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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
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September 13, 1999

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

Subject: FINAL ENVIRONMENTAL ASSESSMENT FOR
THE DROUGHT EMERGENCY PLAN FOR
Hamakuapoko Well No. 1 and No. 2

The Department of Water Supply has reviewed the comments received during the 30-day public comment period which began on June 23, 1999. The Department has determined that this project will not have significant environmental effects and has issued a Finding of No Significant Impact (FONSI). Please publish this notice in the September 23, 1999 OEQC Environmental Notice.

We have enclosed four (4) copies of the Final EA, and a completed OEQC Publication form and will be transmitting a project summary via e-mail. Should you have any questions, please call our Engineering Division at (808) 270-7835.

Sincerely,

David R. Craddick
Director

hk

1999-09-23-MA-FEA-

FINAL

ENVIRONMENTAL ASSESSMENT

FOR THE DROUGHT EMERGENCY INSTALLATIONS

~~Hamakuapoko~~ Wells No. 1 and No. 2, ~~Pumps~~ and Water Mains
(Hamakuapoko, Maui)

Prepared for
Maui County Department of Water

Prepared by

Mink & Yuen, Inc.
Honolulu, Hawaii

September 1999

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FINAL ENVIRONMENTAL ASSESSMENT
FOR THE DROUGHT EMERGENCY INSTALLATIONS

Hamakuapoko Wells No. 1 and No. 2,
Pumps and Water Mains
(Hamakuapoko, Maui)

I. PROPOSING/ACCEPTING AUTHORITY

County of Maui
Department of Water Supply
200 South High Street
Wailuku, Maui, Hawaii 96793

This Environmental Assessment is prepared in accordance with Chapter 343, Hawaii Revised Statutes (HRS), Act 241, Session Laws of Hawaii, 1992, and Chapter 200 of Title 11, Department of Health (DOH) Administrative Rules.

II. DESCRIPTION OF PROJECT AREA

The project site is located in Hamakuapoko and within agricultural lands and is currently being utilized for sugarcane, pineapple, and plantation roadways, by Hawaiian Commercial and Sugar Company and Maui Land & Pineapple Company. The project is within TMK: (2) 2-5-04:039, which is owned by A&B Properties. (See Figures 1-4)

Majority of the entire project site is surrounded by sugarcane and pineapple fields which have been under cultivation for many decades. Hamakuapoko Wells No. 1 and No. 2 (State Nos. 5420-02 and 5320-01) are surrounded by existing sugarcane and pineapple fields. Majority of the proposed pipelines are within existing plantation roadways, with exception of the 12-inch waterline from Hamakuapoko Well No. 2 to HC&S' reservoir no. 10. This portion of the project is in a shallow, dry gully consisting of pasture lands covered with grass and weeds. The upper portion of this line is in a dirt road encircling the open reservoir. Figures 5-10 are from photographs to show the nature of the well sites.

III. DESCRIPTION OF PROPOSED ACTION

The primary objective of the project is to ensure that the Department of Water Supply (DWS) has an alternate source of

water to provide to the Upcountry Water System during periods of drought.

The primary mechanism to achieve this is pump treated waters from Hamakuapoko Wells No. 1 and No. 2 into a clear well at the Kamole Weir Water Treatment Plant (Kamole Weir WTP).

In addition, the Haiku and Kaupakalua wells were envisioned as a part of the drought emergency plan in 1998. As of June 1999, the Haiku Well was made a part of the DWS' system, supplying water to the UCWS on a daily basis. Although the Kaupakalua Well is privately owned, it is now available to the DWS during droughts to place up to 0.5 mgd of raw water into the Wailoa ditch or the UCWS if the well water is disinfected.

The project primarily invclves completion of Hamakuapoko Wells No. 1 and No. 2, construction of a Granular Activated Carbon (GAC) *treatment facility, pipelines, deep well pumps, pump* stations, booster pumps, control stations, disinfection facilites, a prelubrication facility, generators, electrical and communication systems, and other related appurtenances.

More specifically, the proposed action involves construction of the following water appurtenances:

1. Completion of two wells, referred to as Hamakuapoko Well No. 1 and No. 2, deep well pumps, pump stations, control stations, prelubrication facility, generators, and other related appurtenances.

   This was partially completed under Governor's Proclamation dated April 1, 1998 and being modified under Governor's Proclamation dated July 28, 1999. The wells were drilled as exploratory wells under a separate environmental review process.

2. Construction of approximately 2600 lineal feet of 8-inch pipeline from Hamakuapoko Well No. 1 to Hamakuapoko Well No. 2.

   This was completed under Governor's Proclamation dated April 1, 1998.

3. Construction of approximately 1400 lineal feet of 12-inch pipeline from Hamakuapoko Well No. 2 to reservoir no. 10.

   This was completed under Governor's Proclamation dated April 1, 1998.

4. Construction of a Granular Activated Carbon (GAC) treatment facility and appurtenances at the Hamakuapoko Well No. 2 site.

   This is in construction under Governor's Proclamation dated July 28, 1999.

5. Construction of approximately 6,000 feet of 12-inch diameter pipe from the vicinity of reservoir no. 10 to the clear well at Kamole Weir WTP.

   This is in construction under Governor's Proclamation dated July 28, 1999.

6. Installation of two (2) booster pumps and control tank at Hamakuapoko Well No. 1 to deliver water from the Hamakuapoko Well No. 1 to Hamakuapoko Well No. 2. One of the booster pumps may serve as a standby unit.

   This was completed under Governor's Proclamation dated April 1, 1998 and being modified under Governor's Proclamation dated July 28, 1999.

7. Installation of two booster pumps and control tank at Hamakuapoko Well No. 2 to deliver water from the GAC treatment facility to the clear well at Kamole Weir WTP. One of the booster pumps may serve as a standby unit.

   This is in construction under Governor's Proclamation dated July 28, 1999.

8. Installation of electrical and communication system from Haiku Road, crossing Maliko Gulch, to the Hamakuapoko well sites. This is an above-ground system.

All work being performed currently by the DWS related to the project is being performed under a Proclamation issued by the Governor on July 28, 1999.

Items one, two, four, six, seven, and eight listed above could be used for phase one of the East Maui Development Plan which hopes to eventually develop about 16 mgd of water to augment the central Maui water system. The East Maui Development Plan EIS is being supplemented to address environmental concerns. Regardless of the what happens with the East Maui Development Plan, all of the water appurtenances listed above may be used to provide water for the UCWS during drought conditions. The DWS will not issue water meters based on the proposed action.

Initially, the proposed action presented in the Draft EA (June 1998) was to pump the well waters into the HC&S' reservoir no. 10. In exchange, HC&S would release to the DWS additional waters from their Kamole Weir System, that the DWS would treat at the Kamole Weir WTP. Since the publication of the draft EA, HC&S has expressed their concerns about using these well waters for irrigation purposes. And in a letter received from HC&S (July 21, 1999), they have commented that "...HC&S is reluctant to accept any water into our irrigation system from the two Hamakupoko wells which contain DBCP and other contaminants." The letter futher states that "...it may be prudent to put the water from the two Hamakupoko wells directly into the Upcountry system with appropriate treatment."

Recognizing the concerns of HC&S, the DWS has chosen to treat the well waters using a GAC treatment facility and pump these waters directly into the UCWS.

When the Department of Water Supply completes construction of all necessary water appurtenances to deliver water to the UCWS, the system will not be as dependant upon the existing surface water sources to meet the demands to serve the UCWS during droughts. Because the project will be operated only during droughts, the project is anticipated to result in short-term impacts and is not expected to result in any significant long-term impacts.

During this past year, rainfall supplying the surface water sources to the UCWS was reduced to a level that created drought conditions that commenced on June 16, 1999 and extends to the present. During this period, the BWS took appropriate action as defined by Drought Guidelines adopted by the BWS under Resolution. (See Appendix G)

These Drought Guidelines were adopted by the BWS under Resolution No. 98-18, dated August 18, 1999. The BWS may adjust its drought guidelines to address any issues related to public health, safety, and welfare. The legal authority for this is Section 4 of the Rules and Regulations of the Department of Water Supply, County of Maui. (See Appendix F)

Following the Drought Guidelines, the BWS issued a drought emergency for Upcountry Maui, commencing on July 16, 1999. On September 9, 1999, the drought emergency was downgraded to a drought warning by the BWS. The Hamakuapoko wells will reduce the dependence on Wailoa Ditch during periods of drought.

IV. BACKGROUND INFORMATION

The Upcountry water system (UCWS) includes the areas of Haiku, Makawao, Olinda, Haliimaile, Pukalani, Kula, Omaopio/Pulehu, Kula Keokea, Ulupalakua, and Kanio/Waiohuli. Nearly 9,000 water services are off the Upcountry Water System ("1998 Annual Report, County of Maui, Department of Water Supply"). This UCWS is primarily dependant upon surface water sources, which supply the DWS's reservoir systems, and treatment facilities. In addition to the surface water sources, there are four (4) groundwater sources available for the UCWS.

The first groundwater source is the Haiku Well. The Haiku Well, as of June 1999, was made a part of the Department's Makawao System, supply water on a daily basis. But, at this time, it is only capable of servicing a small portion of the Haiku, more specifically the lower Northwest quadrant of Haiku.

The second groundwater source, the Kaupakalua Well, is part of a private development called the Kulamalu Project. It is currently privately owned and under construction. Upon completion of the Kaupakalua Well and related appurtenances (i.e., tank, controls, etc.) it is anticipated that the Kaupakalua Well will be dedicated to the DWS. Currently a temporary pump is installed in the well that can be used to pump waters from the well. If necessary, all water appurtenances, including provisions for disinfection, can be installed to deliver the well water into the Upcountry water system when needed in the event of a drought. The well is available to place up to 0.5 mgd of raw water into the Wailoa ditch.

The third and fourth groundwater sources are the Hamakuapoko Wells No. 1 and No. 2. The pumping of these wells into Kamole Weir WTP clear well is the primary mechanism to achieve the objective of the subject project, which is to ensure that the DWS has an alternate source of water to provide to the UCWS during periods of drought.

The UCWS has three (3) water treatment facilities: Upper Kula Water Treatment Plant, also known as Olinda Water Treatment Plant (Olinda WTP); Lower Kula Water Treatment Plant, also as Piiholo Water Treatment Plant (Piiholo WTP); and Kamole Weir Water Treatment Plant (Kamole Weir WTP).

Olinda WTP is supplied by Kahakapao reservoir system, Piiholo WTP is supplied by Piiholo reservoir system, and Kamole Weir

WTP is supplied by Wailoa Ditch.

V. HISTORY OF DROUGHTS AFFECTING THE Upcountry WATER SYSTEM

The UCWS is primarily dependant upon surface water sources. Until groundwater sources are developed to reduce the dependance on surface water sources during droughts, the Board of Water Supply (BWS), County of Maui, will be forced into drought mitigation measures.

Wailoa Ditch, a raw water source, supplies the Kamole Weir WTP. With base flows in the range of 10-12 mgd, it is a last resort source for the UCWS. Therefore, by employing Wailoa Ditch flow as the severe drought index, where flow for a period of 2 months or more is one half or less of the average flow, there were five periods of severe drought occurred in an 18 year period between 1970 to 1987.

Also, Wailoa Ditch was measured by the USGS for 64 years, which ended in 1987. Average flow over this time was 110 mgd. The severe drought periods occurred in the following years: 1971 (July-October, average flow was 56 mgd); 1974 (August-October, average flow was 41 mgd); 1981-1982 (December-January, average flow 44 mgd); 1983 (January-March, average flow was 41 mgd); and 1984 (July-November, average flow was 41 mgd). The 1984 drought was the most severe on record. During these droughts, and even far less severe droughts, the sugarcane crop is imperiled by lack of irrigation supply, and the DWS withdrawal from the ditch is jeopardized.

Economic losses due to severe droughts in terms of crop damage and/or loss, the inability to plant crops due to lack of water, and the reduction of livestock herds have been reported to be substantial, especially to sugar cane crops. According to the "Watershed Plan - Environmental Impact Statement For the Upcountry Maui Watershed," prepared by the USDA Natural Resources Conservation Service in 1997, the impact of drought on farming activities is described as follows:

> "Upcountry Maui is one of the most productive agricultural areas in the state. However, it lacks an adequate irrigation water supply. According to the Federal Crop Insurance Corporation, drought is historically the major peril to crop production. Fifty-five percent of the crop loss was caused by drought. In this area, water conservation or mandatory restrictions

during the drought period imposed on farming activities by the Maui County Department of Water Supply is a constant fear and concern to farmers. Consequently, farmers grow poor quality crops and production is at an average of less than 40 percent of the potential yield (information from interviews with farmers)."

Past drought occurrences were discussed on pp. 2-5 of the DEA. Moreover, a study of droughts based on a 64-year record (1922-1987) of Wailoa Ditch flow ("Wailoa Ditch at Kamole Weir; Analysis of Daily Record and Proposed Storage Requirement to Supply County DWS", Mink & Yuen, Inc., March 3, 1997) yielded the following results:

1. An extremely dry year, defined as a year with average flow less than or equal to the long-term average flow (110 mgd) less two standard deviations (1 standard deviation = 15.5 mgd), has a probability of 0.05, or once in 20 years.

2. A dry year, defined as a year with average flow less than or equal to the long-term average flow less one standard deviation, has a probability of 0.15, or one in 6.7 years.

3. In the 18-year period from 1970 through 1987, there were five periods of at least three consecutive months when the average ditch flow was less than half the long-term average. Three consecutive months of flow strains the water supply system of both DWS and HC&S. Assuming stability of the statistics for the 18-year period, the probability of a three-month or longer interval is 5/18, or 1 in 3.6 years. Of the five periods of poor average flow, three were for Summer-Fall months (July through October) and two for Winter months (December through March). The lowest persistent flow in the record took place in 1984 when the average from July to November was 41 mgd, but in September only 26, mgd and in October just 14 mgd. For the last two weeks of October, flow was a mere 11.6 mgd. The above statistics suggest that emergency conditions could be expected about on out of four years, and that the normal length of the emergency would be 90 days.

Between 1988 to 1999, there were eight drought occurances known to the DWS.

A Proclamation was issued by Governor Cayetano on April 1, 1998 declaring a drought condition in Upcountry Maui (see Appendix E). Under this Proclamation the Governor suspended the requirement to complete environmental review pursuant to Hawaii Revised Statues, chapter 343, thus allowing the Department of Water Supply to construct all necessary appurtenances to deliver water from the Haiku Well, the Kaupakalua Well, and the Hamakuapoko Wells No. 1 and No. 2, until September 1, 1998. Under this Proclamation, the DWS constructed necessary water appurtenances, but due to the restriction in time allowed, the DWS was not able to construct all necessary water appurtenances.

A second Proclamation was issued by Governor Cayetano on July 28, 1999 declaring a drought emergency in Upcountry Maui (see Appendix E). Under this Proclamation the Governor suspended the requirement to complete environmental review pursuant to Hawaii Revised Statues, chapter 343, thus allowing the Department of Water Supply to construct all necessary appurtenances to deliver treated water from Hamakuapoko Wells No. 1 and No. 2 and the Kamole clear well to Upcountry Maui until September 30, 1999. Under this Proclamation, the DWS will complete construction of the necessary water appurtenances until September 30, 1999. It is anticipated that a "Finding of No Significant Impact" (FONSI) will be made by the DWS, and the DWS will continue to complete construction of the necessary water appurtenances, primarily pertinent electrical and communication services.

VI. EXISTING ENVIRONMENTAL SETTING

A. CLIMATE

In the Paia-Hamakuapoko area, rainfall averages 25-40 inches annually (United States Department of Agriculture, Soil Conservation Service, 1972). Typically, most of the rainfall occurs between November and March. Northeast tradewinds are most evident between April and October. During a typical year, average daily wind velocities range from 10 to 20 miles per hour. Kona winds are experienced about three months each year, generally during the winter months.

B. TOPOGRAPHY

The project site is located in relatively moderate terrain. The 12-inch line between Hamakuapoko Well No.

2 and reservoir No. 10, however, is laid in a shallow dry gulch which is not subject to flooding. Maliko Gulch is not a factor in this project because the electrical and communication system from Haiku/Kokomo Road to the well sites is an above-ground system and will span the gulch without affecting the topography. If helicopters are used for construction, all applicable Federal Aviation Administration (FAA) regulations will be observed.

C. AGRICULTURAL LANDS

Virtually the entire project site is within existing plantation roadways so that there is no loss of agricultural lands. The installation of the necessary water appurtenances may require a small amount of agricultural lands but the loss of less than one acre is considered negligible.

D. ARCHAEOLOGICAL AND HISTORICAL CONSIDERATIONS

In 1992, Aki Sinoto Consulting was retained by Norman Saito Engineering Consultants Inc. to conduct an archaeological inventory survey of the East Maui Waterline Project. (See Appendix A). According to the consultant, surface survey concentrated in the gulch areas since the "majority of the project corridor follows existing paved and cane roads. The cane roads and exposed cut banks were inspected to locate potential exposures of subsurface deposits or features. Standard archaeological procedures were followed." Based on the survey, the consultant concluded that "no archaeological surface remains or other evidence of any significant cultural activities were encountered during the survey." The report further stated that subsurface testing was deemed unnecessary or unfeasible because of the extensive use of the project corridor for roads and sugar cane cultivation and steepness of the gulch areas.

