EXECUTIVE CHAMBERS
HONOLULU

GEORGE R. ARIYOSHI
GOVERNOR

April 7, 1980

Mr. Donald A. Bremner, Chairman
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Bremner:

Subject: Acceptance of Environmental Impact Statement for Lalamilo Water System, South Kohala, Hawaii

Based upon the recommendation of the Office of Environmental Quality Control, I am pleased to accept the subject document as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes. This environmental impact statement will be a useful tool in the process of deciding whether or not the action described therein should or should not be allowed to proceed. My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws, and does not constitute an endorsement of the proposed action.

When the decision is made regarding the proposed action itself, I expect the proposing agency to weigh carefully whether the societal benefits justify the environmental impacts which will likely occur. These impacts are adequately described in the statement, and, together with the comments made by reviewers, provide a useful analysis of alternatives to the proposed action.

With warm personal regards, I remain,

Yours very truly,

George R. Ariyoshi

George R. Ariyoshi

cc: Honorable Susumu Ono

LALAMILO WATER SYSTEM

South Kohala, Hawaii

Revised Environmental Impact Statement

Department of Land and Natural Resources, State of Hawaii · March 1980

REVISED

ENVIRONMENTAL IMPACT STATEMENT

FOR

LALAMILO WATER SYSTEM

SOUTH KOHALA, HAWAII

Prepared for:

THE DIVISION OF WATER & LAND DEVELOPMENT
DEPARTMENT OF LAND AND NATURAL RESOURCES

Submitted by: Susumu Ono
Susumu Ono, Chairman
Dept. of Land & Natural Resources

Prepared by:

Belt, Collins & Associates
Honolulu, Hawaii

March 1980

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LALAMILO WATER SYSTEM, SOUTH KOHALA, HAWAII

Proposed Project: LALAMILO WATER SYSTEM

Proposing Agency: DEPARTMENT OF LAND AND NATURAL RESOURCES, DIVISION OF LAND AND WATER DEVELOPMENT

Accepting Authority: GOVERNOR, STATE OF HAWAII

I. PROPOSED ACTION

The proposed project will consist of:

- four fresh-water wells at 1,000 to 1,200-foot elevation on the State-owned tract of land known as Lalamilo;
- three brackish mixing wells at approximately 600-foot elevation also on the Lalamilo tract;
- transmission and distribution pipelines ranging in diameter from 18 inches to 12 inches and extending the 3.6 miles from the wells at elevation 1,200 feet to an existing 12-inch County water line along Queen Ka'ahumanu Highway;
- three storage tanks, the first of 0.1 million gallons (MG) at elevation 1,000 to 1,200 feet, the second of 1.0 MG at elevation 600 feet, and the third of 0.3 MG at elevation 300 feet;
- approximately 3.8 miles of overhead electric power line from an existing line at Waikoloa to both well field sites.

The initial phase of construction proposes to build the following:

- all transmission and distribution pipelines, storage tanks and overhead electric power lines of the system;
- outfitting two fresh-water wells at elevation 1,000 to 1,200 feet (Wells B and C);
- drilling and outfitting one brackish well at elevation 600 feet.

Remaining portions of the planned system are not funded at this time and are not being built.

II. DESCRIPTION OF PROJECT AREA

The project will be located entirely within the State lands known as the "Lalamilo Tract" in the South Kohala District of the Island of Hawaii. The project site consists of uninhabited, scarcely vegetated land which lies in the State Land Use Commission's Agricultural District.

III. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AREA.

The proposed project is one of a series of public actions which will accommodate the development of a principal destination resort area in the South Kohala Coastal region. The existing governmental land use plans, policies, and controls in the region all support the concept of such a major destination resort area in this region of Hawaii County.

IV. ANTICIPATED ENVIRONMENTAL IMPACTS

The installation of the wells, water transmission lines, storage reservoirs, and other facilities that comprise the proposed Lalamilo Water System would involve construction activity and limited alterations to the existing environment. More importantly, from the standpoint of impacts, it would allow private developers to implement their plans for resort development within the area served by the system. This, in turn, would bring with it extensive secondary growth that would include population increase and expansion of the housing stock. Impacts, both physical and social, would accompany this growth and far outweigh those effects related directly to the construction of the water line.

V. ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED

Various adverse environmental impacts would occur as the result of the growth secondary to the Lalamilo Water System. These impacts would be primarily in the areas of population growth and associated social effects, traffic, air quality and noise impacts.

VI. ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the proposed action include:

- desalinization of brackish or seawater
- development of surface water
- no project

CHAPTER I

CHAPTER I. PROJECT DESCRIPTION

DESCRIPTION OF THE PROPOSED LALAMILO WATER SYSTEM

Physical System to be Constructed*

To meet anticipated growth of water demand in the South Kohala coastal region, the State Department of Land and Natural Resources and the Hawaii County Department of Water Supply plan for the construction of new wells, reservoirs, and pipelines. This new addition to the County's water system, which will be referred to herein as the "Lalamilo Water System," is depicted on Figure I-1. Major elements of the planned system are:

- o four fresh-water wells at 1,000- to 1,200-foot elevation on the State-owned tract of land known as Lalamilo;
- o three brackish mixing wells at approximately 600-foot elevation also on the Lalamilo tract;
- o transmission and distribution pipelines ranging in diameter from 18 inches to 12 inches and extending the 3.6 miles from the wells at elevation 1,200 feet to an existing 12-inch County water line along Queen Ka'ahumanu Highway;
- o three storage tanks, the first of 0.1 million gallons (MG) at elevation 1,000 to 1,200 feet, the second of 1.0 MG at elevation 600 feet, and the third of 0.3 MG at elevation 300 feet;
- o approximately 3.8 miles of overhead electric power line from an existing line at Waikoloa to both well field sites.

The initial phase of construction proposes to build the following:

- o all transmission and distribution pipelines, storage tanks and overhead electric power lines of the system;
- o outfitting two fresh-water wells at elevation 1,000 to 1,200 feet (Wells B and C);
- o drilling and outfitting one brackish well at elevation 600 feet.

Remaining portions of the planned system are not funded at this time and are not being built.

One of the wells at elevation 1,200 feet (Lalamilo "A," Well No. 5946-01) was drilled in 1977 and pump-tested in 1978 (data can be found in Department of Land and Natural Resources, Division of Water and Land Development [DOWALD] 1978). Two more of these high elevation wells (Lalamilo "B"

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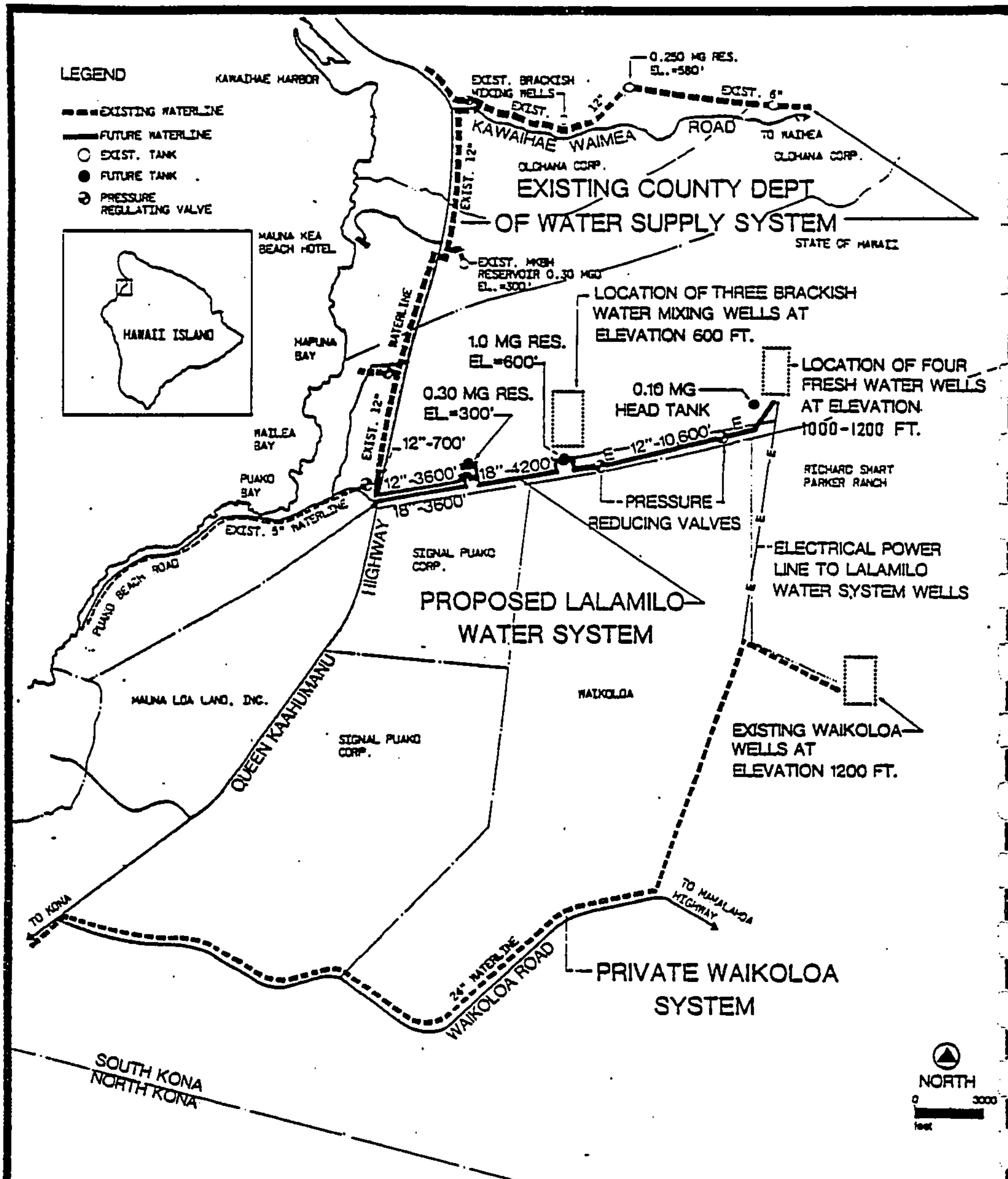
*As used throughout this EIS, "drilling" a well refers to the drilling of a well and setting its permanent casing in place. "Outfitting" a well means to install its pump, complete with electrical power and start and stop controls.



PROPOSED LALAMILO WATER SYSTEM
South Kohala, Hawaii

Figure I-1:

and "C") are currently being drilled at elevation 1100 ft. by Water Resources International, Inc., under contract to the State. DOWALD has undertaken this drilling as part of its groundwater exploration program. Earlier in 1979, DOWALD filed a Negative Declaration for the current drilling work. For the purposes of this EIS, then, work on the Lalamilo Water System's 1,000- to 1,200-foot elevation wells would consist of installing pumps and controls on three, then-existing fresh water wells, and drilling a fourth well and installing pumps and controls on it. It might also be noted that no work has been undertaken on any of the other elements of the proposed water system. These four wells shall be referred to hereinafter as the 1200' elevation fresh water wells.

Except for portions of the overhead electric power lines, the Lalamilo Water System would be constructed on State land in the Lalamilo tract and within the right-of-way of Queen Ka'ahumanu Highway. The system would be owned and operated by the Hawaii County Department of Water Supply (DWS) and would be designed and constructed to the standards of that department. The supply capability of the system referred to throughout this EIS, which is based on the safe and reliable yield of its wells, is also defined in terms of the County's standards.

The most important social characteristic of the project is the employment within the construction industry that it will provide. These issues are discussed fully in Chapter III of this document, as are all the environmental characteristics of the project.

<u>Construction Increments and Defined Supply Capability</u>

The Lalamilo Water System would be constructed in three increments. Construction of the first increment, as described above, is scheduled to begin in April or May, 1980 and be completed in the spring of 1981.

Planned future construction consists of the second increment which includes outfitting of one well at elevation 1,200 feet (Lalamilo "A") with pumps and controls, and drilling and outfitting one well at elevation 600 feet. The third increment would complete the system. It would involve drilling and outfitting one well at 1,200 feet and another one at elevation 600 feet. The timing of the second and third construction increments will depend on actual increases in water usage of the system, prospective development in the region, as well as availability of funding.

Table I-1 presents the defined supply capability of the system by construction increments. Rounding off to two significant digits, capabilities will be 2.0 million gallons per day (MGD) by the first increment, 3.3 MGD after the second increment, and 5.3 MGD when the third increment completes construction of the system. These capabilities are defined by the County DWS standby supply requirement, by the expected water quality from the 1,200-foot fresh water wells and 600-foot brackish water wells, and by a mixing ratio of water from the two well fields. These influence the defined capability as follows:

Table I-1. Defined supply capability of the Lalamilo Water System by construction increments.

Construction Increment and Corresponding Wells	Nominally Rated Capacity (MGD)	Defined Supply Capability[1] (MGD)
First Construction Increment		
o Lalamilo "B" and "C" at elevation 1,200 feet at 1.44 MGD for each well[2]	2.88	
o First well at 600-foot elevation[3]	0.50	
Capacity of the First Increment	3.38	1.97
Second Construction Increment		
o Lalamilo "A" at elevation 1,200 feet[4]	1.00	
o Second well at 600-foot elevation	0.50	
Capacity after the Second Increment	4.88	3.34
Third Construction Increment		
o Lalamilo "D" at elevation 1,200 feet[2]	1.44	
o Third well at 600-foot elevation	0.50	
Capacity after the Third Increment	6.82	5.32

[1]Supply capability is defined by County standards. These require standby well capacity and establish the rate of mixing of brackish water from the 600-foot elevation wells with fresh water from the 1,200-foot elevation wells. Computing supply capability using these standby and water quality considerations can be done as follows: sum the rated capacities of the elevation 1,200-foot wells; decrease the sum by the capacity of the largest of these wells; multiply the reduced sum by the ratio of 1.0 to 0.73 to account for addition of brackish water at elevation 600 feet. This is the basis for the supply capability numbers in the right-hand column of Table I-1.

[2]Lalamilo "B," "C" and "D" will be 16-inch diameter wells outfitted with pumps capable of 1,000-gallons-per-minute (equivalent to 1.44 MGD).

[3]All three brackish wells at elevation 600 feet will be 12 inches in diameter and outfitted with 350-gallons-per-minute (0.5 MGD) pumps.

[4]Lalamilo "A" is an existing 12-inch diameter well. Its pump capacity will be 700 gallons per minute (1.0 MGD), somewhat less than other wells in the elevation 1,200-foot well field due to its smaller well casing size.

- For a field or fields of wells feeding one system, supply capability is calculated with the largest well assumed to be inoperable due to failure or regular maintenance.

- Based on the pump test of Lalamilo "A" (DOWALD, 1978), wells at the 1,000- to 1,200-foot elevation are expected to produce water of approximately 80 ppm chloride ion (Cl ion) content. Based on previous experience of lower elevation wells in the region (see Table III-26), wells at the 600-foot elevation are expected to produce 450 ppm chlorides water. The lower wells' water will be brackish; it must be mixed with water from the higher wells to make it of potable quality.

- The County DWS has mixed brackish well water at the South Kohala coast since about 1965. Based on this experience, it has established a 180 ppm Cl ion mixed water quality as its operating standard. For the expected chloride content of water from the two well fields, this means that maximum brackish water input is limited to 27 percent of the mixed water volume; the remaining 73 percent must be supplied by the 1,200-foot elevation wells.

Construction Cost, Source of Funds, and Water Allocation Agreement

The estimated construction cost of the system is summarized on Table I-2. The first construction increment, which will complete all reservoirs and pipelines and some of the wells, is estimated to cost $2.9 million. The succeeding two construction increments, involving only new wells, pumps, and controls, are estimated to total $1.5 million based on 1979 prices. Funds to construct the first increment will come from a $1.0-million appropriation made by the 1978 State Legislature and $1.9 million in Hawaii County-issued general obligation bonds. The source of funds for succeeding construction increments has not been established.

In January 1979, an agreement was signed by Hawaii County and two joint-venture developers, Olohana Corporation* and Mauna Loa Land, Inc. Commitments made by this agreement are (i) that Hawaii County will issue up to $2.0 million of general obligation bonds to fund a portion of the construction cost of the first increment; (ii) that the joint-venture developers will make payments to the County equivalent to the bond payments due and administrative costs; and (iii) that Hawaii County will allocate 1.0 MGD of the water pumped from the 1,200-foot elevation fresh water wells to the joint-venture developers. The agreement specified that the water allocation was valid as long as full usage of it was made within 60 months of completion of the system.

*In 1978 Mauna Kea Land Corp., a wholly owned subsidiary of UAL, Inc. (United Airlines), purchased the Mauna Kea Beach Hotel. In 1979 Mauna Kea Land Corp. purchased Olohana Corporation and all its assets. Later in 1979 Olohana Corporation merged into Mauna Kea Land Corp. Thus, now, Mauna Kea Land Corp. has assumed all of the obligations of Olohana Corporation.

Table I-2. Construction cost estimate of the Lalamilo Water System based on 1979 prices.

Item	First Increment of Construction	Future Construction Increments
o Fresh water wells at approximately 1,200-foot elevation[1]	$ 400,000	$ 742,000
o Brackish water mixing wells at approximately 600-foot elevation[2]	310,000	620,000
o Transmission and distribution pipeline, pressure breakers, and appurtenances	714,000	--
o Reservoirs[3]	990,000	--
o Service/maintenance road along the pipeline	92,000	--
o Electric power transmission to well fields	140,000	--
Total Construction Cost	$2,646,500	$1,362,000
Contingency (10±%)	253,500	138,000
Grand Total	$2,900,000[4]	$1,500,000

[1]In the first construction increment, work on fresh water wells consists of outfitting two 16-inch diameter wells with 1.44 MGD pumps and their appurtenances. The two wells are currently being drilled in 1979 by Water Resources International under contract to the State Department of Land and Natural Resources. For future construction, work will involve outfitting an existing 12-inch well with a 1.0-MGD pump, and drilling and outfitting a new 16-inch well with a 1.44-MGD pump.

[2]One brackish mixing well is to be constructed in the first increment, and two more are expected to be constructed in the future.

[3]Three reservoirs are to be constructed in the first increment: a 100,000-gallon tank at elevation 1,200 feet; a 1,000,000-gallon tank at elevation 600 feet; and, a 300,000-gallon tank at elevation 300 feet.

[4]By agreement reached between Olohana Corporation, Mauna Loa Land, Inc. and the State of Hawaii Department of Land and Natural Resources, Olohana and Mauna Loa agreed to contribute an additional $250,000 toward the outfitting for production of Lalamilo "A", Well No. 5946-01 at some future date.

Source: Belt, Collins & Associates.

Two aspects of the January 1979 agreement are worth noting. First, it is concerned only with the first construction increment of the water system, work which will achieve approximately 2.0 MGD of its ultimate 5.3 MGD capacity. Both funds and water allocations for future construction increments are not dealt with. Second, the water allocation to the joint-venture developers is specifically for fresh water from the 1,200-foot elevation wells and not the mixed water which is actually delivered to users. Based on expected water quality from the two well fields and the 180 ppm Cl ion standard for mixed water, the 1.0 MGD fresh water commitment can amount to 1.37 MGD of delivered mixed water (calculated as 1.0/0.73 MGD). This means that for bearing approximately two-thirds of the construction cost of the first increment ($1.9 million of the $2.9 million total), the joint-venture developers are allocated about two-thirds of its supply capability (1.37 MGD of its 1.97 MGD defined capability).

Purpose of Constructing the Lalamilo Water System

The Lalamilo Water System is designed to supply the South Kohala coast from Kawaihae to Puako. At present, development in that region includes the harbor at Kawaihae and its adjacent industrial development and residences; 67 residential units at Kawaihae Village; the 310-room Mauna Kea Beach Hotel complex and 33 nearby single-family homesites; Spencer and Hapuna beach parks; as well as 150 house lots and a 38-unit condominium along Puako Beach Road.

The County's water system serving this area currently has about 240 service connections, and the number of these connections has been increasing at about five per year for the last four to five years. Average metered water consumption in this coastal region has been about 0.5 MGD for the last two years, down somewhat from the 0.6 to 0.7 MGD rates of the five preceding years (Figure I-2). The County DWS attributes the recent downturn to somewhat wetter weather, hence lesser irrigation usage rates (Gary Kawasaka of DWS, personal communication). This conclusion is supported by rain gauge data and indirectly, at least, by the increasing number of service connections. The trend of metered water consumption portrayed on Figure I-2, if some smoothing is done to account for weather variability, shows an increase of five to seven percent per year in the coastal region for the past ten years. For DWS's entire South Kohala district system, which includes Waimea and Pu'ukapu as well as Kawaihae to Puako, growth has averaged six to eight percent per year for the same period.

The present source of water supply for the Sourth Kohala coastal region consists of fresh water piped down from Waimea town mixed with brackish water pumped from wells at elevation 580 feet along the Waimea-Kawaihae Road (refer back to Figure I-1). The capacity of the pipeline from Waimea restricts maximum fresh water delivery toward the coast to 0.7 MGD. Quality of water from the mixing well limits the brackish addition to 0.3 MGD, bringing the maximum supply rate to the coastal service region to 1.0 MGD.

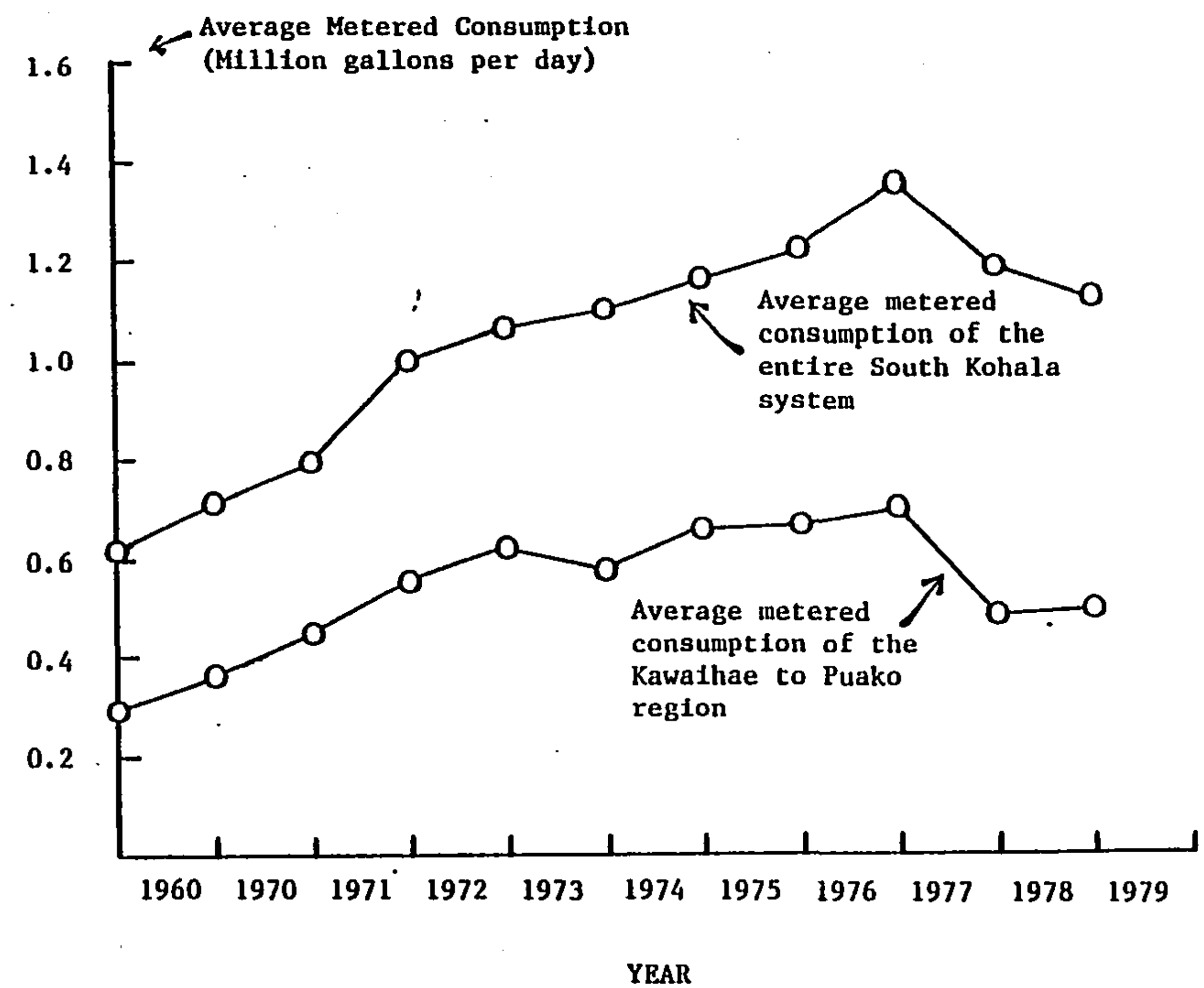


Figure I-2. Average metered water consumption of the County's South Kohala system has increased about 6 percent per year in the last ten years.

To judge the adequacy of this maximum supply rate in relation to current and anticipated metered consumption, leakage and other unmetered losses must be accounted for and seasonal variations in usage rates must be considered. Choosing prudent allowances for both--15 percent for unmetered losses and a 1.5 peak season to year-round factor for usage rates--the relationship between required supply and average metered assumption is:

S = 1.5 (AMC + 0.15 AMC)
Where S = required supply capability
and AMC = average metered consumption

In other words, the supply capability should be about 1.725 times the current or anticipated average metered consumption rate. By this measure, the 1.0 MGD existing supply capability ought to be used to serve up to 0.58 MGD average metered consumption. When average metered consumption exceeds 0.58 MGD, as it did in the 1973 to 1977 period, water shortage problems are likely to occur in the summertime, high usage periods. Shortage problems did, in fact, materialize. Residents and businesses along the coastal region had to be asked to curtail usage to lessen the severity of the shortage.

Limited water supply capability along the coast has also forced the County DWS to impose a moratorium on water service connection requests which involve more than two living units. As these requests have been received, they have been added to a growing list which now amounts to an estimated 0.56 MGD of additional water use. This list includes five proposed condominiums with a total of 399 units, two subdivisions with 23 lots, and a development of 500 agricultural lots (November 16, 1979 letter from Akira Fujimoto, County DWS to Belt, Collins & Associates). Notably, the list does not include potential water usage by two of the region's major resort developers, the Mauna Kea Land Corporation and Mauna Loa Land, Inc. Water supply requirements of these two large-scale developments are potentially several times greater than the total pending water requests of other coastal development.

Substantial development in the South Kohala district, primarily in the form of resorts along the Kawaihae to Puako coast, has been anticipated for a number of years. The historic perspective relating to the proposed water system is presented in Chapter II (Table II-1). In addition to major government investments in infrastructure--Queen Ka'ahumanu Highway, Keahole Airport, and Kawaihae Harbor are examples--both the State and County have been actively involved in increasing water supply capability. Prior to discovery of the Lalamilo groundwater source of supply in 1977, the attention of the two levels of government was focused on developing surface water above Waimea town and boosting the transmission capability from Waimea to the coast (Division of Water and Land Development, 1965; Parsons Brinckerhoff-Hirota Associates, 1970 and 1975; Department of Water Supply, 1971). The left-hand side of the graph on Figure I-3 depicts how water supply has been successively increased to match increasing water use since the mid-1960s. The right-hand side of the graph shows expected future water use. Several aspects of this diagram ought to be noted:

- All supply capability, use rates, and anticipated water demand are for the entire South Kohala District and not just the coastal region.

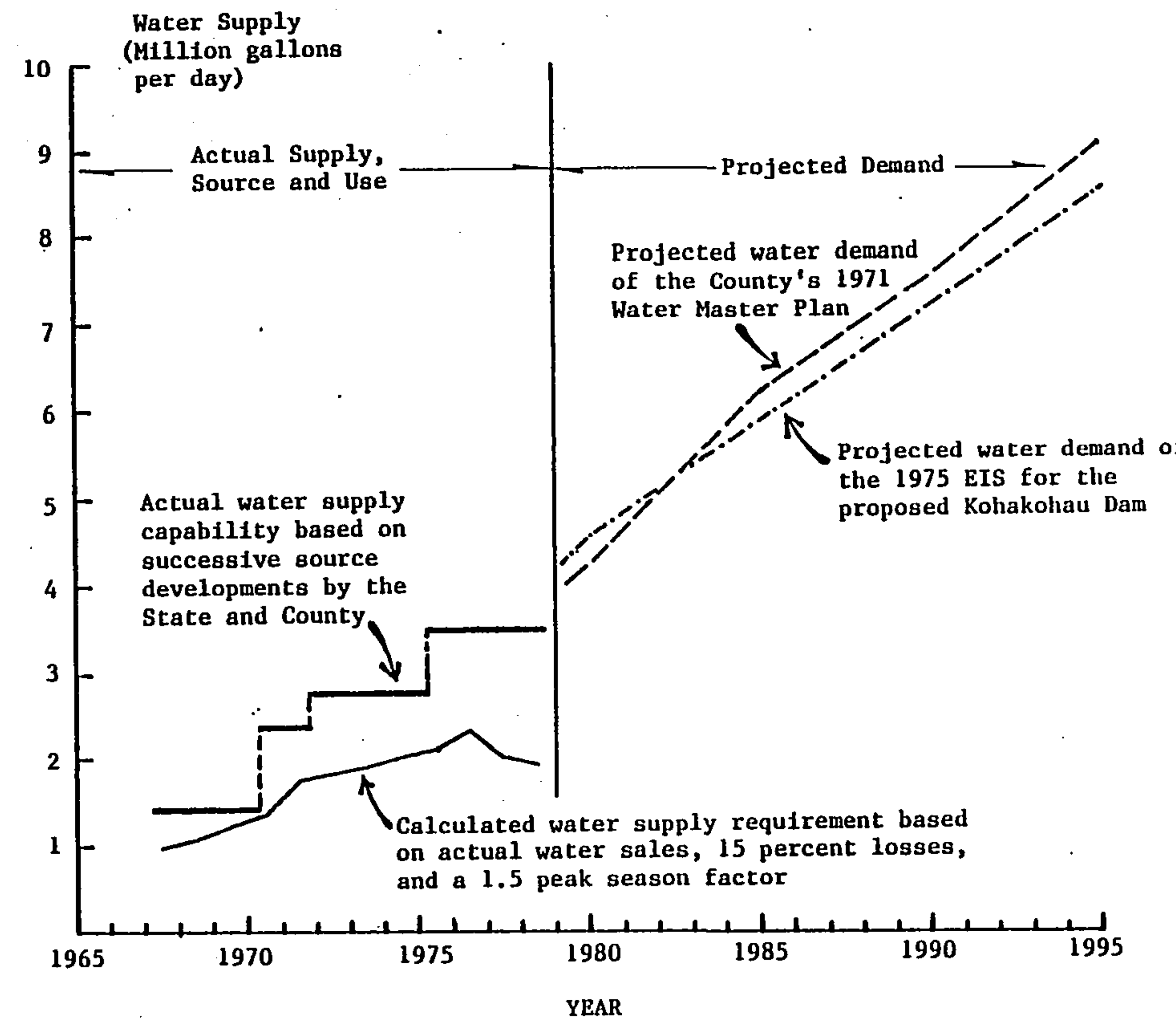


Figure I-3. Supply capability of the County's South Kohala water system compared to actual use and projected demand.

- There is currently a district-wide excess of supply capability over supply requirement of about 1.0 MGD. However, due to the transmission restriction posed by the water line from Waimea town to the coast, none of this supply excess can now be made available to coastal development. Only a new, ten-mile long transmission pipeline could enable the coastal region to utilize the excess. Some of this excess is currently being transmitted to Hamakua.

- Water demand projections in the County's Water Master Plan and for the State's Kohakohau Dam proposal anticipate substantial increases far above current supply capability.

With the proposed development of the Lalamilo groundwater supply source, it becomes important to distinguish between expected development growth along the Kawaihae to Puako coast and that of the South Kohala district as a whole. The new source of supply will only serve the coastal region, hence there is a need to focus specifically on expected growth for that area. Also, developing this new source would allow the current supply excess in Waimea to be applied in that area rather than shared throughout the district. This would postpone the need to develop new supply capability in Waimea for some years.

Table 1-3, supported by data in Table 1-4 and 1-5, details water supply requirements of expected development growth for the next ten years in the Kawaihae to Puako region that would be served by the Lalamilo Water System. The footnotes to these tables explain the basis for these projections. In general, they are based on announced development plans of Mauna Kea Land Corporation and Mauna Loa Land, Inc., water service connection requests and inquiries made to the County DWS, estimates of secondary regional growth due to resort development, and urban-zoned land which is currently unused. The bottom row of Table 1-3 shows the total new water supply requirements for the coastal region: 3.1 MGD to materialize in the 1982 to 1987 period; another 3.8 MGD to develop during the 1987 to 1992 period for a total additional water requirement of 6.9 MGD by 1992.

Table I-3. Estimated new water supply requirements in the Kawaihae to Puako region to be served by the Lalamilo Water System.

Development Element	Estimated Water Demand (MGD) In the 1982-1987 Period	In the 1987-1992 Period
o Resort development by Mauna Kea Land Corporation around the existing Mauna Kea Beach Hotel Complex[1]	0.937	1.623
o Resort development by Mauna Loa Land, Inc. around Makaiwa Bay[2]	1.074	1.414
o Other regional development from Kawaihae to Puako		
o Secondary growth in the region due to resort development by Mauna Kea Land Corporation and Mauna Loa Land[3]	0.375	0.360
o Minor condominium and resort development along Puako Beach Road, Waialea Bay, and Puako Bay[4]	0.550	0.180
o Industrial development at Kawaihae[5]	0.175	0.175
Total for five-year period	3.111	3.752
Cumulative Total	3.111	6.863

[1]Development and water demand anticipated for the Mauna Kea Land Corporation is detailed on Table I-4 following.

[2]Development and water demand anticipated for Mauna Loa Land, Inc. is detailed on Table I-5 following.

[3]Secondary growth in the region due to the Mauna Kea Land Corporation and Mauna Loa Land, Inc. resorts is primarily in-migration of employees and their families. In Chapter 4, the basis for projecting 850 new households by 1987 and another 900 between 1987 and 1992 is explained in detail. Based on plans of Olohana and Mauna Loa Land, it is assumed that 225 of these households will be within one or the other of these resorts by 1987 and another 300 between 1987 and 1992. Thus their water demand is already accounted for in the first two lines of the table. Water demand for the balance of new households, 625 by 1987 and another 600 by 1992, is estimates using 600 gallons per unit per day.

[4]Growth in the region's condominium and resort projects not associated with the two major developers is estimated as follows. The County's list of requests for service connections pending the availability of water is taken to be the entire growth in the first five years. This list includes five condominium projects totaling 399 units, 23 residential lots in two subdivision projects, and a 500-lot agricultural subdivision. Department of Water Supply estimates the total demand to be 0.55 MGD (letter from Akira Fujimoto dated November 16, 1979). Growth in the second five years is estimated to be an additional 300 condominium units. This would be approximately 50 percent of the maximum allowed by zoning after the first five years of development.

[5]Approximately 140 acres of land in Kawaihae is zoned for industrial development but is currently unused. Assuming 25 percent of this acreage is developed in each five-year period, and assuming a maximum daily water use of 5,000 gallons per acre, water demand totals 0.175 MGD for each period.

Table I-4. Estimated water supply requirements of the planned resort development of the Mauna Kea Land Corporation at Kaunaoa and Hapuna Bay.[1]

Development	Maximum Water Demand Rate (Gal/Unit/Day)[3]	In the 1982 to 1987 Period No. of Units	In the 1982 to 1987 Period Maximum Water Demand (MGD)	In the 1987 to 1992 Period No. of Units	In the 1987 to 1992 Period Maximum Water Demand (MGD)
o Hotels					
o MKBH Addition (by rooms)	750	120	0.090	--	--
o Luxury Hotel (by rooms)	1000	400	0.400	--	--
o First Class Hotel (by rms.)	650	--	--	750	0.488
o Condominiums (by units)	650	200	0.130	925	0.601
o SF Residential (by units)	650	250	0.163	400	0.260
o Commercial/Industrial (by acre)	5000	12	0.060	30	0.150
o Recreational Facilities (by acre)					
o Golf Course Clubhouse[2]	5000	10	0.050	10	0.050
o Tennis Complex	2000	10	0.020	25	0.050
o Other	4000	6	0.024	6	0.024
Total for Five-Year Period	--	--	0.937	--	1.623
Cumulative Total	--	--	0.937	--	2.560

[1]Development estimates are based on information implied by Olohana Corporation and are the best possible at this time. The actual rate of development will depend upon a number of factors, such as market demand and County approval of detailed site plans, that are beyond the control of individual property owners. Because of this, it is possible that the development rate may differ from that shown in this document.

[2]It is important to note that the golf course will be irrigated by water from brackish wells on the development site. The water demand here is for potable water use at the clubhouse.

[3]Water demand rates for these developments are estimated by Belt, Collins & Associates.

Source: Olohana Corporation and Belt, Collins and Associates.

Table I-5. Water supply requirements of the planned resort development by Mauna Loa, Land, Inc. at Makaiwa Bay.[1]

Development	Maximum Water Demand Rate (Gal/Unit/Day)[2]	In the 1982 to 1987 Period No. of Units	In the 1982 to 1987 Period Maximum Water Demand (MGD)	In the 1987 to 1992 Period No. of Units	In the 1987 to 1992 Period Maximum Water Demand (MGD)
o Hotels					
o Luxury Hotel (by rooms)	1000	450	0.450	--	--
o Other Hotels (by rooms)	650	500	0.325	1100	0.715
o Condominiums (by units)	650	300	0.195	850	0.553
o SF Residential (by units)					
o Resort	650	40	0.026	75	0.049
o Village Housing	650	35	0.023	--	--
o Commercial (by acres)	5000	4	0.020	8.8	0.044
o Recreational Facilities (by acres)					
o Golf Course Clubhouse[3]	5000	5.0	0.025	--	--
o Tennis & Maintenance Complex	2000	5.0	0.010	--	--
o Beach Club	4000	--	--	3.3	0.013
o Project Nursery	5000	--	--	8	0.040
Total for Five-Year Period	--	--	1.074	--	1.414
Cumulative Total	--	--	1.074	--	2.488

[1]Development estimates are based on information supplied by Mauna Loa Land, Inc., and are the best possible at this time. The actual rate of development will depend upon a number of factors, such as market demand and County approval of detailed site plans, that are beyond the control of individual property owners. Because of this, it is possible that the development rate may differ from that shown in this document.

[2]The type and number of units of development have been provided by Mauna Loa Land, Inc. Water demand rates for these developments are estimated by Belt, Collins & Associates.

[3]The golf course will be irrigated with brackish water from an existing horizontal shaft (Well No. 5750-01). The water demand here is for potable water use at the clubhouse.

Source: Belt, Collins and Associates.

Earlier in this discussion, the capacity of the Lalamilo Water System defined by County DWS standby requirements was shown to be 2.0 MGD at the end of the first, $2.9-million construction increment, 3.3 MGD after the second increment, and 5.3 MGD when the water system is completed. When these capacities are compared to anticipated supply requirements, an idea of the extent of development that this water system could serve can be demonstrated. Linearly interpolating the 3.1 MGD supply requirement in 1987 and 6.9 MGD in 1992, the comparisons are:

- The first construction increment, producing 2.0-MGD supply capacity, would suffice for development through 1987.

- The second construction increment, boosting supply capacity to 3.3 MGD, would suffice until 1987 or 1988.

- The final construction increment, completing the 5.3-MGD system capacity, would serve development through 1990.

Note that the 5.3-MGD ultimate system capacity will be sufficient to supply approximately 80 percent of the expected development shown on Tables I-3 through I-5. When and if actual development does match the 5.3-MGD system capacity, further source development would be required if development in the coastal region is to continue.

SCOPE OF THIS EIS

The construction and operation of the proposed Lalamilo Water System would result in both direct and indirect impacts to the existing environment. Both are discussed in this report, but, because of inherent differences between them and in our ability to predict what they would be, they are treated separately and in differing fashions.

The direct impacts are those that would stem from such things as the clearance of vegetation during the construction of pipelines, the operation of pumps providing water to the system, and construction-related employment. In general, the direct impacts expected to result from the proposed project are both limited in scale and significance and transitory in nature. Once the actual construction work is completed, the areas that would be disturbed would return to essentially their pre-project state; only a few reservoirs and other small facilities would be visible on the surface. If project-related changes were limited to direct impacts, the proposed project would clearly have no significant impact.

It is evident, however, that project-related change would not be limited to direct effects such as these. The Lalamilo Water System is planned to make available an additional 5.3 MGD of water to a coastal area where the lack of sufficient water is the single greatest physical obstacle to large-scale resort development. Hence, it appears likely that the proposed project would lead to considerable urban development. This secondary growth would, in turn, have a wide range of impacts. It must be emphasized that the construction of the water system would not cause urban development of the region to occur. Only the proper combination of market demand, developer initiative, and governmental approval would do that. The water system would, however, permit these market forces to be translated into actual urban growth.

Because this growth may be viewed as a logical outcome of the proposed action, i.e., the construction and operation of the water system, this EIS deals extensively with the various impacts that are associated with it. This treatment is in accordance with Section 1:42e of the State's Environmental Impact Statement Regulations.

While the assessment of primary impacts is a relatively straightforward task that is based on the specific construction plans for the project, consideration of secondary impacts necessarily involves much more speculation. The secondary growth scenario upon which portions of this EIS are based is presented at the beginning of Chapter III. It was derived using existing State, County, and private sector plans as guides, and we believe it outlines the development pattern most likely to occur if the proposed project is implemented. However, to the extent that the actual growth differs from that projected at this time, the resulting impacts could also vary.

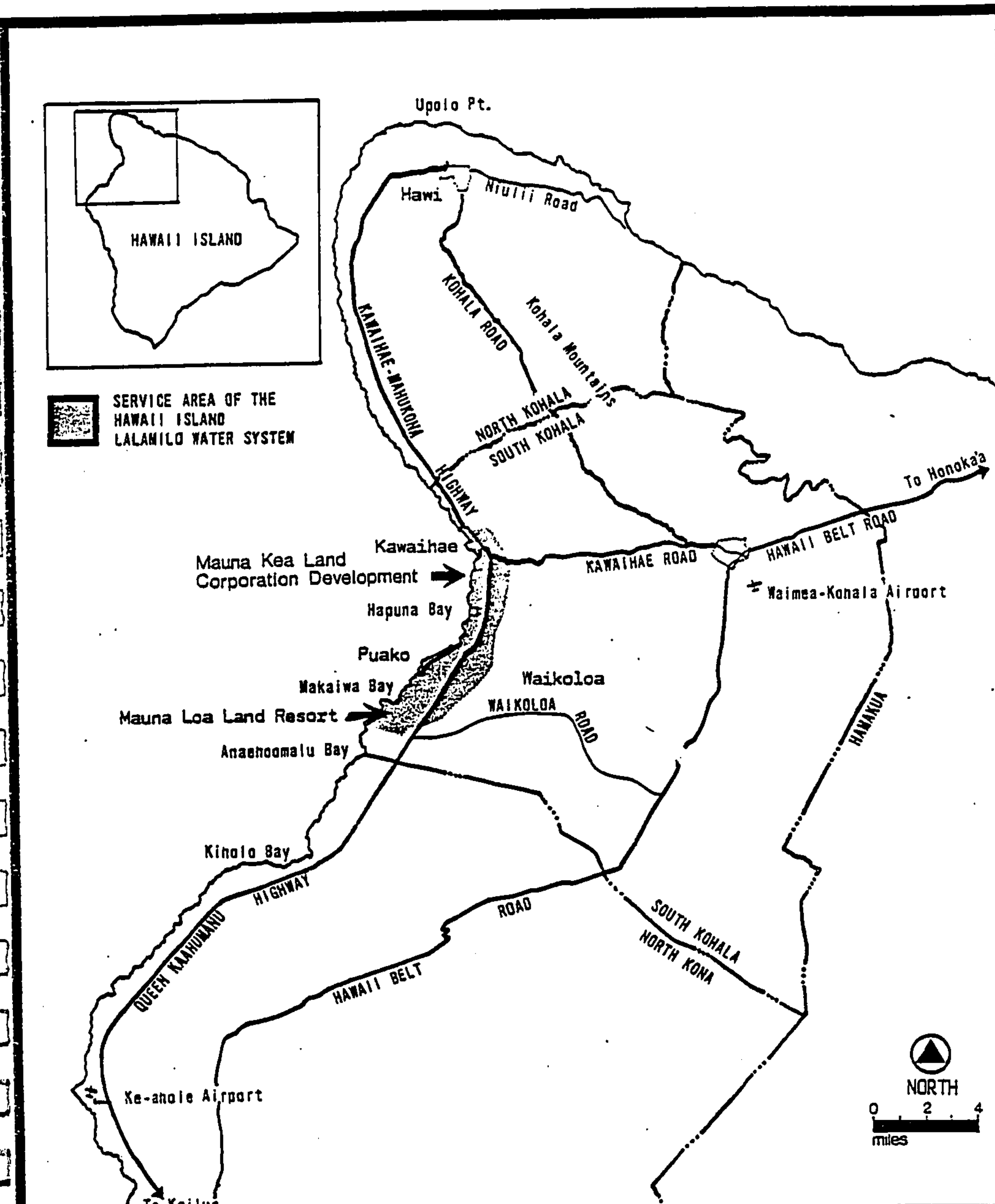
As indicated earlier in this chapter, the bulk of the resort development that would be served by the proposed water system would be on land owned by the Mauna Kea Land Corporation and by Mauna Loa Land, Inc. Because its present development pre-dates the establishment of the State and County EIS requirements, Mauna Kea Land Corporation has never completed a comprehensive EIS for their land. Mauna Loa Land, Inc., on the other hand, has received County approval of an EIS for its proposed resort, and interested readers may consult it for material specific to their proposal. Unfortunately, the Mauna Loa Land, Inc. EIS was not done as a Chapter 343 document. Because of this, it cannot be incorporated here by reference.

In discussing the proposed project, we have found it useful to distinguish between different geographic areas that would be affected. These are defined below.

- Corridor of the Lalamilo Water System. This refers to the land upon which the wells, transmission lines, reservoirs, and other facilities that would comprise the system would be built. It includes limited adjacent areas that would be disturbed by the movement of construction equipment. The boundaries of this area correspond roughly to the transmission line corridor shown on Figure I-1.

- Lalamilo Water System Service Area. The approximate extent of the area that would be served by water from the Lalamilo system is shown on the regional map contained in Figure I-4.

- North and South Kohala Region (or simply "The Region"). This region consists of the North and South Kohala judicial districts as shown on Figure I-4. The boundaries of the South Kohala District correspond to those of census tract 217; those of the North Kohala District are essentially the same as those of census tract 218.



NORTH & SOUTH KOHALA REGION

DECEMBER 10. 1979

FIGURE I-4:

CHAPTER II

CHAPTER II. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AREA

This chapter addresses the conformance to the State and County land use regulations and development policies of the project and the secondary growth that is expected to occur in South Kohala following the construction of the Lalamilo Water System.

The Kohala Coastal Region has long been recognized by both the State and County of Hawaii as a prime location for a principal destination resort development. The existing governmental land use plans, policies, and controls in the region all support the concept of a major destination resort area in South Kohala. Both general policy guidelines and specific land use regulations, on the State and County levels, are discussed below as they relate to the anticipated development of the area.

STATE LAND USE

The facilities proposed as part of the Lalamilo Water System all lie within the State Land Use Commission's Agricultural District. They are defined as "permissible uses" in Section 3-3(1) of the State Land Use District Regulations. Most, if not all, of the coastal land within the Lalamilo Water System service area upon which water system-related development is expected to occur is within the Urban District. Secondary growth projected for North Kohala and Waimea would require re-districting land.

THE HAWAII STATE PLAN

The development of the proposed Lalamilo Water System is generally consistent with the policies and objectives of the Hawaii State Plan which was approved by the 1978 State Legislature. The implementation of this system would allow long-planned resort and residential projects to occur along the South Kohala Coast. This, in turn, would assist in the expansion and growth of the area's economy. The following selected highlights are taken from Sections 6 and 8 of the Hawaii State Plan. These, along with discussion which follows each objective/policy, demonstrate that the State Plan's economic objectives will be easier to fulfill in the South Kohala Region if the Lalamilo Water System is implemented.

Section 6 - Objectives and Policies for the Economy - In General

- "Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people."

Discussion The resort development on the South Kohala Coast that would almost certainly occur once the water system is completed would greatly increase the possibility that the above objectives are reached in this region of the Big Island. Increased and diversified employment opportunities would be achieved through the establishment of both hotels and supportive service businesses. We expect that a variety of new businesses would be established both within and outside of the primary resort areas. Such new businesses would be necessary to provide the wide variety of services normally required when a considerable de facto population increase occurs in a given area. We anticipate that many of the new jobs would be filled by persons already residing on the island. Numerous new businesses would probably also be started by the region's current residents. Furthermore, an expansion of the already existing locally-owned establishments would probably occur.

- "Strive to achieve a sustained level of construction activity responsive to, and consistent with, State growth objectives."

Discussion: A sustained level of construction activity would be achieved if the proposed water system is constructed. This would be in accordance with the State policy of controlled growth, as the State has already designated most of the coastal lands in the Lalamilo Water System service area for urban expansion.

- "Encourage labor-intensive activities that are economically satisfying."

Discussion: The high-quality resorts proposed for the South Kohala Region would be highly labor intensive. We expect the jobs available within them to become increasingly economically satisfying as the salaries paid for all job categories within the visitor industry increase. This improved economic attractiveness of employment within the visitor industry would pertain, largely, to the region's residents as the resort operators strive to seek and train local labor force. We fully expect that employees from outside the County would be brought in only when local help simply could not be found. This policy would relate to jobs at all levels, including the managerial openings.

- "Promote economic activities, especially those which benefit areas with substantial unemployment problems."

Discussion: Based on the September 1979 issue of First Hawaiian Bank's Economic Indicators, as of July, 1979, Hawaii County had the highest unemployment rate of any County within the State. Whereas the statewide rate was estimated at 6.2 percent, fully 8.6 percent of the Big Island's labor force was without a job. By comparison, Maui County, with its extensive resort activity, had only a 5.4 percent unemployment rate; Kauai's unemployment was estimated to be 6.1 percent. Clearly, the visitor industry has been shown to be capable of providing enough jobs to substantially increase employment rates.

- "Encourage businesses that have favorable financial multiplier effects within Hawaii's economy."

Discussion: The visitor industry has historically generated a very favorable financial multiplier effect within the Hawaiian economy. The multitude of ancillary services which are essential to resort development provide a wide variety of employment opportunities to the residents of this State.

Section 8 - Objectives and Policies for the Economy - Visitor Industry

- "Assist in the overseas promotion of Hawaii's vacation attractions."

Discussion Hawaii will have increased market promotion on the U.S. Mainland and abroad if the resort development permitted by the proposed water system occurs in South Kohala. All resort operators would actively promote their projects as destination resort areas not only for the U.S. Mainland market, but also abroad.

- "Ensure that visitor facilities and destination areas are carefully planned and sensitive to existing neighboring communities and activities."

Discussion The major visitor facilities proposed for the South Kohala area have been in the planning stages for many years. Concurrently, there has been increasing sensitivity among the developers and operators of resort facilities toward the existing neighboring communities and activities. Those facilities which have already been constructed such as Mauna Kea Beach Hotel are prime examples of excellent planning and design. Aside from the good design, which minimizes visual disruption to the area, these resorts now provide free public access to their beaches and allow the public to use, albeit for a fee, their various recreational facilities such as golf courses or tennis courts. We expect these policies to be continued within the new resorts proposed for the region.

- "Develop industry in a manner that will provide the greatest number of primary jobs and steady employment for Hawaii's people."

Discussion The visitor industry does provide a large number of primary jobs and, generally, very steady employment. Those jobs are not only within the resort, but are also provided by numerous supportive services.

- "Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the visitor industry."

Discussion As previously stated, the owners/operators of the major resort facilities proposed for the South Kohala Coastal Region have indicated their strong committment to providing local residents with job training. This in turn would give residents access to numerous and varied employment opportunities within the visitor industry.

- "Foster a recognition of the contribution of the visitor industry to Hawaii's economy and the need to perpetuate the Aloha Spirit."

Discussion This objective of the Hawaii State Plan further highlights the belief that the importance of a healthy and appropriately expanding visitor industry in Hawaii must not be underestimated. The implementation of the proposed Lalamilo Water System would insure that this sector of Hawaii Island's economy has an opportunity to expand in South Kohala. It is possible for other sectors, such as agriculture, to expand and prosper along with the visitor industry. In fact, these industries can eventually be supportive of one another.

COUNTY SPECIAL MANAGEMENT AREA

The South Kohala coastal region's lands below the Queen Ka'ahumanu Highway fall within the County's Coastal Zone Special Management Area (SMA). The anticipated development of a major visitor destination area on these lands that would be spurred by the proposed water system would conform to the SMA guidelines for development as follows:

Public Access

Public access to the shoreline and related recreational resources would not be adversely affected or hindered. Rather, it is anticipated that this access would be made easier as the result of the roads and public parking facilities which the developers of the planned resorts would provide.

Solid and Liquid Waste

As explained in the Public Services section of Chapter III, provisions would be made for solid and liquid waste collection and treatment. These provisions would minimize any adverse effects upon Special Management Area resources.

Scenic Views

If the resort network along the coast that would be permitted by the water system becomes a reality, scenic views from Queen Ka'ahumanu Highway toward the ocean would necessarily be modified. However, based on the plans that have been made public, it appears that a great deal of attention would be given to preserving as many view corridors as possible. Building forms would be softened by extensive landscaping, and building forms and heights would be in conformance with the County zoning regulations. These measures would ensure that buildings would be sited to preserve primary ocean views for motorists driving along the Queen Ka'ahumanu Highway. The views to the ocean from Waikoloa and other mauka developments would not be adversely affected by this development.

COUNTY ZONING

The County zoning along the South Kohala Coast indicates a commitment to the development of this region into a destination resort area and a residential community. The following are zoning designations, along with acreage given to each, from Kawaihae to Puako:

V 1.25	(Resort Hotel at 1,250 sq.ft./unit)	37.4 AC
RS 10	(Single Family, 10,000 sq.ft. lots)	35.0 AC
RS 15	(Single Family, 15,000 sq.ft. lots)	23.4 AC
RM 1.5	(Multi-family at 1,500 sq.ft./unit)	14.4 AC
RM 5	(Multi-family at 5,000 sq.ft./unit)	33.0 AC
CV 10	(Village Commercial at 10,000 sq.ft./ac.)	8.9 AC

Additionally, there are 199 acres of industrial-zoned land at Kawaihae, of which 140 acres are still vacant.

COUNTY GENERAL PLAN

The resort/residential development expected to occur once the proposed Lalamilo Water System becomes operational is consistent with the goals, policies, and courses of action identified in the County of Hawaii General Plan. The General Plan, adopted in December 1971, states in part:

> "South Kohala's Coastline, dotted with beaches and coves, is envisioned as a *major resort area*. The area is endowed with natural amenities which are conducive to resort development." (p.96)

Noting that only a small portion of the 200 acres zoned for resort use in the South Kohala district is actually occupied by resort structures (ten acres as of 1971), the County General Plan proposes as a course of action, that:

- "Adequate access, sewer and water systems, and other basic amenities shall be provided in all areas where high density uses are allowed."
- "Resort developments shall provide public access to beach areas." (p. 96)

In accordance with the above policies, several significant government-financed projects have already been implemented in this region. These projects include Keahole Airport, Queen Ka'ahumanu Highway, and Hapuna and Spencer parks. These improvements represent a logical sequence of events leading to the further development of this region. The development of water resources, however, is one crucial project which is yet to become a reality.

Table II-1 summarizes, in chronological order, those developments in the region which have been significant in supporting both the State and County policy of establishing a major resort district along the South Kohala coast.

COASTAL ZONE MANAGEMENT ACT

The Lalamilo Water System, not being within the coastal zone, is not affected by the provisions of this Act. The secondary development which we expect to occur along the Coast will be subject to the CZM Act and will have to adhere to its statutory provisions.

Table II-1. Chronological list of significant South Kohala development events relating to water supply, other infrastructure, and and resort projects along the coastline.

Date	Event
1959	Development of Kawaihae Harbor as a major inter-island shipping terminal by the Corps of Engineers.
1960	State's Visitor Destination Study specifies the Kawaihae-to-Puako region as a potential resort area.
Early 1961	State's Lalamilo Irrigation System utilizing water from the Upper Hamakua Ditch, begins service with the opening of the Lalamilo Farm lots on State land just outside Waimea town.
March 1961	State Division of Water and Land Development (DOWALD) drills its first exploratory well at 580-foot elevation along Waimea-Kawaihae Road, 1-1/2 miles from shoreline; the well yields brackish water.
June 1961	DOWALD's second exploratory well is completed at an elevation of 392 feet, 1.1 miles inland from Kaunaoa Bay; again, brackish water is obtained.
July 1961	DOWALD's third exploratory well is drilled at an elevation of 980 feet along Waimea-Kawaihae Road, 2.4 miles in from shoreline; water of almost potable quality is obtained.
1962	DOWALD, with an appropriation from the legislature and technical help from the U.S.Geological Survey, begins the South Kohala-Hamakua water development study.
January 1963	Interim report on the water study is issued by DOWALD identifying required items of work for a full program of study and requesting funds from the legislature for funds to carry it out. The report cites the growth potential of the deep-water harbor at Kawaihae, farming in Waimea, planned resort facilities on the Kohala coast, and the proposed South Kohala-North Kona Highway.
May 1963	The first irrigation well for the Mauna Kea Beach Hotel golf course is completed at ground elevation of 188 feet and inland from Kaunaoa Bay.
February 1964	Second irrigation well for Mauna Kea Beach Hotel golf course is completed at ground elevation of 340 feet.
January 1965	DOWALD issues A Water Development Plan for South Kohala-Hamakua, Island of Hawaii. Existing South Kohala population, just 1,538 in the 1960 census, is expected to be 11,000 in 1985. County Department of Water Supply water sales, about 0.5 MGD in 1965, are expected to be 2.7 to 3.7 MGD in 1985. The report recommends development of surface water above Waimea town in several increments.
July 1965	Opening of the Mauna Kea Beach Hotel.
1965	County. Department of Water Supply begins mixing brackish well water to increase the supply of water to the South Kohala coast.
1968	Boise Cascade purchases 31,000 acres in Waikoloa from Parker Ranch.
August 1968	Boise Cascade completes a test well at 600-foot elevation, and 3.8 miles inland from the Puakoa coastline; well yields brackish water.
March 1969	DOWALD studies water supply development for the Kawaihae to Mahukona area and recommends rehabilitation of a portion of the Kehena Ditch, transmission line of 13,400 feet to a 60-MG, earth-lined reservoir, a filtration plant, and distribution facilities. A water supply of 1.16 MGD would be obtained for a $2.23-million investment.

Date	Event
February 1969	Boise Cascade completes a second well at 800-foot elevation and 4.3 miles in from Puako coastline; again brackish water is obtained.
Late 1969	At a location 4.7 miles inland from Puako and at elevation 1,200 feet, a third well is completed for Boise Cascade. For the first time in the South Kohala Region, groundwater of potable quality is obtained. Subsequent pump tests of this and another well drilled nearby establish that the yield of the groundwater source is in excess of 2 MGD (Bowles, 1972; Stearns, 1972).
February 1970	An engineering feasibility study of a large dam on Kohakohau Stream above Waimea town is issued. The study, commissioned by DOWALD, suggests development of the dam in two stages. The first stage would cost $6 million and provide 5 MGD of water supply. The second stage would cost another $9.5 million and bring the supply up to 10 MGD.
Mid-1970	County Department of Water Supply completes a 50-MG storage reservoir, increasing its supply capacity by 1.0 MGD. Total capacity of the County's system is 2.38 MGD.
Late 1970	Keahole Airport in North Kona is opened. Construction of the airport was undertaken to serve expected regional growth in tourism.
1971	Construction of a marina adjacent to Kawaihae Harbor by the U.S. Corps of Engineers is begun.
January 1971	County's General Plan designates three locations along the South Kohala coastline as major resort areas. The three are Kauna'oa-Hapuna, Pauoa-Honoka'ope, and Anaeho'omalu.
Late 1971	County Department of Water Supply completes diversion of Kohakohae Stream to its reservoirs, increasing its supply capacity by 0.4 MGD to bring its total to 2.78 MGD.
December 1971	County Department of Water Supply issues its Water Master Plan, in which growth in water use of about 6% per year is anticipated. New source development is cited as a requirement, beginning with a second 50-MG storage reservoir.
August 1972	DOWALD drills and tests a well in Kiholo (4953-01) located 2.7 miles inland from Kiholo Bay at 930-foot elevation; brackish water is obtained.
1972	Mauna Loa Land, Inc. (formerly Orchid Isle) purchases 3,200 acres of land around Makaiwa Bay and the Kalahuipua'a fish ponds to be developed as a resort.
1974	Boise Cascade purchases additional land at Anaeho'omalu from Parker Ranch in order to develop a resort.
1974	A joint venture of major resort developers, the Olohana Corporation (now Mauna Kea Land Corporation) and Mauna Loa Land, Inc., proposes a high elevation groundwater exploration program on State land in Lalamilo as an alternative to Kohakohau Dam.
1975	The Queen Ka'ahumanu Highway, linking Kawaihae to Kailua, Kona along the South Kohala and North Kona coastlines, is completed.
Early 1975	The County Department of Water Supply completes a second 50-MG storage reservoir, increasing its supply capacity by 0.7 MGD to a total of 3.48 MGD.
June 1975	DOWALD issues an EIS for the proposed Kohakohau Dam; it considers eight other water development alternatives, but concludes that the dam is the best regional water supply solution.

Date	Event
July 1978	DOWALD completes and tests a high-elevation (1,200 feet) test well in Lalamilo (Lalamilo "A", no. 5946-01). At a pumping rate of 1.5 MGD, the drawdown in the well is only two feet and water of potable quality (77 ppm chlorides) is obtained. DOWALD concludes that development of potable groundwater in the Lalamilo area is feasible.
1978-79	Transcontinental and Bass Brothers purchase Boise Cascade's holdings in Waikoloa.
January 1979	An agreement is signed by the County, Olohana Corporation (now Mauna Kea Land Corporation) and Mauna Loa Land, Inc. for development of a water system utilizing groundwater from Lalamilo. By this agreement, the County will issue up to $2 million in general obligation bonds to fund construction of the system, the joint-venture developers will make payments due on these bonds to the County, and a portion of the water of the system is reserved for the joint-venture developers.
May 1979	DOWALD awards a contract to drill two more exploratory wells in the Lalamilo area at elevation 1,100 to 1,200 feet.
Mid-1979	Olohana Corporation (now Mauna Kea Land Corporation) undertakes drilling two more brackish water irrigation wells to irrigate a second *(future) golf course*. *Mauna Loa Land, Inc.* builds an irrigation system for its golf course; this system will utilize brackish water from a horizontal shaft (well no. 5750-01) developed by Parker Ranch in 1961.

