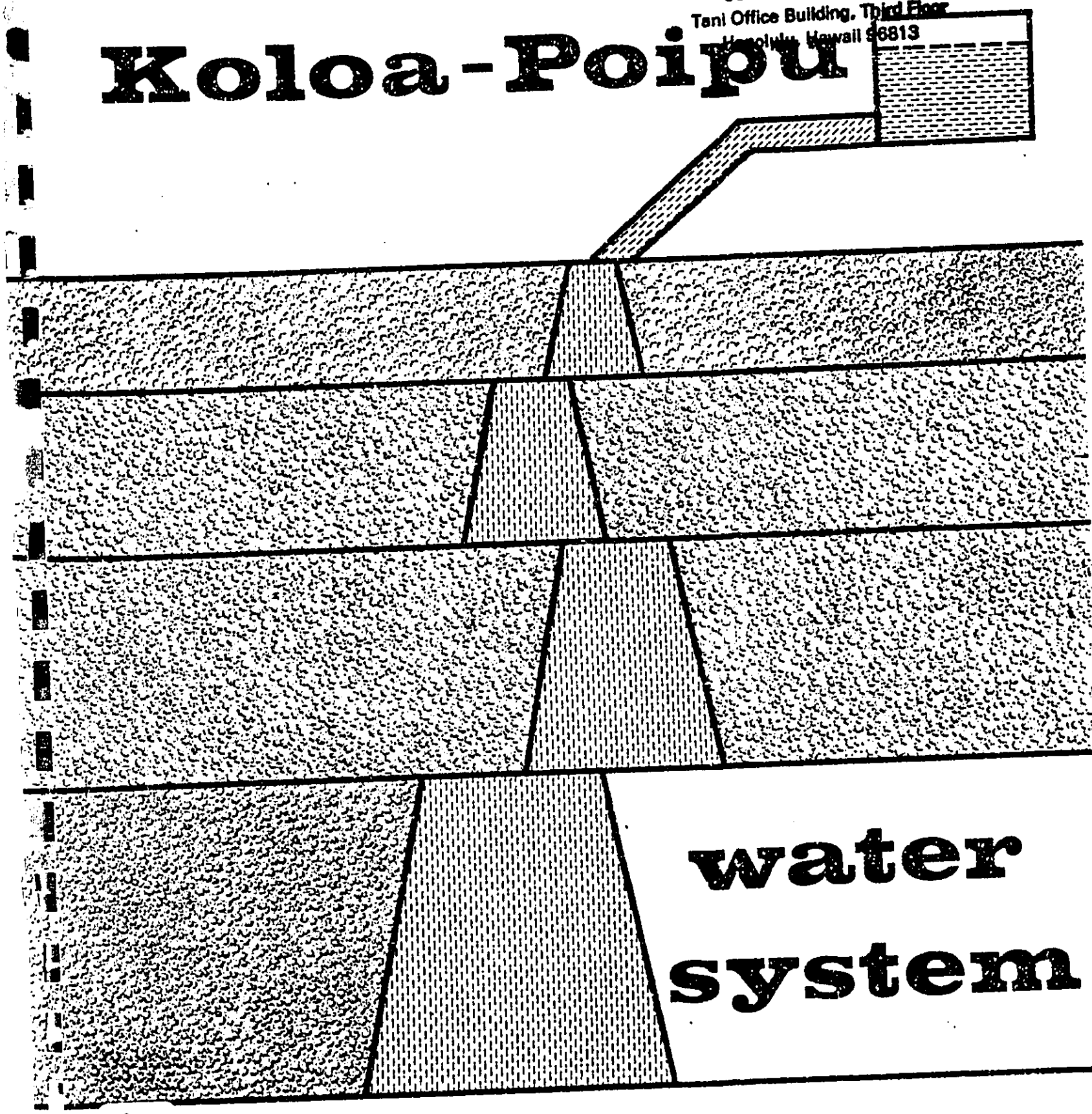
Office of Environmental Quality Control
Office of the Governor
550 Halekauwila Street
Tani Office Building, Third Floor
Honolulu, Hawaii 96813

Koloa-Poipu



water system

KA
118

SUMMARY

1. Description of the Project

The proposed project is located in the Koloa-Poipu area of the island of Kauai. It consists of the installation of a pump and a pump control building, the laying of 7,300 feet of 16" water main, 7,400 feet of 18" pipe and 700 feet of 8" pipe to connect with existing mains, the construction of a 1.5 million gallon reinforced concrete tank and ancillary sitework at the well and tank sites. A second tank of similar size may be added in the future, if required.

The new system will connect an existing exploratory well, which will serve as the water source, to the existing Koloa-Poipu water system, improving service to Poipu while decreasing the community's dependence on Koloa during periods of high demand, drought or pump and pipeline failures. The proposed water system has the flexibility to be expanded to supply the eventual needs of the Poipu area allowing Poipu to achieve its planned growth aims.

2. Description of the Existing Environment

The project is located on land designated agriculture and urban. The area is predominatly sugar cane fields with Koloa Town as the center of the plantation community. Along the coast, Poipu is a major resort town on the island attracting many tourists to its hotels and beaches.

Other than sugar cane, the land is covered generally by haole koa, grasses and a few scattered keawe trees. No endangered species of flora or fauna will be affected by the project. Neither are historical or archaeological sites expected to be encountered.

3. Probable Impacts of the Proposed Action

Primary Impacts

Construction activity related to the project will create noise and dust and may interrupt the normal maintenance and harvesting operations of the sugar plantation. Some sugar cane may be damaged by machinery. Landscaping and excavation will transform the natural topography of the well and tank sites. Earthwork at both sites will create the potential for soil erosion. The well and tank sites and structures will be visible by persons travelling via the Koloa Road.

Development of the water supply will greatly improve service to the residents of Poipu and provide a safety factor against possible pump failures, main bursts and fires.

Secondary Impacts

The development of the new water supply will improve the climate for development and could allow several projects to proceed one step further towards construction.

Following the completion of the water system, pressure on the local government to improve other public services may be applied by residents and developers.

The improved climate for development could lead to fuller use of beach facilities and recreational space in Poipu, while increasing traffic and land values in the area.

Impact on Groundwater Resources

The proposed system provides the facilities for increased withdrawal from the underground Waimea acquifer. Present estimates of acquifer discharge capacity and projections of pump tests indicate that the acquifer can accommodate the eventual demand of the Koloa-Poipu area. However, increased withdrawal also decreases the ability of the acquifer to provide high quality water during long periods of drought.

4. Adverse Environmental Effects Which Cannot Be Avoided

The environmental impacts which cannot be avoided include the transformation of the natural topography at the well and tank sites along with the negative visual effect of the pump control building and reinforced concrete storage tank.

5. Mitigation Measures to Minimize Impact

The following mitigation measures are proposed:

	Impact	Mitigation Measure
a.	Interruption of plantation activities	Coordination and scheduling of construction activities between the contractor and plantation staff.
b.	Dust	Sprinkling of water on the construction site.
c.	Soil erosion due to construction	Enforcement of State and County grading ordinances.
d.	Visual impact of structures	Landscaping of the well and tank sites.
e.	Decrease in ability of acquifer to provide high quality drinking water during long periods of drought.	Management of the resource, based upon continuous observance of pumping rates and water levels of wells in the area by State, County and plantation staffs.

6. Alternatives to the Proposed Action

Conceptual Alternatives

Desalinization and wastewater recycling for irrigation use were evaluated as alternative sources of domestic water. Desalinization was considered uneconomical. Wastewater re-use would involve the construction of two treatment plants, one for surface water and one for recycling wastewater. Since funds for the sewage treatment plant will not be available in the foreseeable future, this alternative was regarded as presently infeasible.

Alternative Sites

The reservoir site and the waterline alignment were chosen to create the least disturbance on the environment.

The knoll on which the storage tank is to be situated is unsuitable for sugarcane while the pipeline generally follows established cane haul dirt roads.

No Action

No action or the postponement of further action would result in the deterioration of water service to the residents of Poipu as demand increases over the capacity of the existing system. This would also jeopardize the safety of residents since emergency fire flows could not be accommodated.

PUMP, CONTROLS, PIPELINE AND STORAGE TANK, KOLOA-POIPU, KAUAI

REVISED

ENVIRONMENTAL IMPACT STATEMENT

Prepared for the

Department of Land and Natural Resources

Division of Land and Water Development

by

SAM O. HIROTA, INC.

August 1978

Pump, Controls, Pipeline and Storage Tank,
Koloa-Poipu, Kauai - Environmental Impact Statement

Table of Contents

List of Figures

List of Tables

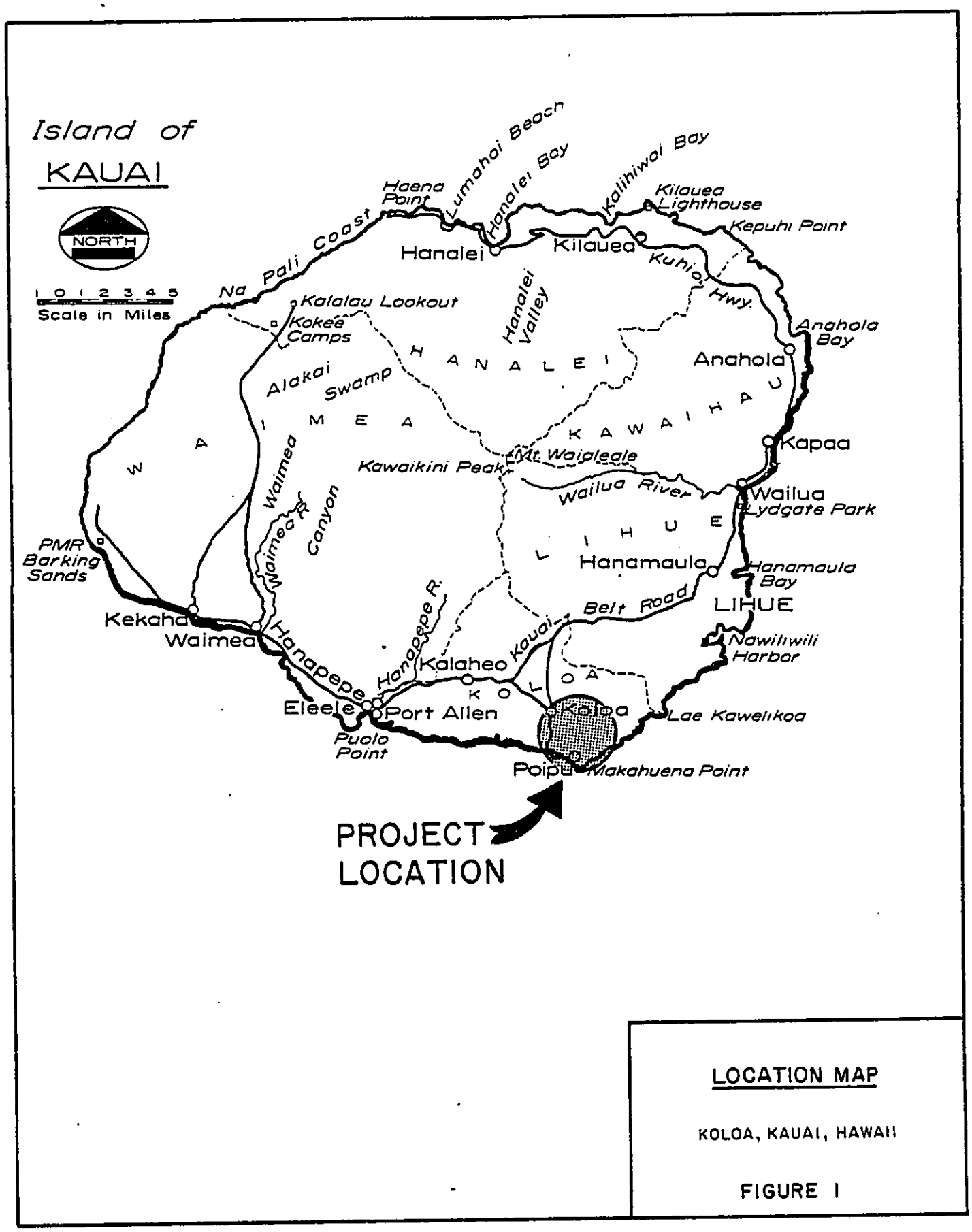
1. DESCRIPTION OF THE PROJECT

The proposed project includes the installation of a 1200 gallon per minute (gpm) pump, pump controls and pump control house at an existing well site; the construction of a 1.5 million gallon reinforced concrete storage tank; and the laying of approximately 7300 feet of 16' pipe, 7400 feet of 18" pipe and 700 feet of 8" pipe to improve service to the residents of the Poipu area. Ancillary work at both the well and tank sites will consist of site preparation and grading, landscaping, the construction of access roads and the installation of chain link fencing.

Project Location

The project is located in the Koloa District of Kauai on the leeward side of the island (Figure 1) in an area which is predominantly under sugar cane cultivation.