As described previously, the project site is entirely located in heavily disturbed agricultural lands. The survey report shows that the lands were altered by sugarcane which makes unlikely that site are present.

All related water appurtenances installed under Governor's Proclamation or to be installed are within existing plantation roadways and areas that have long been under plantation cultivation. During construction of the water appurtenances, there was no record of the

discovery of any archaeological and/or historical sites.

E. FLORA

The majority of the components of the proposed action are installed in plantation roadways and a small potion of pipeline in a shallow gulch leading up to reservoir no. 10. There are no known species of rare, threatened, or endangered plant life found along the project site. The shallow gulch was pasture land with a mixture of weeds and grasses. This is confirmed by a botanical survey made by Evangeline Funk, Ph.D., who concluded that "no proposed or listed threatened or endangered plant species as set forth by the U.S. Department of the Interior Fish and Wildlife Service, Endangered Species Act of 1973, as amended 1992, were encountered." (See Appendix B)

F. FAUNA

The project site is not suitable as habitats for any of the endemic species of birds or mammals. Typically, birds seen in the general area are the Indian Mynah, the common dove, Kentucky Cardinal, English Sparrow, and the Red Bulbul. Rodents could be the roof rat and mongoose. However, it is highly unlikely that any endangered bird or mammals are present in the project area because these plantation lands have been disturbed for many years.

An avifaunal and feral mammal survey performed by Phillip L. Bruner noted that no endangered species of feral animals were recorded. (See Appendix C)

It was also concluded that the "proposed project should have little or no long-term measurable effect on the populations of exotic birds on Maui." And stated that "the scope of the project, likewise, should not pose a serious threat to native birds like the plover or night heron."

G. CONSTRUCTION AND TRAFFIC NOISE

Prior to the construction of the proposed action, noise anticipated from construction activities was not expected to be a serious problem because the project site was in the midst of cane fields and located at considerable distances from established urban-residential areas. Noise problems due to construction work were temporary. Nevertheless, the contractor was made aware of noise

control regulations that had to be observed. There is no record of complaints or excessive noise due to traffic or construction activities.

H. AIR QUALITY

Normally, air quality along the project site is good. Temporary degradation of air quality due to cane burning operations may be expected but that situation has been going on for decades without serious consequences. During construction of the project, it is anticipated that some fugitive dust problems due to trenching and vehicular traffic are anticipated but will be kept under control by the contractor who is aware of the Department of Health's Air pollution control regulations.

I. AESTHETIC CONSIDERATIONS

Installation of the electrical and communication system from Haiku/Kokomo Road to the Hamakuapoko Well sites will have some effect on scenic features since the system must cross Maliko Gulch. However, this effect will be minimal. The crossing will be overhead with electrical lines supported on poles. The area where the lines cross the gulch is not open to general public view, but the electric company will exercise discretion in making the installation as unobtrusive as possible. Maui Electric Company stated that installation procedures would comply with FAA requirements.

The project site may have some visual effect on the area but the DWS will take appropriate measures to minimize the visual impact from public highways.

J. EARTHQUAKE HAZARDS AND FLOODING

According to the Uniform Building Code (UBC), City and County of Honolulu, the island of Maui is designated Seismic Zone 2. On a scale of 1 to 4, Zone 1 has the lowest potential for earthquakes. However, in the interest of safety, the DWS is observing the standards for Seismic Zone 3 for design of all of its structures.

The area in which the project site is built slopes toward small gullies and gulches so that drainage does not pose a problem. There are no perennial streams in the area, and there are no records indicating major flooding around the project area, which is located far above the flood

zone.

K. SOCIO-ECONOMIC IMPACTS

The proposed action is intended to provide water to the UCWS during periods of drought and is short-term. The wells will supplement the surface water sources during droughts to allow the DWS to service the Upcountry area. The action will help provide drought relief to the Upcountry Water system and also remove certain known contaminants and improving water quality.

VIII. CONSEQUENCES OF PROPOSED ACTION ON WATER RESOURCES

A. LOCATION OF HAMAKUAPOKO WELLS NO. 1 AND NO. 2

Hamakuapoko Wells No. 1 and 2 are located west of Maliko Gulch in the Paia Aquifer System and are approximately 2700 feet apart. Although Maliko Gulch is drawn as the boundary between Paia and Haiku Aquifer systems, the basal aquifer tapped by the wells is hydraulically continuous across the Gulch. Hamakuapoko Well No. 1 is 1500 feet and Hamakuapoko Well No. 2 is 3000 feet west of Maliko Gulch. At each site, the water table elevation in the Honomanu basal aquifer, the source of the water to be pumped, is four to five feet above sea level. The stream channel in Maliko Gulch opposite the wells is 500 to 600 feet above sea level. The basal water table is about 4 to 5 feet above sea level.

Hamakuapoko Well No. 1 is about half a mile seaward of Hamakuapoko Well No. 2, and is surrounded by sugarcane fields. This well is on a gently sloping, wide ridge. The ground elevation at this well is 702 feet.

Hamakuapoko Well No. 2 is also surrounded by sugarcane fields, and is near the upper margin of the sugarcane fields. This well is in a shallow, dry gulch that extends to reservoir no. 10. The ground elevation at this well is 780 feet.

At the location of the Hamakuapoko Wells, pineapple was cultivated until approximately 1980 when HC&S reclaimed the land for sugarcane.

B. HYDROGEOLOGY AT THE HAMAKUAPOKO WELL SITES

At both Hamakuapoko Well No. 1 and No. 2 location, the ground surface consists of 1 to 2 feet of soil and sub-soil above a thickness of 50 to 75 feet of saprolite, the in-place weathered zone of the Kula volcanic formation. At Hamakuapoko Well No. 1, the Kula formation, starting at the ground surface, is 188 feet thick, placing its base at 514 feet above sea level, while at Hamakuapoko Well No. 1 it is 112 feet thick, placing the base at 668 feet above sea level. The Honomanu volcanic formation lies immediately below the Kula formation and forms the interior core of the island. The basal aquifer is in the Honomanu formation, but local bodies of perched water occur in the Kula formation.

The Kula formation consists of andesitic basalts which characteristically are thick 20 to 50 feet), dense a'a layers of low permeability. It is a poor water-bearing formation, and at the location of the wells perched water occurrences are sporadic. According to the driller's logs, some perched water was encountered at depth 179 to 182 feet in Hamakuapoko Well No. 1 but none in Hamakuapoko Well No. 2. The Honomanu formation is unsaturated above the basal water table.

The Honomanu formation is the primitive basaltic lavas which erupted from the original volcano that created the eastern portion of the island. It is highly permeable and constitutes the principal exploitable aquifers in East Maui. Groundwater occurs as a basal lens in the region of the wells. The water table does not intersect stream channels except within a few hundred feet of the coast and therefore the basal lens does not contribute to stream flow except at the coastline.

C. WELL CONSTRUCTION AND TESTING

Hamakuapoko Well No. 1 is 736 feet deep, reaching to 34 feet below sea level, and is fitted with a 12-inch diameter casing to sea level and 30 feet of screen below. Hamakuapoko Well No. 2 is 812 feet deep (32 feet below sea level) and also is fitted with 12-inch diameter casing to sea level and 32 feet of screen below. In both wells the annulus is cemented or grouted throughout and below the Kula formation to prevent leakage of perched water to the basal water.

Hamakuapoko Well No. 1 was successfully tested in April, 1992 for four days at rates of 500 gpm (25 hours) and 700

gpm (76 hours) . Drawdown was small, attaining a maximum of 2.82 feet and the maximum chloride content was 65 mg/l, far below the USEPA maximum recommended limit of 250 mg/l. The normal desirable limit in Maui is 80 mg/l.

Hamakuapoko Well No. 2 was tested for four days in November, 1992 at a rate of 700 gpm, and in the following month for seven days at 840 gpm. Maximum drawdown at 840 gpm was 0.6 feet and maximum chloride was 66 mg/l.

The results of the tests at each well indicate that the basal aquifer is highly permeable and can accommodate substantial pumping rates without degrading the quality of the water pumped.

D. AQUIFER PARAMETERS DETERMINATION

Measurements of drawdown during a pump test and recovery following cessation of pumping are employed to estimate the aquifer parameters of transmissivity and storativity. An aquifer with high transmissivity (convertible to hydraulic conductivity) is able to yield a copious supply of water. Storativity (effective porosity) is not as critical a parameter as transmissivity, but a high value helps generate high yields.

At Hamakuapoko Well No. 1, the step-drawdown test data allowed for calculating transmissivity as 116,440 sq. ft./day, convertible to hydraulic conductivity of 2911 ft./day by dividing transmissivity by the depth of the well below the water table (40 feet). Drawdown achieved stability so quickly during continuous test that parameter estimation was not possible. Without a changing drawdown during continuous pumping neither transmissivity nor storativity can be determined.

A hydraulic conductivity of the magnitude calculated for Hamakuapoko Well No. 1 is highly favorable for extraction of groundwater by means of wells. In the Southern Oahu basal aquifers, the most thoroughly studied and productive in the state, the average hydraulic conductivity is 1500 ft./day.

Drawdown during the testing of Hamakuapoko Well No. 2 was so small that the parameters are difficult to estimate with any confidence. Water Resources Associates calculated hydraulic conductivity at 5.940 ft./day ("Results of Drilling and Testing Hamakuapoko Well No.

2", 1993). The recovery data suggest a value of the same magnitude, about 7000 ft./day. As in Hamakuapoko Well No. 1, this high a hydraulic conductivity allows for efficient pumpage by wells. Storativity was not determinable from the data base. (See Appendix D).

E. GROUNDWATER QUALITY

The maximum salinity reached during pump testing at both Hamakuapoko Well No. 1 and No. 2 is far less than the acceptable limits for potability. However, both wells show contamination with volatile organic chemicals which originated with the use of nematocides in pineapple cultivation. Three compounds have been tested for, DBCP, EDB and TCP (trichloropropane). The acceptable limits established by the DOH are 40 ppt (parts per trillion) for DBCP and EDB, and 800 ppt for TCP.

The record of analyses for these compounds is given below. Values are in ppt, and the detection limits are 10 ppt for DBCP and EDB, and 500 ppt for TCP in the period before 1998 and 20 ppt in 1998. ND means the compound was not detected.

HAMAKUAPOKO WELL NO. 1

DATE	DBCP	EDB	TCP
8/12/97	50	ND	900
8/18/97	46	ND	700
12/16/98	40	ND	97

HAMAKUAPOKO WELL NO. 2

DATE	DBCP	EDB	TCP
11/24/92	360	230	ND
12/1/92	230	210	ND
8/12/97	320	160	ND
8/18/97	200	310	ND
12/16/98	240	120	390

Hamakuapoko Well No. 2 exhibits the greatest

contamination, having concentrations of DBCP and EDB several times greater than the DOH maximum concentration level. Concentrations in Hamakuapoko Well No. 1 are at the margin of acceptability for DBCP, while EDB has not been detected. Except for the concentration of 900 ppt in Hamakuapoko Well No. 1 for the 8/12/97 analysis, all other TCP values fall below the limit.

Treatment can remove EDB, TCP, and DBCP to levels below detectability, rendering the water potable. Thus, treated water from the Hamakuapoko Wells No.1 and No. 2 could be used directly in the UCWS to augment drinking supplies for Upcountry customers during droughts. In addition, treated water used for irrigation purposes could have no effect on plant or animal life, or otherwise on the environment. If used without treatment the low concentrations of EDB, DBCP, and TCP will have no effect on plant life during irrigation, and the water that percolates below the root zone will be stripped of most of the contaminants by biological and chemical reaction in the soil mass. At the Del Monte Superfund Site at Kunia, Oahu, the process of phytoremediation, which is based on biological and chemical reactions in soil, is effectively removing all of the EDB and DBCP. This research project is currently still in progress and will continue for a year or more. However, preliminary data compiled to date confirm the efficacy of the process.

At Kunia these constituents occur in concentrations one hundred to one thousand times greater than in the Hamakuapoko Well No. 1 and No. 2 waters. However, treatment of the water prior to putting it into reservoir No. 10 is being considered because of potential adverse effects on the environment and animal life, no matter how remote or unlikely the potential harm may be. Therefore, treatment will be considered an alternative, even if the water may be used for irrigation.

Treatment to remove contaminants is normally done by airstripping or filtration through activated carbon, and will be required for an indefinite period, perhaps on the order of 30 to 40 years or more until the reservoirs of contaminants become exhausted.

Although the use of EDB and DBCP ceased about 20 years ago, the contaminants have not been flushed from the reservoirs of perched water in which they accumulated

after percolating past the soil zone. Time of transit to the basal lens is unknown~ but based on experience on Oahu, where pesticide usage also ceased about 20 years ago, residual contamination will persist for some decades to come.

Removal of DBCP, EDB, and TCP is accomplished by processing the water through a GAC treatment facility where the contaminants are entrapped by a filter layer of activated carbon. The filter must be rejuvenated periodically with fresh activated carbon.

The well water, if piped to HC&S reservoir no. 10, will mix with uncontaminated ditch water from East Maui streams. Dilution as well as volatization will take place, reducing the contaminant levels significantly.

For example, if dilution were at the rate of three measures of ditch water to one of Hamakuapoko Well No. 2 water, the DBCP in the mixture would fall to 60 ppt and the EDB to 30 ppt. Greater dilutions would decrease the concentrations further.

There are no pumping stations that yield potable water for domestic use down gradient of the sugar cane fields irrigate with water from reservoir no. 10. Percolation of surplus irrigation provided by the mixture from reservoir no. 10 will not render the groundwater pumped at the HC&S infiltration galleries (pumps no. 17 and 18) unusable for irrigation.

F. EFFECT OF PUMPING ON STREAMFLOW

Pumping from the basal aquifer in the Honomanu formation will not affect streamflow. The basal water table is just four to five feet above sea level while stream channels are hundreds of feet above sea level. Only within several hundred feet of the coast, which is greater than two miles from Hamakuapoko Well No. 1 and 2.5 miles from Hamakuapoko Well No. 2, does the basal water table surface in the stream channels. There is virtually no possibility that pumping at the wells will induce drawdown at these distances of a magnitude that would affect streamflow. A study made by the United States Geological Survey (USGS) of the effect of pumping the Haiku well, which is on the east side of Maliko Gulch across from the Hamakuapoko wells, concluded that after seven days of pumping 'no such evidence of aquifer/stream

interaction was discernible in groundwater levels during the aquifer test" (Hunt, C.D., "Aquifer Test to Determine Potential Effects on Streamflow of Pumping at Well 6-5419-01, Haiku, Island of Maui, Hawaii: USGS Draft Report, Water Resources Investigation", 1996). At the Haiku wells the basal aquifer water table is about five feet above sea level, the same as at the Hamakuapoko Wells No. 1 and No. 2, while the Maliko Gulch stream channel, the deepest in the region, lies 680 feet above sea level.

Another investigation concerning potential interaction between pumping and stream flow was conducted by Tom Nance Water Resources Engineering in 1998 ("Assessment of the Impact of Operating the Department of Water Supply Hamakuapoko Wells [State nos. 5420-02 and 5320-01] on Stream and Spring Flow in Maliko Gulch"). Nance found that Maliko Stream is normally dry opposite the Hamakuapoko wells and that few seeps on the walls of the Gulch lie 50 feet or more above the invert of the stream channel. He identified five seeps which U.S. Geological Survey measurements indicate flow at 2 to 65 gpm. These seeps issue from the Kula formation, which is sealed off in the wells.

Nance concluded that "Except during and immediately following rain storms, the only stream flow in Maliko Gulch is that which enters from seeps and springs in the valley walls tens of feet above the stream bed. A short distance downstream of each of these seeps, the flow is lost to percolation into the stream bed."

IX. OVERVIEW OF TREATMENT METHODS

Hamakuapoko Wells No. 1 and No. 2 show contamination with volatile organic chemicals: DBCP, EDB, and TCP. These well waters must be treated before it can be used for potable purposes. The DWS has chosen to treat the well waters using a method known as Granular Activated Carbon (GAC) Treatment Method.

The DWS will install one (1) GAC Treatment Facility at Hamakuapoko Well No. 2 that will be capable of treating both wells. Treatment will be accomplished prior to pumping the well waters into the clear well at the Kamole Weir WTP.

There are five principal methods of treating the water to

eliminate or reduce the concentrations of DBCP and EDB. Without going into a long technical discussion of the advantages and disadvantages of each method, the following is a very brief discussion of the features of each:

A. GRANULAR ACTIVATED CARBON (GAC) METHOD

Very high adsorptive capacity for most organic and synthetic organic chemicals. Contaminated water flows downward from the top of a pressurized vessel through a bed of activated carbon. The water is@treated when it flows through the bed of activated carbon and is collected in an underdrain system. Some advantages of the GAC system include no hazardous air emissions, system reliability, enclosed treatment, and ease of operation. Principal disadvantages are the high capital costs and cost of disposal of the spent carbon.

B. POWDERED ACTIVATED CARBON (PAC) METHOD

The primary difference between GAC and PAC systems is the particle size of the activated carbbon. The powder is added to a stream of contaminated water, allowed enough contact time for adsorption to occur, and the carbon is removed by filtration. The PAC method is used typically for taste and odor control, and is not as effective as GAC in removing synthetic chemicals. Its principal disadvantage is the added requirement for filtration.