CHAPTER III

CHAPTER III. DESCRIPTION OF THE EXISTING ENVIRONMENT AND IMPACTS OF THE PROPOSED PROJECT

Introduction

The installation of the wells, water transmission lines, storage reservoirs, and other facilities that comprise the proposed Lalamilo Water System (see Chapter I for a complete description) would involve construction activity and limited alterations to the existing environment. More importantly, from the standpoint of impacts, it would allow private developers to implement their plans for resort development within the area served by the system. This, in turn, would bring with it extensive secondary growth as workers and their families are attracted to (or retained in) the region by the employment opportunities that would be generated. Impacts, both physical and social, would accompany this growth and far outweigh those effects related directly to the construction of the water line. Because of this, the analysis which follows devotes considerable attention to the implications of water-system related growth.

In line with the emphasis on secondary growth, the sections that comprise this chapter are organized somewhat differently than is ordinarily the case. The most conspicuous deviation is the placement of the analyses of socio-economic impacts at the beginning of the chapter. This was necessitated by the fact that the secondary growth scenario associated with the project had to be developed before its impacts on such things as air and water quality, traffic, noise levels, and other environmental factors could be fully assessed. Listed below are the section titles together with a brief summary of the contents.

<u>IMPACTS ON EMPLOYMENT AND POPULATION</u>. This section begins with a brief socio-economic profile of the existing community. It then discusses probable growth if the proposed Lalamilo Water System is not constructed. Following that, the section reviews the results of two growth-forecasting models and presents the regional development scenario used as the basis for the EIS's assessment of other impacts. It concludes with a governmental benefit-cost analysis for the project.

<u>SOCIAL IMPACTS</u>. This section begins with a brief social description of the present residents of North and South Kohala. It then proceeds to outline the changes that are likely to occur as a result of the secondary growth expected to follow construction of the water system. It concludes with a review of present residents' opinions relative to the projected resort growth and a discussion of ways of mitigating social impacts which might otherwise occur.

<u>IMPACTS ON LANDFORM, GEOLOGY, AND SOILS</u>. This section describes the geology, landforms, and soils within the Lalamilo Water System right-of-way and service area that would be affected by construction of the proposed project and related secondary growth. Impacts, which are expected to be minor, are discussed insofar as possible with the generalized plans that are now available.

IMPACTS ON WATER RESOURCES. This section describes the known water resources in the South Kohala District and discusses the various water development options that have been considered in the past. It then goes on to show that the groundwater withdrawals that would be made to feed the Lalamilo Water System would not result in total withdrawals exceeding the aquifer's sustainable yield.

IMPACTS ON BIOLOGICAL RESOURCES. The discussion of biological impacts is divided into two major parts; the first covers effects on fauna and the second effects on vegetation. In both cases, information regarding existing species distribution on land within the pipeline right-of-way and on sites most likely to experience project-related development is presented first; this is followed by a discussion of the ways in which these plant and animal communities would be affected if a decision is made to proceed with the proposed project.

IMPACTS ON ARCHAEOLOGICAL RESOURCES. This brief section presents the results of an archaeological survey of the corridor that would be followed by the transmission facilities in the Lalamilo Water System. It then discusses the general nature of archaeological resources known to be in the area most likely to be affected by project-related secondary growth.

IMPACTS ON THE VISUAL ENVIRONMENT. A very limited number of aboveground facilities are included within the water system itself, and the concrete building plans for the secondary growth that is likely to occur are currently lacking. In view of this, the discussion of visual changes that are likely to occur is kept at a general level.

IMPACTS ON PUBLIC SERVICES AND FACILITIES. Impacts of this nature brought on by the proposed project are all related to the secondary growth that is likely to follow construction of the Lalamilo Water System. They are discussed under seven headings: Schools, Protective Services (fire and police), Sewage Treatment and Disposal, Solid Waste Disposal, Electric Power, Recreation, and Health Care.

IMPACTS ON TRAFFIC. This section describes the existing road network and traffic volumes in the vicinity of the Lalamilo Water System. It then translates project-related growth into traffic estimates and combines these with projections of traffic unrelated to the predicted water system related growth to arrive at projections of traffic volumes at key points. Finally, it discusses the ability of the road system to handle the projected traffic volumes and suggests ways of mitigating possible impacts.

AIR QUALITY IMPACTS. This section uses the traffic projections to arrive at an estimate of project-related changes in air quality. These changes all derive from secondary growth permitted by the water system.

NOISE IMPACTS. This section, like the preceding section on air quality, uses the traffic projections to assess the probable impacts of water-system related development on noise levels.

IMPACTS ON EMPLOYMENT AND POPULATION

The absence of sufficient water has been the major factor forestalling large-scale resort development on the portion of the South Kohala coast that would be served by the proposed Lalamilo Water System. Construction of the wells, transmission mains, and other facilities being proposed as part of the Lalamilo Water System would eliminate this constraint and lead to significant employment and population growth. The remainder of this section discusses these phenomena. The estimates presented herein form the basis of the EIS discussion of secondary impacts. As such, they are an extremely important component of this document.

Socio-Economic Background

Summarized below are selected demographic and economic background data concerning the region that would experience substantial changes as a result of the proposed Lalamilo Water System. This information was assembled by Hastings, Martin, Hallstrom, & Chew, Ltd. in a report prepared especially for this study.For the purposes of this analysis, this region or primary impact area has been defined as the North and South Kohala Judicial Districts, i.e. Census Tract 217 (South Kohala) and Census Tract 218 (North Kohala). The boundaries of this region are shown on Figure I-4.

All of the physical improvements that would be made as part of the Lalamilo Water System project and the resort development which it would allow would be within the South Kohala District. However, because North Kohala may be expected to experience substantial secondary growth and to supply a significant proportion of the resort's labor force, it has been included within the primary impact area.

Population

The most recent, reliable, and comprehensive data for the North and South Kohala impact area are the U.S. Government Censuses for 1960 and 1970. It should be noted that a partial census survey was conducted in 1975 in an attempt to provide comparable data on an updated basis (Community Services Administration, 1976). Unfortunately, the reliability of the results of this undertaking is extremely questionable and, therefore, the usefulness of the data is severely limited (Hastings, Martin, Hallstrom and Chew, Ltd., 1979:1). Rather than present possibly misleading data, the use of 1975 census update data has been omitted entirely. The reader, however, may wish to refer to this source of data.

Although the decennial census data are somewhat outdated, they do provide general background information and an indication of the historical characteristics of the region. Furthermore, the data are helpful in identifying distinctions between the two districts and are the best available for an accurate benchmark for our analysis. Table III-1 summarizes demographic data by district and for the overall County of Hawaii for 1960 and 1970.

Table III-1. General population characteristics for the North Kohala and South Kohala Districts: 1960 and 1970

	No. Kohala District CT 218				So. Kohala District CT 217				Hawaii County			
	1960		1970		1960		1970		1960		1970	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total Number of Persons	3,386	100.0	3,326	100.0	1,538	100.0	2,310	100.0	61,332	100.0	63,468	100.0
Male	1,855	54.8	1,746	52.5	807	52.5	1,205	52.2	32,927	53.7	32,898	51.8
Female	1,531	45.2	1,580	47.5	731	47.5	1,105	47.8	28,405	46.3	30,570	48.2
Age Distribution												
Under 5 Years Old	420	12.4	333	10.0	184	12.0	215	9.3	6,971	11.4	5,446	8.6
5 - 19 Years Old	1,075	31.7	1,059	31.8	507	33.0	694	30.0	19,767	32.2	19,756	31.1
20 - 64 Years Old	1,626	48.1	1,619	48.7	756	49.1	1,254	54.3	30,007	48.9	32,428	51.1
65 Years and Older	265	7.8	315	9.5	91	5.9	147	6.4	4,587	7.5	5,838	9.2
Ethnic Group												
Caucasian	Not Available		851	25.6	Not Available		906	39.2	Not Available		18,298	28.8
Japanese			793	23.8			564	24.4			23,817	37.5
Chinese			142	4.3			30	1.3			1,841	2.9
Filipino			972	29.3			152	6.6			10,454	16.5
Hawaiian/Part-Hawaiian			510	15.3			611	26.5			7,809	12.3
Other			58	1.7			47	2.0			1,249	2.0
Education of Persons 75 Years and Older												
Eight Years or Less	1,185	65.4	784	44.3	368	50.9	297	24.1	17,725	55.3	12,820	37.2
Some High School (1-3 years)	260	14.4	259	14.6	118	16.3	225	18.2	4,662	14.5	5,539	16.1
Completed High School	309	17.1	531	30.0	169	23.3	422	34.2	6,981	21.8	10,903	31.6
Some College (1-3 years)	24	1.3	93	5.2	16	2.2	128	10.4	1,135	3.5	2,638	7.6
Four Years or More College	32	1.8	105	5.9	53	7.3	161	13.1	1,571	4.9	2,601	7.5
Residence Five Years Earlier (Population Five Years or Older)												
Same House	2,325	76.2	1,525	49.8	676	58.4	927	45.7	34,785	64.0	36,242	62.5
Different House, Hawaii County	592	19.4	1,023	33.5	416	36.0	382	18.8	15,906	29.3	12,243	21.1
Different County, State of Hawaii	37	1.2	78	2.6	17	1.5	273	13.4	1,743	3.2	3,215	5.5
Different State or Country	87	2.8	315	10.3	43	3.7	408	20.1	1,745	3.2	4,173	7.2
Moved, Not Reported	12	0.4	116	3.8	5	0.4	41	2.0	182	0.3	2,128	3.7

Source: U.S. Bureau of the Census, Census of Population and Housing, 1960 and 1970 as reported in Hastings, Martin, Hallstrom, & Chew, Ltd., 1979.

North Kohala's primary dependence upon the sugar industry is reflected in a number of areas. The absolute decline in the district's population from 3,386 in 1960 to 3,326 in 1970 was principally the result of both increased mechanization in the cultivation and processing of sugar cane and the lack of a more broadly-based, diversified regional economy capable of accommodating this shift in labor requirements. In fact, Hawaii County's resident population increase of only 2,136, or 3.5 percent, between 1960 and 1970, is, in part, a testimony to the Big Island's lack of economic diversification and its heavy dependence upon the sugar industry through the 1960s. Other statistics from the 1970 Census indicative of North Kohala's plantation economy are the high proportion of Filipinos, who represented a major component of the immigrant labor force, and the lower level of educational attainment throughout the general population. The maturity and lack of growth of the North Kohala communities is further reflected in the low incidence of population in-migration as indicated by the residency data.

The Hastings, Martin, Hallstrom and Chew, Ltd (1979) report observes that while North Kohala's 1970 statistical representation is generally similar to that of the overall Big Island average, South Kohala's representation differs significantly. The ethnic mix, educational attainment levels, and residence mobility all differ from the County-wide average. The ethnic mix is heavily weighted toward Caucasians and Hawaiians or part-Hawaiians; this mix traces back to the ranching operations that dominated the Kamuela area and the wide-spread tradition of the paniolos. Higher educational attainment and increased mobility tend to be highly interrelated characteristics, and, therefore, it is not surprising to find one, given the presence of the other. The extremely high incidence of in-migration, with over one-third of the population having moved to South Kohala from outside the Big Island between 1965 and 1970, is evidence of the economic viability and residential attractiveness of the region. South Kohala experienced a population increase of over 50 percent between 1960 and 1970.

The most recent 1978 population estimates for Hawaii County suggest a continuation of the trends established by the 1960 and 1970 Census data for North and South Kohala. North Kohala's population has exhibited very little growth, again, due to the lack of employment opportunities; its 1978 population is estimated at 3,600 or about 300 persons above the 1970 level. In contrast, South Kohala's estimated population for 1978 is 3,400 persons or almost 1,200 persons above the latest Census count and almost a 50 percent increase over the 1970 level.

Housing

Housing data for North Kohala and South Kohala for 1960 and 1970 are presented in Table III-2. Due to the outdated nature and form of presentation of the data, detailed analyses and comparisons were considered to be of limited value and, therefore, are explicitly avoided. The general character of the data, however, does conform to that expected of rural environments such as the Kohala Districts. Residential housing units tend to be almost exclusively single family structures, and average household size tends to be relatively high. Between 1960 and 1970, employee housing appears to have been

Table III-2. Selected housing characteristics for the North and South Kohala districts: 1960 and 1970.

	North Kohala District				South Kohala District			
	1960		1970		1960		1970	
	No.	%	No.	%	No.	%	No.	%
Total Housing Units	1,020	100.0	941	100.0	644	100.0	798	100.0
Owner-Occupied	205	20.1	585	62.2	189	29.4	317	39.7
Renter-Occupied	700	68.6	294	31.2	205	31.8	333	41.8
Vacant, Available	39	3.8	17	1.8	15	2.3	16	2.0
Other Vacant	76	7.5	45	4.8	235	36.5	132	16.5
Persons per Household	3.72	--	3.75	--	3.84	--	3.51	--
Age of Housing								
0-10 years old	64	6.2	218	23.0	272	44.2	322	37.1
11-20 years old	53	5.2	64	6.8	106	17.2	230	26.4
21-30 years old	912[1]	88.6	64	6.8	238[1]	38.6	115	13.2
31 years and older	--	--	600	63.4	--	--	203	23.3
Persons per Room, Occupied Units	905	100.0	879	100.0	394	100.0	650	100.0
1.00 or Less	732	80.9	659	74.9	318	80.7	505	77.6
1.01 to 1.50	173[2]	19.1	135	15.4	76[2]	19.3	92	14.2
1.51 or More	--	--	85	9.7	--	--	53	8.2
Units Lacking Some or All Plumbing Facilities	611	59.9	155	16.5	286	44.4	100	12.5
Units in Structure								
1	974	95.0	883	93.4	600	96.6	770	97.1
2	46	4.5	18	1.9	6	1.0	10	1.3
3 and 4	5	0.5	24	2.5	15	2.4	5	0.6
5-49	--	--	21	2.2	--	--	8	1.0
50 or More	--	--	--	--	--	--	--	--
Gross Rent, Specified Renter-Occupied Units								
Under $40	344	47.8	33	14.0	32	16.9	--	--
$ 40 to $ 59	207	28.8	65	27.7	12	6.3	11	3.2
$ 60 to $ 79	48	6.7	39	16.6	8	4.2	4	1.2
$ 80 to $ 99	--	--	32	13.6	5	2.6	33	9.5
$100 to $149	8	1.1	14	6.0	--	--	39	11.2
$150 to $199	--	--	--	--	--	--	58	16.7
$200 to $249	--	--	--	--	--	--	35	10.1
$250 or more	--	--	--	--	--	--	13	3.7
No Cash Rent	112	15.6	52	22.1	132	70.0	154	44.4
Value, Specified Owner-Occupied Units								
Less than $ 5,000	44	30.1	23	4.3	25	18.1	2	0.8
$ 5,000 - $ 9,999	50	34.2	82	15.4	37	26.8	17	6.4
$10,000 - $14,999	36	24.7	126	23.6	16	11.6	22	8.3
$15,000 - $19,999	16	11.0	128	24.0	20	14.5	33	12.4
$20,000 - $24,999	--	--	93	17.4	20	14.5	32	12.0
$25,000 - $34,999	--	--	54	10.1	20[3]	14.5	40	15.0
$35,000 - $49,999	--	--	19	3.6	--	--	59	22.2
$50,000 or more	--	--	8	1.5	--	--	61	22.9

[1] 21 years and older.

[2] 1.01 or more.

[3] $25,000 or more.

Source: U.S. Bureau of the Census, Census of Population and Housing, 1960 and 1970 as reported in Hastings, Martin, Hallstrom, & Chew, Ltd., 1979.

a very significant component of the housing supply in both North and South Kohala judging by the high percentage of renter-occupied units and the high percentage of these renters who paid no cash rent. The maturity of the North Kohala District relative to South Kohala is again apparent in the age of housing statistics; as of 1970, over 63 percent of North Kohala's housing units were 31 years of age or older while South Kohala's corresponding figure was only 23 percent. Given this disparity, it is not surprising that another area in which there exists a major variance is the value of owner-occupied housing; North Kohala's housing in 1970 was generally weighted toward the lower end of the value range while South Kohala's housing was weighted toward the higher end.

The most recent, published housing data for the Big Island are shown in Table III-3; the figures are assumed to be accurate through December 1976. As shown, North Kohala's housing growth during the six-year period from 1970 to 1976 was only 1.7 percent per year. Housing by 1976 was still overwhelmingly single family with only 14 units in duplexes and none in multi-family structures. *South Kohala*'s housing supply during this same period more than doubled from 793 units in 1970 to 1,609 units in 1976. Also, multi-family housing comprised almost 20 percent, or one-fifth, of the total supply by the end of 1976, another indication of the residential attraction of the region.

General Employment and Income Characteristics

Employment

Impact area employment data for the last two Census periods are presented in Table III-4. Again, the usefulness of the data in terms of making meaningful comparisons or identifying relevant trends is severely restricted by their outdated nature. This is particularly true of North Kohala since the major economic dislocations associated with the closing of the Kohala Sugar Company did not fully manifest themselves until after 1970. Less comprehensive employment data for the impact area, as compiled by the State Department of Labor and Industrial Relations (DLIR), are presented in Table III-5. These data are presented for qualitative purposes only.

The numbers do provide evidence, however, of the region's strong agricultural heritage. In 1960, over 30 percent of North Kohala's employed labor force was agriculturally employed; furthermore, manufacturing accounted for over 40 percent of the workers, and most of this employment was associated with the processing of cane at the sugar mill. In South Kohala, agricultural employment accounted for almost one-half of all employed persons in 1960.

By 1970, South Kohala had already established a much broader-based economic structure. Although diversified agriculture still remained strong, other sectors of the economy were beginning to exhibit more significant growth in terms of employment. South Kohala's retail base kept pace with the overall growth between 1960 and 1970, while the construction, and service industries grew substantially. By 1970, the retail, construction and personal

Table III-3. Estimated number of housing units by district in Hawaii County: 1970 and 1976.

District	1970 Census				December 1976			
	Total	Single	Duplex	Multi	Total	Single	Duplex	Multi
County Total	18,933	16,700	767	1,466	27,943	22,922	678	4,343
Puna	1,811	1,707	28	76	3,060	2,997	6	57
South Hilo	9,273	8,248	376	649	12,751	10,018	452	2,281
North Hilo	578	493	72	13	566	532	34	--
Hamakua	1,419	1,296	60	63	1,605	1,544	22	39
North Kohala	946	883	18	45	1,045	1,031	14	--
South Kohala	793	770	10	13	1,609	1,311	8	290
North Kona	1,977	1,360	75	542	4,451	2,856	96	1,499
South Kona	1,129	991	106	32	1,565	1,493	24	48
Ka'u	1,007	952	22	33	1,291	1,140	22	129

Note: December 1976 information includes units in boarding homes, dormitories, guest homes, military barracks, etc., and is not strictly comparable to the 1970 information.

Source: County of Hawaii, Planning Department.

Table III-5. Estimated labor force distribution for North and South Kohala: 1975.

Category	North Kohala Number	North Kohala Percent	South Kohala Number	South Kohala Percent
Agriculture and Forestry	203	32.3	142	9.2
Manufacturing	178	28.3	29	1.9
Transportation, Communications, and Public Utilities	--	--	67	4.3
Wholesale Trade	31	4.9	15	1.0
Retail Trade	77	12.3	303	19.6
Finance, Insurance and Real Estate	14	2.2	34	2.2
Services	17	2.7	803	51.9
Government				
Federal	7	1.1	5	0.3
State	102	16.2	66	4.2
Local	--	--	84	5.4
TOTAL	629	100.0	1,548	100.0

Source: State Department of Labor and Industrial Relations, Labor Force Distribution by Employer Site and Industry Category.

Table III-4. Selected employment characteristics for North and South Kohala districts: 1960 and 1970.

	North Kohala District				South Kohala District			
	1960		1970		1960		1970	
	No.	%	No.	%	No.	%	No.	%
Employment Status								
Civilian Labor Force	1,216(1)	100.0	1,355	100.0	565(1)	100.0	951(1)	100.[illegible]
Male	987	81.2	856	63.2	401	71.0	624	65.[illegible]
Female	229	18.8	499	36.8	164	29.0	327	34.4
Employed	1,148	94.4	1,330	98.2	526	93.1	912	95.[illegible]
Unemployed(2)	68	5.6	25	1.8	39	6.9	39	4.[illegible]
Employment by Industry								
Agriculture	353	30.7	(3)	--	259	49.2	(3)	--
Construction	45	3.9	34	2.6	25	4.8	124	13.[illegible]
Manufacturing	468	40.8	389	29.2	8	1.5	21	2.3
Transportation, Communications, Utilities and Sanitary Services	28	2.4	18	1.4	12	2.3	37	4.[illegible]
Wholesale Trade	4	0.3	10	0.8	9	1.7	8	0.[illegible]
Retail Trade	46	4.0	39	2.9	69	13.1	145	15.9
Finance, Insurance, Real Estate	(3)	--	15	1.1	(3)	--	32	3.5
Business and Repair Service	16	1.4	--	--	4	0.8	14	1.[illegible]
Personal Services	43	3.7	344	25.9	33	6.3	163	17.[illegible]
Health Services	41	3.6	58	4.4	6	0.8	18	2.0
Educational Services	57	5.0	114	8.6	57	10.8	92	10.1
Other Services	12	1.0	23	1.7	0	0.0	17	1.[illegible]
Public Administration	19	1.7	73	5.5	25	4.8	28	3.[illegible]
Other Industries	16	1.4	213	16.0	21	4.0	213	23.[illegible]
Employment by Occupation								
Professional and Technical	73	6.4	164	12.3	38	7.2	99	10.[illegible]
Managers and Administrators (non-farm)	30	2.6	29	2.2	24	4.6	94	10.3
Sales Workers	20	1.7	14	1.1	28	5.3	63	6.9
Clerical	76	6.6	92	6.9	39	7.4	90	9.[illegible]
Craftsmen and Foremen	202	17.6	236	17.7	36	6.8	150	16.[illegible]
Operatives (non-transport)	243	21.2	139	10.5	46	8.7	56	6.1
Transport Operatives			71	5.3			17	1.9
Laborers (non-farm)	38	3.3	64	4.8	42	8.0	47	5.[illegible]
Farm Workers	345	30.1	176	13.2	228	43.3	151	16.[illegible]
Service Workers	86	7.5	328	24.7	19	3.6	126	13.[illegible]
Private Household Workers	23	2.0	17	1.3	21	4.0	19	2.1
Not Reported	12	1.0	--	--	5	1.0	--	--

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1 14 years and older.

2 16 years and older.

3 Reported elsewhere.

Source: U.S. Bureau of the Census, Census of Population and Housing, 1960 and 1970.

and educational service industries employed roughly 60 percent of the work force in South Kohala. Meanwhile, North Kohala had not sufficiently expanded its own secondary and tertiary industry bases and remained heavily dependent upon the sugar industry. Given the two districts' dissimilar economic structures in 1970 and the fate of the local sugar industry operation, it is not surprising that since 1970 North Kohala's overall internal growth has slowed while South Kohala's growth has generally kept pace with that of Hawaii County as a whole.

Income

Annual family income data are presented in Table III-6. As indicated by the figures, gross family income levels in 1969 for North and South Kohala were not radically different from one another even though, at the time, there was a significant variance in employment mix between the two districts. Again, it should be recognized that the relevance of this particular observation and the overall utility of the income data in general are greatly constrained by the data being outdated.

The "No-Project" Scenario

The concept of large-scale resort development along the South Kohala coastline has been a fundamental tenet of State and County plans for the region for well over a decade. Major capital improvements, such as Queen Ka'ahumanu Highway, Keahole Airport, and Kawaihae Harbor, have been made in the expectation and hope that it would occur. Now, the development of an adequate water system appears to be all that is needed before several significant resort projects are begun, and it is difficult to imagine reponsible agencies balking completely at this late date, particularly when the major portion of the construction costs will be absorbed by the Lalamilo Water System service area's two major developers. Nevertheless, State law requires such an analysis, and it does provide a baseline projection against which project-related change can be measured.

Economic Development

Studies for all of the major resort developers along the South Kohala Coast have indicated a sizeable market for resort facilities situated there (see, for example, Harris, Kerr, Forster and Company, Report on the Market Demand for a Proposed Resort Complex on Orchid Island Resorts Corporation's South Kohala Land, Island of Hawaii). This demand is not linked to a specific resort (although the marketing talents of individual developers obviously play a part), but to the region as a whole. This is important because development of the proposed Waikoloa Resort Community (WRC) situated on Anaeho'omalu Bay is not dependent upon water from the proposed Lalamilo Water System. On the contrary, it would be supplied by the privately constructed and operated Waikoloa water system. The major components of this system have already been constructed and the source judged adequate for a resort development of several thousand hotel and condominium units, as well as the residential units within Waikoloa Village.

Table III-6. Annual income of families and unrelated individuals residing in the North and South Kohala Districts: 1959 and 1969.

	North Kohala District				South Kohala District			
	1959		1969		1959		1969	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All Families	738	100.0	758	100.0	314	100.0	562	100.0
Less than $5,000	462	62.7	133	17.5	186	59.3	130	23.1
$ 5,000-$ 6,999	135	18.3	138	18.2	59	18.8	69	12.3
$ 7,000-$ 9,999	94	12.7	141	18.6	29	9.2	118	21.0
$10,000-$14,999	25	3.4	214	28.2	24	7.6	123	21.9
$15,000-$24,999	18	2.4	105	13.9	16	5.1	97	17.3
$25,000 or more	4	0.5	27	3.6	0	0.0	25	4.4
Median Income	$4,363		$ 9,421		$4,554		$ 9,182	
Mean Income	NA		10,431		NA		11,200	
Families and Unrelated Individuals	NA		1,047		NA		710	
Median Income	$3,730		$ 7,007		$4,045		$ 7,754	
Mean Income	NA		8,687		NA		9,808	
Unrelated Individuals	NA		289		NA		148	
Median Income	NA		$ 4,051		NA		$ 2,882	
Mean Income	NA		4,113		NA		4,522	

Note: Income values are not corrected for inflation.

Source: U.S. Bureau of the Census, Census of Population and Housing, 1960 and 1970.

Mauna Loa Land, Incorporated's (MLLI) development in Kalahuipua'a and expansion of the Mauna Kea Land Corporation development appear to be more completely dependent upon the proposed Lalamilo Water System. Because the MLLI and Mauna Kea Land Corporation lands do not extend sufficiently far inland, the option of privately-developed wells which has been used by Waikoloa is not open to them. Theoretically, water might be purchased from the Waikoloa system. However, the fact that these neighboring developments are engaged in competition for visitors means that such cooperation would probably not occur.

After all the preceding factors are taken into account, it is our judgment that failure to proceed with the proposed Lalamilo Water System would significantly curtail, but not eliminate, resort-related growth over the next eight to ten years. More specifically, it appears likely that about 1,500 hotel units and 900 condominium units would be developed at the Waikoloa Beach Resort and that no additional construction would occur at Puako or on the MLLI and Mauna Kea Land Corporation sites. Altogether, it appears that the amount of primary resort development that would take place within the South Kohala Region without the Lalamilo system is only about 40 percent as great as that likely to occur with it. The Lalamilo Water System service area, i.e. Kawaihae to Honoka'ope, would probably experience little if any additional growth if neither the proposed project nor one of the water supply alternatives discussed in Chapter V are implemented.

<u>Magnitude of Projected Employment and Population Changes With the Proposed Water System</u>

As those familiar with economic forecasting are aware, there are a number of different econometric models that can be used to project the economic and population growth that would result from a particular undertaking. The remainder of this section presents estimates derived from two of these and defines the secondary growth scenario that was derived from them and used to estimate the secondary and tertiary impacts of the proposed Lalamilo Water System.

Input-Output Model Projections

One series of employment projections was made for this study based on an econometric model that incorporates elements of the State of Hawaii's Input-Output Model, information contained in the Hawaii Visitor Bureau's <u>1974 Visitor Expenditure Survey</u>, and estimates made by Belt, Collins & Associates, and Hastings, Martin, Hallstrom and Chew, Ltd.

Since it is expected that the primary growth that would result from construction of the water system would be in the visitor sector of the economy, our analysis focussed on that aspect. The model that was used visualizes the employment that would be created as being of four different types:

1. Direct Visitor Industry Employment. This includes persons who are on the payrolls of the proposed resort hotels, persons who work in on-site support jobs for other employers (e.g., non-hotel-operated

restaurant and retail concessionaires), and persons who work off-site for such direct visitor industry employers as airlines, ground transportation companies, visitor-oriented retail shops, and entertainment spots. These jobs are supported directly by visitor expenditures.

For this study, the number of such direct visitor industry jobs that would be created by the proposed project was estimated using the employment/expenditure relationships shown in a 1975 study conducted by the State Department of Planning and Economic Development entitled The Impact of Tourism on the Hawaiian Economy: An Input-Ouput Analysis. In estimating the location of the employment, the direct on-site component was calculated first using data from existing resort areas; direct off-site employment was assigned either to the remainder of the North and South Kohala impact area or to outside of that area on the basis of qualitative estimates. The direct employment generation factors that were used are summarized in Table III-7.

2. Indirect Employment. This includes jobs in industries that supply the goods and services that are sold directly to visitors, e.g. wholesaling, food processing, equipment maintenance, etc. For this study, indirect employment generated by the proposed project was estimated using the 0.12 indirect job per direct visitor industry job multiplier from The Impact of Tourism on the Hawaiian Economy (Department of Planning and Economic Development, 1975). The geographic distribution of these jobs was projected using qualitative estimates of probable development patterns.

3. Induced Employment. This category includes jobs that are created as dollars originally spent by visitors make their way through the rest of the economy. Examples of this type of employment are retail sales jobs supported by local residents, agricultural jobs, and jobs in banks and other financial institutions. The induced employment multiplier of 0.32 induced job per direct visitor industry job is based on the same study as the indirect employment factor. The geographic distribution of these jobs was estimated for this study on the basis of a qualitative consideration of residence and employment patterns.

Table III-7. Direct visitor industry employment generation factors derived from the State's Input-Output Model.

Type of Expenditure	Total Jobs per Visitor-Day[1]	Geographic Distribution (in jobs per visitor-day and as percentage of all jobs in category)[2] On-Site JPVD[3]	On-Site %	Elsewhere in Region JPVD	Elsewhere in Region %	Outside Region JPVD	Outside Region %
Food and Beverage	0.0006674	0.0004672	70.0	0.0001335	20.0	0.0000667	10.0
Entertainment	0.0001573	0.0000944	60.0	0.0000472	30.0	0.0000157	10.0
Ground Transportation	0.0001053	--	--	0.0000211	20.0	0.0000842	80.0
Inter-Island Travel	0.0000569	--	--	--	--	0.0000569	100.0
Sightseeing	0.0000412	--	--	0.0000206	50.0	0.0000206	50.0
Retail Sales	0.0007807	0.0004684	60.0	0.0000781	10.0	0.0002342	30.0
Lodging	0.0005863	0.0004984	85.0	0.0000293	5.0	0.0000586	10.0
All Expenditures	0.0023951	0.0015284	63.8	0.0003298	13.8	0.0005369	22.4

[1] Derived using visitor expenditure information from the Hawaii Visitors Bureau 1974 Visitor Expenditure Survey, pp. 4-5; employment multipliers developed by the Department of Planning and Economic Development, State of Hawaii in The Impact of Tourism on the Hawaiian Economy (1975); and corrections made by Belt, Collins & Associates to account for inflation. See the Environmental Impact Statement for the Proposed Expansion of the Kuilima Resort Community (June 1979), pp. A-1 through A-16 for a complete explanation.

[2] Geographic distribution estimated by Belt, Collins & Associates.

[3] JPVD - Jobs-Per-Visitor Day.

Source: Compiled by Belt, Collins & Associates.

4. Government Employment. The resident population supported by the proposed development and, to a lesser extent, the visitors themselves would require governmental services. As a result, governmental employment could increase substantially as a result of the proposed project. While the importance of this effect was down-played in The Impact of Tourism on the Hawaiian Economy (there it was suggested it could be zero), for the purposes of this analysis the increase was assumed to be 0.09 governmental job per direct and indirect job and 0.02 governmental job per induced job. As with the other employment factors, the geographic distribution of the jobs was estimated based on a qualitative assessment of the probable employment patterns.

The employment generation factors for indirect, induced, and governmental employment, together with the estimated geographic distribution of the jobs, are shown in Table III-8.

Table III-8. Indirect, induced, and governmental employment generation rates by geographic area.

Type of Employment	Indirect, Induced, or Governmental Job per Direct Visitor Industry Job: Total	Within Region	Outside Region
Indirect	0.12[1]	0.03	0.09
Induced	0.32[2]	0.06	0.26
Governmental	0.11[2]	0.04	0.07
TOTAL	0.55	0.13	0.42

[1] From Department of Planning and Economic Development, State of Hawaii (1975). The Impact of Tourism on the Hawaiian Economy.

[2] Factor based on information contained in source referenced in footnote 1, above.

Source: Compiled by Belt, Collins & Associates from sources noted above.

In order to use the input-output model, it is first necessary to calculate the number of visitor-days per year that would be spent as a result of the proposed project. Results of these calculations for the fifth and tenth years following construction of the water system are summarized in Table III-9. Combining these with the employment generation factors contained in Table III-7 gives the direct visitor industry job projections shown in Table III-10. Finally, direct visitor industry employment can be used together with the rates for indirect, induced, and governmental employment presented in Table III-8 to produce an estimate of the total increase in jobs expected over the next ten years (see Table III-11). The input-ouput model indicates that resort-related growth over the ten-year period 1981-1991 would involve:

- the creation of 4,350 on-site resort jobs;
- the creation of about 1,800 other jobs within North and South Kohala; and
- a total of over 10,000 new jobs statewide.

Table III-9. Visitor days: cumulative total resulting from project.

Type of Facility	Average Visitor-Days/ Hotel Room/Year	Units Constructed[4] Year 05	Units Constructed[4] Year 10	Estimated Visitor-Days Year 05	Estimated Visitor-Days Year 10
Hotel	490[1]	1,570	3,320	769,300	1,626,800
Condominium	395[2]	1,230[4]	3,000[4,5]	485,850	1,185,000
Resort Residential	275[3]	40	115	11,000	31,625
TOTAL				1,266,150	2,843,425

[1]Based on $\frac{1.8 \text{ visitors}}{\text{occupied room}} \times \frac{0.75 \text{ occupied rooms}}{\text{room}} \times \frac{365 \text{ days}}{\text{year}} = 490$ visitor-days per year per hotel room.

[2]Based on $\frac{2.7 \text{ visitors}}{\text{occupied unit}} \times \frac{0.40 \text{ occupied units}}{\text{unit}} \times \frac{365 \text{ days}}{\text{year}} = 395$ visitor-days per year per condominium unit.

[3]Based on $\frac{3.0 \text{ visitors}}{\text{occupied unit}} \times \frac{0.25 \text{ occupied units}}{\text{unit}} \times \frac{365 \text{ days}}{\text{year}} = 275$ visitor-days per year per resort residential unit.

[4]Figures include 425 units of condominiums in the Puako-Kawaihae area for which building permits have already been sought.

[5]Figure includes 300 units of resort condominium development expected in the Puako-Kawaihae area during years 06 through 10.

Source: Belt, Collins & Associates.

Table III-10. Input-output model estimate of direct visitor industry employment associated with major resort growth within the Lalamilo service area.

(1) Year	(2) Total Jobs[1]	(3) On-Site[2]	(4) Elsewhere in Region[2]	(5) Out of Region[2]
Year 5	3,033	1,935	418	681
Year 10	6,816	4,348	939	1,529

[1]Calculated by multiplying the visitor days per year from Table III-9 by the employment per visitor day estimates shown in Table III-7.

[2]Geographic distribution of jobs is as shown in Table III-7.

Source: Belt, Collins & Associates.

Table III-11. Total resort-related employment by geographic area based on input-output model: years 05 and 10.

Year	Total Direct Visitor Industry Jobs[1]	Total Jobs (Direct, Indirect) Total	Within Region	Outside Region
Year 05	3,033	4,701	2,747	1,954
Year	6,816	10,565	6,173	4,392

[1]From Column 2, Table III-10.

[2]Based on Table III-8.

Source: Belt, Collins & Associates.

Multiplier Model Projections

A less-sophisticated, but more commonly used, type of model uses "per-unit" on-site employment multipliers based on ratios observed at similar types of developments. This approach (which we will refer to as a "multiplier model") was also used to derive employment estimates for this study, and these are discussed below.

o Direct on-site employment

Operational employment is generally calculated on the basis of an average ratio expressed in terms of the number of jobs or employees per hotel room, condominium unit, or square foot of commercial space. It is a long-term measure that is usually applicable once the operation of the facility has stabilized, i.e. once the low occupancy rates and inefficiencies of the start-up period have passed. According to Hastings, Martin, Hallstrom and Chew, Ltd. (1979):

"For hotel operations, the overall statewide average is approximately 0.70 jobs per room. A recent study focusing on Big Island hotel operations revealed a County average of just under 0.60 employees per room. Obviously, this employment-to-room ratio varies from project to project, depending upon hotel size as well as the scope and level of services offered. The Mauna Kea Beach Hotel, for example, has a current ratio in excess of 2.00 employees per room."

"In this analysis, the MLLI 450-room luxury hotel and Olohana's [now Mauna Kea Land Corporation's] 400-room luxury hotel were estimated to possess jobs-to-room ratios of 1.1 and 1.2, respectively; these ratios reflect all on-site employment as well as all employment related to the proposed recreational amenities. Ratios in excess of 1.0 are indicative of those types of higher quality visitor accommodations associated with the contained resort destinations envisioned for the South Kohala region. Other hotels were estimated to generate direct employment based on a 0.70 job-to-room ratio, which is consistent with the level of services envisioned and the size of the hotel."

"Direct employment resulting from the condominium developments is expected to be rather minimal. A survey of visitor-oriented condominium projects on the Big Island revealed an average ratio of 0.18 employees per condominium unit. This ratio is generally in keeping with the 0.26 jobs-to-unit ratio for Neighbor Island apartment-hotel projects. The MLLI and Olohana [Mauna Kea Land Corporation] condominiums, however, should result in much lower employment ratios. These units will probably be marketed toward more affluent owners who, on the average, would be less inclined to actively rent their condominiums. The MLLI condominiums, for instance, will likely be in the $200,000 to $400,000 price range. As a result, direct on-site condominium employment is estimated based upon a 0.10 job-per-unit ratio."

The non-hotel resort commercial development for MLLI is estimated to generate employment on the basis of 1.0 job per 200 square feet of commercial space; full-time employment is estimated at 80 percent of total jobs. Mauna Kea Land Corporation's commercial/industrial development is expected to be weighted toward light industrial uses such as warehousing and, therefore, is estimated to generate employment on the basis of one job per 1,000 square feet of floor space (10 jobs per gross acre). Other facilities such as club-houses, tennis complexes, clubs, and the like, would also contribute somewhat to employment.

As shown in Table III-12, the development expected over the ten-year period of concern would, according to the multiplier model, result in about 3,730 jobs on the resort sites. The proportion of these that are in commercial, recreational, and other miscellaneous activities is relatively high (20 percent). This is an indication of the extent to which the two major projects are expected to be largely independent, self-supporting communities.

To estimate the additional, or incremental, effect of this increase in job opportunities on the number of persons employed (i.e. the employed labor force), a jobs-to-persons conversion factor of 0.92 is incorporated into the analysis. The 0.92 conversion factor adjusts for multiple job holdings exhibited by the employed labor force and corresponds to the general County average as calculated from DLIR statistics. Applying it to the job figures shown in Table III-12, it is estimated that there would be on-site employment for 1,700 persons after five years and 3,400 persons after ten years.

o Indirect, off-site employment

As a result of the direct, on-site employment and the increased basic economic activity created by the MLLI and Mauna Kea Land Corporation resort developments, there will be additional off-site employment generated, both within the North Kohala and South Kohala impact area and elsewhere. The level of secondary or indirectly-generated employment to be created <u>within</u> the impact area is generally estimated through the use of an appropriate employment multiplier. The employment multiplier is a factor which is applied to the total number of directly-generated jobs to yield the total number of both directly- and indirectly-generated jobs. As an illustration, the lowest possible employment multiplier would be a factor of 1.0; a 1.0 multiplier would imply that each new job directly generated by the resort development would indirectly create no new jobs within the impact area. In this extreme example the resort developments would have no indirect employment effect within the defined impact area.

In forecasting the indirect employment effects of the five-year MLLI and Mauna Kea Land Corporation development plans, the appropriate employment multiplier is estimated by Hastings, Martin, Hallstrom and Chew, Ltd. (1979:23) to be 1.1. Each direct, on-site job created at the resort developments is expected to generate an additional 0.1 off-site jobs within the impact area. They believe that the 1.1 employment multipler is a reasonable estimate for a subregional impact area such as North and South Kohala. The <u>total</u> indirect employment effect of the proposed developments should actually result in a multiplier in excess of 1.1, but a substantial amount of this total indirect employment increase would be absorbed in areas outside the defined impact area. Also, a 1.2 multiplier is often considered appropriate for this type of rural impact area;

Table III-12. On-site employment estimates derived using the multiplier model: years 05 and 10.

Type of Facility	No. Units in Operation Year 05	No. Units in Operation Year 10	Jobs per Unit	Estimated No. Jobs[4] Year 05	Estimated No. Jobs[4] Year 10
Hotels	1,570	3,320	various[3]	1,445	2,670
Condominiums	1,230	3,000	0.1	125	300
Resort Residential	40	115	0.1	5	10
Commercial	--[1]	--[1]	--[1]	275	540
TOTAL				1,850	3,520

[1]Various.

[2]Estimate based on one job per 200 sq. ft. GFA and 5,000 sq. ft. GFA per acre for MLLI development; one job per 1,000 sq. ft. GFA and 10,000 sq. ft. GFA per acre for Mauna Kea Land Corporation; all resort commercial development on Mauna Kea Land Corporation or MLLI property; and estimates for recreational and club facilities made by Belt, Collins & Associates.

[3]Estimate by Hastings, Martin, Hallstrom and Chew, Ltd., assumed 1.1 jobs per room for MLLI luxury hotel, 0.4 jobs per room for MKBH expansion, 1.2 jobs per room for first new Mauna Kea Land Corporation hotel, and 0.7 jobs per room for other hotels.

[4]Rounded.

Source: Compiled by Belt, Collins & Associates based on data supplied by Hastings, Martin, Hallstrom and Chew, Ltd., and others.

the 1.2 value is based upon employment multipliers derived by an input-output model of the economy of Kauai County. However, in recognition that a certain amount of resort development at Waikoloa would preceed that within the Lalamilo Water System service area, Hastings, Martin, Hallstrom and Chew, Ltd. (1979:24) concluded that: " . . . the Waikoloa development will probably experience the full 1.2 employment multiplier, and this, in turn, will tend to reduce the effects generated by the MLLI and Mauna Kea Land Corporation developments."

Applying a factor of 0.1 indirect job per direct on-site job (i.e. the indirect component of a total employment multiplier of 1.1) to the previously estimated 3,770 jobs that would be created on the resort sites themselves (see Table III-12) gives a total of 380 indirect jobs. Hence, the total regional employment estimate derived using this model is 4,150 jobs (3,770 plus 380).

Employment and Population Estimates Adopted for this EIS

As shown in Table III-13, the estimates derived using the two models differ significantly from one another, with those based on the input-output approach being consistently higher. It is easy to speculate about possible causes of the discrepancy, but rather difficult to deal with the topic in a rigorously quantitative way. Because of this, and because of the difficulties involved in carrying the range of estimates through all subsequent calculations, it was decided to chose a single set of numbers for use in this EIS. These estimates, which are summarized in Table III-14, are slightly closer to the figures developed using the multiplier model than to those from the input-output model. This reflects our belief that the latter almost certainly underestimates the economic leakages that will occur from the regional economy, especially during the ten-year development period discussed here when the regional economy is still relatively immature.

Finally, it should be noted that the demand for water generated by the ten-year growth plans for the area that would be served by the Lalamilo Water System would exceed that which could be provided by the proposed system. Calculations indicate that the 5.2 MGD would be sufficient for approximately 7.5 to eight years of the development now expected. Because of that, the impact assessment discussed in this report utilizes an eight-year-timeframe. This "Eight-Year Development Scenario" can also be found in Table III-14.

While project-related increases in the resident population of a region are typically of greatest concern, increases in the transient population also have their effects. Because of this, estimates of this population component were also made. They are presented in Table III-15.

Labor Force Availability

As indicated in Table III-14, it is estimated that the development that would be allowed by the presence of the Lalamilo Water System would support an additional 2,900 workers within the North and South Kohala region.

Table III-13. Estimated employment-induced population by year and type of projection technique.

	Year 05		Year 10	
	Input/ Output	Multiplier	Input/ Output	Multiplier
Total Additional Resort-Related Jobs in Region[1]	2,750	2,050	6,150	3,850
Total Additional Employed Resort-Related Workers[2]	2,530	1,890	5,660	3,540
Total Additional Resort-Related Labor Force[3]	2,680	2,000	6,000	3,750
Total Additional Resort-Related Labor Force Residing in Region[4]	2,280	1,700	5,100	3,190
Total Additional Resort Employment-Related Households Residing in Region[5]	1,570	1,170	3,520	2,200
Total Additional Resort-Related Population Residing within:				
Whole Region[6]	4,700	3,500	10,550	6,600
Lalamilo System Service Area[7]	3,300	2,450	7,400	4,600
Other Areas in Region[7]	1,400	1,050	3,150	2,000

1From Table III-12.

2(Total additional resort-related jobs in region) × $\frac{\text{0.92 workers}}{\text{job}}$

3(Total additional employed resort-related workers) × $\frac{\text{1.06 workers}}{\text{employed workers}}$

4(Total additional resort-related labor force) × $\frac{\text{0.85 members of labor force residing in region}}{\text{member of labor force}}$

5Total additional resort-related labor force residing in region divided by $\frac{\text{1.45 labor force members}}{\text{household}}$

6Total additional resort-related households residing within region times 3.0 persons per household.

7Based on estimated 70 percent of the induced population growth within the region occurring within the Lalamilo Water System service area.

Source: Belt, Collins & Associates.

Table III-14. Project-related employment and population growth estimates used in this EIS.[1]

Total Additional Project-Related Jobs in Region	3,500 jobs
Total Additional Employed Project-Related Workers	3,200 workers
Total Additional Project-Related Labor Force	3,400 workers
Total Additional Project-Related Labor Force Residing in Region	2,900 workers
Additional Project-Related Households Residing Within:	
o All of North and South Kohala	2,000 households
- Lalamilo Water System Service Area	1,400 households
- Remainder of North and South Kohala	600 households
Additional Project-Related Population Residing Within:	
o All of North and South Kohala	6,000 persons
- Lalamilo Water System Service Area	4,200 persons
- Remainder of North and South Kohala	1,800 persons

[1]Note: This is the amount of growth that would result from development of the proposed Lalamilo System. It would be achieved during the eighth year of the ten-year development period summarized in Table III-12.

Source: Belt, Collins & Associates.

Table III-15. Estimated transient population used as basis for impact analysis.

Type of Unit	Approximate No. of Units[1]	Av. Annual Occupancy (%)	Av. No. Persons/Unit	Av. No. Transients
Hotel	2,500	75	1.9	3,550
Condominium	2,250	40	2.7	2,400
Resort Residential	75	25	3.0	50
TOTAL				6,000

[1]Corresponds to figures used in the derivation of Table III-14.

Source: Belt, Collins & Associates.

In order to understand the implications of this labor force requirement, it is necessary to consider population and labor force participation trends within the study area and elsewhere on the Big Island. For this study, these trends were analyzed using a cohort-survival projection technique (Hastings, Martin, Hallstrom and Chew, Ltd., 1979:24). The cohort-survival technique utilized is a population projection model which basically recognizes and incorporates three components of change. These three components are: (1) change attributable to natural increase (i.e. the net effect of births minus deaths), (2) change attributable to non-economically-induced net migration, and (3) change attributable to economically-induced net migration. A comprehensive cohort-survival model measures each of the components on as detailed an age-and-sex basis as is possible and projects the combined, anticipated effect of these components upon a specified base population to a given future date.

In the Hastings, Martin, Hallstrom and Chew (1979:25) analysis,

> ". . . the 1970 Hawaii County population census delineation was initially carried forward in two five-year periods to 1980 using the comprehensive cohort-survival technique. The overall County projections for this ten-year period are basically identical to those contained in the State's latest State Tourism Study (1978); minor adjustments were made in order to conform to the State's Department of Planning and Economic Development (DPED) II-F population forecast. Additionally, projections over this ten-year period were estimated at the

individual or combined Big Island district level. The result was an estimated age-and-sex population profile for the various individual or combined district delineations, one of which corresponds to the North Kohala and South Kohala Districts impact area."

"For the ten-year projection period from 1980 to 1990, a modified cohort-survival technique was utilized. With the modified approach, only the natural increase and non-economically-induced migration components were integrated into the projection; the third component of economically-induced migration is omitted from the analysis even though one of the major precepts of a comprehensive regional analysis model is the assumption that population location is ultimately influenced by economic or employment-related considerations. Nevertheless, by making this adjustment it is possible to derive a rough estimate of what the change in population would be if the base population were to remain fixed in location and allowed to age naturally over a ten-year period; non-economically-induced migration, which, in this analysis, is represented by a positive net increase, is also treated as a natural, though exogenous, element. Deleting the economically-induced migration component allows for an estimate of potentially available new labor force prior to such migration. Comparison of this potential labor force vis-a-vis the forecasted new employment needs yields an approximation of the direction and magnitude of likely economically-induced migration."

The Hastings, Martin, Hallstrom and Chew, Ltd. projections are summarized in Table III-16. These figures represent a ten-year aging f an immobile resident population combined with five-year periodic incremental additions of non-economically-induced migration. It should be noted that, as such, they assume that sufficient additional employment opportunities will develop to support the increased population. Historically, such an even balance between population and employment growth has not occurred, and the figures are presented for discussion purposes only.

Using the modified cohort-survival assumptions of no net migration, the Hastings, Martin, Hallstrom and Chew, Ltd. (1979:26) study concludes that:

"The resident population in the North and South Kohala impact area is projected to increase from a 1980 base year estimate of 7,400 to 8,300 by 1985 and 9,300 by 1990. Applying average Hawaii County age-and-sex-specific labor force participation rates to the projected population profiles yielded the following estimates for potentially available new labor force within the impact area: an increase in the labor force of approximately 400 persons from 1980 to 1985 and another incremental increase of 400 persons from 1985 to 1990, [see Table III-16]. If the 1980 unemployment rate for the impact

Table III-16. Population and Labor Force Projections.

Region	Population			Labor Force		
	Base Year (1980)	Five-Year Projection (1985)	Ten-Year Projection (1990)	Base Year (1980)	Five-Year Projection (1985)	Ten-Year Projection 1990)
North and South Kohala Districts	7,400	8,300	9,300	3,200	3,600	4,000
North Kona District	9,800	11,000	12,400	4,500	5,000	5,600
South Kona District	5,100	5,600	6,300	2,200	2,500	2,700
Hamakua & North Hilo Districts	7,600	8,400	9,300	3,100	3,500	3,900
South Hilo District	42,000	46,700	52,600	17,700	19,900	22,400
Puna District	8,600	9,700	11,000	3,800	4,300	4,800
Ka'u District	4,200	4,700	5,300	1,800	2,000	2,300
Hawaii County	84,700	94,400	106,200	36,300	40,800	45,700

Source: Hastings, Martin, Hallstrom and Chew, Ltd.

area is estimated at 9-10 percent, this would indicate a base year labor force pool of approximately 300 available workers. Summing the unemployed labor force pool and the projected labor force increases resulting from the "natural aging" population scenario results in total labor force availability estimates of 700 persons by 1985 or 1,100 persons by 1990."

"Comparison of the impact area's labor force availability projection of 700 persons by 1985 and 1,100 persons by 1990 with the previously estimated additional employment requirement by 1987, indicates a substantial labor force shortage."

Even if it were assumed that 100 percent of the projected available regional labor force shown in Table III-16 would be available for project-related development, it is estimated that there would be a shortage of about 2,100 workers. When one considers that resort development at the Waikoloa Beach Resort will probably generate at least 800 to 1,000 job opportunities by 1990 and that agricultural and commercial development elsewhere in the Kohalas would add another 100 to 150 jobs to this, thereby diminishing the labor force available to fill new jobs that are expected following construction of the water system, the magnitude of the labor force deficit becomes even greater. Assuming that about 75 percent of the workers associated with the Waikoloa Beach Resort and 90 percent of the "other" workers in the region would reside in either North or South Kohala, it appears that in-migration of as many as 2,900 workers could be required in order to supply the region's labor force requirements under this scenario. [See Table III-17.] This amounts to about 1,900 households.

Any answer to the question of where these in-migrants would come from must, of necessity, be conjectural at this time. One view is expressed by Hastings, Martin, Hallstrom and Chew, Ltd. (1979:28 and 29):

> "The origination points of this potential in-migrating labor force are extremely difficult to forecast with any meaningful accuracy. The modified cohort-survival technique, however, as applied to the Big Island, does identify areas or regions in which the unabated "natural aging" growth process would probably result in significantly large labor force surpluses in future years; these areas could obviously provide a source of potentially available labor force that might migrate inter-regionally and possibly relocate into the North and South Kohala impact area. The East Hawaii region stretching from Hamakua to Ka'u and centered around South Hilo is an example of such an area. Based upon the modified cohort-survival projection, unabated "natural aging" of the 1980 base year population for East Hawaii results in resident population estimates of 69,500 persons by 1985 and 78,200 persons by 1990. Corresponding labor force estimates total 29,700 persons and 33,400 persons by 1985 and 1990, respectively. Over this time period, East Hawaii's share of total Big Island employment is forecast to decline from approximately 72 percent in 1980 to 68 percent in 1985 and 63.5 percent in 1990; the declining capture rate reflects the relatively faster growth rate anticipated for West Hawaii (i.e. North Kohala to South Kona) as a result of visitor industry growth. Utilizing the DPED's II-F employment forecast for the Big Island results in a total East Hawaii employment forecast of 27,700 jobs by 1985 and

Table III-17. Calculation of estimated regional labor force deficit in 1990 assuming zero net migration.

	No. of Workers
Estimated Additional Labor Force Requirements by 1990, North and South Kohala	
o Project-Related[1]	2,900
o Other[2]	800
TOTAL	3,700
Estimated Increase in Available Regional Labor Force by 1990, North and South Kohala[3]	800
Projected Labor Force Deficit by 1990, North and South Kohala[4]	
o Project-Related	2,250
o Other	650
TOTAL	2,900

[1] From Table III-14.

[2] See text for derivation.

[3] From Table III-16

[4] Additional Labor force requirements minus projected additional labor force assuming zero net migration. Distribution between "project-related" and "other" makes the simplifying assumption that the deficit will be distributed in the same manner as the labor force requirements.

Source: Belt, Collins & Associates

29,000 jobs by 1990. This indicated level of jobs would not be able to support the labor force estimates of 29,700 and 33,400 persons by 1985 and 1990 without exhibiting extraordinarily high unemployment and massive government transfer payments . . . "

"Faced with this prospect of probable out-migration from East Hawaii, the economically logical solution would be for the labor force surplus to flow towards an area of labor force shortage, such as the North and South Kohala impact area. This would appear to be workable in light of the similar age characteristic of those persons most likely to fill the visitor industry job requirements. If achievable, this might also be the most ideal scenario from an overall social impact standpoint. Considering the entire Big Island as a single regional entity, this type of intra-regional relocation between East Hawaii and West Hawaii would probably result in greater positive, and lesser negative, overall socio-economic impacts than would alternative forms of inter-regional relocation."

Other observers of the situation are inclined to believe that a substantial number of the jobs in the resort industry would be filled by young transient workers. This has very definitely been the case on Maui during a period of rapid tourism growth similar to that projected for the Lalamilo Water System service area. However, there are differences between the Maui and Hawaii Island situations that complicate any attempt to draw a parallel between the two.

Housing Impacts

As indicated in Table III-14, it is expected that 3,700 more workers will reside in the Kohalas in 1990 than at present. About 2,900 of this increase is attributable to Lalamilo Water System-related growth and about 800 to other regional growth. Because of the relatively small existing population of the region and the significant distances that are involved, it has been assumed that there would be no increase in the number of workers who reside in the North/South Kohala region but who work elsewhere. Assuming 1.45 workers per household (see Table III-18):

- the number of households in North and South Kohala would increase by 2,550 by 1990;
- Lalamilo Water System-related growth would amount to 2,000 households by 1990; and
- 550 of the new households would be composed of persons retained in the region because of new employment opportunities.

The most recent County estimates indicate that there are currently about 2,700 dwelling units in North and South Kohala. The 2,000-household increase that could follow the construction of the proposed Lalamilo Water System would increase this by about 75 percent to a total of approximately 4,700 units. If the non-project-related increase of about 550 households is considered as well, it is apparent that the number of dwelling units in the region would have to almost double by 1990 if the region's housing needs are to be met. This rate of development would, if spread relatively evenly over

Table III-18. Estimated number of households and average household characteristics, 1980-1990.

	1980	1985	1990
North and South Kohala Districts			
Number of Households	2,150	2,450	2,800
Average Household Size	3.45	3.38	3.33
Average Labor Force per Household	1.49	1.47	1.44
North Kona District			
Number of Households	2,820	3,220	3,710
Average Household Size	3.47	3.41	3.34
Average Labor Force per Household	1.58	1.56	1.51
South Kona District			
Number of Households	1,520	1,700	1,930
Average Household Size	3.37	3.32	3.26
Average Labor Force per Household	1.46	1.43	1.42
Hamakua and North Hilo Districts			
Number of Households	2,290	2,500	2,760
Average Household Size	3.31	3.35	3.38
Average Labor Force per Household	1.36	1.39	1.40
South Hilo District			
Number of Households	11,880	13,550	15,480
Average Household Size	3.53	3.45	3.40
Average Labor Force per Household	1.49	1.47	1.45
Puna District			
Number of Households	2,500	2,820	3,220
Average Household Size	3.44	3.44	3.40
Average Labor Force per Household	1.53	1.53	1.50
Ka'u District			
Number of Households	1,210	1,360	1,560
Average Household Size	3.48	3.46	3.43
Average Labor Force per Household	1.45	1.46	1.45
Hawaii County			
Number of Households	24,370	27,600	31,460
Average Household Size	3.48	3.42	3.38
Average Labor Force per Household	1.49	1.48	1.45

Source: Hastings, Martin, Hallstrom and Chew, Ltd.

the eight-year growth period that could be sparked by the availability of water from the Lalamilo system, would amount to over 300 dwelling units per year. Based on this, it appears that the provision of adequate housing will be a major concern. Moreover, this rate of construction is unlikely to be achieved, at least in the early years of the period, without significant participation by the major resort developers.

The exact location of project-related housing growth is, of course, difficult to predict with certainty. The Kohala Community Development Plan (which has never been officially adopted by the County) discussed several growth options (Environmental Communications, Inc., 1976:4-15 to 4-21). It pointed out that allocating growth to existing communities would allow sharing of existing public facilities and, therefore, tend to minimize public infrastructure costs. At the same time, however, it pointed out that such a policy would tend to result in very significant social impacts and would be inconsistent with the existing County policy calling for development of support communities in reasonable proximity to the proposed resort communities. After reviewing County policies and discussing support housing development plans with the Lalamilo Water System service area's major resort developers, we have concluded that about 70 percent of the resident population growth in the Kohalas associated with the proposed project is likely to occur within the Kawaihae-Puako area that would be served by the system. Conversely, 30 percent would be outside of it. These percentages have been translated into actual numbers in Table III-19.

Table III-19. Projected location of resident population growth expected to follow completion of the proposed Lalamilo Water System.

Location	Estimated Population Increase	Estimated Increase in No. of Households
Waimea	600	200
Waikoloa	300	100
North Kohala	900	300
Subtotal	1,800	600
Lalamilo Water System Service Area	4,200	1,400
North and South Kohala Total	6,000	2,000

Source: Belt, Collins & Associates

It must be stressed that the actual population distribution that would be achieved is so dependent upon specific County planning initiatives, the arrangements for support housing made by prospective resort developers, and relative land and development costs at various sites that the estimated distribution used in this report may not be realized. However, at present it appears to be a relatively accurate assessment of what is most likely to occur.

Income and Retail Spending

The economic activity that would be fostered by the proposed water system would affect personal income and increase retail spending. Hastings, Martin, Hallstrom and Chew, Ltd. (1979:38-40) has studied these potential effects, and the analytical framework which they have established forms the basis of the discussion which follows. Because of the data base which is used, all figures are expressed in terms of 1977 dollars, although the employment estimates are, in fact, based on the 1982 through 1990 time period.

Information supplied by the State of Hawaii Department of Labor and Industrial Relations (1977) indicates that the average wage per hotel job on the Island of Hawaii in 1977 was $7,545 per year; this average reflects both full-time and part-time/casual employment. During the same year, the average annual wage for all other non-hotel service employment was $8,066.

The multiplier model described previously in this chapter suggests that about 90 percent of the employment growth that would be allowed by the increased water provided by the proposed water system would occur on-site. The input-output model approach indicates that the on-site component would be much smaller, probably about 70 percent. For the purposes of this analysis we will assume that the best estimate is that 80 percent of the new jobs would be in direct visitor industry jobs and that the average salary would be $7,545 per year. Of the remaining 20 percent that are off the resort sites, it is believed that about half (i.e. ten percent of the total) will be in non-hotel service employment at an average salary of $8,066 per year and half in other industries at an average salary of $11,328 per year. [Note: The first two wage rates are as reported by the State of Hawaii Department of Labor and Industrial Relations (1977). The third is an unweighted average of the rates reported in that source for manufacturing, transportation, retail, communication, utilities, wholesale trade, finance/ insurance/real estate, and government.]

Based on the 3,500 jobs in the Kohalas that would follow construction of the proposed waterline (see Table III-14) and the salary rate distribution presented above, it is estimated that the total wages associated with the projected development would amount to $27.9 million per year. This is broken down into $21.2 million at the resort sites themselves and $6.7 million in the remainder of the Kohalas. No estimate was made of employment impacts outside the region, but some increase in jobs would obviously occur. Failure to include extra-regional employment means that the figures presented above probably underestimate the actual employment benefits that would occur. Another factor which probably results in an understatement of income benefits is the low average annual income figure used for on-site employment. Hence, according to Hastings, Martin, Hallstrom and Chew, Ltd. (1979:38),

> ". . . the average annual wage estimate of $7,545 per employment [sic] accounts for both full-time and part-time/casual employment. For the destination resorts envisioned in this study, it is estimated that 80 percent of the jobs will be full-time positions. A recent

survey of Big Island hotels indicated that the current average of full-time employment as a percentage of total employment is closer to 65 percent. Inasmuch as the $7,545 average County wage level reflects the existing 65 percent full-time employment ratio rather than the 80 percent full-time employment ratio which is forecast, the average annual wage figure tends to be understated."

For a semi-rural area such as the North/South Kohala region, actual retail spending is typically about 35 to 40 percent of gross income (Hastings, Martin, Hallstrom and Chew, Ltd., 1979:40). Applied to the estimates cited above, this would suggest that the overall retail spending impact would be $10 to $11 million annually. However, a large amount of this spending is expected to occur in larger commercial centers such as Hilo and, to a lesser extent, Kailua-Kona. The resident retail expenditures most likely to occur within the region will probably be weighted toward such items as groceries, non-durable consumer goods, and services. Since these normally comprise about 20 percent of gross income and consumers would probably purchase a certain amount of other items in Waimea or other towns within the region, it is believed that resident retail spending within the Kohalas would total about 25 percent of gross personal income, i.e. about $7 million. At $125 in sales per year per square foot, such an increase in retail spending could support about 55,000 square feet of commercial retail space within the region.

