involving the collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or wastes, unless granted a special exception either through permit or another ordinance, must have a secondary containment system which is easily inspected and whose purpose is to intercept any leak or release from the primary containment vessel or structure. Underground tanks must be in compliance with underground storage tank rules adopted January 28,2000 in HAR Title 11 Chapter 281.

Open liquid waste ponds containing materials referred to in item (1) above will not be permitted without a secondary containment system.

All permitted facilities must adhere to appropriate federal and state standards for storage, handling and disposal of any hazardous waste materials.

All abandoned wells should be properly plugged according to local and state regulations.

Confined animal facilities should meet "Management Measure for Wastewater and Runoff from Confined Animal Facilities" as set in Hawaii's Coastal Nonpoint Pollution Control Program Management Plan, Volume 1, 1996.

Irrigated crops should implement Integrated Pest Management in accordance with US Department of Agriculture Natural Resources Conservation Service Technical Guide 1989.

Construction activities shall be in accordance to County Code Chapter 20.08 and these standards:

There shall be a designated person on site during operating hours who is responsible for supervising the use, storage, and handling of hazardous material and who shall take appropriate mitigating actions necessary in the event of fire or spill.

.Hazardous materials left on site when the site is unsupervised must be inaccessible to the public. Locked storage sheds, locked fencing, locked fuel tanks on construction vehicles, or other techniques may be used if they will preclude access.

Construction vehicles and stationary equipment that are found to be leaking fuel, hydraulic fluid, and/or other hazardous materials shall be removed from the site and from Wellhead Protection Zones A, B or C. The vehicle or equipment may be repaired in place, provided the leakage is completely contained.

Storage and dispensing of flammable and combustible liquids from tanks, containers, and tank vehicles into the fuel and fluid reservoirs of construction vehicles or stationary equipment on the construction site shall be in accordance with these standards and County Fire Code Chapter 16.04A

Hazardous materials and other deleterious substances shall not be allowed to enter stormwater systems.

3.4 ZONE C – INDIRECT CHEMICAL CONTAMINATION ZONE: 10 YEAR TRAVEL TIME.

Zone C consists of the surface area overlying the portion of the aquifer(s) that contributes water to the well within a ten-year time-of-travel.

a. Permitted Uses:
All other uses permitted in the underlying zoning districts, unless prohibited under 3.3 b. provided that they can meet the Performance Standards as outlined for the Wellhead Protection Overlay District under 3.3.e.

b. Prohibited Uses.
The following uses are prohibited within Zone C, the ten-year time-of-travel zone.

Electrical/electronic manufacturing facility;

Chemical processing/storage facility;

Plastics/synthetic production facility;

Junk/scrap/salvage yard;

Metal plating/finishing/fabricating facility;

Mines/gravel pit

Landfills/dumps

Injection wells/dry wells/sumps;

Underground storage tanks, (except those with spill, overfill, and corrosion protection requirements in place);

All uses not permitted in the underlying zone district

c. Prohibited Uses Subject To Exception:
The following uses, unless granted an exception under 3.4.d., are prohibited within Zone B, the ten-year time-of-travel zone.

Automobile body/repair shop;

Gas station;

Fleet/trucking/bus terminal;

Dry cleaner;

Golf courses;

Machine shop;

Wood preserving/treating facility;

Confined animal feeding operations

Land divisions resulting in high density (>1 unit/acre) septic systems;

Equipment maintenance/fueling areas;

All other facilities involving collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste having potentially harmful impact on groundwater quality;

d. Exceptions:
Where the underlying zoning permits a use that would be prohibited by this ordinance, a wellhead area exception may be granted by the County Department of Water Supply, provided that the use conforms to provisions of the underlying zoning district as certified by the County Department of Planning, meets the performance standards outlined in 3.3.e below, follows design guidelines outlined in section 4, that any concerns of the State Department of Health have been addressed, and that adequate information to evaluate the project has been provided.

Exception may be approved by the County Department of Water Supply for expansion of existing nonconforming uses to the extent allowed by the underlying district. The applicant should consult the local zoning plan to confirm nonconforming uses. The County Department of Water Supply reserves the right to review all applications and shall not grant approval unless it finds such expansion does not pose greater potential contamination of groundwater than the existing use.

4. DEVELOPMENT GUIDELINES

The following design guidelines are encouraged for all new commercial, residential or mixed use development projects, excluding residential subdivisions of 2 lots or less in the 2-year time of travel Zone B:

Commercial and high-density residential development should be minimized and located at as far distance from the wellhead as possible.