C. AIRSTRIPPING (PACKED TOWER AERATION)

The liquid is introduced into an air stripping tower and flows downward through a packing consisting of ceramic, stainless steel, plastic or other inert materials. Simultaneously, air is forced upward from the bottom of the tower and is discharged into the atmosphere at the top of the tower. Performance is inconsistent because of variations in the concentrations of inlet contaminants. To maintain an effluent of consistent quality, the facility needs to be enlarged or modified depending upon the quality of the inlet contaminants. in addition, the packed tower process can create an air quality problem which may require emission controls and/or monitoring.

DBCP removal by packed tower stripping requires a very large tower to provide the required contract time of water and air. It has been estimated that packed tower stripping to remove 99% of DBCP costs about $7.00 per

1,000 gallons of treated water. The cost of GAC treatment at the Mililani Well I is $0.31 per 1,000 gallons of treated water.

For DBCP removal, the tower would have to be very large because the relatively low volatility of DBCP would require a higher contact time between air and the water. A larger tower would result in higher capital and operating costs.

D. ADSORBENT EXCHANGE RESINS

Certain adsorbent resins have been used to treat water contaminated with organic compounds, but its use is not widespread. Information about the method is sparse, but a study was done in England comparing adsorbent resins with activated carbon. It was shown that activated carbon was more effective in removing certain contaminants such as pesticides than adsorbent resins.

E. MEMBRANE TECHNOLOGY

This method involves the pressurized flow of contaminated water through a membrane. The effectiveness of this method depends on the size of the membrane pores. More information and testing is needed to determine the suitability of both the membrane and adsorbent resin methods for removal of EDB and DBCP.

The GAC method was selected over the other methods because of proven performance, system reliability, enclosed operations, ease of operation, and the fact that it has no hazardous air emissions. It also has an overall superior cost effectiveness. Its primary disadvantages are its high capital and disposal costs. Oahu now has at least four GAC plants in operationn and the Honolulu Board of Water Supply has found their operations satisfactory.

Studies conducted by GMP & Associates, an engineering consulting firm in Honolulu, concluded that the GAC treatment method is the most cost-effective under local conditions. GMP made a study, supported by pilot study data of the principal methods of treatment before arriving at their conclusion. Their studies led to their design of several GAC plants for the Honolulu Board of Water Supply. The GAC method has the advantage of performance stability, operational ease, reliability, enclosed treatment, and no air emissions. (See References)

There is extensive practical experience over the past two decades removing volatile organic compounds, including DBCP, TCP,and EDB, from drinking water. Public suppliers on Oahu, as well as in California and elsewhere, have used GAC as the most cost-effective method of removing these compounds to below detectable levels. Other methods of removing pesticides and related compounds from water include: Powdered activated carbon(PAC); synthetic adsorbants airstripping (packed tower aeration); and membrane filtration. Reference No. 9 contains a detailed description of the GAC treatment method, which is the most commonly used treatment method. Studies and pilot tests done by GMP Associates, Inc. (1996), concluded that GAC is the most cost-effective method. GMP Associates, Inc., has done studies and design work on GAC treatment for the Honolulu Board of Water Supply and Maui County Department of Water Supply.

Furthermore, the manufacturers of DBCP have entered into a Settlement Agreement with the BWS that requires they pay all capital improvement and operating costs to treat the water. Therefore, the GAC treatment facility and operating costs to treat the well waters will be payed for by the producers of DBCP.

X. ALTERNATIVES TO PROPOSED ACTION

A. ABANDON THE PROJECT

To abandon the project would result, most importantly, in the loss of readily available source of groundwater for the UCWS during droughts. As long as Upcountry Maui is faced with periods of low rainfall, it is imperative that the DWS implement available groundwater sources, especially during droughts.

B. USE OTHER SOURCES OF GROUND OR SURFACE WATER

At the present time other sources of ground and surface water are not readily available to meet the demands of Upcountry Maui during droughts. Assuming that they were, it would cost a considerable amount to develop these sources and to transport them to areas of Upcountry Maui where it is needed.

C. RESERVOIR

The construction of a reservoir to address droughts on a

short-term basis is not a cost effective alternative. The drought installations are to provide Upcountry Maui a reliable source of water supply during droughts.

Reservoirs are supplied by surface water sources that are affected by droughts. A reservoir to provide additional storage for upcountry Maui is currently being considered at a higher elevation than the Kamole Weir WTP. Due to the planning, design, and construction time, a reservoir would be a long-term solution for the water system.

D. DESALINATION

Capital and operational cost data on desalination based on local experience make this alternative unfeasible. These data are based on the desalination of brackish water, which may be limited in quantity in the project area. To desalt sea water would cost much more, and the disposal of brine attendant to the process would create environmental problems.

E. WATER CONSERVATION

The general philosophy of water conservation is meritorious but conservation is primarily an on-going process. It could have an indirect effect on alleviating drought conditions but the need for water during droughts is immediate and the volume needed is high. That is the principal advantage of the proposed action. The Maui County Water Department has implemented a public water conservation program as part of its day to day operations.

F. PUMPING UNTREATED WELL WATERS INTO RESERVOIR 10 FOR EXCHANGE FOR WATER FROM KAMOLE WEIR SYSTEM WITH HC&S

Treatment of the water may not be required if it is used exclusively for agriculture irrigation. If HC&S does decide to agree to an exchange for the Hamakuapoko well waters, without treatment for removal of the known contaminants, and the waters are used for irrigation, the untreated water could have adverse effects on plant and animal life, no matter how remote the likelihood may be. More importantly, HC&S has expressed that they are reluctant to accept any water into its irrigation system from the Hamakuapoko Wells No. 1 and No. 2, which contain DBCP and other contaminants.

XI. PERMITS REQUIRED

1. Water Use and Pump Installation Permits - State Department of Land and Natural Resources.

2. New Water Source and System Permit; NPDES Permit will be applied for if required - State Department of Health.

3. Building and Construction related permits - County of Maui, Department of Public Works & Waste Mangement.

XII. ENVIRONMENTAL ASSESSMENT SIGNIFICANCE CRITERIA

In accordance with Title 11, Department of Health, Chapter 200 and Subchapter 6, Section 11-200-12, Environmental Impact Statement Rules, and based on analysis of this documents, the following criteria are met:

1. The proposed action will not result in an irrevocable commitment to loss or destruction of any natural or cultural resources.

   Conclusion: Development of the treatment facility and wells will involve a relatively small area within the cane field or in a small remnant area between cane fields.

2. The proposed action will not curtail the range of beneficial uses of the environment.

   Conclusion: The wells are a permitted use within state and county agricultural districts. The water will be treated and used to service the Upcountry water system, particularly during droughts and as supplemental water source.

3. The proposed action will not conflicts with the State's long-term environmental policies and guidelines as expressed in Chapter 344, HRS; and any revisions thereof and amendments thereto, court decisions, or executive orders.

   Conclusion: The water will be able to alleviate water shortage during droughts for the Upcountry water system.

4. The proposed action will not substantially affect the economic or social welfare of the community, County or State.

   Conclusion: The action will help provide drought relief to the Upcountry Water system.

5. The proposed action will not substantially affect public health.

   Conclusion: The wells required treat by passing the water through granular activated carbon (GAC) contactors that will adsorb the contaminants and provide potable water suitable for domestic use. The finished water

entering the Upcountry Water system. will be in compliance with all Federal EPA and State Department of Health regulations.

6. The proposed action will not involve substantial secondary impacts, such as population changes or effects on public facilities.

   Conclusion: The well waters when used will help provide drought relief to the Upcountry water system, which includes residential, commercial, and agricultural users.

7. The proposed action does not involve a substantial degradation of environmental quality.

   Conclusion: The treatment of the well waters will remove contaminats DBCP and EDB from the water improving the quality of the water.

8. The proposed action will not produce cumulative impacts and does not have a considerable effect on the environment or involve a commitment for larger actions.

   Conclusion: The proposed action is short-term and will be implemented during droughts. Treatment of the well waters will remove certain known contaminants improving water quality.

9. The proposed action will not substantially affect a rare, threatened, or endangered species, or its habitat.

   Conclusion: The project area is within lands existing agricultural lands, used for pineapple and sugarcane cultivation. Existing vegetation include various weeds, grasses and shrubs. There are no rate, endangered, or threatened species of plants or animal life at the project site.

10. The proposed action will not detrimentally affect air or water quality or ambient noise levels.

    Conclusion: The wells are developed in strict accordance with the Department of Land and Natural Resources, Commission on Water Resource Management, "Hawaii Well Construction & Pump Installation Standards" to insure that the wells do not result in pollutants penetrating the aquifer. Pump capacity is limited to the tested yield of each well of 500 gpm. There will be no adverse

air or ambient noise level impacts since the nearest residence is over a couple of thousand feet away from the well sites.

11. The proposed action will not substantially affect or be subject to damage by being located in an environmentally sensitive area, such as flood plain, shoreline, tsunami zone, erosion-prone area, estuary, fresh waters, geologically hazardous land or coastal waters.

Conclusion: The project site is within within Flood Zone C, an area of minimal flood and tsunami hazard, as determined by the Flood Insurance Rate Map for this region.

12. The proposed action will not substantially affect scenic vistas or view planes identified in county or state plans or studies.

Conclusion: The project site is not nearby to any public highways and will not be readily visible from highways.

13. The proposed action will not require substantial energy consumption.

Conclusion: Pumping of the wells will require the use of diesel fuel. The consumption of diesel fuel will be limited to periods of drought.

XIII. FINDINGS AND CONCLUSION

The primary objective of the proposed action is to ensure that the Department of Water Supply has a more reliable source of water to provide to the Upcountry Water System during periods of drought. This can be accomplished by complete installation of all necessary water appurtenances and the ability to deliver treated water from Hamakuapoko Wells No. 1 and No. 2 into the Upcountry Water System.

The short-term impacts associated with the proposed action are not anticipated to have a significant adverse impact to the environment, archaeological or historical features, flora or fauna in the project area, socio-economic conditions, public services or infrastructure, or the existing land uses at the project site.

Therefore, as a result of the finding of this environmental assessment, the proposed action is not anticipated to have any significant environmental impacts and it is anticipated that a "Finding of No Significant Impact" (FONSI) will be made by the Department of Water Supply, County of Maui.

XIV. PARTIES CONTACTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

County of Maui

Department of Public Works and Waste Management
Department of Planning
Maui Economic Development Agency
Maui County Council

State of Hawaii

Department of Agriculture
Department of Health
Department of Hawaiian Home Lands
Department of Land and Natural Resources, DLNR
Land Use Commission
Office of Environmental Quality Control
Historic Preservation Division, DLNR
Environmental Center, University of Hawaii Manoa
Office of Hawaiian Affairs

Federal

U.S. Army Corps of Engineers, Honolulu
U.S. Department of Interior, Fish and Wildlife Services
U.S. Geologic Survey, Water Resources Division

Private Section

Alexander and Baldwin, Inc.
Hawaiian Commercial and Sugar Company
Maui Land & Pineapple Company, Ltd.
Maui Electric Company, Ltd.
Nature Conservancy
Sierra Club
Native Hawaiian Advisory Council
Del Monte Fresh Foods (Hawaii)
Maui Farm Services Agency
Isaac Davis Hall, Attorney at Law for the Plaintiffs in the Coalition to Protect East Maui Water Resources, an unincorporated association, et al.

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6. Tom Nance Water Resource Engineering, Assessment of the Impact of Operation DWS' Hamakuapoko Wells (State Nos. 5420-02 and 5320-01) on Stream and Spring Flow in Maliko Gulch, (October 1988).

7. Norman Saito Engineering Consultants, Inc. and Parametrix, Inc., Final Environmental Impact Statement (FEIS) for East Maui Water Development Plan (1992).

8. GMP Associates, Inc., Preliminary Engineering Report For GAC Treatment Facility at Napili Well "A" (July 1996).

9. GMP Associates, Inc., Preliminary Technology Study For Treatment Method of EDB and DBCP for the Hamakuapoko Well No.2 (Haiku, Maui, Hawaii) (August 1994).

10. Board of Water Supply, County of Maui, 1998 Annual Report.

11. Water Resources and Associates, Results of Drilling and Testing Hamakuapoko Well No. 2 (1993).

12. C. Takumi Engineering, Inc., research of records and personal conversations.

13. Uniform Building Code, 1988 Edition, City and County of Honolulu.

14. Corbitt, Robert A., Standard Handbook of Environmental Engineering (1989).

Figures

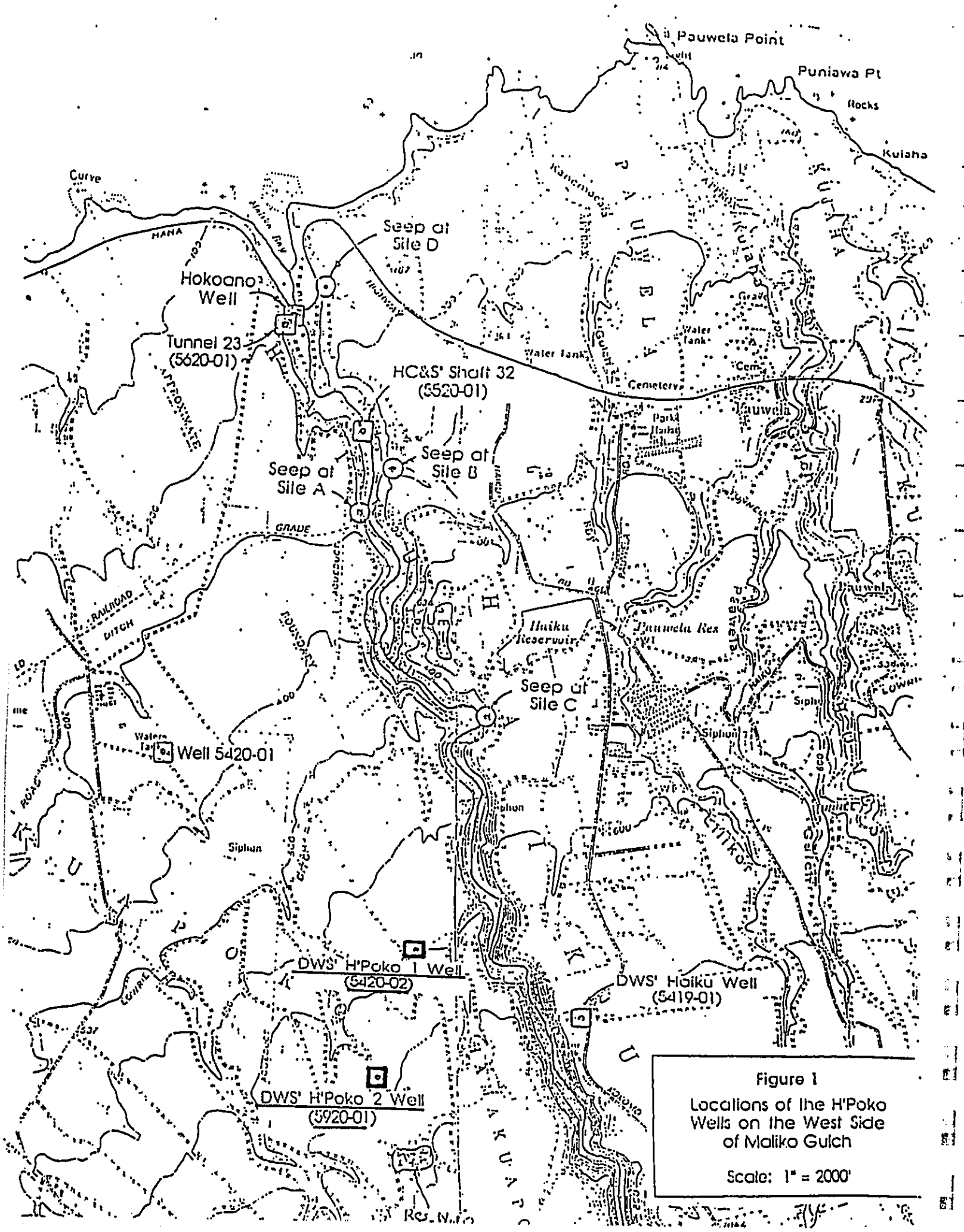


Figure 1

Locations of the H'Poko Wells on the West Side of Maliko Gulch

Scale: 1" = 2000'