In addition to the increased resident spending discussed above, there would also be very significant visitor spending. Ignoring expenditures by visitors staying outside the region (e.g., at Kailua or Keahou) who make day trips into it and who purchase items while there, average visitor expenditures (in 1974 dollars) are estimated to be about $37 per visitor per day. From Table III-9, it can be seen that ten-year development plans for the region would result in about 2.8 million visitor-days per year being spent in the region by 1992. The water made available by the proposed Lalamilo Water System would support only about eight years of growth, roughly the amount equivalent to 2.25 million visitor-days per year. These visitors would spend over $80 million per year (1974 dollars).

Hawaii County Public Benefit-Cost Analysis

Public water systems are seldom, if ever, supported purely by charges to users. At the very best, it is expected that operating costs for a system will be covered by user fees. Rarely is it possible to amortize the capital investment in a system from these fees. In the case of the proposed Lalamilo Water System, roughly two-thirds of the capital cost for the first phase is being paid for by the two major resort owners who stand to benefit most from it. The remaining third would be funded with money appropriated by the State Legislature. While no specific terms have been established for the provision of the additional wells needed to bring the system up to its 5.3 MGD capacity, it appears likely that a similar formula would be used to apportion costs between developers and the public. If so, only two-thirds of the initial public investment is likely to be recovered directly from developers. This is rather typical of major public infrastructure items, however, and a more appropriate analysis must take into account secondary (indirect) benefit-cost relationships as well.

The expected eight-year development scenario's long-term, operational impact on governmental revenues and expenditures was measured by Hastings, Martin, Hallstrom and Chew, Ltd. (1979:40-46). Their analysis involved a systematic comparison of the additional government revenues that would be generated by the increase in the visitor population and the additional governmental expenditures that would be incurred on behalf of these same visitors. The results of the comparison were expressed as a public benefit-to-cost ratio. In describing the analysis, the study stated:

"In order to simplify the analysis, the following assumptions and preconditions are imposed. Public sector revenues and costs are measured only as they relate to the local County government of the Island of Hawaii. The incremental fiscal analysis encompasses 100 percent, or all, of the visitors expected to be attracted to the proposed developments; this is not a critical assumption as long as both revenues and costs are measured on an identical basis. The fiscal analysis is measured in terms of 1977 dollars based upon 1977 revenue and cost relationships; this is a critical assumption since the proposed developments are not scheduled for completion until 1982 at the earliest. However, in lieu of actually forecasting, in detail, government expenditures at least three years into the future, recent historical data provides the most reliable basis for measurement. Data from 1977 also represents the most recent comprehensive information on visitor spending which is a primary component in the revenue calculation. Misrepresentations resulting from the use of historical data will also be minimized, from a qualitative standpoint, to the extent that future increases in both per capita visitor spending and per capita government expenditures might offset one another.

"The basic formulation for calculating revenues of expenditures is patterned after the methodology utilized in the public sector benefit-cost analysis of the <u>State Tourism Study</u>. Increased revenues at the County level are determined by converting total additional visitor spending into additional resident income by accounting for leakage and multiplier factors. An applicable county-specific, revenue-to-income coefficient is then applied to the additional resident income estimate to derive the projected increase in government revenues. The algebraic representation is:

$$R = (VE) \times (Q) \times (R/Y)$$

where	R	=	increased government revenues
	VE	=	increased visitor expenditures
	Q	=	visitor expenditures to resident income conversion factor
	R/Y	=	revenue to income ratio

"Increased visitor spending levels (VE) can be measured on either a daily or annual basis. The "Q" conversion factor may be adjusted based upon the desired degree of the multiplier effect to be measured. The revenue-income ratio (R/Y) may be adjusted for exhibited elasticity over time. For this analysis, VE will be based upon an average daily spending estimate subsequently converted into an annual estimate. Two values for "Q" are employed: .63, which is applicable to the measurement of a direct and indirect multiplier effect, and .88, which is applicable to the measurement of a direct, indirect, and induced multiplier effect. (Department of Planning and Economic Development, 1975.) The (R/Y) ratio is estimated at 0.048 based on historical data (Tax Foundation of Hawaii, 1970-1978 [annual]).

"Table III-20 presents increased revenue estimates based upon the different "Q" values and under various assumptions of average daily visitor spending. Hawaii Visitors Bureau (HVB) data for 1977 lists a single Neighbor Island visitor spending estimate of approximately $50 per person per day. Since most of the envisioned facilities are targeted for the visitor industry's carriage trade, it seems reasonable to assume that this spending estimate is understated for this analysis. Two alternative cases are presented in Table III-20, whereby the average daily spending estimate is increased to $75 and $100, respectively. Based upon the estimated 5.2 days average length of stay, the two alternative spending estimates correspond to average expenditures of $390 and $520 per total visit per person, and even these estimates might be considered too conservative. At any rate, six different revenue impacts are calculated based upon the two estimates for "Q" and the three estimates of daily visitor spending; the values range from $3,309,466 per year to $9,250,560 per year.

"Governmental costs are measured on an annual per capita basis. County functions relating to public safety, highways, health and sanitation, recreation, and capital improvements are allocated on a de facto population basis which includes a calculation for the average daily visitor census. All other functions are allocated on a straight resident population basis. The resulting per capita costs for the County of Hawaii in 1977 are presented in Table III-21. As shown in the table, annual direct cost per visitor is estimated at $282.76, and annual cost per resident is estimated at $472.95."

The direct fiscal cost impact on the County of water system-related development was estimated by multiplying the average daily visitor census (see Table III-15) by the annual cost per visitor, $282.76. The result, $1,697,000, is a measure that is conceptually comparable to a revenue estimate based upon a "Q" value of 0.63.

County government would also incur costs serving the population supported by project-related jobs. As a worst case example, one could assume that all of the increased population is attributable to the project. If existing per capita costs continued, these resident-related costs would amount to about $2,840,000 ($472.95 times 6,000). However, at least part of these costs are ones which the County would face regardless of whether or not the expected resort development occurs because they would result from natural increase in the population. Realistically, we believe that only about half of the total, i.e. about $1,400,000, would be attributed to the project. Combining this figure with the $1,697,000 visitor cost estimate gives a total cost to the County of about $3.1 million.

Table III-20. Estimation of increased Hawaii County government revenues (1977 dollars).

Equation for Calculating Increased Revenue (R): R = VE x Q x 0.048

Direct and Indirect Multiplier Effect: Q = 0.63

Case I: Average Daily Visitor Expenditure (ADE) = $49.97
Annual Visitor Expenditure (AVE) = $18,240 ($49.97 x 365)
Total Annual Visitor Expenditure (VE) = $109,440,000
($18,240 x 6,000)
R = $109,440,000 x 0.63 x 0.048
R = $3,309,466

Case II: ADE = $75.00; AVE = $27,373; VE = $164,238,000
R = $164,238,000 x 0.63 x 0.048
R = $4,966,557

Case III: ADE = $100.00; AVE = $36,500; VE = $219,000,000
R = $219,000,000 x 0.63 x 0.048
R = $6,622,560

Direct, Indirect and Induced Multiplier Effect: Q = 0.88

Case IV: ADE = $49.97; VE = $109,440,000
R = $109,440,000 x 0.88 x 0.048
R = $4,622,746

Case V: ADE = $75.00; VE = $164,238,000
R = 164,238,000 x 0.88 x 0.048
R = $6,937,413

Case VI: ADE = $100.00; VE = $219,000,000
R = $219,000,000 x 0.88 x 0.048
R = $9,250,560

Source: Calculations by Belt, Collins & Associates based on methodology reported in Hastings, Martin, Hallstrom and Chew, Ltd., 1979.

Table III-21. 1977 Hawaii County government annual per capita expenditures.

Function	1977 Expenditures[1] (In 1,000)	1977 Population Estimates[2] (Resident/de facto)	1977 Per Capita Annual Resident Cost	1977 Per Capita Annual Visitor Cost
General Government	$ 5,605	79,200	$ 70.77	$ --
Public Safety	11,090	85,700	129.40	129.40
Highways	3,761	85,700	43.89	43.89
Health and Sanitation	1,205	85,700	14.06	14.06
Public Welfare	506	79,200	6.39	--
Public Schools	226	79,200	2.85	--
Recreation	3,128	85,700	36.50	36.50
Interest	2,122	79,200	26.79	--
Bond Redemption	2,247	79,200	28.37	--
Pension and Retirement	3,330	79,200	42.05	--
Cash Capital Improvements	5,049	85,700	58.91	58.91
Miscellaneous	1,027	79,200	12.97	--
TOTALS	$39,295		$472.95	$282.76

[1]Expenditures are for the fiscal year ending in 1977, as reported in Government in Hawaii, 1979, published by the Tax Foundation of Hawaii.

[2]The 85,700 figure represents the de facto population and 79,200 represents the resident-only population. The population estimates are as of July 1, 1977, as reported in Data Book 1979 of the State of Hawaii's Department of Planning and Economic Development.

Source: Hastings, Martin, Hallstrom and Chew, Ltd., 1979:44.

Taking the revenue and cost estimates together, it is possible to calculate benefit-cost ratios for the proposed system. These are displayed in Table III-22 and indicate that the increases in County revenues are likely to exceed increased costs by from 48 percent to nearly 300 percent. Since the methodology and assumptions used with respect to visitor spending are believed to be extremely conservative, it is unlikely that the estimates exaggerate the net fiscal benefits to the County.

Table III-22. Summary of Hawaii County government fiscal benefit-cost ratios for the Lalamilo Water System Project (1977 dollars).

Direct and Indirect Effect		
Benefits:	Case I	= $3,309,466
	Case II	= $4,966,557
	Case III	= $6,622,560
Costs: Cases I, II and III		= $282.76 x 6,000 = $1,697,000
Benefit-Cost Ratios:	Case I	= 1.95
	Case II	= 2.93
	Case III	= 3.90
Direct, Indirect and Induced Effect		
Benefits:	Case IV	= $4,622,746
	Case V	= $6,937,413
	Case VI	= $9,250,560
Costs: Cases IV, V and VI		= ($282.76 x 6,000) + ($472.95 x 6,000 x 0.5) = $3,115,000
Benefit-Cost Ratios:	Case IV	= 1.48
	Case V	= 2.23
	Case VI	= 2.97

Source: Belt, Collins and Associates based on methodology outlined in Hastings, Martin, Hallstrom and Chew, Ltd. (1979).

State Government Benefit-Cost Analysis

A statewide government benefit-cost analysis was performed by Hastings, Martin, Hallstrom and Chew, Ltd. (1979) subject to the same assumptions and preconditions set forth in the Hawaii County-specific analysis except that the fiscal impacts were measured at the State level. The model for estimating fiscal impacts was, again, patterned after the methodology utilized in the

State Tourism Study. Revenues are estimated based on the following algebraic representation:

$$R = (VE) \times (Q) \times (R/Y)$$

where:

R	=	increased government revenues
VE	=	increased visitor expenditures
Q	=	visitor expenditures to resident income conversion factor
R/Y	=	revenue to income ratio

Costs are estimated on an annual per capita basis.

Table III-23 presents estimates of increased government revenues for the State of Hawaii as expressed in 1977 dollars. Six different cases are presented as derived from combinations of three different visitor spending estimates and two different values for the "Q" factor. The statewide average daily expenditure per visitor in 1977 was estimated at $54.62 by the Hawaii Visitors Bureau (HVB). This statewide estimate is approximately nine to ten percent higher than the HVB's neighbor island visitor spending estimate of $49.97. Assuming this relationship to be typical on an average basis, we have utilized daily visitor spending estimates of $54.62, $82.00, and $110.00 in the revenue estimation analysis. In conjunction with "Q" values of 0.63 and 0.88 and given a revenue-to-income (R/Y) ratio of 0.135, estimated increased revenues range from $11,532,000 to $28,512,000 at the State government Level. [The (R/Y) ratio of 0.135 is consistent with that utilized in the State Tourism Study, Public Revenue-Cost Analysis (DPED, 1978).]

State government costs on an annual per capita basis for visitors and residents for 1977 are shown in Table III-24. Annual per capita cost per visitor is calculated at $234.74, and annual per capita cost per resident is $1,540.20. The direct fiscal cost impact is estimated at $1,408,000 by multiplying the forecasted average daily visitor census (6,000 persons) by the annual per capita visitor cost ($234.74).

The State government would also incur costs serving the population supported by project-related jobs. As a worst case example, one could assume that all of the increased population is attributable to the project. If existing per capita costs continued, these resident-related costs would amount to about $9,240,000 ($1,540.20 times 6,000). However, at least part of these costs are ones which the County would face regardless of whether or not the expected resort development occurs because they would result from natural increase in the population. Realistically, we believe that well under half of the total should be attributed to the project. The remainder would occur even without the proposed project. However, if we take 50 percent as a high estimate of the project's statewide population impact, we get increased costs of $4.6 million. Combining this figure with the $1,697,000 visitor cost estimate gives a total cost to the State of about $6.3 million.

Taking the revenue and cost estimates together, it is possible to calculate benefit-cost ratios for the proposed system. These are displayed in Table III-25 and indicate that the increases in State revenues are likely to exceed increased costs by from 136 percent to nearly 1,355 percent. Since the methodology and assumptions used with respect to visitor spending are

Table III-23. Estimation of increased State government revenues (1977 dollars).

Equation for Calculating Increased Revenue (R): $R = VE \times Q \times 0.135$

Direct and Indirect Multiplier Effect: $Q = 0.63$

Case I: Average Daily Visitor Expenditure (ADE) = \$54.62
Annual Visitor Expenditure (AVE) = \$19,940 (\$54.62 x 365)
Total Annual Visitor Expenditure (VE) = \$119,640,000
(\$19,940 x 6,000)
R = \$119,640,000 x 0.63 x 0.135
R = \$11,532,000

Case II: ADE = \$82.00; AVE = \$29,930; VE = \$179,580,000
R = \$179,580,000 x 0.63 x 0.135
R = \$15,273,000

Case III: ADE = \$110.00; AVE = \$40,150; VE = \$240,000,000
R = \$240,000,000 x 0.63 x 0.135
R = \$20,489,000

Direct, Indirect and Induced Multiplier Effect: $Q = 0.88$

Case IV: ADE = \$54.62; VE = \$119,640,000
R = \$119,640,000 x 0.88 x 0.135
R = \$14,213,000

Case V: ADE = \$82.00; VE = \$179,580,000
R = \$179,580,000 x 0.88 x 0.135
R = \$21,334,000

Case VI: ADE = \$110.00; VE = \$240,000,000
R = \$240,000,000 x 0.88 x 0.135
R = \$28,521,000

Source: Calculations by Belt, Collins & Associates based on methodology reported in Hastings, Martin, Hallstrom and Chew, Ltd. (1979b).

Table III-24. 1977 State of Hawaii government annual per capita expenditures.

Function	Expenditures[1] (Millions)	Population Estimates[2] (Resident/ de facto)	Per Capita Annual Resident Cost	Per Capita Annual Visitor Cost
General Government	$ 80.9	891,400	$ 90.76	$ --
Public Safety	65.3	969,200	67.38	67.38
Highways	28.3	969,200	29.20	29.20
Natural Resources	15.3	969,200	15.79	15.79
Health and Sanitation	24.8	969,200	25.59	25.59
Hospitals and Institutions	73.3	891,400	82.23	--
Public Welfare	203.5	891,400	228.29	--
Education/ Public Schools	425.2	891,400	477.00	--
Recreation	12.1	969,200	12.48	12.48
Utilities and Other Enterprises	37.7	891,400	42.29	--
Debt Service/Bond Redemption and Interest	108.7	891,400	121.94	--
Retirement and Pension	49.6	891,400	55.64	--
Employees Health Insurance	11.5	891,400	12.90	--
Unemployment Compensation	99.7	891,400	111.85	--
Urban Redevelopment	38.1	891,400	42.74	--
Cash Capital Improvements	81.7	969,200	84.30	84.30
Miscellaneous	35.5	891,400	39.82	--
TOTALS	$1,391.2		$1,540.20	$234.74

[1] Expenditures are for the fiscal year ending in 1977, as reported in Government in Hawaii, 1979, published by the Tax Foundation of Hawaii.

[2] The larger number represents the de facto population and the smaller number represents the resident-only population. The population estimates are as of July 1, 1977, as reported in the State of Hawaii's Department of Planning and Economic Development, Data Book 1979.

Source: Hastings, Martin, Hallstrom and Chew, Ltd. (1979b).

Table III-25. Summary of State government fiscal benefit-cost ratios (1977 dollars).

Direct and Indirect Effect

Benefits:	Case I	=	\$11,532,000
	Case II	=	\$15,273,000
	Case III	=	\$20,489,000
Costs: Cases I, II and III		=	\$234.74 x 6,000 = \$1,408,000
Benefit-Cost Ratios:	Case I	=	8.19
	Case II	=	10.85
	Case III	=	14.55

Direct, Indirect and Induced Effect

Benefits:	Case IV	=	\$14,213,000
	Case V	=	\$21,334,000
	Case VI	=	\$28,512,000
Costs: Cases IV, V and VI		=	(\$234.74 x 6,000) + (\$1,540.20 x 3,000) = \$6,029,000
Benefit-Cost Ratios:	Case IV	=	2.36
	Case V	=	3.54
	Case VI	=	4.73

Source: Hastings, Martin, Hallstrom and Chew, Ltd.

believed to be extremely conservative, it is unlikely that the estimates exaggerate the net fiscal benefits to the State.

Property Tax Burden

It is expected that a relatively large proportion of the development that would be allowed by the proposed water system would occur on property owned by Mauna Loa Land, Inc. and Mauna Kea Land Corporation. Presumably, these developers and the Puako property owners who have already applied for development permits have taken this into consideration in their plans and would not be adversely affected by it. However, other property owners in the region may not be so well positioned.

Of particular concern are individuals and families with low or fixed incomes who might find it difficult to pay the higher property taxes that would be imposed if the assessed valuation of their land should rise as a result of nearby development. Such property owners are always able to escape the financial burden by selling their land at the inflated price and moving to another, less expensive area. However, the social and psychological impacts associated with forced relocation can be high. Because of this, it is important that consideration be given to means of sheltering needy residents from the tax effects of the expected increase in property values.

DESCRIPTION OF SOCIAL SETTING AND SOCIAL IMPACTS

Construction and operation of the proposed Lalamilo Water System would have virtually no direct social impacts on the existing residents of the Kohalas. However, the indirect effects on the community of secondary growth permitted by the project are expected to be substantial. As part of this investigation, Public Affairs Advisory Services, Inc. (December 1979) conducted a social impact assessment study. The most relevant portions of their final report are reproduced below.

THE SOCIAL ENVIRONMENT

A. Social elements making up the social environment have served as a background for this assessment. The following are examples:

1. Social assets of individuals and families such as health, education, vocational training, employment, diligence, self-reliance, financial security, safety, family stability, morality, respect for property of others, obedience, solvency, breathing spaces, tranquility, quiet;

2. Social liabilities of individuals and families such as illness, ignorance, vocational unfitness, unemployment, laziness, dependency, financial insecurity, danger, family breakdown, immorality, vandalism, delinquency and crime, indebtedness, congestion, disturbance, noise;

3. Social relationships such as mutual respect, friendliness, neighborliness, cooperation, tolerance, mutual trust, loyalty, "aloha," and the reverse: disrespect, hostility, exclusiveness, conflict, intolerance, distrust, disloyalty, "stink eye";

4. Social groupings such as families, clans, clubs, churches, other special interest groups, community organizations, neighborhoods and communities;

5. Social programs such as medical care, mental health services, education, job training, rehabilitation, police protection, fire protection, help with housing, financial assistance, family and child welfare, services to the elderly, sports and recreation, culture and the arts, legal aid, social research, counseling, religion.

B. Human resources in the immediate impact area of North and South Kohala have not been measured with any comprehensiveness and accuracy since the 1970 dicennial census.* More

*For data compiled by the U.S. Census Bureau and the State Department of Labor and Industrial Relations, see Tables 1, 4, 5 and 6 of the Economic Impact Analysis.

recent tentative estimates of the size, distribution and growth of the resident population are shown in Table III-26. In any event, respondents who have resided in the area for the past 10 years have seen the following:

1. North Kohala

   a. a slight increase in population when many expected a decrease,

   b. relocation of families moving to new homes within the district,

   c. a steady in-migration of persons from off the island and from outside the state,

   d. an increase in persons commuting to jobs outside the district,

   e. a continuing exodus of younger persons who have grown up in the district.

2. South Kohala

   a. a marked increase in population,

   b. the growth of an entirely new community at Waikoloa,

   c. a steady in-migration of persons from off the island and from outside the state,

   d. a noticeable increase in the ratio of haoles (Caucasians),

   e. a continuing exodus of young persons who have grown up in the district,

   f. and recently, the breaking of ground for hotel development at Anaehoomalu and for the Mauna Loa Land, Inc. golf course and utility systems.

THE SOCIAL IMPACT ASSESSMENT: ITS LIMITATIONS AND ITS USEFULNESS

A. Limitations of social impact assessments should be understood. Criteria for assessing a social impact are by their very nature often subjective and imprecise because what one is attempting is a judgment of whether a change affecting the social side of the individual, family, neighborhood or community is for the better or for the worse. What one person may consider a positive change may be a negative one in the judgment of another. Take the example of an attractive island girl who

TABLE III-26. RESIDENT POPULATION OF COUNTIES AND DISTRICTS: 1970 TO 1978

County and district	April 1, 1970	July 1, 1977 1/	July 1, 1978 1/	Percent change, 1970-1978 2/
The State	769,913	891,400	896,600	16.4
Honolulu	630,528	717,600	719,600	14.1
Honolulu	324,871	353,600	352,100	8.4
Koolaupoko	92,219	103,600	104,000	12.8
Koolauloa	10,562	12,900	13,000	22.9
Waialua	9,171	10,100	9,900	8.3
Wahiawa	37,329	42,200	42,600	14.1
Waianae	24,077	27,100	28,100	16.6
Ewa	132,299	168,100	169,800	28.3
Hawaii	63,468	79,200	80,900	27.4
Puna	5,154	8,100	8,300	61.9
South Hilo	33,915	40,500	41,000	20.9
North Hilo	1,881	2,100	2,000	4.6
Hamakua	4,648	5,200	5,400	15.7
North Kohala	3,326	3,600	3,600	6.9
South Kohala	2,310	3,200	3,400	49.0
North Kona	4,832	7,800	8,400	72.9
South Kona	4,004	4,800	4,800	20.9
Ka'u	3,398	3,900	4,000	18.2
Maui and Kalawao	46,156	60,300	61,400	33.1
Hana	969	1,200	1,200	23.1
Makawao	9,979	13,500	14,200	42.8
Wailuku	22,219	28,800	29,300	31.9
Lahaina	5,524	8,100	8,100	47.4
Lanai	2,204	2,200	2,100	-4.2
Molokai	5,089	6,300	6,200	22.9
Kalawao	172	200	200	-3.4
Kauai	29,761	34,400	34,700	16.6
Waimea	7,569	8,300	8,200	8.5
Koloa	6,851	8,000	8,200	19.3
Lihue	6,766	7,700	7,700	14.3
Kawaihau	7,393	8,800	8,900	20.6
Hanalei	1,182	1,700	1,700	40.3

1/ Independently rounded and may not add exactly to the indicated totals and subtotals.

2/ Computed from unrounded data.

Source: Hawaii State Census Statistical Areas Committee, Estimated Population of Hawaii by Districts, 1978 (Report CTC-42, August 30, 1979).

has the option of settling down in her rural community with a stable marriage, children, and part-time work to supplement her husband's modest income or of going into the entertainment field of tourism, meeting and marrying a well-to-do outsider, living away from the islands much of the time, "seeing the world," but constantly on the move and having no children. By what criteria does one judge the impact of tourism on the girl who is drawn away from her community? The answer lies in the mind of the observer. This involves a subjective judgment.

Measuring the extent to which an action has a social impact can rarely, if ever, be precise for the simple reason that such actions as creating a resort development never occur in isolation from other forces of social change. The approval of a resort development has been preceded by a series of other events and decisions. Likewise, one cannot expect an evaluator to establish firm "cause and effect" relationships. Neither is there any sure method of accurately measuring the "net" of the gains and losses when positive and negative impacts are weighed one against the other. An example is seen in the opening up of the Mauna Kea Beach Hotel and the closing down of the Kohala Sugar Company. Resort employment income replaced sugar employment income at the expense of some family security and stability. It is a question of how one evaluates the tradeoffs.

B. Usefulness of such a social impact assessment may be in doubt, not only because of the limitations noted above, but because proponents and opponents of a given project action will attempt to take advantage of these circumstances to support their particular cause. However, the social impact assessment provides the individual, family, neighborhood, special interest group, community association, developer, government agency, public or private organization, etc. with the following useful information:

1. It alerts interested parties to the possible and probable social consequences of the action being taken.

2. It gives the reader an idea of how the various segments of the public perceive the impending action at a particular time.

3. It points up actions which can be taken to help enhance positive impacts and minimize negative ones.

In judging the usefulness of a social impact assessment, one should recognize the following:

1. What people believe and feel (their perceptions and attitudes) are, for them, their realities. In the social sector where much is in the sphere of intangibles, it serves little purpose to discredit points of view because they

seem unreasonable or irrational. They must be recognized as some of the forces that lead persons into action. This social impact assessment contains data which indicate what the people of the Island of Hawaii, and, in particular, the districts of North and South Kohala, perceive and feel about resort developments in the South Kohala area. This needs to be known and taken into account in proceeding with the development and in dealing with its impacts on the people.

2. The social impacts of many actions can be modified for better or for worse. The dynamic nature of the process of social change, over time, which involves the elements enumerated earlier in this report, makes possible conscious action to formulate plans and influence decisions and thus modify results. There need not always be the same finality that one finds in certain irreversible actions that, for example, change the physical environment permanently.

C. <u>Public participation</u> in the preparation of this assessment has included the following:

1. Drawing on existing documents which contain data on the public's knowledge, attitudes, and perceptions and of the social impacts elsewhere of projects similar to the development being proposed.

2. Surveying the public as a whole, including the so-called "silent majority."

3. Conducting interviews with selected organizational representatives and community leaders in the North and South Kohala area.

This participation has added to the credibility of the assessment as a reflection of how the people of the Island of Hawaii, and especially those in the North and South Kohala districts, view the impending development and its likely impact. This process has made it possible to inform some of the community leaders of factors which are included in a social impact assessment, to obtain their helpful contributions to the assessment and to discuss ways in which the residents of the area can take steps to enhance positive and minimize negative impacts.

This participation has already opened the way to a hoped for, on-going dialogue between those who are bringing about changes and those who will be helped and/or hurt by the changes.

For a list of contacts refer to Appendix C.

D. <u>Application of the findings</u> in this assessment depends on the following actions:

1. The use made by those who are involved in various aspects of the development projects,

2. The extent to which the EIS document is publicized and made available to interested parties,

3. The steps taken by individuals and community groups to help shape the impact they will feel,

4. The advance planning and follow-through that public officials and government agencies undertake to see that government programs meet the service needs of the people without the customary delays.

SECONDARY SOCIAL IMPACT POTENTIALS

Features and Elements of the First Ten Years (1980-1990) of the Development Complex that are Expected to have Social Impacts

The Lalamilo Water System will make possible the building and operation of hotels, condominiums, single-family residences, commercial and light industrial facilities (including restaurants, shops, etc.), landscaping, recreational amenities (including golf courses, tennis courts, swimming pools, etc.), boat facilities and historical and cultural parks.

Within the premises will be a variety of physical, economic and social programs and activities participated in by individuals and groups made up of hotel guests and project residents, management personnel, employees, entertainers, and vendors, as well as the public. The following features and elements of this development can be expected to have significant social impacts.

1. The transformation of open space to occupied space; of relatively unproductive land to productive use and of practically uninhabited areas to a populated resort development with varied activities.

2. The growth of economic activity especially employment.

3. The accelerated growth of population, both resident and visitor.

While it is recognized that actions taken and impacts felt are interrelated parts of a dynamic process, they are dealt with under separate headings for clarity of presentation.

Social Impacts that will Likely Occur

Social Impact of Transforming Open Space to Occupied Space

Most of the area of the development site has had almost no public use due to its unsuitable lava terrain and thickets of kiawe. Archaeological sites, especially the petroglyph fields and the trails, have been so difficult to reach that few have enjoyed them. The planned development will open up the area for productive use with resort buildings, landscaped grounds, parks and protected archaeological sites accessible to the public.

Many of the commercial, cultural and entertainment facilities and activities will be open to the public and thus provide a source of social enjoyment.

In these respects, the impacts felt by the public should be generally positive. Much, of course, depends on the kind of relationship the management establishes with the community in the course of the growth of the project, the care with which archaeological sites are respected and protected and the way in which public access to the facilities is handled.

Adverse reaction to the change can be anticipated by those who place a high value on keeping the area in its "natural" state and preserving as much open space as possible. It is likely some will object to any disturbance close to the archaeological sites.

The transformation of this undeveloped area for use as a resort development will have an impact on the Puako Community because of its proximity. The two rows of homes and second homes (plus an apartment building) that border the beach road lie between Mauna Loa Land, Inc.'s property and the ocean along approximately two miles of the coastline. Property values, and thus taxes, have risen rapidly in the past few years due in part to outside speculators. Owners on fixed incomes face the option of either meeting the higher taxes or moving out. Thus, there is an air of uncertainty about the further impact as the resort developments are built and attract more speculators. On the positive side is the prospect of having retail outlets close by. At present, shopping is done in Kawaihae (eight miles away) or Waimea (fifteen miles away).

Social Impact of Economic Growth

The increased business and employment which will be generated by the resort development will have far-reaching consequences for the resident population because the economic impacts* will have immediate social impacts.

a. Cost of Living

The prices of basic consumer goods and housing can be expected to rise more than the norm as the demand exceeds the supply. Retail outlets will have higher overhead as new businesses replace family stores and local consumers are attracted to the newer and more expensive outlets and goods. In the long term, the development may result in attracting some discount retail outlets to the area when the size of the consumer population and competition among vendors warrants it.

The inflationary impact of the development has already been felt in the housing market as investors speculate on the anticipated demand, buy into the area, primarily into the Waimea/Kamuela and Puako communities.

*Refer to the Economic Impact Analysis.

b. <u>Employment</u>

The social impact of the new job opportunities that could arise following implementation of the project would depend on several factors, among which are the following:

- Extent and rate at which labor requirements exceed the resident supply and thus require importation of workers from outside the region.

- Degree to which the new jobs may conflict with the mores, value systems and patterns of daily living of individual job seekers.

- Wages, working conditions and social status in the newly created employment as compared to customary on-going employment in the job seeker's community.

- Extent to which workers are enticed away from locally established businesses, other resorts in the Kohala-Kona areas or are imported.

- Extent to which there is a reduction in the numbers of persons dependent on government support via public assistance, unemployment compensation, food stamps, Medicaid, etc.

- Extent to which the appropriate government educators gear their programs to provide residents training for these jobs far enough ahead so that they can be qualified at times of initial offerings.

c. <u>Labor Demand and Supply</u>

The social consequences of the above anticipated shortage of local labor can be far-reaching. Some labor must be imported because:

- The local population is not large enough and local industry has not been extensive or diversified enough to have produced an adequate supply of workers with the necessary skills.

- Manpower training programs have not been geared to train residents who have the potential, and the government requires a long lead time.

The in-migration of workers needed to fill the expected jobs will likely create problems.

- A growing ratio of newly arrived workers and their families, added to the newly arrived small business operators serving them, will likely change the established ethnic ratios in the community.

- Creation of a housing shortage with its consequent inflated rents for tenants and increased profits for landlords will be part of the impact.

- Depletion of the labor supply of others in competitive enterprises will possibly lead to tension between residents and newcomers.

  Presence of a group of temporary, single workers who have no local community or family ties, and who may feel little or no responsibility to respect local customs, can be expected to cause an increase in social problems related to drinking, gambling, womanizing, etc.

Should those responsible for manpower training fail to help prepare residents for anticipated job opportunities, the social consequences could include one or more of the following:

- Local residents will miss chances to get jobs, qualify for new occupations, or get promotions.

- If the shortage is acute enough and the affirmative action programs aggressive enough, resident workers may be hired into jobs beyond their capacities and later demoted or dismissed or given a false sense of accomplishment.

d. <u>Conflict with Local Mores, Values and Pattern's of Daily Living (Life-Styles)</u>

The demand of some jobs in the visitor/resort industry where a majority are filled by females, will make it difficult for certain residents to accept employment, or upon acceptance, may result in social conflict and problems because of one or more of the following:

- Duties the employee must perform will sometimes be in conflict with accepted community standards, family expectations, religious values or the individual's own standards.

- Persons with whom the employee works and/or the type of customers served will often be ones he or she would not normally associate with or maintain the particular type of relationship with.

- The circumstances of unaccustomed regularity and hours of work, separation from family members, commuter travel and independent income will place an undue strain on, some individuals and on their family relationships.

- Changes in the housewife's role to that of a breadwinner outside the home will create some conflict and even divorce. However, because (1) there has been the precedent of the Mauna Kea Beach Hotel, (2) the community has experienced a wider acceptance of the emancipation of women, and (3) so many have been exposed to the persistent and penetrating influence of television, the rate of family conflict and breakdown by reason of such employment likely will be less.

- Children will receive less parental supervision and thus an increase in rates of child neglect, deviant behavior and even delinquency can be expected.

e. Employment as a Learning and Broadening Experience

On the other hand, the employment opportunities offered residents will provide some useful experiences.

- Duties performed can help improve the employee's skills, self-discipline, self-confidence, and sense of self-worth.
- New skills can be learned.
- There will be opportunities for training off the job.
- On-the-job contacts with a variety of people can be a positive broadening experience.
- The demand for entertainers, artists and craftsmen will provide opportunities for residents to profit from their skills in music, dancing, painting, sculpturing, crafts and other arts and will give them exposure that can lead to bigger things.

f. Employee Housing

The eventual mix of additional housing required by employees and their families, both in terms of location, development, ownership and management has not been decided. Various options are under study.

Such housing has social impact considerations, including the following:

- Extent to which needed housing is provided by the resort developers, outside developers, individual builders, the employees, the government, or by the families and friends who share their own homes.
- Location of such housing in relation to the development site and existing communities.
- Cost of housing to employees and their families.
- Amenities provided in connection with any sizable developments.
- Desirability of housing provided employees in comparison to employee housing offered by other employers.
- Inflationary impact on the communities in the region.

g. Employment Prospects

Judging by past experience of similar employment in the impact area and more specifically by the high degree of interest reflected in a recent survey (refer to Table III-27), it is likely the response will be as follows:

- Interested North and South Kohala residents who qualify and are unemployed, underemployed or seeking a change in jobs, will want to benefit from this opportunity.
- Young persons who might otherwise be forced to leave the area and seek employment elsewhere, will seek jobs in order to stay.
- Interested Big Island residents outside the Kohala area can be expected to take advantage of this employment, a better option than bringing workers from off the island.

h. Social Impact of Full Employment on the Community (beyond economic considerations)

Such employment will result in:

- Reduced costs of public assistance, food stamps, unemployment benefits, Medicaid, etc.
- Restoration of self-reliance and pride among unemployed obtaining work.
- Less idleness and related problems of delinquency among those youth who succeed in the job market.

Social Impact of Resident Population Growth

By 1990, it is estimated there will be about 6,300 residents added to the population of North and South Kohala as an outgrowth of the development (refer to Appendix D). Other projects will generate additional population. Such an increase in the ratio of new residents to already established residents will have far-reaching social impacts.

a. Community Affairs

Those who have been accustomed to conducting community affairs with fellow residents in a mutually understood social system will face increasing adjustments as more new residents move in wanting to make changes in accordance with the socio-cultural patterns of their previous places of residence or origin.

Some long-term residents will find their low-key participation in community affairs and decision-making by consensus upset by the combination of newcomers who are more vocal, articulate and dominating.

TABLE III-27.

REACTION TO THE RESORT DEVELOPMENTS PROPOSED IN THE SOUTH KOHALA COASTAL REGION: ALL RESPONDENTS*

REACTION	KOHALA/ WAIMEA	KONA	ENTIRE ISLAND
I think it's an excellent idea	35.1%	26.1%	28.3%
I think it's a good idea	30.8%	13.5%	21.4%
I think it's an acceptable idea	13.9%	23.0%	18.2%
I don't like the idea much	10.2%	14.5%	10.2%
I am very opposed to the idea	3.5%	10.0%	5.6%
It doesn't matter much to me	3.1%	7.7%	12.1%
	96.6%	94.8%	95.8%
No reply to this question	3.4%	5.2%	4.2%
	100.0%	100.0%	100.0%

* Question posed: "How do you feel about the resort development proposed in the South Kohala coastal region?" (CHECK ONE)

EXPRESSED INTEREST IN EMPLOYMENT RESULTING FROM ONE OF THE PROPOSED SOUTH KOHALA RESORT DEVELOPMENTS: ALL RESPONDENTS*

REACTION	KOHALA/ WAIMEA	KONA	ENTIRE ISLAND
Yes	52.2%	20.4%	28.4%
No	41.7%	75.8%	66.6%
	93.9%	96.2%	95.0%
No reply to this question	6.1%	3.8%	5.0%
	100.0%	100.0%	100.0%

* Question posed: "Would you be interested in a job in one of the proposed South Kohala resort developments?" (CHECK ONE)

Note

During the period October 6-8, 1979, 1,355 persons were surveyed on the Island of Hawaii. Of these, 325 were in North and South Kohala and 310 in North and South Kona. Their responses to two of a series of questions related to resort developments and employment are shown above. The results have a confidence level of approximately 95 percent.

Source: Public Affairs Advisory Services, Inc., Honolulu

Some new residents who are sensitive and humble enough to blend with the existing pattern of community life will be accepted as equal partners in community affairs. Thus they will be able to make a contribution which will be welcomed and will enrich the lives of the residents.

As the ratio of recent to long-time residents increases, those with their roots in the community will experience a threat to the customary pattern of daily living and community decision-making accompanied by a shift in the power structure.

More small businesses will be taken over or started up by newcomers, thus changing the day-to-day feeling residents have about their community.

b. <u>The Housing Dilemma</u>

The developers estimate that by 1990 the additional population mentioned above will create a need for 2,000 more dwelling units (houses and apartments). Distribution of these is projected as follows:

Outside the development site but in the service area of the project	1,400
Waikoloa	100
Waimea/Kamuela	200
North Kohala	300
TOTAL	2,000

The magnitude of these housing projections highlights the potential economic impact which in turn will have sweeping social consequences. The principle ones are the following:

- Established residents will be faced with:
  * High property taxes.
  * Having to sell out to a buyer who is making a generous offer and then having to locate themselves elsewhere.
  * Likelihood their children and/or grandchildren will have to move elsewhere.
- The growing ratio of new residents able to afford the inflated prices will possibly result in the growth of two "communities" rather than a single, integrated one. The newcomers will probably fall into two categories: the full-time residents and those who buy "second homes" and are only part-time residents with their roots elsewhere.
- Absentee speculators who are counting on the resort developments helping drive up the value of property in the area will continue to contribute to the present shortage of affordable homesites.

- Along with the rising property values and taxes will eventually come better roads and other community improvements financed by private developers and/or increased government revenues.

c. Social Behavior

It is not possible to precisely predict the impact such a population growth will have on the social behavior of individuals, families and small groups without knowing the characteristics of the in-migrant population. However, the following generalizations can be made on the basis of other areas that have experienced the kind of development that attracts a minimum of persons who are dependent on illegal sources of income, marginal self-employment, periodic government handouts and who insist on a life-style out of tune with the pattern established by the community.

- While there likely will be an increase in social breakdown (family disorders, divorces, drug use, alcohol abuse, juvenile delinquency, adult crimes, etc.) as a result of more people, the rate is not expected to change appreciably.

- Likewise, the incidence of illness will increase but not the rate.

- On the other hand, the rate of traffic accidents is likely to increase due, not only to an increase in volume of traffic but an increase in the ratio of speeding commuters and of late-nite drivers working in the hotels.

- The change in ethnic ratios with the anticipated influx of more haoles (Caucasians) can be expected to increase inter-ethnic tensions in those quarters where they are seen as a threat to the established way of life, as intruders with the power of their money.

d. Community/Human Services

There is a recurrent pattern in Hawaii of the supply of needed community/human services lagging behind the demand when in-migration substantially exceeds out-migration. These shortages include all of the following as the population grows ahead of the public services:

- Public safety (police, fire).

- Education (school facilities, teachers).

- Health [emergency units, medical facilities and personnel, public health services (including clinics), sanitation controls and waste disposal].

- Family and child welfare services (counseling, foster care, day care, services to elderly).

- Sports and recreation (youth programs, parks, camping).
- Culture and arts.

It should be noted that deficiencies in one or more of the government's human services programs can be partially offset by the private sector through actions taken by developers and/or voluntary community organizations.

e. Recreational Resources

The establishment residents will feel the full impact of the additional resident population, as well as the influx of tourists, when using common recreation sports and facilities such as parks, picnic areas, fishing grounds, campsites and beaches. This impact will be most keenly felt at the swimming beaches where the ratio of sunbathers, swimmers and skin divers to sandy beach will create serious problems.

There are only the three good, sand-bottom beaches:

- Anaeho'omalu (access through the Waikoloa Hotel development).
- Hapuna (a State Park beach).
- Kaunaoa (access through the grounds of the Mauna Kea Beach Hotel).

Not only is there a growing problem of the ratio of users to space, but of access and public parking, especially at the Mauna Kea Beach Hotel. These conditions, accentuated by the anticipated increase in resident population and volume of tourists, can easily lead to growing tensions and unpleasant incidents.

Social Impact of Visitor Population

The Mauna Loa Land, Inc. and the Mauna Kea Land Corporation resort complex will be the major single contributor to the anticipated increase in the visitor population in the North and South Kohala area. The daily visitor population made up of temporary residents in their second homes, the 3,400 average daily number of hotel guests, other tourists, residents coming from other parts of the island for recreation, persons in the area on business only and those holding local jobs to which they commute each day from outside the area, can be expected to have a variety of social impacts including many of those described earlier in this assessment and which will not be repeated here.

Two aspects of the anticipated visitor population which will result in a noticeable social impact are its size and its transitory nature. The visitor population falls into two categories:

a. <u>Big Island Residents</u>

The social impact of these visitors to the area can be expected to be felt in added vehicular traffic (including a likely higher rate of road accidents due to increased numbers of high-speed commuters and late, after hours driving), and, in the case of those coming to the area for recreation, an increase in tensions as these residents and the tourists vie for limited space in parks, camp grounds, parking lots and on the few sandy swimming beaches.

Some Big Island residents can be expected to come into the area to take money and goods away from the tourists, illegally.

On the other hand, there probably will be instances when resident visitors and tourists will enjoy social contact with each other and form fast friendships.

b. <u>Tourists from Outside Hawaii and Visitors from Other Islands</u>

Tourists include those who come on business combined with rest and/or recreation, members of tour groups, independent travellers (including back-packers), and those who depend on the hospitality of others and/or resort to illegal acts to get along or to supplement inadequate personal travel finances.

The presence of these types of visitors will be felt directly in several ways including the following:

- An increase in vehicular traffic which is likely to slow down the movement of residents, both because of numbers of vehicles and because of the reduced driving speed of some sightseers.
- Greater crowding of most community facilities such as beaches, parks, fishing areas, archaeological sites, scenic viewpoints, mountain trails, campsites, public restrooms, etc.
- A combination of increased sales of goods and services and thus profits for businesses, on the one hand, and higher living costs for residents, on the other.
- Greater attention to island culture as the demand for entertainment and the arts and crafts increases.
- Clearing, restoration, preservation, supervision and enjoyment of archaeological sites, some of which are inaccessible, obscured and/or in disrepair today.
- Mixed interaction between residents and tourists ranging from overt anti-tourist behavior and exploiting the tourist economically, to making the tourists feel welcome and to forming lasting friendships.
- Exposure of local employees to the different life-styles and levels of spending of tourists resulting in both positive and negative consequences.

c. Adverse social impacts that are probably unavoidable. The criteria used in making a judgment as to adverse social impacts are those that the established residents of a community view as undesirable changes that cannot be reversed, such as changes in individual and family behavior, life-styles and in the pattern of the society itself.

The long-range impact of a massive increase in the defacto population of North and South Kohala appears to be unavoidable. The immediate physical, economic and social impacts will have a cumulative effect which will be cultural and psychological -- a societal change that probably cannot be undone.

The far-reaching changes brought about will be gradual, subtle, and many residents will not be aware of what is happening until considerable change has occurred. It will be the cumulative effect of the day-to-day, week-to-week, month-to-month visual and "felt" impacts. The increase in numbers of "strange faces" seen at the stores, service stations, community gatherings, on the roads, at the beaches, etc., the filling in of open spaces, the growing congestion wherever people meet and travel, the replacement of familiar buildings with strange ones, the growing independence of spouses and children, seeing family and friends relocating elsewhere and feeling more and more of a hustle and bustle, sensing a rising level of tension, a greater disparity of household incomes; all of these will contribute to the irreversible trend.

The impact of these and other social forces can cause some residents to seek an outlet for their frustrations. Under these circumstances, changes in behavior will take different forms from withdrawal (social and/or physical), to "making the best of it," to anti-growth activism, and, in extreme cases, to aggressive and possibly criminal behavior. The following are examples of social changes that can be anticipated*:

1. Character, spirit and ambience of the neighborhood, community, district, region. All segments of the area will experience changes that will alter the feeling people have about where they live. Many residents will feel that most of the change they experience of this sort will be for the worse. They will long for "the good old days." They will long for the identity they feel eroding away.

2. Interrelationships. The unwritten but understood code of Hawaii's multi-cultural relations, of unsigned agreements, of friendly racial banter, of consensus decision-making will be altered and likely never be restored.

*It should be noted, however, that these changes can be modified, if there are enough concerned persons in the community willing to devote their time and efforts to secure public support to minimize these adverse effects, if there is cooperation from the developers and their project managers and if government officials do their part.

3. Community organization. The coalitions, centers of power and character of community participation will all be changed. It is likely there will emerge a more extensive pattern of segmented organizations of rivalry, and an increasing element of alienation.

4. System of social values. Standards of behavior, and codes of conduct will inevitably change and will be reflected in more social breakdown such as broken families, neglected children, increase in use of escape mechanisms such as alcohol and drugs, more personal indebtedness, illegitimate pregnancies, abortions, bizzare behavior, juvenile delinquency, crime, mental illness. These are not likely to be reversible. Many individuals will eventually say "things will never be the same."

MEASURES TO BE CONSIDERED FOR ENHANCING POSITIVE IMPACTS AND/OR MINIMIZING NEGATIVE ONES

In The Field of Employment

Job Status

How the jobs are viewed, not only in the minds of the employees and prospective employees, but in the eyes of those in the community whose opinions are valued, will have an impact on the way in which the public views the industry coming into the community or region. Such factors as the following have a bearing:

a. The way information about jobs is presented to the community.

b. The extent to which the prospective employee understands the economics of the job including wages, possible gratuities, fringe benefits, payroll deductions, and expenses connected with the job such as uniforms, tools, and cost of commuting to and from work.

c. How these compare to similar jobs in the area.

d. Security of the job (temporary or regular employment).

e. General working conditions.

f. Emplcyee housing.

g. Employer-employee relations as demonstrated by deeds more than words.

h. Opportunities for advancement including help in preparing for advancement.

i. Relationship of management to the residents in nearby communities.

Competition with Others for a Limited Labor Supply

The projected rate of expansion of all the resort developments in the region is likely to result in stiff competition for the limited labor supply on the island and will probably result in importation of workers from off the island, outside the state and even of aliens from abroad. The social impact of such hirings can be shaped by the following:

a. Encouraging employers in the region to cooperate in planning for their manpower needs by (1) arranging for vocational training and retraining, and (2) by sharing the existing labor supply in the region, island, and state.

b. Controlling the rate of expansion and hirings.

c. Monitoring the extent to which other businesses in the area are affected by resort development hirings.

d. Making adequate provisions for housing, community services and other amenities required by persons brought in from outside the region.

e. Carefully screening and orienting employees hired from outside the state and preparing nearby communities for any sizable group brought in.

f. Cooperating in efforts toward resolving the housing needs generally.

Small Enterprises

The planned resort development with its projected volume of tourists will create a demand for entertainers, artists, craftsmen, taxi drivers, baby sitters, hair stylists, etc. This aspect of economic growth will have a direct social impact on the nearby communities because of opportunities for persons who are unable to hold regular jobs to get income and for job holders to supplement their income. How beneficial these opportunities will be for the nearby residents will depend on the following:

a. Extent to which the resort management and concessionaires alert the community and the training agencies to the anticipated needs so there is enough lead time to prepare.

b. Extent to which local enterprises, services, and products can be given first opportunities.

In all such efforts to achieve as desirable a social impact as possible in the field of employment, there is need for early planning and close cooperation between the employers, the officials of the State Employment Service, union officials, the community associations and the cultural groups on the island, especially in the North and South Kohala area.

In the Field of Industry-Community Relations

Many of the problems that have surfaced elsewhere in an otherwise calm setting might have been minimized or even avoided had the new industry maintained an on-going dialogue with community representatives and special interest groups.

Such an effort will pay off in avoiding misunderstandings, correcting misinformation, spiking false rumors and in cooperative efforts to deal with the many problems that are ahead for the North and South Kohala region.

In the Field of Public Human Services

Here is a challenge which can make a vast difference in the adverse social impact that a community feels when there is a lag in the County and State governments' provision of the public services necessary to reduce that very impact. Unless sufficient pressure is brought to bear on elected and appointed officials and on hired civil servants well in advance of anticipated needs, the people of North and South Kohala will suffer in proportion to the rate and size of the population increase generated by the resort developments in the area. This can mean reduced levels of the following:

1. Public school education.
2. Public health services, emergency, out-patient and acute medical and hospital care.
3. Police protection.
4. Fire protection.
5. Public housing.
6. Vocational manpower training.
7. Employment services.
8. Social services (family and child welfare, services to the elderly, probation services, day care, etc.).
9. Parks and recreation.
10. Civil defense.

This challenge can be met by the joint efforts of the Community Associations of Waimea-Kawaihae, Puako and North Kohala, the developers (or their representatives) and officials of the State and County governments. The lengthy process required to obtain an increase in government human services because of the politics and bureaucracy involved, requires far-sighted planning and strategy on the part of the community. If there is to be an effective reduction of the pending adverse impact, early steps should be initiated by one or more of the above groups.

NORTH AND SOUTH KOHALA RESIDENTS' KNOWLEDGE AND OPINIONS REGARDING RESORT DEVELOPMENTS IN SOUTH KOHALA

During the period October 6 to 8, 1979, 1,355 persons were surveyed on the Island of Hawaii. Of these, 325 were in the North and South Kohala Districts. Following are excerpts from the findings of this survey. They have a confidence level of approximately 95 percent.

A. 93% knew about the Mauna Kea Beach Hotel.

B. 92% knew about the Waikoloa resort development.

C. 71% knew about the Mauna Loa Land resort development.

D. 43% knew about the Mauna Kea Land Corporation resort development.

E. 80% felt that the resort developments proposed for South Kohala were acceptable, good or excellent.

F. 59% felt that the biggest advantage of such developments was the jobs that would be created.

G. 48% selected the hotel/visitor industry as offering the most encouragement of young people to remain in the area. Second choice was agriculture with 13%.

H. 52% expressed interest in employment resulting from one of the South Kohala resort developments.

I. 65% felt that the government and private developers are not providing adequate public access to the beaches.

J. Over-population/transients was viewed as the greatest disadvantage.

Source: Public Affairs Advisory Services, Inc., Honolulu.

DESCRIPTION OF AND IMPACT ON LANDFORM, GEOLOGY, AND SOILS

The brevity of this section of the EIS reflects the relatively insignificant effect that the Lalamilo Water System would have on landform, geology, and soils. This judgment applies both to the direct impact that construction and operation of the system would bring about and to the secondary effect of urban development made possible by construction of the water system.

Landform

The corridor of the water system runs from elevation 1,200 feet in Lalamilo straight down slope to Queen Ka'ahumanu Highway. Except for localized irregularities, the ground slope along this corridor is between six and seven percent. It is not interrupted by the intrusive vents and cones which are present both inland and to the south of this route, nor is it distinguished by substantial erosional features. The corridor does cross two intermittent storm runoff waterways, one which is ultimately tributary to Hapuna Bay and the other to Wailea Bay. In both cases, the topographic expression of these waterways is quite modest, a matter of several feet in depth and about 20 feet in width.

Landform of the coastal region which the water system would serve primarily features a series of small bays set in a youthful and uneroded shoreline. Kauna'oa and Hapuna bays have substantial beach sand deposits which show significant seasonal fluctuation. The rest of the shoreline, including other bays, is either rocky or has a thin veneer of beach sand overlying rocks.

Geology

The entire Lalamilo Water System corridor, as well as most of the coastal region the water system would serve, consists of lava flows from Mauna Kea volcano. Stearns and MacDonald (1946) group lava flows of Mauna Kea into two volcanic series, an older Hamakua series and a more recent Laupahoehoe series. All of the Lalamilo Water System corridor and the entire coast from Kawaihae to Puako are older, Hamakua series lavas. As far as is known from surface evidence, from geophysical prospecting as reported in Adams, et al. (1969), and from initial well exploration (Well No. 5946-01, Lalamilo "A"), these Hamakua lava flows are layered continuously at depth to at least some distance below sea level. This rather simplified picture of geologic structure is in contrast to findings at Waikoloa a little more than two miles to the south (Stearns, 1972 and Bowles, 1972), and in fact may ultimately be disproved as more wells are drilled in the region. The existence of a more complicated geologic situation would, of course, be important to regional groundwater development. However, present knowledge is still rooted within the framework of continuous lava flows uninterrupted by intrusive structures or extended periods of weathering.

Toward the two extremes of the coastal region the Lalamilo Water System would serve, Kawaihae to the north and Puako to the south, the lavas came from different volcanoes. The Kawaihae area was built by lava from Kohala mountain, primarily by lavas of that volcano's more recent, Pololu volcanic series. The boundary between Kohala lava on the north and Mauna Kea lavas to the south is distinguished by abrupt changes in land slope. In general, the Waimea-Kawaihae Road runs along or quite near to this boundary.

Lavas at the southern end of the service area of the Lalamilo Water System are from Mauna Loa. These flows traveled a long distance from the northwest flank of Mauna Loa, through the saddle area, and then on to the shoreline. In general these lavas overlie older Mauna Kea lavas, in some cases leaving intrusive cones of Mauna Kea projecting up through the Mauna Loa flows. The Mauna Loa lavas are primarily distinguished from Mauna Kea lavas by their youthful, unweathered appearance. The boundary between these two is at Makaiwa Bay within the Mauna Loa Land, Inc. resort site. It is marked by an escarpment of about 15 to 20 feet and an abrupt transition from partially weathered pahoehoe supporting some weeds and kiawe trees to a complete unweathered, fresh-appearing a'a flow.

Soils

Classification of the soil by the U.S. Soil Conservation Service (SCS) along the entire Lalamilo Water System corridor is "Kawaihae extremely stony very fine sandy loam" (Sato, et al., 1973). This dark reddish brown soil is of variable thickness, typically from several inches to about three feet, and it overlies bedrock pahoehoe. Outcrops of the bedrock are common. According to the SCS, the soil has only a moderate erosion hazard. During dry and windy weather, however, substantial amounts of it are moved around by wind.

Soil elsewhere within the coastal region that the water system would serve is variable. The Kawaihae sandy loam is the dominant soil type for the area from Puako Bay to Kawaihae. From Puako to Pauoa Bay, the dominant soil type, by the SCS designation, is "Kamakoa very fine sandy loam." This soil is the alluvial deposits of Kamakoa and Auwaiakeakua gulches and it covers much of the flat land area between Puako Beach Road and Queen Ka'ahumanu Highway. In some locations, it is as much as eight to ten feet thick. To the south of Pauoa Bay, which is south of the alluvial plain, there is virtually no soil.

Impacts on Landform, Geology, and Soils

The direct impact of constructing and operating the Lalamilo Water System on landform, geology, and soils would not be significant. Well sites require only a modest amount of grading to construct a concrete slab. Reservoir sites have been chosen for their relatively flat topography and thus would require only a modest amount of grading. It is anticipated that most, if not all, trenching for the various pipelines would be accomplished by ripping. For all of these improvements, the principal impacts will be the noise and dust created during the construction phase, a period of about 14 months. Following the County's grading ordinances would provide adequate protection, particularly in view of the completely isolated location of most of the construction.

In terms of scale, the secondary impact of urban development made possible by the Lalamilo Water System would be substantially greater than construction of the water system itself. This urban development would include numerous hotel and condominium sites, several new golf courses, and roads and utilities within the area's two major resort sites, Mauna Kea Land Corporation and Mauna Loa Land, Inc. Each project would involve some grading and, quite possibly, the importation of a signficant amount of soil. Of the entire coastal region, only the Mauna Loa Land, Inc. resort site, with its extensive alluvial soil deposit in Puako flats, has sufficient soil to carry out an intensive landscaping program characteristic of resort developments.

At this point in the region's development, when planning of most of the resorts' areas has not progressed past land use concepts, there is little point in discussing land form, geology, and soil impacts beyond the following few generalizations. First, grading is very likely to be kept to a minimum because of its cost. Since the soil cover is extremely thin almost everywhere along the coast except at Puako Flats, bedrock lava would be encountered in any deep excavation. Second, importation of soil from wherever it can most inexpensively be obtained, probably in Waimea or North Kona, is likely to be a part of most development projects. Third, the most obvious change in landform will come not from excavation or earth moving, but from the structures which will be built upon the land. The impact of this is largely visual, and it is dealt with specifically in another part of this EIS.

DESCRIPTION OF AND IMPACT ON WATER RESOURCES

Introduction

The discussion of the project's probable impact on South Kohala water resources consists of four parts. The first part is a brief description of the occurrence of ground and surface water in the South Kohala district. The second discusses the chronology of water development in the district by government and private interests over the last 20 years. The third part is largely technical, describing in as quantitative terms as is realistic what effect the proposed water system would have on the groundwater body in Lalamilo that it would tap. The final part summarizes what use of groundwater from Lalamilo would mean from a South Kohala, district-wide perspective of water resource development and allocation.

Occurrence of Water Resources in South Kohala

If only known resources are included in the discussion of the natural occurrence of water in South Kohala, then there are just three areas to consider: surface water of streams on the slopes of the Kohala mountain above Waimea town; fresh groundwater (defined as water with a Cl ion content less than 250 ppm) located beneath the South Kohala plain and between three and five miles in from the shoreline; and brackish groundwater (defined as water with Cl ion greater than 250 ppm but still suitable for irrigation purposes) located beneath the South Kohala coastal area from about one-half to two miles in from the shoreline. The existence and location of other water resources of significance in the region can only be speculated upon, but one such possibility deserves to be noted. It does seem likely, though it has never been actually proven, that fresh groundwater exists below Waimea town; it may also be present in the Kohala mountain, possibly extending along the saddle between Kohala mountain and Mauna Kea.

Knowledge of the extent and potential yield of South Kohala's water resource areas is variable. Surface water above Waimea town has been developed, used, and gauged for a number of years, and through this experience, the potential of this resource is well established. Both groundwater areas on the South Kohala plain, the inland fresh water and the coastal brackish water, are not understood as well. Among the reasons for this, the most important are that data are limited to the few existing wells and that pumpage from these wells has been insufficient to accurately define either the flux of groundwater or the control of groundwater movement by subsurface geology. At this point in water resource development, the potentials of South Kohala's two known groundwater resource areas can only be approximated.

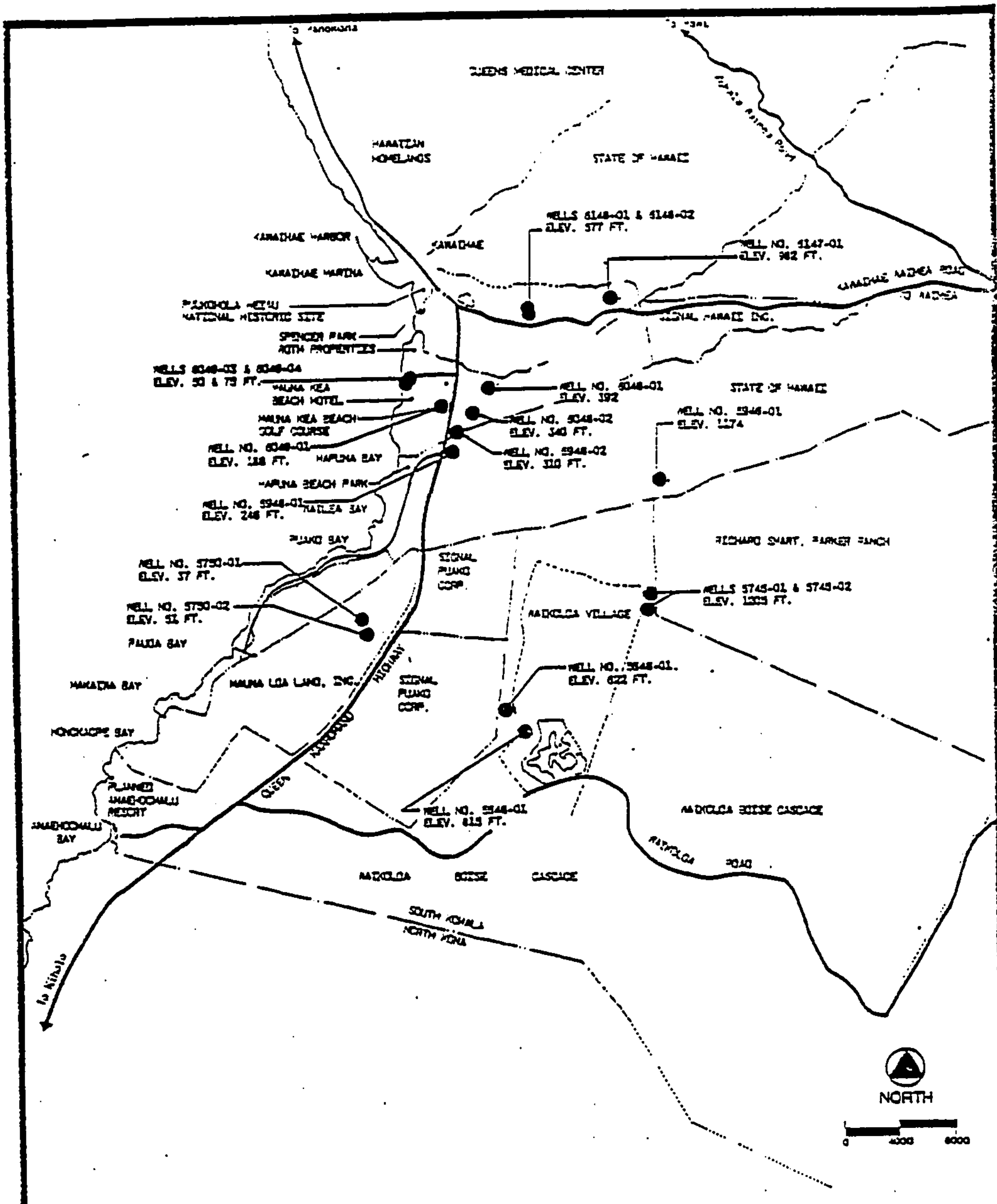
Chronologic Development of South Kohala Water Resources Since 1960

Prior to 1960, development of water resources in South Kohala was limited to three systems all within the Kohala watershed: (i) the County DWS' potable system which diverted water from Waikoloa and Hauani streams and delivered it via pipeline to Waimea town and to Kawaihae and Puako some ten miles away; (ii) the diverse system of high-level stream intakes and overland pipelines developed by Parker Ranch to irrigate range lands on the slopes of Kohala and Mauna Kea; and (iii) the Upper Hamakua Ditch system, a series of ditches, flumes, and tunnels which captured water of Kawai Nui, Kawai Iki, and Alakahi streams for both potable and irrigation uses. In 1960, the County's Waimea system delivered an average of 0.33 MGD to users, about three-quarters of which was consumed in the Waimea town area and the balance in Kawaihae-Puako. (DOWALD, 1965:24.) Records of flow diverted to the Parker Ranch system have not been researched for this EIS, but the amount was then and is today a relatively minor portion of the total surface water resource. The Upper Hamakua Ditch system supplied about 0.15 MGD to the County DWS for treatment and delivery to users in Ahualoa-Honoka'a-Kalopa (DOWALD, 1965:25) and an unknown (to the writers of this EIS) amount to farms in Waimea.