Down along the coast, 1.5 miles from Koloa Town, is Poipu, a growing resort center on Kauai. Several hotels and condominiums have been built with many others in the planning stage. The Koloa-Poipu area is expected to experience one of the larger population growth rates on the island. (Reference 19)



LOCATION MAP

KOLOA, KAUAI, HAWAII

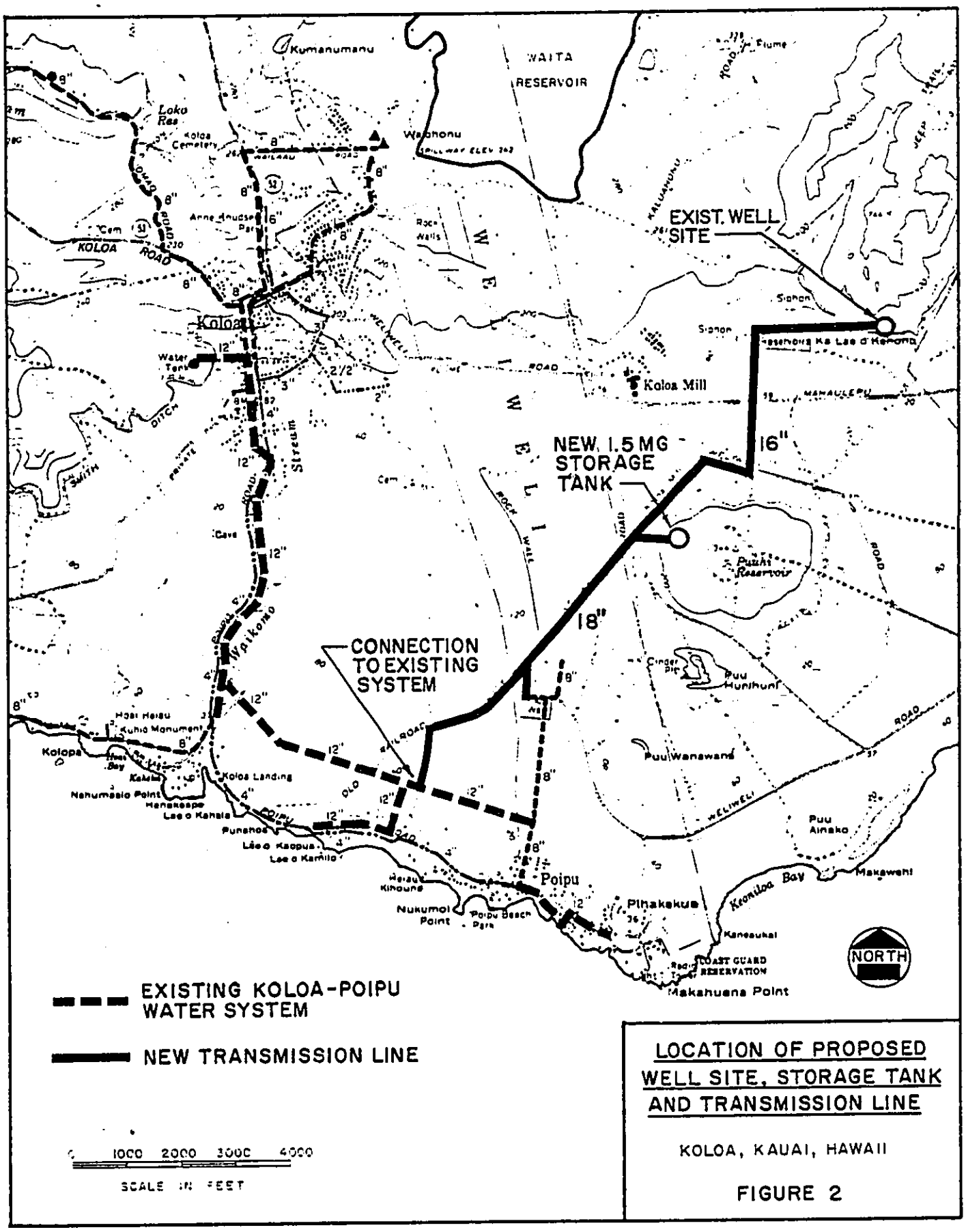
FIGURE 1

The proposed water system begins at an existing well located at the foot of the Haupu Range about 5,000 feet east of Koloa Mill (Figure 2). Cane haul roads provide a path for the waterline which will run up the west side of Puu Hi, an extinct volcanic cone, to connect with the storage tank at a ground elevation of 230 feet MSL. The pipe will continue along cane haul roads, an old railroad grade and Hapa Road where it will connect with the existing 12 inch line paralleling Poipu Road. The pipe will also connect with the 8" line now serving Weliweli subdivision to form a service loop providing a safety factor against main bursts.

Project Objective

The purpose of the proposed project is to sufficiently upgrade the existing Koloa-Poipu water supply by developing a new water source and connecting it with the existing system to satisfy the growing demands of the Poipu community. The present water system is insufficient to protect the area from possible pump failures or to supply recommended fireflows at the levels required should growth occur as visualized by the 1970 Kauai General Plan.* The proposed project will ensure an adequate supply of water for residents as the Koloa-Poipu area progresses toward its planned growth aims.

*Eckbo, Dean, Austin & Williams and Muroda, Tanaka, Itagaki, Inc., A General Plan for the Island of Kauai, Honolulu, 1970.



LOCATION OF PROPOSED WELL SITE, STORAGE TANK AND TRANSMISSION LINE

KOLOA, KAUAI, HAWAII

FIGURE 2

Design Objectives

The project can be separated into three elements for the purpose of design: pipeline, reservoir and pump. Only the pipeline has been designed to accommodate the projected water demand envisioned by the Kauai County General Plan because of the cost savings over later installing a second parallel line for future increased demand. Both the reservoir and pump have been designed to handle a smaller demand of water which has been calculated on the basis of the following sum:

existing consumption (1975-1976)	0.5887 mgd
+ estimated demand of County approved subdivisions	0.0403 mgd
+ estimated demand of pending subdivisions*	0.84 mgd
= Projected average daily demand	1.47 mgd

Approximately 20 percent of the 1.47 mgd average daily demand will be supplied by the existing system. The pump will supply maximum day flows based on the remaining average daily demand of 1.14 mgd. Applying the maximum day factor of 1.5 to 1.14 mgd results in a required pumpage rate of 1.71 mgd or about 1200 gpm, the discharge capacity of the pump.

The capacity of the reservoir has been designed to accommodate the average daily demand, therefore, the reservoir will store 1.5 million gallons.

*This figure includes the estimated demand of Kiahuna Golf Village within 10 years.

To be capable of handling demand flows expected by the Kauai General Plan the pump discharge capacity will have to be increased and a second reservoir must be built.

The capacity of the pipeline is based on demand figures projected by the General Plan for Domestic Water for the island of Kauai. Thus, the average daily water demand for Poipu is estimated to be 3.31 mgd. Twenty percent of this demand will be supplied by the existing system. Therefore, the average daily demand to be supplied by the new pipeline will be 2.65 mgd.

The section of pipeline between the existing well and the reservoir must handle the discharge of the pump which will be supplying the maximum day flow of 2.65 mgd X 1.5 or 3.98 mgd. The section of pipeline between the reservoir and the connection with the existing 12" line on Poipu Road must be capable of supplying peak hour flows. The peak hour factor of 2.5 applied to the average daily demand results in a peak hour flow of 6.63 mgd. This difference in pipeline design flows is the reason for the disparity in sizes of the transmission main.

Proposed Water System

Well Site and Well

The well site will be a graded area approximately 5,000 square feet in area and surrounded by chain link fencing. The pump will be installed in the open with the electrical controls and chlorination apparatus sheltered within a control house nearby.

The well site is located at the base of a ridge of the Haupu Range. The well which was drilled specifically for domestic use, is now temporarily being pumped for extended periods of time at 1800 gpm for irrigation use by McBryde Sugar Company. Part of the site had been cleared during the initial drilling of the well and is covered by crushed coral for use as parking and turnaround area.

The well is 18" in diameter with a 16" diameter grouted casing to prevent cave-ins and to keep contaminated shallow groundwater out of the well. The well has been drilled down to an elevation of -236 feet below mean sea level. The static water level is encountered at 25 feet MSL.

Water Quality

Tests done upon the water in the new well have shown that the quality of the freshwater to be supplied by the new system is within the U.S. Public Health Service Standards for drinking water of 250 milligrams/liter (mg/l) chlorides and 500 mg/l total dissolved solids (Reference 32). The test data is shown in Table 1.

Table 1. Test Data for Chlorides

Continuous Pumping (2/22-2/25/77)

	Date	Time	Rate (gpm)	Drawdown (ft)	Chlorides (mg/l)
Start	2/22/77	1045	0	0	
	2/22/77	1130	2000	10.25	60
	2/22/77	1700	2000	10.45	57
	2/22/77	2400	2000	10.85	57
	2/23/77	1800	2000	10.85	57
	2/24/77	0700	2100	10.85	58
Stop	2/25/77	0700	0	0	

Pump and Pump Control House

A 1200 gpm pump will be installed in the existing well. Electricity to drive the pump will be supplied by Kauai Electric Company via a power line originating from Koloa Town. Initially the pump will be operating approximately eight hours a day. However, as demand increases the pump will operate for increasingly longer periods of time. Sometime in the future, a pump with greater capacity may be installed to withdraw the water required. Both pump and electric motor will be mounted upon a concrete pad adjacent to and outside the pump control house.

The control house will shelter recording instruments and the control panel for the manual override of the pump. Under normal operating conditions, the pump will be controlled automatically as the level of water in the storage reservoir rises and falls. The control house will be a two room, one-story building constructed of hollow tile blocks.

As a safety precaution, the water will be chlorinated as soon as it leaves the well. Chlorine gas will be dissolved into the water supply to protect against the infiltration of pathogens. The chlorinating apparatus will be enclosed within a separate, well ventilated room of the control house.

Pipeline

The first section of pipe, 16 inches in diameter and 7,300 feet long, serves as the pumping main between the well site and reservoir. A second section of pipe, 18 inches in diameter and

7,400 feet long, transmits water from the tank to the existing distribution system, while a third section, 8 inches in diameter and 700 feet long, connects Weliweli Subdivision with the new main.

Most of the pipeline length will be installed just alongside existing cane haul roads. The remainder of the pipeline will be placed along an old railroad grade and through land covered with thick haole koa brush. All pipe will be laid with a minimum cover of 3 feet to protect it from plantation equipment and other vehicles. The pipeline's connection to the existing system on Poipu Road will not require crossing the road. Neither will the connection to the existing distribution system at Weliweli subdivision disturb any existing public or private structures.

Reservoir Site and Storage Tank

The reservoir site will be one and one-half acres in area to accommodate the 1.5 million gallon, reinforced concrete storage tank and a second tank if and when it is required. The dimensions of the reservoirs will be approximately 120 feet in diameter and 20 feet high. Some excavation into the side of the hill will be required to prepare the site for the initial reservoir. A 15-foot wide perimeter road will encircle the tank to provide access for maintenance crews. The perimeter road will be extended at the same time that the second tank is installed.

Washout and overflows will be discharged into an existing irrigation ditch below the site.

Sitework

Clearing and grading will be required at both the well and tank sites to form the base for the proposed structures. Grading will be done with attention to County of Kauai Ordinances. Cuts at the reservoir site, which will be about 15 feet high, will be sloped not more than 1-1/2" horizontal to 1 foot vertical. The sites will be landscaped to insure that surface runoff drains properly and does not endanger areas downstream. Cut and fill surfaces will be replanted with ground cover to inhibit soil erosion. Chain link fencing will surround each site to prevent unauthorized entry.

Access Roads

Two asphalt concrete roads will be constructed to provide access to the pump and tank sites for maintenance. An existing dirt road approximately 150 feet long leading to the well site from an existing cane field road will be upgraded to a 12 foot wide pavement. Access to the reservoir will be provided by a 15 foot wide road which branches off of an existing cane haul road leading up the slopes of Puu Hi. The roadway will be about 1500 feet long with a maximum grade of 13%. Drainage swales along either side of the roadway bed will convey rainfall runoff into an existing irrigation ditch below.

Cost

The preliminary estimated cost of the project (one storage tank only) is $2,093,000 at 1977 price levels. This does not include expenses for land acquisition. A detailed cost estimate is shown in Table 2. Funds for the project have already been appropriated by the State. A tentative time schedule for the completion of the water system is as follows:

End of design - send project out to bid	September 1978
Award bid and start construction	November 1978
End Construction	August 1979
Testing	September 1979
Start-up and place in operation	October 1979

Table 2. Construction Cost Estimate

Item	Description	Unit	Quantity	Price	Amount
I.	Site Work				
	Clearing and Grubbing	Ac	2	3,000.00	6,000
	Exc. and Emb.	CY	64,000	5.00	320,000
	Topsoil	CY	700	15.00	10,500
	Grassing	SF	30,000	0.30	9,000
			Subtotal		345,500
II.	Access Road				
	A.C. Pavement	SY	2,350	12.00	28,200
	Guardrail	LF	600	30.00	18,000
			Subtotal		46,200
III.	Water Line				
	8" Asb. Cem.	LF	700	25.00	17,500
	16" Asb. Cem.	LF	7,300	42.00	306,600
	18" Asb. Cem.	LF	7,400	48.00	355,200
	Bends (T's Y's L's)	Ea	20	400.00	8,000
	Valves	Ea	25	1,800.00	45,000
	Conc. Thrust Blocks	Ea	20	200.00	4,000
			Subtotal		736,300
IV.	Control House				
	Bldg., Pump (1200 GPM) Accessories	LS	1	200,000.00	200,000
	Chain Link Fence	LF	2,000	10.00	20,000
	Driveway Gate	Ea	2	250.00	500
			Subtotal		220,500
V.	1.5 M.G. Storage Tank	Ea	1	450,000.00	450,000
VI.	Electrical	LS		104,500.00	104,500
					1,903,000
	10% Contingency				190,300
			TOTAL		2,093,300
			Say		2,093,000

2. DESCRIPTION OF THE EXISTING ENVIRONMENT

Physical Environment

Climate

The climate of Kauai is comfortably uniform and is characterized by the northeast tradewinds generated by regions of high pressure to the north. These winds keep the average monthly temperatures near sea level within the range of 69°F in February to 77°F in August. The mean temperature decreases about 3° for every 1000 foot increase in elevation.

The consistent approach of the tradewinds from the northeast distinguishes the island into windward and leeward sides. Windward Kauai receives larger amounts of rainfall as the result of the condensation of water vapor laden air as it is forced up into the atmosphere by the mountain mass. This feature of the island's climate creates extreme differences in rainfall within short distances. Mount Waialeale, for example, has a mean annual rainfall of 466 inches while at Mana, 18 miles away, rainfall is 21 inches per year. Koloa on the leeward side of Kauai receives 40 to 50 inches per year.

The tradewinds are recurrently interrupted by Kona storms which occur generally during the winter months of October through April. Kona storms are responsible for periods of

heavy rainfall which often cause flooding. The air becomes overly humid and winds blow from the south or west.