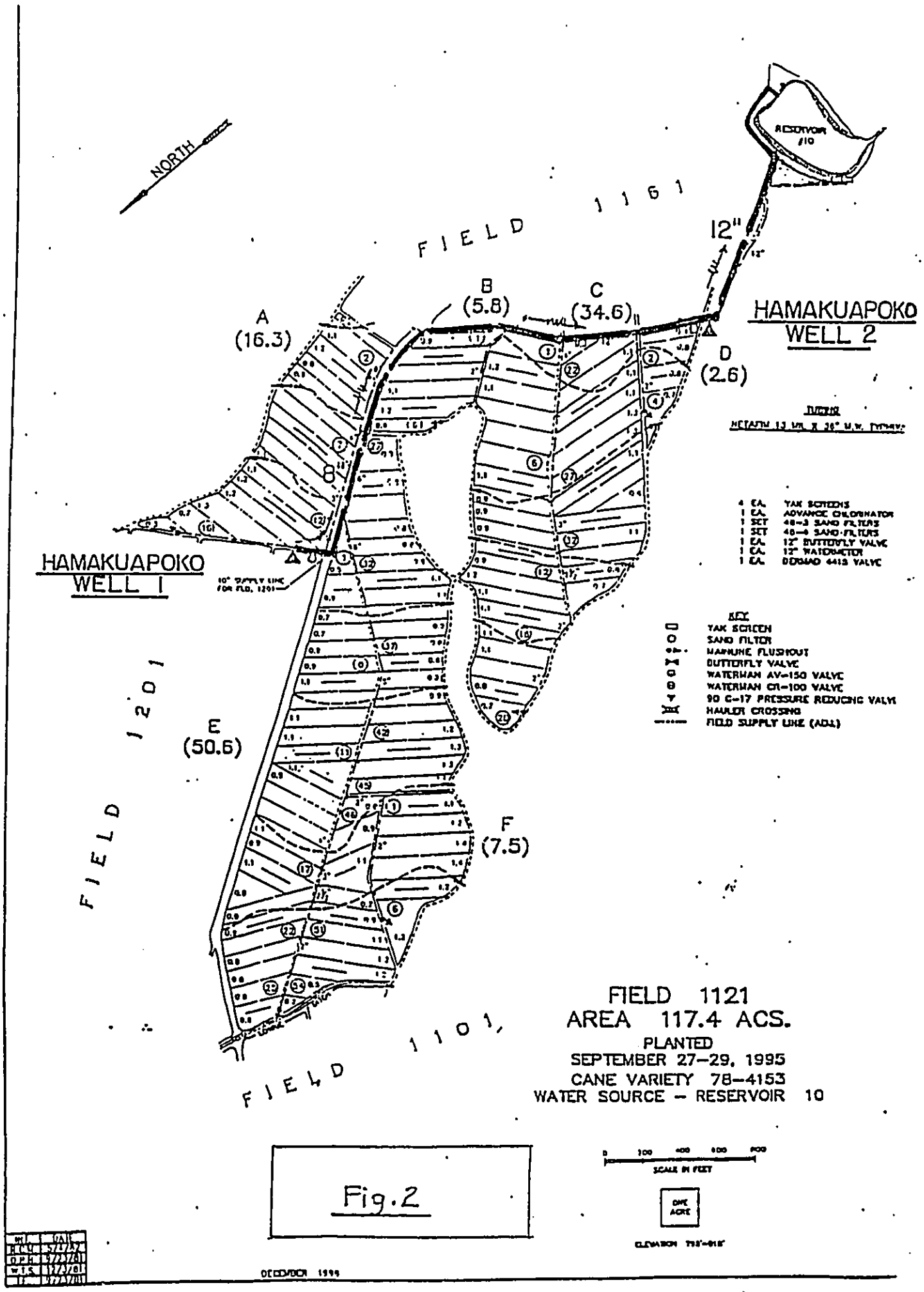
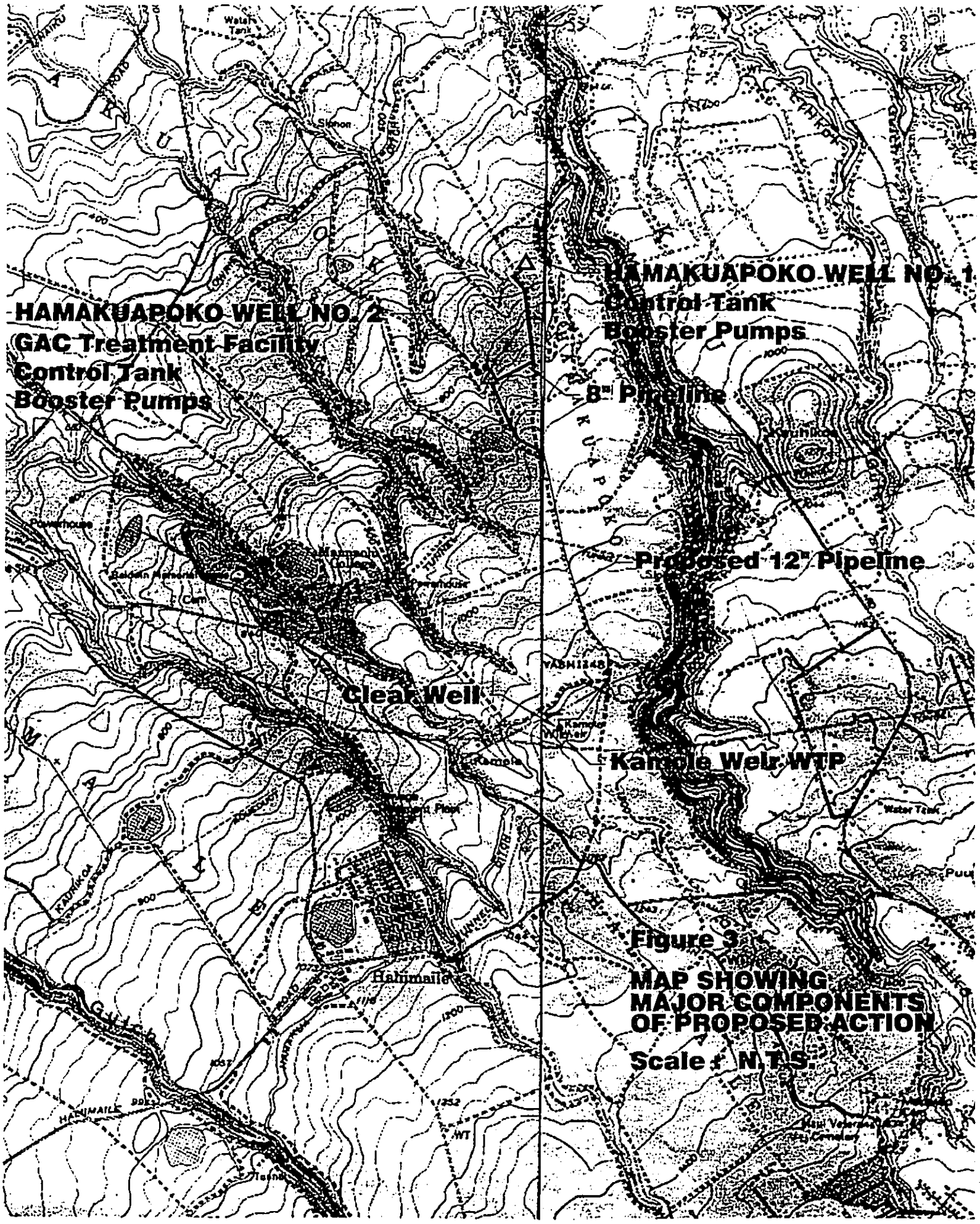

NORTH
RESERVOIR #10
FIELD 1161
12"
A (16.3)
B (5.8)
C (34.6)
D (2.6)
HAMAKUAPOKO WELL 2
HAMAKUAPOKO WELL 1
10" BUTTERFLY LINE FOR FLD. 1201
1201
E (50.6)
F (7.5)
FIELD 1101
FIELD
4 EA. YAK SCREENS
1 EA. ADVANCE CHLORINATOR
1 SET 48-3 SAND FILTERS
1 SET 48-4 SAND FILTERS
1 EA. 12" BUTTERFLY VALVE
1 EA. 12" WATERMETER
1 EA. DORMAD 4413 VALVE
KEY
YAK SCREEN
SAND FILTER
MANJINE FLUSHOUT
BUTTERFLY VALVE
WATERMAN AV-150 VALVE
WATERMAN CH-100 VALVE
90 C-17 PRESSURE REDUCING VALVE
HAULER CROSSING
FIELD SUPPLY LINE (ADJ.)
FIELD 1121
AREA 117.4 ACS.
PLANTED
SEPTEMBER 27-29, 1995
CANE VARIETY 78-4153
WATER SOURCE - RESERVOIR 10
SCALE IN FEET
ONE ACRE
DECEMBER 1995

Fig. 2


HAMAKUAPOKO WELL NO. 2
GAC Treatment Facility
Control Tank
Booster Pumps
HAMAKUAPOKO WELL NO. 1
Control Tank
Booster Pumps
8" Pipeline
Proposed 12" Pipeline
Clear Well
Kahoma Weir WTP
Figure 3
MAP SHOWING
MAJOR COMPONENTS
OF PROPOSED ACTION
Scale : N.T.S.

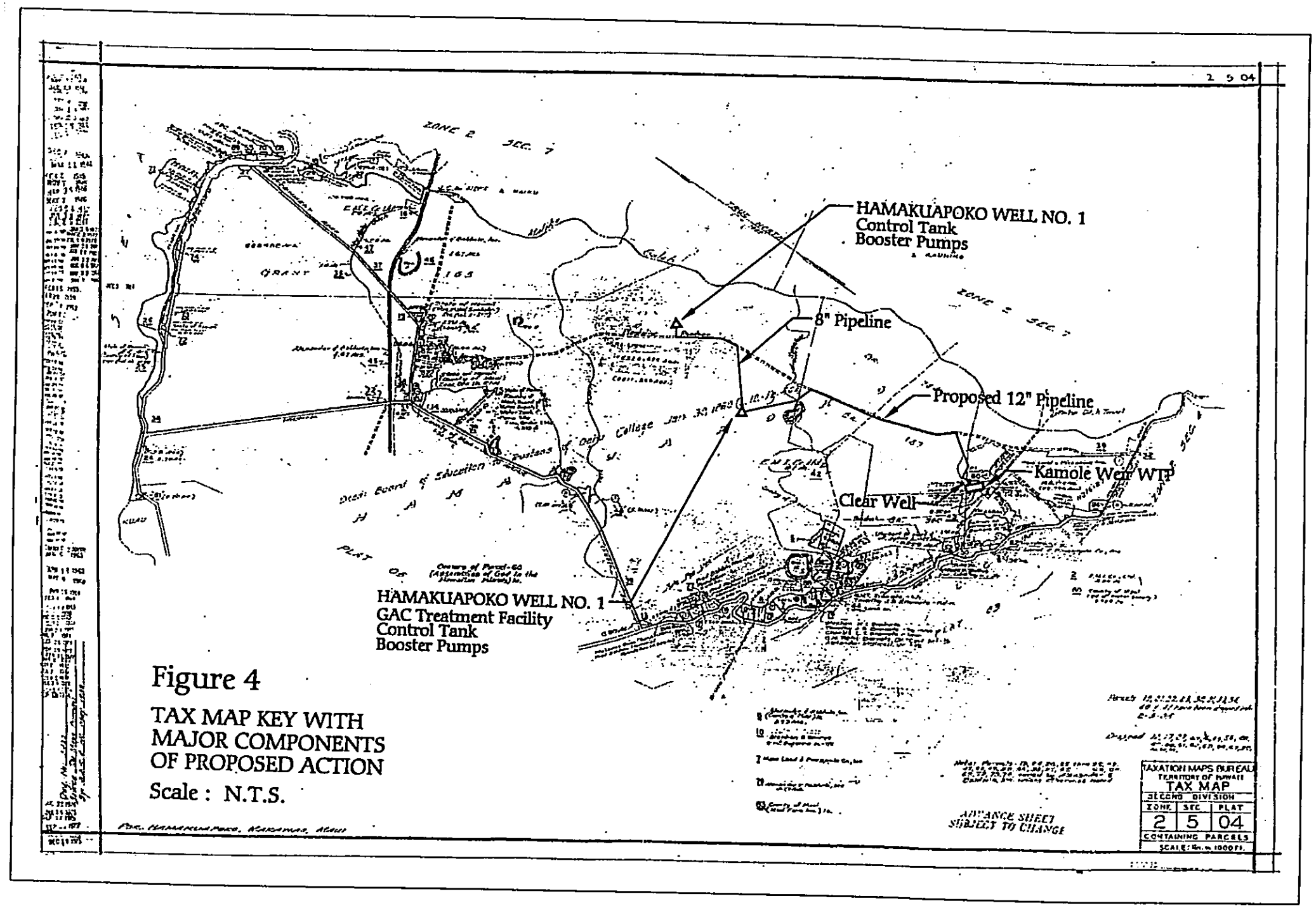


Figure 4

TAX MAP KEY WITH
MAJOR COMPONENTS
OF PROPOSED ACTION

Scale : N.T.S.