The first major South Kohala water development project in the period since 1960 was completion by the State of the Lalamilo Irrigation System. The system utilizes the Upper Hamakua Ditch as a source of supply in conjunction with a 60-million-gallon storage reservoir. Through a 4.5-million-gallon distribution reservoir and associated pipelines, this system provides irrigation water primarily for the State's farm lot subdivision in Lalamilo to the southwest of Waimea town. It commenced operation with the opening of that subdivision in 1961. In its early years, a portion of its water was delivered to the County DWS for the above-mentioned Ahualoa-Honoka'a-Kalopa area. However, the County's Waimea system now supplies that area, and this has left the Upper Hamakua Ditch exclusively for irrigation supply.

The next significant water development event was an exploratory well drilling program undertaken from 1961 to 1963 by the State in the South Kohala coastal region. Until this program, development of South Kohala groundwater amounted only to a few dug wells and a horizontal shaft (Well No. 5750-01 by the USGS numbering system), the latter producing brackish stockwater for Parker Ranch in Puako. During the State's exploration program, three wells were completed (Well Nos. 6048-01, 6147-01, and 6148-01; see DOWALD 1961, 1961a, and 1963). All yielded brackish water suitable for golf course or farm irrigation, but not suitable for human consumption unless mixed with a fresher water supply. Despite the failure to obtain potable water, however, the exploration program did open up uses of the brackish groundwater to be found beneath the South Kohala coastal region. Irrigation wells were drilled for the Mauna Kea Beach Hotel and Waikoloa golf courses (Well Nos. 6048-02, 6049-01, and 5548-01), and to mix with fresh water supply for domestic use (Well Nos. 6148-01 and 6148-02). Figure III-1 shows the location of water wells in the South Kohala coastal area, and Table III-28 provides specific data for each well.

Based on results of wells drilled in the early and mid-1960s, the State concluded that a potable groundwater supply beneath the South Kohala coastal region could not be developed at a reasonable depth. Anticipating substantial growth in this region, particularly major destination resorts along the coastline, the State undertook studies to determine if the future water demand could be met by other means (Division of Water and Land Development 1963a, 1963b and 1963c). This led to the creation of an incremental development plan to expand use of surface water resources of the Kohala watershed above Waimea town (DOWALD, 1965). The plan featured diversion of Waikoloa and Kohakohau streams and construction of two 50-million-gallon storage reservoirs. This development plan was carried out in three construction increments from 1969 to 1975, and it increased the supply capability of the County DWS' Waimea system from 1.38 MGD in the late 1960s to 3.48 MGD in 1975. The 3.48 MGD figure remains the capacity of the system today.



LOCATIONS OF WATER WELLS IN THE SOUTH KOHALA COASTAL AREA

Figure III-1

Table III-28. Data of wells in the South Kohala coastal region from Kawaihae to Honoka'ope Bay.[1]

USGS Well No.	Identifying Name (If Any)	Year Installed	Ground Elevation (feet)	Bottom of Well Elevation (feet)	Elevation of Still Water Level (ft. msl)	Representative Chloride Content (mg/l)	Original Purpose	Present Use	Present Year-Round Average Pumpage (MGD)
5548-01	Parker 1	1968	815	- 34	6.1	430 to 560	exploratory	irrigation	0.7±
5648-01	Parker 2	1968	622	- 31	5.1	38	exploratory	unused	none
5745-01	Parker 5	1969	1,207	- 20	16.0	25 to 30	domestic	domestic	0.2±
5745-02	Parker 4	1969	1,208	- 24	16.0	25 to 30	domestic	domestic	0.2±
5750-01	Parker Shaft	1961	37	- 2	2.8	600 to 700	irrigation	irrigation	1.2[2]
5750-02	--	unknown	51	- 4	2 to 3	600 to 700	irrigation	unused	none
5849-01	--	unknown	40±	- 4	2 to 3	unknown	irrigation	unused	none
5946-01	Lalamilo "A"	1977	1,174	-116	8.0	78	exploratory	unused[3]	none
5946-02	--	drilling in progress	1,008	--	--	--	exploratory	--	--
5948-01	Hapuna	1970	246	- 24	2.6	410 to 440	irrigation	irrigation	0.05±
6048-01	Kawaihae 15	1961	392	- 37	3 to 5	500 to 550	exploratory	unused	none
6048-02	MKBH 1	1964	340	- 40	4.7	600 to 750	irrigation	irrigation	0.4
6049-01	MKBH 2	1964	188	- 30	4.7	600 to 750	irrigation	irrigation	0.4
6049-02	MKBH 3	1967	50±	- 40	unknown	1,750	air conditioning	air conditioning	2.0±
6049-03	MKBH 4	1969	50±	- 40	unknown	1,850	air conditioning	air conditioning	2.0±
6049-04	--	1972	75	- 60	unknown	unknown	sewage disposal	sewage disposal	0.15[5]
6147-01	Kawaihae 16	1963	982	- 58	4.6 to 5.2	180 to 260[4]	exploratory	unused	none
6148-01	Kawaihae 14	1961	579	- 41	3.3	350	exploratory	domestic	0.15
6148-02	Kawaihae 14B	1969	575	unknown	unknown	350	domestic	domestic	0.15

1 Primary source of this data is the files of the USGS. This has been augmented by data in Belt, Collins and Associates's files and field investigation.

2 This well, which includes a horizontal shaft, is currently being outfitted to irrigate the MLLI resort golf course. The pumpage rate shown here is the anticipated, rather than present, rate.

3 This high elevation well in Lalamilo will be outfitted with a one-MGD pump and incorporated into the County's domestic water system.

4 Chloride content for the initial pump test was 220 to 260 mg/l. The bottom portion of the well was backfilled with gravel and a concrete plug, which improved the quality of pumped water somewhat.

5 This flow rate is injected into rather than withdrawn from the well.

Source: Compiled by Belt, Collins & Associates as noted in footnote 1 above.

By the late 1960s, DOWALD recognized that the proposed improvements of its 1965 development plan would not be sufficient to supply the long-term growth envisioned for the district. Accordingly, it commissioned a feasibility study and subsequent EIS of a much larger-scale project, a 1.8-billion-gallon dam and reservoir on Kohakohau Stream above Waimea town (Parsons Brinckerhoff-Hirota Associates, 1970 and 1975). The feasibility study suggested construction of the dam in two phases, the first to cost $6.0 million (1969 prices) and yield five MGD and the second to cost $9.5 million (also 1969 prices) and boost the yield to ten MGD. This proposal has run into opposition from Waimea residents through the EIS process, and at the present time it is not being actively pursued by DOWALD.

In 1968, coincident with the State's feasibility study of a dam above Waimea, Boise Cascade independently undertook its own groundwater exploration program at Waikoloa. It began with the drilling of a small-diameter hole near the coastline (Well No. 5648-01), and proceeded to other holes drilled further inland (John D. Fetts and Associates, 1969). On the third exploratory hole, which was located more than five miles in from the shoreline and at ground elevation 1,200 feet (Well No. 5745-01), a landmark discovery of potable groundwater was made. The water's exceptional quality and relatively high level in the well both demonstrated the existence of a thick body of fresh groundwater. Two groundwater consultants also commented in manuscript reports to Boise Cascade that the quality and level of the groundwater suggest that a major hydraulic discontinuity exists between this well and those closer to the shoreline (Stearns, 1972 and Bowles, 1972). Pump testing has shown that the yield from this higher-level, better-quality groundwater is at least one million gallons per day (DOWALD, 1970), and quite likely several times this rate (Bowles, 1972).

The 1969 discovery of fresh groundwater at Waikoloa represents a pivotal point in South Kohala water development. Prior to this, the Kohala watershed was considered to be the only practical area to develop fresh water; the find of fresh groundwater at Waikoloa opened a second area of potential supply. Eight years after the Waikoloa find, the State drilled an exploratory well at 1200-foot elevation in Lalamilo and 2.4 miles north of the Waikoloa fresh water well (Well No. 5946-01, also known as Lalamilo "A"). As at Waikaloa, groundwater of potable quality was obtained. The quality of this water - approximately 80 ppm Cl ion versus 25 to 30 ppm at Waikaloa (DOWALD 1978, Swain, 1973) - and its level in the well - eight feet above sea level versus 16 feet at Waikoloa (measurements in 1979 by Ron Soroos of the USGS; Bowles, 1972) - demonstrate that significant differences do exist between the groundwater at these two well sites. Conclusions concerning these differences may be premature, particularly since the groundwater level at Waikoloa has not been measured with the accuracy of recent USGS measurements at the Lalamilo well. However, the data do suggest that the geologic feature creating the higher level and lower salt content at Waikoloa does not exist at Lalamilo. Rather, the groundwater at Lalamilo appears to be part of a regional basal lens.

The success of the State's test well in Lalamilo, in turn, has become the basis for the proposed Lalamilo Water System. Though an accurate depiction of the ultimate yield of this groundwater resource must await the installation and pumpage of more wells, the State has concluded that a major fresh water supply can be developed there utilizing a field of wells. Its conclusion is based on the pump test of Lalamilo "A" (Well No. 5946-01) and a lengthy hydrologic water budget study by the University of Hawaii Water Resources Research Center (Kanehiro and Peterson, 1977).

Impact of the Lalamilo Water System on South Kohala Groundwater

The discussion here of potential effect of the Lalamilo Water System on South Kohala groundwater will focus on the coastal region extending from Spencer Park on the north to Honoka'ope Bay on the south, a seven-mile stretch of the coast. It is within this area that all major wells for the foreseeable future are or will be located. To portray the potential effect of the Lalamilo Water System on this region, an estimate of potential future groundwater use will be compared with the best available estimates of the amount of developable groundwater.

At the present time, five wells are pumping an estimated average of 2.1 MGD from the Spencer Park to Honoka'ope Bay region (refer to Table III-29). Based on various hydrologic water budgets that will be subsequently presented, the present regional pumping rate is far less than could be sustained without adverse effect. There has been some degradation in quality experienced at the Mauna Kea Beach Hotel irrigation wells, but this appears to be a design problem of these particular wells rather than a regional overdraft phenomenon.

Growth of the region's major resorts would require a dramatic increase in total groundwater pumpage. In addition to pumpage from the proposed Lalamilo Water System's two well fields, there would be pumpage increases for brackish water irrigation of resort golf courses and substantial fresh and brackish water pumpage at Waikoloa for both Waikoloa Village (an inland residential community) and Waikoloa Beach Resort (a proposed destination resort at Anaeho'omalu Bay). Table III-30 presents an estimate of the potential regional groundwater pumpage rate. The estimate includes the present pumpage rates of existing wells (Table III-29), the approximately eight years of anticipated development growth from Kawaihae to Puako (see Tables I-3, I-4, and I-5) that would fully utilize the Lalamilo Water System, planned Waikoloa Village and Beach Resort developments to be supplied by a private water system, and brackish water irrigation of three new golf courses. It should be noted that the estimates are for average, year-round pumpage rates and not peak-season supply rates. Year-round averages are the rates which need to be compared with the safe yield of the groundwater resource; peak-season supply requirements are the basis for sizing wells, reservoirs, and pipelines, the hardware of a water system. Note in particular that the year-round pumpage from the Lalamilo Water System is expected to be about 3.55 MGD rather than its 5.3-MGD defined supply capability (see footnote 3 of Table III-30). The difference is the 1.5 peak-season to year-round average factor.

As depicted in Table III-30, total groundwater pumpage in the South Kohala region could eventually amount to 14 MGD based on planned and announced development. Approximately 25 percent of this would be pumped by the Lalamilo Water System; total potable water pumpage would be 10.0 MGD or about 70 percent of the regional withdrawal rate; and a little over four MGD or 30 percent of regional pumpage would be brackish water for irrigation. It is also worth noting that reuse of wastewater for irrigation has not been considered in these figures. If this does occur, it could reduce a large portion

Table III-29. Estimated pumpage of South Kohala groundwater, 1978.[1]

Well Identification		Water Use	Pumpage (MGD)
USGS Well No.	Owner and/or User		
6148-01	o County Department of Water Supply Brackish Mixing Wells at Kawaihae	Domestic	0.26[2]
6048-02 and 6049-01	o Mauna Kea Beach Hotel Golf Course Wells	Irrigation	0.72[3]
5948-01	o Hapuna State Park Irrigation Well	Irrigation	0.20[4]
5548-01	o Boise Cascade's Parker 1	Irrigation	0.70[5]
5745-01 and 5745-02	o Boise Cascade's Parker 4 and Parker 5	Domestic	0.20[5]
	Estimated Total Groundwater Pumpage, 1978		2.10

[1]Pumpage from several wells in the region is excluded from this estimate. In particular, the Mauna Kea Beach Hotel's air conditioning wells are too near the shoreline to be of significance to the fresh/brackish groundwater balance, and the withdrawal is returned to the ground upon passing through the air conditioning chillers. Also, Pu'u Wa'awa'a Ranch's pumpage from the State's Well No. 4953-01 in Kiholo is considered too small and too distant to be of significance.

[2]Figure is computed from published water sales data and assumed losses in transmission and mixing ratios.

[3]Figure based on monitoring by the Olohana Corporation and Published in Bowles (1978).

[4]Figure from data in USGS files, Honolulu office.

[5]Pumpage rates from Claude Jenkins of Waikoloa and USGS Records.

Source: Compiled by Belt, Collins & Associates.

Table III-30. Projected future pumpage of South Kohala groundwater[1]

Well Identification			Projected Average
USGS Well No.	Own. and/or User	Water Use	Pumpage (MGD)
6148-01	o County Department of Water Supply Mixing Wells at Kawaihae	Domestic	0.26[2]
6048-02 and 6049-01 (future)	o Mauna Kea Beach Hotel Golf Course Wells	Irrigation	0.72
	o Olohana Corporation 'Ouli Golf Course Irrigation Wells	Irrigation	0.72
5946-01 and (future)	o County Department of Water Supply High Elevation Wells of the Lalamilo Water System	Domestic	2.59
(future)	o County Department of Water Supply Mixing Wells of the Lalamilo Water System	Domestic	0.96
5948-01	o Hapuna State Park Irrigation Well	Irrigation	0.20
5750-01	o Mauna Loa Land, Inc. Irrigation Well (or Wells)	Irrigation	1.20[4]
5548-01	o Boise Cascade's Parker 1	Irrigation	0.70
5745-01 and 5745-02 and (future)	o Well Field Including Boise Cascade's Parker 4 and Parker 5	Domestic	6.20[5]
(future)	o Anaeho'omalu Resort Golf Course Wells	Irrigation	0.80
	Projected Total Groundwater Pumpage		14.00

[1] Projected pumpages in this table include all existing wells, those that are now under construction, and computed rates based on development plans of the region's three major land owner/developers: Olohana Corporation, Mauna Loa Land, Inc., and Boise Cascade. It does not include an allocation for Signal Properties, another major landholder in the region, because its development plans are not known to us. Based solely on acreage and location, it is grossly estimated that its groundwater use might ultimately be on the order of one MGD.

[2] Inclusion of DWS' Kawaihae mixing well assumes that some treated surface water from Waimea will continue to supply a portion of the potable water needs along the South Kohala coast.

[3] The figures for the Lalamilo Water System well fields--2.59 MGD for the high elevation wells and 0.96 MGD for the brackish wells--are expected year-round average pumping rates when the system is fully utilized. They are computed by dividing the peak season, maximum supply capability of 5.32 MGD by 1.5, and then allocating 73 percent to the high elevation wells and 27 percent to the brackish wells.

[4] Mauna Loa Land, Inc.'s first irrigation well will be the existing horizontal shaft in Puako. If it is incapable of supplying the 1.2 MGD irrigation water needs of the golf course and roadway landscaping on a long-term basis, a second well will be drilled somewhere to the south of the shaft.

[5] The estimate of pumpage from the Boise Cascade's high elevation well field is computed from the latest (1978) development plans for its entire 31,000-acre parcel. The timeframe for this development is not specified, but it will obviously take far longer than the next ten years to be fully achieved.

Source: Compiled by Belt, Collins & Associates.

of the brackish water pumpage rate since reuse would undoubtedly be for golf course irrigation.

Now that an estimate of 14 MGD potential future groundwater pumpage has been presented, it must be compared to estimates of the natural regional groundwater flux (flow) to determine if such pumpage would be feasible. A number of estimates of the regional groundwater flux have been made: Cox, et al. (1969:11-12); Bowles (1974:1-9); Kay, et al. (1977:26-29); and Kanehiro and Peterson (1977). While these estimates vary significantly in sophistication and detail, they share a common denominator: the use of a data base which is quite fragmentary. Geologic structures which influence and/or control groundwater flow are unknown or not well understood; there are only a few rain gauges over a vast area; there are no evapotranspiration data; surface runoff, albeit a relatively minor amount of the water budget, is not gauged; and data from wells and pump tests do not allow an accurate calculation of groundwater flux by purely hydraulic techniques. In view of this situation, the creation of still another groundwater flow computation for this EIS is not warranted. Rather, for the purposes of this EIS, previous computations will be compared with the 14 MGD estimate of future regional pumpage.

Table III-31 summarizes the computations of groundwater flow in the references cited above. These suggest that, to at least an order of magnitude accuracy, the groundwater flow is probably somewhere between three and six MGD per mile of coast. The weight of these analytical efforts seems to say that it is probably not outside of this range.

Table III-32 compares the techniques and results of the two groundwater flux computations judged by the writers of this EIS to be most credible, those of Bowles (1974) and Kanehiro and Peterson (1977). It is hoped that this table will serve two functions. The first is to illustrate how varied and inherently judgmental the two approaches are, and hence, how inevitably imprecise their resulting figures are. The second function the table might serve is to discourage the use of a single figure to characterize the amount of groundwater flow. It will take many more wells and years of pumping at higher rates than at present before the estimated three to six MGD per coastal mile for the groundwater flux can be refined.

The three to six MGD per coastal mile for the seven miles from Spencer Park to Honoka'ope Bay amounts to about 20 to 40 MGD total regional groundwater flux. What does this range suggest when compared to the 14 MGD estimate of potential groundwater pumpage? The first point to bring out in answering this is that not all groundwater flow can be developed without serious sea water intrusion and salting of coastal irrigation wells. As with other aspects of groundwater calculations, it is not known precisely what portion of the total flow can be safely developed. However, the figure of 75 percent is repeatedly used by hydrologists locally and will be employed again here. That means that of the 20 to 40 MGD total groundwater flow, perhaps 15 to 30 MGD might be developable. On a regional basis and using this criterion, then, it appears that the foreseeable pumpage could probably be realized. However, if individual wells are poorly located or overpumped, local problems still could occur.

Perhaps a more instructive way to examine the question of groundwater flow versus potential pumpage, however, is from the perspective of the way

Table III-31. Comparative estimates of groundwater flow in the South Kohala region.

Investigator	Analytical Technique	Probable or "Best" Estimate of Groundwater Flow (MGD/Mile)	Range of Estimate of Groundwater Flow (MGD/Mile)
D.C. Cox in Cox, et al. (1969)	Water budget.	Less than 7	None given
Stephen P. Bowles in Bowles (1974)	Water budget.	3.0	2 to 4
A number of individuals at the University of Hawaii and reported by L. Stephen Lau in Kay, et al. (1977)	Water budget with watershed as a single unit.	3.2	None given
	Water budget for six sub-watersheds.	5.0	None given
	Method 1 hydraulic flux.	5.1	2.6 to 5.3
	Method 2 hydraulic flux.	5.4	2.6 to 8.0
Brian Kanehiro in Kanehiro and Peterson (1977) budget.	Computer-aided water	6.4	3.2 to 11.8

Source: Compiled by Belt, Collins & Associates.

Table III-32. Comparative water budget techniques and results of Bowles (1974) and Kanehiro and Peterson (1977)[1]

Hydrologic Technique on Parameter	Bowles (1974)	Kanehiro and Peterson (1977)
o Groundwater area	o Defined on the north by Honokoa Gulch and the Waimea-Kohala Road, on the east by Mamalohoa Highway, on the south approximately by the Auwaiakekua Gulch, and the west by the shoreline; total area is 52 square miles and it includes eight miles of coastline.	o Defined by the topographic divide from Kiholo Bay, to the top of Hualalai, to the peak of Mauna Loa, across the saddle to the peak of Mauna Kea, down the flanks of Mauna Kea to the shore of Kawaihae Bay; total area is 711 square miles and it includes 16.3 miles of coastline.
o Inflow from beyond the groundwater area, either as surface or subsurface flow	o Both surface and subsurface inflow computed or assumed: as surface flow sources, 6.5 MGD from Kohakohau and 3.0 MGD from Waikoloa Streams of the Kohala Mountain, and 2.0 MGD from the several gulches on the flanks of Mauna Kea (all but 0.2 MGD assumed to percolate into the ground rather than be lost as surface flow to the ocean); as groundwater inflow, ten MGD from both the Kohala and Mauna Kea areas.	o None, included, under the assumptions that the aquifer is phreatic and that geologic boundries do not significantly invalidate groundwater movement under phreatic conditions.
o Method for computing groundwater recharge by rainfall	o Estimated as 50 percent of the rainfall for November, December, and January, with no rainfall recharge for the remainder of the year; total amounts to just under 0.17 MGD per square mile on a year-round average.	o Day by day computation for several years of complete record of rainfall, evapotranspiration loss, and water storage in the soil, leading to a daily net amount of deep percolation (computations both in time and space were done with the aid of a computer); total rainfall recharge amounts to just under 0.15 MGD per square mile on a year-round average.
o Resulting computed recharge	o Estimated at between 22 and 30 MGD on a year-round average over the 52-square-mile area or, equivalently, about 2.7 to 3.7 MGD per coastal mile.[2]	o Estimated at 104 MGD on a year-round average for the 711-square-mile area, or equivalently, 6.4 MGD per coastal mile (a range for this estimate was also given: a minimum of 3.2 MGD per coastal mile to a maximum of 11.8 MGD per coastal mile).
o Comments	o Approximately 30 percent of this region's; total groundwater flow is estimated to come from rainfall on the region itself; the balance comes from surface runoff into the area (37 percent) and groundwater underflow (33 percent).	o By assuming a phreatic groundwater body coincident with the topographic boundary of the watershed, all groundwater recharge comes from rainfall directly on the area.

1 The regions of the two water budgets overlap considerably but they are far from identical. The implication of this difference is discussed in the text.

2 The figures given in Bowles (1974) are somewhat less than this by the amount of surface inflow provided by Kohakohau Stream. At the time S.P. Bowles did his study, it was thought that the Kohakohau Dam would be built above Waimea, thus cutting off the stream's flow toward the South Kohala coastal area. If the dam is eventually built, then the recharge might be reduced from two to three MGD per mile of coastline.

Source: Compiled by Belt, Collins & Associates.

in which the groundwater would actually be developed. The numbers developed herein do suggest that significantly more than the 2.0-MGD supply capacity of the first construction increment of the Lalamilo Water System can be safely obtained. Expansion of the system beyond this first increment would occur in response to impending demand. For each such expansion, designers will evaluate again whether or not the increase in pumpage should be undertaken, and at that time they would have more information on which to base their choice. When and if it appears that the safe yield of the groundwater body is being approached, then either another water supply would have to be sought or development growth in the coastal region would have to stop.

Within the context of knowledge of the extent of the resource, its potential future use to supply planned development, and the incremental steps in which the resource would be tapped, two summary conclusions concerning the Lalamilo Water System can be made. The first is that there is a high probability that use of all of the 2.0-MGD capacity of the system's first increment, together with expansion of brackish water pumpage and Waikoloa fresh water pumpage, could be achieved without adverse effect on the region's groundwater. The second conclusion is that it would appear, using today's best estimates, that the entire 5.3-MGD capacity of the Lalamilo Water System, along with other regional groundwater use, could also be developed without adverse effect. The second conclusion is clearly more tentative than the first. It also implies that the choices of well locations and pumping rates need to be coordinated on a regional scale to avoid localized overdraft problems.

South Kohala District-Wide Water Resource Development and Allocation

In the preceding subsection, the potential effect of the proposed Lalamilo Water System on South Kohala groundwater was assessed. In this subsection, a broader view of South Kohala district-wide resources will be taken, including both surface and groundwater. It has been shown that over the past 20 years there has been an increasing need for water in the district for domestic and irrigation use. There have been two areas of water demand, inland at high elevation (Waimea to Pu'ukapu) and along the coastline (Kawaihae to Puako). Both the State and County have undertaken a number of water development projects to meet the increasing water demand, primarily projects which have made more extensive use of surface water of the Kohala watershed. Private involvement in water development in the past 20 years has been mainly in the coastal region. It has included installation of a number of brackish irrigation wells and construction of the Waikoloa water system supplied by deep wells at 1200-foot elevation and five miles in from the shoreline.

Based primarily on planned resort development at the coast, water use in the South Kohala district is expected to increase much more rapidly than the five to seven percent annual rate of increase that has occurred over the past ten years. In order for this to take place, however, new supply capability must be developed. None of the district's major water systems are capable of absorbing the anticipated future demand. If Parker Ranch's irrigation system is eliminated outright from consideration, the limitations of the district's three other major water systems are as follows:

- The State's Lalamilo Irrigation System was built and is reserved for agricultural use. Its capacity could be increased somewhat by improvements to the Upper Hamakua Ditch and additional storage, but both its size and intended use eliminate it from consideration to meet projected domestic water needs.

- The capacity of the private Waikoloa system could be expanded with the installation of new wells. However, the ultimate yield of the Waikoloa groundwater which it taps is thought to be about equivalent to the water needs of that owner's development plans. So while this system is an important part of regional water resource development, its use is committed to the Waikoloa area and a single, major landowner.

- The County DWS' Waimea system has a present surplus capacity of about one MGD, but because of *limited transmission* capacity of the pipeline to the coast, the surplus could not be used in the Kawaihae to Puako coastal region. Further, projected domestic water needs for the district far exceed the current one-MGD excess now available only in Waimea.

Alternative ways to meet projected water demand have been evaluated in detail. In addition to the proposed Lalamilo Water System, these have included: pumping water up to Waimea from Waipio Valley (U.S. Army Engineer District, Honolulu, 1974); brackish and sea water desalinization at the coast (Duncan and Garrick, 1974); and building a major dam on Kohakohau Stream above Waimea town (Parsons Brinckerhoff-Hirota Associates, 1970 and 1975). The investigations of pumping from Waipio and desalinization at the coast concluded that these would be uneconomical, and neither has been pursued further. From an economic standpoint, then, Kohakohau dam and the Lalamilo Water System are the most promising alternatives to meet anticipated future water needs of the district.

Specific cost comparisons of these two alternatives are deferred to the "Alternatives to the Proposed Action" chapter of this EIS. However, significant differences with regard to resource allocation, operational flexibility, and project acceptability need to be pointed out here. To begin with, the immediate need for new water supply is in the coastal region and not in Waimea. It is, therefore, a simpler and more direct approach to develop the resource closest to the area it is needed. Lalamilo groundwater is approximately 3.5 miles away from potential consumers at the coast whereas the Kohakohau dam would be more than ten miles away.

The second point to raise, again with regard to the magnitude of the project, is that a well field can be constructed incrementally and with little disturbance to the natural environment. This contrasts sharply with a dam project as large as that proposed for Kohakohau Stream; such a project would involve substantially greater disturbance during construction and result in permanent alteration of the riverine environment downstream. Judging from the responses to the EIS for Kohakohau dam, this was a significant objection to the project.

The third point to raise in distinguishing between the source alternatives is in regard to the electrical energy requirements for operation. While the dam would be far more expensive to build initially, it could be operated using much less energy, essentially only that required to treat its stored water prior to gravity distribution to users. Based on current treatment experience of the County DWS Waimea treatment plant, it would amount to approximately 0.1 kw-hour per 1,000 gallons (Bill Sewake, County DWS, personal communication). By contrast, pumping groundwater from deep wells of the Lalamilo Water System would require approximately 5.0 kw-hour per 1,000 gallons, 50 times more energy than Waimea surface water (calculated with pumping efficiency assumed to be 75 percent).

Finally, it should be pointed out that creating the Lalamilo Water System prior to Kohakohau dam or other source development on the Kohala watershed would leave greater flexibility for the future. The Lalamilo Water System, it has been shown in the first chapter of this EIS, would serve anticipated growth in the Kawaihae to Puako region for about the next eight years. This would leave the current one-MGD surplus capacity of the County DWS' system to handle only increasing water use in the Waimea area. If use in the Waimea area continues to increase at about the same rate that has prevailed for the last ten years, then the one-MGD surplus capacity should suffice for about the next ten years (based on a seven percent annual increase of the 0.6 to 0.7 MGD current average water sales and accounting for the peak season and unmetered losses). In other words, construction of the Lalamilo Water System would allow further source development in Waimea to be postponed to about the time when further source development for the coastal region is also needed. At that point, some eight to ten years hence according to development plans, knowledge of water resources would be greater, and this would enable decisions on further source development to be made on a firmer basis.

DESCRIPTION OF AND IMPACT ON THE BIOLOGICAL ENVIRONMENT

The construction and operation of the Lalamilo Water System would have only minimal and temporary direct impacts upon the biological environment. The system of wells, pipelines, storage and mixing tanks, breaker stations, and service roads would be located within a narrow corridor on vacant public lands above Hapuna Bay (between 1200-foot elevation and Queen Ka'ahumanu Highway). The system corridor is situated entirely on open scrub grassland. The soil and vegetation disturbed by the construction activities within this corridor would be replaced after the project's completion. The birds and mammals present in this area would not be significantly affected. The composition of faunal species along the Lalamilo Water System corridor is similar to that found along the open scrub grasslands below Queen Ka'ahumanu Highway (Bruner, 1979). This fauna is described in the discussion which follows. The temporary construction period disturbance of the narrow strip of land would affect such a small proportion of this extensive habitat, that the impacts would be minimal. This chapter, therefore, addresses only the long-term impacts which we expect will be generated by the developments made possible by the Water System.

Fauna

A general survey of the coastal area below Queen Ka'ahumanu Highway was conducted to determine the composition of its avifaunal and mammal population. (Bruner, 1979) Based on this survey and on the review of pertinent literature (Berger, 1972; Mull-Elapaio, 1978; Shallenberger, 1977; Tomich, 1979), the probable effects of the contemplated coastal development upon the fauna have been determined. The specific survey was conducted only on those properties which are most likely to be developed soon after the implementation of the Lalamilo Water System (specifically, on the Mauna Kea Land Corporation and Mauna Loa Land, Inc. lands). It can be said, however, that because of similar climatic and physical conditions all along the South Kohala Coast, this survey is a good representation of the conditions along the entire coastline.

Birds

No rare or endangered species of birds are known to be present within the Lalamilo Water System service area. The complete listing of birds which are known to be present in this region is presented in Table III-33. This table also indicates their relative abundance and general habitat preference. The coastal survey recorded a total of twelve exotic bird species. Of special interest were the sightings of a Saffron Finch (*Sicalis flaveola*) and Warbling Silverbill (*Lonchura malabarica*), both having been introduced to the Big Island fairly recently. Only two game bird species, Gray Francolin (*Francolinus pondicerianus*) and Black Francolin (*Francolinus francolinus*) were observed during Bruner's recent survey, but the literature (Mull-Elepaio, Vol. 38, No. 7, January 1978) notes several other potential species for this area. The most likely of these species are Erckel's Francolin (*Francolinus erckelii*), Japanese Quail (*Coturnix coturnix*), and Ring-necked Pheasant (*Phasianus colchius*). A previous study conducted by Bruner in Mahukona, Hawaii (on properties with similar habitat to the South Kohala coastline) recorded all three of the above-mentioned species.

Table III-33. Relative abundance and habitat preference of birds along the South Kohala Coast from Puako to Kawaihae.

COMMON NAME	SCIENTIFIC NAME	*HABITAT	ABUNDANCE
A. EXOTIC SPECIES			
Gray Francolin	*Francolinus pondicerianus*	G, K, E	C
Black Francolin	*Francolinus francolinus*	E	U
Barred Dove	*Geopelia striata*	K, E, G, H	A
Spotted Dove	*Streptopelia chinensis*	K, E, G, H	U
Mockingbird	*Mimus polyglottos*	K, H, E	U
Common Myna	*Acridotheres tristis*	H, K, E	C
Japanese White-eye	*Zosterops japonica*	H, K, E, G	C
Cardinal	*Cardinalis cardinalis*	K, H	U
House Sparrow	*Passer domesticus*	H, E	U
Warbling Silverbill	*Lonchura malabarica*	K, G, E, H	C
Saffron Finch	*Sicalis flaveola*	H, E, G	U
Spotted Munia	*Lonchura punctulata*	G, E, K	U
B. MIGRATORY SPECIES			
Wandering Tattler	*Heteroscelus incanus*	S	C
Ruddy Turnstone	*Arenaria interpres*	S	C
Golden Plover	*Pluvialis dominica*	L, H, S	A
Bristle-thighed Curlew	*Numenius tahitiensis*	S	U
C. INDIGENOUS (NATIVE) SPECIES			
Night Heron	*Nycticorax nycticorax*	P	U

*Key to the table

Habitat - Area most frequented. Order of most preferred or utilized begins at left.

G = Grassland
K = Kiawe thickets
H = Housing areas (man-made structures)
E = Edge of road
L = Man-landscaped areas, such as golf courses.
S = Shoreline
P = Inland water areas (ponds)

Abundance

A = Abundant
C = Common
U = Uncommon

Source: Bruner (1979).

Three migratory shorebird species, Wandering Tattler (Heteroscelus incanus), Ruddy Turnstone (Arenaria interpres), and Golden Plover (Pluvialis dominica), appear to be quite common in this area. The latter of these species is especially numerous, and is usually seen on and around the existing Mauna Kea Beach Hotel golf course. Though none were observed during Bruner's recent survey, it would be reasonable to assume that the ponds on the Mauna Loa Land properties periodically support migratory water fowl. This statement is made based on the knowledge that similar habitats along the Kohala coast do serve as important refuges (Shallenberger, 1977). The only native bird observed during the survey was a Black-Crowned Night Heron (Nycticorax nycticorax), seen around the Mauna Loa Land ponds. Hawaiian Coot (Fulica americana) are common to the south of the study area at such sites as Kiholo, Makalawena, and Honokohau. It would be reasonable to assume that they also might frequent the Mauna Loa Land ponds -- though none were seen during the site survey by Bruner. The generally open and arid nature of this region probably precludes the support of most native land birds. A possible exception might be the Hawaiian Owl, called Pueo (Asio flammeus sandwichensis), which is known to hunt in this type of habitat.

Mammals

Although the Hawaiian Bat (Lasirus cinereus semotus), an endangered species of mammals, occurs on the Island of Hawaii, there are no records of its sightings in the coastal areas of South Kohala. Most sightings of this bat have been recorded around Hilo and in higher, wetter forests. Among the most common mammals in this region are the House Mouse (Mus musculus) and mongoose (Herpestes auropunctatus). The population of the former, incidentally, has reached epidemic proportions during the past summer and had to be brought under control via aerially-dropped poison baiting. Larger mammals, such as feral goats (Capra hircus), are relatively uncommon in the drier, lower elevation areas where development is most likely to occur.

Anticipated Impacts of Development

Although the Black-crowned Night Heron was the only native waterbird actually observed, it is reasonable to assume that Hawaiian Coot may also utilize the ponds on the Mauna Loa Land property. Further, it is possible that migratory ducks on occasion also use these ponds. Migratory shorebirds, especially Golden Plover, are abundant in this area. With the development of more short grass areas (lawns and golf courses), even more Golden Plover should be expected to seek these lands for foraging. Other migratory shorebird species would not increase; they might even be less common following development of the land as they frequent undisturbed shorelines rather than grassy areas. The reduction in the amount of dry open high grassland which naturally results from development of the land would affect the composition and abundance of the exotic species populations. Those species which would be expected to increase their population density following development and the introduction of more lush vegetation are: Common Myna (Acridotheres tristis), Japanese White-eye (Zosterops japonica), Cardinal (Cardinalis cardinalis), House Sparrow (Passer domesticus), Saffron Finch (Sicalis flaveola), with possibly Warbling Silverbill (Lonchura malabarica) and Mockingbird (Mimus polyglottos) also showing a slight increase. Grassland species such as the gamebirds will undoubtedly decrease in numbers with the loss of habitat. Spotted Dove (Streptopelia chinensis) and Barred Dove (Geopelia striata) are both adaptable to developed areas or open field situations. Their present populations are probably at or near maximum levels and should not change markedly following development.

In summary, one can expect to see a shift in the population levels among the exotic species and an increase in the numbers of Golden Plover during the migratory season. Development around the ponds on the Mauna Loa Land, Inc. resort site would also limit their use by water birds. It is recommended that any development around the ponds be implemented with great care. Bruner (1979) recommends that alteration of the ponds and of their associated shoreline vegetation should be avoided, as these are important foraging areas for shorebirds and, possibly, migratory water fowl as well.

Flora

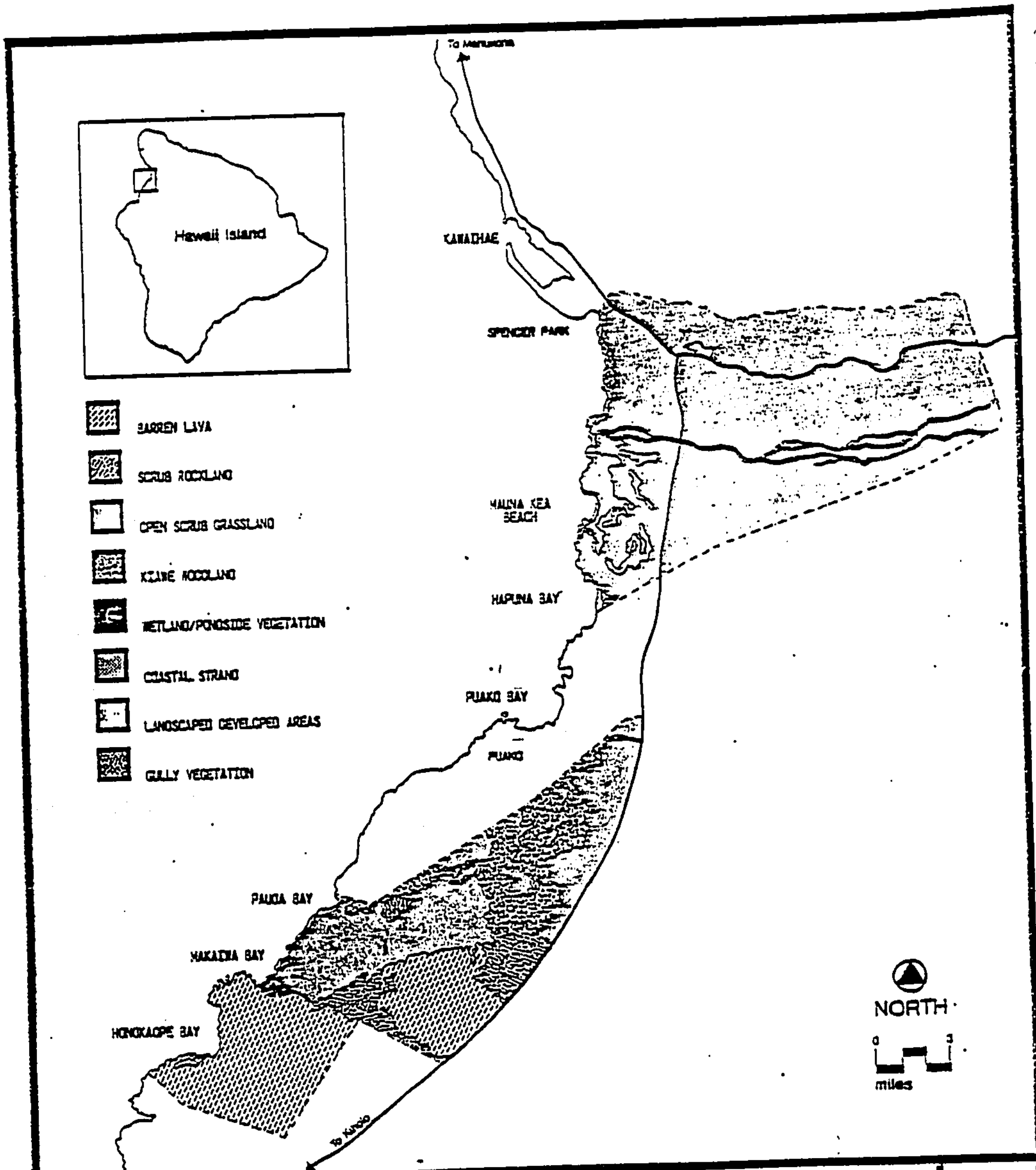
As in the case of fauna, the survey of existing vegetation conducted for this study was limited to specific sites where initial development activity is expected. Both parcels fall within the kiawe and lowland shrub vegetation zone. This zone is characteristic of these land areas on the island of Hawaii which are below 1000 feet in elevation and receive less than 20 inches of rainfall per year. The great majority of the secondary growth which is anticipated to occur in the Kohalas after the Lalamilo Water System becomes operational would be within this vegetation zone. We feel, therefore, that the survey which has been performed for the Olohana/UAL (now Mauna Kea Land Corporation) and Mauna Loa Land properties (Earthwatch, 1979) is an adequate basis for this impact assessment. The summary of cover types for these properties is presented in Table III-34; they are shown graphically in Figure III-2. The complete checklist of plant species for the coastal area surveyed is shown in Appendix B. Because we anticipate that there would be incréased housing development occurring in the region as the result of resort-related immigration, reference is made below to two areas where this growth is most likely to occur: Káwaihae Village and Puako. It must be recognized, however, that no intensive survey has been done here, and the following description is very general.

Kawaihae Village and surroundings: This residential community was initially developed to accommodate employees from the Olohana resort projects. There are still 21 acres of land zoned for residential development available here. Those areas which have already been built on are landscaped and well-maintained; common ornamentals and weedy escapes are the dominant land cover. The undeveloped areas are characterized by open scrub grassland, which is described in greater detail in Table III-34.

Puako: This is a small, low-density residential community along the coast, between the Mauna Kea Land Corporation and Mauna Loa Land properties. Common ornamentals and escapes found in gardens and vacant lots include milo, sea grape, crown flower, oleander, hibiscus, coconut, bougainvillea, kiawe, beach naupaka, ironwood, royal poinciana, monkeypod, shower trees, Chinese banyan, bottle brush, plumeria, Messerschunidia, Bermuda grass, mango, avocado, papaya and, possibly the native cotton, a species of which is on the endangered species list. Upland areas above the community are dominated by dense kiawe woodland. The latter cover type is further described in Table III-34.

Table III-34. Summary of cover types.

COVER TYPE	CHARACTERISTICS	IMPORTANT PLANT SPECIES
A. MAUNA LOA LAND, INC. PROPERTIES		
1. Barren Lava	Rough, clinkery, unweathered a'a lava flows supporting very few, scattered plants, mostly grasses. Total vegetation cover is less than 5%.	Herb layer: feathery pennisetum (Pennisetum setosum), ilima (Ilima spp.) Shrub layer: kiawe (Prosopis pallida)
2. Scrub Rockland	Primarily pahoehoe flows with small pockets of accumulated soil. Sparse vegetative cover (less than 50%).	Herb layer: fountain grass (Pennisetum setaceum), waltheria (Waltheria americana) Shrub layer: kiawe
3. Open Scrub Grassland	Level to rolling, dry annual grasslands with scattered trees and shrubs. Occasional rock outcrops.	Herb layer: feathery pennisetum, ilima, waltheria, sixweeks threeawn (Aristida adscendens) Shrub layer: nehe (Lipochaeta lavarum var. lavarum), kiawe Tree layer: kiawe
4. Kiawe Woodland	Dense thickets of shrubs and trees to 40 feet high. Herb layer shaded, supporting dryland grasses, forbs.	Herb layer: feathery pennisetum, nettle-leaved goosefoot (Chenopodium murale) Shrub and tree layer: kiawe
5. Wetland/Pondside Vegetation	Anchialine ponds with margins varying from steep, hard lava rock to soft, spongy soils. Vegetation including several native species primarily consists of emergents and coastal strand plants.	Herb layer: ohelo-kai (Lycium sandwicense), water hyssop (Bacopa monnieria), sea purslane (Sesuvium portulacastrum), makaloa Cyperus laevigatus) Shrub and tree layer: milo (Thespesia populnea), coconut (Cocos nucifera), hau (Hibiscus tiliaceus)
6. Coastal Strand	Strand vegetation associated with beaches. Substrate mixture of sand and lava rock.	Herb layer: beach morning glory (Ipomoea brasiliensis), beach dropseed (Sporobolus virginicus), Australian salt bush (Atriplex semibaccata) Shrub layer: native capparis (Capparis sandwichiana var. zoharyi), beach naupaka (Scaevola taccada) Tree layer: milo, coconut
7. Disturbed/ Pre-landscaped	Vegetation primarily weedy, associated with transforming areas from one cover type to another by grading, transferring soil or otherwise disturbing the natural vegetation.	Herb layer: Bermuda grass (Cynodon dactylon), garden spurge (Euphorbia hirta), West Indian beggar's tick (Bidens cynapiifolia) Shrub layer: castor bean (Ricinus communis), pluchea (Pluchea odorata), cocklebur (Xanthium saccharatum) Tree layer: kiawe
B. MAUNA KEA LAND CORPORATION		
1. Open Scrub Grassland	Vast expanses of dry annual grasses; trees and shrubs adapted to dry conditions are sparsely scattered throughout.	Herb layer: feathery pennisetum (Pennisetum setosum), pili grass (Heteropogon contortus), ilima (Ilima spp.) Shrub layer: kiawe (Prosopis pallida), koa haole Leucaena leucocephala), 'aheahea (Chenopodium oahuense) Tree layer: occasional kiawe
2. Kiawe Woodland	Dense thickets of shrubs and trees to 40 feet high near the coast. Herb layer shaded supporting dryland grasses, forbs.	Herb layer: feathery pennisetum, nettle-leaved goosefoot (Chenopodium murale) Shrub and tree layer: kiawe
3. Gully Vegetation	Dry intermittent gulches with steep to moderate slopes, large boulders, small pockets of moist soil or water. Flora more diverse and luxuriant than in surrounding areas.	Herb layer: fountain grass (Pennisetum setaceum), Guinea grass (Panicum maximum), honohono (Commelina diffusa), morning glory (Ipomoea spp.) Shrub and tree layer: Kiawe, koa haole, guava (Psidium guajava), Christmas berry (Schinus terebinthifolius)
4. Coastal Strand	Strand vegetation associated with beaches. Substrate mixture of sand and lava rock.	Herb layer: beach morning glory (Ipomoea brasiliensis), beach dropseed (Sporobolus virginicus), Australian salt bush (Atriplex semibaccata) Shrub layer: beach naupaka (Scaevola taccada), kiawe Tree layer: coconut (Cocos nucifera), kiawe
5. Landscaped/ Developed Areas	Vegetation associated with existing structures or facilities. Man-induced flora supported by irrigation, fertilization and other landscape practices. Includes golf course.	Herb layer: Bermuda grass (Cynodon dactylon) Shrub and tree layer: ornamentals, e.g. bougainvillea (Bougainvillea spp.), false kamani (Terminalia catappa)



VEGETATION/LAND COVER OF THE PROPOSED MAJOR RESORT SITES Earthwatch, 1979

Figure III-2

Anticipated Impacts of Development

Anticipated development actions in the region may be divided into three phases: (1) site preparation, (2) construction and land transformation, and (3) facility maintenance and operation. Although specific designs for proposed developments are not known, impacts may be predicted on the assumption that standard facilities or structures would be developed. These would include hotels, condominiums, single- and multiple-family dwelling units, parking, roads, trails, walkways, commercial facilities, public works facilities, nurseries, maintenance areas, and recreational facilities (golf, tennis, swimming, riding, etc.,). Environmental impacts generated by such development, relative to vegetation, are outlined below.

Site Preparation. This phase covers the initial preparation of raw land, prior to construction or major landscape modification. Surveying and creation of temporary access roads for construction are included as are ground clearance and excavation for proposed facility sites. Site preparation includes digging, cutting, blasting and bulldozing as required for removal of vegetation, soil, boulders, and bedrock. Surface preparations after clearing may also require scraping, crushing, grading, terracing, and introduction of fill material. Below is a summary of impacts associated with site preparation.

- All vegetation in the path of clearing activities would be destroyed unless transplanted. This would not result in an irreversible commitment of resources for areas such as open scrub grassland since this cover type is extensive and species involved could theoretically be replanted, replaced, or incorporated into the landscape. For coastal strand and wetlands, however, any loss of vegetation would be adverse, since these cover types occupy limited areas and host many native (though no endangered) plant species.

- Presence of construction equipment, destruction of vegetation, exposure of bare soil, generation of debris, etc. would result in unavoidable negative aesthetic impacts. This would be a short-term impact only since clean up operations would be practiced and the overall goal is for highly aesthetic land transformation.

- Air pollutants, including fumes from machinery and dust raised by equipment, may damage tissue or degrade the visual quality of ornamental plant species. Wildlife within the vicinity of clearing activities may be driven away by noise and vibration.

- Removal of vegetation would result in the exposure of bare soil or bedrock. In the case of bare soil, exposure to wind and rain (though infrequent) would be unavoidable. This could be a significant adverse effect since gusty winds are not uncommon and soils of both regions are loose, dry, fine-grained and fairly structureless. Dust pollution and possible nearshore and pond sedimentation would be temporary, but the loss of some soil resources would be a long-term effect of erosion.

- The erosion problem is compounded by the existence of soil borrow areas. Here large areas of vegetation would be removed, exposing deep accumulations of alluvial soils (for example, Mauna Loa Land, Inc.'s northern sector). These soils would be scooped up, placed in trucks, and transported to areas requiring soil or fill, such as prepared barren lava surfaces. All stages of this process are subject to the forces of erosion, particularly wind erosion. Mitigation measures include careful planning of borrow area locations, use of natural windbreaks, sprinkling for dust control, monitoring of wind levels, covering of truck loads, restriction of unnecessary traffic in fill and borrow areas, and finally, reshaping and revegetation of borrow pits after use.

- Removal of vegetation would result in localized changes of microclimate. Removal of large trees or shrubs would reduce total shaded areas. This in turn would effect higher air and ground temperatures and increase soil dessication. Removal of vegetation would also result in the loss of frictional surfaces which reduce wind velocity along the ground surface. This too would subject soils and nearby plants to greater dessication.

- Removal of vegetation would result in some displacement of birds and other wildlife. However, at this stage (site preparation), displacement is not irreversible since natural vegetation could recover or be replaced.

- It is assumed that valuable plant resources, such as large and attractive trees, unique native plants, aesthetic natural settings, etc., wouldbe maintained as much as possible. This is a potential positive impact of site preparation since surrounding undesirable elements, such as agressive weedy species, would be removed, allowing desirable elements to proliferate or be enhanced.

- Disturbance or removal of natural vegetation and watering for irrigation or dust control may result in seed dispersal and wider establishment of weedy species. These may compete with both natural and landscaped plant species in the future.

Construction/Land Transformation. This phase covers all activities required for facilities construction and eventual total land transformation. Standard engineering and landscaping practices for resort development are anticipated. Environmental impacts of these, relative to vegetation, are summarized below.

- With respect to vegetation, landscaping and planting offer potentially positive aesthetic and environmental effects. Introduction of soils, nutrients, shade and irrigation would result in moderation of harsh environmental elements and the successful establishment of both natural and ornamental plant species. For some areas, particularly open scrub grassland, this could result in significant improvement of visual and environmental quality.

- Wildlife displaced by ground clearance may return given the increase in overall plant diversity. Some populations may, in fact, increase in the man-modified environment. However, those species of wildlife sensitive to nearby human occupation will likely suffer overall habitat reduction rather than increase.

Facility Maintenance and Operation. After construction and landscaping are completed, environmental impacts would continue to be generated by maintenance and operation activities. The new facilities would require irrigation, fertilization, weed control, and sewage disposal, and will host all forms of visitor and resident use. Environmental impacts of these, relative to vegetation, are summarized below.

- Application of irrigation waters drawn from brackish wells may result in increased salt levels in the soil and possible damage to plants. Salt accumulation problems may be compounded by application of fertilizers and pesticides to the soil surface.

- Leaching of nutrients, particularly from heavily fertilized and irrigated golf courses, could have a significant diverse impact on pond and ocean water quality. Ponds are particularly sensitive, being fairly closed systems, not as subject to dilution and flushing as are coastal waters. Pond nutrient levels should be monitored before golf course development and periodically during upkeep and maintenance. Care should be taken so that water and nutrient application is efficient and not wasteful. In this way groundwater resources may be conserved and aquatic pond organisms will not suffer ecologic imbalance due to artificial over-nutrition. Care should also be taken so that drawing of brackish groundwater does not increase the salinity of nearby brackish ponds to adverse levels.

- Increased pedestrian traffic on newly established roads or trails will result in greater access and use of coastal resources. If coastal strand vegetation is removed or damaged this may result in exposure of already limited beach sands to wind and wave erosion.

- Passive recreational use of ponds and wetlands are not expected to generate adverse environmental impacts. Tree trimming and clearing of plant debris from the pond surfaces will in fact improve the visual quality of these already highly aesthetic areas. On the other hand, leaf litter and plant detritus provide food for aquatic organisms. Pond maintenance, unless extreme, will probably not severely harm pond ecology.

DESCRIPTION OF IMPACTS ON ARCHAEOLOGICAL RESOURCES

An archaeological reconnaissance survey of the proposed Lalamilo Water System corridor was conducted in December, 1978 by Archaeological Research Center Hawaii, Inc. (Appendix A). This reconnaissance survey indicated that no sites of historic importance exist within this corridor, above Queen Ka'ahumanu Highway. The South Kohala coastal region, however, is an area of considerable historical interest and significance, and has been the subject of numerous archaeological studies. A listing of these studies is included at the end of this section. If one general recommendation was to be made based on the review of available literature, it would have to stress that all future development along the South Kohala coast should be implemented with great care. This care must be exercised so that the many archaeological resources which are essential to the understanding of the region's history are either preserved or at least studied before they are salvaged or relocated. Below is a brief summary of South Kohala's historic significance, based on the review of available studies.

The archaeological study that was prepared for the Queen Ka'ahumanu Highway corridor - between Kailua and Kawaihae - (Ching, 1971), indicates that the architectural remains which were found within this corridor reflect ancient Hawaiian occupational adaptations and land use patterns. Three primary zones of cultural activity can be distinguished:

a) coastal or makai zone - where fishing and other maritime activities, as well as limited amount of agriculture occupied the people;

b) transitional or middle zone - removed from the coastline, this area was not suited for maritime activities but was used by travelers who found temporary shelter there; and

c) upland (inland) or mauka zone - where large-scale agricultural activities were concentrated.

It is the interrelationship between these zones, particularly between the coastal and upland areas, which is especially interesting. Based on the studies heretofore performed, indications are that there might have been a well-developed exchange system between the peoples inhabiting these areas: the makai settlements provided fish to the mauka inhabitants -- in exchange for agricultural crops and, perhaps, water. It is through the continuing studies of the archaeological reviews that we may become ever more knowledgeable about the lifestyle and socio-economic structure of the ancient Hawaiians. The coastal area appears to be richest in archaeological remains, particularly with respect to the sites representing former residential structures. The Waimea to Kawaihae Road corridor study (Barrera, 1974), however, indicates that the inland area, in the vicinity of Waimea, shows evidence of agricultural as well as habitational utilization. The intricate system of makai-mauka trails points to the already-mentioned relationships between people living in these areas. Yet, the discovery of possible fishing sinkers in upland sites raises questions as to the extent to which seafood was obtained via the traditional exchange of goods and the extent to which individuals from the upland areas went to the coast themselves to procure their own seafood.

In conclusion, it is important to keep in mind that a planned, systematic and consistent preservation of the system of archaeological sites is the desirable approach in the South Kohala region. This can be done through the selective process of preserving those remains which, when viewed in relation to one another, can tell us a story of this region's past. The above approach is preferable to the preservation of only the major sites deemed to be of historic and, perhaps, visual interest. The various studies heretofore performed are a good start in that direction, and will be helpful as the development in the region proceeds. In addition to providing historical background and surveys of specific important sites, certain studies (e.g. the 1969 Rosendahl survey of 'Ouli coastal lands) give recommendations as to how these sites may be integrated into the resort concept. Additional work, however, may be necessary with relation to both specific sites and the region as a whole.

List of archaeological studies relating to the South Kohala Region:

Barrera, William Jr. Anaeho'omalu: A Hawaiian Oasis. Preliminary Report of Salvage Research in South Kohala, Hawaii. Bernice P. Bishop Museum, 1971.

Barrera, William Jr. Archaeological and Historical Survey of the Waimea to Kawaihae Road Corridor, Island of Hawaii, April 1974.

Ching, Francis. The Archeology of South Kohala and North Kona, January 1971.

Kirch, Patrick V. Recommendations for Preservation and Archaeological Salvage of Prehistoric and Historic Sites in the Kalahuipua'a Area, Hawaii Island. Bernice P. Bishop Museum, 1975.

Rosendahl, Paul H. Archaeological Salvage of the Ke-Ahole to Anaeho'omalu Section of the Kailua-Kawaihae Road (Queen Ka'ahumanu Highway), Island of Hawaii. Bernice P. Bishop Museum, 1973.

Rosendahl, Paul. An Archeological Survey of 'Ouli Coastal Lands between Hapuna Bay and Kaunaoa Bay, South Kohala, Hawaii. Bernice P. Bishop Museum, 1969.

Soehren, Lloyd J. An Archaeolgical Survey of the Shores of 'Ouli and Kawaihae, South Kohala, Hawaii. Bernice P. Bishop Museum, 1964.

DESCRIPTION OF AND IMPACTS ON THE VISUAL ENVIRONMENT

The Lalamilo Water System, once completed, will not have a significant adverse visual impact. The water line, installed underground, will not be visible. The only sign of its existence will be a narrow service road built along this water line. The visual impact of above-ground elements, that is wells, pressure breaker stations, and reservoirs, will be minimal. The largest elements, two 20-foot high and 30-foot diameter one-million-gallon reservoirs, and two 100,000-gallon reservoirs, will be placed partially below grade to minimize the visual effect. The same will apply to pressure breaker stations, which are 15-foot high and 15-foot diameter steel tanks. Wells will be visible above-ground as electric meters six to eight feet high; they will be placed on concrete slabs. Though visible, these elements of the system will be so far removed from the public roads that they will not have an impact on the views for the general public.

The anticipated resort developments will certainly effect a significant and irreversible change in the appearance of the lands upon which they will be built. Whether this change will be of positive or negative nature is a purely subjective consideration, dependent upon one's individual preferences. All that can be stated objectively is that the essentially arid, lava-covered terrain will be to a large extent turned into a lush, heavily-vegetated environment -- within which the roads, pedestrian pathways, various buildings, recreational facilities, and other appurtenant structures of the proposed resort will be located. Those areas which display greater diversity of vegetative cover and/or terrain features, such as the lands around the ponds or within the Puako or Kawaihee Village developments, will be also subject to alterations that will effect their appearance. As with the construction in less verdant areas, however, the most desirable features of these sites can be to a large degree preserved or even enhanced by the implementation of good design practices. The impact of these man-made features (we refer here particularly to roads and buildings, rather than to introduced vegetation) shall be to a great extent mitigated by the fact that they can be designed with the terrain features intrinsic to this area in mind. That is to say, the design will stress the blending and integration of these features with the land, by the use of sensitive siting, alignments, materials, and colors. The heights of the individual structures can be kept at such a level so as to not block the views toward the ocean from the Queen Ka'ahumanu Highway.

DESCRIPTION OF AND IMPACTS ON PUBLIC SERVICES AND FACILITIES

The construction and operation of the proposed Lalamilo Water System will not generate significant impacts upon any of the public services or facilities. The resort/residential developments which will be made possible by the implementation of this water system will, however, have significant and long-term impacts upon the public service/facility network in the region. This section will consider impacts associated with the growth of the Lalamilo Water System service area and of adjacent areas, which we anticipate will occur after the system is operational.

Schools

Resort developments have very little direct impact upon educational facilities, as their population consists primarily of temporary hotel residents. Although the planned resorts along the Kohala coast will include condominium units as well as single-family housing, the occupants thereof will contribute only minimally to the school-age population. This can be said because the majority of these units will be sold to persons purchasing them for use as retirement homes, temporary vacation residences, or vacation rentals. Any impacts upon the educational facilities will be generated by the secondary growth which is expected to occur after the resorts begin to operate. This growth will, as previously mentioned, result mainly from the in-migration of necessary additional labor force.

The South Kohala District, where the proposed resort development and most of the associated secondary growth will occur is served by two public schools: Honoka'a Elementary-High (K-12) and Waimea Elementary-Intermediate (K-9). For the purpose of this analysis we will also include the Kohala Elementary-High (K-12), located in North Kohala, as a school having the potential to serve this district. In addition to these public institutions, two private schools are located in this region: The Hawaii Preparatory Academy (K-12) and the Parker School (7-12), both in Waimea. The current capacities, enrollment figures and enrollment projections for the public institutions are shown in Table III-35 (projections for private schools are not available).

Table III-35. Capacities, current enrollment, and enrollment projections for Kohala schools.

School	Capacity	Current Enrollment	Enrollment Projections (DOE, 1978) 1984	1995
Honoka'a (K-12)	1,297	1047 (453 in grades 9-12)	1047	1180
Kohala (K-12)	847	744 (260 in grades 9-12)	653	630
Waimea (K-9)	788	727	807	920
Hawaii Prep		396	--	--
Parker		106	--	--

Source: Compiled by Belt, Collins & Associates based on data supplied by the Department of Education, State of Hawaii.

Enrollment Factors: In order to determine the impact of anticipated regional growth upon the school system, it is necessary to estimate the enrollment factors (or number of students per household) which will be used as the basis for student population projections. We will base these enrollment factor estimates upon two figures: (1) current enrollment factors, and (2) anticipated future enrollment factors which, we feel, will differ from the existing situation. Below we show these estimates, along with appropriate explanations.

1. Current enrollment factors (included are districts of South Kohala, North Kohala, and Honoka'a):

   Grades K-8 0.51/household
   Grades 9-12 0.20/household

   The above figures are based on current student populations at the Honoka'a, Kohala and Waimea schools. It is estimated that 3,500 households are in the service areas of these schools.