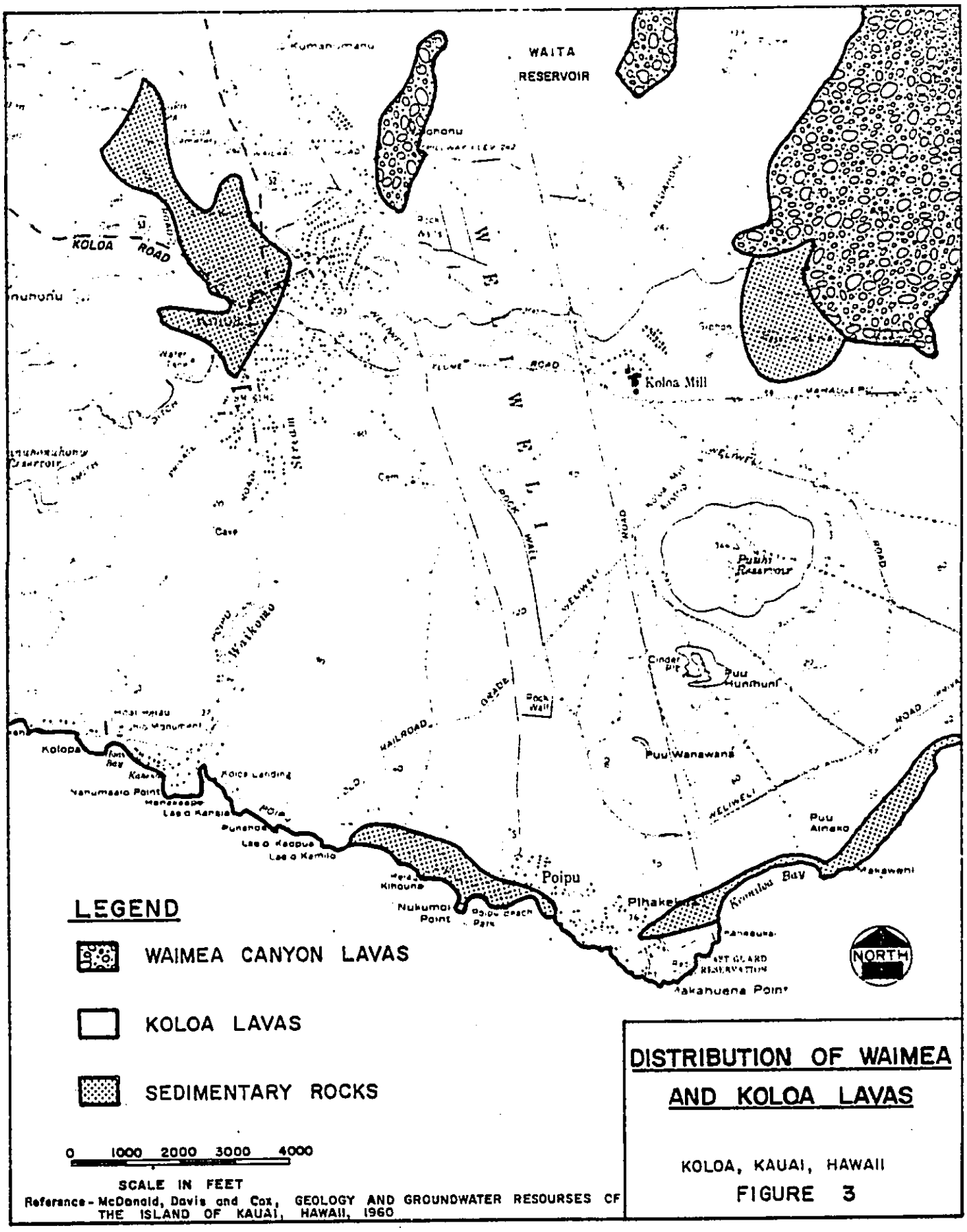
Geology

Kauai is, geologically, the oldest of the major islands in the Hawaiian chain. The Kauai volcanic shield built itself off the ocean floor more than four million years ago. Rock formations belonging to this original shield are part of the Waimea Canyon volcanic series, a major portion of which are the thin lava flows of the Napali formation which later covered the shield mass.

Following a long period of quiescence, further volcanism occurred which produced the thick flows of the Koloa volcanic series. The distribution of the Waimea Canyon and Koloa series in the Koloa-Poipu area is shown in Figure 3.

Water Bearing Properties of the Geologic Formations

The drilling of a well into either of the volcanic series has an important influence on the amount of water available for withdrawal from the ground. The Napali formation is highly permeable allowing water to flow quickly through the ground to be withdrawn by the well. In the project area this ground water is confined between impermeable dikes and is not part of the basal lens. Therefore, there is little danger of salt water intrusion from below the basal lens during periods of high demand. The existing source well is drilled into rocks of the Napali formation.



Reference - McDonald, Davis and Cox, GEOLOGY AND GROUNDWATER RESOURSES OF THE ISLAND OF KAUAI, HAWAII, 1960

DISTRIBUTION OF WAIMEA AND KOLOA LAVAS

KOLOA, KAUAI, HAWAII

FIGURE 3

The Koloa volcanic series, on the other hand, is poorly to moderately permeable. Water withdrawal is slower and more difficult. Water presently being tapped in this series by Koloa Mill originates from perched acquifers. These acquifers and the Waimea acquifers are isolated hydraulically from each other. Essentially, there is no water transfer between the two underground reservoirs.

Soils

The soils found in the project area are generally of the type called the Waikomo-Kalihi-Koloa association. This soil is moderately deep, well drained and fine textured, the result of erosion of igneous rock and poorly drained, very fine textured alluvial soils. The association is distributed in the following proportions: Waikomo 70%; Kalihi 20%; and Koloa 10%.

Waikomo soils have a surface layer of dark brown to very dark grayish-brown, very firm stony clay. The subsoil is reddish-brown to dark yellowish-brown, firm heavy silty clay loam. The substratum is hard basic igneous rock.

Kalihi soils have a surface layer of very dark-gray to mottled dark-brown, firm clay. The subsoil is dark-gray, mottled, firm clay. The substratum is grayish-brown and dark-gray, firm clay.

Koloa soils have a surface layer of dark reddish-brown, firm stony clay. The subsoil is dusky-red to dark reddish-brown, firm silty clay. The substratum is hard rock.

Topography

The topography of the land is very closely associated to the type of volcanism which produced it. Land underlaid by the Waimea Canyon valcanic series is steep and well drained. The average slope of the Haupu range just behind the well site is 25 percent. The steep slope accounts for the relatively thin lava flows which accumulated on top of one another creating the high permeability characteristic of the Waimea series.

Conversely, land underlaid by the Koloa volcanic series is comparatively flat, although well drained. The average slope of the land below the Haupu range and extending to the ocean is about two percent. Koloa lavas spread out slowly from their source forming thick layers and producing underground formations with low permeability. The slight slope of the land, however, makes it practical for sugar cane cultivation since mechanical harvesters are most effective over flat areas.

Unusual topographic features consist of three volcanic vents which were sources of Koloa lavas: Puu Hi, Puu Hunihuni and Puu Wanawana. The crater of Puu Hi, the cone on which the storage tank is to be situated, serves as a reservoir for irrigation water. Waita Reservoir, the largest man made body of water in the State is to the northeast of Koloa.

Flood and Tsunami Hazards

The project area is located within the Koloa Watershed of hydrographic area III as designated by the Division of Water

and Land Development. The main stream course for the area is Waikomo Stream which drains approximately 10 square miles (Reference 29). This stream runs intermittently and flows only during periods of heavy rainfall.

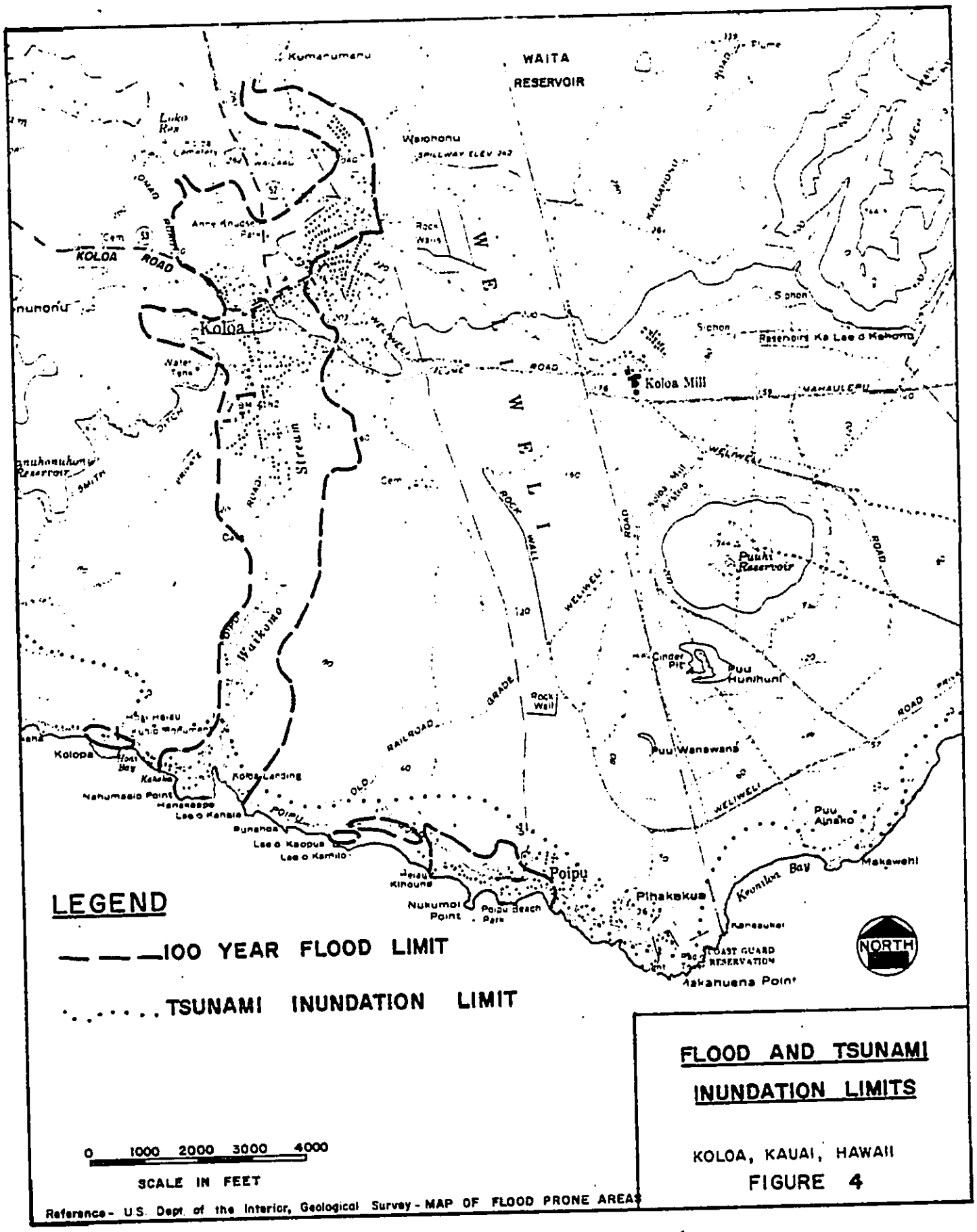
A major flooding problem exists in the coastal Poipu area. There sheetflow and poor drainage create local ponding in depressions which inundates homes and roadways. These areas of ponding sometimes take up to three days to dissipate.

A tsunami hazard is also present along the Poipu coast. The coastal high hazard area extends inland from the coast an average of 1200 feet. The coastal area is also subject to high surf damage. Figure 4 illustrates the limits of both the flood and tsunami hazards.

Social Environment

Population

The population of the island of Kauai was 29,524 in 1970 (Reference 30). The Kauai General Plan, completed before the 1970 census figures were available, estimated the population of the island in 1970 at 32,000. The most recent estimate of the actual number of residents on Kauai is 32,500 as of July, 1975, an increase of 10 percent over 1970 (Reference 2). The Koloa District had a population of 6,851 in 1970 (Reference 30). In 1973, the resident population was estimated at 7,510 increasing 10 percent in three years. Most of the increase in the district


WAITA RESERVOIR
Kumarumaru
Waiohonu
SPILLWAY ELEV 342
Luiki Ran
KOLOA ROAD
Koloa
Water Tank
Anuhanuhunui Reservoir
Stream
Waikomo
Waiohonu Stream
Rock Walls
WELIWELI
Siphon
Reservoirs Ka Lae o Koholio
Koloa Mill
MANAULEPU
ROAD
Puuki Reservoir
Cinder Pit
Puu Hunihuni
Puu Wanawana
Puu Ainako
Kolopa
Fish Bay
Kaiuka
Nahumasio Point
Hanaseape
Lae o Kanaio
Koloa Landing
Punahoa
Lae o Kaopua
Lae o Kamilo
Poipu
Nukumoi Point
Poipu Beach Park
Pihakakua
Kuniau Bay
Makaweni
Kanesuker
COAST GUARD RESERVATION
Aakahuena Point
RAILROAD
GRADE
OLD
ROAD
Rock Wall
NORTH
LEGEND
100 YEAR FLOOD LIMIT
TSUNAMI INUNDATION LIMIT
0 1000 2000 3000 4000
SCALE IN FEET
Reference - U.S. Dept. of the Interior, Geological Survey - MAP OF FLOOD PRONE AREAS
FLOOD AND TSUNAMI INUNDATION LIMITS
KOLOA, KAUAI, HAWAII
FIGURE 4

can be attributed to the more numerous job opportunities in the hotel and service industries (Reference 18).

Economy

Employment and income in the Koloa-Poipu area are derived mainly from the sugar and tourist industries. As primary sources of employment, these two industries also support several other occupations.

McBryde Sugar Company now owns the sugar operation formerly run by Grove Farm Company. Following its leasing of Grove Farm's sugar cane lands, McBryde increased its total cane acreage to 13,000 acres to make it Hawaii's eighth largest sugar plantation (Reference 19). However, the unstable market for sugar and recent periods of drought have had their effect on sugar production and income.

McBryde's 1976 production of sugar was 53,640 tons, down 13 percent from the record 61,364 tons in 1975. Dry weather in late 1976 may adversely affect the 1977 crop; the estimate for this year is 56,000 tons (Reference 19). To further exacerbate McBryde's sugar situation, economic recession, competition from other kinds of sweeteners and resistance to high prices has reduced the per ton sugar return from $690.00 in 1974 to $225.00 in 1976 (Reference 19).