See "List of Figures" for Description of Figures 5 - 10

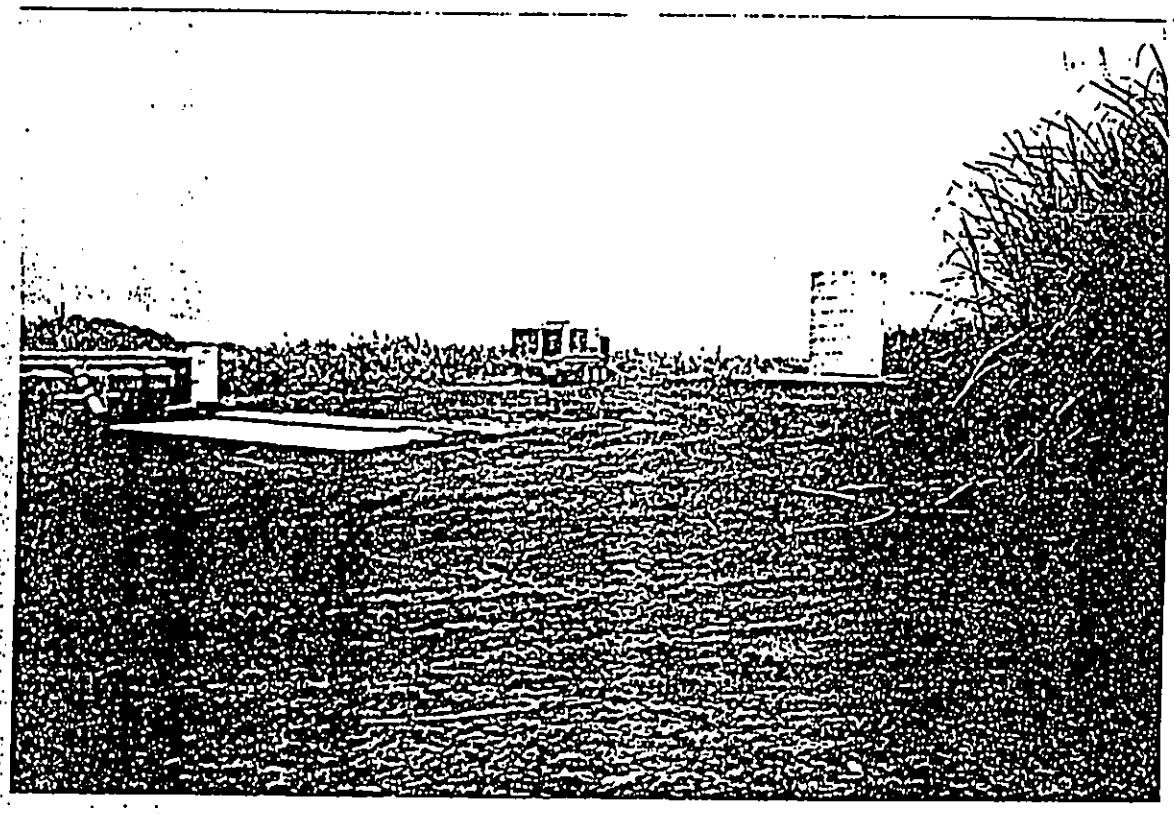


Figure 5
Well No. 1

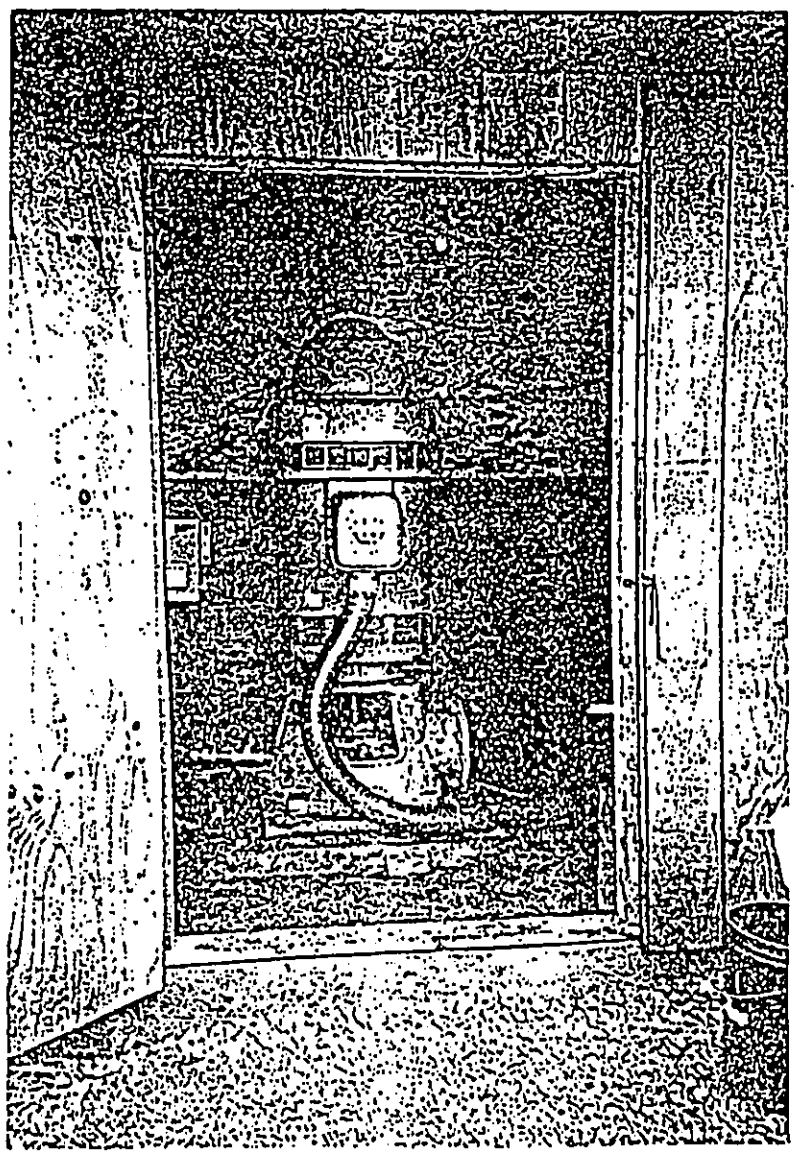


Figure 6
Well No. 2

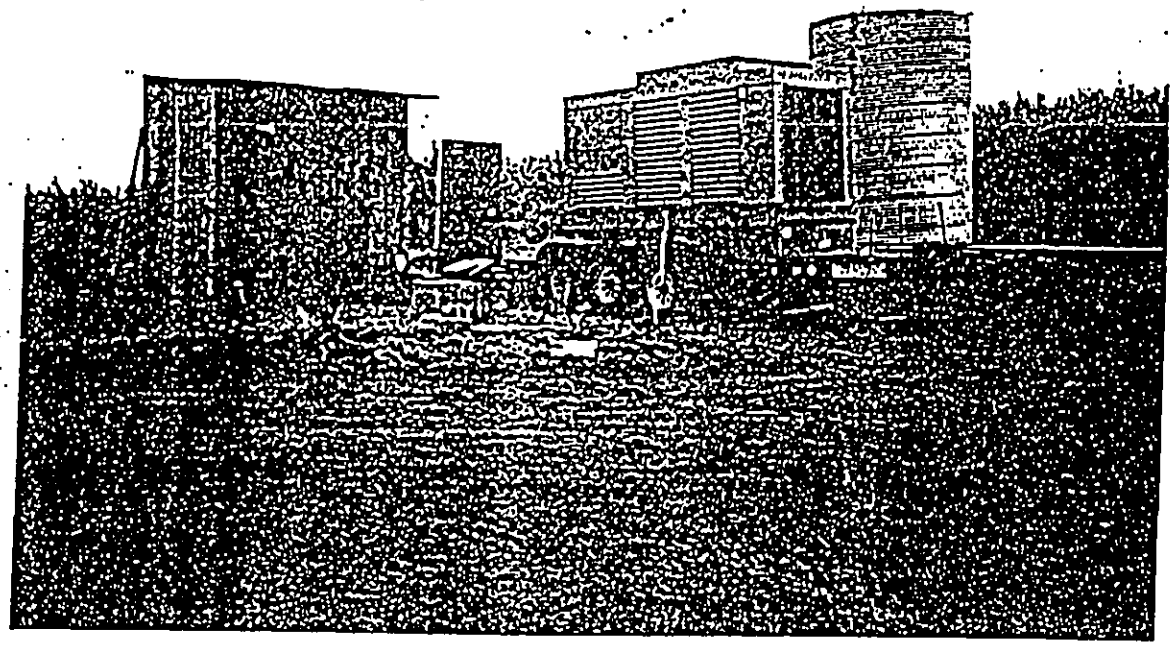


Figure 7
Well No. 1

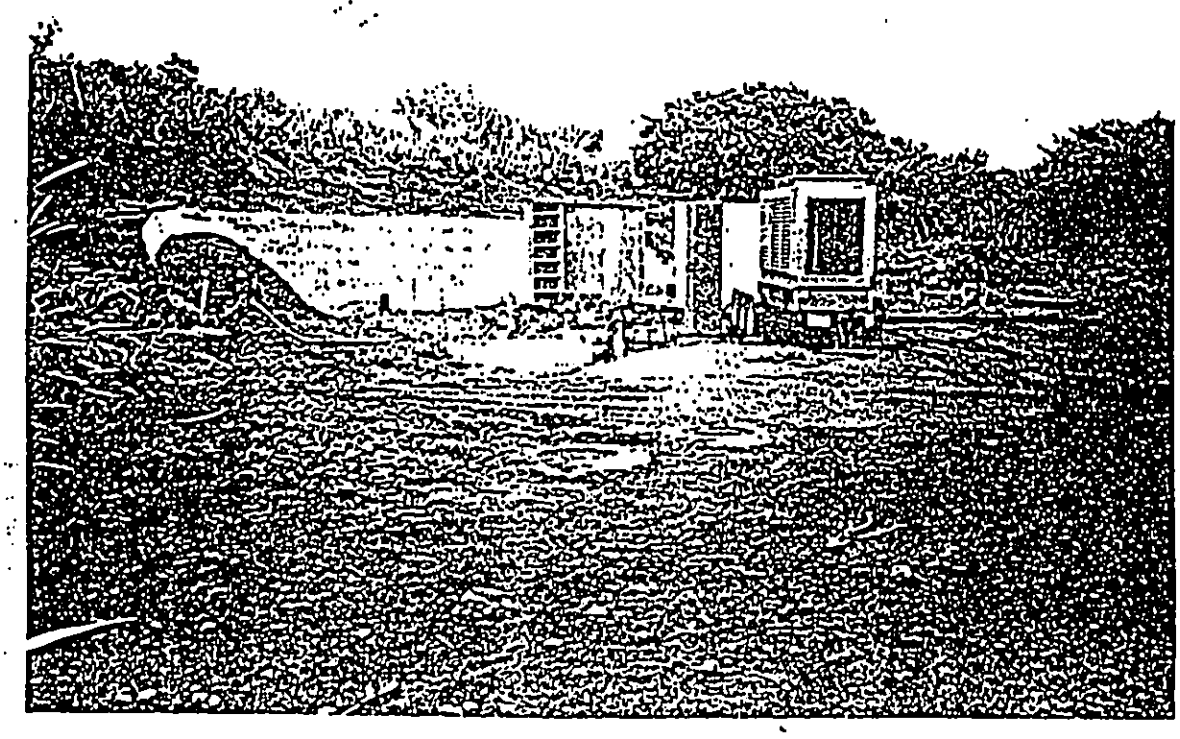


Figure 8
Well No. 2

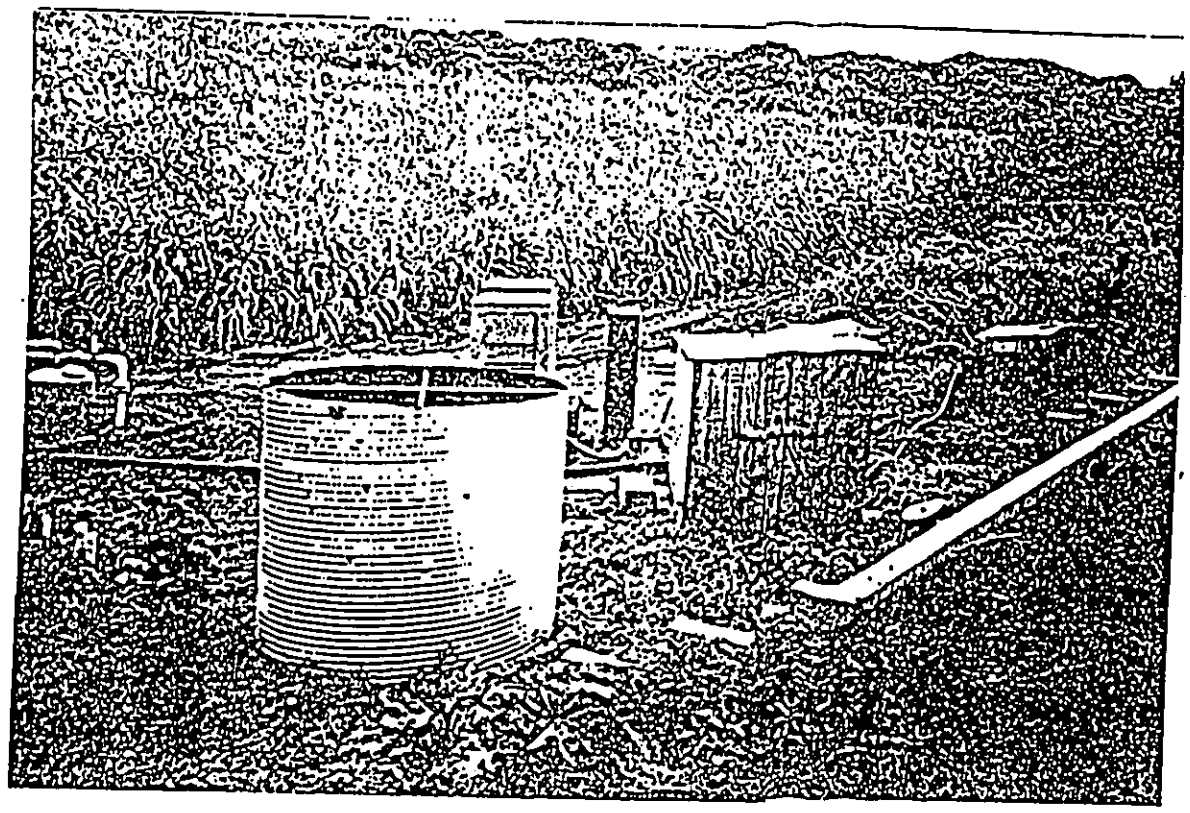


Figure 9
Well No. 2

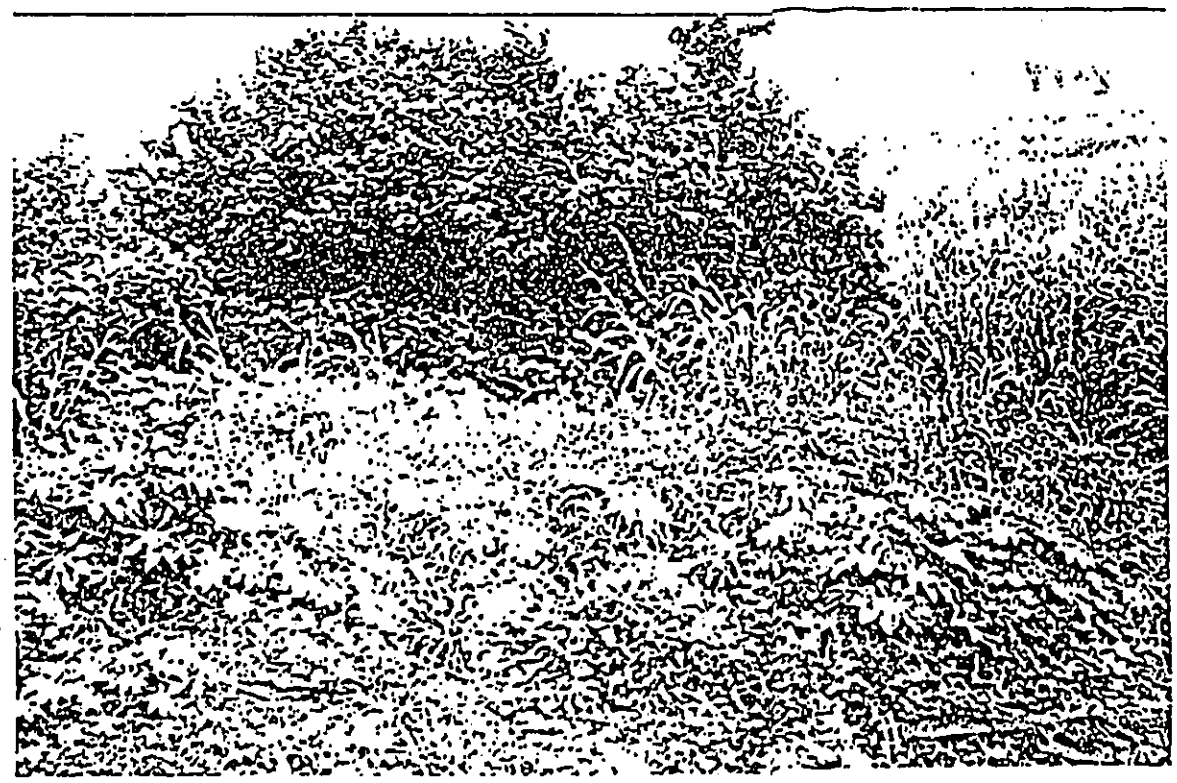


Figure 10
Vegetation Around Well No. 2

Appendix A

Archaeological Inventory Survey

ASC92-9

ARCHAEOLOGICAL INVENTORY SURVEY OF THE EAST MAUI WATERLINE PROJECT. WAILUKU AND MAKAWAO. MAUI ISLAND

(TMK 2-5-03 thru 05; 2-7-03. 2-7-07 thru 11. 2-7-13. 2-7-16 thru 20; 3-8-01. 3-8-06 thru 07. 3-8-51, 3-8-59. 3-8-61. 3-8-70. 3-8-71)

by

Aki Sinoto

and

Jeffrey Pantaleo. M.A.

for

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2158 Main Street
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September 1992

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2333 Kapioiani Blvd. #2704
Honolulu. Hawai'i 96826

INTRODUCTION

At the request of Norman Saito Engineering Consultants, Inc., of Wailuku, Maui; Aki Sinoto Consulting conducted an archaeological inventory survey for the proposed East Maui Waterline Project in Northeast Maui. The main 36" pipeline, measuring over 20 miles long, extends from East Maui sources to the existing 36" Central Maui Transmission Pipeline near Kuihelani Highway. Connections to the Central Maui Water System between Hamakuapoku and the Central Maui Transmission Pipeline are proposed at Paia, Haleakala Highway, and Puunene. The pipeline also will extend east from Hamakuapoku, across Maliko Gulch, and into the Haiku area. Several 12" and 8" pipelines branch from the main 36" pipeline where it will connect to new wells. The survey was conducted during several intervals, as engineering plans were refined. An initial field assessment of Maliko Gulch and associated well locations took place in October of 1991. The current inventory survey was conducted during intermittent periods between June 17 and September 3, 1992. The survey was undertaken by the two authors of this report.

PROJECT AREA

The project area is located along coastal and inland portions of northeastern Maui and traverses various parcels in TMK 2-5-03 thru 05; 2-7-03, 2-7-07 thru 11, 2-7-13, 2-7-16 thru 20; 3-8-01, 3-8-06 thru 07, 3-8-51, 3-8-59, 3-8-61, 3-8-70 and 71. The majority of the pipeline extends over existing paved and cane roads and across several gulches (Fig. 1). Appendix A provides the pertinent Tax Maps.

The new waterline will be completed in six construction phases as follows:
Phase 1 will involve installing a new 36" waterline from the Upper Paia 12" waterline to the Hana Highway via the former Kaheka Village and Old Makawao Road. From the intersection of Sunnyside Road and Old Makawao Road, the main 36" pipeline will extend westerly across Kailua Gulch. A 16" pipeline parallel to and west of Kailua Gulch will connect the main 36" pipeline on Sunnyside Road with the existing 12" pipeline on Hana Highway.

Phase 2 will involve extending the main 36" pipeline along Hana Highway from Sunnyside Road to Haleakala Highway. A 16" pipeline will extend along Haleakala Highway from Hana Highway and connect to existing pipelines at Kahului Airport. The

Figure 1. Location of Project Area and Previously Recorded Sites

main 36" pipeline will continue along Baldwin Avenue from the Upper Paia water tank, and extend along Sunnyside Road from Kailua Gulch to Hana Highway. A 12" pipeline will extend along Kauhikoa Road from Haiku, and a 8" pipeline will connect Wells 2A and 2B.

Phase 3 will involve connecting the main 36" pipeline in Haiku Road to new wells on the East Maui Transmission Line. The 36" pipeline will extend along Hansen Road from Spanish Road to Haleakala Highway. The 36" pipeline will also extend along Spanish Road from Kahului Industrial Park to Hansen Road. A 24" pipeline will branch from the main 36" pipeline along Spanish Road from Kahului Industrial Park to Dairy Road. A 8" pipeline will connect to Wells 3A and 3B, and a 12" pipeline will connect to Well 3B to Haiku Road on West Kuiaha Road.

Phase 4 will involve continuing the main 36" pipeline west along Haiku Road from Konanui Gulch. A 12" pipeline will extend south on East Kuiaha Road from Haiku Road. A 8" pipeline will branch from the main 36" pipeline on East Kuiaha Road to Wells 4A and 4B.

Phase 5 will involve connecting the main 36" pipeline from Puunene to the Central Maui Transmission Main.

Phase 6 will involve continuing the main 36" pipeline from Konanui Gulch to Hana Highway. A 12" pipeline will branch from Hana Highway to Well 5A, and a 8" pipeline will connect wells 5A to 5B.

ENVIRONMENT

Major segments of the pipeline is located on paved and cane roads, existing sugar cane fields, and gulches. Annual rainfall averages 0-5 inches in the drier, coastal areas near Paia, and 5-10" in the higher elevations near Makawao, with most of the precipitation occurring in the winter months between November and February.