2. Estimated future (year 1990) enrollment factors in South Kohala, North Kohala and Honoka'a:

   Grades K-8 0.30/household
   Grades 9-12 0.20/household

   As can be seen, we foresee a considerable reduction in the number of lower grade students that will be generated by each household.

The currently high rate in this area is partly due to the establishment of Hawaiian Homestead properties, which have a relatively high ratio of young children per household.

Projected enrollment: Based on the above figures, we have projected additional student population in the region, which can be expected as the result of the anticipated development activities along the South Kohala coast. These projections, split into two grade level categories, appear below; they are based on the estimated addition of 2,000 housing units (outside of the resort developments) to the region by the year 1990.

	Based on Current Enrollment Factors	Based on Projected Enrollment Factors
Grades K-8	1,000 students	600 students
Grades 9-12	400 students	400
Total	1,400 students	1,000 students

Anticipated impacts on the existing facilities: In the case of both scenarios which have been shown above, the capacity of the existing facilities will be exceeded. This capacity would be exceeded to a far greater degree within the K-8 grade category if the enrollment factors should continue at the existing level. All indications point, however, to an increasing enrollment but at a decreasing rate. The above figures should be further reduced by those students who would be attending private schools.

Insofar as the capacity of the existing facilities to accommodate the growing student population is concerned, it has been the DOE's policy to expand the schools as the need arises. Such expansions can be accomplished through the implementation of portable classrooms; permanent facilities would be constructed only if a long-term increase of students justifying such expansion occurs. The existing facilities in this region have enough land area to allow either for temporary or permanent expansion, providing the lands abutting the schools are not otherwise developed.

Protective Services

Fire Department

In South Kohala, the Fire Department consists of a 24-hour, 13-man, three-truck (one tanker, one pumper, one rescue van) fire station in Waimea; an eight-hour, one-man, one-truck facility in Kawaihae; and a truck stationed at Puako staffed by volunteers. Fire protection in the Kawaihae and coastal area is of limited effectiveness due to the distances involved, the low population density, and the lack of a suitable volunteer force. These limitations are further increased by the inherent problems of the dry, grassland environment, which is highly susceptible to fires during the summer and fall seasons. These conditions will change considerably when the area has been further developed -- in effect decreasing the fire hazard in and around the new resorts. Private fire protection services are maintained in two locations, with a one-truck facility adjacent to Waikoloa Village and a single fire truck at the Mauna Kea Beach Hotel for protection of the resort facilities and the adjacent house lots. It is anticipated that each of the subsequent resort developments will provide some individual fire protection, but that increased development in the area will eventually necessitate expansion of public fire protection facilities and services. Possible sites for a new facility would be Kawaihae or Puako. It should be noted that fire flows available from the proposed Lalamilo system will exceed the requirements in case of emergency.

Police Department

The Police Department operates stations in both South and North Kohala Districts. The South Kohala facility is located in Waimea; Kapa'au is the location of the North Kohala station. The personnel strength of these facilities, as of December 1979, is as follows:

Waimea	Kapa'au
1 Captain	1 Captain
1 Lieutenant	2 Sergeants
2 Sergeants	9 Police Officers
13 Police Officers	1 Senior Clerk-Stenographer
1 Senior Clerk-Stenographer	

According to the County of Hawaii Police Department, the current staffing is adequate for the present level of calls for services. Both facilities are relatively new -- Waimea Station was built in 1975 and Kapaau facility was constructed in 1973 -- and are well-equipped to serve the existing population of these districts. With relation to the future plans for these districts as well as the anticipated impacts which the anticipated growth of this area will have on the police protection, the Police Department has stated the following:

> There are no immediate plans for capital improvements such as additional police stations to service the North and South Kohala areas although plans for a new police station at Kailua, Kona are in the design stage. Plans are also underway to expand the police microwave radio system to improve radio communications in the area. Increases in personnel are contingent on population increases and calls for service.
>
> Development of the North and South Kohala regions at the magnitude projected would require a 100- to 150-percent increase in staffing in the South Kohala district and a 50-percent increase in personnel for North Kohala. The high concentration of resort development in the South Kohala coastal region coupled with the anticipated increase in households in the Puako, Kawaihae and Waikoloa areas may necessitate the construction of a police station in that area. (Kaaua, December 12, 1979.)

Sewage Treatment and Disposal

All resort projects which will be built in the area following construction of the Lalamilo Water System will require the installation of sewage treatment facilities. These will be in strict compliance with Federal, State, and County standards, but specific methods of treatment and disposal have not, as yet, been determined. Some recycling of treated sewage for irrigation purposes will probably be implemented at each of the resort developments. Other construction in the area secondary to the development of the resorts will either be serviced by the existing facilities or require construction of individual systems adhering to the applicable government regulations.

Solid Waste Disposal

At the present time, the County of Hawaii does not have individual residence refuse collection. Each homeowner must transport their refuse to one of the compactor-transfer stations, landfills, or open dumps that exist on the island. The closest existing compactor-transfer station is located at Puako. This station has a 70-cubic yard compactor-container for the collection of residential waste.

The County will not accept commercial/private contractor refuse or commercial/hotel refuse at compactor-transfer stations, which are reserved for residential waste. This implies that all new households which we anticipate will be forthcoming after the Lalamilo Water System implementation could dispose of their refuse at the stations, as long as they transport the waste themselves.

There are two existing open dumps which may be used by the residents of South Kohala coastal area. The closest dump is located at Kamuela, about 17 miles northeast of the Lalamilo Water System service area. The other open dump is located in Kailua, approximately 20 miles to the south. In the near future, it is planned for both of these open dumps to be closed and new landfill operations started in Kailua near Kona Village (12 miles to the south) and in Ahualoa near Honoka'a (31 miles northeast). There is no charge for the dumping of refuse at these sites and the County foresees no future change in this policy. Both residential and commercial solid wastes are accepted at these locations. The Hawaii Sewers and Sanitation Bureau reports that the new landfills will have sufficient capacity to meet the needs of resort developments planned for the Kohala coast (personal communication, Harold Sugiyama, September 19, 1979).

Electric Power

The operation of the Lalamilo Water System well pumps will require a relatively small amount of electricity. The necessary power can be provided from the existing power transmission line along the Belt Road.

The anticipated resort and residential development in the South Kohala coastal region will require considerable amounts of power, as indicated below. Both consumption rates as well as peak demand factors are shown.

Use	No. of Units in Region by Year 1990	Est. Consumption rate (kwh yr/unit)	Peak Demand (kw/ unit)	Use (kwh/yr)	Demand (kw)
Hotel	2,500	18,000	2	45,000,000	5,000
Condominium	2,250	12,000	2	27,000,000	4,500
Resort Residential	75	12,000	3	900,000	225
Single Family	2,000	12,000	3	24,000,000	6,000
TOTAL				96,900,000	15,725

In 1977, the total consumption of electricity in Hawaii County was 376,808,000 kwh. Based on that figure, the additional projected use of electricity resulting from the Kohala develoment would generate about a 25 percent increase in the island-wide use of electric energy.

According to Hawaiian Electric and Light Company (HELCO), there are adequate generating sources to supply the needed electric power to this area. The two existing North-South (parallel to the shoreline) transmission lines can transmit 15 to 20 kw. These lines would have to be supplemented by a mauka-makai line (possibly along the proposed Lalamilo Water line), which would supply power to the coast.

Recreation

Existing recreational sites in North and South Kohala emphasize camping, hiking, golf, tennis, volleyball, baseball, and picnicking at inland facilities; and swimming, surfing, boating, and fishing at beach facilities. A few indoor recreation areas are also available, with such sports as basketball and ping-pong as well as more passive activities such as playing cards or chess.

Table III-36 summarizes existing major recreation sites in North and South Kohala as recorded in the 1974 County of Hawaii Recreation Plan. Their locations are shown on Figure III-3.

There are also three named hiking trails in the area -- Kawaihae Pu'u Hue Trail, the Kohala Ditch Trail, and the King's Trail from Kiholo to Puako.

Extensive additional recreational facilities are proposed for both North and South Kohala in the County Recreation Plan. The more important of these are: beach and shoreline parks and recreation areas at Kapanaia Bay, 'Upolu Point, Niuli'i, and Hapu'u in North Kohala, and at Waiulaula, Kukui Point, Wailea Bay, Puako Bay, Anaeho'omalu Bay, Makaiwa Bay, Pauoa Bay, Mau'umae Beach, and Kaluhi'ikamu Beach in South Kohala. The Hawaii County Planning Department is currently in the process of developing the County-Wide Shoreline Access Program. All of the future developments will be subject to this program, as well as to SMA and building setback requirements.

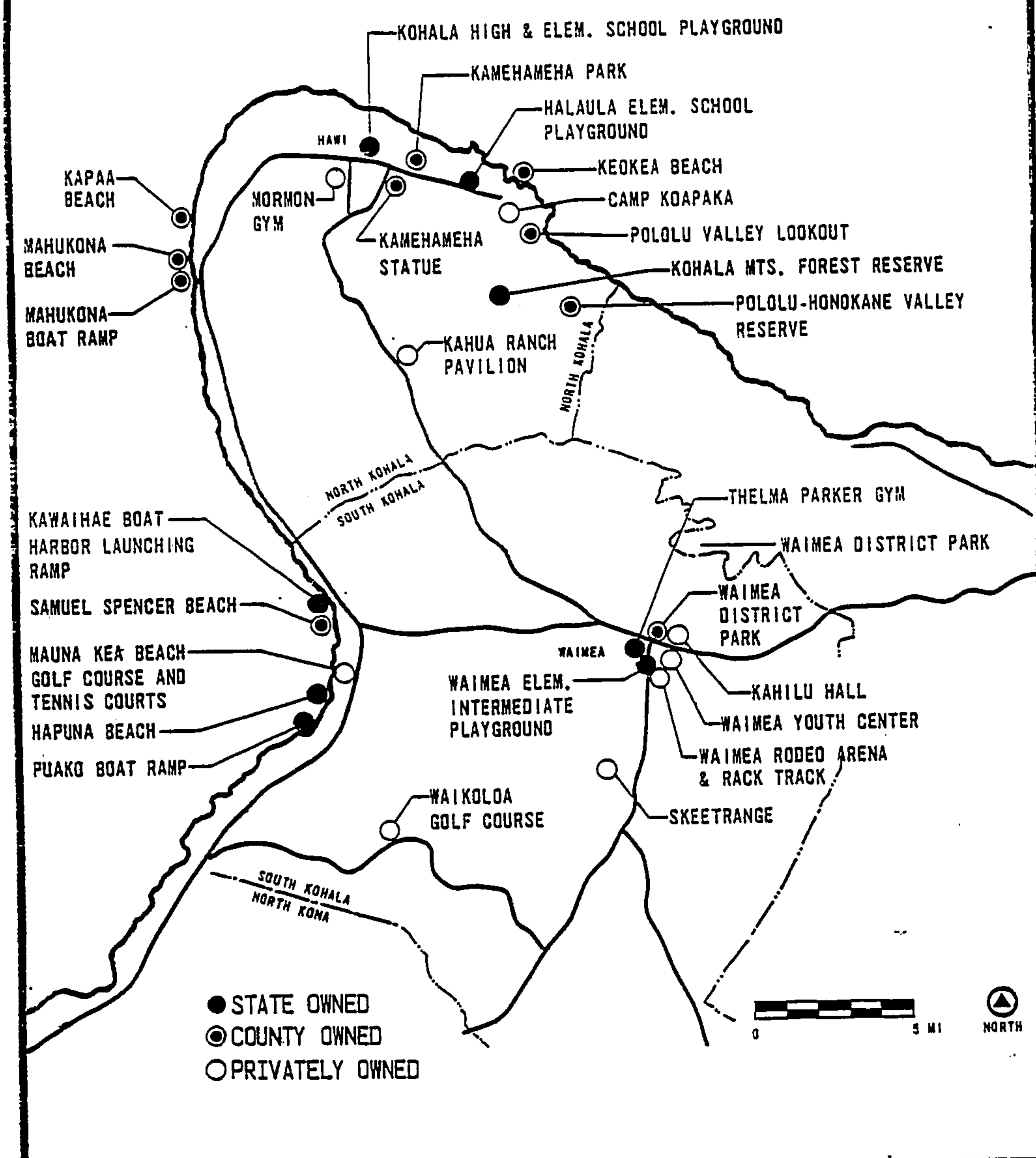
A large State Historic Park has been developed at Lapakahi in North Kohala encompassing an extensive archaeological complex that is made accessible to the public by trails and made easier to explore by explanatory signs. Of concern also is public access to the Puako Petroglyph Fields; a State park for the area is proposed to preserve and protect the petroglyphs.

The principal existing beach parks are the County's Samuel Spencer Park, located just south of Kawaihae Harbor, and the State's Hapuna Beach, situated midway between Kawaihae and Puako. Both parks contain excellent white-sand beaches and provide parking, picnicking, and restroom facilities. Other beach parks are located at Kapa'a, Keokea, and Mahukona. While facilities are quite adequate at these parks, the quality of the beaches does not match either Spencer or Hapuna Beach Parks.

The development of major resort projects in this area is expected to increase attendance of the facilities listed above, especially when secondary

Table III-36. Existing recreational facilities in North and South Kohala.

Facility	Area (Acres)	Agency	Activities
North Kohala			
Camp Koapaka (Old Makalapa School)	--	Private	Indoor recreational activities
Halaula School Playground	5.0	State	School playground activities
Kahua Ranch Pavilion	--	Private	Picnicking
Kamehameha Park	18.5	County	Picnicking, town-park activities
Kapa'a Beach Park	26.3	County	Skin diving, fishing, picnicking, auto camping
Kohala High School	4.5	State	High school athletic activities
Keokea Beach Park	7.1	County	Limited swimming, fishing, picnicking
Mahukona Beach Park	2.7	County	Swimming, skin diving, fishing, boat launching, picnicking, auto camping
Mormon Gym, Hawi	--	Private	Indoor recreational activities
Pololu Valley Lookout	1.7		Picknicking, scenic viewpoint
South Kohala			
Hapuna Beach Park	65.0	State	Swimming, surfing, camping, lodging
Kahilu Hall	--	Private	Indoor recreational activities
Kawaihae Boat Harbor	246.0	State	Marina, boat-launching ramp, fishing
Kohala Forest Reserve	23,800.0	State	Wilderness, hiking
Mauna Kea Beach Hotel's Golf Course and Tennis Courts		--	Private (fee)
Puako Boat Ramp	0.5	State	Fishing, boat-launching ramp
Samuel Spencer Beach Park	13.4	County	Camping, surfing, swimming
Skeet Range	--	Private	Skeet shooting
Thelma Parker Gym	--	State	Indoor recreational activities
Waikoloa Golf Course	--	Private (fee)	Golf
Waimea Elementary/Intermediate School	5.0	State	School playground activities
Waimea Park	10.5	County	Athletics, picnicking
Waimea Rodeo and Racetrack	--	Private	Rodeo activities
Waimea Youth Center	--	Private	Indoor recreational activities



RECREATIONAL FACILITIES NORTH & SOUTH KOHALA

FIGURE III-3

growth begins to occur. Initially, the resort-generated population would not be expected to influence these facilities, as the resorts will provide extensive recreational opportunities within their boundaries. One facility which may experience considerable growth in attendance is Lapakahi Park, but this may be viewed as a positive impact.

Health Care

The Kohala coastal region development will be served, at least during the initial years of growth, by three existing medical facilities: the Kohala Hospital, located just north of Hawi in North Kohala, the Honoka'a Hospital, and the Lucy Henriques Medical Center in Waimea. Both hospitals are administered by the State Department of Health -- the County of Hawaii being the only County in the State with no privately-administered hospitals. The Lucy Henriques clinic is a privately-owned and administered facility, operated as a non-profit corporation. Presented below is a summary description of all three facilities, representing their present service capabilities as well as operating level:

Kohala Hospital

	Acute Care	Skilled Nursing
Beds	16	10
Admissions	132	17
Daily census	1.0	10.3
Length of stay	2.8	220.9
Percent of occupancy	6.3%	103%

Above figures for fiscal year ending June 30, 1979.

The following patient spaces are available at the Kohala Hospital, but are not being used due to lack of qualified personnel:

X-ray room
Laboratory
Delivery room
Operating room
Emergency room

Honoka'a Hospital

	Acute Care	Skilled Nursing
Beds	27	8
Admissions	548	10
Daily census	8	7.9
Length of stay	5.3	289.4
Percent of occupancy	28%	99%

Above figures for fiscal year ending June 30, 1979.

Patient spaces included within the Honoka'a Hospital are:

X-ray room
Laboratory
Delivery room and maternity ward
Major and minor operating rooms
Emergency room

All of the above spaces are used on a regular basis; the examples of frequency of facility utilization are shown below (fiscal year 1978-1979):

Outpatient visits	2,855
Emergency room visits	989
Operations	116
Deliveries	108
Radiological exams	2,608
Anaesthesia	120

A total of eight physicians (six general practitioners, one general surgeon, and one internist) utilize the facilities of this hospital or refer their patients here. Four of these physicians (including the internist) have their offices at the Lucy Henriques Clinic and four physicians are based at the plantation infirmary. The Honoka'a Hospital operates its own ambulance.

Lucy Henriques Medical Center

This facility is not certified to operate as a hospital and is only allowed to maintain holding beds (where patients can be retained for up to 24 hours). There are two holding beds at the clinic. In addition the following patient services are available:

Emergency room (open 8 am - 9 pm M-F
8 am Sat. - 9 pm Sun.)
X-ray (includes fluoroscopy, the only such service in the area)
Examination room
Four physicians' offices
Two dentists' offices

In addition, six visiting specialists come to the clinic once a month.

Of the three facilities described above, the Lucy Henriques clinic is the newest and most modern -- both in terms of overall design as well as equipment. The Kohala Hospital is a structually-sound concrete block building, which can be brought up to the most modern standards if necessary. The Honoka'a Hospital, though it is well-maintained and appears to be structurally sound, is a wooden building. Consequently, this facility is out of compliance with both the Medicare and Medicaid certification requirements, and cannot be brought up to the prescribed standards merely by remodeling.

If we assume the regional population at about 12,000 (districts of South Kohala, North Kohala, and Hamakua, based on the 1977 estimates in the 1978 County of Hawaii Data Book), then a figure of 3.6 acute care beds per 1,000 population is obtained. This is a very favorable ratio, considering that Oahu's 2.8 acute care beds per 1,000 population is thought of as being quite adequate. It is not possible, however, to assess the adequacy of health care facilities on the basis of bed-to-population ratios. The quality of medical care must be assessed based on the availability of both properly-equipped facilities as well as qualified personnel.

Obviously, even the most up-to-date facilities are of no use if there are no qualified physicians, nurses and technicians to staff them. This region of the Big Island is currently experiencing this problem; the size of the population is simply not adequate to justify an establishment of a permanent practice for most specialists. Consequently, most patients requiring specialized care are treated either in Hilo or Honolulu. With the Kailua-Kona area also gaining numerous specialists, more people may seek medical care there and be admitted to the expanding Kona hospital if necessary.

Though it is difficult to precisely estimate future health care needs of the Kohala region, these needs are certain to increase as the population grows. It appears that present facilities -- both in terms of size and equipment -- could handle the growth which we are anticipating will occur over the next ten years or so. What is needed are more specialists, physicians, nurses, and technicians. Based on the past experience on Maui or in the Kailua-Kona area of the Big Island, we can anticipate that as the demand for physicians becomes real, they do establish practices in these areas. There are almost 100 doctors on Maui, for example, and more than 30 in Kailua-Kona. These numbers make for very high physician/population ratios. It is reasonable to expect, therefore, that when the very desirable (in terms of climate and scenery) Kohala region becomes more populous, so will its medical force.

In terms of facilities improvement, the State is currently considering a possibility of constructing a new acute care hospital in the region, while converting both existing Kohala and Honoka'a hospitals to skilled nursing and intermediate care facilities. No site has been chosen as yet, but possible locations include Honoka'a (next to the existing facilities) as well as Waimea (adjacent to the Lucy Henriques Medical Center).

DESCRIPTION OF AND IMPACTS ON TRAFFIC CONDITIONS

Other than a very small amount of construction traffic, primarily between Kawaihae Harbor and the waterline for materials, and between workers' residences and the waterline for construction workers, development of the proposed Lalamilo System would have no direct traffic impacts. Because of this, the remainder of this section focuses on the traffic impacts that would result from the secondary resort and residential growth that could occur as a result of the system's existence.

The discussion is divided into three parts. The first describes existing traffic roadway conditions. The second projects changes likely to occur between now and the time when the capacity of the water system is fully utilized, i.e., by 1990. The third, and final, section discusses the impact that these changes would have on the highway system's ability to provide a high level of service.

Existing Roadway and Traffic Conditions

Existing Road Network

North and South Kohala's existing highways are shown in Figure I-4. As can be seen from the drawing, Queen Ka'ahumanu Highway is the only major roadway transiting the Lalamilo Water System Service Area. It would provide primary access to all the resort and residential development that would be made possible by the increased availability of water.

Queen Ka'ahumanu Highway originates just outside of Kailua Town in South Kona. On the north it terminates at a T-intersection about one mile east of Kawaihae Harbor. The west branch of the "T" is formed by the Kawaihae-Mahukona Highway and carries vehicles to the harbor and the coastal areas of North Kohala. The Kawaihae-Waimea Road forms the eastern approach of the "T" and continues on to the town of Waimea. There, it joins the Hawaii Belt Road which provides access to Hamakua and Hilo and the upland areas of South Kohala and North Kohala. The other roads in the region that are of note are Waikoloa Road, which connects Queen Ka'ahumanu Highway with the Hawaii Belt Road via Waikoloa Village, and the access roads to Hapuna, Puako, and Anaeho'omalu.

All of the roads are two-lane facilities, and only Queen Ka'ahumanu Highway is of modern, high-speed design. With the exception of the Mauna Kea Beach Hotel entrance road, all of the access roads connecting to Queen Ka'ahumanu Highway are designed to high standards and have separate acceleration/deceleration and left-turn lanes. Kawaihae-Waimea Road and the Kawaihae-Mahukona Highway (to Kawaihae) are older roadways with numerous curved sections. According to the State Department of Transportation, a new four-lane alignment has been proposed but no definite construction schedule has been set.

According to a study by Alan M. Voorhees & Associates, Inc. (1979), there is no regular scheduled public transportation service within the Lalamilo Water System service area. However, charter bus service is currently provided to some employees of the Mauna Kea Beach Hotel by the County Mass

Transit Agency (MTA). Two trips per day are to/from Honoka'a and five per day are to/from North Kohala. A proposal now being evaluated would substitute a vanpool program for the bus service, but this might not prove necessary if rapid development of the area results in much higher bus ridership. The Voorhees (1979:6) study notes that MTA officials ". . . have unofficially indicated they would consider increasing transit services to meet increased travel needs of employees generated by new development in the area."

Existing Traffic

The greatest traffic impacts of the water system-related growth that is projected would occur on Queen Ka'ahumanu Highway, especially at the existing and proposed intersections. State Department of Transportation data assembled for this study (Voorhees, 1979:7) indicated the following average daily traffic volumes (ADT):

- 1,750 vehicles per day (vpd) on Queen Ka'ahumanu Highway north of the Waikoloa Road intersection.
- 3,100 vpd on Queen Ka'ahumanu Highway at the Kawaihae Road.
- 2,800 vpd on Kawaihae Road at its intersection with Queen Ka'ahumanu Highway.
- 2,450 vpd on the Kawaihae-Mahukona Highway at its intersection with Queen Ka'ahumanu Highway.
- 7,500 vpd on the Hawaii Belt Road (Mamalahoa Highway) east of its intersection with the Kawaihae-Waimea Road.

Existing peak-hour turning movement data from the Kawaihae-Waimea Road/ Queen Ka'ahumanu Highway intersection and the Mauna Kea Beach Hotel access road/Queen Ka'ahumanu Highway intersection are shown in Figure III-4.

Accident History

Accident data maintained by the State Department of Transportation provides useful insights into highway safety conditions on the major roadways in the region. The annual number of accidents and fatalities on each roadway segment is shown in Table III-37 for each of the past three years.

The number of accidents per million miles of vehicle travel in 1978 on each roadway segment were 0.7 for Queen Ka'ahumanu Highway, 4.6 for Kawaihae Road, and 4.4 for Kawaihae-Mahukona Highway. These rates compare with an estimated rate of 3.3 accidents per million miles of vehicle travel on all state roadways on the Island of Hawaii. Hence, Queen Ka'ahumanu has a lower than average rate of accidents while Kawaihae Road and Kawaihae-Mahukona Highway have a higher than average rate of accidents. The older roadways have a higher accident rate than the newer roadway.

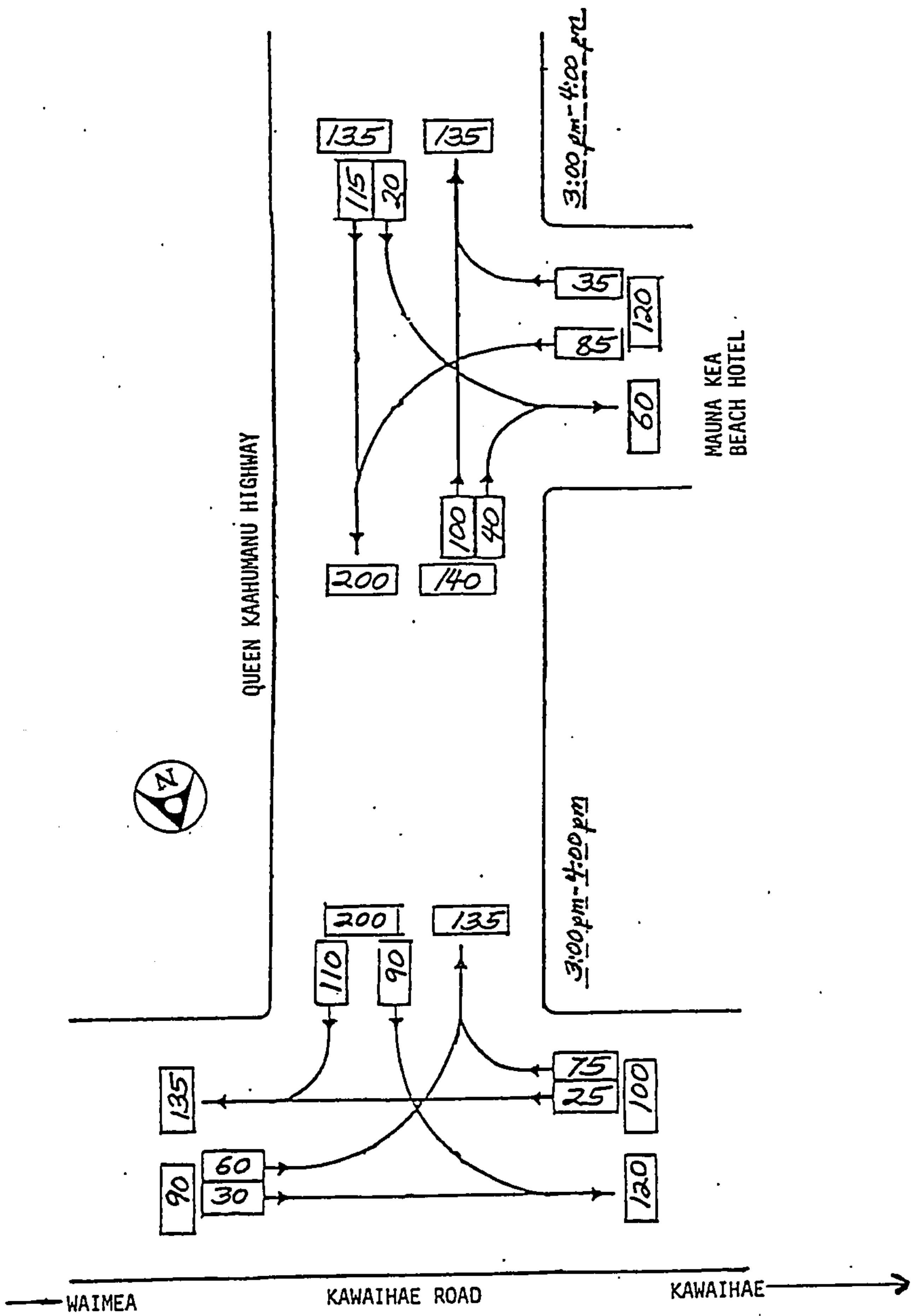


FIGURE III-4. EXISTING PEAK HOUR TURNING MOVEMENT COUNTS

Table III-37. Accident summary report.

Roadway Segment	Number of Accidents per Year 1976	1977	1978
Queen Ka'ahumanu Highway	16	14	15
Kawaihae Road	32	50	52
Kawaihae-Mahukona Highway	2	4	5

Source: State Department of Transportation; table compiled by Alan M. Voorhees & Associates.

Traffic Impacts

Projected Changes in Traffic Without the Project

A travel model developed by Alan M. Voorhees & Associates (1978) was used to forecast daily traffic volumes without the project at two locations. The first is the Hawaii Belt Road in Waimea at a point east of its junction with the Kawaihae-Waimea Road; the second is Palani Road in Kailua at a point west of the junction with Queen Ka'ahumau Highway. Supplemental data was then used to forecast traffic on roadways between these two points. Since projections were available only for five-year intervals, it was necessary to adjust the data produced by the model to make it compatible with the eight-year impact period used in this report. This was done by assuming that traffic during years six through eight of the projection period would increase at the same percentage rate as it did during years one through five. Results of these "without the project" projections are shown in Figures III-5 and III-6. It should be noted that the estimates shown in that figure were based on somewhat less development at the proposed Waikoloa Beach Resort than it is now believed will occur. Because of this, the estimates may slightly underestimate the actual growth.

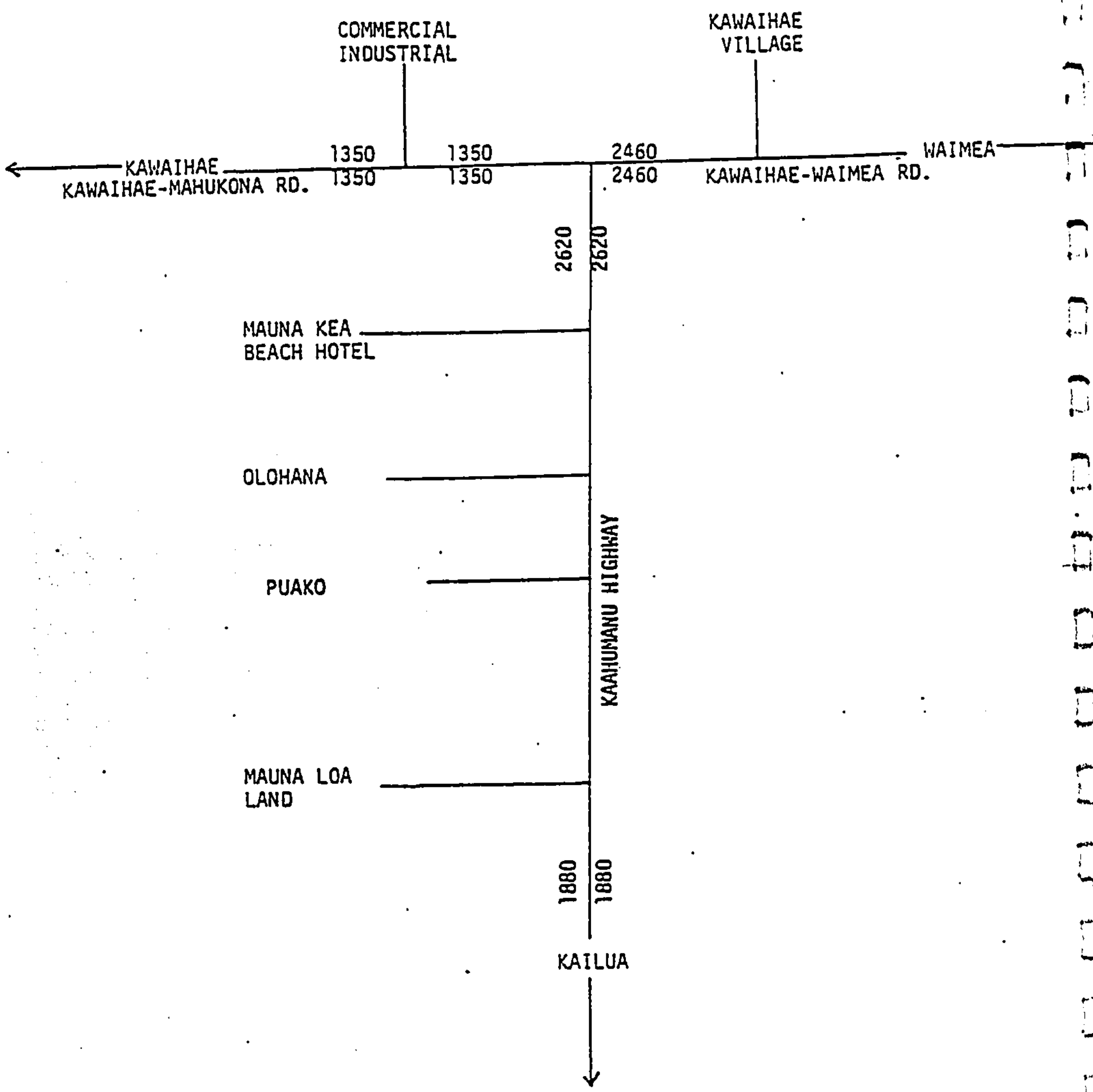


FIGURE III-5.
1990 FORECAST OF DAILY TRAFFIC WITHOUT PROJECT GENERATED TRAFFIC

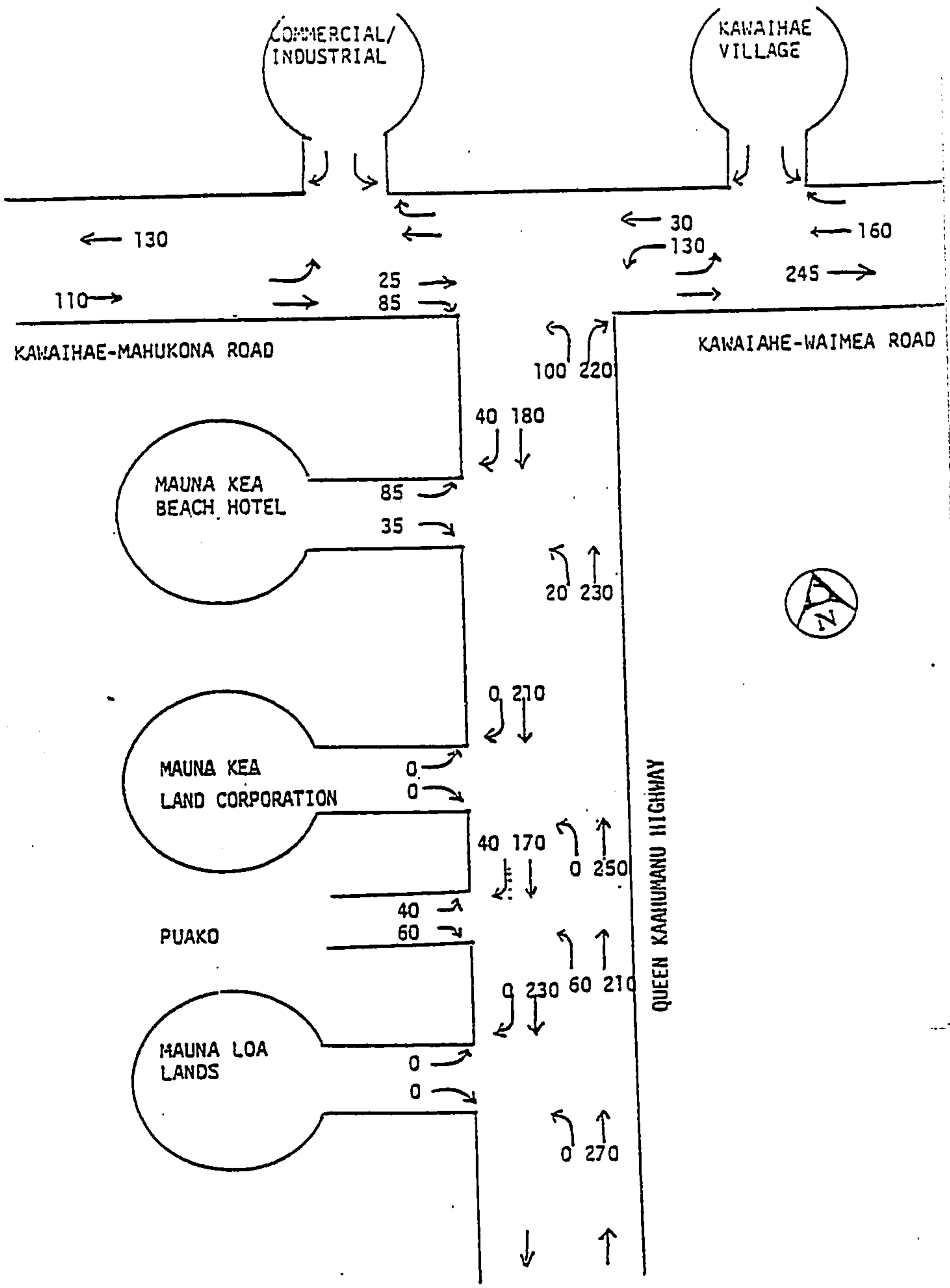


FIGURE III-6.
1990 FORECAST OF PEAK HOUR TRAFFIC WITHOUT PROJECT GENERATED TRAFFIC

Traffic Volumes with the Proposed Project

A forecast of daily and peak-hour traffic that would be generated by the proposed projects was prepared by Alan M. Voorhees & Associates (1979) using a sequential procedure of trip generation, distribution, and assignment. The trip generation rates used are shown in Table III-38. Different rates were used for the residential units at Kawaihae Village than for those on the Mauna Loa Land Resort project because the former were assumed to be largely single-family and the latter multi-family units. The rates are reportedly based on counts at similar developments on Maui (Alan M. Voorhees & Associates, 19796:2).

Quoting from the Voorhees study:

> "The generated trips were then distributed by the factors shown on Table 4 [III-39]. The same distribution rates were used for the daily and peak-hour trips. *Different distribution rates were used for visitor*, employee, residential, and commercial trips. In some instances, several of these trip purposes overlapped and had to be accounted for in the total volume of trips generated by the site. These overlapping situations included:
>
> o Employee work-site trips and residential trips
>
> o Community commercial center trips and residential trips
>
> o Visitor trips and resort commercial center trips
>
> "The generated trips were then assigned to the highway network. A minimum path assignment technique was utilized due to the capacity of the highway network in the study area. The assignments were then transposed from the one-way trip format used in the trip generation procedure to a two-way format."

Estimates of daily and peak-hour vehicle trips generated by water system-related growth are summarized in Table III-40. The Voorhees study from which the figures are taken notes that several of the trip purposes are overlapping (and are therefore shown in two categories), and that many of the trips generated within the proposed Mauna Loa Land Resort would remain within the resort boundaries (i.e., they would not impact Queen Ka'ahumanu Highway).

The gross trip rates from Table III-39 were then assigned to the road network in accordance with the percentage distribution factors displayed in Table III-40 to arrive at the daily and peak-hour project-related traffic estimates shown in Figures III-7 and III-8, respectively. As indicated by the figures, the proposed Mauna Loa Land, Inc. project is expected to be the largest single generator of vehicular trips in the region.

Table III-38. Trip-generation rates used in projecting project-related traffic.

Unit	Auto Vehicle Trips/Unit Daily	Peak Hour
VISITOR (Per Occupied Unit)		
Hotel	3.6	0.36
Condominium/Resort/Residential	4.0	0.36
EMPLOYEE (Per Employee at Jobsite)	1.1	0.11
RESIDENT (Per Dwelling Unit)		
Kawaihae Village	8.3	0.83
Mauna Loa Land	5.4	0.54
COMMERCIAL (Per 1,000 s.f. Retail Area)		
Resort	57.9	5.8
Community	86.8	11.6
INDUSTRIAL (per Acre)	42.0	6.0

Source: Alan M. Voorhees & Associates (1979).

Table III-39. Daily and peak-hour vehicle trips generated by proposed development.

	Daily Trips	Peak Hour Trips In	Peak Hour Trips Out	Peak Hour Trips Total
MAUNA LOA LAND RESORT				
Visitors, Hotels & Condos	8,180	345	470	815
Employees	1,725	67	105	172
Employee Housing	4,320	235	195	430
Resort/Commercial	2,895	115	175	290
	17,120	762	945	1,707
PUAKO				
Visitors, Condos	2,080	90	120	210
Employees	65	3	4	7
	2,145	93	124	217
MAUNA KEA LAND CORPORATION (Previously Olohana)				
Visitors, Hotels & Condos	5,840	245	340	585
Employees	975	38	60	98
	6,815	283	400	683
MAUNA KEA BEACH HOTEL (ADDITIONAL)				
Visitors, Hotel	390	20	20	40
Employees	45	2	3	5
	435	22	23	45
KAWAIHAE INDUSTRIAL/COMMERCIAL				
Commercial Center	3,255	220	215	435
Industrial	1,050	40	110	150
	4,305	260	325	585
KAWAIHAE VILLAGE	5,000	270	235	505

Source: Alan M. Voorhees & Associates.

Table III-40. Distribution rates of daily and peak-hour trips.

	PERCENT DISTRIBUTION				
	North Kohala	Kawaihae Village	Waimea & Beyond	Mauna Loa Lands	South to Waikoloa & Kona
EMPLOYEE WORK TRIPS					
Mauna Loa Land	13	25	16	34	12
Mauna Kea Land Corp. (Previously Olohana)	13	25	16	34	12
Mauna Kea Beach Hotel (Additional Employees)	11	34	11	34	10
RESIDENT TRIPS (Does Not Include Work Trips)					
Mauna Loa Land	25	0	65	0	10
Kawaihae Village	25	0	65	0	10
VISITOR TRIPS (Excluding Commercial Trips)					
Mauna Loa Land	10	0	30	0	60
Mauna Kea Land Corp. (Previously Olohana)	10	0	30	0	60
Mauna Kea Beach Hotel	10	0	30	0	60
COMMERCIAL TRIPS					
Mauna Loa Land[1]	9	0	0	42	10
Community Center	13	28	16	34	9
INDUSTRIAL TRIPS	13	28	16	34	9

Source: Alan M. Voorhees & Associates.

[1] 7% to Mauna Kea Beach Hotel
30% to Olohana.
11% to Puako Resort.

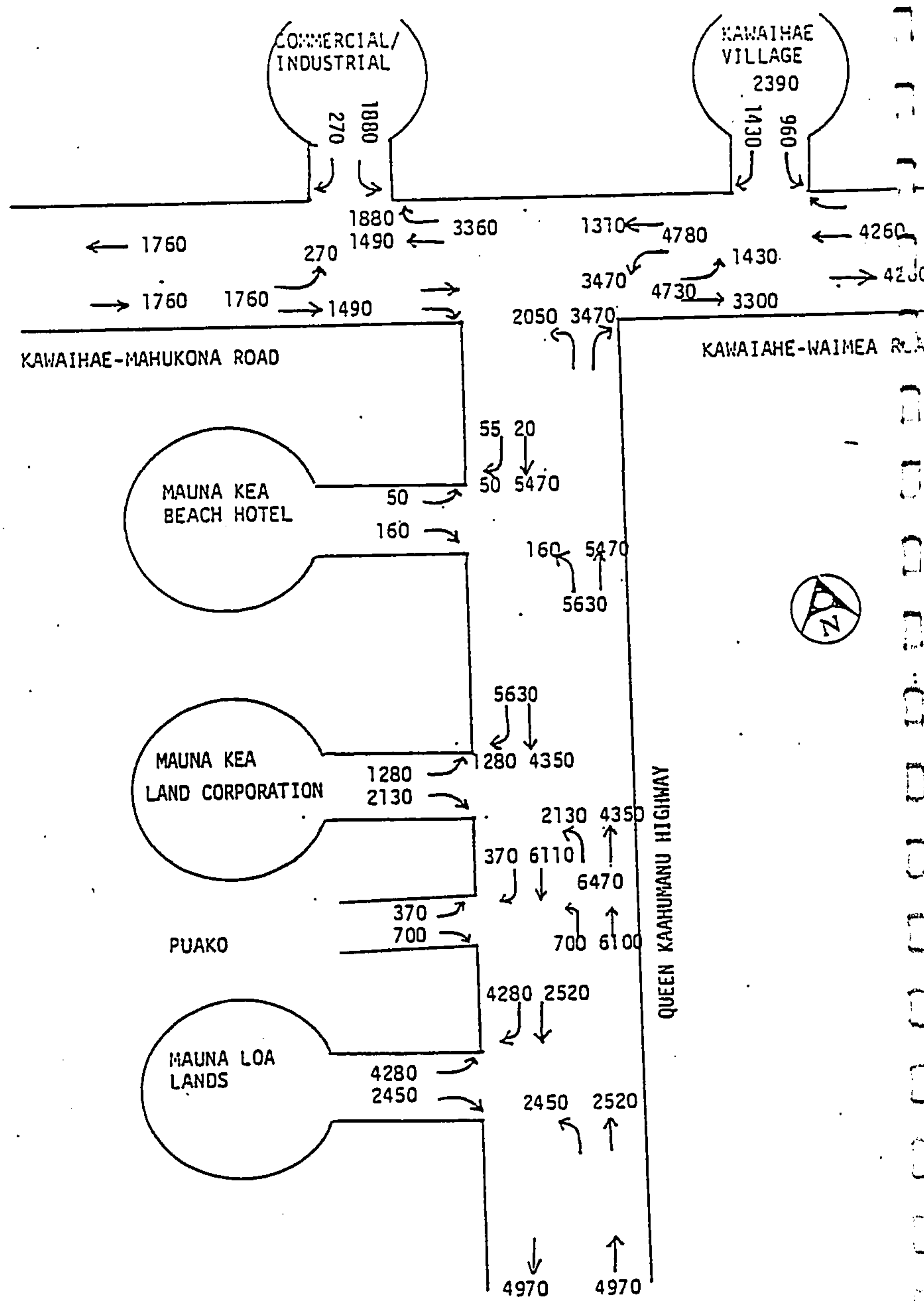


FIGURE III-7. DAILY ASSIGNMENT OF GENERATED TRIPS

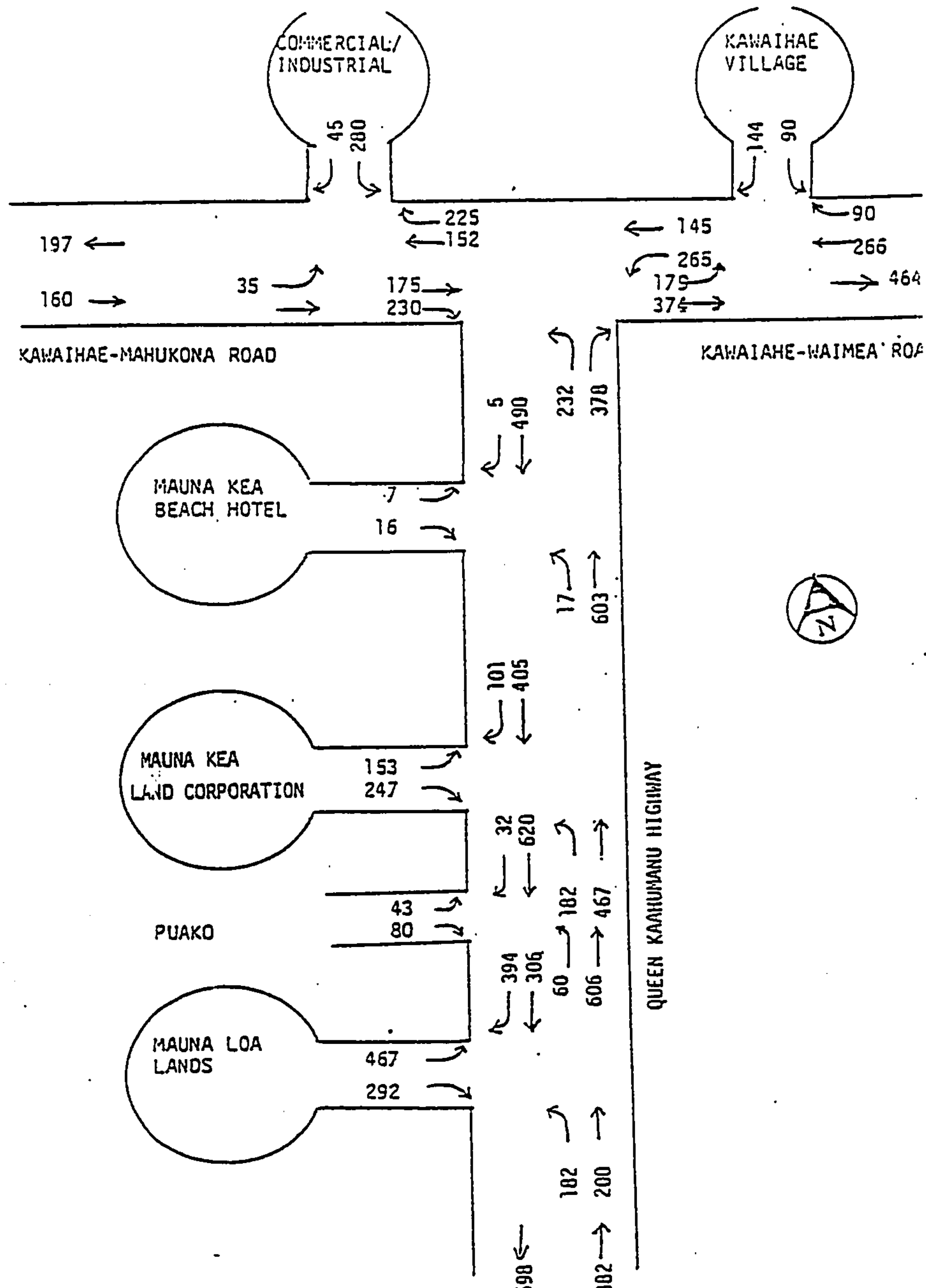


FIGURE III-8. PEAK HOUR ASSIGNMENT OF GENERATED TRIPS

The results of the two forecasts (i.e., of project-related and non-project-related traffic in 1990) were combined to arrive at the total daily and peak-hour traffic estimates shown in Figure III-9 and III-10. According to the Voorhees study, (19796:4) project-related traffic would amount to over 60 percent of the forecast traffic on both Queen Ka'ahumanu Highway and Kawaihae Road. The daily traffic forecast for the Hawaii Belt Road near the Parker Ranch Shopping Center is 12,700 vehicle trips. The peak-hour volumes projected for Queen Ka'ahumanu Highway are four to six times the existing levels.

Traffic Impact Analysis

Once the traffic projections presented above were completed, they were analyzed to determine the extent to which they would affect roadway service levels (Alan M. Voorhees & Associates, 1979b:4):

"A volume/capacity (V/C) analysis was conducted at each of the critical intersections to determine the impact of the proposed development on the local highway network. The same methodology and assumptions used in the original study were utilized. The results of the analysis are summarized in Table 6 [III-41].

"The V/C analysis indicates that capacity problems would occur at each of the intersections. Each of the left turn lanes on the resort access roadways would be over capacity. Vehicles turning left into the Mauna Loa Land resort project would also have capacity problems which would manifest themselves as long queues. Each of the approaches for the Mauna Loa Land project are over capacity, indicating the need for a second access roadway, or possibly, signalization of the intersection. Each approach of the Queen Ka'ahumanu Highway-Kawaihae Road intersection is above capacity, indicating the need for some highway improvement or mitigating circumstances.

"There are several mitigating circumstances which would tend to lessen the impacts described above, including traffic diversion, more buses, and new roadway projects. A large portion of the additional traffic (about 1,800 vehicles per day) is expected to be through-traffic travelling between East and West Hawaii. Much of this traffic could divert to the Hawaii Belt Road if traffic conditions on Queen Ka'ahumanu Highway became too congested. As a result, the daily traffic volumes shown on Figure 5 [III-9] could be reduced by as much as 900 vehicles in each direction.

"The larger number of first-class hotels (as opposed to luxury hotels) proposed in this study would tend to cater to tour groups which are more amenable to using tour buses. This may have some impact upon the visitor-generated traffic. However, this reduction would be minimal as low trip-generation rates for visitors have already been assumed. A shuttle bus service for employees living in the area may also tend to reduce the number of employee trips.

"The realignment of Kawaihae Road has been proposed for several years but design has not been implemented. One proposed alignment would intersect Queen Ka'ahumanu Highway across the Hapuna Beach Park

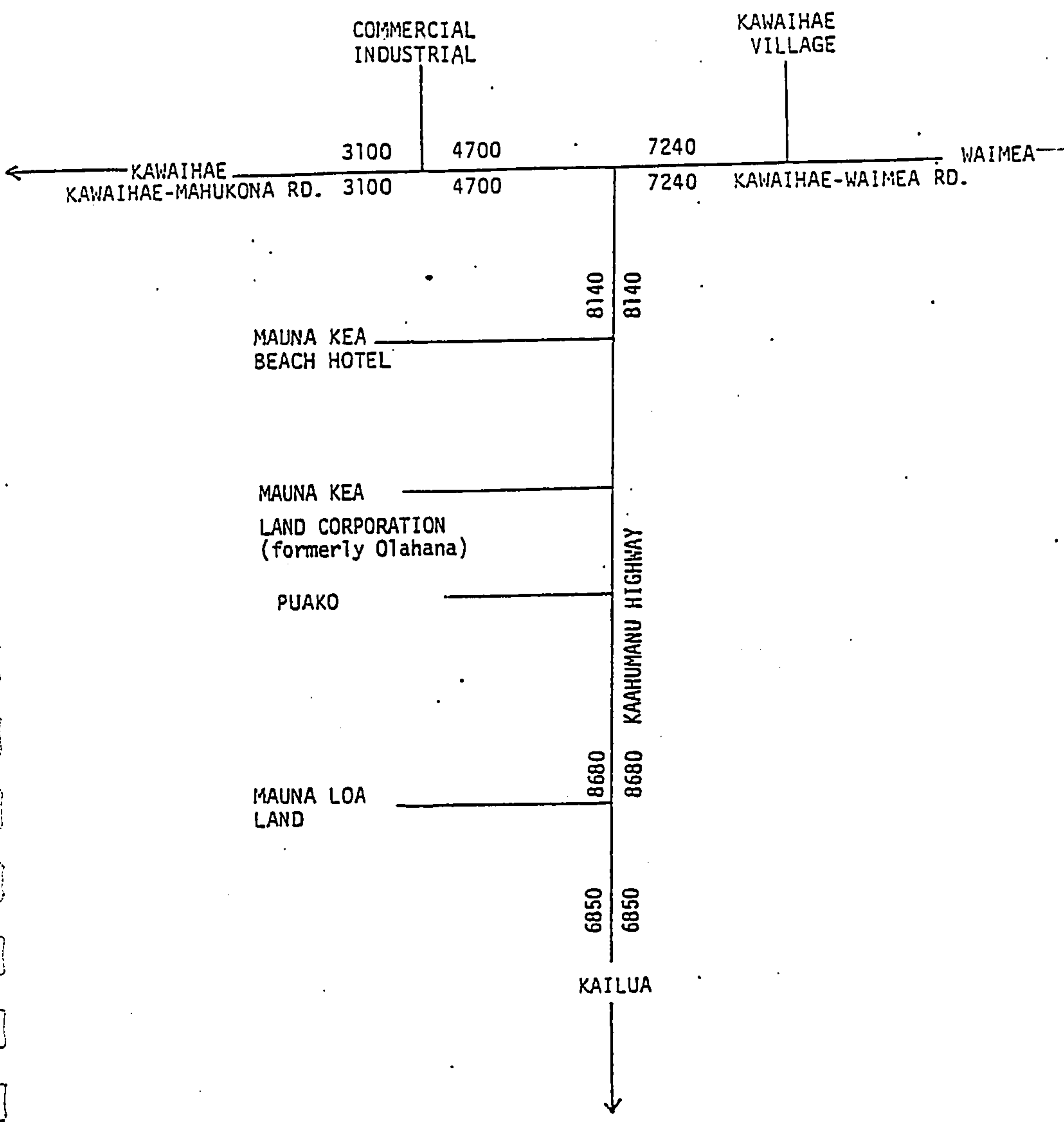


FIGURE III-9. 1990 DAILY FORECAST WITH PROJECT

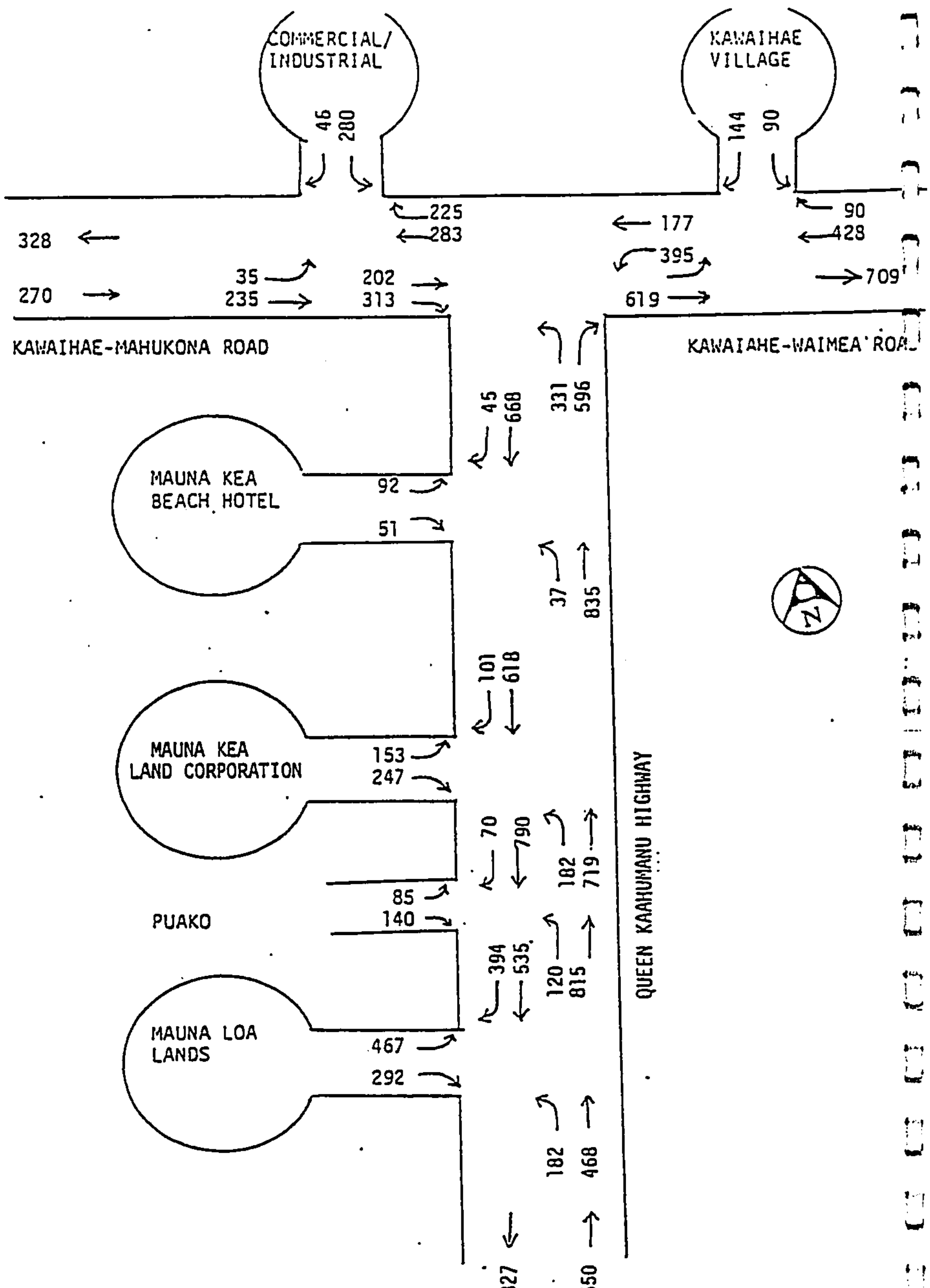


FIGURE III-10. 1990 PEAK HOUR FORECAST W/PROJECT

Table III-41. PM peak-hour traffic impact summary: Intersection volume/capacity ratios.

Intersection on Queen Ka'ahumanu	Approach	Existing 1979	1990 W/ Project
Kawaihae Road	Left turn to Kawaihae	0.18	1.74
	Left turn to Kona	0.12	1.39
	Tight turn to Waimea	0.19	1.32
Mauna Kea Beach Hotel Access Road	Left turn to Kawaihae	0.20	1.67
	Left turn to Hotel	0.04	0.18
	Right turn to Kona	0.07	0.23
Mauna Kea Land Corp. Access Road	Left turn to Kawaihae	N/A	2.78
	Left turn to Development	N/A	0.87
	Right turn to Kona	N/A	1.00
Mauna Loa Lands Access Road	Left turn to Kawaihae	N/A	4.67
	Left turn to Development	N/A	1.21
	Right turn to Kona	N/A	1.06

Source: Alan M. Voorhees & Associates.

access road, south of the Olohana [now Mauna Kea Land Corporation] project site. This realignment would tend to reduce traffic volumes on Kawaihae Road and the north end of Queen Ka'ahumanu Highway. This reduction would tend to increase the capacities of left turn lanes at the Mauna Kea Beach Hotel and Mauna Kea Land Corporation access roads.

"The realignment at the Waimea terminus of the roadway would also tend to reduce traffic volumes on the Hawaii Belt Highway through the town.

"The large forecasted volumes would require future engineering evaluation of traffic volume and accident experience based on future field data to be collected at the resort access points. The large volumes of left turns from the access roadways may also indicate the eventual installation of traffic signals to permit these vehicles access onto the highway. If these intersections were signalized, they would be operating at level of service C to D, and are not expected to have capacity problems. Even with signalization, the large number of left turns from the Mauna Loa Land development may require a second access roadway in time."

AIR QUALITY IMPACTS*

SECONDARY IMPACTS OF THE PROPOSED LALAMILO WATER SYSTEM

Introduction

Completion of the proposed Lalamilo Water System will enable a number of major developments to proceed in the South Kohala area. These residential-resort developments will in turn have a variety of impacts on the present rural, undeveloped environment. One of these secondary impacts will involve air quality, and the purpose of this analysis is to assess the significance of that impact. Primary attention was paid to emissions and pollutant concentrations emanating from vehicular traffic generated by the project, but other project-related sources, i.e., power generation and construction activity were also addressed. In the following sections, the data and analytical methods employed are described as well as the results and conclusions of the analyses.

Existing Air Quality

As noted above, the study area is largely rural and undeveloped at the present time. There are no major stationary sources in the area and the existing highways, i.e., Queen Ka'ahumanu Highway and Kawaihae Road, carry relatively light traffic volumes, i.e., average daily traffic of 3,100 or less (Alan M. Voorhees & Associates, unpublished data on the secondary traffic impacts of the Lalamilo Water Supply System, Honolulu, 1979). On this basis, one would expect only slight degradation of air quality. The nearest air-monitoring station operated by the State Department of Health is located at Hilo some 60 miles east-southeast of the project area on the east coast of Hawaii. Recent data from that station are summarized in Table III-42 and also indicate good air quality. Unfortunately, there are no carbon monoxide (CO) data for Hawaii County. It should also be noted that the worst air pollution episodes experienced in the County are due to the infrequent and unpredictable volcanic eruptions. While volcanic emissions have not been completely characterized, it is well known that high particulate levels are generated along with mercury and sulfur-containing gases. The latest emissions inventory for the County is presented in Table III-43.