Appropriate uses are open space, passive parks, schools and low density residential (minimum 2-acre lots)

The following design guidelines are encouraged for all new commercial, residential or mixed use development projects, excluding residential subdivisions of 2 lots or less in the 10 year time of travel Zone C:

High risk commercial and high-density residential development should be minimized and located at as far distance from the wellhead as possible.

Appropriate uses are open space, passive parks, schools, low risk commercial and low density residential (minimum 1-acre lots)

The following design guidelines are encouraged for all new commercial, residential or mixed use development projects, excluding residential subdivisions of 2 lots or less in Zone B and C:

Storm-water infiltration basins should be located outside the WHPA where feasible.

Active parks and schools should implement Integrated Pest Management.

Where development is proposed on property extending both inside and outside the WHPA, and where sufficient buildable land area exists on the portion of the property outside the WHPA boundary to accommodate the proposed development, and where applicable setbacks permit, that area in its entirety should be utilized before any land within the WHPA should be used. Where insufficient buildable land area exists on the portion of the property outside the WHPA to accommodate the proposed development, as much of the development as possible should be sited outside the WHPA.

Proposed development entirely within the WHPA should be grouped and sited on the subject parcel at as far distance as possible from the wellhead.

Expansions of existing uses should at least conform to these guidelines where the use is expanding beyond its' property boundaries.

Vegetative cover should be provided on all disturbed land areas, excluding fallow agricultural fields, not covered by paving, stone or other solid material. The maintenance or use of native plant materials with lower water and nutrient requirements is encouraged.

5. LIABILITY

Nothing in this ordinance shall be construed to imply that the County of Maui has accepted any of an owner/developer's liability if a permitted facility or use contaminates groundwater in any aquifer.

6. DISTRICT BOUNDARY DISPUTES

If the location of the Wellhead Protection Overlay District boundary in relation to a particular parcel is in doubt, the rules in Chapter 19.06 apply.

7. ENFORCEMENT

a. Any person may submit a verbal or written complaint alleging a violation of this ordinance.

b. Any approval or permit issued pursuant to the provisions of this ordinance shall comply with all applicable requirements of Chapter 19.530.

c. Where an exception to a prohibited use is granted condition to performance standards, the appropriate enforcement agency of the applicable performance standard shall be notified to follow up with inspection as needed.

8. SAVING CLAUSE

Should any section or provision of this ordinance be declared invalid, such decision shall not affect the validity of the ordinance as a whole or any other part thereof. A determination that any portion or provision of this overlay protection district is invalid shall not invalidate any special permit previously issued thereunder.

Approved by: _____

Date: _____

APPENDIX G

Resolution Establishing The Lana'i Water Advisory Committee

COUNTY OF MAUI BOARD OF WATER SUPPLY
RESOLUTION NO. 05 (1999)

ESTABLISHING THE LANAI WATER ADVISORY COMMITTEE

WHEREAS, the preparation of the Maui County Water Use and Development Plan (WUDP) is the responsibility of the Board of Water Supply (Board); and

WHEREAS, Board Rule §16-02-17 enables the Board to appoint standing committees and select committees to discharge its responsibilities and functions; and

WHEREAS, the Board wishes to formalize and establish consistent guidelines for implementation of community participation in Water Use and Development Planning; and

WHEREAS, water use issues on the island of Lanai have arisen because the island has limited water resources; and

WHEREAS, the Board is committed to public involvement in planning and decision-making efforts as it relates to the Lanai WUDP; and

WHEREAS, the establishment of the Lanai Water Advisory Committee (LWAC) will enable the Board to complete the WUDP for the island of Lanai;

NOW, THEREFORE, BE IT RESOLVED by the Board of Water Supply and the County of Maui:

1. The Lanai Water Advisory Committee (LWAC) is hereby established. The LWAC shall consist of the following members selected by their respective organization (where appropriate):

   (1) Two (2) voting members from Lanai Company;

   (2) Two (2) voting members from Lanai'ians for Sensible Growth;

   (3) One (1) voting member from the Lanai Planning Commission;

   (4) Councilmember from the island of Lanai, or his representative, with voting rights on the LWAC;

(5) Three (3) residents of Lanai who are not affiliated with any of the above referenced organizations and who are entitled to vote on LWAC matters. The residents shall be selected by six (6) affirmative votes cast by the LWAC voting members from Lanai Company, Lanai'ians for Sensible Growth, the member of the Lanai Planning Commission, and the Lanai Councilmember or his representative. In the event that six (6) votes can not be obtained as to any resident, the Director is hereby authorized to make the selection of the resident(s) from among those considered. The Director's decision shall be final.