Vegetation in the project area varies, depending on specific locations along the 20 mile corridor. The majority of vegetation along the corridor is sugar cane (Saccharum officiarum). The gulches are dominated by christmasberry (Schinus terebinthifolius), mango (Mangifera indica), koa hoale (Leucaena glauca), guava (Psidium guajava), laua'e (Microsorium scolopendria), Natal redtop grass

(Tricholaena rosea), false staghorn fern (Dicranopteris linearis), and other various ferns and grasses.

The following soils are represented in the project area:
(name/slope/runoff/erosional hazard/occurrence)

Ewa Silty Clay Loam / 0-3% / very slow / slight / in basins and alluvial fans.

Haiku Clay / 3-7% / slow / slight / well drained upland soil.

Haiku Clay / 7-15% / slow to moderate / slight / uplands.

Iao Silty Clay / 0-3% / slight / slight / well drained, alluvial fans.

Iao Silty Clay Loam / 7-15% / medium / slight to moderate / smooth alluvial fans.

Iao Cobbly Silty Clay Loam / 3-7% / medium / slight to moderate / cobbles.

Jaucas Sand / <7% / slight / severe wind erosion hazard / near coast.

Molokai Silty Clay Loam / 0-7% / slow to medium / moderate / well-drained uplands.

Molokai Silty Clay Loam / 7-15% / slow to medium / moderate / knolls.

Paia Silty Clay / 3-7% / slow / slight / uplands and gentle slopes.

Paia Silty Clay / 7-15% / slow / slight to moderate / uplands.

Pulehu Silt Loam / 0-3% / slow / slight / alluvial fans and basins.

Pulehu Silty Clay Loam / 0-3% / slow / slight / stream terraces.

Puuone Sand / 7-30% / slow / moderate to severe wind erosion / low uplands.

Waiakoa Cobbly Silty Clay Loam / 3-7% / slow / slight / smooth low uplands.

Rockland - rocks cover 25-90% of surface - occurs in gulches.

Rough Broken Land - steep intermittent drainage - occurs in gulches.

Other than those soils that occur in gulches and sand dune areas, these soils are coomonly used for pineapple, sugarcane, pasturage, and homesites.

LAND USE HISTORY

Other than the coastal areas included in the Phase 2 development corridor and the Kahului sand dune areas in the Phase 5 development corridor, prehistoric exploitation of much of the intermediate zones included in the Phase 1, 3, and 4 corridors was minimal according to available archaeological data.

The majority of the project area has been cultivated in sugar cane for over one-and-a-half centuries by a number of plantations including Claus Spreckels' Hawaii Commercial and Sugar, H.P. Baldwin Company, Maui Agricultural Company, and Haiku Plantation. Thus much of the historical uses of the area were associated with the development of intensive agriculture. These included irrigation and transportation systems as well as camps for the growing population of immigrant workers. The agricultural lands are currently consolidated under Alexander and Baldwin, the major landowner in the project area, and sugar cane continues to be cultivated by the Hawaii Commercial and Sugar Company.

The project corridor passes through or runs adjacent to seven Land Commission Awards as listed on Table 1.

Table 1. Land Commission Awards

L.C.A. No.	Awardee	Acreage	Use
3336	Nalopi	5.15	-
3829	Paele	3.97	-
4133:4	Kaai	1.82	-
4579	Ii	1.88	-
6510pp:1	Niu	0.40	-
6510xx:1	Kauhi	0.77	taro
11216:27	Kekuaonohi	2919.75	-

The documentation for only one of the awards, 6510xx:1 to Kauhi, included reference to any usage of the land. Taro in this case, although unspecified in the records, was probably dryland cultivated.

The project corridor traverses or runs adjacent to twenty-six Grants as listed on Table 2. -

Table 2. Grants

Grant No.	Grantee	Acreage	Date
121	Richard Armstrong	6c110f11ft	5-26-1849
138	Kapiha	39.79	9-27-1849
139	Kaia	16.79	9-27-1849
165	M Kekuanaoa	567.00	11-20-1849
220	William L Lee	612.00	2-19-1850
3152	Henry Cornwell	Waikapu ahupua'a	11- ?-1875
3343	Claus Spreckels	24000.00	9-30-1882
4579	Jacinath d'Erstalla	90.13	3-29-1902
6425	E G Bartlett	29.73	8-04-1915
6470	Carl F M Sommerfield	49.58	1-01-1915
6484	Elizabeth A. Turner	30.42	11-04-1915
6500	Lester L Souers	32.00	12-17-1915
6553	Florence Wood	30.15	5-10-1916
6691	William J. Cooper	48.30	9-11-1916
6872	T W Ferguson	49.25	7-13-1917
7078	Earnest O. Born	50.23	8-05-1918
7179	Ida L Harris Collins	43.64	2-08-1919
7280	Elizabeth J Lindsay	35.76	5-31-1919
7359	W I Wells	45.50	10-31-1919
7434	H M Wells	38.10	3-04-1920
7525	Elizabeth C A Lindsay	35.10	7-08-1920
7669	Antone Borge	40.30	11-16-1920
7683	Phillip McKaig	34.98	11-30-1920
8046	William Henning	56.86	4-12-1922
8078	Masachi Tanaka	14.75	6-24-1922
8443	James Lindsay	37.75	4-25-1924

Claus Spreckels the grantee of Grant 3343 was the founder of Hawaii Commercial and Sugar Company and often referred to as Hawaii's "Sugar King."

PREVIOUS ARCHAEOLOGY

No archaeological investigations have been conducted within the pipeline corridor, but numerous projects have been undertaken in the vicinity.

Bordner (1982) conducted an archaeological reconnaissance for the Paia sewage system part A (Job #82-45). Results of the survey and monitoring were negative.

Mitchell (1983) investigated reports of burials exposed along a cliff-face at Paia. Results of the investigation determined that erosion along the cliff exposed human remains.

Speakman (1986) reported to Bishop Museum a petroglyph site located in Maliko Gulch (TMK 2-5-04:37). The petroglyphs are located near the stream below the area where the old railroad crossed the gulch.

Clark and Toenjes (1987) conducted archaeological monitoring of the sewer line construction from Sprecklesville to Ku'au, Maui. Results of the archaeological investigation indicated the presence of prehistoric occupation, fishing, and burials along the coast. Six archaeological sites (State Sites 50-50-05-1777-1782) were recorded during the monitoring. State Site 50-50-05-1777, an exposed cultural deposit, included charcoal, volcanic glass, marine shell, sea urchin, bird and mammal bone, and basalt and coral artifacts. Radiocarbon dates recovered from the deposit ranged from A.D. 1420-1810. State Site 50-50-05-1778, an exposed cultural deposit, included three pit features, charcoal stained soil, a charcoal concentration, an ash lens, and a burial. Radiocarbon dates recovered from the deposit ranged from A.D. 1660-1945. State Site 50-50-05-1779, an exposed cultural deposit, included a pit feature and two charcoal lens. State Site 50-50-05-1780, an exposed cultural deposit, included three hearths, three charcoal concentrations, and four pit features. State Site 50-50-05-1781, an exposed cultural deposit, included a hearth, a charcoal concentration, and two pit features. State Site 50-50-05-1782, an exposed cultural deposit, included marine shell.

Fredericksen (1988) conducted an archaeological inventory survey on a 34 acre parcel of land in Sprecklesville, Maui. Results of the survey were negative.

Griffin (1988) conducted an archaeological surface survey of the proposed Kula water system improvements project. The survey was conducted between the Olinda Water Treatment Plant and the Waikomai Reservoir at the 4200 ft elevation. Results of the survey were negative.

Fredericksen (1990) conducted an archaeological inventory survey of an 18 acre parcel in Kuiaha-Pauwela Homesteads, Haiku, Maui. The project area is located on a plateau bounded by a gulch and Kauhikoa road. Results of the survey were negative.

Borthwick (1990) conducted an archaeological reconnaissance of a 12.4 acre parcel in Paia, Maui. Results of the survey identified several burials (State Site 50-50-05-1064).

Donham (1991) conducted a field inspection of a rock feature at Pu'u o uma (Haiku Hill), Hamakuapuko, Maui. Results of the investigation determined that the rock feature is natural.

SITE EXPECTABILITY

Recent synthesis of available data have suggested earliest settlements on Maui Island occurred between A.D. 300–600 in the windward and coastal areas, with population expansion into dry leeward areas by A.D. 1000. Initial occupation in windward and coastal areas occurred due to favorable agricultural and marine resources (Kirch 1979).

Since the project area ranges from coastal to inland regions of Northeast Maui, site expectability will vary according to location. Although the majority of the project corridor along coastal areas is covered by existing roads, potential subsurface remains may be identified during excavation for the waterline. These subsurface features may include buried cultural deposits that contain charcoal, marine shell, volcanic glass, basalt artifacts, and pit features, and burials.

The inland portions of the project corridor transects along existing paved and cane roads and crosses several gulches. Since the majority of the project corridor is located on existing roads and sugar cane fields, any remaining archaeological sites probably exist in the gulches or areas not disturbed by large scale cultivation. Site types expected in these gulches and surrounding areas include heiau trails, cairns, petroglyphs, walls, overhang shelters, and agricultural features on the gulch floors.

METHODS

The survey involved walking systematic transects along selected segments of the project corridor. Since the majority of the project corridor follows existing paved and cane roads, surface survey concentrated in the gulch areas. Machetes were used to cut through dense vegetation. The cane roads and exposed cut banks were inspected to locate potential exposures of subsurface deposits or features. Standard archaeological procedures were followed.

SURVEY RESULTS

No archaeological surface remains or other evidence of any significant cultural activities were encountered during the survey. Based on the extensive use of the project corridor for roads and sugar cane production and steepness of the gulch areas, subsurface testing was deemed unnecessary or unfeasible.

All of the gulches where the waterline crosses were inspected. Professional surveyors cleared a path into Maliko Gulch in order to provide access to the gulch bottom. The corridor is slated to cross this gulch roughly 600 feet above (south) of the Lowrie Ditch siphon. This portion of the gulch was observed to be narrow and steep with no usable stream side "gulch floor." Thus the probability for any cultural remains was very low. Several natural overhangs were found along the base of the gulch walls within the flood prone area and none exhibited evidence of cultural activity.

Other gulches surveyed, including Kanemoeala, Ohia, East Kuiaha, and West Kuiaha Gulches, exhibited extensive alteration by existing ranching or farming activities.

DISCUSSION

The majority of the project corridor have undergone extensive disturbances through large scale agricultural activities continuing for nearly a century. No surface archaeological sites remain in these areas. Although the absence of prehistoric remains may be attributed to the effects of compounded extensive alteration to the area, other archaeological surveys in the inland portions of Northeast Maui have resulted in a similar paucity of remains. This suggests that the intermediate area between the coast and further inland areas were generally not extensively used prehistorically for sedentary activities.

Previous archaeological research provides only minimal aid for predictability of subsurface remains. Pertinent data is unavailable for much of the project area.

Subsurface cultural remains, such as human burials, may be encountered during construction activities in the coastal and dune portions of the pipeline corridor, especially in the Phases 2 and 5 corridors where previous findings have been recorded by Clark and Toenjes (1987) and Rotunno and Cleghorn (1990).

RECOMMENDATIONS

Much of the final locations and alignments, such as additional well sites and location of pipeline through roadways, have not been determined at this time. When the specific locations are finalized, mitigation planning can also take place. Until such time, monitoring is recommended for those areas that manifest potential for subsurface remains. Full-time monitoring is recommended for all excavation in the corridors for Phases 2 and 5 as well as for the additional well sites. Spot checks and an archaeologist on-call is recommended for the rest of the pipeline corridors.

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Appendix B

Botanical Survey

BOTANICAL SURVEY REPORT FOR THE PROPOSED EAST MAUI WATER DEVELOPMENT PLAN RIGHT-OF-WAY

for
PARAMETRIX, INC.
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Honolulu, Hawaii 96813

by
Evangeline J. Funk, Ph.D.
Botanical Consultants
Honolulu, Hawaii
1993

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FIGURES

INTRODUCTION

A botanical survey of the proposed East Maui Water Development Plan right-of-way was conducted in April, 1993. The purpose of the East Maui Water Development Plan is to harvest water in the Haiku area then funnel it westward to users as far away as the junction of Kuihelani and Honoapiilani Highways. This project is envisioned to be completed in six phases (Figure 1). . The vegetation of each phase along the right-of-way will be described seperately.

METHODS

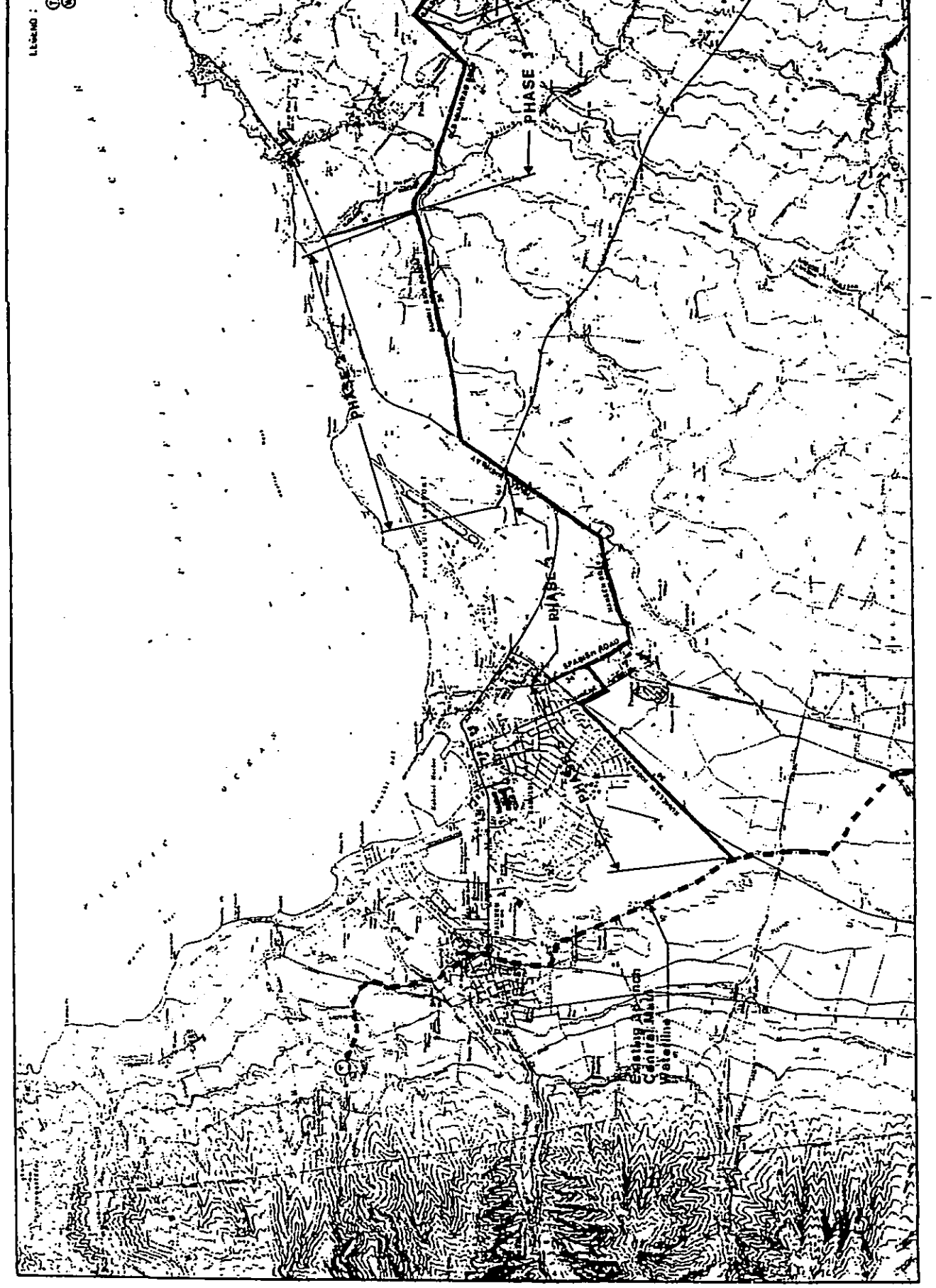
Data collection for this survey was carried out by two and three person teams. In some sections of the right-of-way, observations were made from a slow moving vehicle with frequent stops for on the ground forays and inspections. In other areas such as Maliko Gulch and other lesser gulches, on the ground searches were made. Ten man days were spent in the examination of this thirty mile corridor.