In contrast, the other major sector of the economy, tourism, has been growing steadily. A total of 699,300 visitors spent a night or longer on Kauai in 1976, an increase of 10.5

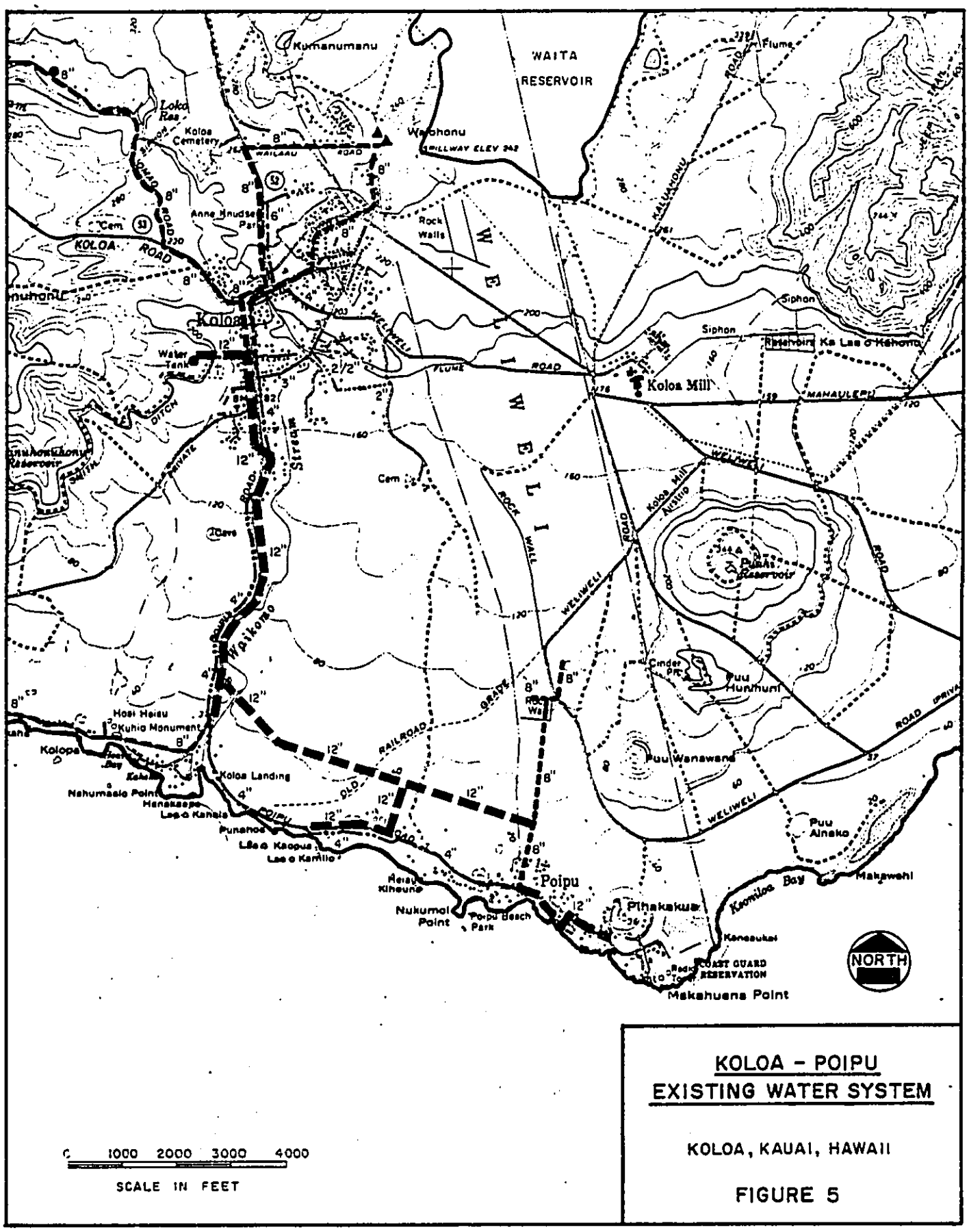
percent over the year before, and the first four months of 1977 show an increase of 8.3 percent. Prospects are good that Kauai may reach the 750,000 mark by the end of this year.

In the project area, Poipu has been attracting tourists to its beaches, surfing spots and fine weather. Moana Corporation is proceeding with its 486 acre development across from the present Kiahuna resort. Intending to develop over a 15 year period, Moana Corporation has just recently received approval from the State Land Use Commission to upgrade its lands to an urban designation. It must now apply to the County of Kauai for re-zoning. Two other condominiums are nearing completion and two more are in their planning stage (Reference 20).

Utilities - Existing Water Supply

The existing Koloa-Poipu water supply consists of two well sources, three storage tanks and water mains ranging in size from four inch to twelve inch diameters (Figure 5). The Koloa-Poipu system can be supplemented by water from the Lawai-Omao system to the west; however, the connection between the two supplies is normally closed.

Two service areas are supplied by the existing system. The high service area, generally encompassing Koloa, is fed by one of the wells from which water is pumped into the 200,000 gallon Omao Tank. The low service area, generally Poipu and Kukuiula, receives water from the second well and the 250,000 gallon Koloa



KOLOA – POIPU
EXISTING WATER SYSTEM

KOLOA, KAUAI, HAWAII

FIGURE 5

Tank. The third tank is the 75,000 gallon Poipu Tank which is not used except in emergencies. Water from the high service area may be transferred to the low service area when required. The proposed water system will increase the source capacity of the lower service area and decrease its dependence on the high service area during periods of drought.

Utilities - Public Sewage, Solid Waste and Roadway Services

At present there is no municipal sewer system serving Koloa and Poipu. All residents and resort developments depend upon individual systems and ultimate underground waste disposal. Unless the sewer facilities are improved, population growth would increase the quantity of waste to amounts which could seriously affect the quality of water offshore (Reference 12).

In 1973, the firm of Sunn, Low, Tom and Hara, developed the Water Quality Management Plan as Related to Waste Treatment for the County of Kauai*, which was based upon population estimates projected by the Kauai General Plan. The Water Quality Management Plan, as it applies to Koloa-Poipu, envisions a $12.7 million (1973 dollars) sewage collection and treatment system to be implemented in stages as the size of the population requires and as the financial situation permits. The first stage of the system will serve the communities of Kihouna and

*Sunn, Low, Tom & Hara, Inc., Water Quality Management Plan as Related to Waste Treatment for the County of Kauai, Prepared for the Department of Public Works, County of Kauai, July 1973.

Punahoa-Kamilo at an initial cost of $4.8 million (Reference 12).

All of the County collected domestic solid waste from Koloa-Poipu is presently being hauled directly to the temporary Halehaka sanitary landfill near Lihue. The Koloa open dump has been restricted to private users with trucks less than three quarters of a ton in capacity. Within two years, the County intends to close the existing dump and institute a new transfer station two miles west of Koloa off Omao Road. The transfer station will compact County collected refuse, and private and commercial wastes for eventual hauling to the permanent Kipu sanitary landfill.

The two-lane Poipu Road is the only link between Koloa and the Poipu coast. No plans exist for any future improvement or construction of roadways in the area. The Kauai General Plan foresees the requirement for a second road between Koloa Town and Poipu; however, neither the State nor County have taken steps towards its construction.

Biological Environment

Five species of animals, which are regarded as rare and endangered, have been sighted in the general area of the proposed project. The Hawaiian Bat (Lasiurus cinereus semotus) has been sighted flying over the Koloa-Poipu coastal plain and is on the federal and state endangered species list. The species is a solitary-roosting, nonhibernating animal, which does not require a specific tree or plant in which to roost. Since the

bat is a nocturnal animal, sightings of the bat often occur at sunset while it searches for food (Reference 34).

Two cave animals have recently received attention by the Department of Interior, Fish and Wildlife Service (Reference 35). The Kauai cave wolf spider (Adelocosa anops) has been proposed as an endangered species. It is known only to occur in Koloa Cave No. 2, west of Poipu Road, a proposed critical habitat. The cave is the deepest and wettest lava tube in the Koloa area.

The Kauai cave amphipod (Spelaeorchestia koloana) has been proposed as a threatened species. Its proposed critical habitats are Koloa Caves No. 1 and No. 2, west of Poipu Road, and Limestone Quarry Cave, 3 miles away to the east.

Newell's Shearwaters (Puffinus newelli), designated a threatened species, have a sizeable colony located just north of the Kaluahonu Crater, approximately 2 miles northeast of Koloa Mill. The shearwaters are diurnal, feeding over the sea in the daytime and returning to their nesting grounds before nightfall. The shearwaters are found in Hawaii between the months of April and October.

The Hawaiian Stilt (Himantopus himantopus knudseni) has been designated an endangered species. Throughout the year two or three stilts are generally found inhabiting the artifical habitat created by the Puu Hi irrigation reservoir. They feed on small fish, worms, seeds, and roots of water plants (Reference 36)

Neither the habitats nor the feeding habits of these

endangered species will be disturbed by the project. The evening flights of the Hawaiian Bat, from its roosting areas in the mountains to the sea, will not be subject to the activities of daytime construction. Koloa Caves No. 1 and No. 2 and the Limestone Quarry Cave are further than one mile away from the closest portion of the project. Similarly, the shearwater colony is at least 1.5 miles away from the well site. The Hawaiian Stilt habitat on Puu Hi is about 1000 feet from the proposed reservoir site. Although noise and dust will be created by construction activities, minimal impact is expected on the habitat and no mitigating measures are considered necessary.

Because the well site and most of the pipeline length has been previously cleared for sugar cane cultivation or for the construction of the railroad grade, any endangered species of flora or fauna in the immediate area would have by now disappeared.

Two areas of the project have not yet been cleared: a 0.6 acre portion of the reservoir site which is surrounded by cane fields, and a 20 foot wide, 700 feet long corridor for the water-line connection to Weliweli subdivision. The reservoir site is thinly covered with haole koa trees and grasses. The corridor to Weliweli subdivision is thickly covered by haole koa and scattered clumps of grasses and keawe trees. The area has been surveyed by a wildlife biologist in connection with the development of Weliweli subdivision and he has concluded that the area has "insignificant wildlife value" (Reference 24).

The common species of animals which can be expected in the area are:

Mammals (Reference 21)

Hawaiian Rat (Rattus exulun hawaiiensis)

Black Rat (Rattus rattus)

House Mouse (Musmusculus domesticus)

Feral Cat (Felus catus)

Birds (Reference 22)

Black-crowned Heron (Nycticorax nycticorax hoacti)

Pacific Golden Plover (Pluvialis dominica fulva)

Wandering Tattler (Heteroscelus incanus)

Hawaiian Short-eared Owl (Asio flammeus sandwichensis)

Lace-necked Dove (Streptopelia chinensus)

Barred Dove (Geopelia striata)

Mocking Bird (Minus polyglottos)

Indian Mynah (Acridotheres tristis)

White Eye (Mejiro) (Zosterops palpebrosus japonicus)

Western Meadowlark (Sturnella neglecta)

House Finch (Carpodacus mexicanus frontalis)

English Sparrow (Passer domesticus)

Ricebird (Munia punctulata topela)

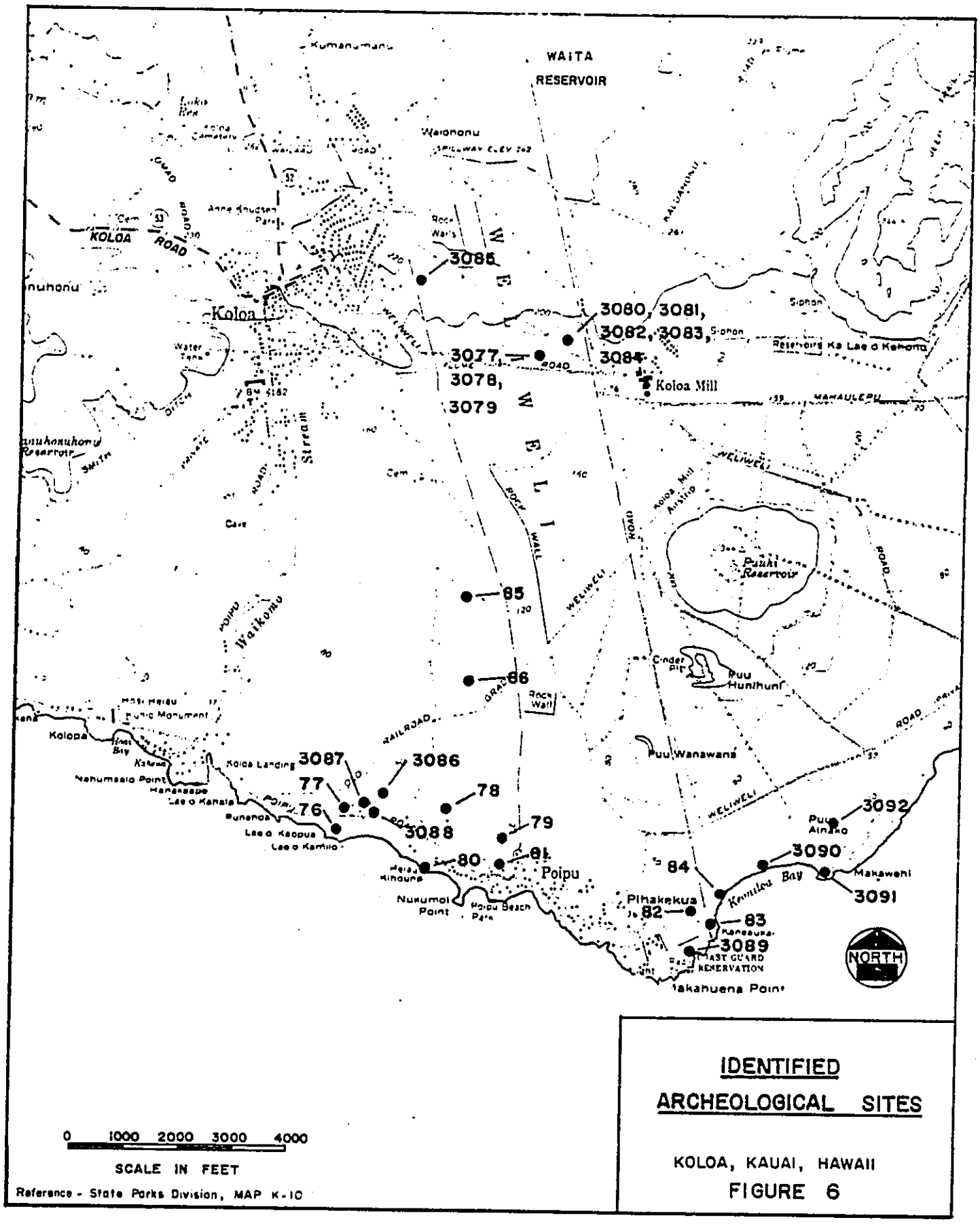
Cardinal (Richmondena cardinalis)

3. ARCHAEOLOGICAL AND HISTORICAL SITES

There are several sites in the vicinity of the project which have been recognized as having some archaeological significance, but are in varying states of disrepair. These sites are listed in Table 3 and located in Figure 6. Three of the sites are listed in the Hawaii Register of Historic Places: Kihouna Heiau (Site 80), Walled Enclosure and House Sites (Site 79) and House Sites (Site 85).