Surface Winds

The nearest site for which wind data were readily available was the Mauna Kea Beach Hotel located about one mile south-southwest of Kawaihae Village (U.S. Army Corps of Engineers, Pacific Ocean Division. Wind data, Mauna Kea Beach Hotel and Kawaihae Harbor, 1967). Raw data collected in 1967 were reduced to produce an annual wind rose as well as 0700 LST and 1600 LST wind roses (Tables III-44, III-45, III-46). The period of data collection ran from March through December 1967 and included 3,785 observations. Examination of the reduced data reveals a strong land-sea breeze regime dominating local air movement. East-southeast winds prevail during the night and early morning while west-northwest seabreezes occur during most of the daylight hours.

*This analysis has been prepared by J. W. Morrow, January 1980.

TABLE III-42

AIR QUALITY DATA - HILO, HAWAII

1975-79

	24-Hour Concentrations (ug/m^3)				
	1975	1976	1977	1978	1979*
Particulate Matter					
Range of values	12 - 89	11 - 64	15 - 80	13 - 169	17 - 65
Average concentration	30	30	32	34	33
Sulfur Oxides					
Range of values	<5 - 32	<5	<5	<5 - 45	<5 - 20
Average concentration	5	<5	<5	<5	<5
Nitrogen Dioxide					
Range of values	<5 - 29	9 - 29**	No Sampling		
Average concentration	16	20			

* 3 months of data

** 3 months of NO_2 data

SOURCE: State of Hawaii
Department of Health

TABLE III-43

COUNTY OF HAWAII

EMISSIONS INVENTORY

MAY 1978

TONS/YEAR

	Sulfur Oxides	Particu-lates	Carbon Monoxide	Hydro-Carbons	Nitrogen Oxides
Transportation					
Motor Vehicles	135	324	24,643	3,758	3,032
Aircraft	56	147	1,233	712	378
Vessels	201	27	50	38	166
Gasoline Handling & Evaporation	0	0	0	331	0
TOTAL:	392	498	25,926	4,839	3,576
Fuel Combustion in Stationary Sources					
Residential, Commercial, Institutional	38	20	11	9	50
Industrial	1,348	6,046	1,527	1,518	1,915
Steam-Electric Utilities	2,275	79	29	19	1,007
TOTAL:	3,661	6,145	1,567	1,546	2,972
Solid Waste Disposal					
Open Burning	3	153	1,116	236	43
Incineration	0	0	0	0	0
TOTAL:	3	153	1,116	236	43
Industrial Process Losses	64	1,989	0	1,625	0
Agricultural Field Burning	0	6,564	23,166	7,722	772
GRAND TOTAL	4,120	15,455	52,644	16,117	7,388

SOURCE: State of Hawaii Department of Health

TABLE III-44

ANNUAL WIND ROSE

MAUNA KEA BEACH HOTEL
1967

	Wind Speed (mph)					
Direction	<1 - 2	3 - 7	8 - 18	19 - 24	>24	All Speeds
N	.0005	.0008	.0000	.0000	.0000	.0013
NNE	.0082	.0092	.0008	.0000	.0000	.0182
NE	.0034	.0209	.0003	.0000	.0000	.0246
ENE	.0362	.0671	.0367	.0085	.0000	.1485
E	.0042	.0040	.0005	.0000	.0000	.0087
ESE	.0412	.0948	.1052	.0196	.0000	.2608
SE	.0048	.0320	.0092	.0000	.0000	.0460
SSE	.0079	.0048	.0040	.0000	.0000	.0166
S	.0040	.0021	.0000	.0000	.0000	.0061
SSW	.0008	.0021	.0003	.0000	.0000	.0032
SW	.0003	.0011	.0003	.0000	.0000	.0016
WSW	.0016	.0050	.0003	.0000	.0000	.0069
W	.0098	.0235	.0045	.0000	.0000	.0378
WNW	.0476	.2201	.0962	.0000	.0000	.3638
NW	.0011	.0029	.0000	.0000	.0000	.0040
NNW	.0135	.0132	.0008	.0000	.0000	.0275
All directions:	.1849	.5036	.2589	.0280	.0000	1.0000

Calms = .0246

DATA SOURCE: U.S. Army
Corps of Engineers
Pacific Ocean Division

TABLE III-45

0700 LST WIND ROSE

MAUNA KEA BEACH HOTEL
1967

Direction	Wind Speed (mph) 1 - 4	5 - 8	9 - 12	13 - 16	17 - 20	≥21	All Speeds
N	.0000	.0063	.0000	.0000	.0000	.0000	.0063
NNE	.0063	.0000	.0000	.0000	.0000	.0000	.0063
NE	.0252	.0252	.0000	.0000	.0000	.0000	.0504
ENE	.1761	.0755	.0126	.0000	.0000	.0000	.2642
E	.0063	.0189	.0000	.0063	.0000	.0000	.0315
ESE	.1572	.1447	.1006	.0252	.0692	.0063	.5032
SE	.0126	.0943	.0189	.0000	.0000	.0000	.1258
SSE	.0000	.0000	.0000	.0000	.0000	.0000	.0000
S	.0000	.0000	.0000	.0000	.0000	.0000	.0000
SSW	.0000	.0000	.0000	.0000	.0000	.0000	.0000
SW	.0000	.0000	.0000	.0000	.0000	.0000	.0000
WSW	.0000	.0000	.0000	.0000	.0000	.0000	.0000
W	.0000	.0000	.0000	.0000	.0000	.0000	.0000
WNW	.0126	.0000	.0000	.0000	.0000	.0000	.0126
NW	.0000	.0000	.0000	.0000	.0000	.0000	.0000
NNW	.0000	.0000	.0000	.0000	.0000	.0000	.0000
All Directions:	.3963	.3649	.1321	.0315	.0692	.0063	1.0003

DATA SOURCE: U.S. Army Corps of Engineers
Pacific Ocean Division

TABLE III-46

1600 LST WIND ROSE

MAUNA KEA BEACH HOTEL
1967

	Wind Speed (mph)						
Direction	1 - 4	5 - 8	9 - 12	13 - 16	17 - 20	≥21	All Speeds
N	.0000	.0000	.0000	.0000	.0000	.0000	.0000
NNE	.0000	.0000	.0000	.0000	.0000	.0000	.0000
NE	.0000	.0000	.0000	.0000	.0000	.0000	.0000
ENE	.0061	.0000	.0000	.0000	.0000	.0121	.0182
E	.0000	.0000	.0000	.0000	.0000	.0000	.0000
ESE	.0000	.0000	.0061	.0000	.0121	.0000	.0182
SSE	.0061	.0000	.0000	.0000	.0000	.0000	.0061
S	.0061	.0000	.0000	.0000	.0000	.0000	.0061
SSW	.0000	.0000	.0000	.0000	.0000	.0000	.0000
SW	.0000	.0000	.0000	.0000	.0000	.0000	.0000
WSW	.0000	.0000	.0000	.0000	.0000	.0000	.0000
W	.0182	.1152	.0000	.0000	.0000	.0000	.1334
WNW	.0788	.5455	.1576	.0121	.0000	.0000	.7940
NW	.0000	.0061	.0000	.0000	.0000	.0000	.0061
NNW	.0121	.0061	.0000	.0000	.0000	.0000	.0182
All directions:	.1213	.6790	.1637	.0121	.0121	.0121	1.0004

DATA SOURCE: U.S. Army Corps of Engineers
Pacific Ocean Division

Long-Term Impact

Traffic

Current and projected traffic volumes, average speeds and vehicle mix used in the air quality impact analyses were taken from a traffic report prepared as part of the Lalamilo System secondary effects studies (Voorhees, 1979). The specific highway sections studied include Queen Ka'ahumanu Highway from the entrance to the proposed Mauna Loa Land, Inc. project north to the intersection with Kawaihae Road and one-mile segments of Kawaihae Road to the east and west of that same intersection.

Electrical Generation

Electrical demand for the major developments which will be able to proceed as a result of completion of the Lalamilo System has been estimated at 4.3×10^7 Kwhr per year based on residential and hotel unit planning factors provided by the Hilo Electric Light Company for a previous project at Mahukona (J. W. Morrow. Air Quality Impact Assessment Report: Mahukona Resort Development, September 1979). Fuel requirements were estimated based on the use of residual oil.

Emission Factors

In order to estimate both emissions and ambient air quality impact attributable to motor vehicles, appropriate emission factors had to be computed. These were based on analysis year; site-specific average speed, percent cold start, and vehicle mix; and low-altitude vehicle emission factors as reported by the U.S. Environmental Protection Agency.* Emission factors for electrical generation were based on 2-percent sulfur fuel and were taken from EPA publication AP-42 (EPA, 1978).

Annual Emissions

Using the current and projected traffic data, estimates of annual pollutant emissions were computed. The results are displayed in Table III-47. Since the traffic study indicated that the traffic generated by the various proposed projects would exceed the capacities of the existing highways, it was not possible to project annual emissions for a 1990 "with project" scenario. Such projections will have to be made at the time the EIS for the highway improvements necessary to accommodate the forecast traffic is prepared. This analysis indicates that carbon monoxide (CO) and hydrocarbons (HC) would be expected to decline by 1990 due to the federal motor vehicle emission control program which would overcome the relatively small projected traffic increase that is projected without the various proposed developments. On the other hand, oxides of nitrogen (NOx), sulfur oxides (SOx) and particulates

*Federal Highway Administration, Office of Environmental Policy, Noise and Air Quality Branch. Tabulation of Selected Low-Altitude Vehicle Emission Factors Based on EPA's Mobile Source Emission Factors dated March 1978, September 1978 and U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors (Third Edition) with Supplements 1-8, May 1978.

TABLE III-47

ESTIMATED ANNUAL TRAFFIC-GENERATED EMISSIONS IN THE VICINITY OF THE QUEEN KAAHUMANU HIGHWAY-KAWAIHAE ROAD INTERSECTION

	Annual Emissions (Tons/Year)	
Pollutant	1979	1990 w/o Project
Carbon monoxide	235	193
Oxides of nitrogen	37	38
Hydrocarbons	34	18
Sulfur oxides	2	3
Particulate matter	4	6

(PM) appear to increase over the same period. In the case of NOx, this is due to less stringent emission standards as compared with CO and HC. In the case of SOx and PM, no emission standards have been set. The significantly greater traffic volumes associated with the development of the various projects would clearly result in much higher emissions of each of the aforementioned pollutants, but since the quantities are a function not only of volume, but of speed and mix as well, quantification will have to wait for decisions to be made regarding highway improvement.

In the case of electrical power generation, it was possible to estimate the additional increments of pollutant emissions arising if the various projects are completed by 1990. The results are displayed in Table III-48 and indicate the additional tons per year of each of the major pollutants. These emissions may be compared with the County inventory in Table III-43.

Ambient Air Quality Impact

Long Term

Due to the present state-of-the-art in air quality modeling, microscale analyses such as this are generally limited to estimating concentrations of non-reactive pollutants. For projects involving motor vehicles as the principal air pollution source, carbon monoxide is normally selected for modeling because it is relatively inert in the atmosphere and it comprises the largest fraction of pollutant emissions. In this instance, the microscale analysis focused on the Queen Ka'ahumanu Highway-Kawaihae Road intersection since the traffic studies indicated that it had the highest current and projected volumes. The EPA-developed computer model PAL (U.S. Environmental Protection Agency. Users Guide for PAL: A Gaussian-Plume Algorithm for Point, Area and Line Sources, February 1978) was used to estimate 1-hour CO concentrations at an array of potential receptor locations in close proximity to the intersection. The analysis was "worst case" in the sense that peak-hour traffic volumes and meteorological conditions known to produce concentration maxima were input to the model. The results of this analysis are summarized in Figure III-11. Comparing these 1-hour CO concentrations with the state and federal standards (Table III-49) suggests that under existing conditions and projected conditions (without the Lalamilo System) standards would be met. The 1-hour estimates are in fact lower than the more stringent 8-hour standards thus suggesting that the latter standards would also be met. Again, as in the case of annual emissions, it did not seem appropriate to model conditions for the "with project" scenario since the traffic study indicated that the major intersections and therefore the highway would not be capable of accommodating the projected traffic volumes. Such modeling would be appropriately done when and if the highway is expanded. At that time, the correct design and operating parameters could be input to the model. For the present, suffice it to say that if the highway is not expanded and the projected traffic volumes are realized, then it is highly probable that state standards would be exceeded and possibly even the federal standards.

The emissions resulting from electric power generation will of course impact on ambient air quality, but this is more difficult to quantify since the source of the power is not necessarily a single plant in the immediate project area and may in fact be several power plants at widely dispersed sites; thus, the impact may be more regional than local.

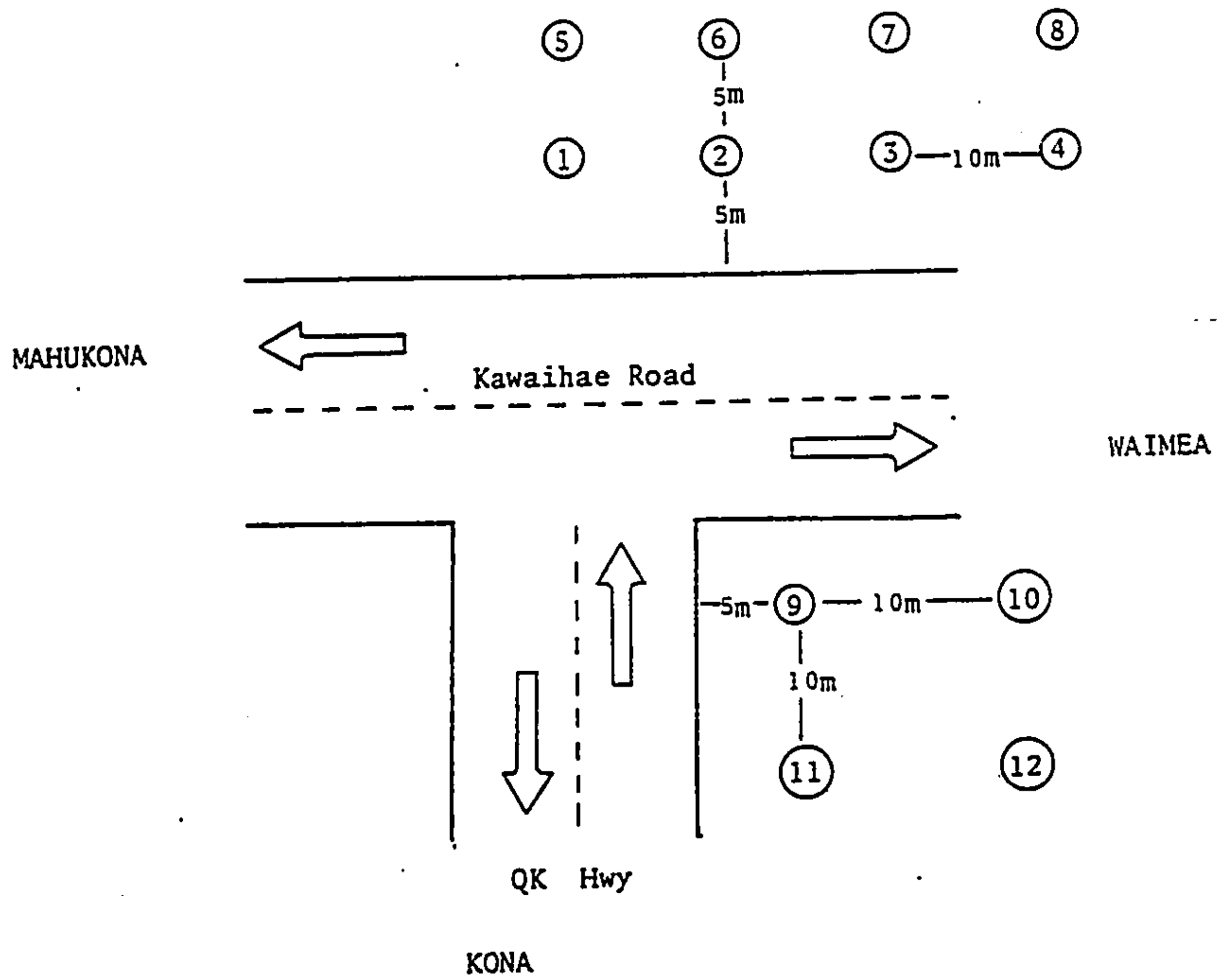
TABLE III-48

ESTIMATED INCREASE IN ANNUAL ELECTRIC POWER-GENERATED EMISSIONS AS A RESULT OF PROJECT COMPLETION
1990

Pollutant	Emissions (T/yr)
Sulfur oxides	170
Oxides of nitrogen	56
Particulate matter	12
Carbon monoxide	3
Hydrocarbons	1

FIGURE III-11

ESTIMATED 1-HOUR CARBON MONOXIDE CONCENTRATIONS
AT THE QUEEN KAAHUMANU-KAWAIHAE ROAD INTERSECTION
1979 AND 1990



RECEPTOR	1-HOUR CARBON MONOXIDE CONCENTRATION (mg/m^3)	
	EXISTING CONDITIONS (1979)	WITHOUT PROJECT (1990)
1	2.7	1.2
2	7.0	3.5
3	3.1	1.9
4	0.8	0.5
5	1.9	0.9
6	7.8	3.4
7	3.3	2.0
8	0.9	0.6
9	4.0	2.2
10	0.5	0.3
11	3.4	1.9
12	0.2	0.1

Meteorology: 1 m/sec winds parallel to QK Highway

TABLE III-49

SUMMARY OF STATE OF HAWAII AND FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Sampling Period	Federal Standards Primary[a]	Federal Standards Secondary[b]	State Standards
1. Suspended Particulate Matter (TSP) (micrograms per cubic meter)	Annual Geometric Mean	75	60	—
	Annual Arithmetic Mean	—	—	55
	Maximum Average in Any 24 Hours	260	150	100
2. Sulfur Dioxide (SO_2) (micrograms per cubic meter)	Annual Arithmetic Mean	80	—	20
	Maximum Average in Any 24 Hours	365	—	80
	Maximum Average in Any 3 Hours	1300		400
3. Carbon Monoxide (CO) (milligrams per cubic meter)	Maximum Average in Any 8 Hours	10		5
	Maximum Average in Any 1 Hour	40		10
4. Hydrocarbons (HC) Non-methane (micrograms per cubic meter)	Maximum Average in Any 3 Hours	160		100
5. Photochemical Oxidants (micrograms per cubic meter)	Maximum Average in Any 1 Hour	240		100
6. Nitrogen Dioxide (NO2) (micrograms per cubic meter)	Annual Arithmetic Mean	100		70
	Maximum Average in Any 24 Hours	—		150
7. Lead (micrograms per cubic meter)	Calendar Quarter	1.5		N/A

[a]Intended to prevent adverse effects on public health.
[b]Intended to prevent adverse effects on public welfare including effects on comfort, visibility, vegetation, animals, aesthetic values, and soiling and deterioration of materials.

Short Term

The principal source of short-term air quality impact will be construction activity. Construction vehicle activity will increase automotive pollutant concentrations along Queen Ka'ahumanu Highway and Kawaihae Road as well as at the various project sites themselves. Increased truck traffic on those highways will also reduce their level of service and lower average operating speed. This also contributes to higher emissions. Site preparation and earth moving will create particulate emissions as will building and on-site road construction. Construction vehicle movement on unpaved on-site roads will also generate particulate emissions. Since the area is very dry due to an annual rainfall of only 10 to 15 inches, it will be important to employ continuous and effective dust-suppression measures. Failure to do this will undoubtedly result in violation of state and possibly federal particulate standards. This will become even more important in later phases as more people will then be living in the area. The sea breeze that seems to dominate most of the daylight hours will carry particulate emissions inland providing further reason for effective dust control.

Conclusions and Discussion

Based on the foregoing analysis, the following conclusions may be drawn:

One of the Lalamilo System's principal secondary impacts will be on air quality. This will be due to the various residential/resort developments which will be able to proceed once water supply is assured. These latter projects will have a long-term impact on air quality primarily due to the motor vehicle traffic that they will generate. Unless the current road system is expanded to meet the projected demand, state and possibly federal air quality standards are likely to be exceeded at locations near major intersections. This is not to say that highway improvement will completely eliminate the probability of standards violations, but such improvement will certainly reduce near-roadway ambient concentrations.

The residential/resort developments will also create an electrical demand which under the existing system will be met by the burning of oil. Such burning will result in pollutant emissions at locations other than the development sites thereby contributing to regional air quality degradation. Development of geothermal energy on the Island of Hawaii may help reduce this potential impact. Extensive use of solar water heating in the designs of the various projects could be another potential mitigating factor.

Short-term impact will be primarily the result of on-site construction activity. Suspended particulate levels could easily exceed state and possibly federal standards if adequate dust-control measures are not employed. The South Kohala area is very dry and thus would be highly subject to fugitive dust emissions.

NOISE IMPACTS

The water system noise, while significant, will be only temporary and so far removed from any existing development as not to effect any residents of the region. The noise impacts, therefore, will be addressed in the level of secondary development only. This will effectively deal with long-range noise effects of the resort/residential developments which will be made possible by the implementation of this water system. Two significant noise impact areas can be identified within the secondary growth framework of analysis: 1) noise associated with construction and operation of resorts and housing areas; and 2) traffic noise.

Resort and Housing Construction Noise Analysis

Though the construction noise can be potentially significant and will adversely affect a growing number of people (as individual increments of development become completed), it will still be of only a temporary nature. It would be difficult, at this time, to define the exact noise levels and associated impacts because there is not enough information available pertaining to the type of structures and the phasing of implementation. It is also not known what precise type of equipment would be used. The noise associated with operation of particular resorts and housing areas will not be significant, except with respect to increased local and regional traffic. This section, therefore, is primarily concerned with the traffic noise analysis.

Traffic Noise Analysis*

Objectives

This section describes the existing and anticipated noise levels in the environs of the anticipated resort/residential developments in South Kohala, and evaluates potential noise conflicts which may arise as a result of the developments with emphasis placed upon traffic noise. Recommendations for minimizing potential noise impacts are also provided when applicable.

Summary of Findings

The proposed resort/residential developments within the Lalamilo Water System Service Area will increase traffic noise levels by 1 to 6 dB above non-project traffic noise in 1990. Additionally, growth in non-project traffic by 1990 will increase traffic noise levels by 1 to 3 dB. All direct access roadways to the development areas (Queen Ka'ahumanu Highway, Kawaihae-Mahukona Road and Kawaihae Road) will experience the larger traffic volume increases (as a percentage of existing traffic), and will also experience the larger increases in noise levels. Some residential or noise sensitive units within 50 to 100 feet of a major roadway servicing the proposed projects may be exposed to traffic noise levels in excess of current criteria as a result of these developments. Other units beyond a 100-foot setback may experience higher background ambient noise levels due to the increased traffic. Noise

*Prepared by Darby-Ebisu & Associates, Inc.

mitigation measures such as noise barriers, sound insulation of buildings, vehicle speed reductions, and roadway realignment are available as possible short- and long-term remedial measures to mitigate the traffic noise level increases.

Noise Descriptors* and Their Relationship to Land Use Compatibility

A general trend has developed toward the increasing use of the Day-Night Sound Level (L_{dn}) in describing environmental noise in general. Environmental Protection--Planning in the Noise Environment, jointly published by the Air Force, Army and Navy in June 1978, adopts the L_{dn} metric. "HUD Environmental Criteria and Standards, 24 CFR Part 51," Federal Register, adopted as a replacement of HUD Circular 1390.2 (a pioneer document), also utilizes the L_{dn} metric. The U.S. Environmental Protection Agency (EPA) is working toward the development of a "uniform federal statement and guidance package on the noise element of land use control" (see "Land Use: EPA Launches Effort to Consolidate Federal Land Use Guidance," Noise Regulation Reporter). Because of EPA's prior support of the L_{dn} metric (see The National Academy of Science's Guidelines for Preparing Environmental Impact Statements on Noise), it is likely that the L_{dn} metric will be included in this future uniform guidance. A general consensus among federal agencies has developed whereby residential housing is considered acceptable where exterior noise does not exceed L_{dn} 65. EPA's prior recommendation of L_{dn} 55 or less for residential housing has not been adopted by other federal agencies, but is recognized as a desirable long-term goal.

Table III-50, extracted from Guidelines for Preparing Environmental Impact Statements on Noise, describes the typical variation of L_{dn} for various neighborhood categories. Levels of L_{dn} 60 or greater are typical along city streets whose daily traffic volume exceeds 2,500 vehicles. L_{dn} 65 to 70 are typical values for city business districts where traffic is a dominant noise source.

Table III-50. Typical values of yearly day-night average sound level for various residential neighborhoods where there are no well-defined sources of noise other than usual transportation noise.

Description	L_{dn} - dB
Rural (undeveloped)	35
Rural (partially developed)	40
Quiet Suburban	45
Normal Suburban	50
Urban	55
Noisy Urban	60
Very Noisy Urban	65

*A brief description of the acoustic terminology and symbols used are provided in Appendix E.

Existing (1978) Noise Environment

Exterior noise measurements were obtained on November 20 and November 21, 1979 along existing roadways which would service the resort developments. These measurements were made to verify the accuracy of the traffic noise prediction method (see DOT's FHWA Technical Advisory T 50405.5) and to form a basis for estimating the potental noise impact of the developments in 1990. Noise measurements obtained were compared with predicted noise levels for the observed traffic volumes, speeds, and local shielding effects. All sound levels used in this report are A-weighted sound levels (L_A) unless otherwise indicated.

Table III-51 presents the results of traffic noise measurements along the streets which are anticipated to service the vehicles associated with the proposed developments. Comparisons between measured and predicted traffic *noise are presented. Spot counts of traffic volume by vehicle types (automobiles, medium trucks, and heavy trucks) were also obtained in order to* generate the predicted equivalent sound levels (L_{eq}). As shown in Table III-51, good agreement between measured and predicted sound levels were obtained for all locations. Hence, the highway noise prediction methods of the DOT's FHWA Technical Advisory T 50405.5 were utilized for computing existing and future traffic noise levels.

Table III-52 presents existing (1978) traffic noise levels at various distances from the roadway centerlines. The Day-Night Sound Level (L_{dn}) descriptor was utilized to express traffic noise levels. Hourly traffic volumes and vehicle mixes were obtained from traffic projections done by Alan Voorhees dated November 13, 1979 in order to compute the L_{dn} values shown.

Existing residential and other noise-sensitive developments fronting the major roadways examined are currently exposed to highway noise levels at or below acceptable criteria level of 65 L_{dn} established by HUD.* Setbacks of residential units are generally 100 feet or greater from the roadway centerlines, although some units in Waimea and Kawaihae have 30- to 50-foot setbacks. Homes with the larger setbacks are generally exposed to levels below HUD criteria, and homes with smaller setbacks are exposed to levels at the HUD criteria level. Currently, by HUD standards, special highway noise mitigation measures are not required for residential areas along the major roadways examined.

Future (1990) Noise Environment

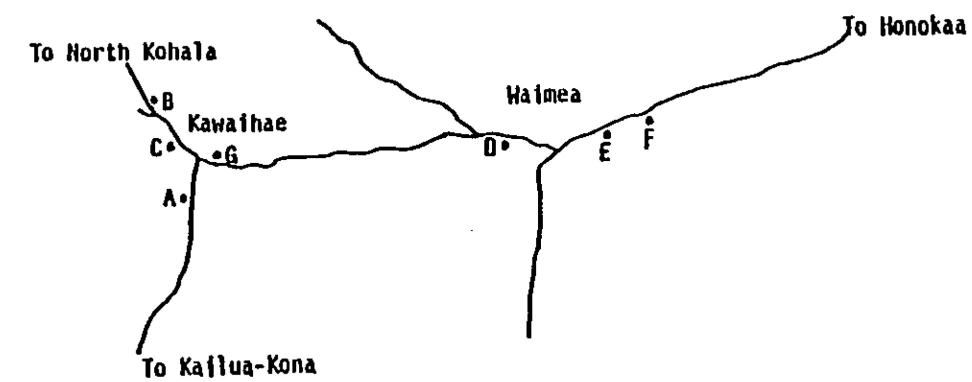
Future traffic noise with and without the proposed developments were computed to determine the respective increases in noise levels over the existing conditions. Daily traffic volumes used in the computations of L_{dn} were obtained from Alan M. Voorhees & Associates through Belt, Collins & Associates. The following assumptions were utilized in performing the noise analyses:

*Accuracy of L_{dn} values are estimated at 1 to 2 dB.

TABLE III-51.

COMPARISON OF MEASURED AND PREDICTED TRAFFIC NOISE

Roadway	Location	Ave.Speed (MPH)	Time of Day (HRS)	Hourly Traffic Volume Auto	Med.Trucks	Heavy Trucks	Measured L_{eq}[1] (dB)	Predicted L_{eq}[1] (dB)
Q.Kaahumanu Hwy.	A-1.3 Miles south of Kawaihae Rd. Intersection	50	1606 to 1700	147	0	4	51.3	51.9
Kawaihae-Mahukona Hwy.	B-0.4 Miles north of service station in Kawaihae	55	1724 to 1746	63	0	0	56.6	57.0
Kawaihae-Mahukona Road	C-1.0 mile west of Q.Kaahumanu Hwy Intersection	45	1756 to 1820	105	0	3	55.5[2]	55.8[2]
Kawaihae-Road	D-Valley View Pre-School	35	0703 to 0720	240	30	8	63.5	63.9
Hawaii Belt Road	E-0.5 Miles north of Kawaihae Rd. Intersection towards Honokaa	30	0733 to 0833	537	12	19	64.6	64.6
Hawaii Belt Road	F-2.5 Miles north of Kawaihae Rd. Intersection towards Honokaa	47	0845 to 0901	304	9	14	66.6	66.8
Kawaihae Road	G-On Hulukupana St. adjacent to Kawaihae Village Development	45	1031 to 1131	168	3	11	59.5[3]	58.9[3]



[1] 50 FT setback distance from centerline of roadway unless otherwise indicated.
[2] 95 FT setback distance from centerline of roadway.
[3] 120 FT setback distance from centerline of roadway.

Source: Darby-Ebisu & Associates, Inc.

TABLE III-52.

EXISTING (1978) AND FUTURE (1990) TRAFFIC NOISE LEVELS

Roadway	Location	Ave. Speed (MPH)	Distance from Centerline (FT)	Daily Volume/L_{dn} Existing	Daily Volume/L_{dn} Future w/o Project	Daily Volume/L_{dn} Future with Project
Q. Kaahumanu Hwy.	Toward Kailua-Kona and South of Mauna Loa Land Development	50	50	1749/63	3760/66	13,700/71 to 65
			100	1749/59	3760/62	13,700/66 to 60
			200	1749/54	3760/57	13,700/62 to 56
Q. Kaahumanu Hwy.	South of Kawaihae Rd. Intersection in development area	50	50	3529/67	5240/68	16,280/72 to 66
			100	3529/62	5240/63	16,280/67 to 61
			200	3529/58	5240/59	16,280/63 to 57
Kawaihae-Mahukona Road	Between Q. Kaahumanu Hwy. and Kawaihae Harbor	45	50	2445/64	2700/64	9400/69 to 63
			100	2445/59	2700/60	9400/65 to 59
			200	2445/55	2700/55	9400/60 to 54
Kawaihae-Mahukona Road	Kawaihae Village Commercial area	35	30	2445/64	2700/64	6200/70 to 64
			50	2445/59	2700/60	6200/65 to 60
			100	2445/55	2700/55	6200/60 to 55
Kawaihae-Mahukona Highway	North of Kawaihae towards North Kohala	55	50	2445/66	2700/66	6200/69 to 63
			100	2445/61	2700/62	6200/65 to 59
			200	2445/57	2700/57	6200/60 to 54
Kawaihae Road	From Kawaihae Village Development to Waimea	45	50	2790/66	4920/68	14,480/71 to 66
			100	2790/61	4920/63	14,480/66 to 60
			200	2790/57	4920/59	14,480/62 to 57
Kawaihae Road	35 MPH Posted Speed Zone in Waimea	35	50	2790/64	4920/66	14,480/69 to 64
			100	2790/59	4920/62	14,480/65 to 59
			200	2790/55	4920/57	14,480/60 to 55

TABLE III-52 (Continued)

EXISTING (1978) AND FUTURE (1990) TRAFFIC NOISE LEVELS

Roadway	Location	Ave. Speed (MPH)	Distance from Centerline (FT)	Daily Volume/L_{dn} Existing	Daily Volume/L_{dn} Future w/o Project	Daily Volume/L_{dn} Future with Project
Kawaihae Road	Near Hawaii Belt Road Intersection in Waimea	25	50	6689/59	8722/60	11,303/62 to 58
			100	6689/55	8722/56	11,303/58 to 53
Hawaii Belt Road	Near Kawaihae Road Intersection in Waimea towards Honokaa	30	50	7516/62	9800/63	12,700/64 to 58
			100	7516/57	9800/58	12,700/59 to 53
			200	7516/53	9800/54	12,700/55 to 49
Hawaii Belt Road	Past Waimea Commercial area towards Honokaa	47	50	7516/66	9800/67	12,700/68 to 62
			100	7516/62	9800/63	12,700/64 to 57
			200	7516/57	9800/58	12,700/59 to 52

- o For future traffic without the project implemented, vehicle speeds and mixes were assumed to be identical to 1978 values. The relative variations in hourly traffic volumes were also assumed to be proportional to 1978 volumes.

- o For future traffic with the project implemented, the relative variation in hourly traffic volumes and vehicle mixes were considered to be proportional to those provided in "Traffic Projections with the Project Implemented," by Alan M. Voorhees & Associates, Inc. dated November 20, 1979.

Due to roadway capacity problems anticipated in 1990 following implementation of the project developments, uncertainties in future traffic flow, and uncertainties in the types of roadway improvements necessary to accommodate the increased traffic volumes, 1990 noise levels following project development were calculated over a range of vehicle speeds. Highway noise levels are strongly dependent upon speed, and vary by approximately 4 decibels per 10-miles-per-hour change in speed. Therefore, 1990 noise levels with the project implemented were calculated for current (1978) speeds, as well as for speeds 50 percent lower than current values.

Table III-52 presents the futue traffic noise levels in L_{dn} units for comparison with existing levels. Future traffic noise with and without the project developments are shown to indicate the increases in traffic noise attributable to the proposed developments. 1990 traffic noise without the project will increase by 1 or 2 dB on all roadways except for Queen Ka'ahumanu Highway (toward Kailua-Kona), where a 3 dB increase is anticipated. As a result of this growth in traffic volume, residential units in the 45-mile-per-hour speed zones in Waimea, and within 50 feet of Kawaihae Road and the Hawaii Belt Road will be exposed to highway noise in excess of HUD criteria (65 L_{dn}). However, without the project, residential units at setbacks of 100 feet or greater should not be exposed to noise levels above HUD criteria.

Following implementation of the project developments in 1990, the following increases in traffic noise are predicted:

1. Queen Ka'ahumanu Highway--Large increases in traffic noise are anticipated if average vehicle speeds of 50 miles per hour are maintained. Increases of 4 to 5 dB above 1990 noise levels without the project and increases of 5 to 8 dB above existing noise levels are anticipated. Setbacks of residential units in excess of 150 feet from the highway will be required to meet HUD criteria.

2. Kawaihae-Mahukona Road and Kawaihae Road--5 to 6 dB increases over existing and future (without the project) traffic noise levels are anticipated in Kawaihae, at the Kawaihae Village Development, and at the western portion of Waimea. Minimum setbacks of 100 feet for residential units will be required to meet HUD criteria in all areas except for the Kawaihae Village Commercial area, where 50-foot setbacks will be sufficient.

3. Kawaihae-Mahukona Highway and Hawaii Belt Road--2 to 4 dB increases in existing traffic noise levels are anticipated along the highway between Kawaihae and North Kohala, and in Waimea along

the Hawaii Belt Road to Honokaa. Increases of 1 to 3 dB in traffic noise above predicted 1990 noise levels without the project are anticipated for these areas. Minimum residential setback distances of 100 feet and 50 feet for the high speed (45 miles per hour or greater) and low speed (30 miles per hour or less) sections, respectively, are required to meet HUD criteria.

Impact of the increased traffic noise generated by proposed developments on existing residential units will range from 1 to 6 dB above that generated by non-project traffic in 1990. By the L_{dn} descriptor percentage increases in 24-hour cumulative noise exposure per dB increase in L_{dn} are: 26% for 1dB; 58% for 2 dB; 100% for 3 dB; 151% for 4 dB; 216% for 5 dB; and 298% for 6 dB. Residential units in Kawaihae and Waimea within 50- and 100-foot setbacks, respectively, from the roadways examined would warrant noise mitigation measures by HUD criteria. These measures could include noise barrier construction or sound insulation of the homes or a combination of both. *Other noise impacts resulting from the increased levels of background* traffic noise can be expected to occur for all residential units in West Waimea, Kawaihae, and Mauna Kea resort areas within 200 to 400 feet of the major roadways, unless these units are shielded from the roadways by natural terrain features or man-made construction items such as barriers or other buildings.

CHAPTER IV

CHAPTER IV. SUMMARY OF ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED

The direct impacts associated with the construction and operation of the Lalamilo Water System are generally short-term and/or insignificant. Those impacts which cannot be avoided include, on the temporary level, such things as the clearance of vegetation during the construction of pipelines, generation of dust and noise and some disruption of the animal population in the immediate area. These impacts are not considered to be significant. Once the actual construction work is completed, the areas that would be disturbed would return to essentially their pre-project state. The few reservoirs and other small facilities visible on the surface would have only a minimal visual impact. The actual operation of the system would not have significant impacts--as no unrenewable natural resources would be used. The water would not be "mined," but rather "harvested," and water is a rechargeable resource.

The water system-related future growth of South Kohala would have numerous adverse unavoidable environmental impacts. These include:

Population Growth

The development of an anticipated resort/residential network in South Kohala would necessitate considerable in-migration into the region, as the job opportunities would greatly exceed the locally available labor force. This additional population may contribute to increased social tensions within the area--as the new residents try to assimilate into the existing community. The population increase will also necessitate additional housing and an increased social service/facility network. The greater demand for housing can contribute to faster increases in property values--values which will already be escalating rapidly due to the introduction of new resorts and other facilities.

Impact on Biological Resources

While the construction and operation of the water system would have only minimal effect on the biological resources, the secondary growth of the region would considerably alter the vegetative and faunal composition of areas where construction activity would occur. Both the temporary disruption as well as long-term alterations of flora and fauna cannot be avoided.

Impacts on Traffic

The secondary growth in the South Kohala Coastal area would have several adverse impacts on traffic: The volume traffic analysis indicates that capacity problems would occur at each of the intersections. Each of the left turn lanes on the resort access roadways would be over capacity. Vehicles turning left into the Mauna Loa Land resort project would also have capacity problems which would manifest themselves as long queues. Each of the approaches for the Manua Loa Land project are over capacity, indicating the need for a second access roadway, or possibly, a signalization of the intersection. Each approach of the Queen Ka'ahumanu Highway-Kawaihae Road intersection is above capacity, indicating the need for some highway improvement or mitigating circumstances.

Noise Impacts

The proposed resort developments within the Lalamilo Water System Service Area will increase traffic noise levels by one to six dB above non-project traffic noise in 1990. Additionally, growth in non-project traffic by 1990 will increase traffic noise levels by one to three dB. All direct access roadways to the development areas (Queen Ka'ahumanu Highway, Kawaihae-Mahukona Road, and Kawaihae Road) will experience the larger traffic volume increases (as a percentage of existing traffic), and will also experience the larger increases in noise levels. Some residential or noise sensitive units within 50 to 100 feet of a major roadway servicing the project may be exposed to traffic noise levels in excess of current criteria as a result of the project. Other units beyond 100 feet setback may experience higher background ambient noise levels due to the increased traffic.

Air Quality Impacts

The long-term adverse impacts on air quality will result from two basic sources of pollution: automotive emissions and electric power generation. These impacts cannot be totally avoided, but can be greatly mitigated through a variety of measures (see Chapter VII). The principal souce of short-term air quality impacts will be construction activity. In the case of system construction, this pollution will not impact the existing community. The future resort/residential construction, however, will progressively affect increasing number of already completed projects.

Rationale for Proceeding with the Proposed Action

It must be expected that any large-scale development will bring with it numerous adverse impacts which cannot be avoided. In the case of the Lalamilo Water System, these impacts pertain mainly to the secondary growth, rather than to the system itself. The important issue is the comparative analysis, where the adverse impacts can be weighted against the positive aspects of the proposed action. In the case of resort/residential developments in South Kohala, the positive impacts appear to outweigh the negative ones: The growth will be consistent with the State and County policies--providing the region and the County with a greatly expanded economic base. The State encouraged dispersion of visitor industry outside of Oahu will also be helped considerably once the planned resorts become a reality. To this end, numerous significant government-financed projects have already been implemented in the region - as described in Chapter II. The proposed action is one crucial project which is yet to be implemented. Table III-1 summarizes those developments which have been significant in supporting both the State and County policy of establishing a major resort district along the South Kohala Coast. This new economic activity will assist in lowering the unemployment rate which has been high in the area, allowing many local young people who would otherwise have to leave the area to stay. The increased tax base would also aid in the improvement and expansion of the social service and facility network.

CHAPTER V

CHAPTER V. ALTERNATIVES TO THE PROPOSED LALAMILO WATER SYSTEM

Section 1:42.g. of the Environmental Quality Commission Environmental Impact Statement Regulations requires that EIS's contain:

> "A rigorous exploration and objective evaluation of the environmental impacts of all reasonable alternative actions..."

A "reasonable alternative" is defined as one which could feasibly attain the objectives of the action. In the case of the Lalmilo Water System, the objective of the proposed action is the provision of sufficient water to allow development of the resort and other commercial and residential uses called for in the area by State and County plans. The water system configuration shown in Figure I-1 utilizes the shortest possible transmission line route and the minimum number of reservoirs and other facilities; the system's wells are situated at as low an elevation as is considered prudent in view of the need for water with a low chloride content. In view of this, it is believed to be the least expensive means of tapping the region's groundwater resources. Since there are no significant direct environmental impacts that would result from construction of the system as it is now configured, no other layouts are presently under consideration. This leaves three basic alternatives to consider:

- o desalinization of brackish or seawater;
- o development of surface water;
- o no project.

These alternatives are discussed below.

ALTERNATIVE MEANS OF ACHIEVING THE PROJECT'S OBJECTIVES

The proposed Lalamilo Water System would provide a maximum of 5.3 MGD and an average of about 3.55 MGD to consumers in the Kawaihae to Puako region. In all technical and economic practicality, there are only two alternatives which could provide the same amount of water to users in this region: desalination of brackish groundwater or seawater; and further development of surface water of the Kohala watershed above Waimea.

Desalinization

Desalinization along the South Kohala coastline was evaluated in detail in a 1974 study done for the State (Duncan and Garrick, 1974). The basic conclusions of that study were (i) that brackish groundwater desalinization would be more economical than sea water desalinization, and (ii) that neither of these would be economically comparable with more conventional water supply alternatives. In fact, the cost of brackish desalinization quoted in the 1974 study, even without updating it to 1979 prices, is more than twice as great as present costs for either Kohakohau dam or the Lalamilo Water System (these costs will be presented subsequently). When this overwhelming economic disadvantage is considered along with a greater impact on the physical environment than the Lalamilo Water System would have, it is reasonable to dismiss desalinization from further consideration.

Further Development of Surface Water

Consideration of further development of surface water above Waimea led to a proposal by the State for a large dam at elevation 3,500 feet on Kohakohau Stream (Parsons Brinckerhoff-Hirota Associates, 1970). It was proposed to construct the dam in two increments, the first to result in a supply capacity of five MGD and the second to increase capacity to ten MGD. In terms of supply potential, the first construction increment is approximately equivalent to the Lalamilo Water System and thus provides the natural basis for the comparisions made in the following paragraphs.

The first five-MGD increment of the dam, according to the feasibility study, would store 390 million gallons behind a rockfill structure. It would capture water of both Kohakohau Stream and the Upper Hamakua Ditch, the latter via a diversion to be constructed along with the dam. The cost of these improvements, based on 1969 prices, was estimated as $5.952 million. It is estimated that they would cost approximately $12.85 million today (based on an average annual escalation rate of eight percent since 1969). The raw water stored at the dam would have to be treated prior to distribution. It would also require a new pipeline to the South Kohala coast to get water to users there. Table V-1 (left hand side) summarizes estimated costs for the dam, treatment, and pipeline. The estimates show that Kohakohau dam water would cost about $0.90 per thousand gallons, about half of which would be attributable to the dam itself.

Table V-1 also depicts comparable costs of the Lalamilo Water System. Of the $0.65 per thousand gallons total cost, almost half would be attributable to the energy cost of pumping. Within the assumptions and accuracy of the estimates summarized on Table V-1, two points ought to be made. The first is that there does appear to be a present economic advantage for the Lalamilo Water System in comparison to the dam. The second is that future escalation of oil prices, hence the cost of energy, will tend to diminish the present economic advantage of well water. Energy consumed by the dam alternative to water supply would only be in the treatment process, and it has been shown previously in this EIS that well water pumpage would require approximately 50 times as much energy as treatment would. In the long run, then, overall costs of these two water supply alternatives would be roughly equivalent.

While the economics of these two alternatives do not clearly distinguish between them, other factors certainly do. It has been shown elsewhere in this EIS that the Lalamilo Water System could be constructed with only a modest impact on the physical environment and that it could be operated without adversely affecting regional groundwater resources. The physical impact of the dam system, on the other hand, would be substantially greater. In addition to the permanent structure of the dam and reservoir behind it, the riverine environment of Kohakohau Stream below the dam would be altered due to a lower flow rate.

From a long-term perspective, one can envision a future time when both the Lalamilo Water System and some further Kohala watershed development would be needed. Based on existing development plans for the coastal region, past growth rates in Waimea, and secondary growth in Waimea due to coastal resorts, that time may be about eight to ten years from now. From

Table V-1. Summary of Comparative Costs of Water Delivered to the Coastal Region.[1]

Kohakohau Dam[2]		Lalamilo Water System[6]	
Element	Approximate Cost ($/1,000 gal.)	Element	Approximate Cost ($/1,000 gal.)
o Dam on Kohakohau Stream[3]	$0.47	o Wells and pumps[7]	$0.23
o Treatment[4]	0.28	o Pipelines, reservoirs, and powerlines[8]	0.12
o Pipeline to the coastal region[5]	0.15	o Energy cost of pumping[9]	0.32
TOTAL	$0.90	TOTAL	$0.67

[1] This comparison is made using an interest rate of seven percent. This is in line with Federal guidelines for evaluating water projects.

[2] All figures on the Kohakohau dam alternative are based on constructing only the first increment for which the feasibility study (Parsons Brinckerhoff-Hirota Associates, 1970) states that a five-MGD supply would be created.

[3] The 1969 estimated construction cost of the first increment, $5,952,000, has been updated to 1979 using an eight percent per year escalation rate. This first cost is converted to a cost per 1,000 gallons by assuming a perpetual life for the dam.

[4] Cost of treatment is based solely on past experience of the County DWS, and includes both capital costs plus operation and maintenance (Bill Sewake, County DWS, personal communication).

[5] A 14-inch diameter pipeline, 12.8 miles long, and with a 40-year useful life has been used here.

[6] The capacity of the Lalamilo Water System is 5.3 MGD. Its year-round average water use would be less than this capacity, however. Calculations presented earlier put expected pumpage at 3.55 MGD, and it is this average delivery rate which has been used to determine costs here.

[7] It is assumed here that useful lives of all pumps are 15 years and useful lives of wells are 40 years.

[8] Useful lives of pipelines, reservoirs, and powerlines are all assumed to be 40 years.

[9] Energy cost of pumping assumes 73 and 27 percent split between fresh and brackish pumping, 75 percent pumping efficiency, and $0.07 per kilowatt-hour energy charge. (Based on the 1979 energy costs.)

Source: Belt, Collins & Associates.

this perspective, the choice between the two water development alternatives may only be a matter of timing since both alternatives would ultimately be required. The logical and orderly sequence of development would be the course the State is now pursuing. The immediate need for water is in the coastal region, and it can be most expeditiously met by the proposed Lalamilo Water System. Then, as growth trends in South Kohala materialize in future years, the next water development project can be pursued.

THE NO-ACTION ALTERNATIVE

Thus far, only actions which would help meet the objective of supplying water to the Kawaihae to Honoka'ope Bay coastal area of South Kohala have been discussed. However, Section 1:42.g. of the State Environmental Quality Commission Environmental Impact Statement Regulations requires that the alternative of no-action also be considered.

In the present case, failure to construct either the Lalamilo Water System or one of the alternatives discussed above would result in continuation of the building moratorium now in effect for the system's service area. This would preclude long-planned resort development and, in all probability, lead to the withdrawal of the two major landowners who are dependent upon the system (Mauna Kea Land Corporation and Mauna Loa Land, Inc.).

With resort development impossible in the Kawaihae-Honoka'ope Bay area, two basic possibilities exist. The first is that the economic activity that would have been allowed by the proposed water system would not occur on the Big Island. If this should occur, the secondary growth impacts identified in Chapter III would be avoided; instead, the County would almost certainly experience high unemployment and outmigration by a very substantial number of individuals and families. This, in turn, has serious adverse social implications that are discussed in the social impact section of this report.

The second possibility is that resort development would simply occur elsewhere on the island. The most likely alternatives are at the Waikoloa Beach Resort just south of the Mauna Loa Land Resort and at the Kailua-Keauhou area of North Kona. If this should happen, the increase in employment opportunities within commuting distance of the residents of North and South Kohala would probably be sufficient to support the population growth expected to result from natural increase (i.e., excess of births over deaths).

Because of the shorter commuting distances that are involved, resort development at the Waikoloa Beach Resort would be much more likely to benefit the residents of North Kohala than would further development of the Kailua-Keauhou area. As a result, continued County-support for the Waikoloa project appears likely. However, the developers of the proposed Waikoloa Beach Resort have experienced serious and prolonged difficulties obtaining necessary financing. Hence, while their competitive position would appear to be improved by a decision not to construct the Lalamilo Water System, it is by no means certain that they have the financial and marketing power necessary to take advantage of what would amount to a near monopoly in resort facilities in the Kohala region. If they are not, and the Waikoloa Beach Resort continues to languish, workers from North and South Kohala will either be faced with long commuting times or the necessity of moving closer to expected resort jobs in the Kailua-Keauhou area.

Assuming that the Waikoloa project does prove to be viable, a decision not to construct the Lalmilo Water System would not preclude continued resort development in South Kohala. In fact, given the development projections presented in Chapter III, it appears that there would be sufficient employment growth to support the projected natural increase in the population. This would eliminate the need for significant net in- or out-migration from the region. There would still be a need for increases in utility and other public services, but the magnitude of the required growth would be considerably less without the Lalamilo Water System-related growth than with it. Similarly, while residents would still have to adjust to a significant rise in the number of visitors present, the increase would be less without the Lalamilo Water System than with it.

CHAPTER VI

CHAPTER VI. RELATIONSHIP OF THE PROPOSED USE TO LONG-TERM GOALS

WATER SYSTEM

As has already been mentioned in Chapter II, the implementation of the Lalamilo Water System is consistent with the long-term State and County goals for the South Kohala Coastal Region. The development and utilization of the groundwater source is also in line with the goal of providing adequate water supply at the lowest possible cost and with minimal disruption of the environment.

RESORT/RESIDENTIAL DEVELOPMENT

Short-Term Environmental Gains Versus Long-Term Losses

The implementation of proposed resort/residential development along the Kohala Coast will result in numerous immediate gains for the region. The planned projects will provide public access to the shoreline and the excellent swimming beaches. The provision of additional rights-of-way and parking will increase the area's accessibility. Various other recreational facilities will be made available to the general public, albeit for a fee. These facilities will include golf and tennis. As the resident and visitor population of the region grows, however, these facilities may become over-burdened, thus losing much of their original attractiveness and usefulness. The jobs created by the initial increments of the proposed developments will almost certainly result in decreased unemployment in the region, a beneficial effect. However, unless job creation is carefully monitored and controlled to insure that employment-induced in-migration occurs on only a limited scale, this benefit could be partially offset.

Long-Term Environmental Gains Versus Short-Term Losses

The adverse impact to the on-site environment will primarily occur during the construction phase of the proposed resorts. Noise, dust, temporary denudation of the ground, and other effects typically associated with construction activity will all occur as the projects are developed, but will cease when the construction is completed. In return for these, and for the longer lasting adverse effects discussed elsewhere in this report, there would be a number of long-term environmental gains:

- The projects will greatly increase employment opportunities in the region, thereby greatly reducing the involuntary out-migration of area residents.
- Recreational and entertainment opportunities available to the region's residents will greatly increase.
- Considerable financial resources of the major land-holders/ developers within the study area will help insure the availability of financial capital necessary to expand the island's visitor plant at a rate consistent with official public goals.

Foreclosure of Future Options

The lands on which the proposed resort are to be built are not suited for agricultural uses. Due to their relatively remote location, these properties could not be profitably used, within the foreseeable future, for intensive industrial or commercial activities. The proximity of the Kawaihae Harbor, however, does increase the area's attractiveness for possible industrial/commercial development and it could be implemented here on a limited basis.

The main future option that will be precluded once the area becomes developed is the preservation of the region's "rural flavor." Adequate government controls could be used to limit the adverse effects of such a change, but could not prevent it entirely.

CHAPTER VII

CHAPTER VII. MITIGATION MEASURES

The purpose of this chapter is to suggest ways in which those aspects of the proposed action which are considered as being of an adverse nature can be either reduced in intensity or eliminated. As is the case with all topics addressed within this document, the discussion of possible mitigation measures must be divided into two distinct parts: mitigation of impacts associated with the construction and operation of the water system; and mitigative measures which may be employed in dealing with impacts expected to occur as a result of future resort/residential development in the region, made possible when the water becomes available.

It should be pointed out, that a more detailed coverage of this chapter's topic has been incorporated into the preceding discussion of probable impacts. Consequently, the text which follows will not attempt to itemize every way in which the expected impacts of the proposed and/or anticipated projects could be reduced by alterations of design, phasing, and general development philosophy. Instead, we will only refer selectively to those aspects of the proposed or anticipated projects which can be most clearly identified and described. Furthermore, when addressing long-term impacts of future developments in the region, we are faced with describing a supposed scenario rather than specific projects. It is reasonable to refrain therefore, from addressing specific counter-measures aimed at reducing impacts associated with projects which have not as yet been well defined.

HYDROLOGIC CONSIDERATIONS

The proposed water system will utilize a renewable resource which is being continually recharged by rainfall. The way of mitigating any possible negative impact upon the ground water is to make certain that no more water is being withdrawn then can be naturally replenished. So long as the water is being harvested rather than "mined" there should be no negative impacts associated with system's operations.

RESORT/RESIDENTIAL DEVELOPMENT

Physiographic Resources

The predominant feature of the landscape where the future resort and residential projects are expected to occur is gently sloping, scarcely vegetated, terrain with the Pacific Ocean forming its western boundary. The most valuable land features along the coast of this part of South Kohala are several excellent white sand beaches, and fish ponds which are home to varied wildlife. The development of those lands for resort and residential uses will not endanger or severely affect these resources, as long as good design practices are employed. Sensitive planning for those lands will ensure that these resources are treated as valuable amenities, and will be incorporated into the overall design scheme in such a fashion as to preserve them as intrinsic features of the development. The plans which have already been prepared by major developers in the region attest to this approach.

Public Services and Facilities

Mitigating measures with reference to the public services and facilities are addressed here only as they apply to the long-term effects of the anticipated future development of this region. The construction and operation of the water system itself will not have any significant impacts on the public service/facility network.

There are two major ways in which any adverse impacts upon the public services and facilities will be mitigated in the future. First, the planned and anticipated resort residential and commercial developments will contribute a considerable additional income to the County and State which should cover the costs of any needed increases in services and/or facilities. (For public benefit-cost analysis, see page III-34 to III-43.) Secondly, in the case of resorts, many of the facilities and services will be provided on-site. These include security, sewage treatment facilities and extensive recreational amenities. Furthermore, the resort's recreational and service network will be accessible to the public, providing the region with added amenities.

Historical and Archaeological Resources

As has been indicated in Chapter III, the South Kohala Region is very rich in important archaeological resources. These historic sites, both individually and in terms of functioning as a system, will be for the most part preserved and incorporated into the developments that are contemplated for the region. In fact, the historic and aesthetic value of these sites can be enhanced by sensitive design of the resorts and residential communities; their accessibility to the general public will also improve.

Biological Resources

A) Fauna.

Any impacts upon the animal population during the construction of the Lalamilo Water system would be mitigated by the following conditions:

- The water system corridor represents a very small portion of a vast scrub grassland environment.
- The soils and vegetation disturbed by the construction activities within this corridor would be replaced after the project's completion.
- Any fauna misplaced by the construction of the system could find virtually identical conditions just a short distance away.

The long-term effect on fauna of secondary growth in coastal South Kohala would be more significant, but can be mitigated by good design practices. The construction of housing and the development of large expanses of short grass (lawns and golf courses) would alter somewhat the faunal composition of the area. Any significant adverse impacts upon water birds can be largely mitigated if alteration of the ponds and of their associated shoreline vegetation is avoided.

B. Flora.

The construction of the Lalamilo Water System in the scrub grassland environment would not impact any endangered plant species; those plants destroyed during construction activity would be eventually replaced. Future resort/residential growth in the region will change the plant environment considerably. This change, however can be of a positive rather than negative nature. The increased diversity of plants associated with new development will provide habitats to new species of birds and other animals, while the less frequent waterfowl species can be maintained if the developers refrain from alterations to the brackish ponds and shoreline areas.

Traffic Noise

Reduction of traffic noise levels to 65 L_{dn} at affected noise sensitive areas can be accomplished by the construction of noise barriers six to ten feet above grade. Noise reductions in the order of 3 to 10 dB are possible depending upon the specific topography, lot layout, and height of the affected residential units. If aesthetic or other conditions preclude the use of noise barrier construction, sound insulation treatment to residential or other noise sensitive units could be applied to reduce traffic noise to acceptable levels within the interiors of the affected units. Minimum exterior-to-interior noise reductions of 15 to 20 dB should be considered for noise sensitive structures exposed to exterior noise levels above 65 L_{dn}.

Some uncertainty of 1990 traffic conditions exists due to predicted saturation of existing roadways and due to the probable addition of roadway improvements to accommodate the higher volumes of traffic generated by the proposed developments. If vehicle speeds while going past noise sensitive locations are reduced by 10 to 20 MPH, the predicted noise impacts from the project would likewise be reduced by 4 to 8 dB. If this occurs, noise mitigation measures may not be necessary to meet the U.S. Department of Housing and Urban Development (HUD) criteria.

Realignment of Kawaihae Road and its Waimea terminus would be more preferable for reduction of noise impacts rather than improvements to Kawaihae Road. Over the long term, the diverting of traffic away from existing urbanized areas would reduce noise impacts significantly, whereas, improvements to existing roadways through urbanized areas to accommodate higher traffic volumes would increase noise impacts.

Socio-Economic Considerations

The negative impacts of development and associated population growth of the region can be mitigated through a variety of measures. It should be kept in mind that these impacts will be of both a physical as well as psychological nature and will require differing approaches to reducing their scale. These approaches are discussed on pages III-65 through III-67 of this document and deal with the areas of jobs within the visitor industry, private enterprises, industry-community relations and public human services. Essentially, the most important concern is that the new employers are seen as providers of not only "jobs" but also of training and advancement opportunities to the resident population. It is also important that the region's growth gives an opportunity for small local businesses to be established and profit from this growth. The population increase and associated increase in tax base should mean improvement in public services and facilities of the region. Another crucial area is the housing situation. The County is concerned about this potential problem area and has indicated that various methods will be implemented to ensure that adequate housing is made available. It appears at this time that developers of large resorts will be required to participate in providing affordable housing to their employees.

Traffic

"There are several mitigating circumstances which would tend to lessen the impacts described above, including traffic diversion, more buses, and new roadway projects. A large portion of the additional traffic (about 1,800 vehicles per day) is expected to be through-traffic traveling between East and West Hawaii. Much of this traffic could divert to the Hawaii Belt Road if traffic conditions on Queen Ka'ahumanu Highway became too congested. As a result, the daily traffic volumes shown on Figure 5 (III-9) could be reduced by as much as 900 vehicles in each direction.

"The larger number of first-class hotels (as opposed to luxury hotels) proposed in this study would tend to cater to tour groups which are more amenable to using tour buses. This may have some impact upon the visitor-generated traffic. However, this reduction would be minimal as low trip-generation rates for visitors have already been assumed. A shuttle bus service for employees living in the area may also tend to reduce the number of employee trips.

"The realignment of Kawaihae Road has been proposed for several years but design has not been implemented. One proposed alignment would intersect Queen Ka'ahumanu Highway across the Hapuna Beach Park access road, south of the Olohana [now Mauna Kea Land Corporation] project site. This realignment would tend to reduce traffic volumes on Kawaihae Road and the north end of Queen Ka'ahumanu Highway. This reduction would tend to increase the capacities of left turn lanes at the Mauna Kea Beach Hotel and Olohana [now Mauna Kea Land Corporation] access roads.

"The realignment at the Waimea terminus of the roadway would also tend to reduce traffic volumes on the Hawaii Belt Highway through the town.

"The large forecasted volumes would require future engineering evaluation of traffic volume and accident experience based on future field data to be collected at the resort access points. The large volumes of left turns from the access roadways may also indicate the eventual installation of traffic signals to permit these vehicles access onto the highway. If these intersections were signalized, they would be operating at level of service C to D, and are not expected to have capacity problems. Even with signalization, the large number of left turns from the Mauna Loa Land development may require a second access roadway in time." (Alan M. Voorhees & Associates, 1979b:4)

CHAPTER VIII

CHAPTER VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

WATER SYSTEM

The construction of the proposed Lalamilo Water System will not involve any irreversible or irretrievable commitments of resources other than those of necessary building materials and manpower. In its operational stage, the system will not irreversibly or irretrievably utilize the ground water. Rather, it will utilize a renewable resource which is continually recharged by rainfall. Consequently, so long as no more water is being withdrawn than is being naturally replenished ("harvesting" as opposed to "mining" of water) there should be no problems associated with the system operation.

RESORT/RESIDENTIAL DEVELOPMENT

The growth of the physical development within the South Kohala region facilitated by the implementation of the proposed Lalamilo Water System will necessitate a long-term commitment of natural resources, particularly of land. For all practical purposes, this commitment will be irreversible as the currently existing barren and open land will be transformed into a man-landscaped environment containing infrastructure of roads and buildings that will be a part of the proposed resorts. Because, however, this land is not suitable for any other practical use (such as agriculture), the commitment of this resource will not have a negative impact upon the region.