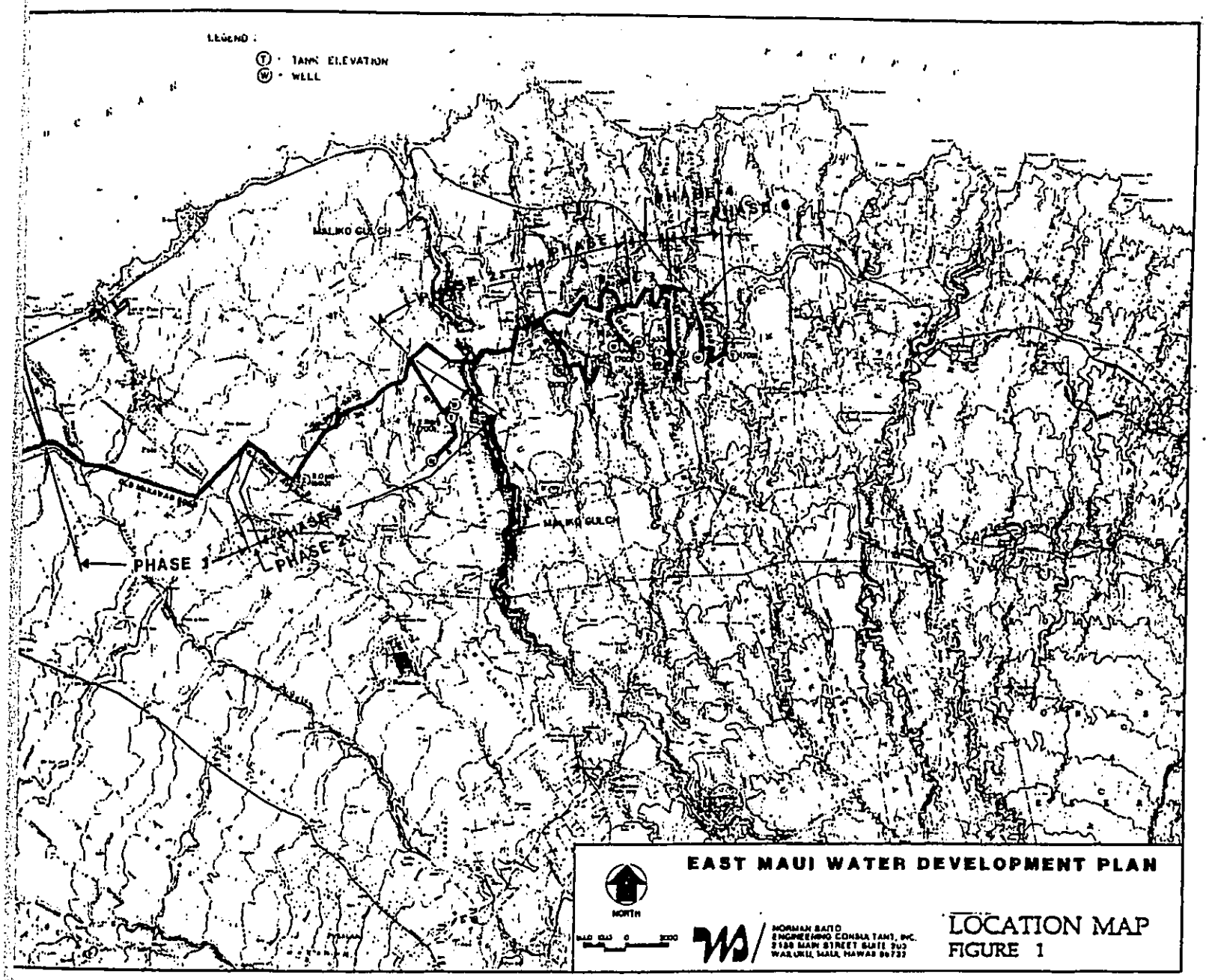
RESULTS

Phase I. The first phase of this six phase project begins just west of Maliko Gulch at two well sites on Upper Hamakuapoko Road. At the junction of Hamakuapoko Road and Holomua Road the line turns westward and follows Holomua Road to Baldwin Avenue and to the end of Old Makawao Road, a distance of about five and three quarter miles. A small section where Old Makawao Road intercepts Baldwin Avenue will be included in Phase II.

All of Phase I follows cane haul roads through working sugarcane fields (*Saccharum officinarum* L.). The weed community which develops along openings in the fields, such as roads, is kept under control by the use of herbicides. The area around the two proposed well sites on Upper Hamakuapoko Road has been cleared, but more aggressive, woody species such as koa haole

Figure 1. Location Map


PHASE 3
PHASE 2
PHASE 4
PHASE 5
Spanish Road



LOCATION MAP
FIGURE 1

(*Leucaena leucocephela* (Lam.) de · Wit), castor bean (*Ricinus cumminus* L.), Christmas berry (*Schinus terebinthifolius* Raddi), and yellow guava (*Psidium guajava* L.) and many sorts of introduced grasses and weeds are beginning to fill the space.

Two small gorges cross the Holomua Road section of the right-of-way. In these gorges can be found a wide variety of planted trees. The most common are Java plum (*Syzygium cumini* (L.) Skeels), Chinaberry tree (*Melia azedarach* L.), Eucalyptus (*Eucalyptus robusta* Sm.), coffee (*Coffea arabica* L.), yellow guava (*Psidium guagava* L.), mango (*Mangifera indica* L.), Rose apple (*Syzygium jambos* (L.) Alston) and Christmasberry. The dense understory in the gulches is primarily made up of grasses such as molasses grass (*Melinis minutiflora* P. Beauv.) and California grass (*Brachiaria mutica* (Forssk.) Stapf), along with numerous adventives (weeds).

Phase II of the East Maui Water Development Plan consists of two sections of line and the upper Paia Tank Site. Section One of Phase II includes a half mile of line along Kauhikoa Road, sections of Haiku and Kokomo Roads, a short distance through pineapple fields to Maliko Gulch and westward to Hamakuapoko Road - a distance of about three and one half miles.

Kauhikoa Road is a paved, country road along which considerable development has occurred. The adjoining properties are landscaped and the lawns and road shoulders are kept mowed. This is a wet, lush locale and the surrounding vegetation is robust and all introduced. Eucalyptus, ironwood (*Casuarina equisetifolia* L.), guava, and avocado (*Persea americana* Mill.) trees. The under story vegetation is ferns (*Nephrolepis exaltata* (L.) Schott., *Blechnum occidentale* L.), shrubs (*Lantana camara* L.), and a variety of grasses.

Westward from Kauhikoa Road, the line follows Haiku Road through a densely populated section of Haiku Town. At Kokomo Road the line turns mauka for a short distance, then again goes westward to the pineapple fields and on to Maliko Gulch. Except for the pineapple fields, this part of the route is through a mostly urbanized area with landscaped yards and paved roads with mowed and trimmed shoulders.

Beyond the pineapple field, the line crosses Maliko Gulch just mauka of the siphon. Maliko Gulch is heavily vegetated. The canopy is twenty meters above the gulch floor and is made up of Kukui (*Aleurites moluccana* (L.) Willd.), chicle (*Manilkara zapota* L.), Java plum, and banyan trees (*Ficus microcarpa* L.). The understory contains a scant population of coffee trees and saplings of the canopy trees. The ground layer is almost non-existent except for some scattered ferns (*Adiantum hispidulum, Adiantum cueatum* Langs. & Fisch., *Blechnum occidentale* L., and *Dryopteris dentata* (Frosk.) C. Chr.) and tree seedlings. On the banks of the stream some taro (*Calocasia esculenta* (L.) Schott) and ginger (*Hedychium* spp.) plants were found.

Section two of Phase II traverses working sugar cane fields by way of Sunnyside Road. This is a broad, paved road with shoulders which vary from even with the road to very steep on either side. Along part of Sunnyside Road there is a line of mature monkey pod trees (*Samanea saman* (Jacq.) Merr.), but generally, the wayside plant community is kept under control by the use of herbicides.

Phase III is also composed of two sections, one, in the Haiku area includes West Kuiaha Road and Haiku Road as far as Kauhikoa Road. The second section is along Hana Highway from Haleakala Highway to Dairy Road by way of Hansen and

Spanish Roads.

The portion which includes West Kuiaha Road to Kauhikoa Road along Haiku Road or Part 1, Phase III is approximately two miles long. All of these roads are paved and considerable development has taken place in the area. The road shoulders are mowed or have been landscaped with a variety of trees and shrubs.

In one place, where Ohia Gulch crosses Haiku Road, deep cuts were made for the road right-of-way leaving steep banks on the mauka side. In this area the most common vegetation is Eucalyptus spp., mango, African tulip (*Spathodia campanulata* P. Beauv.), and Norfolk island pine (*Auraucaria hetrophylla* (Salisb.) Franco) trees. The understory is almost completely missing or consists of Christmasberry, Ti (*Cordyline fruticosa* (L.) A. Chev.), Hibiscus, Bouganvillea, and other types of cultivars. The ground layer is common ferns, grasses and adventives.

Phase III, Section 2. From the junction of Haleakala Highway to the junction of Hansen Road, Hana Highway, the path of the line, is a major highway with broad, mowed shoulders which passes through sugarcane fields. Many common weeds species such as puncture vine (*Tribulus terrestris* L.), wild bean (*Macroptilium lathroides* (L.) Urb.), prickly lettuce (*Lactuca serriola* L.), Pualele (*Sonchus olerarceus* L.), pigweed (*Portulaca oleracea* L.), yellow poppy (*Argemone mexicana* L.), buffel grass (Cenchrus ciliaris L.) and Bermuda grass (*Cynodon dactylon* (L.) Pers.) are all part of the vegetation community which is kept mowed.

Along Hansen Road the vegetation community includes African tulip, ironwood, monkey pod, and earpod (*Entrolobium cyclocarpum* (Lacq.) Griseb.) trees. Long stretches in this area are filled with Castor bean (Ricinus cummunis L.), koa haole, wild tomato (*Lycopersicon pimpinellifolium* (Just.) Mill. bushes

and buffel grass.

Phase IV is quite short, only one and one half miles. It includes East Kuiaha Road and the short stretch of Haiku Road from East Kuiaha Road to West Kuiaha Road. All of the roads are paved and the road shoulders are either mowed or landscaped. In those places where development has not taken place the vegetation is Eucalyptus, mango, Java plum, rose apple, and guava trees. Ferns and grasses such as palm grass (*Setaria palmifolia* (Koen.) Stapf.) and elephantgrass (*Pennisetum purpureum* Schumach) are common.

Phase V includes the right-of-way along the connector between Spanish Road and Puunene Avenue, a short portion of Puunene Avenue and Kuihelani Highway to Honoapiilani Highway.

The connector between Spanish Road and Puunene Avenue is a service road through sugarcane fields. The berms on either side of the road have recently been treated with herbicide. Some very hardy plants such as bitter melon (*Momordica charantia* Crantz), Alena (*Boerhavia repens* L.), Chinese violet (*Asystasia gangetica* (L.) T. Anders), and buffel grass have survived the weed killer.

Puunene Avenue is a main thoroughfare and its most striking feature is the line of large, windswept, monkey pod trees between it and the surrounding sugarcane fields. Some grasses such as buffel grass and *Chloris barbata* and lowland weeds such as Australian saltbush (*Atriplex semibaccata* R. Br.), prickly lettuce (*Lactuca serriola* L.), Alena, and nut grass (*Cyperus rotundus* L.) can also be found.

Kuihelani Highway from Puunene Road to Honoapiilani Highway is a four lane, heavily travelled road. The shoulders are broad and the vegetation is kept low. Inspite of the regular care a fair number of weedy species persist.

Indigo (*Indigo suffruticosa* Mull.), smooth rattle box (*Crotalaria pallida* Aiton), Partridge pea (*Chamaecrista nictitans* (L.) Moench), sensitive plant (*Mimosa pudica* L.), wild bean, Spanish needle (*Bidens pilosa* L.), and beggar's tick (*Desmodium triflorum* (L.) DC), and several grass species to name a few.

Phase VI includes Peahi Road from the wells to Haiku Road and a short distance along Haiku Road to East Kuiaha Road- one and one quarter miles in all. Even though Peahi Road is the most remote section of the proposed project, the street is paved and the shoulders are trimmed. The wayside vegetation includes Siris (*Albizia lebbeck* (L.) Benth.), Eucalyptus, and Christmasberry trees. Introduced grasses and ferns are common. A variety of weeds fill all of the space. Near the houses, quite often, dense mats of *Wedelia trilobata* (L.) Hitchc. abut Peahi Road.

The section of Haiku Road to East Kuiaha Road is paved and passes through a developed area with landscaped properties on either side.

During this survey, three native taxa, Ulei (*Osteomeles anthylidifolia* (Sm.) Lindl.), Moa (*Psilotum nudium* L.), and Koali or blue morningglory (*Ipomoea indica* (J. Burm.) Merr.) were found. The remainder of the vegetation is made up of introduced species.

ENDANGERED SPECIES

No proposed or listed threatened or endangered plant species as set forth by the U. S. Department of the Interior Fish and Wildlife Service (Endangered Species Act of 1973, [16 U.S.C. 1531 - 1543] as amended. USFWS 1992) were encountered.

SPECIES LIST

The plant families in the following species list have been alphabetically arranged within three groups, Ferns and Fern Allies, Monocotyledons, and Dicotyledons. The genera and species are arranged alphabetically within families. The taxonomy and nomenclature follow that of St. John (1973) and Wagner, Herbst and Sohmer (1990). For each taxon the following information is provided:

1. An asterisk before the plant name indicates a plant introduced to The Hawaiian Islands since Cook or by the aborigines.
2. The scientific name.
3. The Hawaiian name and or the most widely used common name.
4. Abundance ratings are for this site only and they have the following meanings:

   Uncommon = a plant that was found less than five times.

   Occasional = a plant that was found between five to ten times.

   Common = a plant considered an important part of the vegetation.

   Locally abundant = plants found in large numbers over a limited area. For example the plants found in grassy patches.

This species list is the result of an extensive survey of these areas during the beginning of the growing season (April 1993) and it reflects the vegetative composition of the flora during a single season. Minor changes in the vegetation will occur due to introductions and losses and a slightly different species list would result from a survey conducted during a different season.

Scientific Name	Common Name	Abundance
FERNS AND FERN ALLIES		
PSILOTAACEAE - Psilotum Family		
Psilotum nudum L.	Moa	Uncommon
POLYPODIACEAE - Common Fern Family		
**Adiantum hispidulum*	Coarse maidenhair	Locally abundant
**Adiantum cueatum* Langs. & Fisch.	Maiden hair fern	Common
**Blechnum occidentale* L.	Blechum	Locally abundant
**Dryopteris dentata* (Frosk.) C. Chr.	Oak leaf fern	Occasional
**Polypodium scolopendrium* Burm. f.	Lauai	Locally abundant
**Sphenomeris chusana* (L.) Copel.	Palaa	Occasional
**Nephrolepis exaltata* L.	Boston fern	Locally abundant
MONOCOTYLEDONES		
ARACEAE - Arum family		
**Calocasia esculenta* (L.) Schott	Taro	Locally abundant
**Xanthosoma roseum* Schott		Uncommon
ARAUCARIACEAE - Araucaria Family		
**Araucaria heterophylla* (Salisb.) Franco	Norfolk Island pine	Uncommon
ARECACEAE - Palm Family		
**Cocos nucifera* L.	Coconut	Occasional
BROMELIACEAE - Pineapple Family		
**Ananas comosus* (Stickm.) Merr.	Pineapple	Locally abundant
COMMELINACEAE - Spiderwort Family		
**Commelina diffusa* N. L. Burm.	Honohono	Locally abundant
CYPERACEAE - Sedge Family		
**Cyperus rotundus* L.	Nut grass	Locally abundant
GRAMINEAE - Grass Family		
**Bambusa valgaris* Schrad ex Wendl	Bamboo	Locally abundant
**Brachiaria mutica* (Forsk.) Staph	Paragrass	Locally abundant
**Cenchrus ciliaris* L.	Buffel grass	Locally abundant
**Cenchrus echinatus* L.	Sandbur grass	Locally abundant

Scientific Name	Common Name	Abundance
POACEAE - Grass Family con't		
**Chloris barbata* Swartz	Swollen fingergrass	Locally abundant
**Chloris divaricata* R. Br.	Stargrass	Locally abundant
**Chloris inflata* Link		Occasional
**Cynodon dactylon* (L.) Pers.	Bermuda grass	Common
**Digitaria adscendens* (HBK) Henr.	Henry's crabgrass	Occasional
**Digitaria violascens* Link	Smooth crabgrass	Locally abundant
**Digitaria insularis* (L.) Ness	Sourgrass	Occasional
*Echinochloa colonum (L.) Link	Jungle rice	Occasional
**Eleusine indica* (L.) Gaertn.	Wiregrass	Common
**Eragrostis cilianensis* (All.) Link	Stinkgrass	Uncommon
**Melinis minutiflora* P. Beauv.	Molasses grass	Locally abundant
**Oplismenus hirtellus* (L.) P. Beauv.	Basketgrass	Locally abundant
**Panicum maximum* Jacq.	Guinea grass	Common
**Panicum coloratum* L.	Blue panic grass	Locally abundant
**Paspalum conjugatum* Bergius	Hilo grass	Locally abundant
**Paspalum dilatatum* Poir.	Dallis grass	Occasional
**Paspalum orbiculare* Forst	Rice grass	Occasional
**Pennisetum purpureum* Schumach	Napier grass	Locally abundant
**Rhynchelytrum repens* C.E.Hubb	Natal redtop	Common
**Setaria glauca* (L.) Beauv.	Yellow foxtail	Occasional
**Setaria palmifolia* (Koen.) Stapf	Palm grass	Locally abundant
**Sporobolus diander* (Retz.) Robyns & Tournay	Smutgrass	Occasional
LILIACEAE - Lily Family		
**Cordyline fruticosa* (L.) A. Chev.	Ti	Occasional
**Hymenocallis littoralis* (Jacq.) Salisb.	Spider lily	Uncommon
PANDANACEAE - Screw pine Family		
**Pandanus tectorius* S. Parkinson ex Z	Screw pine	Uncommon
ZINGIBERACEAE - Ginger Family		
**Hedychium* spp.	Ginger	Occasional
DICOTYLEDONES		
ACANTHACEAE - Acanthus Family		
**Asystasia gangetica* (L.) T. Anders	Chinese violet	Common
**Justica betonica* L.	White shrimp plant	Uncommon
**Thunbergia alata* Bojer	Black-eyed Susan vine	Common
**Thunbergia fragrans* Rosb.	White thunbergia	Common