Two historical places of interest are located in the Koloa-Poipu area. The original Koloa Mill listed in the Hawaii and National Register of Historic Places, is situated at the entrance of Maluhia Road into Koloa Town (Reference 25). The Kuhio Monument opposite Hoai Bay designates the birthplace of Prince Jonah Kuhio Kalanianaole.

The two identified archaeological sites closest to the waterline alignment are numbered 78 and 86. They are approximately 600 feet from the proposed pipeline and are not in danger of being disturbed by construction activities.



IDENTIFIED
ARCHEOLOGICAL SITES

KOLOA, KAUAI, HAWAII
FIGURE 6

Table 3

Identified Archaeological Sites

Site I.D. No. 30-10-	Description	Remarks
76	Salt Pans	Designated Marginal by HHPRB
77	Ponds	Designated Marginal by HHPRB
78	Taro Terraces & House Sites	Destroyed
79	Walled Enclosure & House Sites	Designated Reserve by HHPRB
80	Kihouna Heiau	Designated Valuable by HHPRB
81	Kaneiolouma Heiau	
82	Unidentified	
83	Weliewli Heiau	Destroyed
84	Petroglyphs	Site Covered with Sand
85	House Sites	Designated Reserve by HHPRB
86	House Sites	Possibly Destroyed
87	Unidentified	
3077	Ali'i Cane	Destroyed
3078	Stone Wall	Destroyed
3079	Cave "A"	Destroyed
3080	Cattle Pen	Destroyed
3081	Wall-Well	Destroyed
3082	Wall-Well	Destroyed
3083	Wall	Destroyed
3084	Caves	Destroyed
3085	House Sites	
3086	Shetters	Probably Destroyed
3087	Fish Shrine	Probably Destroyed
3088	Hula Grounds	No visible evidence of platform or structures that may have been associated with Hula Grounds
3089	Kane'au-kai Heiau	
3090	Walls	
3091	Petroglyph	
3092	Structure	
3093	Petroglyphs	
3094	Petroglyph Rock	Valuable
3095	Structures	Destroyed
3096	Unidentified	
3097	Shelter	Destroyed

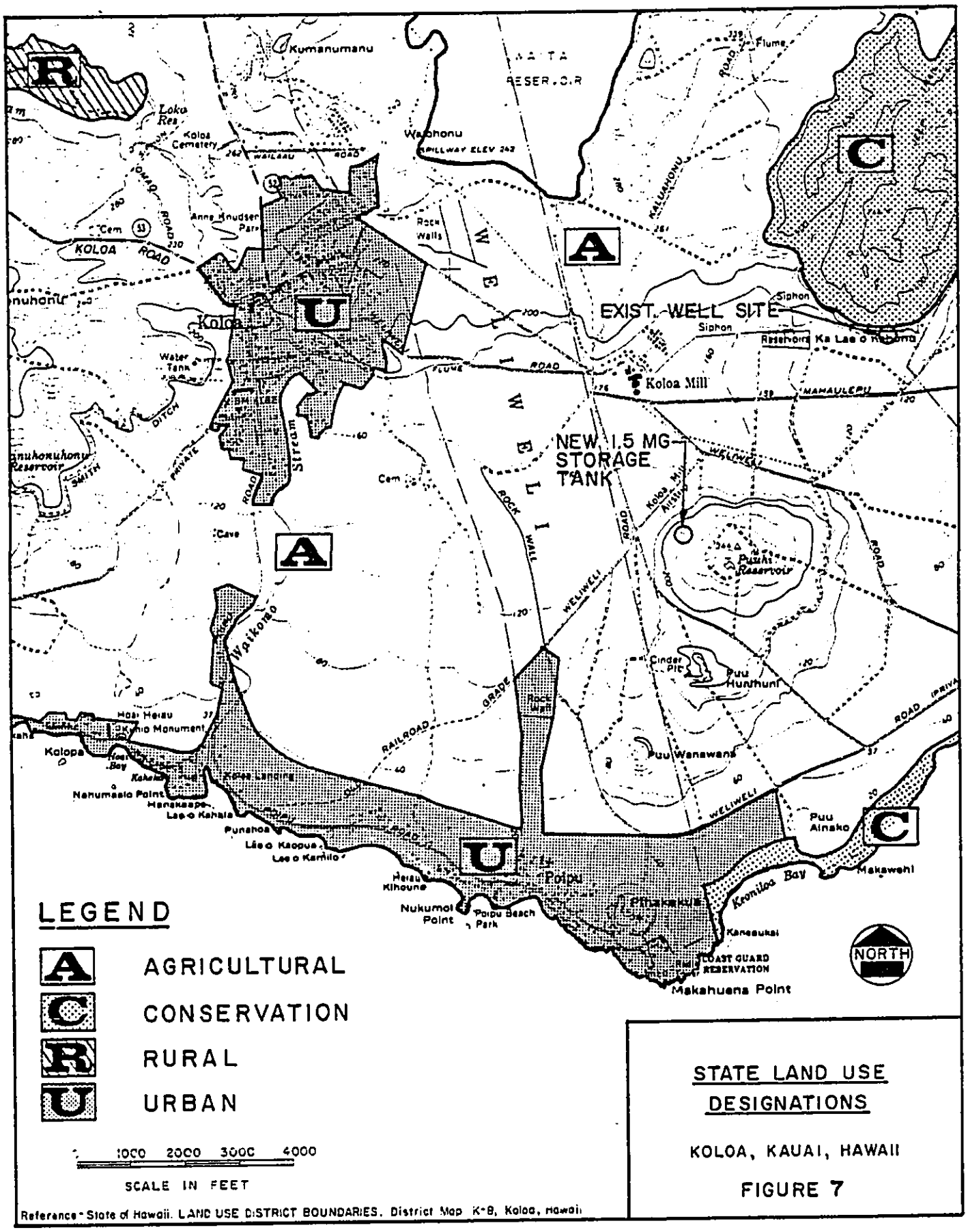
4. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

State Land Use Designation

The proposed project lies entirely within land designated as urban or agriculture (Figure 7). The pump house and water-lines are permissible uses under the Rules of Practice and Procedure and District Regulations. The storage tank, however, will require a special permit for its construction within the agriculture district. The permit process involves a hearing before the County Planning Commission and, if approved at the County level, a non-public review by the State Land Use Commission (LUC).

The LUC will apply five tests to determine whether the proposed use is "unusual and reasonable" and should be permitted (Reference 28):

1. Such use shall not be contrary to the objectives sought to be accomplished by the Land Use Law and Regulations.
2. That the desired use would not adversely affect surrounding property.
3. Such use would not unreasonably burden public agencies to provide roads and streets, sewers,



Reference - State of Hawaii. LAND USE DISTRICT BOUNDARIES. District Map K-8, Koloa, Hawaii

STATE LAND USE DESIGNATIONS

KOLOA, KAUAI, HAWAII

FIGURE 7

water, drainage and school improvements and police and fire protection.

4. Unusual conditions, trends and needs have arisen since the district boundaries and regulations were established.
5. That the land upon which the proposed use is sought is unsuited for the uses permitted within the district.

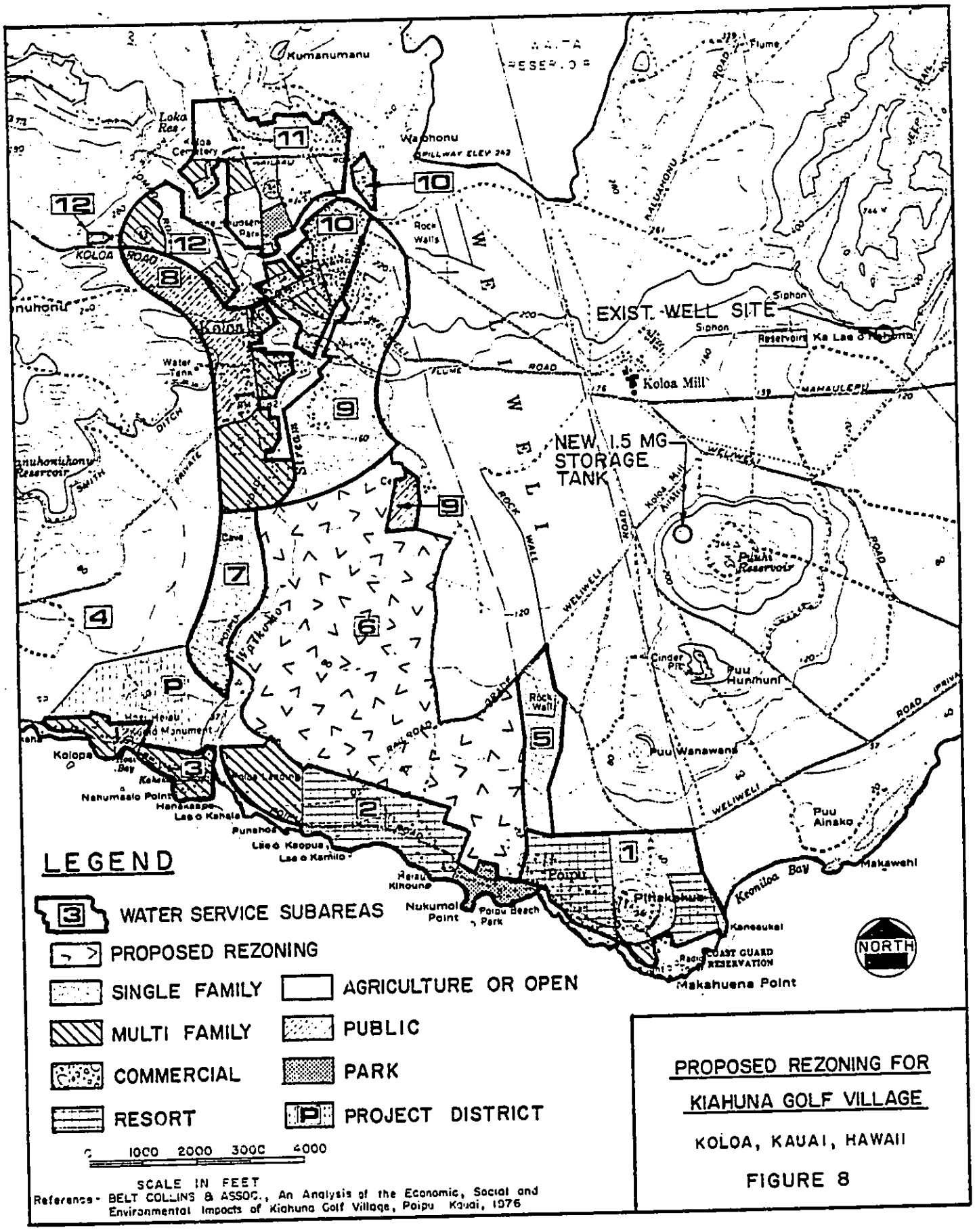
Kauai General Plan Zoning Districts

The proposed waterline will enter agricultural, single family residential and resort areas as designated by the Kauai General Plan. The Moana Corporation has an amendment to the General Plan pending before the County Planning Commission to allow the development of Kiahuna Golf Village in a project district. The existing zoning and the proposed rezoning for Kiahuna Golf Village are shown in Figure 8.

Under the provisions of the County Zoning Ordinance No. 164, public utilities and facilities are permissible uses within all districts.

Recreation Resource System Plan (State Parks Plan)

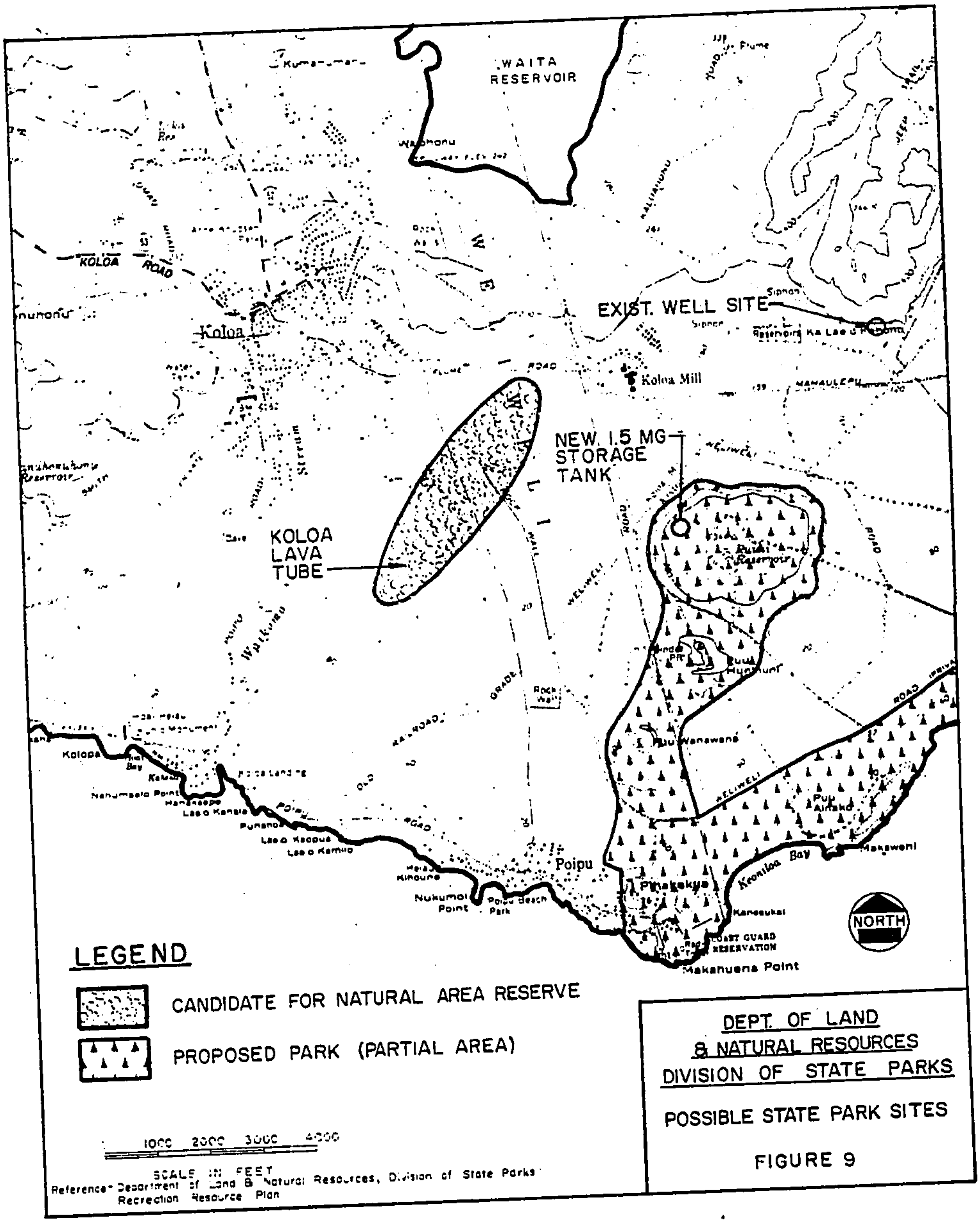
Preliminary recommendations of the Department of Land and Natural Resources' Recreation Resource System Plan include proposals for a State park along the southeast coast of Kauai (Figure 9). The proposed Maha'ulepu State Park includes the



Reference - BELT COLLINS & ASSOC., An Analysis of the Economic, Social and Environmental Impacts of Kiahuna Golf Village, Poipu Kauai, 1976

PROPOSED REZONING FOR
KIAHUNA GOLF VILLAGE
KOLOA, KAUAI, HAWAII

FIGURE 8



DEPT. OF LAND
& NATURAL RESOURCES
DIVISION OF STATE PARKS

POSSIBLE STATE PARK SITES

FIGURE 9

proposed reservoir site as part of the protected area. The main concern of the Division of State Parks, however, is that the view mauka from the coast is preserved. The storage tanks will be shielded from view by the mass of Puu Hi and will not impose an offensive visual impact on the horizon.