(6) One (1) non-voting member from Lanaiians for Economic Growth and Stability.

2. The Department of Water Supply, through the Director, shall be the lead agency and shall provide appropriate staffing for the LWAC. The Department of Planning, Department of Public Works and Waste Management, Commission on Water Resources Management, Department of Land and Natural Resources, and other appropriate county or state agencies shall be consulted and may participate in the Lanai WUDP process. Staff personnel from these departments or agencies shall not have any vote in any LWAC proceedings.

3. The purpose and intent of the LWAC is to provide public input and involvement during the development of the Lanai WUDP and to monitor the Lanai WUDP implementation. The LWAC may organize itself as it deems appropriate to accomplish its purpose, including the adoption of by-laws for its own internal governance.

4. The LWAC is established and shall remain in existence until otherwise determined by the Board by subsequent resolution.

5. In consultation with the LWAC, the Director shall determine the meeting dates of the LWAC.

6. All communications between the Board and the LWAC shall only be through the Director.

7. The Director may propose amendments to the composition, purpose, and term of the LWAC, which may be approved by the Board by resolution. The Director shall notify the LWAC members prior to proposing any such amendments to the Board.

8. The Director is authorized to take any and all appropriate action necessary to carry out the purpose and intent of this Resolution that does not require Board approval.

9. That this resolution shall apply only to the process of drafting, reviewing, updating and implementing Water Use and Development Plans, and does not supersede any powers the Board, Administration, or other agencies already have to appoint advisory committees.

10. The Director shall notify each member of their selection to the LWAC.

IN WITNESS WHEREOF, and by proper vote of the Board of Water Supply, I have hereunto subscribed my name and affixed the seal of the Board of Water Supply this 16th day of March, 1999.

Robert K. Takitani, Chairman
Maui County Board of Water Supply

Approved as to form and legality:

Gary W. Zakian, Deputy
Corporation Counsel

Resolution No. 05 (1999)

CERTIFICATION

The undersigned hereby certifies that the foregoing Resolution is a true and correct copy of Resolution No. 05 (1999) adopted at the meeting of the Board of Water Supply, County of Maui, duly held on the 16th day of March, 1999.

David Craddick, Director
Department of Water Supply

APPENDIX H

Establishing Water Advisory Committees

LWAC DISCUSSION DRAFT

A BILL FOR AN ORDINANCE
TO ESTABLISH COMMUNITY PARTICIPATION
IN THE FORM OF WATER ADVISORY COMMITTEES
FOR DEVELOPMENT AND REVIEW OF
WATER USE AND DEVELOPMENT PLANS

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

Chapter 2.88 A of the Maui County Code is amended as follows:

I. Section 2.88A.010 Sections:

Section 2.88A.010 is amended to include definitions provided herein. Section 2.88A.020 is amended to include language provided herein. A new section 2.88A.030 is added, and the current Sections 2.88A.030 through 2.88A.050 are re-numbered as Sections 2.88A.040 through 2.88A.060. A new Section 2.88A.070 is added. The Sections of the amended Chapter are as follows:

Sections:

II. Section 2.88A.020 Definitions:

For purposes of this chapter, unless it is plainly evident from the context that a different meaning is intended, certain terms and words are defined as follows:

"Board" means the board of water supply of the county of Maui

"Commission" means the commission on water resource management of the State of Hawaii

"Council" means the council of the county of Maui

"County" means the County of Maui, a political subdivision of the State of Hawaii

"Department" means the Department of Water Supply of the County of Maui

"Director" means the director of water supply of the county of Maui

"DWS" means the Department of Water Supply of the County of Maui

"Plan" means the water use and development plan for the County of Maui, comprised of the technical report and executive summary.

"State Water Code" means chapter 174C, Hawaii Revised Statutes. (Ord 1948 §2, 1990)

A new definition is hereby added:

"Water Planning Districts" means areas served by a common mix of sources, connected such that sources are shared, or a distinct region or area served by small separate systems. They are defined as the following broad service areas, and shall include both DWS and non-DWS facilities:

1) Central Maui

Including but not limited to the area along the north from Waihee to Kuau, across the central isthmus, and along the south from Maalaea to Makena

2) Upcountry

Including but not limited to the current system areas known as Upper Kula, (incl. Ulupalakua-Kanaio), Lower Kula, and Makawao (incl. Pukalani through Makawao and Haiku to Ulumalu).