CHAPTER IX

CHAPTER IX. OFFSETTING CONSIDERATIONS OF GOVERNMENT POLICY

As noted previously in this document (see especially Chapter III), the construction and operation of the proposed Lalamilo Water System would result in a number of adverse impacts. Direct impacts associated with the water system, e.g., construction noise, release of air pollutants, accelerated soil erosion, etc., would be quite limited and would be confined almost entirely to the construction period. Secondary impacts, i.e., change made possible in part by the increased availability of water that the system would provide would be much more extensive. Because of the differing attitudes towards population and economic growth held by the individuals and groups that would be most affected by it, secondary-growth related change is also much more difficult to categorize as "adverse" or "beneficial." Nevertheless, at least some of the changes that could occur if the water system is constructed would be considered undesirable (and, therefore, adverse) by some residents of Hawaii County. These potentially adverse effects are offset by the fact that the project would help in the achievement of many positive public policy objectives. These beneficial effects are discussed in Chapter II of this report, "Relationship of the Proposed Action to Land Use Plans, Policies, and Controls for the Area."

The primary benefit associated with the proposed project, i.e., the economic and social development of the South Kohala resort area, could be achieved by any of the alternative water supply systems discussed in Chapter V of this report. Similarly, the same adverse secondary growth impacts would result regardless of which water supply system is chosen. The proposed Lalamilo Water System is less costly than the other possibilities, however, and would therefore result in the least fiscal impact on government. The Lalamilo System also entails the least environmental impacts of any alternative (see Chapter V). Because of this, it is believed that there is no reasonable alternative that would avoid the adverse environmental effects discussed herein.

CHAPTER X

CHAPTER X. ORGANIZATIONS AND PERSONS CONSULTED

As required in the State Environmental Impact Statement Regulations, the following agencies, organizations and individuals were sent copies of the EIS Preparation Notice. They were included as a result of either requesting to be consulted parties or their known interest in the area. Letters from those who chose to submit comments based on information in the EIS Preparation Notice are reproduced in the next chapter. The copies of two types of four letters which were sent as a response to comment are also included in the following chapter.

County of Hawaii

Mayor's Office
Planning Department
Department of Public Works
Department of Research and Development
Department of Parks and Recreation
Police Department
Fire Department

State of Hawaii

Office of Environmental Quality Control
Department of Agriculture
Department of Land and Natural Resources
State Historic Preservation Office
Department of Planning and Economic Development
Department of Accounting and General Services
Department of Social Services and Housing
Department of Transportation
Department of Education
Department of Health

Federal Government

Environmental Protection Agency
Department of the Interior, Fish and Wildlife Service

University of Hawaii

Environmental Center
Water Resources Research Program

Private Organizations

Waimea Community Association
Puako Community Association
Hawaii Electric Light Company
Hawaiian Telephone Company

See also Appendix C for list of persons consulted as part of Social Impact Study.

CHAPTER XI

GEORGE R. ARIYOSHI
Governor

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

HIDEO MURAKAMI
Comptroller

MIKE N. TOKUNAGA
Deputy Comptroller

LETTER NO. (P)1830.9

AUG 20 1979

Honorable Susumu Ono
Chairman
Department of Land and
Natural Resources
State of Hawaii
Honolulu, Hawaii

Dear Mr. Ono:

Subject: Lalamilo Water System

Thank you for this opportunity to review and comment on the subject project.

The project will not have any adverse environmental effect on any existing or planned facilities serviced by our department.

Very truly yours,

HIDEO MURAKAMI
State Comptroller

DEPARTMENT OF PARKS & RECREATION
COUNTY OF HAWAII

Herbert Matayoshi, Mayor
Milton Hakoda, Director

August 22, 1979

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Subject: Lalamilo Water System - EIS Preparation Notice

We have no adverse comments to offer on the subject report.

Thank you for the opportunity to review the preparation notice.

Milton T. Hakoda
Director

25 AUPUNI STREET • HILO, HAWAII 96720 • TELEPHONE 961-8311

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

MEMO TO: Honorable Susumu Ono, Chairman of the Board
Department of Land and Natural Resources

F R O M: Charles G. Clark, Superintendent
Department of Education

SUBJECT: Lalamilo Water System

We have reviewed the subject EIS and have no comments to offer at this time.

CGC:WO:jl

cc Mr. James E. Edington
Hawaii District

AN EQUAL OPPORTUNITY EMPLOYER

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

August 8, 1979

STP 8.5596

Mr. Susumu Ono
Chairman of the Board
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: EIS Preparation Notice
Lalamilo Water System

Thank you very much for giving us the opportunity to review and comment on the above-captioned notice. We have no substantive comments to offer which would be helpful in the preparation of the Environmental Impact Statement.

Yours very truly,

Ryokichi Higashionna

HERBERT T. MATAYOSHI
MAYOR

HAWAII COUNTY FIRE DEPARTMENT
466 KINOOLE ST. HILO, HAWAII 96720
PHONE 935-2928

DONALD THOMPSON
FIRE CHIEF

August 9, 1979

Mr. Susumu Ono
Chairman of the Board
Department of Land & Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

SUBJECT: LALAMILO WATER SYSTEM

The Hawaii County Fire Department has no objections to the proposed Lalamilo Water System.

Yours very truly,

Hiroshi Shishido

HIROSHI SHISHIDO
DEPUTY FIRE CHIEF

HS/mo

HAWAIIAN TELEPHONE COMPANY
P.O. BOX 2200 • HONOLULU, HAWAII 96841 • TELEPHONE (808) 546 7733 • CABLE TELHAWAII

HERMAN S. L. HU

August 10, 1979

Mr. Susumu Ono
Chairman of the Board
State of Hawaii
Department of Land and Natural Resources
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Ono:

Lalamilo Water System Project

We have reviewed the Environmental Impact Statement Preparation Notice for the above-mentioned project and have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,

H. Hu
Network Planning & Engineering
Director

Environmental Law Center of the Pacific
250 South Hotel Street 2nd floor Auditorium Honolulu Hawaii 96813

July 13, 1979

Division of Water & Land Development
Department of Land & Natural Resources
P. O. Box 373
Honolulu, Hawaii 96815

Dear Person(s):

Please include the Environmental Law Center of the Pacific (ELC) on a list of consulted parties in the preparation of the Environmental Impact Statement for Lalamilo Water System. The ELC would appreciate your forwarding any documents that were relief upon in determining that an environmental impact statement is required.

Sincerely,

Tim Fitzpatrick

Tim Fitzpatrick

TF:vb

808 533 7491

LIFE OF THE LAND A GROUP FOR ENVIRONMENTAL RESEARCH AND ACTION

July 19, 1979

DONALD
SLNR
P.O. Box 373
Honolulu, Hawaii
96809

Gentlemen:

Life of the Land would like to be a consulted party on the EIS being prepared for the Lalamilo Water System, South Kohala, Hawaii.

Please send use a copy of the draft EIS as soon as it is available.

Thank you for your kokua.

Sincerely,

Doug Heller

Douglas Heller
Staff Supervisor

404 PIIKOI STREET HONOLULU HAWAII 96814 TELEPHONE 521 1300

DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII · 25 AUPUNI STREET · HILO, HAWAII 96720 · TELEPHONE (808) 961-8321

HERBERT T. MATAYOSHI
Mayor

EDWARD K. HARADA
Chief Engineer

ARTHUR T. ISEMOTO
Deputy Chief Engineer

August 2, 1979

Mr. Susumu Ono
Chairman of the Board
Department of Land and
Natural Resources
P. O. Box 621
Honolulu, HI 96809

SUBJECT: LALAMILO WATER SYSTEM
ENVIRONMENTAL IMPACE STATEMENT
NOTICE OF PREPARATION

Thank you for your July 23, 1979 letter transmitting the EIS preparation notice for the subject water system for our review.

We have reviewed the EIS preparation notice and have no comments to offer.

EDWARD HARADA
Chief Engineer

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

August 6, 1979

MEMORANDUM

To: Mr. Susumu Ono, Chairman
Board of Land and Natural Resources

Subject: Lalamilo Water System EIS Notice of Preparation

The Department of Agriculture has reviewed the subject document and has no comments to offer.

It is our understanding that the Lalamilo Water System is an entirely separate system from the Lalamilo Irrigation System.

Thank you for the opportunity to comment.

JOHN FARIAS, JR.
Chairman, Board of Agriculture

CHAPTER XI. COMMENTS AND RESPONSES DURING CONSULTATION PERIOD

The following persons or organizations submitted comments expressing specific concerns and were sent a copy of form letter A (reproduced at right) by the Division of Land and Water Development. The letters from these groups are reproduced on the following pages.

Office of Environmental Quality Control, State of Hawaii

Environmental Center, University of Hawaii

Department of Health, State of Hawaii

Fish and Wildlife Service, U.S. Department of the Interior

Department of Research and Development, County of Hawaii

Mr. Edward F. Austin, Puako Community Association

Planning Department, County of Hawaii

Historic Preservation Program, State of Hawaii

<u>DRAFT OF LETTER "A"</u>

Dear Sir:

<u>Lalamilo EIS Notice of Preparation</u>

Thank you for your letter of ______(Date)______ regarding the subject EIS Notice of Preparation. Your comments have been taken into consideration and your concerns will be addressed in the Draft Environmental Impact Statement (DEIS). You will, of course, be given an opportunity to review the DEIS when it is published.

Sincerely yours,

4777

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
OFFICE OF THE GOVERNOR

RICHARD L. O'CONNELL
DIRECTOR

August 28, 1979

MEMORANDUM

TO: Susumo Ono, Chairman
Department of Land and Natural Resources

FROM: Richard L. O'Connell, Director
Office of Environmental Quality Control

SUBJECT: Environmental Impact Statement Preparation Notice for Lalamilo Water System

We have reviewed the subject EIS preparation Notice and offer the following comments:

The proposed project is a key element in the fostering of growth in West Hawaii, particularly the South Kohala District. Therefore, the project should be evaluated with respect to the long term direct and indirect impacts from operation of the water system.

There should be an archaeological survey of all proposed construction sites since the Lalamilo area has been reported to contain numerous archaeological sites due to its relatively undisturbed nature. We refer you to the EIS for the Hawaii Belt Road, Mud Lane-Waikea-Kawaihae Road" which was accepted by the Governor on July 20, 1976. We also recommend consultation with the National Park Service regarding historic sites in the project area.

We recommend consultation with Big Island conservation groups such as the Big Island Chapter of Conservation for Hawaii and the West Hawaii chapter of Friends of the Earth. Since, Hawaiian Home Lands in Kawaihae are in the project area, the Hawaiian Homes Commission should be consulted.

We wish to point out that although EIS's for Boise Cascade's Waikoloa" and the Mauna Loa Land Corporation's "Kalahuipuaa" projects were required by the County of Hawaii, they were not filed pursuant to Chapter 343, H.R.S. Therefore,

Susumo Ono
Page -2-
August 28, 1979

neither EIS received the broad public review afforded by the State EIS law. We therefore recommend that more than a brief summary of the impact of these proposed developments be included in the Lalamilo Water system EIS. Other proposed developments in thee area should also be discussed.

The irrigation requirement of the resort golf courses should be discussed. This should include the potential use of treated sewage effluent as a source of irrigation water.

The potential socio-economic impacts will affect more than the South Kohala District and should be discussed as they relate to the other nearby districts and the Big Island in general. Such impacts would include the demand for construction and resort worker housing.

You might also refer to the EIS for the Central Maui Water Transmission System as an example of a somewhat similar project.

We trust that our comments should prove useful to you in the preparation of the EIS. Thank you for allowing us to review the subject EIS Preparation Notice.

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

August 22, 1979

Mr. Susumo Ono, Chairman
Board of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Lalamilo Water System

I have reviewed the assessment of the proposed Lalamilo Water system submitted 23 July 1979 and have the following comments.

The principal additional water supply for the proposed water system will be two new wells (p. 5) to be drilled at an altitude of about 1050 feet (p. 6), but at a location shown in Attachment KKK as about 1200 feet altitude. These new wells are to have proposed capacities of 1000 gpm a piece, and to be pumped on the average, 1.4 mgd, in total. The system is proposed to have a potential for expansion to 6.5 mgd. This will apparently require additonal new wells, but of what capacity and at what locations is not indicated.

The EIS should present and discuss the nature of the ground-water bodies now serving and proposed to serve the area, and all evidences as to the relationships between their sustainable yields and the drafts now made on them.

The assessment (p. 2) refers to an exploratory well already drilled and tested, but does not indicate its location or the results of its testing. The locations of the existing high elevation Waikoloa wells (26 ppm), and the locations and pump capacities of a number of existing low-elevation wells are shown in Attachment III.

It should be noted that all of the present wells are located on the slopes of Mauna Kea. The difference in head between the high-elevation Waikoloa wells and the low-elevation wells indicates the existence of some barrier who orientation and nature are not known. Studies of recharge rates indicate that it ground-water recharge on Mauna Kea is as great as the total draft proposed. The only possibility that the supply proposed can be drawn from the area seems to be that much of the groundwater is derived from recharge in the Kohala Range.

Theoriginal tests and subsequent performance of the upper Waikoloa wells do not prove thtat the ground-water body they tap has a recharge greater than that which could be supplied from Mauna Kea alone. The exploratory well

referred to in the assessment may suggest, but cannot prove, that the high head groundwater body at the upper Waikoloa wells extends further north and is recharged from Kohala The problem with well tests, and even monitored actual use. is that the storage in the groundwater body is so great that the effects of recharge limitations and overdraft cannot be detected except over a very long period. There is no escaping the need for estimating sustainable yields by assuming alternative possible recharge areas, estimating respective recharge rates, and estimating fractions of recharge of recoverable developable while retaining adequately low salinity level.

According to the assessment (p. 9), the proposed system will have negligible physical impacts. However, unless there is definitve evidence that the recharge-rate studies are erroneous or that the body to be tapped by the proposed new wells is recharged from Kohala, and that the total sustainable yield exceeds the total proposed draft, the potential overdraft of the ground-water body and great increase in salinity of water drawn from it must be recognized.

As recognized in the assessment (pp. 8-9), the socio-economic impacts of constructing the proposed system will be very great. These will need to be extensively analyzed in the EIS.

Potential secondary impacts on the physical environment, derived from the population increase an associated development that will be permitted and stimulated by the system should also be assessed. These include increased risks to endemic and rare flora and to archeological sites.

The socio-economic impacts associated with the possibility that the sustainable of the ground-water resource on which reliance will be placed will not be as great as estimated should also be recognized. These will depend, not only on the extent of underestimate, but on the rate of development in the area relative to the rate of improvement insustainable-yield estimation.

I understand that the Water Resource Research Center has submitted comments on the assessment similar to the above. In some respects the staff of the WRRC are probably more familiar with the status of groundwater development then I am, and some of the questions I have raised may be settled by their comment.

Sincerely,

Doak C. Cox
Director

DCC/dah

cc: WRRC

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

VERNE C. WAITE, M.D.
DEPUTY DIRECTOR OF HEALTH

HENRY N. THOMPSON, M.A.
DEPUTY DIRECTOR OF HEALTH

JAMES S. KUMAGAI, PH.D., P.E.
DEPUTY DIRECTOR OF HEALTH

TADAO BEPPU
DEPUTY DIRECTOR OF HEALTH

In reply, please refer to:
File: EPHS-SS

August 23, 1979

Mr. Susumu Ono
Chairman of the Board
Department of Land &
Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: Request for Comments on Proposed Environmental Impact Statement (EIS) for Lalamilo Water System, South Kohala, Hawaii

Thank you for allowing us to review and comment on the subject proposed EIS.

As you are aware, new water systems such as the proposed Lalamilo Water System are required to comply with the applicable terms and conditions of Chapter 49, Potable Water Systems, Public Health Regulations. In the case of a completely new system, as the Lalamilo System would be, special attention should be given to Sections 29 and 30 of Chapter 49, pertaining to approval of new sources and new distribution systems respectively.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Sincerely,

Brian J. J. Choy
for JAMES S. KUMAGAI, Ph.D.
Deputy Director for
Environmental Health

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P O BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

August 6, 1979

Mr. Susumu Ono
Board of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Re: EIS Preparation Notice -
Lalamilo Water System,
South Kohala, Hawaii

Dear Sir:

We have reviewed the referenced document. The proposed action will have little adverse impact on fish and wildlife in the area once construction is completed. However, we recommend that anti-erosion control measures be taken during the construction phase. The proposed measures should be described in the EIS.

We appreciate this opportunity to comment.

Sincerely yours,

Maurice H. Taylor

Maurice H. Taylor
Field Supervisor
Division of Ecological
Services

cc: HA
NMFS
HDF&G
EPA, San Francisco

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

DEPARTMENT OF RESEARCH AND DEVELOPMENT

COUNTY OF HAWAII

August 6, 1979

Mr. Susumu Ono
Chairman of the Board
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

LALAMILO WATER SYSTEM

Thank you for this opportunity to review and comment on the above mentioned subject. We offer the following for your consideration.

1. The coastal areas of the South Kohala district has been identified as having tremendous potential for resort/recreation/residential developments. This area possesses many of the amenities deemed positive, ie. warm climate, beaches, etc.

2. One of the major constraints inhibiting development has been the lack of a potable water system of sufficient volume.

3. We are of the opinion that the development of resort/recreational/residential centers in South Kohala would have a positive effect on the County's economy.

A. DUANE BLACK
DIRECTOR

• 25 AUPUNI STREET • HILO, HAWAII 96720 • TELEPHONE 961-8366 •

---

150 Puako Beach Drive
Kamuela, Hawaii 96743
Aug. 14, 1979

Mr. Susumu Ono,
Chairman of the Board,
Department of Land & Natural Resources,
P. O. Box 621, Honolulu, Hawaii 96809

In re: Lalamilo Water System,
Lalamilo, South Kohala, Hawaii

Dear Mr. Ono:

Thank you very much for sending the PUAKO COMMUNITY ASSN a copy of the EIS Preparation Notice. I can reply as Chairman of the Water Resources Committee of that Association as well as immediate past president.

We can anticipate no adverse environmental factors from the construction of the proposed pipeline; however we anticipate much adverse environmental impact from the development which the pipeline makes possible. Therefore I must oppose the project.

Your report states that the $3,000,000 expenditure of tax money is primarily for the benefit of two privately-owned developers (Olohana Corp. and Mauna Loa Land, Inc.) as well as the State of Hawaii. Would you please tell me how the State will directly benefit from the proposed pipeline--I know of no proposed State developments that require additional water from this source.

It seems to me the underlying assumption attributed to County officials is that resort/condominium development is good per se. I take issue with this assumption and would maintain that County expenditures will necessarily increase to service newly developed areas--even to the point where it cancels out the increase in assessments. That there will be an increase in assessments in Puako--as a result of those proposed developments--there can be no doubt. There is no doubt that our taxes will actually double every two years or so (if these projects take place) with the result that local people will be forced to sell their Puako homes to ever hungry speculators anticipating that this entire coast will be given over to condo developers. We find this intolerable--absolutely against good public policy. The pressure from prospective developers is already responsible for our losing many good residents, who have decided it is no longer possible to pay taxes based upon speculative valuations representing antiaipated values should this area go dondominium.

Further, it seems intolerable that the taxpayers should put up the money to finance foreign exploitation of our limited beach resources for profit that goes to foreign nationals, as is the case with the major developer in this case, the one who gets most of the water provided by this tax-paid pipeline.

I would appreciate hearing from you concerning these matters.

Yours very truly,

Ed Austin

Edward F. Austin

COUNTY OF HAWAII

PLANNING DEPARTMENT

25 AUPUNI STREET • HILO, HAWAII 96720

HERBERT T. MATAYOSHI
Mayor

SIDNEY M. FUKE
Director

DUANE KANUHA
Deputy Director

August 3, 1979

Rec'd Plng. Ofc. AUG 9 1979
By ____
Gordon ____ Estelle ____
Ali ____ Post ____
Roger ____ Library ____
Len ____
File in ____
Return to ____

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Ono:

EIS Preparation Notice - Lalamilo Water System

Thank you for notifying us of the drafting of the subject EIS for the Lalamilo Water System.

We have reviewed the text, and have no major comments to offer at this time. However, we would like to note that if Olohana Corporation and Mauna Loa Land, Inc. are also participating in the water source development project, this should also be acknowledged, rather than to list them as beneficiaries only.

We would greatly appreciate the opportunity to review and comment on the subsequent full EIS document. Mahalo.

Sincerely,

Sidney Fuke
Planning Director

BS/lgv

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF STATE PARKS
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

September 10, 1979

MEMORANDUM

TO: Mr. Susumu Ono
Chairman of the Board
Dept. of Land and Natural Resources

FROM: Ralston Nagata

SUBJECT: Lalamilo Water System

The proposed undertaking will have no effect on any known historical or archaeological site. However, it is known there are a great number of sites along the proposed Waimea Kawaihae Road, as well as a number of sites along the present Waimea Kawaihae Road. Since this proposed development will be impacting similar areas it is our recommendation that an archaeological reconnaissance be conducted to ascertain if any sites are located within the impact area. From this information we can then make recommendations regarding mitigative measures if necessary.

Ralston Nagata
Program Director
Historic Preservation Program

RN/PB:my

The following persons or organizations submitted letters expressing no immediate concern and were sent a copy of form letter B (reproduced at right) by the Division of Land and Water Development. The letters from these groups are reproduced on the following pages.

Hawaiian Electric Light Company, Inc., Hilo, Hawaii

Police Department, County of Hawaii

Department of Accounting and General Services, State of Hawaii

Department of Parks & Recreation, County of Hawaii

Department of Education, State of Hawaii

Department of Transportation, State of Hawaii

Hawaiian Telephone Company

Hawaii County Fire Department

Department of Public Works, County of Hawaii

Department of Agriculture, State of hawaii

Environmental Law Center of the Pacific

Life of the Land

<u>DRAFT OF LETTER "B"</u>

Dear Sir:

<u>Lalamilo EIS Notice of Preparation</u>

Thank you for your letter of ______(Date)______ regarding the subject EIS Notice of Preparation. A copy of the Draft EIS will be made available to you for future review.

Sincerely yours,

HAWAII ELECTRIC LIGHT COMPANY, INC.
P. O. BOX 1027 HILO, HAWAII-96720

August 24, 1979

State of Hawaii
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Attention: Mr. Susumu Ono, Chairman of the Board

Subject: Lalamilo Water System

Gentlemen:

Reference is made to your letter of July 23, 1979 on the proposed Lalamilo Water System.

We have no comments on this project, except that we propose to construct an electric transmission power line alongside the proposed water line from the two (2) fresh wells down to Queen Kaahumanu Highway. After completion of the transmission line, we propose to construct an electric substation which will be used to serve electric power to the well pumps.

Very truly yours,

Jitsuo Niwao (sd)

Jitsuo Niwao, Manager
Engineering Department

JN:bk

POLICE DEPARTMENT
COUNTY OF HAWAII
349 KAPIOLANI STREET
HILO, HAWAII 96720

GUY A. PAUL
CHIEF OF POLICE

OUR REFERENCE 13123
YOUR REFERENCE

August 13, 1979

Mr. Susumu Ono
Chairman of the Board
Environmental Quality Commission
State Dept. of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

RE: LALAMILO WATER SYSTEM

Thank you for the opportunity to review the EIS Preparation Notice for the Lalamilo Water System.

From the police standpoint, neither the system nor its construction appear to present a problem.

Guy A. Paul

GUY A. PAUL
CHIEF OF POLICE

RLP/k

CHAPTER XII

CHAPTER XII. SUMMARY OF UNRESOLVED ISSUES

Only a few issues related to the construction and operation of the Lalamilo Water System itself have not been resolved as of this date. The most important are:

Timing

Construction of the first phase improvements will begin in mid-1980 if the impacts are found acceptable and the funds already appropriated for the project are released. However, the additional wells that would be needed to bring it up to its full planned capacity of 5.3 MGD would be added only when necessary to meet immediately foreseeable needs.

Cost

The construction costs given in this report are estimates. Exact costs will not be known until construction bids are opened. This is now expected to occur in June 1980.

Financing

The exact financing terms for the necessary bond issue will not be known until the time it is actually put on the market.

Permits

As indicated in Chapter XIII, a number of permits must still be obtained before the system can be constructed and put into operation. Detailed construction plans not available at this time will be necessary before these can be obtained.

CHAPTER XIII

CHAPTER XIII. LIST OF NECESSARY APPROVALS

Large portions of coastal lands in South Kohala already have been designated for urban use and, in many places, zoned for resort, residential or commercial use. However, much of the land available in the region still retains agricultural or open designation. In all instances, various additional approvals and permits will be necessary before any construction can proceed. All new projects will be subject to the State and/or County environmental impact assessment process. Below is a partial list of these approvals; at least some of these will be applicable to all lands in the region.

A. Lalamilo Water System

Approval Needed	Approving Agency or Body	Status
Approval of Construction Drawings	DOWALD, Department of Land and Natural Resources, State of Hawaii	Approved
	Department of Water Supply, County of Hawaii	Approved
	Department of Transportation, State of Hawaii (for pipeline crossing of Queen Ka'ahumanu Highway)	Under review
	Department of Public Works, County of Hawaii (grading permit)	Not yet initiated
Water System Clearance Sec. 29, Safe Drinking Water Act	Department of Health, State of Hawaii	Not yet initiated

B. Secondary Resort/Residential Development

Approval Needed	Approving Agency or Body
State Land Use District Boundary Change	State Land Use Commission
Conservation District Use Application	Department of Land and Natural Resources, State of Hawaii
Amendment to the General Plan	County of Hawaii Council

Approval Needed	Approving Agency or Body
Zoning Maps Amendment	County of Hawaii Council
Shoreline Management Area Permit	Planning Department, County of Hawaii
Subdivision Approvals	Planning Department, County of Hawaii
Building Permits	Public Works Department, County of Hawaii
Planned Development Permits	Planning Department, County of Hawaii
Conservation District Use Application	Department of Land and Natural Resources, State of Hawaii
Plan Approvals	Planning Department, County of Hawaii

CHAPTER XIV

CHAPTER XIV. REFERENCES

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APPENDICES

APPENDIX A.

ARCHAEOLOGICAL RECONNAISSANCE OF PROPOSED WATER PIPELINE

ARCHAEOLOGICAL RESEARCH CENTER HAWAII, INC

P. O. Box 285; Lawai, Kauai, Hawaii 96765; Ph. 332-8521

7
December
1978

Mr. Joseph Vierra
Sr. Project Engineer
Belt, Collins & Associates, Ltd.
Hawaii Building, Suite 514
745 Fort Street
Honolulu, Hawaii 96813

Subject: Archaeological Reconnaissance of proposed water pipeline for the South Kohala Water System. ARCH 14-146.

Dear Joe:

At the request of Belt, Collins & Associates, Ltd., the Archaeological Research Center Hawaii, Inc., ARCH, conducted an archaeological reconnaissance of a proposed water pipeline in south Kohala, Hawai'i, (see enclosed map). The reconnaissance was conducted on December 4, 1978. An area 20,000 feet long and 30 to 50 feet wide was surveyed on foot by a crew of two (2).

A number of stone structures were located along the path of the proposed pipeline. These structures consist of small to medium sized *ahu* (rock piles) and small C-shaped structures. However, all of these structures were determined to be of modern construction. The *ahu* are probably modern surveyers markers and the C-shaped structures are modern hunting blinds. They are crudely constructed and contain no scatters of shell midden or other evidence of archaeological significance. The *mauka* 6,000 feet of the pipeline route has been previously bulldozed up to the upslope end of the pipeline near the stone cattle wall and estimated intersection of the Puakō-Waimea Trail.

Our archaeological reconnaissance indicated no archaeological sites within the path of the proposed pipeline. Therefore archaeological clearance is recommended without further work.

Mr. Joseph Vierra
ARCH 14-146
December 7, 1978
Page 2

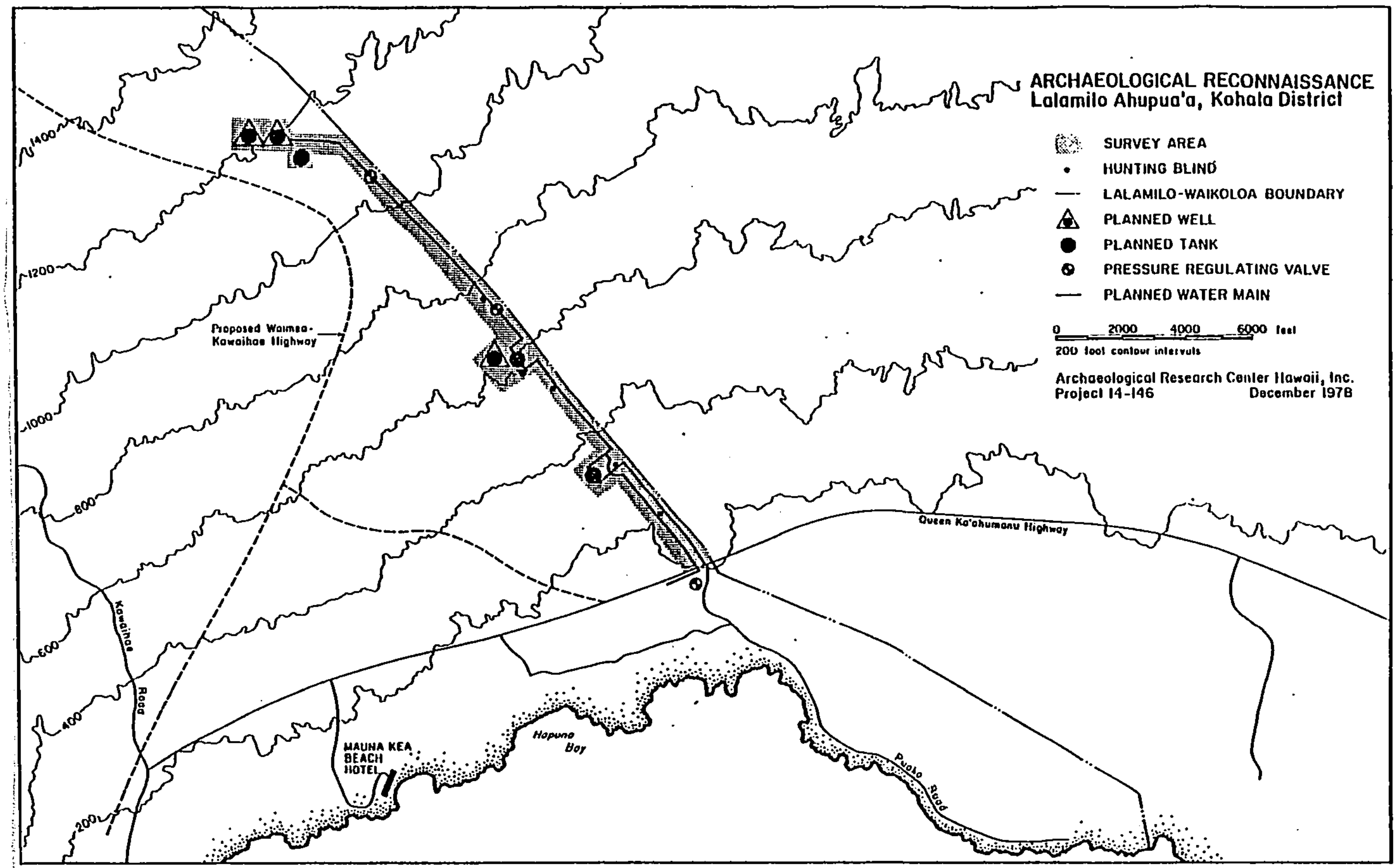
If you have any questions concerning the above or if we can be of any further assistance to you please do not hesitate to contact me. As always we have enjoyed working with you.

Nā Kau a Kau,

ARCHAEOLOGICAL RESEARCH CENTER HAWAII, INC.

Francis K.W. Ching
President

FKWC/jj
enclosed


ARCHAEOLOGICAL RECONNAISSANCE
Lalamilo Ahupua'a, Kohala District
SURVEY AREA
HUNTING BLIND
LALAMILO-WAIKOLOA BOUNDARY
PLANNED WELL
PLANNED TANK
PRESSURE REGULATING VALVE
PLANNED WATER MAIN
0 2000 4000 6000 feet
200 foot contour intervals
Archaeological Research Center Hawaii, Inc.
Project 14-146
December 1978
Proposed Waimea-Kawaihae Highway
Queen Ka'ahumanu Highway
Kawaihae Road
MAUNA KEA BEACH HOTEL
Hapuna Bay
Puako Road
1400
1200
1000
800
600
400
200

APPENDIX B.

CHECKLIST OF PLANT SPECIES

Scientific Name	Common Name Hawaiian Name	Status	Location
Malvaceae (Mallow Family)	-		
Abutilon grandifolium (Willd.)Sweet	Hairy abutilon Ma'o	Exotic	G
*Hibiscus tiliaceus L.	Hau	Indigenous	C,L
*Sida cordifolia L.	'Ilima	Indigenous	O
*Sida fallax Walp.	Ilima 'Ilima papa	Indigenous	O,C
Myrtaceae (Myrtle Family)			
Psidium guajava L.	Guava Kuawa	Exotic	G
Nyctaginaceae (Four O'Clock Family)			
*Boerhavia diffusa var. diffusa L.	Alena Alena	Indigenous	O
Bougainvillea spp.	Bougainvillea	Exotic	C,L
Onagraceae (Evening Primrose Family)			
Ludwigia octivalvis (Jacq.)Raven	Primrose willow Kamole	Exotic	G
Portulacaceae (Purslane Family)			
*Portulaca cyanosperma Egler	Blue-seeded portulaca 'Ihi	Endemic	O
Portulaca oleracea L.	Common purslane 'Ihi	Exotic	C
Sterculiaceae (Cocoa Family)			
*Waltheria americana L.	Waltheria Hi'aloa; 'uhaloa	Indigenous	O,G,C,K
Thymeliaceae (Akia Family)			
*Wikstroemia aff. pulcherrima Skottsb.	Akia	Endemic	O,G
Verbenaceae (Verbena Family)			
Lantana camara L.	Lantana Lakana	Exotic	O
Stachytarpheta jamaicensis (L.)Vahl	Jamaica vervain Owi	Exotic	G
MONOCOTYLEDONEAE			
Cyperaceae (Sedge Family)			
*Cladium leptostachyum Nees&Meyen	Native sawgrass 'Uki	Endemic	W
*Cyperus javanicus Houtt.	Marsh cyperus 'Ahu'awa	Indigenous	W
*Cyperus laevigatus L.	Smooth flatsedge Makaloa	Indigenous	W
*Scirpus paludosus A. Nels.	Makai	Indigenous	W
Gramineae (Grass Family)			
Aristida adcensionis L.	Sixweeks threeawn	Exotic	O
Chloris inflata Link	Swollen fingergrass Mau'ulei	Exotic	O,C,D
Chloris radiata (L.)Sw.	Radiate fingergrass	Exotic	D
Cynodon dactylon (L.) Pers.	Bermuda grass Mānienie	Exotic	C,D
Eleusine indica (L.)Gaertn.	Wiregrass Mānienie-ali'i	Exotic	D
Eragrostis cilianensis (All.)Vignolo-Lutati	Stinkgrass	Exotic	O
Pennisetum setaceum (Forsk.)Chiov.	Fountaingrass	Exotic	B,R,O,D
Pennisetum setosum (Sw.) L.C.Rich.inPers.	Feather pennisetum	Exotic	B,R,O,K,C,D
Rhynchelytrum repens (Willd.)C.E.Hubb.	Natal redtop	Exotic	D
*Sporobolus virginicus (L.)Kunth	Beach dropseed 'Aki'aki	Indigenous	W,C
Palmae (Palm Family)			
Cocos nucifera L.	Coconut Niu	Exotic	W,C
Pandanaceae (Screw Pine Family)			
*Pandanus odoratissimus var. odoratissimus L.	Screw pine Hala	Indigenous	W
Ruppiaceae (Ruppia Family)			
*Ruppia maritima	Ruppia	Indigenous	W
DICOTYLEDONEAE			
Aizoaceae (Carpetweed Family)			
*Sesuvium portulacastrum (L.)L.	Sea purslane 'Akulikuli	Indigenous	W,C
Amaranthaceae (Amaranth Family)			
Amaranthus viridis L.	Slender amaranth Pakai	Exotic	D
Asclepiadaceae (Milkweed Family)			
Calotropis gigantea (L.)R.Br.exAit.f.	Crown flower Pua-kalaunu	Exotic	W
Boraginaceae (Heliotrope Family)			
*Heliotropium curassavicum L.	Seaside heliotrope Nena	Indigenous	W,C
Messerschmidia argentea (L.f.)Johnston	Tree heliotrope	Exotic	C
Capparaceae (Caper Family)			
*Capparis sandwichiana var. zoharyi Deg.&Deg.	Native caper	Endemic	C
Gynandropsis gynandra (L.)Briq.	Wild spider flower Hohonina	Exotic	O,C,D

* Native Species

Locations: B = Barren Lava; C = Coastal Strand; D = Disturbed; G = Gully; K = Kiawe Woodland; L = Landscaped/Developed Areas; O = Open Scrub Grassland; R = Scrub Rockland; W = Wetland/Pondside

Scientific Name	Common Name / Hawaiian Name	Status	Location
Caryophyllaceae (Pink Family)			
Spergula arvensis L.	Corn spurry	Exotic	O,C,D
Casuarinaceae (Casuarina Family)			
Casuarina equisetifolia Stickm.	Common ironwood	Exotic	C
Chenopodiaceae (Goosefoot Family)			
Atriplex muelleri Benth.		Exotic	O,D
Atriplex semibaccata R.Br.	Australian salt-bush	Exotic	O,W,C
Chenopodium album L.	Lamb's quarters 'Aheahea	Exotic	O
Chenopodium murale L.	Nettle-leaved goosefoot	Exotic	O,K,C,D
Salsola pestifer A.Nels	Russian thistle	Exotic	D
Compositae (Sunflower Family)			
Bidens cynapiifolia HBK.	West Indian beggar's tick	Exotic	D
*Lipochaeta lavarum var. lavarum (Gaud.)DC.	Gaudichaud lipochaeta Nehe	Endemic	O
Picris hieracioides L.	Hawksweed	Exotic	D
Pluchea odorata (L.) Cass.	Pluchea; sourbush	Exotic	W,D
Sonchus oleraceus L.	Sow thistle Pua-lele	Exotic	C,D
Xanthium saccharatum Wallr.	Cocklebur Kikania	Exotic	D
Convolvulaceae (Morning Glory Family)			
Ipomoea alba L.	Moon flower Koali-pehu	Exotic	W
*Ipomoea brasiliensis (L.)Sweet	Beach morning glory Pohuehue	Indigenous	W,C
*Jacquemontia sandwicensis var. sandwicensis Gray	Jacquemontia Pa u-o-hi'i-'aka	Endemic	C
Merremia aegyptia (L.) Urban	Hairy merremia Koali-kua-hulu	Exotic	O
Cucurbitaceae (Gourd Family)			
Cucumis dipsaceus Ehrenb.exSpach	Wild spiny cucumber	Exotic	O
Euphorbiaceae (Spurge Family)			
Euphorbia hirta L.	Garden spurge Koko-kahiki	Exotic	D
Ricinus communis L.	Castor bean Koli	Exotic	D
Goodeniaceae (Naupaka Family)			
*Scaevola taccada (Gaertn.)Roxb.	Beach naupaka Naupaka-kahakai	Indigenous	W,C
Leguminosae (Bean Family)			
Cassia leschenaultiana DC.	Partridge pea Lauki	Exotic	D
Leucaena leucocephala (Lam.)deWit	False koa Koa-haole	Exotic	O,K
Prosopis pallida (Humb.&. Bonpl.exWilld.)HBK.	Mesquite Kiawe	Exotic	B,R,O,K,W,C,D
Malvaceae (Mallow Family)			
*Hibiscus tiliaceus L.	Hau	Indigenous	W
Malvastrum coromandelium (L.)Garcke	False mallow Hauuoi	Exotic	D
*Sida cordifolia L.	Lei ilima 'Ilima	Indigenous	B,R,O
*Sida fallax Walp.	Ilima 'Ilima papa	Indigenous	R,O,D
Thespesia populnea (L.) Soland.exCorrea	Portia tree Milo	Exotic	W,C
Portulacaceae (Purslane Family)			
Portulaca oleracea L.	Common purslane 'Ihi	Exotic	C,D
Scrophulariaceae (Figwort Family)			
*Bacopa monnieria (L.) Wettst.	Water hyssop	Indigenous	W
Solanaceae (Nightshade Family)			
*Lycium sandwicense Gray	Ohelo-kai	Indigenous	W,C
Sterculiaceae (Cocoa Family)			
*Waltheria americana L.	Waltheria Hi'aloa; 'uhaloa	Indigenous	R,O,D

* Native Species

Locations: B = Barren Lava; C = Coastal Strand; D = Disturbed; G = Gully; K = Kiawe Woodland; L = Landscaped/Developed Areas; O = Open Scrub Grassland; R = Scrub Rockland; W = Wetland/Pondside

CHECKLIST OF PLANT SPECIES

Scientific Name	Common Name / Hawaiian Name	Status	Location
MONOCOTYLEDONEAE			
Amaryllidaceae (Amaryllis Family)			
Agave sisalana Perrine ex Engelm.	Sisal Malina	Exotic	G,L
Commelinaceae (Spiderwort Family)			
Commelina diffusa Burm.f.	Dayflower Honohono	Exotic	G
Cyperaceae (Sedge Family)			
*Fimbristylis dichotoma (L.)Vahl	Tall fringe rush	Indigenous	G
Gramineae (Grass Family)			
Aristida adscensionis L.	Sixweeks threeawn	Exotic	O,G
Chloris inflata Link	Swollen finger-grass Mau'ulei	Exotic	O,C,L
Cynodon dactylon (L.)Pers.	Bermuda grass Manienie	Exotic	O,L
Dactyloctenium aegyptium (L.)Willd.	Beach wiregrass	Exotic	C
Eleusine indica (L.)Gaertn.	Wiregrass Manienie-ali'i	Exotic	C,L
*Heteropogon contortus (L.)Beauv.exR.&S.	Pili grass Pili	Indigenous	O
Panicum maximum Jacq.	Guinea grass	Exotic	G
Paspalum orbiculare Forst.f.	Ricegrass Mau'u-laiki	Exotic	G
Pennisetum setaceum (Forsk.)Chiov.	Fountaingrass	Exotic	O,G
Pennisetum setosum (Sw.)L.C.Rich.inPers.	Feather pennisetum	Exotic	O,G,C,K
Rhynchelytrum repens (Willd.)C.E.Hubb.	Natal redtop	Exotic	O
*Sporobolus virginicus (L.)Kunth	Beach dropseed 'Aki'aki	Indigenous	C
Palmae (Palm Family)			
Cocos nucifera L.	Coconut	Exotic	C,L
DICOTYLEDONEAE			
Anacardiaceae (Mango Family)			
Schinus terebinthifolius Raddi	Christmas berry Nani-o-hilo	Exotic	G
Apocynaceae (Periwinkle Family)			
Catharanthus roseus (L.)G.Don	Madagascar periwinkle Kihapai	Exotic	G
Cactaceae (Cactus Family)			
Opuntia megacantha Salm-Dyck	Prickly pear Pa-nini	Exotic	O
Caryophyllaceae (Pink Family)			
Spergula arvensis L.	Corn spurry	Exotic	O,G
Chenopodiaceae (Goosefoot Family)			
Atriplex semibaccata R.Br.	Australian salt bush	Exotic	O,C,K
Chenopodium murale L.	Nettle-leaved goosefoot	Exotic	O,C,K
*Chenopodium oahuense (Meyen)Aellen	'Āheahea	Endemic	O
Combretaceae (Terminalia Family)			
Terminalia catappa L.	False kamani Kamani-haole	Exotic	C,L
Compositae (Sunflower Family)			
*Lipochaeta lavarum var. lavarum (Gaud.)DC.	Gaudichaud lipochaeta Nehe	Endemic	O
Pluchea odorata (L.)Cass.	Pluchea; sourbush	Exotic	O
Sonchus oleraceus L.	Sow thistle Pua-lele	Exotic	G
Xanthium saccharatum Wallr.	Cocklebur Kīkānia	Exotic	O
Convolvulaceae (Morning Glory Family)			
*Ipomoea brasiliensis (L.) Sweet	Beach morning glory Pohuehue	Indigenous	C
*Ipomoea cairica var. cairica (L.)Sweet	Koali	Indigenous	O,G
*Ipomoea congesta R.Br.	Morning glory Koali-'awania	Indigenous	O,G
*Jacquemontia sandwicensis var. sandwicensis Gray	Jacquemontia Pa'u-o-hi'i-aka	Endemic	O,C
*Jacquemontia sandwicensis var. tomentosa (Choisy)Hbd.		Endemic	O,C
Euphorbiaceae (Spurge Family)			
Euphorbia hirta L.	Garden spurge Koko-kahiki	Exotic	O,G,L
Goodeniaceae (Naupaka Family)			
*Scaevola taccada (Gaertn.)Roxb.	Beach naupaka Naupaka-kahakai	Indigenous	C,L
Leguminosae (Bean Family)			
Cassia leschenaultiana DC.	Partridge pea Lauki	Exotic	O,G
Crotalaria mucronata Desv.		Exotic	G
Leucaena leucocephala (Lam.)deWit	False koa Koa-haole	Exotic	O,G
Phaseolus lathyroides L.	Cow pea	Exotic	G
Prosopis pallida (Humb. &Bonpl.exWilld.)HBK.	Mesquite Kiawe	Exotic	O,G,C,K,L

* Native Species

Locations: B = Barren Lava; C = Coastal Strand; D = Disturbed; G = Gully; K = Kiawe Woodland; L = Landscaped/Developed Areas; O = Open Scrub Grassland; R = Scrub Rockland; W = Wetland/Pondside

APPENDIX C.

PERSONS CONSULTED IN CONNECTION WITH SOCIAL IMPACT STUDY

APPENDIX C. PERSONS CONSULTED IN CONNECTION WITH SOCIAL IMPACT STUDY

Harold Adams, President, Puako Community Association

A. Duane Black, Director, Department of Research and Development, County of Hawaii

Norman Brand, Past President, Puako Community Association

Reverend Donald Daughtry, Pastor, Imiola Congregational Church; Member, Local School Advisory Council; Past President, Waimea Parents Teachers Students Association; Past Member, Hawaii District School Advisory Council

Norman Davidson, businessman, Waimea

Jean De Mercer, President, Kohala Parents Teachers Students Association

Reverend John Filler, Vicar, St. Augustine's Episcopal Church, North Kohala; Chairman, Board of Directors, Big Island Council on Alcoholism

Elaine Flores, President, Waimea Hawaiian Civic Club

Frank Fuchino, Manager, Kamuela Branch, First Hawaiian Bank; President, Waimea-Kawaihae Community Association

Sidney Fuke, Director, Department of Planning, County of Hawaii

Michael Gomes, President, North Kohala Community Association

Kayoko Hanano, life-time resident of North Kohala, commuter to work in South Kohala

Ken Melrose, Chairman, Planning and Urban Design Committee, Waimea-Kawaihae Community Association

Dr. Charles Morin, Physician, Kohala Health Center; Medical Committee and Environmental Control Committee, North Kohala Community Association

Fred Nanaka, Past President, Waimea-Kawaihae Community Association; Past Chairman, Hawaii District School Advisory Council; Member, Board of Directors, Lucy Henriques Medical Center

Dr. Edward S. Okada, Principal, Kohala High and Elementary School

Jerry Sakamoto, Principal, Honokaa High and Elementary School

Mark Sperry, Administraor, Lucy Henriques Medical Center

Rep. Yoshito Takamine, Division Director, ILWU; Member, State House of Representatives

APPENDIX C. (con't)

Robert Tsuyemura, Manager, Kohala Corporation; Vice President, Oceanic Properties

Herbert S. Watanabe, Staff Specialist, Business and Facilities, Hawaii District Schools, State Department of Education

Without the kokua of the above individuals this assessment would not have been possible. Many gave generously of their time, even during busy schedules. Their interest goes beyond helping with the EIS. They are ready to help as partners in their community's development process.

APPENDIX D.

METHOD USED TO ARRIVE AT ESTIMATES OF ADDITIONAL JOBS AND POPULATION IN NORTH AND SOUTH KOHALA WHICH MAY BE GENERATED BY THE DEVELOPMENT COMPLEX BY 1990

APPENDIX D.
METHOD USED TO ARRIVE AT ESTIMATES OF ADDITIONAL JOBS AND POPULATION IN NORTH AND SOUTH KOHALA WHICH MAY BE GENERATED BY THE DEVELOPMENT COMPLEX BY 1990

Using Data Contained in the Economic Impact Analysis and the Ten Year Construction Program Projected as of December 1979.

1. Estimated number of residents and hotel guests who will occupy dwelling units within the development complex.

TYPE OF UNIT	NUMBER OF UNITS	AVG. ANNUAL OCCUPANCY	AVG. PARTY SIZE	AVG. DAILY CENSUS
Hotels	2,700 rooms	70%	1.8	3,402
Condominiums	1,800 apartments	25%	2.0	900
Residences	220 houses	25%	2.5	138
			TOTAL	4,440

2. Estimated number of employees required for jobs within the development complex.

TYPE OF UNIT	NUMBER OF UNITS	JOBS PER UNIT	NEW JOBS GENERATED
Hotels	2,700 rooms	0.8	2,160
Condominiums	1,800 apartments	0.1	180
Residences	220 houses	---	---
Commercial/industrial			510
Construction (average daily*)			360
Total additional jobs			3,210
Job to person conversion			x 0.92
Estimated number of employees			2,953

3. Estimated number of employees required for jobs outside the development complex.

Number of equivalent full-time jobs generated within the development . . . 2,953

Employment multiplier used to determine number of jobs generated outside the project (1.1)

Estimated number of such jobs (0.1 x 2,953) 295

Job to person conversion . . . . x 0.92

Estimated number of outside employees 271

* The number of construction workers will fluctuate according to the rate of construction of the development complex.

APPENDIX D. (con't)

4. Estimated number of employees who are likely to move into North and South Kohala to fill jobs generated by the development complex.

Number needed on-site		2,953
Number needed off-site		271
	TOTAL	3,224
Less number who are expected to be retained as residents of North and South Kohala	1,500	
and		
Less number who are expected to commute daily from outside the area (.05 x 3,224)	161	
	TOTAL	1,661
Estimated number of in-migrant employees		1,563

5. Estimated number of persons who will be added to the resident population of North and South Kohala by virtue of the development complex.

Number of in-migrant employees	1,563	
Average household, Hawaii County	3.38	
Estimated additional residents generated by employment (1,563 x 3.38)		5,283
Estimated average daily resident population of the development complex		1,038
	TOTAL.	6,321

6. Estimated additional average daily defacto population of North and South Kohala in 1990 generated by the Mauna Loa Land, Inc. and Olohana Corp./UAL development complex

Residents	6,321	
Visitors	3,402	
TOTAL		9,723*

---

* Less number of persons who may have left if rate of construction work is cut back.

APPENDIX E.

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

BNA

TEXT

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table 1. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table 1.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the L_{Cdn} with the LAdn.

Although not included in the tables, it is also recommended that "L_{PN}" and "L_{EPN}" be used as symbols for perceived noise levels and effective perceived noise level, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

> The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, L_{eq} is designated the "equivalent sound level". For L_d, L_n, and L_{dn}, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristic of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, dBA, PNdB, and EPNdB are not to be used. *Examples of this preferred usage are:* the Perceived Noise Level (L_{PN} was found to be 75 dB. L_{PN} = 75 dB.) This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of-Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighted Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

TABLE 1: A-Weighted Recommended Descriptor List

	Term	Symbol
1.	A-Weighted Sound Level	L_A
2.	A-Weighted Sound Power Level	L_{WA}
3.	Maximum A-Weighted Sound Level	L_{max}
4.	Peak A-Weighted Sound Level	L_{Apk}
5.	Level Exceeded x% of the time	L_x
6.	Equivalent Sound Level	L_{eq}
7.	Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8.	Day Sound Level	L_d
9.	Night Sound Level	L_n
10.	Day-Night Sound Level	L_{dn}
11.	Yearly Day-Night Sound Level	$L_{dn(y)}$
12.	Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is L_{eq} (1)). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine.)

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TABLE II: Recommended Descriptor List

	TERM	A-WEIGHTING	ALTERNATIVE(1) A-WEIGHTING	OTHER WEIGHTING (2)	UNWEIGHTED
1.	Sound (Pressure) (3) Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2.	Sound Power Level	L_{WA}		L_{WB}	L_W
3.	Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4.	Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5.	Level Exceeded x% of the time	L_x	L_{Ax}	L_{Bx}	L_{px}
6.	Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7.	Equivalent Sound Level Over Time(T) (4)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8.	Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9.	Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10.	Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11.	Yearly Day-Night Sound Level	$L_{dn(y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12.	Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13.	Energy Average value over (non-time domain) set of observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14.	Level exceeded x% of the total set of (non-time domain) observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15.	Average L_x value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown.. Applies also to C,D,E,..... weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified as $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine)).

- 0 -

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APPENDIX F.

COMMENTS AND RESPONSES

APPENDIX F: COMMENTS AND RESPONSES

This appendix contains letters of comment on the Lalamilo Environmental Impact Statement. All those letters requiring a response are followed by such responses. Those letters not requiring a response are reproduced only.

1317

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

RECEIVED
'80 MAR 5 P 1:32
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

RECEIVED
MAR 10 P 4:01
DIV. OF WATER & LAND DEVELOPMENT

February 29, 1980

Mr. Susumu Ono
Chairman, Board of Land
and Natural Resources
P.O. Box. 621
Honolulu, Hawaii 96809

Re: Environmental Impact Statement Lalamilo Water System, South Kohala, Hawaii

Dear Sir:

We have reviewed the referenced document and offer the following comments for your consideration.

It still appears that the direct impacts of construction for the water system will be slight and should have only a minimal effect on local wildlife. We are not yet convinced that this is true for the long-term impacts of development also described in the EIS.

However, these concerns will be discussed at a later time as property developers provide detailed plans and get involved in the permit application process.

One of our prime concerns, that still has not been adequately addressed, is anti-erosion control measures during the construction phase. For the water transportation corridor this may be a minor concern, but needs to be addressed for subsequent coastal development.

We appreciate this opportunity to comment.

Sincerely yours,

Thomas R. Hebbett

For Maurice H. Taylor
Field Supervisor
Division of Ecological Services

CONSERVE AMERICA'S ENERGY

cc: NMFS
HDF&G
EPA, San Francisco
EQC

Save Energy and You Serve America!

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 18, 1980

Mr. Maurice H. Taylor
Field Supervisor
Division of Ecological Services
United States Department of the Interior
Fish and Wildlife Service
300 Ala Moana Boulevard
Post Office Box 50167
Honolulu, Hawaii 96850

Dear Mr. Taylor:

Re: Environmental Impact Statement Lalamilo Water System, South Kohala, Hawaii

Thank you for your comments on the proposed Lalamilo Water System. The following are our response to your comments:

Your concerns regarding erosion control during the construction phase are addressed, to the extent possible, on pages III-67e and III-68 of the EIS. We believe that, as is the case with impacts on wildlife, the localized erosion control will have to be addressed as the developers become involved in the permit application process.

Very truly yours,

SUSUMU ONO
Chairman of the Board

SO:mu

HCRS 9ufs

COPY

DEPARTMENT OF PARKS & RECREATION
COUNTY OF HAWAII
HILO, HAWAII 96720

DLNR
MAR 3 1980
HCRS

RECEIVED
80 FEB 29 A9:29
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

February 26, 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Subject: Lalamilo Water System, South Kohala - EIS

The following corrections should be made to Table III - 36 (page III - 101) and Figure III - 3 (page III - 102):

Kamehameha Park	18.5 acres
Kapaa Beach Park	26.3 acres
Pololu - Honokane	Not a County facility
Pololu Valley Lookout	Not a County facility
Thelma Parker Gym	State facility
Waimea Park	10.5 acres

We have no other comments to offer and we thank you for the opportunity to review the report.

Milton T. Hakoda

Milton T. Hakoda
Director

cc: Dept. of Land and Natural Resources

encl. (EIS returned)

RECEIVED
80 MAR 12 P3:49
DIV. OF WATER & LAND DEVELOPMENT

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 19, 1980

Mr. Milton T. Hakoda
Director
Dept. of Parks & Recreation
County of Hawaii
Hilo, Hawaii 96720

Dear Mr. Hakoda:

Environmental Impact Statement
for Lalamilo Water System,
South Kohala, Hawaii

Thank you for your comments regarding the Lalamilo Water System contained in your letter dated February 26, 1980. We have implemented the changes within the body of the EIS per your request.

Very truly yours,

SUSUMU ONO
Chairman of the Board

GEORGE R. ARIYOSHI
GOVERNOR

CHARLES G. CLARK
SUPERINTENDENT

RECEIVED
80 MAR 10 A8:09
DEPT. OF LAND
& NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

March 4, 1980

RECEIVED
80 MAR 12 A10:33
DIV. OF WATER &
LAND DEVELOPMENT

MEMO TO: Office of Environmental Quality Control
Office of the Governor

F R O M: Charles G. Clark, Superintendent
Department of Education

SUBJECT: Lalamilo Water System
South Kohala, Hawaii

We have reviewed the subject Environmental Impact Statement and would like to offer the following comments:

1. The 1995 enrollment projection noted on Page III-96 for Waimea Elementary-Intermediate School represents a K-8 grade structure due to a proposed organizational change from K-9 to K-8.

2. The statement on Page III-97 that the schools have enough land to allow either for temporary or permanent expansion should be modified to include..." that provided the lands abutting the schools are not developed."

Should there be any question regarding these comments, please contact Mr. Howard Lau at 5704.

CGC:HL:th

cc Hawaii District
Dept. of Land & Nat. Resources

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 19, 1980

Mr. Charles G. Clark
Superintendent
Department of Education
P. O. Box 2360
Honolulu, Hawaii 96804

Dear Mr. Clark:

Environmental Impact Statement
for Lalamilo Water System,
South Kohala, Hawaii

Thank you for your comments regarding the Lalamilo Water System contained in your letter dated March 4, 1980. We have implemented the changes within the body of the EIS per your request.

Very truly yours,

SUSUMU ONO
Chairman of the Board

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

March 7, 1980

RE:0302

Mr. Richard O'Connell
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Review of
Environmental Impact Statement
Lalamilo Water System
South Kohala, Hawaii

The Environmental Center has reviewed the above cited EIS with the assistance of Chuck Gee, Juanita S. Liu, Travel Industry and Management; Joe Halbig, Hilo College; Frank Peterson, Geology and Geophysics; Penelope Canan, Sociology; Doak Cox, John Sorensen, and Barbara Vogt, Environmental Center.

The EIS adequately addresses many important issues and is to be lauded for its treatment of economic impacts. We do have, however, several reservations concerning the impacts on the water resources of the district and the analysis of social impacts.

1. Impact on Water Resources in Kohala

Table III-28 (p. III-72) and the text on page III-73 indicate that a head of 16 feet was found at Parker wells 1 and 2 (USGS nos. 5745-01 and 5745-02). The text sites two consultant reports suggesting that the difference between the head at these wells and the heads at wells closer to the shoreline indicates a major hydraulic discontinuity. It is our understanding that the 16-foot head report resulted from a faculty bubbler system for head measurement, and that the head has recently been found to be about the same as that at Lalamilo well A (USGS 5946-01), 8 feet, and only about half that indicated in the report.

Although no estimate of the groundwater recharges or the sustainable yield presented in the report is based on the reported high head at Parker wells 1 and 2, the error in the head (if our understanding is correct) should be corrected in the table and the text of the final EIS.

No estimates of the sustainable yield, as such, are presented in the EIS. However, there is an extensive discussion of estimates of the ground-water flux (or recharge) based on water budget methods. The recognition of the range of uncertainty in these estimates in the EIS is to be commended.

From the estimates of flux the EIS concludes (p. III-80) "that there is a high probability that use of all of the 2.0-mgd capacity of the [Lalamilo] system's first increment, together with expansion of brackish water pumpage and Washoloa's fresh water pumpage, could be achieved without adverse effect on the region's groundwater" and, more tentatively, "that the entire 5.3-mgd capacity of the Lalamilo Water System, along with other groundwater use, could also be developed without adverse effect." The meaning and derivation of ~~these "capacity" figures is~~ not clear. They appear to correspond to rates identified as "Defined supply capabilities" in Table I-1 (p. I-4). However these are capacities 0.73 times the total new well pump capacity less the capacity of the largest single pump, the factor 0.73 taking into account the effects of mixing of the water from the new pumps with brackish water being delivered from existing wells. Mean draft rates would be more significant in comparison with recharge or safe yield.

Discussion on page I-9 suggests that the mean draft may be 0.67 times the supply capability. If this is valid, the mean draft attributable to the first increment will be 1.3 mgd and the mean draft attributable to the three planned increments in total will be 3.5 mgd. However, Table III-30 (p. III-77) shows a projected average pumpage for the "High elevation wells of the Lalamilo Water System" of 2.6 mgd. The probability that the draft attributable to the three increments can be supplied from the ground-water resource is clearly greater if the projected mean draft of the new wells is 2½ or 3½ mgd than if it is 5.3 mgd, and the EIS should clarify the matter.

It should be noted, however, that the total "projected groundwater pumpage" from all South Kohala wells is estimated in Table III-30 at 14.0 mgd. It appears from Figure III-1 (p. III-71) that the wells will draw from a part of the ground-water body discharging to about 6 miles of coastline. The two preferred estimates of the recharge per unit coastal length (Tables III-31 and III-32, pp. III-73 and III-79) would lead to estimates of 18 to 38 mgd recharge in this area. It is quite unlikely that the sustainable yield of the basal aquifer can be as great as 14 mgd if the recharge is only 18 mgd, but much more probable if the recharge is 38 mgd. The EIS is therefore correct in suggesting that the aquifer may not be able to supply all of the projected demand.

2. Secondary Social Impacts

Our reviewers found the section on "Secondary Social Impact Potentials" (pp. III-soff) to be comprehensive and well written. However, the reliance on data from 1960 and 1970, even with the authors apologies, must be questioned. If the data is unreliable then so is the Draft EIS.

The thrust of Description of Social Setting and Local Impacts" (pp. III-45-65) appears more realistic and thoughtful. Pointing out methods to assist residents in dealing with the possible effects of future development seldom is provided in an EIS.

We appreciate the opportunity to comment on this document and hope our review will be of use in preparing the Final EIS.

Sincerely,

Doak C. Cox

Doak C. Cox
Director

DCC:lmk

cc. DLNR
Chuck Gee
Juanita S. Liu
Joe Halbig
Frank Peterson
Penelope Canan
Doak Cox
John Sorenson
Barbara Vogt

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 18, 1980

Mr. Doak C. Cox
Director
University of Hawaii at Manoa
Environmental Center
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Mr. Cox:

Re: Environmental Impact Statement for Lalamilo Water System, South Kohala, Hawaii

Thank you for your comments regarding the Lalamilo Water System contained in your letter dated March 7, 1980. The following are our responses to your comments:

1. COMMENTS

Impact on Water Resources in Kohala

Table III-28 (p. III-72) and the text on page III-73 indicate that a head of 16 feet was found at Parker wells 1 and 2 (USGS nos. 5745-01 and 5745-02). The text sites two consultant reports suggesting that the difference between the head at these wells and the heads at wells closer to the shoreline indicates a major hydraulic discontinuity. It is our understanding that the 16-foot head report resulted from a faculty bubbler system for head measurement, and that the head has recently been found to be about the same as that at Lalamilo well A (USGS 5946-01), 8 feet, and only about half that indicated in the report.