The Natural Area Reserves System Commission has listed the Koloa Lava Tube as a candidate for a Natural Area Reserve. This area will not be affected by the proposed water system.

5. PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

The impact that the proposed project will have on the environment can be broken down into two categories: primary impacts, which are associated with the construction and initial operation of the water system, and secondary or long term impacts which may or may not become apparent after several years of continuous functioning. Because of their particular importance, impacts on ground water resources in the area are discussed separately.

Primary Impacts

During the construction phase of the project, it is expected that some volume of dust and noise will be produced. In the midst of cane fields this will not be an inconvenience. As the construction approaches Weliewli subdivision, further efforts to reduce the amounts of dust and noise will be taken. Construction will occur only during specific daylight hours and dust prevention measures, such as dampening the ground with a minimum amount of water, will be instituted.

Construction activities, if not properly coordinated, will interfere with the normal harvesting and maintenance operation performed by sugar plantation employees. While many of the cane

haul roads are wide enough to accommodate cane trucks and construction machinery simultaneously, there are a few areas to which alternate routes may have to be devised.

Site work at both the well and reservoir sites will permanently transform the landscape in those immediate areas. Clearing and excavation work at the reservoir site will alter the existing drainage patterns. Excavation and trenching for the pipeline will be temporary and the ground surface shall be restored to its original condition. Therefore, interruption of water through irrigation furrows to certain areas of sugar cane will also be temporary.

Once construction has ended, one of the primary impacts resulting from the initial operation of the water system will be the upgrading of the existing water supply to Koloa and Poipu. The new system will increase the capacity of the Koloa water system to provide required fireflows. It will also provide greater security against potential pump failures or water main breaks by developing a second source of water to Poipu. The upper service level (Koloa Town) will benefit since it no longer serves as the only source of water for Poipu during emergencies.

The pump control house and storage tanks will be visible by persons approaching Koloa via Koloa Road. The sites will not be visible from the coastal roadways because of the thick haole koa brush interrupting the lines of sight. View of the reservoirs will be shielded from the proposed Mahaulepu State Park coastal area by the mass of the Puu Hi volcanic cone.

The cane fields surrounding the reservoir site and on the slopes of Puu Hi will soon be adapted to drip irrigation. Crossings under the access road to the tank will be provided for the small diameter pipes conveying irrigation water to the fields. The existing flumes will no longer be required.

Secondary Impacts

The installation of the proposed water supply improves the climate for development, but will not in itself result in a sudden movement towards further urbanization. Several requirements must be satisfied for residential or resort development to proceed sucessfully: land must be available, public service facilities must be able to handle greater numbers of people and the public must be in favor of such projects. In Poipu, at present, the availability of land is controlled by zoning restrictions; the existing water system (there is no public sewer system) is inadequate to provide significant flow increases and the recent public outcry against new development along the Poipu coastline has received statewide attention. Only an appropriate combination of the aforementioned factors will result in continued building construction.

There are presently several developments which have been in the planning stage for a number of years which could proceed one step further towards construction once the new water supply is installed. However, the private sewage treatment system for each development must be approved by the Department of Health.

Once the water system becomes operable attention may be focused on other public services which require improvement. One of these is the public sewage collection and treatment system. Pressure may be exerted on local governmental agencies by the residents of Poipu to implement the Water Quality Management Plan. The schedule for the installation of the area's public sewage treatment plant and collection system, however, depends heavily upon the availability of Federal grants.

The improved climate for development may lead to fuller use of available beach facilities and recreational and open space in Poipu. Traffic volume along Maluhia Road and Poipu Road could increase through Koloa Town which is an older, more placid community than Poipu. Land values in the area could rise.

6. IMPACT ON GROUNDWATER RESOURCES

The initial pump to be installed at the well site has been designed to supply the Poipu community with 1.14 million gallons of water per day. The proposed water system, however, has the designed flexibility to supply 80 percent of Poipu's (i.e. the lower service area's) projected demands as envisioned by the General Plan plus the demand incurred by Moana Corporation's subdivision. (The other 20 percent will be supplied by the present system.) The eventual withdrawal rate of this system from the Waimea acquifer, therefore, could be as high as 2.65 mgd.

Estimates of Regional Water Recharge and Withdrawal

The reservoir of underground water stored within the acquifer is recharged continuously by rainfall seeping down from the soil above and by underflow from neighboring underground regions. The rate of replenishment depends primarily upon the amount of rainfall and the type lava rock overlying the acquifer. The rate of withdrawal is a function of the number of wells sunk into the acquifer and their pumpage rates. Unfortunately, the periods of drought which cause a drop in the rate of acquifer recharge also lead to an increase in the

rate of extraction as surface water sources fail to supply their normal portion of agricultural and domestic demand.

Bowles (Reference 15) has estimated the amount of available ground water in the Waimea acquifer under the Koloa coastal plain. The net average annual rainfall finding its way into the underground reservoir is about 7 mgd. Recharge from neighboring underground reservoirs is also approximately 7 mgd. Therefore, there is a total average annual available safe yield of 14 mgd. The safe yield is defined as "the rate at which water can be withdrawn for human use without depleting the supply to such an extent that withdrawal at this rate is no longer economically feasible." (Reference 33)

There are presently ten wells drilled into the Waimea acquifer in the Koloa area. These wells are listed in Table 4. Wells 16A and 16B presently supply all of the domestic demand in the Koloa-Poipu area, which in 1975-1976 averaged approximately 0.82 mgd. The remaining eight wells serve as supplementary sources of irrigation water. Although irrigation water is mainly of above ground origin, Bowles estimates that these wells may have to be depended on to supply a total of 5 mgd for plantation use. Therefore, the total present withdrawal from the Waimea acquifer can be as high as 5.8 mgd.

Table 4. WELLS DRILLED INTO THE WAIMEA ACQUIFER

Well	Elevation	Total Depth	Water Level	Capacity (MGD)	Chloride PPM
Mahaulepu					
14N	85'	526'	31'		75-92
14K	85'	420'	31'		
14L	85'	421'	30.7'		
14M	85'	425'	30.8'	Total 3.88	
Koloa Mill					
16A	235'	455'	47'	0.49	25
16B	235'		47'	2.30	
Grove Farm (McBryde Sugar)					
K-26	222.3'	575'	35'	5.76	34
K-36	357'	1050'	45'	5.4	74
K-32	355'	1010'	+163'	5.76	74
K-55	438.5'	910'	+49'	5.4	34

Reference 15

The demand for domestic, potable water is expected to increase. To conservatively estimate the demand stress on the acquifer this increase may be assumed to be supplied entirely by the Waimea acquifer. The eventual demand exerted by the Koloa-Poipu area is estimated by the General Plan to be 4.3 mgd. The eventual demand of Moana Corporations's subdivision is 0.6 mgd. Therefore, 4.9 is the expected domestic demand which will be placed on the acquifer. This figure includes the 2.65 mgd which is to be supplied to Poipu by the proposed water system. The domestic demand added to the agricultural requirements (which are not expected to increase) of 5 mgd sums to 9.9 mgd.

The rates of recharge and withdrawal are recapitulated below:

Present			
Recharge		14	mgd
Withdrawal			
Domestic	0.82		mgd
Agricultural	5.0		mgd
		5.8	mgd
Reserve		8.2	mgd
Eventual			
Recharge		14	mgd
Withdrawal			
Domestic	4.9		mgd
Agricultural	5.0		mgd
		9.9	mgd
Reserve		4.1	mgd

Therefore, under full average flow conditions there is an average annual reserve of 4.1 mgd. Bowles, however, feels that there is reason for caution: "As there is continued emphasis to develop domestic water from the Waimea acquifer, full acquifer development is in sight."

Bowles' concern is due to the difficulty in estimating the actual discharge capacity of the acquifer. Although he estimates the safe yield to be 14 mgd, Bowles recognizes the large degree of error which is inherent in attempting to quantify the capacity by stating in his report (Reference 15), "That the Waimea acquifer can support a sustained annual pumpage of from 5 to 10 mgd."

The experience during the 1975 drought illustrates the need for the careful handling of the water resource. During the drought the existing wells were pumped heavily for the first time since their construction. In September, 1975, total pumpage from all wells averaged 16.3 mgd and water levels in the wells dropped dramatically. However, there was no significant increase in the salinity of the water pumped.

Results of Pump Tests

The initial pump test was performed on the existing well source over a period of 68 hours at a continuous rate of 2000 gpm or 2.88 mgd. After 10 hours the water level in the well stablized at 10.9 feet below the static water level - the undisturbed water level - until the pump was shut off, indicating that the rate of water recharge into the well was at least as high as the rate of withdrawal (2000 gpm).

Since the well was drilled in early 1977 it has been used by McBryde Sugar Company as a source of irrigation water. The longest uninterrupted period of recorded pumping occurred

between July 12 and September 3, 1977, when it was pumped at a rate of 1800 gpm or 2.59 mgd. During the 53-day period, the water level in the well stablized at about 11.8 feet below static water level.

The data from the two periods of pumping indicate that, at least for those durations, the well source is capable of supplying the required 2.65 mgd.

Implications for Sustained Use of the Acquifer

The difficulty of, first, estimating the safe yield of the underground acquifer and, second, of projecting the results of pump tests indicates the need for careful long term observance and management of the resource. However, using the presently available data, the acquifer is apparently capable of supplying Koloa-Poipu's eventual demand of 4.9 mgd.

This increase in water withdrawal moves the withdrawal rate closer to the safe yield of the acquifer; in other words, the point at which water extraction is no longer economically feasible. As the acquifer approaches safe yield the cost of water extraction increases due to the lowering of well water levels and the possible deterioration of ground water quality.

The dual use of the water also poses potential problems during periods of heavy pumpage. Coordination between the requirements of agriculture and the public needs to be effected. A program of coordination and resource management has been initiated between the County of Kauai and McBryde Sugar Company

who have agreed to inform each other of pumpage rates and plans for future expansion of their water extraction facilities (Reference 31).

who have agreed to inform each other of pumpage rates and plans for future expansion of their water extraction facilities (Reference 31).

7. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Excavation and grading of the well and storage reservoir sites cannot be avoided. Although the natural topography of the existing land will be changed, the earthwork at both sites is necessary to provide areas which can be used effectively. Storm runoff from the sites will be properly channelled into existing drainage courses. Cuts and fills will be covered with grass or other vegetative cover to prevent erosion.

The pump control building and the storage tank will be constructed within the predominantly agricultural setting of sugar cane fields. Both structures will be visible from portions of Koloa Road. The impact on the visual aesthetics of the area, however, is minimized by the presence of Koloa Mill and will be mitigated by the landscaping of both the well and tank sites.

8. ALTERNATIVES TO THE PROPOSED ACTION

The locations of both the reservoir and pipeline were chosen to create the least amount of disturbance to the existing environment and, at the same time, satisfy the requirements for an efficient system. The reservoir site was placed in an area unsuitable for sugar cane cultivation and in a location which does not exhibit any significant plant or animal activity. Puu Hi also provides the elevation required to produce adequate water pressure in the system.

Similarly, the pipeline location was designed to follow previously cleared routes as much as possible deviating from them only to connect with the waterline serving Weliweli Subdivision. Relocation of the transmission main would increase the cost of the project unnecessarily.

Desalinization as an alternative to groundwater development was considered to be uneconomical. The Division of Water and Land Development Report, Water Desalting in Hawaii, foresees that "It is unlikely that desalting brackish water...will provide an economically competitive alternative to transporting existing sources unless transport distances are very great or expensive water treatment and costly impounding facilities must be provided for the source." (Reference 27). Furthermore, desalinization is an energy intensive process. Rising fuel costs will be

represented in even higher operating costs.

Wastewater re-use for sugar cane irrigation has been utilized as a practical alternative effluent disposal method in some areas of Hawaii. In the Koloa-Poipu area wastewater re-use may allow a diversion of surface water now used for irrigation into the domestic supply. The implementation of this alternative would involve the construction of two treatment plants, one for sewage and one for the treatment of surface water. Because the construction of the sewage treatment plant planned for in the Water Quality Management Plan is so highly dependent on the timing of Federal grants, the installation of the wastewater re-use system may be delayed interminably. The water supply situation in the area cannot allow a long period of delay without severely exceeding its present capacity.

The last alternative is no action. The continuing increase in the area's population will eventually lead to the deterioration of the present water supply as the demand exceeds capacity. Poor supply will be evidenced by low flows and pressures in service connections at higher elevations and at the ends of the distribution system. The safety of residents would also be in jeopardy since emergency fire flows could not be accommodated.

9. RELATIONSHIP BETWEEN SHORT TERM USES AND LONG TERM PRODUCTIVITY

The need for the water supplied by this proposed system will be as great, if not greater, in the future as it is at present. The short term use of the system is the same as its long term use - supplying water for domestic consumption.

The safe yield of the underground acquifer from which this system derives its water varies widely year to year. Bowles indicates that it could vary as much as 5 mgd. Uncontrolled withdrawal of water could cause the acquifer to move beyond its safe yield limits as demand increases in the future. The combined effect of several wells pumping at increased rates from the same acquifer could be counter-productive as the maximum limits of yield are attained, the price of water rises, and consumers receive less water than they want. Therefore, the tapping of any underground acquifer requires continued observance and proper management.