3) Lahaina

Including but not limited to the current system areas known as Honokohau, Mahinahina/ Alaeloa, and Lahaina

4) Hana

Including but not limited to Kailua, Keanae, Nahiku, Hana and Kaupo

5) Molokai

Including the entire island of Molokai

6) Lanai

Including the entire island of Lanai

III. Section 2.88A.020 Purpose and Intent

Section 2.88A.020 is hereby amended as follows.

The purpose of the plan is to meet the mandate of the state water code relative to statewide water resources planning, more specifically to aid the commission and the county of Maui in the conservation, development and use of the water resources of the county. (Ord. 1948 §2, 1990)

The intent of this ordinance is to insure effective community participation in Water Use & Development Planning, and to acknowledge the direction taken by the State in publishing its *Framework for Updating the Hawaii Water Plan* to involve the public in planning & decision making and to practice integrated resources planning.

IV. Section 2.88A.030 Water Advisory Committees

Section 2.88A.030 is hereby added

2.88A.030 Water Advisory Committees

A. A Water Advisory Committee shall be established in each Water Planning District.

B. Water Advisory Committees shall be composed of residents, purveyors and resource managers in the district served by the committee. In addition, at least one member of the Water Advisory Committee may be a Planning Commission representative for that district, (provided that person is willing to serve) and at least one shall be a County Council members serving the affected region, or that person's appointed representative

C. The membership of Each Water Advisory Committee shall be proposed by the Director, with review by the Board, and approval by the Mayor.

D In recruiting and selecting members for each Water Advisory Committee, The Department shall follow the principles in the Statewide Framework For Updating the Hawaii Water Plan, striving to be inclusive of stakeholders and achieve balanced participation.

E If deemed advisable by the Department and Mayor, a substantial and balanced mailing list may substitute for a defined number of committee participants, provided that the mailing list is greater than 25 people, the opportunity to participate is advertised for at least a month, and the Mayor and Council have opportunity to contribute to the mailing list.

F To allow for flexibility and recognition of the unique character of each district, various particulars of the committees, including but not limited to composition, membership, terms, meeting schedule, sunset, functions and other items described in 2.88A.030 D through J, contained herein, will be defined by the Director as specified in attachments for each district. These attachments are hereby incorporated into this rule, may be revised by the Director as needed to optimize implementation of the Water Use & Development Planning Functions without need for additional ordinance or rule-making proceedings.

G Each Water Advisory Committee shall meet at a schedule determined by the Director, to discuss and make recommendations for update and development of the Draft Water Use and Development Plan, or for review of plan status and implementation.

H In the event that the Director finds it necessary, Water Advisory Committees may be asked to select representatives to meet with Water Advisory Committees of other regions, to work toward resolution of inter-regional disputes.

I Upon completion of the Water Use and Development Plan the Water Advisory Committees may continue to meet to review status and implementation of the Water Use and Development Plan, as deemed advisable by the Director.

J The purpose of the Water Advisory Committees pertains specifically to the process of drafting, reviewing, updating and monitoring the implementation of the Water Use & Development Plans, and the establishment of these committees does not supersede any existing powers of the Board, Administration, Planning Commission, Council or other agencies.

K The Director may waive the provisions of this section to the extent that they prevent obtaining or granting of federal aid on any project or the prosecution of work thereunder.

2.88A.040 Adoption of the Plan

The council hereby adopts the plan, and any future revision, amendment or modification of the same, pursuant to section 2.88A.050 of this chapter, shall be deemed part of the plan without further adoption or amendment to this chapter and will be incorporated into this chapter by reference. (Ord. 1948 §2 1990)

2.88A.050 Application of the Plan

Section 2.88A.020 is hereby amended as follows.

The plan shall serve as a guideline to the council, the board and all other agencies or departments of the County (a) in approving or recommending to other agencies the use or commitment of the water resources in the County, ~~and~~ (b) in using public funds to develop water resources to meet existing or projected future demands on the public water systems as set forth in the plan, and (c) in establishing or recommending for consideration policies or protective measures for water resource management as appropriate to meet critical concerns of individual or collective water districts. (Ord. 1948 §2 1990)

2.88A.050 Amendment

Section 2.88A.020 is hereby amended as follows.