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From the estimates of flux the EIS concludes (p. III-80) "that there is a high probability that use of all of the 2.0-mgd capacity of the (Lalamilo) system's first increment, together with expansion of brackish water pumpage and Washoloa's fresh water pumpage, could be achieved without adverse effect on the region's groundwater" and, more tentatively, "that the entire 5.3-mgd capacity of the Lalamilo Water System, along with other groundwater use, could also be developed without adverse effect." The meaning and derivation of these "capacity" figures is not clear. They appear to correspond to rates identified as "Defined supply capabilities" in Table I-1 (p. 1-4). However these are capacities 0.73 times the total new well pump capacity less the capacity of the largest single pump, the factor 0.73 taking into account the effects of mixing of the water from the new pumps with brackish water being delivered from existing wells. Mean draft rates would be more significant in comparison with recharge or safe yield.

Discussion on page I-9 suggests that the mean draft may be 0.67 times the supply capability. If this is valid, the mean draft attributable to the first increment will be 1.3 mgd and the mean draft attributable to the three planned increments in total will be 3.5 mgd. However, Table III-30 (p. III-77) shows a projected average pumpage for the "High elevation wells of the Lalamilo Water System" of 2.6 mgd. The probability that the draft attributable to the three increments can be supplied from the ground-water resource is clearly greater if the projected mean draft of the new wells is 2½ or 3½ mgd than if it is 5.3 mgd, and the EIS should clarify the matter.

It should be noted, however, that the total "projected groundwater pumpage" from all South Kohala wells is estimated in Table III-30 at 14.0 mgd. It appears from Figure III-1 (p. III-71) that the wells will draw from a part of the ground-water body discharging to about 6 miles of coastline. The two preferred estimates of the recharge per unit coastal length (Tables III-31 and III-32, pp. III-78 and III-79) would lead to estimates of 18 to 38 mgd recharge in this area. It is quite unlikely that the sustainable yield of the basal aquifer can be as great as 14 mgd if the recharge is only 18 mgd, but much more probable if the recharge is 36 mgd. The EIS is therefore correct in suggesting that the aquifer may not be able to supply all of the projected demand.

1. RESPONSE

The faulty bubbler system you mentioned cannot be confirmed. In fact, discussions with Mr. Claude Jenkins of Waikoloa (responsible for well system maintenance) indicate that the bubbler system is operating properly and he knows of no fault in the system. To date, the best information available, cannot substantiate the water level change.

From the discussion (including tables) on ground-water from III-74 through III-80 of the EIS, we estimate that 15 to 30 MGD might be developable. Since Table III-30 (Project future pumpage ...) shows a 14.0 MGD pumpage estimate, 3.55 of which is from this project, we conclude the high probability of achievement for the 2.0 MGD increment. Further, since the 3.55 MGD average relates to the 5.3 MGD system capability and is still below our estimate of 15-30 MGD, we again conclude that the 5.3 MGD capacity could also be developed without adverse impact. We hope thid clarifies the point as Table I-1 is not the source of our conclusions.

The discussion on mean draft was merely to point out what must be provided in supply capability and was not meant to suggest that these be used for average pumping rates. Table III-30 (p. III-77) shows the average rate that is withdrawn from the aquifer and is therefore what recharged (flux) is balanced against, while the supply capability shows what is necessary to be pumped during times of larger than average usage.

2. COMMENTS

Secondary Social Impacts

Our reviewers found the section on "Secondary Social Impact Potentials" (pp. III-soff) to be comprehensive and well written. However, the reliance on data from 1960 and 1970, even with the authors apologies, must be questioned. If the data is unreliable then so is the Draft EIS.

The thrust of Description of Social Setting and Local Impacts" (pp. III-45-65) appears more realistic and thoughtful. Pointing out methods to assist residents in dealing with the possible effects of future development seldom is provided in an EIS.

2. RESPONSE

The data used in the preparation of the Social Impacts section is best available at this time. It would not be fair to say, therefore, that even if this data is somewhat outdated it renders the EIS unreliable.

Very truly yours,

SUSUMU ONO
Chairman of the Board

P. O. Box 394
Naalehu, Ka'u, Hawaii 96772
March 7, 1980

To: Office of Environmental Quality Control
To: Division of Land and Water Development Office
Regarding: The Proposed Lalamilo Water System Project in South Kohala

Dear People,

The Honest Environmental Citizens Against Progress Opposes the use of tax dollars in the form of County issued general obligation bonds to pay for the proposed construction of new wells, reservoirs, and pipelinges for the purpose of accomodating the development of a resort area in the South Kohala coastal region for the following reasons:

1) The land is already crying for water. Agriculture is the principle means of livelihood at present on the island and the plants and animals and people depend on water. The already existing wells for Waikoloa have already drained the surrounding area of land turning good agriculture pasture land into desert and taking away the crops and fields necessary to feed the cattle and horses which are the principle means of livelihood for the existing ranchers and farmers.

More wells such as the ones proposed to be paid for by the County-issued general obligation bonds- will only increase the water shortages already prevalent on the island and run the existing ranchers and farmers out of business, promoting a redistribution of employment from agriculture to urban slum.

Since agriculture-plants and animals are in FACT- FOOD and WATER not just for ourselves but for everyone we ask strongly that the good agricultural land be protected and preserved and drainage projects such as the one proposed at Lalamilo be without question denied!!!!!

2) When the water is drained to proposed urban slum concrete jungle it only goes out to pollute our class AA ocean water with sewage. When water is used for irrigation of plants and animals, it goes into the roots and comes out the stems and leaves into the good clean air to come down again in Rain. Animals who graze provide rich soil in the form of organic fertilizer necessary for more growth of plants and animals.

The land is already crying for water. Therefore, we oppose tax dollars being used to help rob the land of its' water in wells such as these, which will only end in sewage to pollute our class AA waters from Mauna Loa Land Corp. developers get rich quick scheme.

3) We oppose the proposed redistribution of employment from agriculture to urban slum concrete jungle which will result in Mauna Loa Land Corp, walking off multi-millionaires and all the people left holding the bag of traffic, noise, congestion, pollution and <u>higher taxes</u>!!!

4) Any proposed employment in construction is only <u>temporary</u> until the destruction is concrete.

5) Any proposed employment for island people in tourism resort area will take away from existing employment in fishing as the now class AA waters become too polluted to fish in.

We ask tax dollars to irrigate the good agricultural land and support existing employment of ranching and farming rather than promote all the garbage that has destroyed the environment in Honolulu, Oahu and other Urban slum centers.

*We ask that the land in question remain Open for hiking trails, camping and fishing available free or at little cost, to everyone.

6) When you multiply the number of proposed units in a building by the selling cost per unit minus <u>temporary construction</u> costs--the gross land developers are walking away multimillionaires and all the little people must pay forever for the traffic, noise, congestion, pollution, and <u>higher taxes</u> that <u>FORCE</u> existing landowners and farmers and ranchers out of business. The rich get richer and the poor get poorer and our fragile environment is destroyed. There ought to be a law against the printing of paper (in the form of tax general obligation bonds) to pay for such destruction of our fragile environment. NO MORE TAXATION WITHOUT REPRESENTATION.

7) Animals are extinct and endangered species in Honolulu, Oahu's concrete jungle. The ocean there is so polluted that none of the fish or shells are edible anymore. The people there would have to be CANNIBALS if the boats and planes run out of fuel and they could not buy their food. The world is already overpopulated and hungry, as experienced with the recent starving people of Cambodia. What they have to do for money is atrocious!!!!!

Let us preserve and protect what is left of our natural resources and priceless and precious agriculture land and use the agriculture land for that purpose, in order to provide FOOD FOR the overpopulated HUNGRY world.

8) We would like to see the multimillionaire building developers clean the toilets and pick up the sewage and garbage that pollute the oceans and burn their $million dollars of paper that destroy the plants, animals, fish and shells that are FOOD and WATER for everyone. The difference between the developers who get paper richer and the poor who get poorer and the threat to the environment necessary for food is too great !!!!! to be allowed to go any farther. We have asked time and again when will it end and pray that the State Environmental Quality Commission and the Office of Environmental Quality Control and Division of Land and Water Development will NOT BUCKLE under the almighty $ dollar and for get what almighty God created for everyone.

*Please help save what little is left and do not let it be destroyed by the concrete jungle as other urban slum centers have. Remember plants and animals are FOOD and WATER and promote agriculture and save the agricultural land that is left for that purpose in order to feed all the future generations.

9) Help STOP URBANIZATION!!! Help STOP TAXES and POLLUTION from going sky HIGH!!! Help STOP $Multimillionaire Developers from WIPING OUT our FRAGILE ENVIRONMENT and making all the people pay forever for the traffic, noise, congestion, pollution and higher taxes that gets dumped in the concrete jungles.

10) If the proposed area in question in South Kohala Coastal Region is to be resort area we believe strongly that people do not want to come to concrete jungles and the land in question would be much better used in pasture land for hiking, camping, and fishing at low and moderate prices with some endangered species of horses available for recreational riding and hunting or work riding herding the cattle, than any of the multimillion dollar concrete jungles that everyone wants to get away from.

11) The newspaper article says the water system is designed to supply the South Kohala Coast from Kawaihae to Puako.

We can only state that ~~the existing~~ well for Waikoloa has left the surrounding land area desert, while providing for the Waikoloa Buildings and WE PRAY that more proposed wells will not wipe out the remaining agriculture land in question, for the same reason.

12) We state once again that water used for $multi-millionaire buildings ends up only in sewage polluting the ocean, while water used for irrigation for plants and animals provides more rain and fertilizer necessary for existing agriculture dependents and growth of FOOD and WATER, for everyone in this already overpopulated and HUNGRY world.

13) We PRAY that NO MORE sewage will destroy the class AA water abundant source of FISH, SHELLS, CRABS, OYSTER, LOBSTER, TURTLE, WHALES, DOLPHINS, and that NO MORE agriculture land will be destroyed and agricultural dependents displaced as water is drained in wells such as these for such proposed resort concrete jungles, that leave a hand full of millionaires and a million more people on the streets.

SAVE OUR OCEAN!!! SAVE OUR ENVIRONMENT!!! SAVE OUR ENDANGERED SPECIES OF PLANTS AND ANIMALS!!! BURN THE PAPER $ MONEY PRINTED BY TAXES!!!

14) 3.6 miles of electric power lines, electricity and lights will obstruct the view by the Volcano Observatory. People from all over the world come to study there!!!!!

We would like to see tax dollars used to provide better schools for island people and visitors--maybe Veterinary school, Oceanography school on outer islands, Medical, Dental and Law Schools for island people, rather than let tax dollars continue to pay for the traffic, noise, congestion, pollution for all the people who come here and fill in all the job markets.

Mahalo,
Elizabeth Ann Stone

Elizabeth Ann Stone, children, and endangered species of plants and animals.
President, Honest Environmental Citizens Against Progress

P. S. Could you please send to us a copy of the environmental impact statement prepared by Belt, Collins and Associates for the Department of Land and Natural Resources Division of Land and Water Development for the area in

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 18, 1980

Ms. Elizabeth Ann Stone
Post Office Box 394
Naalehu, Ka'u, Hawaii 96772

Dear Ms. Stone:

Re: Lalamilo Water System

Thank you very much for taking the time to express your views on the proposed Lalamilo Water System project.

Pursuant to your request, we are herewith enclosing a copy of the EIS. We believe that after having read the EIS, you will find that the concerns expressed in your letter have been adequately addressed.

Very truly yours,

Susumu Ono

SUSUMU ONO
Chairman of the Board

SO:mu

Enclosure

The Exchange Club of Waimea
KAMUELA, HAWAII 96743

March 8, 1980

Mr. James Y. Yoshimoto, P.E.
Chief Project Development Engineer
State of Hawaii
Department of Land and Natural Resources
Division of Water and Land Development
P.O.Box 373
Honolulu, Hawaii 96809

RE: LALAMILO WATER SYSTEM - - ENVIRONMENTAL IMPACT STATEMENT

Dear Jimmy:

Special thanks go to you and Joe Vierra for your presentation at our luncheon meeting yesterday. Your explanation of the Lalamilo Water System E.I.S. was very well received. The 20 members in attendance were pleased that the two of you responded to our request and took time to discuss this very important project with us.

You and Joe answered many of our questions and clarified certain issues. As we discussed yesterday, there are several points of view that we feel should be officially noted either in the text of the E.I.S. or in the appendix.

I have enclosed these notes for your review. Even though these notes are being mailed on the weekend and may not get to you by the official closing date for responses to the E.I.S., I trust that you will see to it that they are included in the appropriate section of the final E.I.S.

Again, Mahalo for your sincere interest in the concerns and questions of the Waimea, Kawaihae, and Puako communities.

Sincerely yours,

John J. Crouch

John J. Crouch
President

cc: Mr. Robert Chuck
Department of Land and Natural Resources
Division of Land and Water Development
P.O.Box 621
Honolulu, Hawaii 96809

Mr. Frank Fuchino, Resort Development Coordinator
Waimea-Kawaihae Community Association
Kamuela, Hawaii 96743

The Exchange Club of Waimea
KAMUELA, HAWAII 96743

COMMENTS AND OBSERVATIONS ABOUT THE E.I.S. FOR
THE LALAMILO WATER SYSTEM, SOUTH KOHALA, HAWAII

1. Those who prepared the Bvironmental Impact Statement for the Lalamilo Water System, South Kohala, Hawaii are to be congratulated and thanked for dealing extensively with the impacts that will result from the growth that the Lalamilo Water System will enable. Had the E.I.S. been limited to the wells, water transmission lines, storage resevoirs, and other facilities connected with these, the community would be less prepared to deal with the real impacts that will follow the development of the Lalamilo Water System. We are grateful for the opportunity to comment on the E.I.S. and add to the needed discussion of the developments that will occur on the South Kohala coast.

2. We feel that there are several points that need to be made with respect to the E.I.S. that will clarify some issues and provide some additional imput from our community.

A. Areas of incorrect implications:

1. On page II-4, under the section "Public Access" there is no indication that the public is guaranteed access to the beaches and related recreational resources. On page II-3 the point is made that "these resorts, Mauna Kea Beach Hotel, now provide free public access to their beaches . . .". Ten spaces for public parking is NOT "free public access" to the beach, which is not their beach, but public property. Also the use of plural,"these hotels", implies that several facilities are now supplying adequate public access to the beach when in fact only one facility, Mauna Kea Beach Hotel, is in existence. The Public needs written guarantees that it has full and free access to all beaches on the West Hawaii Coast, including those in the area served by the proposed Lalamilo Water System.

2. On page II-3 there is a quotation from Section 8 - Objectives and Policies for the -- Visitor Industry. It reads: "Foster a recognition of the contribution of the visitor industry to Hawaii's economy and the need to perpetuate the Aloha Spirit." The "Discussion" which follows does not speak to the issue of perpetuating the Aloha Spirit. Comments on the perpetuating of the Aloha Spirit would be appreciated. There is cause for concern in this area.

TABLE S-2 (cont.)

ITEM	REACTION					
	(a) EXCELLENT IDEA	(b) GOOD IDEA	(c) ACCEPTABLE IDEA	(d) DON'T LIKE THE IDEA	(e) OPPOSE THE IDEA	(f) DOESN'T MATTER
Age						
15-19 years of age	6.6%	8.5%	14.0%	15.9%	10.4%	16.9%
20-24 years of age	7.5%	9.9%	12.5%	16.9%	16.2%	13.6%
25-29 years of age	11.6%	13.7%	18.8%	20.5%	23.6%	15.2%
30-34 years of age	17.1%	14.5%	18.7%	12.9%	16.7%	11.5%
35-39 years of age	9.8%	12.5%	11.8%	11.6%	11.9%	7.0%
40-49 years of age	14.5%	13.3%	11.3%	10.5%	9.8%	12.3%
50-59 years of age	17.5%	13.3%	7.4%	5.0%	4.0%	7.5%
60 years or older	14.2%	12.0%	4.8%	5.7%	2.5%	14.3%
Formal Education						
Completed grade school	7.1%	8.1%	4.2%	4.4%	0.0%	9.0%
Some high school	12.8%	15.3%	14.9%	11.1%	14.6%	18.3%
High school graduate	30.8%	34.2%	24.6%	32.6%	35.6%	33.7%
Some college (incl. bus./ tech. sch.)	29.3%	26.2%	30.4%	30.5%	30.3%	24.3%
4-year college graduate	8.7%	7.4%	12.5%	10.5%	8.4%	7.0%
Some graduate work	8.9%	6.8%	10.8%	6.6%	10.0%	3.7%

TABLE S-2 (cont.)

ITEM	(a) EXCELLENT IDEA	(b) GOOD IDEA	(c) ACCEPTABLE IDEA	(d) DON'T LIKE THE IDEA	(e) OPPOSE THE IDEA	(f) DOESN'T MATTER
	REACTION					
Ethnic Extraction						
Caucasian extraction	29.1%	19.5%	26.4%	39.1%	39.8%	25.3%
Chinese extraction	3.4%	2.5%	2.4%	2.6%	3.3%	0.7%
Filipino extraction	9.0%	11.7%	10.2%	8.2%	3.1%	12.6%
Hawaiian extraction	15.8%	23.5%	16.0%	23.0%	22.4%	16.5%
Japanese extraction	26.9%	25.2%	27.8%	13.4%	2.6%	29.1%
Portuguese extraction	9.4%	8.8%	6.7%	5.9%	9.2%	9.4%
Other	5.2%	7.8%	7.9%	6.2%	18.1%	4.7%
Annual Family Income						
Under $5,000 per year	7.4%	10.9%	10.6%	13.3%	27.2%	20.5%
$5,000-$9,999 per year	14.0%	16.3%	18.0%	21.9%	27.8%	12.8%
$10,000-$14,999 per year	19.0%	22.7%	27.6%	19.9%	17.0%	18.5%
$15,000-$19,999 per year	15.6%	11.1%	7.1%	14.5%	6.9%	8.6%
$20,000-$29,999 per year	14.6%	13.3%	11.0%	8.2%	7.1%	10.8%
$30,000-$39,999 per year	6.4%	2.8%	5.9%	1.3%	1.3%	3.3%
$40,000 or more	7.5%	4.2%	4.3%	3.0%	1.2%	4.7%
Length of County Residence						
Less than 3 years	9.6%	9.5%	15.9%	20.1%	30.1%	13.6%
3-5 years	11.0%	7.3%	11.8%	16.7%	9.9%	7.0%
6-9 years	8.0%	9.1%	8.3%	10.3%	10.5%	8.4%
10-17 years	10.3%	10.5%	14.8%	15.8%	12.6%	11.3%
18 or more years	60.4%	63.2%	48.9%	37.0%	35.7%	58.4%

3. In the last paragraph on page III-43 there is a suggestion thatt "families with low or fixed incomes who might find it difficult to pay the higher property taxes that would be imposed if . . ." Is it an "if" situation, or is it a "when" situation? Is there a realistic possibility that property taxes may not be increased as a result of nearby development? If not, this statement is misleading.

4. On page VII-4 this statement is made: "Large employers will be required to ensure, through a variety of means, that housing is adequate to meet the needs of their employees." Yet the whole issue of adequate employee housing is far from settleled. The implication is that the employee housing issue is a settled matter ans that the general public need not worry about it any further. However, some important questions that need to be addressed are: Who will provide the housing? When will it be constructed? How much will be rental and by whom will the rental housing be owned? What provisions will be made for low-income housing to be purchased by employees?

B. Incorrect text:

1. There appears to be an error on page I-7. The first sentence of the second paragraph reads: "The Lalamilo Water System is designed to supply the South Kohala coast from Kawaihae to Puako." Yet we understand the system to be designed to permit development of tourist resorts on the coastal area South of Puako. Please clarify.

2. Page III-13 and III-15 in the E.I.S. are duplicates. Apparently page III-13 is missing. Please send us three copies of page III-13.

C. Areas needing additional treatment or references to other relavent work.

1. The "No-Project" Scenario begun on page III-11 is highly suspect because of the obvious bias of the writers -- and, probably, of the County and State. The comment is made that, "Nevertheless, State law requires sush an analysis . . ." The integrity of the "No-Project" discussion ought not to be compromised. What would happen if the Lalamilo water project were not undertaken by the State?

2. "The Social Impact of Visitor Population" section needs additional discussion. Crime rates and types of crimes that tend to follow increases in tourism, necessary training of police to deal with urban/transitional communities and tourism oriented crimes, and juvenile deliquency issues need to be considered. What increase in police personnel and equipment, in school facilities and teachers, in fire protection capabilities, in County and State road services, in utilities services and many more services will be needed to meet the influx of population made possible by implementation of the Lalamilo water project?

3. Several comments are made in Section III pages 61 through 64 about the potential adverse effects, misunderstandings and misinformation that can develop if the total community does not become involved in issues of tourism growth. A most helpful statement is found on page III-64: "Unless sufficient pressure is brought to bear on elected and appointed officials and on hired civil servants well in advance of anticipated needs, the people of North and South Kohala will suffer in proportion to the rate and size of the population increase generated by the resort developments in the area. . . . This challenge can be met by the joint efforts of the Community Associations of Waimea-Kawaihae, Puako and North Kohala, the developers (or their representatives) and officials of the State and County governments. . . ." These references to the importance of community, developer, and governmental cooperation are crucial to the well-being of the communities of the region involved. Further comments as to how this coalition can function would be helpful.

4. On page III-74 under the heading "Impact of the Lalamilo Water System of South Kohala Groundwater," the second paragraph reads, in part: "There has been some degradation in quality wxperienced at the Mauna Kea Beach Hotel irrigation wells, but this appears to be a design problem of these particular wells rather than a regional overdraft phenomenon." ". . .appears to be. . . ." -- where is the hard scientific data? This is a critical issue. Residents of Puako are concerned about potential increase salinaty of their ground water caused by heavy pumping of the associated fresh and brackish water lense.

5. Two or more developments opening at the same time or within a year of each other will have different impacts than if they were opened at intervals of five, ten, or twenty years. MaunaLoa Land, Inc. and T.A.A.S. -Waikoloa will each open its first hotel soon, probably within a year or each other. The E.I.S. for the Lalamilo Water System does notdeal effectively with the cumulative effect of the several developments. Yet the letter from Richard O'Connell, Director, Office of Environmental Quality Control, seem to suggest that this be considered.

6. The "no comments" by significant governmental bodies is distressing. It defeats, in part, the purpose of the law requiring the E.I.S. process. The Lalamilo Water System will influence the functioning of some of the agencies that replied, "no comment". Further effort to get thoughtful comments is indicated.

We wish to give special thanks to the developers of the Lalamilo Water System E.I.S. for their efforts at addressing the secondary impact issues that will arise as a result of such water development. We are grateful for the stress put on human value issues. The preparers of this E.I.S have earned the appreciation of the community. We hope that our notes will be of help in understanding the concerns of a resort destination community.

Sincerely,

John J. Crouch

John J. Crouch
President
The Exchange Club of Waimea

Text prepared by Tourism committee;
Reverend Donald S. Daughtry,
Chairman

cc: Mr. Robert Chuck
Department of Land and Natural Resources
Division of Land and Water Development
P.O.Box 621
Honolulu, Hawaii 96809

Mr. Frank Fuchino
Resort Development Coordinator
Waimea-Kawaihae Community Association
Kamuela, Hawaii 96743

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 18, 1980

Mr. John J. Crouch
President
The Exchange Club of Waimea
Kamuela, Hawaii 96743

Dear Mr. Crouch:

Re: Environmental Impact Statement for Lalamilo Water System, South Kohala, Hawaii

Thank you for your comments regarding the Lalamilo Water System contained in your letter dated March 8, 1980. The following are our responses to your comments:

COMMENT: A. Areas of incorrect implications.

1. On page II-4, under the section "Public Access" there is no indication that the public is guaranteed access to the beaches and related recreational resources. On page II-3 the point is made that "these resorts, Mauna Kea Beach Hotel, now provide free public access to their beaches ...". Ten spaces for public parking is NOT "free public access" to the beach, which is not their beach, but public property. Also the use of plural, "these hotels", implies that several facilities are now supplying adequate public access to the beach when in fact only one facility, Mauna Kea Beach Hotel, is in existence. The public needs written guarantees that it has full and free access to all beaches on the West Hawaii Coast, including those in the area served by the proposed Lalamilo Water System.

RESPONSE: A.1. Because the Department of Land and Natural Resources is the builder of the Lalamilo Water

System rather than the developer of the lands that would use the water, it is not in a position to guarantee public access to the shoreline. It is, however, State and County policy to ensure that adequate public access to the shoreline be made available whenever possible. Consequently, it is our belief that the land developments which are likely to follow the implementation of the Lalamilo Water System will most likely include increased provisions for public access to the shoreline.

Your observation that the Mauna Kea Beach Hotel is the only existing resort hotel in South Kohala is correct. However, access to Anaeho'omalu Bay has been provided as part of the Waikoloa Beach Resort proposed for that location, and public parking and restroom facilities have been constructed.

COMMENT: A.2. On page II-3 there in a quotation from Section 8 - Objectives and Policies for the -- Visitor Industry. It reads: "Foster a recognition of the contribution of the visitor industry to Hawaii's economy and the need to perpetuate the Aloha Spirit." The "Discussion" which follows does not speak to the issue of perpetuating the Aloha Spirit. Comments on the perpetuating of the Aloha Spirit would be appreciated. There is cause for concern in this area.

RESPONSE: A.2. Although the concept of "Aloha Spirit" is not easily defineable, it can be broadly described as the love of land, people and the Hawaiian way of life. One of the more important elements of this "Hawaiian way of life" is the hospitality that people extend to one another, the feeling of welcome that one extends even to strangers. When the Hawaii State Plan speaks of the "perpetuation of the Aloha Spirit" as being essential to the continued prosperity of Hawaii's visitor industry, it simply recognizes that this traditional Island hospitality towards the visitors is one of the major attractions of Hawaii. More specifically, the State Plan shows the awareness on the part of its draftors that Hawaii has to compete with other resort areas around the world for tourist money. While there are other areas which can compete with Hawaii in terms of climate, scenery and accommodations, the famed "Aloha Spirit", often painfully lacking in other parts of the world, has kept people returning to these islands - even if it meant longer travel and higher expenses. Consequently, in order to achieve the objective of "recognition of the contribution of the visitor industry to Hawaii's economy...", it only follows that the State would find it necessary that the "Aloha Spirit" be preserved to the greatest extent possible. We certainly recognize that with the numerous pressures and changes which accompany resort developments, especially in the previously predominately rural areas such as the Kohalas, it is often difficult to expect people not to alter their attitudes. The State recognizes, however, that many of the unfavorable attitudes towards the visitors often result from misconceptions and misunderstandings which exist between the local residents and the visitor, and that both sides need to be "educated" about one another. While the tourist can only be approached on a "last minute basis" via various publications (such as the HVB's "Happy Hawaii Tourist"), the local population can be reached through long-range educational programs. Such programs have been initiated within the public schools in recognition of the fact that one's attitudes are mainly formed during the early years of life.

COMMENT: A.3. In the last paragraph on page III-43 there is a suggestion that "families with low or fixed incomes who might find it difficult to pay the higher property taxes that would be imposed if ..." Is it an "if" situation, or is it a "when" situation? Is there a realistic possibility that property taxes may not be increased as a result of nearby development? If not, this statement is misleading.

RESPONSE: A.3. The wording used in our discussion of the changes in property tax burden that could occur as a result of development made possible, in part, by construction of the Lalamilo Water System was chosen because it is not certain that property taxes on nearby parcels would rise. Steps could be taken to buffer existing residents from such effects if the County desired to do so. Nevertheless, we agree with your suggestion that such taxes probably would increase, especially if we base such assumption on continued inflation past experience.

COMMENT: A.4. On page VII-4 this statement is made: "Large employers will be required to ensure, through a variety of means, that housing is adequate to meet the needs of their employees." Yet the whole issue of adequate employee housing is far from settled. The implication is that the employee housing issue is a settled matter and that the general public need not worry about it any further. However, some important questions that need to be addressed are: Who will provide the housing? When will it be constructed? How much will be rental and by whom will the rental housing be owned? What provisions will be made for low-income housing to be purchased by employees?

RESPONSE: A.4. Your comment with respect to the assertion that "Large employers will be required to ensure, through a variety of means, that housing is adequate to meet the needs of employees" is well taken. The quote is from the summary section and assumes somewhat more than can be justified by the material presented in the body of the Environmental Impact Statement. The text has been revised to reflect your comment.

The questions raised in the remainder of your comment are addressed on pages III-30 through III-33 of the EIS. As you note, the employee housing issue is far from resolved. The EIS concludes that a major effort will be required if a housing shortgage is to be averted, and that much of the effort will have to come from the major resort developers. Input received from the Hawaii County government during the preparation of the EIS, as well as the positions taken by the County with respect to resort development elsewhere on the island, lead us to believe that resort development permitted by the Lalamilo Water System will be approved only when developers have provided an adequate guarantee of housing availability of the type and cost necessary to meet the needs of the expected population growth. If resort developers are unable to meet the need for employee housing, the actual rate of resort growth is likely to be slower than projected.

COMMENT: B. Incorrect text:

1. There appears to be an error on page I-7. The first sentence of the second paragraph reads: "The

Lalamilo Water System is designed to supply the South Kohala coast from Kawaihae to Puako." Yet we understand the system to be designed to permit development of tourist resorts on the coastal area South of Puako. Please clarify.

RESPONSE: B.1. The EIS states correctly that the Lalamilo Water System has been designed to serve the South Kohala coastal region from Kawaihae to Puako. Puako, in this case, is used simply as a geographical orientation point; the water system will serve some resort developments south of Puako but, none of the anticipated resort developments are sufficiently south of Puako to justify a different description of their geographical location. Further, the Lalamilo Water System is not designed to serve the proposed resort development at Anaehoomalu, which will be served by an already existing, separate water system.

COMMENT: B.2. Page III-13 and III-15 in the EIS are duplicates. Apparently page III-13 is missing. Please send us three copies of page III-13.

RESPONSE: B.2. Page III-13, has, indeed, been inadvertently left out of the EIS. We regret this error, and the final document contains this page.

COMMENT: C. Areas needing additional treatment or references to other relevant work.

1. The "No-Project" Scenario begun on page III-11 is highly suspect because of the obvious bias of the writers -- and, probably, of the County and State. The comment is made that, "Nevertheless, State law requires such an analysis ..." The integrity of the "No-Project" discussion ought not to be compromised. What would happen if the Lalamilo water project were not undertaken by the State?

RESPONSE: C.1. What you took to be "... an obvious bias of the writers (of the EIS) -- and, probably, of the County and State", was actually an attempt to be as honest and forthright as possible. In other words, we believe that what we have said with reference to the "No-Project" Scenario is a correct representation of the existing situation. Page III-13 covers the questions you raise here. We feel that the information on this page clearly defines the likely course of events if the Lalamilo Water System is not constructed.

COMMENT: C.2. "The Social Impact of Visitor Population" section needs additional discussion. Crime rates and types of crimes that tend to follow increases in tourism, necessary training of police to deal with urban/transitional communities and tourism oriented crimes, and juvenile delinquency issues need to be considered. What increase in police personnel and equipment, in school facilities and teachers, in fire protection capabilities, in County and State road services, in utilities services and many more services will be needed to meet the influx of population made possible by implementation of the Lalamilo water project?

RESPONSE: C.2. While we are aware of the fact that increases in tourism are often accompanied by higher rates of certain crime categories, we also believe that the local authorities (including the Police Department) are best equipped to address this problem. The Hawaii County Police Department has been consulted concerning the impacts of the anticipated regional growth, and their comments are included in the EIS. Clearly, their response indicates that they do anticipate need for additional staffing and, eventually, new facilities. In answer to your concern about juvenile delinquency issues, we feel that there is a lack of hard evidence which would link growth of tourism with increasing juvenile delinquency rates. To the contrary, we believe that additional jobs which the development will bring to the region may serve to decrease juvenile delinquency.

In answer to the second part of your question, we have, in the section entitled: "Description of and Impacts on Public Services and Facilities", pages 95-105, discussed these concerns based upon the information and projections presently available.

COMMENT: C.3. Several comments are made in Section III pages 61 through 64 about the potential adverse effects, misunderstandings and misinformation that can develop if the total community does not become involved in issues of tourism growth. A most helpful statement is found on page III-64: "Unless sufficient pressure is brought to bear on elected and appointed officials and on hired civil servants well in advance of anticipated needs, the people of North and South Kohala will suffer in proportion to the rate and size of the population increase generated by the resort developments in the area. ... This challenge can be met by the joint efforts of the Community Associations of Waimea-Kawaihae, Puako and North Kohala, the developers (or their representatives) and officials of the State and County governments. ..." These references to the importance of community, developer, and governmental cooperation are crucial to the well-being of the communities of the region involved. Further comments as to how this coalition can function would be helpful.

RESPONSE: C.3. We have asked PUBLIC AFFAIRS ADVISORY SERVICES, INC., social planners who have prepared this section of the EIS, to respond to this question. Their comments are reproduced below.

COMMENT: C.4. On page III-74 under the heading "Impact of the Lalamilo Water System of South Kohala Groundwater," the second paragraph reads, in part: "There has been some degradation in quality experienced at the Mauna Kea Beach Hotel irrigation wells, but this appears to be a design problem of these particular wells rather than a regional overdraft phenomenon." "... appears to be ..." -- where is the hard scientific data? This is a critical issue. Residents of Puako are concerned about potential increase salinaty of their ground water caused by heavy pumping of the associated fresh and brackish water lense.

RESPONSE: C.4. Though the "hard scientific data" to support our statement which you quote does not exist, we are confident that what we say with regard to the degradation problems at the Mauna Kea Beach Hotel is correct, based on long-term observations of the well system in question. We do maintain that the problem in water quality at the Mauna Kea Beach Hotel irrigation wells is a local problem, related either to the location of wells (and relationship to one another) and/or to the existing lava formations in the area. This does not mean, however, that water cannot be taken elsewhere in the basin; there is simply no reason to believe that similar problems to the ones described above would occur in other locations. The water quality will, of course, be monitored once the Lalamilo Wells become operational, and any potential problems will be identified.

COMMENT: C.5. Two or more developments opening at the same time or within a year of each other will have different impacts than if they were opened at intervals of five, ten, or twenty years. Mauna Loa Land, Inc. and T.A.A.S. -Waikoloa will each open its first hotel soon, probably within a year of each other. The EIS for the Lalamilo Water System does not deal effectively with the cumulative effect of the several developments. Yet the letter from Richard O'Connell, Director, Office of Environmental Quality Control, seem to suggest that this be considered.

RESPONSE: C.5. We believe that your conclusion that the EIS "... does not deal effectively with the cumulative effects of the several developments" is incorrect. All of the impacts discussed in Chapter III of the EIS considered the effects of all the development likely to occur within the region during the period in question. Discussions of other growth may be found on pages III-28 through III-30, III-11 through III-13, V-4 and V-5, and elsewhere. Together, the coverage identifies all of the impacts that can reasonably be expected to occur if the Lalamilo Water System and other unrelated projects are implemented.

COMMENT: C.6. The "no comments" by significant governmental bodies is distressing. It defeats, in part, the purpose of the law requiring the EIS process. The Lalamilo Water System will influence the functioning of some of the agencies that replied, "no comment". Further effort to get thoughtful comments is indicated.

RESPONSE: C.6. Though we may share your concern about "no comment" responses from certain agencies,

Mr. John J. Crouch
March 18, 1980
Page Nine

we believe that it is their prerogative to do so. Certainly, if a given agency has no comment to make, it must feel that the project will not significantly impact their operations, nor have significant environmental impacts in the area of their concern.

Very truly yours,

Susumu Ono

SUSUMU ONO
Chairman of the Board

SO:mu

COMMENTS FOR USE IN REPLYING TO INQUIRY
FROM THE WAIMEA EXCHANGE CLUB

March 14, 1980

We are pleased to respond to your inquiry concerning the social impact portion of the EIS for the Lalamilo Water System by suggesting ways in which the people of your community can help enhance positive and/or minimize negative impacts of the potential development and growth in the Kohala area. We have asked our social planner to comment.

First, it may help to look at four interrelated spheres of activity:

1. The building, supplying, servicing and operation of the proposed developments.
2. The potential influx of a large resident and visitor population.
3. The need for increased government services as the population grows.
4. The changes that will likely occur within the Kohala communities which affect relationships between individuals and groups, the ways in which new residents are absorbed into the community and the ways in which the community organizes to deal with its problems.

As will be seen from the above, organizations such as the Waimea Exchange Club and the three community associations in North and South Kohala can make a major contribution by jointly organizing a community-wide workshop on the future of Kohala. This can be done with the help of such organizations as the following:

- Hilo Center for Continuing Education and Community Services to help with the mechanics of organizing and conducting such a workshop.
- County Planning Department to provide consultation and basic resource data.
- Hawaii Committee for the Humanities to help finance the public's participation in a dialogue on the issue of population growth and the developers' and governments' responsibilities.

COMMENTS (cont.)

Fortunately you have a group of concerned citizens who are capable of providing the leadership needed to alert the public and to set up an on-going dialogue with those responsible for development projects, related businesses and expansion of needed government services.

The agenda for a public workshop could include not only an examination of what are to be the likely impacts of what is being planned, and what the residents', developers', and County and State Governments' responsibilities are, but also the steps residents of North and South Kohala can take to set up a continuing dialogue with industry and government. Data for the workshop's agenda can be found in the several EIS's already completed and in the draft of the Kohala Community Development Plan prepared for the County in 1976..

Turning to the question of crimes associated with tourism expansion, it is likely the experience in Kohala will be similar to other tourist areas. Rates of burglaries, robberies, assaults, thefts, drug use, fraud, larceny disorderly conduct and prostitution can be expected to rise. With the influx of tourists comes the influx of construction workers, resort employees, operators and employees of businesses servicing the tourist industry and individuals exploiting the situation. Tourists will not be the only victims of crime. The friction between "outsiders" and "locals" will also be a contributing factor.

We hope this supplies you with information that will be useful. If there are further questions concerning this EIS, please let us know.

Morris G. Fox
Social Planner

1901

GEORGE R. ARIYOSHI
GOVERNOR

RICHARD O'CONNELL
DIRECTOR
TELEPHONE NO.
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
OFFICE OF THE GOVERNOR
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

March 10, 1980

MEMORANDUM

TO: Mr. Susumu Ono, Director
Board of Land and Natural Resources

FROM: Richard L. O'Connell, Director
Office of Environmental Quality Control

R. O'Connell

SUBJECT: Environmental Impact Statement for Lalamilo Water System, South Kohala, Hawaii

We have reviewed the subject document and offer the following comments for your consideration:

CONSTRUCTION SCHEDULE (Page I-3)

The EIS indicates that construction is scheduled to begin April or May 1980. Is this realistic? What is a more realistic date for construction?

HISTORIC PERSPECTIVE

EIS Regulation 1:42 b.7. requires that the project description include a historic persepctive of a project. What is the relationship of this project to Kohakohau Dam project? Has the latter been replaced by the Lalamilo project?

LAND USE POLICIES (Page II-5)

Reference is made to the County general plan which was adopted in December 1971. It should also be noted that the County revised their general plan last year.

Reference should be made to the Hawaii Coastal Management Program in this section. Is the project consistent with CZM statutory policies?

OPINION SURVEYS (Pages III-56, 65)

A profile of the persons surveyed for their reaction to resort developments should be given (eg. age, length of residency, sex, and employment).

ANCHIALINE POOLS (Page III-91)

Urban development within the planning area may have an impact on anchialine pools which contain unique aquatic organisms. These tidal pools appear elsewhere in the world but nowhere else in the United States. In a memorandum report of the U.S. Fish and Wildlife Service (John Maciolek, Memo to M. Taylor 4/19/77) were expressed concerns that such pools may be adversely affected by urban development. Increased nutrient runoff, pesticide residue levels, and sediment load would affect the water quality of the ponds but the extent is unknown and unpredictable. This should be discussed in the EIS.

NOISE LEVELS (Pages III-142, IV-42)

The EIS gives noise level increases. It should also present the absolute levels to permit a full understanding of the impact.

COST OF THE DAM (Page V-2)

According to the Kohakohau dam EIS, the estimated cost of the dam was $20 million, not $12.85 million.

FUTURE OPTIONS (Page VI-2)

The proposed project will eventually supply 5.3 mgd of water. The total estimated requirement of the area is 6.9 mgd which means that more water will be needed. How will the additional need be met? Will the proposed project be expanded? Will developement be limited to that served by the proposed project?

LIST OF APPROVALS (Page XIII-1)

EIS Regulation 1:42 states, "The status of each identified approval shall also be described. "The list provided in this section does not give the status of the approvals. We recommend that the list be revised.

We trust that these comments will be helpful to you in preparing a revised EIS. An attached sheet lists the other commentors known to this Office.

If you should have any questions regarding this matter, please do not hesitate to contact us.

Attachment

LIST OF COMMENTORS

FEDERAL

U.S. Coast Guard	February 12, 1980
*U.S. Navy	February 20, 1980
*U.S. Army - Support Command	February 20, 1980

STATE

*Department of Defense	February 13, 1980
*Department of Health	February 27, 1980
Department of Transportation	March 3, 1980
Department of Agriculture	March 5, 1980

COUNTY OF HAWAII

Department of Public Works	February 22, 1980
*Department of Parks and Recreation	February 26, 1980
*Department of Research and Development	March 6, 1980

*Denotes comment forwarded to DLNR by reviewer

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 18, 1980

Mr. Richard O'Connell, Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Re: Environmental Impact Statement for Lalamilo Water System, South Kohala, Hawaii

Thank you for your comments on the proposed Lalamilo Water System. The following are our responses to your comments:

1. COMMENT: CONSTRUCTION SCHEDULE (Page I-3). The EIS indicates that construction is scheduled to begin April or May 1980. Is this realistic? What is a more realistic date for construction?

RESPONSE: CONSTRUCTION SCHEDULE. We anticipate that the construction of the Lalamilo Water System will begin some time in June, 1980.

2. COMMENT: HISTORIC PERSPECTIVE. EIS Regulation 1:42 b.7. requires that the project description include a historic perspective of a project. What is the relationship of this project to Kohakohau Dam project? Has the latter been replaced by the Lalamilo project?

RESPONSE: HISTORIC PERSPECTIVE. The historic perspective of this project is provided in Table II-1. Beginning on page V-2, the project's historic relationship to the Kohakohau Dam is presented. It is not correct to assume that the Kohakohau Dam project has been totally replaced by the Lalamilo Water System. The

Mr. Richard O'Connell, Director
March 18, 1980
Page Two

Lalamilo Water System does replace a portion of the Kohakohau Dam project concept which was broader than that covered by the Lalamilo Water System. Therefore, it would be more correct to state that the Kohakohau Dam project has been deferred.

3. COMMENT: LAND USE POLICIES (Page II-5). Reference is made to the County General Plan which was adopted in December 1971. It should also be noted that the County revised their General Plan last year.

Reference should be made to the Hawaii Coastal Management Program in this section. Is the project consistent with CZM statutory policies?

RESPONSE: LAND USE POLICIES. The 1979 revisions to the County General Plan have been reviewed during the preparation of this EIS. Our review indicates that these revisions do not alter the General Plan in any way which would affect the Lalamilo Water System's consistency with the provisions of the 1971 General Plan document.

The proposed Lalamilo Water System is not inconsistent with any of the CZM statutory policies. The individual developments which we expect will follow the water system will have to be consistent with these policies before they are permitted to proceed. As you request, reference to the CZM Act is made on page II-5.

4. COMMENT: OPINION SURVEYS (Pages III-56, 65). A profile of the persons surveyed for their reaction to resort developments should be given (eg. age, length of residency, sex, and employment).

RESPONSE: OPINION SURVEYS. The Public Affairs Advisory Services, Inc., the firm which has conducted the public opinion survey for this EIS, has prepared the profile which you have requested. It is attached herewith as part of this response.

5. COMMENT: ANCHIALINE POOLS (Page III-91). Urban development within the planning area may have an impact on anchialine pools which contain unique aquatic

organisms. These tidal pools appear elsewhere in the world but nowhere else in the United States. In a memorandum report of the U.S. Fish and Wildlife Service (John Maciolek, Memo to M. Taylor 4/19/77) were expressed concerns that such pools may be adversely affected by urban development. Increased nutrient runoff, pesticide residue levels, and sediment load would affect the water quality of the ponds but the extent is unknown and unpredictable. This should be discussed in the EIS.

RESPONSE: ANCHIALINE POOLS. You are correct in stating that there exists a potential of adverse impacts on the aquatic organisms within the subject anchialine pools, resulting from an increased nutrient runoff. However, even though there are indications that the ponds already contain substantial levels of nutrients (substantial enough to have had an impact upon the existent organisms), no substantial adverse effects have as yet been observed. In other words, there have been no indications of eutrophic conditions within the pools to date in spite of the rather high nutrient levels.

6. COMMENT: NOISE LEVELS (Pages III-142, IV-42). The EIS gives noise level increases. It should also present the absolute levels to permit a full understanding of the impact.

RESPONSE: NOISE LEVELS. The absolute noise levels are presented in Table III-52 of the Environmental Impact Statement.

7. COMMENT: COST OF THE DAM (Page V-2). According to the Kohakohau Dam EIS, the estimated cost of the dam was $20 million, not $12.85 million.

RESPONSE: COST OF THE DAM. We have used the cost projections from the 1969 Kohakohau Dam engineering report (Phase I project only). The figures contained within the 1975 EIS are different, as they have been adjusted for inflation.

8. COMMENT: FUTURE OPTIONS (Page VI-2). The proposed project will eventually supply 5.3 mgd of water. The total estimated requirement of the area is 6.9 mgd

which means that more water will be needed. How will the additional need be met? Will the proposed project be expanded? Will development be limited to that served by the proposed project?

RESPONSE: FUTURE OPTIONS. This EIS has been prepared to assess the impacts of the initial phase of Lalamilo Water System's construction. This phase is presented on page i of the SUMMARY. The description of the entire project is shown within Chapter I, PROJECT DESCRIPTION.

As additional need is better defined and established, further study together with a careful monitoring of the proposed project will be required and implemented. If additional water can be safely supplied, the proposed project may be expanded. This has not and cannot now be finally determined.

Development will be limited by various constraints including the availability of water delivered by the proposed project and other future sources.

9. COMMENT: LIST OF APPROVALS (Page XIII-1). EIS Regulation 1:42 states, "The status of each identified approval shall also be described." The list provided in this section does not give the status of the approvals. We recommend that the list be revised.

RESPONSE: LIST OF APPROVALS. Status of the approvals has been added to the list on pages XIII-1 and XIII-2.

Very truly yours,

Susumu Ono

SUSUMU ONO
Chairman of the Board

SO:mu

TABLE S-2

COMPOSITION OF THE BIG ISLAND (HAWAII) PUBLIC PROFILED ACCORDING TO THE REACTIONS TOWARD PROPOSED RESORT DEVELOPMENTS IN THE SOUTH KOHALA COASTAL REGION*

	REACTION					
ITEM	(a) EXCELLENT IDEA	(b) GOOD IDEA	(c) ACCEPTABLE IDEA	(d) DON'T LIKE THE IDEA	(e) OPPOSE THE IDEA	(f) DOESN'T MATTER
Sex						
Male	57.5%	53.2%	43.1%	48.1%	47.0%	43.3%
Female	42.5%	46.8%	56.9%	51.9%	53.0%	56.7%
Marital Status						
Married	73.3%	77.4%	60.5%	59.5%	55.2%	64.4%
Unmarried	26.3%	21.0%	38.6%	40.5%	44.8%	32.0%

* Question posed: "How do you feel about the resort developments proposed in the South Kohala Coastal Region?" (CHECK ONE)

(a) I think it's an excellent idea
(b) I think it's a good idea
(c) I think it's an acceptable idea
(d) I don't like the idea much
(e) I am very opposed to the idea
(f) It doesn't matter much to me

TABLE S-2 (cont.)

ITEM	(a) EXCELLENT IDEA	(b) GOOD IDEA	(c) ACCEPTABLE IDEA	(d) DON'T LIKE THE IDEA	(e) OPPOSE THE IDEA	(f) DOESN'T MATTER
	REACTION					
Length of Current Address Residence						
Less than 6 months	9.9%	8.0%	10.2%	22.3%	23.5%	7.4%
Between 6 months & 1 year	8.6%	7.8%	15.6%	12.4%	13.6%	13.8%
Between 1 year & 3 years	11.5%	14.1%	17.0%	19.5%	27.6%	14.4%
3 or more years	69.1%	69.3%	56.6%	45.8%	35.2%	63.3%

* * *

1649 Kalakaua Avenue • Room 204 • Honolulu, Hawaii 96826 • Telephone (808) 946-1695

1478

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

PROJECT OFFICES

WAIMEA OFFICE
P. O. BOX 125
KAMUELA, HAWAII 96743

KEAUKAHA OFFICE
P. O. BOX 833
HILO, HAWAII 96720

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

RECEIVED
80 MAR 12 A7:50
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

PROJECT OFFICES

MAUI OFFICE
P. O. BOX 22
KAHULUI, MAUI 96732

MOLOKAI OFFICE
P. O. BOX 198
HOOLEHUA, MOLOKAI 96729

KAUAI OFFICE
P. O. BOX 332
LIHUE, KAUAI 96766

March 10, 1980

Mr. Richard O'Connell, Director
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

SUBJECT: Lalamilo Water System
Comments on Environmental Impact
Statement (EIS)

The Department of Hawaiian Home Lands has reviewed the EIS for the proposed Lalamilo Water System and is in full agreement with the proposed project. However, the Department is concerned about the moratorium placed on development north of Kawaihae Harbor.

With the advent of the proposed project, will the moratorium on the development be lifted by the Board of Water Supply? Or will the community continue to wait until the resort demands for water are satisfied before other developments can proceed?

Because of its land holdings, the Department of Hawaiian Home Lands is quite concerned with the moratorium; however, very little of this problem is addressed in the Statement. Perhaps some effort should be placed on conditions that exist on the adjacent lands.

We thank you for the opportunity to comment on the proposed project, and we do not envision any adverse impact on the environment.

Sincerely yours,

Georgiana K. Padeken

Georgiana K. Padeken
Chairman

GKP:GW:jn

Attachment

cc: DLNR

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 19, 1980

Honorable Georgiana K. Padeken
Director and Chairman
Dept. of Hawaiian Home Lands
550 Halekauwila St.
Honolulu, Hawaii 96813

Dear Ms. Padeken:

Environmental Impact Statement
for Lalamilo Water System,
South Kohala, Hawaii

Thank you for your comments on the Lalamilo Water System EIS. Our response to your comment is as follows:

1. COMMENT: With the advent of the proposed project, will the moratorium on the development be lifted by the Board of Water Supply? Or will the community continue to wait until the resort demands for water are satisfied before other developments can proceed?

Because of its land holdings, the Department of Hawaiian Home Lands is quite concerned with the moratorium; however, very little of this problem is addressed in the Statement. Perhaps some effort should be placed on conditions that exist on the adjacent lands.

RESPONSE: Discussion on the water supply and allocation of water is provided on pages 1-5 through 1-7. The initial phase of the project will provide 1.97 million gallons per day of new water supply of which about 1.37 million gallons per day is being allocated to the two developers who are contributing funds toward the construction of this project. This leaves a balance of 600,000 gallons per day for other users of water within the service area including those users located north of Kawaihae. This newly added water supply is to be allocated by the Department of Water Supply. Insofar as lifting the moratorium on the development north of Kawaihae harbor is concerned, we feel that this decision will have to be made by the Department of Water Supply at such time when they deem it appropriate.

Very truly yours,

Susumu Ono

SUSUMU ONO
Chairman of the Board

U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT SHAFTER, HAWAII 96858

PODED-PV

10 March 1980

Mr. Richard O'Connell, Director
Office of Environmental Quality Control
350 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

We have reviewed the Environmental Impact Statement (EIS) for the Lalamilo Water System, South Kohala, Hawaii, forwarded to us on 12 February 1980 by your office. We offer the following comments on this report. The proposed action does not affect any US Army Corps of Engineers projects or areas of regulatory jurisdiction. The proposed water system will be located in areas designated "minimal flooding" according to the flood insurance study for the island of Hawaii, prepared by the Federal Emergency Management Agency, Federal Insurance Administration. The area is shown on the attached Flood Insurance Rate Map (Incl 1).

The brief discussion of recreational use impacts on ponds and wetlands (page III-91, paragraph 4) underestimates the potential for serious damage to these sensitive, unique environments. Swimming or wading in the anchialine ponds should be discouraged where possible to prevent disturbance of habitat and inadvertent crushing of pond fauna. We recommend that landscaping and gardening around the ponds be avoided. Pond maintenance should not involve more than periodic clearing of synthetic trash (paper, plastic wrappers, cans). To avoid adverse impacts to the ponds' trophic ecology and microhabitat structure, the natural riparian vegetation and aquatic algal communities within the ponds should not be altered. We recommend that the water quality and biological findings contained in the report "Survey of the Aquatic Biota and Water Quality Characteristics of the Anchialine Ponds of Anaehoomalu, Hawaii" prepared by Dr. Paul K. Beinfang of Oceanic Institute, November 1977, be incorporated into the subject EIS.

Mr. Richard O'Connell

10 March 1980

We are returning the subject EIS to you for your files (Incl 2). We appreciate the opportunity to comment on this document.

Sincerely,

original signed
KISUK CHEUNG
Chief, Engineering Division

2 Incl
As stated

Copy Furnished:
Director
Division of Water and Land Development
Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 18, 1980

Mr. Kisuk Cheung
Chief, Engineering Division
U.S. Army Engineer District,
Honolulu
Building 230
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Re: Environmental Impact Statement for Lalamilo Water System, South Kohala, Hawaii

Thank you for your comments on the proposed Lalamilo Water System. The following are our responses to your comments:

1. COMMENT: The proposed water system will be located in areas designated "minimal flooding" according to the flood insurance study for the island of Hawaii, prepared by the Federal Emergency Management Agency, Federal Insurance Administration. The area is shown on the attached Flood Insurance Rate Map (Incl 1).

RESPONSE: Your comment that the proposed water system will be located in areas designated "minimal flooding" is acknowledged. We further note that the designation of "minimal flooding" means little or no flood hazard.

2. COMMENT: The brief discussion of recreational use impacts on ponds and wetlands (page 111-91, paragraph 4) underestimates the potential for serious damage to these sensitive, unique environments. Swimming or wading in the anchialine ponds should be discouraged where possible to prevent disturbance of habitat and inadvertent crushing of

Mr. Kisuk Cheung
March 18, 1980
Page Two

pond fauna. We recommend that landscaping and gardening around the ponds be avoided. Pond maintenance should not involve more than periodic clearing of synthetic trash (paper, plastic wrappers, cans). To avoid adverse impacts to the ponds' trophic ecology and microhabitat structure, the natural riparian vegetation and aquatic algal communities within the ponds should not be altered. We recommend that the water quality and biological findings contained in the report "Survey of the Aquatic Biota and Water Quality Characteristics of the Anchialine Ponds of Anaehoomalu, Hawaii" prepared by Dr. Paul K. Beinfang of Oceanic Institute, November 1977, be incorporated into the subject EIS.

RESPONSE: We concur with your comments and recommendations concerning the preventive measures which should be implemented with regard to the anchialine pools. We feel that the EIS has made statements similar to yours (see, for example, page III-91).

You are correct in stating that there exists a potential of adverse impacts on the aquatic organisms within the subject anchialine pools, resulting from an increased nutrient runoff. However, even though there are indications that the ponds already contain substantial levels of nutrients (substantial enough to have had an impact upon the existent organisms), no substantial adverse effects have as yet been observed. In other words, there have been no indications of eutrophic conditions within the pools to date in spite of the rather high nutrient levels.

You will also note that the report "Survey of the Aquatic Biota and Water Quality Characteristics of the Anchialine Ponds of Anaehooomalu, Hawaii" has been included in the bibliography.

Very truly yours,

SUSUMU ONO
Chairman of the Board

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

COMMANDER (dpl)
Fourteenth Coast Guard District
Prince Kalanianaole Federal Bldg
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

16450
Series 517
12 February 1980

Office of Environmental Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Dear Sir:

The Coast Guard has reviewed the Environmental Statement for the Lalamilo Water System and has no objection to the plan or constructive comments to offer at the present time.

Sincerely,

J. F. OTRANTO
Commander, U. S. Coast Guard
District Planning Officer
Fourteenth Coast Guard District
By Direction of the District Commander

894

State of Hawaii
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 Diamond Head Road
Honolulu, Hawaii 96816

HIENG

DEPT OF LAND ... STATE OF HAWAII

13 FEB 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Lalamilo Water System

We have received a copy of the "Lalamilo Water System" Environmental Impact Statement and have no comments to offer at this time. The Environmental Impact Statement is being forwarded to the Commission under separate cover.

Sincerely,

signed

WAYNE R. TOMOYASU
Major, CE, HARNG
Contr & Engr Officer

cc: Dept of Land & Nat'l Resources
Div of Land & Water Development

RECEIVED
80 FEB 15 A 8: 11
DIV. OF WATER & LAND DEVELOPMENT

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
FORT SHAFTER, HAWAII 96858

APZV-EHR-E

20 FEB 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

The Environmental Impact Statement (EIS) for the Lalamilo Water System, South Kohala, Hawaii has been reviewed and we have no comments to offer. No Army installations or activities will be adversely affected by the proposed project.

The EIS is returned in accordance with your request.

Sincerely yours,

Original signed by

PETER D. STEARNS
COL, EN
Director of Engineering and Housing

1 Incl
As stated

Copy Furnished:
Department of Land and Natural Resources
Division of Land and Water Development
P.O. Box 621
Honolulu, Hawaii 96809

RECEIVED
FEB 22 A9:28

HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860

IN REPLY REFER TO:
002A:amn
Ser 384

20 FEB 1980

Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Environmental Impact Statement for
Lalamilo Water System, South Kohala, Hawaii

The Environmental Impact Statement for Lalamilo Water System has been reviewed, and the Navy has no comments to offer. As requested, the subject EIS is returned.

The opportunity to review the EIS is appreciated.

Sincerely,

J. W. CARL
LIEUTENANT COMMANDER, CEC, USN
DEPUTY FACILITIES ENGINEER
BY DIRECTION OF THE COMMANDER

Encl

Copy to:
State DLNR

RECEIVED
80 FEB 22 A 9:25
DIV. OF WATER &
LAND DEVELOPMENT

HERBERT T. MATAYOSHI
Mayor
EDWARD K. HARADA
Chief Engineer
ARTHUR T. ISEMOTO
Deputy Chief Engineer

DEPARTMENT OF PUBLIC WORKS

COUNTY OF HAWAII - 25 AUPUNI STREET - HILO, HAWAII 96720 - TELEPHONE (808) 961-8321

February 22, 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT
LALAMILO WATER SYSTEM
SOUTH KOHALA, HAWAII

Thank you for the opportunity to review the subject E.I.S. document on Lalamilo Water System.

This department has no comments to offer on the submittal.

As requested, returned attached is the copy of the report.

Edward Harada

EDWARD HARADA
Chief Engineer

Attach. (Copy of E.I.S. report)

cc: Mayor
Planning Department

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

RECEIVED
80 FEB 28 AM 10
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801

GEORGE A. L. YUEN
DIRECTOR OF HEALTH
~~Audrey W. Mertz, M.D., M.P.H.~~
Deputy Director of Health
Henry N. Thompson, M.A.
Deputy Director of Health
James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

February 27, 1980

In reply, please refer to:
File: EPHS - SS

MEMORANDUM

To: Mr. Susumu Ono, Chairman
Department of Land and Natural Resources

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Lalamilo Water System, South Kohala, Hawaii

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Public Health Regulations, please be informed that we have no objections to this project.

We wish to reiterate our earlier statement that the development of new potable water sources will require approval by the Director of Health as provided for in Section 29 of Chapter 49, Potable Water Systems, Public Health Regulations. It is our understanding that there will be a total of seven new sources developed for the Lalamilo Water System. Under the terms of Section 29, each new source must be addressed.

If you should have any questions, please feel free to contact the Drinking Water Program staff at 548-2235.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Brian J. J. Choy
MELVIN K. KOIZUMI

cc: OEQC
DHO, Hawaii

GEORGE R. ARIYOSHI
GOVERNOR

RYOKICHI HIGASHIONNA, PH.D.
DIRECTOR

DEPUTY DIRECTORS
JAMES R. CARRAS
JAMES B. McCORMICK
DOUGLAS S. SAKAMOTO
JACK K. SUWA

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

IN REPLY REFER TO:

March 3, 1980

STP 8.6065

Dr. Richard O'Connell
Office of Environmental
Quality Control
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

Dear Dr. O'Connell:

Subject: Environmental Impact Statement
Lalamilo Water System
South Kohala, Hawaii

Thank you for giving us the opportunity to review and comment on the above-captioned statement. We have no substantive comments to offer which could improve the document.

Very truly yours,

Ryokichi Higashionna

Ryokichi Higashionna
Director of Transportation

GEORGE R. ARIYOSHI
GOVERNOR

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE
YUKIO KITAGAWA
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

March 5, 1980

MEMORANDUM

To: Office of Environmental Quality Control

Subject: EIS for Lalamilo Water System, South Kohala, Hawaii

The Department of Agriculture has reviewed the statement and has no comments to offer.

Thank you for the oppportunity to review this environmental impact statement.

John Farias Jr.

JOHN FARIAS, JR.
Chairman, Board of Agriculture

HERBERT T. MATAYOSHI, MAYOR
A. DUANE BLACK, DIRECTOR

DEPARTMENT OF RESEARCH AND DEVELOPMENT

COUNTY OF HAWAII • 25 AUPUNI STREET • HILO, HAWAII 96720 • TELEPHONE (808) 961-8366

March 6, 1980

Office of Environmental Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

SUBJECT: Environmental Impact Statement for Lalamilo Water System, South Kohala, Hawaii

Thank you for this opportunity to review and comment on this matter. We offer the following for your consideration.

a. The establishment of this water system will have a positive effect on the economic development of the South Kohala coastal area.

b. There ~~are~~ proposed plans for development in this area which are pending the development of this water system.

A. DUANE BLACK
DIRECTOR

cc: Department of Land and Natural Resources
Division of Land and Water Development

United States Department of Agriculture
Soil Conservation Service
P. O. Box 50004
Honolulu, Hawaii
96850

March 6, 1980

Mr. Richard L. O'Connell
Director, Office of Environmental
Quality Control
550 Halekauwila Street, Rm. 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Subject: EIS for Lalamilo Water System, South Kohala, Hawaii

We reviewed the subject environmental impact statement and have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,

Jack P. Kanalz
State Conservationist

cc:
Department of Land Natural Resources
Division of Land and Water Development
P. O. Box 621
Honolulu, Hawaii 96809

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March 7, 1980

Ref. No. 0808

Mr. Richard L. O'Connell, Director
Office of Environmental Quality
Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Subject: Lalamilo Water System EIS
South Kohala, Hawaii

We have reviewed the Environmental Impact Statement for Lalamilo Water System and found that the statement has adequately addressed all of the probable impacts of this proposed project.

Thank you for the opportunity to review this document.

Sincerely,

Hideto Kono

cc: Department of Land and Natural Resources
Division of Land and Water Development

COPY

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII

P. O. BOX 1820 • HILO, HAWAII 96720 • 25 AUPUNI STREET

March 14, 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

LALAMILO WATER SYSTEM
ENVIRONMENTAL IMPACT STATEMENT

We have no adverse comments to offer on this Environmental Impact Statement.

Continuing coordination has been maintained between the proposing agency and our Department insofar as the water source development portion of this project is concerned.

We have a copy of the Environmental Impact Statement on file and therefore we are returning a copy to your office.

H. William Sewake
Manager

GK

Enc.

cc - Department of Land and Natural Resources

...Water brings progress...