An increase in the supply of water provides the potential for further growth in the Koloa-Poipu area. The direction of growth has been described by the Kauai County General Plan. Because the new Koloa-Poipu water system is compatible with the County's General Plan, the new system will allow Koloa-Poipu to attain its controlled growth aims.

10. MITIGATION MEASURES TO MINIMIZE ADVERSE IMPACTS

Measures to minimize impact resulting from the construction of the proposed project are relatively simple. Dust generated by construction machinery in the vicinity of residences will be controlled by the dampening of the work site. Disruption of the harvest and maintenance operations of the sugar plantation may be minimized by advance scheduling and coordination between the contractor and the plantation supervisory staff. Erosion hazards due to grading and excavation will be limited by observance of the regulations of the County's grading ordinance. Should any site of potential historical or archaeological significance be encountered, construction activity in that area will be halted and a local historic resources officer will be notified.

Secondary impacts, including possible further development in the Koloa-Poipu area, may be mitigated by the Koloa-Poipu residents who are in a position to influence government policies. Their participation in zoning and use permit applications may determine the extent of development in their community.

The rates of water withdrawal from the well will be closely monitored by the County. Instruments to record the pumping rate, time of operation and well water level will be housed within the pump control building. Data from these instruments can be

used to determine the status of the acquifer. This information, in turn, will control pumpage rates at this and other wells withdrawing water from the acquifer. This program of data collection, analysis and response necessitates close coordination between the State, County and McBryde Sugar Plantation management to provide an equitable distribution of water for domestic and agricultural uses.

11. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction of the water system would involve the commitment of materials and manpower. A portion of the storage reservoir site would be committed to its use as an element of the water system rather than as a potential sugar cane growing area.

The groundwater withdrawn from the acquifer is a replaceable resource recharged by rainfall and the seepage of stream and ponded water into the ground.

APPENDICES

APPENDIX A. List of Necessary Approvals

1. County Planning Commission (for special land use permit)
2. State Land Use Commission (for special land use permit)

APPENDIX B. Organizations and Persons Consulted

1. Department of Agriculture, State of Hawaii
2. Department of Health, State of Hawaii
3. Division of State Parks, Department of Land and Natural Resources
4. Division of Fish and Game, Department of Land and Natural Resources
5. Department of Water, County of Kauai
6. Department of Public Works, County of Kauai
7. Planning Department, County of Kauai
8. McBryde Sugar Company
9. Moana Corporation
10. Park Engineering
11. The Ohana'o Maha'ulepu
12. Life of the Land
13. Roy Yee, Kims Inc.
14. Joann Yukimura, Councilwoman, Kauai County Council
15. Stephen P. Bowles

APPENDIX C. Comments Received and Responses Made During the Consultation Period

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

RECEIVED
77 JUN 21 P 2:49
WATER &
LAND DEVELOPMENT

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

FILE NO. _____

June 20, 1977

MEMORANDUM

TO: Division of Water and Land Development

FROM: Division of State Parks

SUBJECT: EIS Preparation Notice - Improved Koloa-Poipu Water System, Kauai, Job No. 13-KW-12.

Thank you for recognizing the recreation values of the Mahaulepu coast. It certainly is desirable to keep this "wild" coastline as natural as possible. State Parks interests in the area have not been fully determined and no funds appropriated for the area. There are no other State Park interests in the project area at this time.

J. M. SOUZA, JR.
State Parks Administrator

Division of State Parks
Department of Land and Natural Resources
1151 Punchbowl Street, Room 310
Honolulu, Hawaii 96813

Attention: Mr. J.M. Souza, Jr., State Parks Administrator

Gentlemen:

Subject: Koloa-Poipu Water System EIS Preparation Notice

On behalf of the Division of Water and Land Development, thank you for your letter of June 20, 1977, regarding the subject EIS.

A discussion of the proposed Mahaulepu park has been included on page 33 of the attached EIS. Because the proposed storage reservoir will be installed on the mauka slope of Puu Hi volcanic cone we do not foresee any adverse impacts on the esthetics of the view inland from the Mahaulepu coast.

A notice will soon be published in the Environmental Quality Commission Newsletter announcing the availability of the EIS for public inspection.

Very truly yours,

SAM O. HIROTA, INC.

Alan Hee
Civil Engineer

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

RECEIVED
77 JUL 13 P1:10
LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801

July 12, 1977

RECEIVED
JUL 21 1977
Sam O. Hirota, Inc./Tes
By

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

In reply, please refer to:
File: EPHS-SS

MEMORANDUM

To: Mr. Robert Chuck, Manager-Chief Engineer
Division of Water and Land Development, Department of Land and Natural Resources

From: Chief, Environmental Protection & Health Services Division

Subject: Environmental Impact Statement Preparation Notice for Koloa-Poipu Water System Including Pump, Controls, Pipeline and Storage Tank

Thank you for allowing us to review this EIS preparation notice.

Staff comments are:

1. The present water supply system in the Koloa-Poipu area has limited the growth of this region. We have no objection to further development there, but other environmental health related factors must be resolved before such development occurs. These include a regional sewage collection and treatment/disposal system and, equally important the immediate need for an alternative solid waste disposal facility. The present open dump is a source of health related problems including fugitive dust, smoke, and source of vectors. The sewage disposal matter is of wide-spread community concern.

2. The sewage and solid waste disposal problems are basic County functions. We are not informed of the County's plans and any firm timetable in these areas.

3. There are no environmental health related objections to the proposed project per se.

SHINJI SONEDA

Department of Health
Environmental Protection and Health
Service Division
1250 Punchbowl Street
Honolulu, Hawaii

Attention: Mr. Shinji Soneda, Chief, Environmental Protection and Health Services Division

Gentlemen:

Subject: Koloa-Poipu Water System EIS Preparation Notice

On behalf of the Division of Water and Land Development, thank you for your letter of July 12, 1977, regarding the subject EIS.

Your comments concerning the sewage collection and solid waste disposal systems have been noted and a discussion of the present, and future, public service situation is included in the EIS. (See EIS page 24).

Notice of the availability of the EIS for public inspection will soon be published in the Environmental Quality Commission Newsletter.

Very truly yours,

SAM O. HIROTA, INC.

Alan Hee
Civil Engineer

McBRYDE SUGAR COMPANY, LIMITED
P. O. Box 8
ELEELE, KAUAI, HAWAII 96705

AH ✓
BK ✓
DS ✓

July 22, 1977

RECEIVED
JUL 25 1977
Sam O. Hirota, Inc./ Les.

Mr. Robert T. Chuck
Manager-Chief Engineer
Division of Water & Land Development
Department of Land & Natural Resources
P. O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Chuck:

We are pleased to comment on your letter of June 15, 1977, and the EIS preparation notice with regard to the pump, controls, pipeline and tank, Koloa-Poipu Water System, Kauai.

As you know, McBryde Sugar Company, Limited has a major interest in the underground water resources in the Koloa region as the plantation is dependent on pumping from a number of wells to satisfy its need. Geological studies made of this area, including the most recent by Stephen P. Bowles for the Kauai Department of Water, indicate the recharge of the Waimea groundwater aquifer is limited and existing pumping stations have developed most of this supply. Grove Farm Co., Inc., the owner of the Koloa land involved in this project and lessor of the McBryde plantation lands in this area, has entered into agreement with the Board of Water Supply to carefully monitor and control pumping from the groundwater aquifer. We trust the environmental impact statement will review the sensitive groundwater situation in the Koloa region.

We ask that we be consulted by Sam O. Hirota, Inc. during the course of the engineering of the project in order that the concerns of the plantation be reflected in the design of the Koloa-Poipu water system.

Very truly yours,

McBRYDE SUGAR COMPANY, LIMITED

P. F. Conrad

Philip F. Conrad
Manager

PFC:sf

cc: Grove Farm Co., Inc.
Kauai Dept. of Water
Sam O. Hirota, Inc. ✓
A&B - R.H.Cox

McBryde Sugar Company, Ltd.
P.O. Box 8
Eleele, Kauai, Hawaii 96705

Attention: Mr. Philip F. Conrad, Manager

Gentlemen:

Subject: Koloa-Poipu Water System EIS Preparation Notice

On behalf of the Division of Water and Land Development, thank you for your letter of July 22, 1978, regarding the subject EIS.

The matter of groundwater resources in the Koloa area is discussed in detail on page 41 of the attached EIS. Data from pump tests and chemical analyses along with a discussion of Mr. Bowles' geological studies and safe yield analysis is presented.

We thank you for your assistance and courtesy during our visits and consultations.

Notice of the availability of the EIS for public inspection will soon be published in the Environmental Quality Commission Newsletter.

Very truly yours,

SAM O. HIROTA, INC.

Alan Hee
Civil Engineer

APPENDIX D. Comments Received and Responses Made During the Public Review Period

List of Responding Agencies, Organizations and Persons

1.* Headquarters, Fourteenth Naval District.

2.* U.S. Army Support Command, Hawaii.

3.* Engineering, Construction and Environmental Planning Division, Headquarters, 15th Air Base Wing.

4. U.S. Army Engineer District, Honolulu.

5.* Soil Conservation Service, U.S. Department of Agriculture.

6.* Department of Defense, Office of the Adjutant General, State of Hawaii.

7.* Department of Agriculture, State of Hawaii

8.* Division of State Parks, State of Hawaii.

9.* Department of Planning and Economic Planning, State of Hawaii.

10.* Department of Accounting and General Services, State of Hawaii.

11.* Department of Transportation, State of Hawaii

12.* Department of Social Services and Housing, State of Hawaii.

13. Office of Environmental Quality Control, Office of the Governor, State of Hawaii.

14.* Water Resources Research Center, University of Hawaii.

15. Environmental Center, University of Hawaii.

16.* Planning Department, County of Kauai.

17.* Department of Public Works, County of Kauai

18. Department of Water, County of Kauai

19. Stephen P. Bowles

* Agency had no comments.

5059

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858

PODED-PV

24 April 1978

RECEIVED
78 APR 28 P 3:55
WATER & LAND DEVELOPMENT

Mr. William Thompson, Director
Department of Land and Natural
Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Thompson:

We have reviewed your environmental statement for the Koloa-Poipu Water System. The U.S. Army Engineer District, Honolulu, does not have any projects located along the project alignment. Your project is not located within any 100-year flood hazard areas. The project does not fall under the Corps regulatory responsibilities, and a Department of the Army permit is not required for the action.

We thank you for the opportunity to review the project.

Sincerely yours,

for: James W. Dumpy, LTC, EN
ADE
B. R. SCHLAPAK
Lt Col, Corps of Engineers
District Engineer

Copy Furnished: w/1 incl
Office of Environmental
Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

GEORGE R. ARIYOSHI
[redacted]
GOVERNOR OF HAWAII

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

August 3, 1978

Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858

Attn: Lt. Col. B. R. Schlapak,
District Engineer

Gentlemen:

Koloa-Poipu Water System EIS

Thank you for your letter of April 24, 1978 regarding the subject EIS. Your letter will be appended to the revised EIS.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Sam O. Hirota, Inc.

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

May 3, 1978

Mr. Richard L. O'Connell, Director
Office of Environmental Quality Control
550 Halekauwila St., Rm. 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Review of Draft EIS for Pump, Controls,
Pipeline and Storage Tanks,
Koloa-Poipu, Kauai

The Environmental Center has received the above EIS. At this time we do not plan to review the EIS due to constraints in time and personnel.

The project in general seems well-written. We are pleased to note that water levels will be carefully monitored by the County.

Thank you for the opportunity to review the document.

Yours very truly,

Doak C. Cox
Director

DCC/lmk

cc: Jackie Miller
Michael McNulty
Barbra Vogt

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

August 3, 1978

Environmental Center
University of Hawaii
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Attention: Dr. Doak Cox, Director

Gentlemen:

Koloa-Poipu Water System EIS

Thank you for your letter of May 3, 1978 regarding the subject EIS. Your letter will be appended to the revised EIS.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Sam O. Hirota, Inc.

LEND A HAND TO CLEAN OUR LAND. STATE OF HAWAII

GEORGE R. ARIYOSHI
GOVERNOR

RICHARD L. 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

RECEIVED
MAY 26 1978
SAM O. HIROTA, INC.
By

RECEIVED
'78 MAY 26 A7:33
LAND DEVELOPMENT

May 22, 1978

MEMORANDUM

TO: William Thompson, Director
Department of Land and Natural Resources

FROM: Richard L. O'Connell, Director
Office of Environmental Quality Control

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR KOLOA-POIPU WATER SYSTEM, POIPU, KAUAI

We have reviewed the above statement and have found several areas where discussion should be expanded. We offer the following comments for your consideration:

1. Page 6

It is not clear whether the proposed water system will be able to provide for two reservoirs. The EIS states, "To be capable of handling demand flows expected by Kauai General Plan, the pump discharge capacity will have to be increased and a second reservoir must be built." Does this imply that a second reservoir is being considered? Is the proposed action a phase of a larger water project? If this is part of a larger undertaking, there should be discussion on the entire system.

2. Page 11-12

Is there any state funding involved? If so, how much? Who owns the land for the reservoir?

3. Page 25

We question the statement, "It is highly unlikely that any endangered flora or fauna exist within the project area." First, there has been sitings of the Hawaiian bat, an endangered specie listed on the federal and

state endangered species lists in the Koloa-Poipu area. Secondly, Dr. Francis Howarth, an entomologist at the Bishop Museum, testified at the land use commission hearing for Kiahuna Golf Village that two very rare cave animals were found outside the project site. These two species are being proposed on the federal endangered list. They are a blind, eyeless member of the big-eyed hunting spider and a blind terrestrial sandhopper. As a result, we recommend that these points raised and mitigation measures to protect these species be discussed.

4. Page 28

What mitigation measures will be taken to protect the archaeological and historic sites located near the proposed action?

5. Page 39

The EIS states, "The installation of proposed water supply improves the climate for development, but will not in itself result in sudden movement towards further urbanization." It should be realized that water availability is an important factor influencing growth. Whether the movement is slow or rapid, the potential of growth has been established. Moreover, the cited statement conflicts with "There are presently several development which have been in the planning stage for a number of years which could proceed once the new supply is installed."

6. What will happen to the existing system should the proposed action be implemented?

7. Page 45

If in September 1975 the total pumpage from all wells averaged 16.3 mgd during the drought, the worst condition when the proposed action is implemented could be as follows:

16.3 mgd (present use- worst condition)	+	4.9 mgd (future domestic supply required)	=	21 mgd (total use)

Since the safe yield is estimated at 14 mgd, it appears that during particularly dry periods, that safe yield would be exceeded by 50% and much hardship will occur for water users. A discussion is needed.