If a proposed community plan amendment will impact the plan, the director shall initiate any necessary plan amendments.

An amendment to the plan proposed by the council, the director or any agency shall be referred to the Department for its review and recommendation. The Department shall hold

appropriate public hearings on proposed revisions or amendments and shall transmit them, with its findings and recommendations to the council. Within forty-five days of receipt of a proposed amendment, the council shall approve the amendment by ordinance. If the council fails to act within forty-five days, the amendment shall be deemed disapproved.

~~The mayor shall appoint a nine-member task force to be chaired by the director to assist the Department with the review and amendment of the plan whenever the planning director recommends the revisions to the general plan pursuant to section 8-8.3.3 of the revised charter of the county of Maui. The task force shall recommend to the Department amendments to the plan so as to be consistent with any community plan amendment. (Ord. 1948 §2, 1990)~~

The Water Advisory Committees shall be established and serve as described in Section 2.88A.040 above, and shall recommend updates or changes as necessary based on community plan amendments, status of water resources or other critical factors. The Water Advisory committees shall recommend to the Department amendments as necessary to be consistent with general and community plan amendments. (Ord. 1948 §2, 1990)(Ord. 1948 §2, 1990)

VIII.2.88A.070 Severability

Section 2.88A.070 is hereby added:

The invalidity of any word, section, clause, paragraph, sentence part, or provision of this chapter shall not affect the validity of any other part of this chapter which can be given effect without such invalid part or parts.

IX.Effective Date

This ordinance shall take effect upon its approval.

Attachment A

Water Use & Development Plan - Water Advisory Committee for Lana`i

I. Establishment of the Lana`i Water Advisory Committee.

There shall be a Lana`i Water Advisory Committee (LWAC).

II. Special Provisions:

A. Balance of Membership

Membership and representation on the Lana`i Water Advisory Committee shall be as follows:

Organization or Entity	**Number of Representatives**
Lana`i Company	2
Lana`ians for Sensible Growth	2
At Large Lana`i Residents	3
Member of Lana`i Planning Commission	1
Council Member Residing on Island	1
Lead Agency - Department of Water Supply Staff	1 Ex Officio
Advising Agency - Commission on Water Resources Management	1 Ex Officio
Advising Agency - Department of Land & Natural Resources	1 Ex Officio
Advising Agency - Maui County Planning Department	1 Ex Officio
Advising Agency - Maui County Department of Public Works & Environmental Management	1 Ex Officio

B. Meeting Frequency & Triggers for Calling a Meeting

The LWAC shall meet bimonthly during drafting and update of the Water Use and Development Plan, and quarterly thereafter. Additional meetings may be held on an as-needed basis, if one or more of the following conditions apply:

1) DWS receives a development proposal for review for the island of Lana`i which is inconsistent with the Water Use and Development Plan.

2) DWS receives a development proposal for review for the island of Lana`i which is anticipated to utilize more than 60,000 gpd, or which will cause pumpage to exceed designation triggers set by the Commission on Water Resource Management.

3) DWS receives a development proposal for review which may cause pumpage to exceed operational guidelines.

4) DWS receives a development proposal for review which involves a community plan amendment.

5) Status of the aquifer or watershed has been altered, implementation of source water protection is in question, or monitoring shows that implementation is ineffective and discussion is deemed advisable.

6) LWAC members or other supporting agencies request a meeting due to questions regarding implementation of Water Use and Development Plan measures, or status of water source & supply, or other unforeseen issues pertaining to the status of the water supply, or the drafting, implementation, and consistency of the Water Use and Development Plan with the Community Plan.

C. Coordination with Planning

If a proposed land use is heard by the planning department and or council, and if said land use could be contrary to the information in the Water Use and Development Plan, exceed consumption triggers based on standards for source and system viability as set by the Department, have potential for significant adverse affect on source or systems, or be contrary to any policy or resource protective measure contained in the plan, the Department may request to the Planning Department that the project be reviewed by the water advisory committee.

The Planning Director will determine whether such request for referral is to be granted. In the case of such referrals, the Planning Department, Planning Commission or Council shall consider the recommendations of the Water Advisory Committee for the record.

The results of these reviews shall be forwarded to the Director. The Director will in turn forward these recommendations to the Director of the Planning Department of the County of Maui.

The land use decision making body may over-ride the recommendations of the Department and Water Advisory Committee, except where this would conflict with the but should state the reason for such action on the record.