8. Page 49:

Under the alternatives, consideration should be given to desalination and use of recycled water as possible methods for enlarging the available water supply.

9. Page 50

The short-term uses vs. long-term productivity discussion should be expanded to include secondary impacts. As stated before, water is an important factor to growth and must be considered as such. We quote:

> It should be realized that several actions, in particular those that involve the construction of public facilities...(e.g., highways, airports, sewer systems, water resource projects, etc.) may well stimulate or induce secondary effects. Such secondary effects may be equally important as, or more important than, primary effects, and shall be thoroughly discussed to fully describe the probable impact of the proposed action on the environment. (EIS Regulation, 1:42e)

10. Page 51

The statement,

> Secondary impact involving the improvement of the climate for development must be mitigated by Koloa-Poipu residents who are in a position to influence government policies. Their participation in zoning and use permit applications will determine the extent of development in their community,

is in conflict with Chapter 344-4(1)(A), Hawaii Revised Statutes. Your agency must also assume environmental responsibilities. This responsibility should be recognized and not be passed on to the residents. Citizen participation may determine the extent of development. However, the land use commission still changed the land use boundary in that area despite loud and agressive objections over the change. We recommend that this statement be revised.

11. The responses to the comments shall be done by the agency and not the consultant as per EIS Regulation 1:62.

We are aware of the fourteen day response period. Since the accepting authority has the discretion to accept responses beyond the fourteen day period, we will accept responses beyond that period. This Office did not attempt to summarize other review comments, however, we recommend that you carefully consider them. An attached sheet lists the responding agencies.

We thank you for the opportunity to review the EIS. We look forward to the revised EIS.

Attachment

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

August 4, 1978

Office of Environmental Quality Control
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

Attention: Mr. Richard L. O'Connell
Director

Gentlemen:

Koloa-Poipu Water System EIS

Thank you for your letter of May 22, 1978 regarding the subject EIS. We have examined your comments and respond to each as follows:

1. A second reservoir, approximately the same size as the one presently being proposed, may be required if and when the demand for water makes it necessary. The pipelines would not need to be modified because they have been designed to accommodate the greater expected demand. The reservoir site will be large enough to allow the construction of two equal size reservoirs. The cost estimate and schedule of construction included on pages 12 and 13 of the EIS reflect the installation of the first tank only. No significant additional environmental impacts, beyond those mentioned as resulting from the construction of the first reservoir, are expected from the second tank.

2. State funds are available to cover the cost of the project as detailed on page 13. Grove Farm Company, Inc. owns the land to be used as the reservoir site. It is presently leased to McBryde Sugar Company.

3. The testimony of Dr. Francis Howarth is acknowledged and the Biological Environment section of the EIS has been modified to include sightings of the Hawaiian Bat and the existence of the two rare cave animals.

4. The archaeological sites located near the project alignment are not close enough to be disturbed by construction activities. See Chapter 3 - Archaeological and Historical Sites.

5. The installation of a water system is an important factor influencing growth and the potential for growth will be established. There are, however, other requirements to be fulfilled before developments can be built as discussed in the EIS. Therefore, the new water system, alone, will not result in the sudden urbanization of the Koloa-Poipu area. Once the water supply is installed, the developments mentioned in the Secondary Impacts section of the EIS may proceed to the next step in their effort to begin construction, namely, obtaining approval from the Department of Health of a private sewage treatment system.

6. The existing system will be retained and will continue to serve consumers in Poipu. Approximately 20 percent of Poipu's water needs will be supplied by the existing system after the new supply is in operation.

7. The safe yield value of the aquifer is only an estimate. The actual safe yield may be higher (or lower) than the average annual 14 mgd estimated by Bowles.

Furthermore, the aquifer acts like a vast storage tank which is capable of supplying water at high withdrawal rates for short periods of time. Withdrawal of groundwater from the Waimea aquifer during droughts at rates exceeding the average annual safe yield can be accomplished. Continued pumpage at these rates beyond the natural "buffer" capacity of the aquifer, however, would result in the deterioration of water quality, probably in the form of higher chloride concentrations. Hardship for water users would occur as restrictions on water use.

Once normal rainfall and water withdrawal rates are restored, the aquifer will gradually return to its original condition without damage to its resource capacity.

8. A discussion of these alternatives has been included in the EIS.

9. The section has been expanded to include a discussion of secondary impacts.

10. The statement has been revised as recommended.

11. Your comment is acknowledged. Future such correspondence will bear the letterhead of the proposing agency.

Your comments and these responses will be appended to the revised EIS.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

DEPARTMENT OF WATER

COUNTY OF KAUAI
P. O. BOX 1706
LIHUE, HAWAII 96766

160750

DS –
DK –
AH –

RECEIVED
JUN 6 1978
SAM O. HIROTA, INC.
By JAA

RECEIVED
78 JUN 2 P2:47
LAND DEVELOPMENT

May 19, 1978

Environmental Quality Control
550 Halekauwila St., Rm 301
Honolulu, HI 96813

Re: EIS - Koloa-Poipu Water System
Pump, Controls, Pipeline and Storage Tank

The project addressed by this EIS is in accordance with the Kauai County Board of Water Supply's General Plan for Domestic Water which, in turn, is in accord with the County's General Plan and Comprehensive Zoning Ordinance.

This project is necessary if we are to follow these plans and we, therefore, whole-heartedly endorse this project.

Walter L. Briant Jr.
Manager and Chief Engineer

XC: Dept. of Land and Natural Resources

GEORGE R. ARIYOSHI
[redacted]
GOVERNOR OF HAWAII

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

August 3, 1978

Department of Water
County of Kauai
P. O. Box 1706
Lihue, Hawaii 96766

Attention: Mr. Walter Briant, Jr.,
Manager & Chief Engineer

Gentlemen:

Koloa-Poipu Water System EIS

Thank you for your letter of May 3, 1978 regarding the subject EIS. Your letter will be appended to the revised EIS.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Sam O. Hirota, Inc.

STEPHEN P. BOWLES
CONSULTING HYDROLOGIST - GEOLOGIST

4988 MAUNALANI CIRCLE
HONOLULU, HAWAII 96816

TELEPHONE
737-2961

RECEIVED
DIV. OF WATER & LAND DEVELOPMENT
May 22, 1978

Ofc. of Environmental Quality Control
550 Halekauwila Street Rm. 301
Honolulu, Hawaii 96813

Subject: Pump, Controls, Pipeline and Storage Tank, Koloa-Poipu

Dear Sirs:

In reviewing the Environmental Impact Statement entitled "Pump, Controls, Pipeline and Storage Tank, Koloa-Poipu," I feel that the following comments are appropriate:

1) In my 1976 study for the County of Kauai I strongly recommended that the lavas of the Koloa volcanic series be explored as a potential source for domestic water supply- "For water development purposes, the Waimea and Koloa aquifers should be considered as separate resource units. As such, development of the water from one has very little effect on the other. With significant domestic demand anticipated in the future, it is important that the potential of the Koloa aquifer be determined before competition between domestic and agricultural uses become too severe."

2) The subject well should be considered as a first step in a longer range program of domestic water supply for the Koloa-Poipu area.

3) The subsurface geology and groundwater hydrology on the island of Kauai are complex and contrastingly dissimilar to other islands of the Hawaiian group. The lack of subsurface information makes interpretation of the ground-water hydrology difficult. As more exploration and well development occurs, our knowledge of these resources will increase. The economic future of Kauai will depend largely on our knowledge of these valuable resources as it has in the past.

In conclusion, I thank you for the opportunity to review this important document.

Sincerely,

Stephen P. Bowles

Copy: DLNR

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

August 4, 1978

Mr. Stephen P. Bowles
4988 Maunalani Circle
Honolulu, Hawaii 96816

Dear Mr. Bowles:

Koloa-Poipu Water System EIS

Thank you for your letter of May 22, 1978 regarding the subject EIS. We have examined your comments and respond to each as follows:

1. Your recommendation regarding the development of Koloa aquifers is acknowledged. Source development within the Koloa lavas will be given serious consideration, should any further expansion of the source capacity be required.

2. This project can be considered as a first step in a very long range program extending beyond the time period covered by the General Plan for the Island of Kauai. As discussed within the body of the EIS, the Waimea aquifer can apparently supply all of Koloa-Poipu's future requirements as envisioned by the General Plan. Any further increases in source capacity will necessitate a hard look into the development of the more difficult and smaller yielding Koloa aquifers.

3. It is hoped that the flow and pump data from this well will add to the available information on the groundwater hydrology of Kauai and, therefore, increase our knowledge of this previous resource.

Your comments and these responses will be appended to the revised EIS.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Sam O. Hirota, Inc.

LEND A HAND TO CLEAN OUR LAND, HAWAII
STATE OF HAWAII

REFERENCES

REFERENCES

1. McDonald, G.A., D.A. Davis & D.C. Cox, Geology and Ground Water Resources of the Island of Kauai, Bulletin 13, Hawaii Division of Hydrography, State of Hawaii, 1960.
2. Kauai County, Facts and Figures - 1977, Published jointly by the Department of Planning and Economic Development, State of Hawaii and the Kauai County Office of Economic Development, 1977.
3. Eckbo, Dean, Austin & Williams and Muroda, Tanaka, Itagaki, Inc. A General Plan for the Island of Kauai, Honolulu, 1970.
4. A General Plan for Domestic Water/Island of Kauai, Department of Water - County of Kauai, Report 40, Prepared by the Division of Water and Land Development, Department of Land and Natural Resources, State of Hawaii, February 1972.
5. "Grove Farm breaks with the past", Hawaii Business, Hawaii Business Publishing Corp. Honolulu, Vol. 18, No. 4, October 1973.
6. "Tourism '76: Rumblings of things to come", Hawaii Business, Vol. 22, No.1, July 1976.
7. "The Greening of the Garden Isle", Hawaii Business, Vol. 20, No. 4, October 1974.
8. Hawaii Housing Authority, Dept. of Social Services and Housing, Environmental Impact Statement for Weliweli

Subdivision, 1975.

9. Clark, J.W., W. Viessman, Jr., M.J. Hammer, Water Supply and Pollution Control, International Textbook Company, Scranton, 1971.

10. Soil Survey Interpretations, Kauai, Soil Conservation Service, U.S. Department of Agriculture, Honolulu, January 1972.

11. Spencer, Koebig & Koebig, Solid Waste Management Plan, (Prepared for the County of Kauai) April 1974.

12. Sunn, Low, Tom & Hara, Inc. Water Quality Management Plan as Related to Waste Treatment for the County of Kauai, Prepared for Dept. of Public Works, County of Kauai, July 1973.

13. Andersen, R.N., G.R. Vieth, B.J. Seidenstein, B. Bradshaw, Kauai Socioeconomic Profile, Center for Nonmetropolitan Planning and Development, Cooperative Extension Service and Hawaii Agricultural Experimental Station, University of Hawaii, Departmental Paper 35, May 1975.

14. Study Element Report, Social Base, Hawaii Water Resources Regional Study, 1975.

15. Bowles, Stephen P., Domestic Water Sources for the Koloa-Poipu Area, Kauai, January 1976.

16. Hinds, Norman E.A., The Geology of Kauai and Niihau, Bernice P. Bishop Museum, 1930.

17. Flood Hazard Information, Island of Kauai, Prepared by

the Dept. of the Army, Pacific Ocean Division, Corps of Engineers, Honolulu, June 1973.

18. Muroda, Tanaka, & Itagaki, Inc. and Eckbo, Dean, Austin & Williams, Appendix I, Economic Base Analysis with Resulting Population Projections for the Island - County of Kauai, State of Hawaii, 1970-1990, Part of the Kauai General Plan, Honolulu, March 1970.
19. Alexander & Baldwin, Inc., 1976 Annual Report.
20. "Growing despite itself", Hawaii Business, July 1977.
21. An Analysis of the Economic, Social and Environmental Impacts of Kiahuna Golf Village, Poipu, Kauai, June 1976, Belt, Collins & Associates.
22. DLNR, Annotated Checklists of the Birds and Mammals of Hawaii, Division of Fish and Game, Revised 1975, (as quoted in Ref. 21).
23. Notice of Determination (Negative Declaration) Drilling and Testing of Koloa Well 5426-04, Kauai, DLNR, April 1, 1973.
24. Hawaii Housing Authority, Dept. of Social Services and Housing, Environmental Impact Statement for Weliweli Subdivision, 1975, Exhibit "D".
25. Dept. of Land and Natural Resources, The Hawaii Register of Historic Places, 1974, Vol. II.
26. Sunn, Low, Tom & Hara, Inc., Hawaiian Engineering Consultants, Inc., General Plans-Water, Sewerage and

Drainage, County of Kauai, State of Hawaii, Honolulu, August 1963.

27. Duncan, J.M. and B.J. Garrick, Water Desalting in Hawaii (Prepared for Dept. of Land and Natural Resources), June 1974, (as quoted in the Hawaii Water Resources Regional Study, Study Element Report, Water Supply, Preliminary Draft, April 1975).

28. State of Hawaii, State Land Use Commission, Rules of Practice and Procedure and District Regulations, effective Dec. 21, 1975.

29. Flood Hazard Information, Island of Kauai, Department of the Army, Pacific Ocean Division, Corps of Engineers in cooperation with the State of Hawaii, Dept. of Land and Natural Resources, Honolulu, June 1973.

30. The State of Hawaii Data Book, 1975, A Statistical Abstract, Department of Planning and Economic Development, Honolulu, November, 1975.

31. Agreement Between the Board of Water Supply, Department of Water, County of Kauai and Grove Farm Company, Inc., October 6, 1976.

32. Standard Methods for the Examination of Water and Wastewater, 13th Edition, APHA, AWWA & WPCF, American Public Health Association, New York, 1971.

33. Meinzer, O.E., "Outline of Groundwater Hydrology", U.S. Geological Survey Water - Supply Paper 557, 1923, (as quoted in Linsley, R.K. Jr., Hydrology for Engineers, McGraw Hill Book Company, San Francisco, 1975.)

34. Kramer, Raymond J., Hawaiian Land Mammals, Charles E. Tuttle Co., Rutland, Vermont, 1971.

35. Federal Register, Volume 43, No. 117 - June 16, 1978.

36. Munro, George C., Birds of Hawaii, Charles E. Tuttle Co., Inc., Rutland, Vermont, 1960.