Scientific Name	Common Name	Abundance
AMARANTHACEAE - Amaranth Family		
**Alternanthera pungens* Kunth	Khaki weed	Occasional
**Amaranthus spinosus* L.	Spiny amaranth	Common
**Amaranthus viridis* L.	Slender ameranth	Common
ANACARDIACEAE - Mango Family		
**Mangifera indica* L.	Mango	Occasional
**Schinus terebinthifolius* Raddi	Christmas berry	Occasional
APIACEAE - Parsley Family		
**Centella asiatica* (L.) Urb.	Asiatic pennywort	Locally abundant
**Daucus pusillus* Michx.	American carrot	Locally abundant
ASTERACEAE - Sunflower Family		
**Ageratum conyzoides* L.	Maile honohono	Locally abundant
**Bidens alba* (L.) DC		Common
**Bidens pilosa* L.	Spanish needle	Common
**Conyza canadensis* Cronq.	Canadian fleabane	Occasional
**Crassocephalum crepidioides (Benth.)*		*Common*
**Eclipta alba* (L.) Hassk	False daisy	Uncommon
**Elephantopus spicatus* Juss. ex. Aubl.		Locally abundant
**Emilia sonchifolia* (L.) DC	Flora's paint brush	Common
**Gnaphalium purpureum* L.	Purple cudweed	Occasional
**Lactuca serriola* L.	Prickly lettuce	Occasional
**Pluchea symphytifolia* (Mill.) Gillis	Sourbush	Occasional
**Sigesbeckia orientalis* L.	Small yellow crown-beard	Occasional
**Sonchus olerarceus*L.	Pualele	Occasional
**Synedrella nodiflora* (L.) Gaertn.	Nodeweed	Occasional
**Tridax procumbens* L.	Coat buttons	Locally abundant
**Verbesina encelioides* Cav.	Golden crown-beard	Occasional
**Vernonia cinerea* (L.) Less.	Little ironweed	Occasional
**Wedelia trilobata* (L.) Hitchc.		Locally abundant
**Youngia japonica* (L.) DC	Hawksbeard	Occasional
BIGNONIACEAE - Bignonia Family		
**Spathodea campanulata* P. Beauv.	African Tulip tree	Occasional
BORAGINACEAE - Borage Family		
**Heliotropum procumbens* Mill.		Uncommon
BRASSICACEAE - Mustard Family		
**Lepidium virginicum* L.		Locally abundant

Scientific Name	Common Name	Abundance
CACTACEAE - Cactus Family		
**Hylocereus undatus* (Haw.) Britton & Rose	Night-blooming cereus	Locally abundant
CAPPARIDACEAE - Caper Family		
**Gynandropsis gynandra* (L.) Briq.	Wild spider flower	Common
CARICACEAE - Papaya Family		
**Carica papaya* L.	Papaya	Occasional
CASUARINACEAE - Casuarina Family		
**Casuarina equisetifolia* L.	Ironwood	Occasional
CHENOPODIACEAE - Goosefoot Family		
**Atriplex suberecta* L.	Salt bush	Occasional
CONVOLVULACEAE - Moringglory Family		
**Ipomoea batatas* (L.) Lam.	Sweet potato	Uncommon
Ipomoea indica (J. Burm.) Merr.	Koali	Occasional
**Ipomoea obscura* (L.) Ker-Gawl		Occasional
**Ipomoea triloba* L.	Little Bell	Occasional
CRASSULACEAE - Orpine Family		
**Kalanchoe pinnata* (Lam.) Pers.	Air plant	Uncommon
CUCURBITACEAE - Cucumber Family		
**Momordica charantia* Crantz	Balsam apple	Occasional
EUPHORBIACEAE - Spurge Family		
**Aleurites moluccana* (L.) Willd.	Kukui	Occasional
**Chamaesyce hirta* L.	Hairy spurge	Common
**Chamaesyce hypericifolia* Mellsp.	Graceful spurge	Common
**Chamaesyce hyssopifolia* (L.) Small		Locally abundant
**Chamaesyce prostrata* (Ait) Millsp.	Prostrate spurge	Occasional
**Euphorbia cyathophora* J. A. Murray	Mexican fire plant	Locally abundant
**Phyllanthus debilis* Klein & Willd.	Niruri	Occasional
**Ricinus communis* L.	Castor bean	Occasional
FABACEAE - Bean Family		
**Albizia lebbeck* (L.) Benth.	Siris tree	Locally abundant

Scientific Name	Common Name	Abundance
FABACEAE - Bean Family con't		
**Alysicarpus vaginalis* (L.) DC.	One-leaved Clover	Locally abundant
**Caesalpinia* sp.		Uncommon
**Canavalia cathartica* Thouars	Mounaloa vine	Occasional
**Cassia leschenaultiana* DC.	Japanese tea	Occasional
**Crotalaria incana* L.	Fuzzy rattle-pod	Occasional
**Crotalaria mucronata* L.	Smooth rattle-pod	Common
**Desmanthus virgatus* Willd.	Virgate mimosa	Occasional
**Desmodium tortuosum* (Sw.) DC	Flordia beggar weed	Occasional
**Desmodium triflorum* (L.) DC		Common
**Enterolobium cyclocarpum* (Jacq.) Griseb.	Earpod	Uncommon
**Glycine wightii* (Wight & Arnott) Verdc.		Locally abundant
**Indigofera suffruticosa* Mill.	Indigo	Occasional
**Leucaena leucocephala* deWit	Koa-haole	Common
**Macroptilium lathyroides* (L.) Urb.	Wild bean	Common
**Medicago polymorpha* L.	Bur clover	Locally abundant
**Melilotus indica* (L.) All.	Clover	Common
**Mimosa pudica* L.	Sensitive plant	Locally abundant
**Pithecellobium dulce* Benth.	Madras thorn	Occasional
**Samanea saman* (Jacq.) Merr.	Monkeypod	Occasional
**Senna occidentalis* (L.) Link	Coffee senna	Occasional
**Cassia pendula* (Humb. & Bonpl. ex Willd.) H. Irwin & Barneby		Occasional
**Senna surattensis* H. Irwin & Barn.	Kolomona	Locally abundant
LAURACEAE - Laurel Family		
**Persea americana* Mill.	Avacado	Uncommon
MALVACEAE - Hibiscus Family		
**Abutilon grandifolium* Sweet	Hairy abutilon	Uncommon
**Malvastrum coromandelianum* Garcke	False marrow	Common
**Sida fallax* Walp.	'Ilima	Common
**Sida rhombifolia* L.	Cuba jute	Occasional
**Sida spinosa* L.	Prickly sida	Occasional
MELIACEAE - Mahogany Family		
**Melia azedarach* L.	Neem tree	Occasional
MORACEAE - Fig Family		
**Ficus microcarpa* L. fil.	Chinese banyan	Uncommon
MYRTACEAE - Myrtle Family		
**Eucalyptus citriodora* Hook.	Lemon-scented gum	Occasional
**Eucalyptus robusta* Sm.	Swamp mahogany	Locally abundant

Scientific Name	Common Name	Abundance
MYRTACEAE - Myrtle Family Con't		
**Psidium guajava* L.	Guava	Occasional
**Syzygium cumini* L.	Java plum	Common
**Syzygium jambos* (L.) Alston	Rose apple	Locally abundant
**Tristania conferta* R. Br.	Brisbane box	Locally abundant
NYCTAGINACEAE - Four-o'clock Family		
**Boerhavia repens* L.	Alena	Occasional
**Mirabilis jalapa* L.	Four-o'clock	Occasional
OLEACEAE - Olive Family		
**Olea europaea* L.	Olive	Uncommon
OXALIDACEAE - Wood sorrel Family		
**Oxalis corniculata* L.	Yellow wood sorrel	Occasional
**Oxalis corymbosa* DC	Pink wood sorrel	Uncommon
PAPAVERACEAE - Poppy Family		
**Argemone mexicana* L.	Mexican poppy	Locally abundant
PASSIFLORACEAE - Passionflower Family		
**Passiflora edulis* Sims	Lilikoi	Occasional
**Passiflora suberosa* L.	Huehue haole	Occasional
**Passiflora foetida* L.	Love-in-a-mist	Occasional
PHYTOLACCACEAE - Pokeweed FAmily		
**Rivina humilis* L.	Coral berry	Occasional
POLYGONACEAE - Buckwheat Family		
**Polygonum aviculare* L.		Common
PORTULACACEAE - Purslane Family		
**Portulaca oleracea* L.	Pigweed	Occasional
Portulaca pilosa L.	Akulikuli	Locally abundant
PRIMULACEAE - Primrose Family		
*Anagalis arvensis L.	Scarlet pimpernel	Occasional

Scientific Name	Common Name	Abundance
PROTEACEAE - Silk Oak Family		
**Grevillea robusta* A. Cunn	Silk oak	Occasional
ROSACEAE - Rose Family		
Osteomeles anthylidifolia (Sm) Lindl.	Ulei	Uncommon
**Rubus rosifolius* Sm.	Thimbleberry	Locally abundant
RUBIACEAE - Coffee Family		
**Coffea arabica* L.	Arabian coffe	Locally abundant
SAPOTACEAE - Sapodilla Family		
**Manilkara zapota* L.	Chicle tree	Locally abundant
SOLANACEAE - Tomato Family		
**Lycoperscicon pimpinellifolium* (Jusl.) Mill.		
Solanum americanum Mill.	Wild tomato	Uncommon
**Solanum linnaeanum* Hepper & P. Jaeger	Popolo berry Apple of sodom	Occasional Uncommon
STERCULIACEAE - Stink tree Family		
**Waltheria indica* L.	Hi'aloa, uha-loa	Locally abundant
TILIACEAE - Linden Family		
**Triumfetta semitriloba* Jacq.	Sacramento bur	Uncommon
VERBENACEAE - Verbena Family		
**Citharexylum caudatum* L.	Fiddlewood tree	Occasional
**Lantana camara* L.	Lantana	Occasional
**Stachytarpheta jamaicensis* Vahl.	Vervain	Common
**Verbena litoralis* L.	Owi	Occasional
ZYGOPHYLLACEAE -Creosote bush Family		
**Tribulus terrestris*L.	Puncture vine	Occasional

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Appendix C

Avifaunal and Feral Mammal Survey

AVIFAUNAL AND FERAL MAMMAL SURVEY OF LANDS INVOLVED IN THE EAST MAUI WATER DEVELOPMENT PROJECT, MAUI

Prepared for

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by

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5 May 1993

INTRODUCTION

The purpose of this report is to summarize the findings of a three day (30 April, 1-2 May 1993) bird and mammal field survey of lands proposed for the East Maui Water Development Project, Maui (see Fig. 1,2). Also included are references to pertinent literature as well as unpublished reports.

The objectives of the field survey were to:

1- Document what bird and mammals species occur on the property or may likely be found there given the type of habitats available.

2- Provide some baseline data on the relative abundance of each species.

3- Determine the presence or likely occurrence of any native fauna, particularly any that are considered "Endangered" or "Threatened". If such occur or may likely be found on the property identify what if any features of the habitat may be essential for these species.

4- Determine if the property contains any special or unique habitats that if lost or altered by development might result in a significant impact on the fauna in this region of the island.

GENERAL SITE DESCRIPTION

Figure One and Two indicate the proposed alignment and area of development. Sugar cane fields dominate this region of the island. Irrigation ditches, brush and weeds occur along the edges of fields and roads. Several gulches with large trees and dense undergrowth traverse the area. The largest and deepest of these is Maliko Gulch. The stream in this gulch was not running in the region of the survey. The large size of the stream bed indicates that when there is water moving down the gulch the flow is significant. Lands east of Maliko Gulch include residential property and pasture lands. Rainfall in this area is higher, judging from the amount of vegetation.

Weather during the survey was overcast and cool with passing light showers in the morning. Winds were gusty NE tradewinds (20-25 mph).

STUDY METHODS

Field observations were made with the aid of binoculars and by listening for vocalizations. These observations were concentrated

during the peak bird activity periods of early morning and late afternoon.

At various locations and in all representative habitats (see Fig. 1,2) eight minute counts were made of all birds seen or heard. Between these count stations observations of birds were also kept. These data provide the basis for the relative abundance estimates given in this report. Unpublished reports of birds known from this region were also reviewed in order to acquire a more complete picture of possible avifaunal activity (Bruner 1981, 1990, 1991). Observations of feral mammals were limited to visual sightings and evidence in the form of scats and tracks. No attempts were made to trap mammals in order to obtain data on their relative abundance and distribution. Two evenings were devoted to searching for the presence of owls and the Hawaiian Hoary Bat (Lasiurus cinereus semotus).

Scientific names used herein follow those given in Hawaii's Birds (Hawaii Audubon Society 1989); A field guide to the birds of Hawaii and the Tropical Pacific (Pratt et al. 1987) and Mammal species of the World (Honacki et al. 1982).

RESULTS AND DISCUSSION

Resident Endemic (Native) Land Birds:

No endemic species were recorded. One possible species which may occur occasionally in this area is the Hawaiian Owl or Pueo (*Asio flammeus sandwichensis*). Pueo are reasonably common in agricultural lands on Maui, particularly on the upper slopes of Haleakala but are seen less frequently in more urban habitat (Hawaii Audubon Society 1989).

Resident Endemic (Native) Waterbirds:

No endemic waterbirds were discovered on the field survey. Two species, Black-necked Stilt (*Himantopus mexicanus knudseni*) and American Coot (*Fulica americana alai*), may use the ditches and irrigations ponds found in the area. These two species are listed as endangered. Stilt are particularly opportunistic and will forage in flooded fields as well as in more permanent wetlands. Kanaha Pond and Kealia Pond are the two most important and heavily used sites on Maui for both stilt and coot.

Migratory Indigenous (Native) Birds:

Migratory shorebirds winter in Hawaii between the months of August through late April. Some juveniles will stay over the summer months as

well (Johnson et al. 1981, 1983, 1989). Of all the shorebird species which winter in Hawaii the Pacific Golden Plover (Pluvialis fulva) is the most abundant. Plover prefer open areas such as mud flats, lawns, pastures, plowed fields and roadsides. They arrive in Hawaii in early August and depart to their arctic breeding grounds during the last week of April (Johnson et al. 1981). Bruner (1983) has also shown plover are extremely site-faithful on their wintering grounds and many establish foraging territories which they defend vigorously. Such behavior makes it possible to acquire a fairly good estimate of the abundance of plover in any one area. These populations likewise remain relatively stable over many years (Johnson et al. 1989). A total of only three plover were recorded on the survey. An earlier survey would have undoubtedly found more birds. The majority of the population migrated around the third week of April.

Ruddy Turnstone (Arenaria interpres) is another common migrant that forages in plowed fields as well as in wetlands and intertidal habitat. No. turnstone were recorded on this survey.

Resident Indigenous (Native) Birds:

This category includes only those species which are native but not endemic such as the Black-crowned Night Heron (Nycticorax nycticorax).

Night heron are common around irrigation ponds and along ditches. Twelve heron were counted on the survey. This is the only native, resident waterbird not listed as endangered.

Resident Indigenous (Native) Seabirds:

This site is totally unsuitable for nesting or roosting seabirds. Several species can be seen offshore but would not utilize this property. Ground predators such as dogs, cats, rats and the Small Indian Mongoose (Herpestes auropunctatus) prevent seabirds from nesting on the main Hawaiian Islands in all but a few isolated or protected locations.

Exotic (Introduced) Birds:

A total of 15 species of exotic birds were recorded during the field survey. Table One shows the relative abundance of each species. In addition to these species other exotic birds which potentially could occur on the property include: Common Barn Owl (Tyto alba) and Eurasian Skylark (Alauda arvensis) (Bruner 1981, 1988, 1990; Pratt et al. 1987; Hawaii Audubon Society 1989).

Feral Mammals:

Wild (feral) cats were seen as well as Small Indian Mongoose (Herpestes auropunctatus). No rats or mice were recorded, however,

it would be highly unusual if these ubiquitous animals did not occur on the property. Without a trapping program it is difficult to conclude much about the relative abundance of these species, but it is likely that their numbers do not differ dramatically from similar habitat elsewhere in the region.

Maui records of the endemic and endangered Hawaiian Hoary Bat are sketchy (Tomich 1986; Kepler and Scott 1990). None were observed on this field survey despite two evening searches. This species generally roosts solitarily in trees. Much remains to be known about the natural history of this bat and its ecological requirements here in Hawaii. Kepler and Scott (1990) suggest that this bat occurs on Maui only as a "migrant, probably from the Big Island". Duvall and Duvall (1991) question this idea and suggest that the bat is more common on Maui than reported by Kepler and Scott (1990).

CONCLUSION

A brief field survey can at best provide only a limited perspective of the wildlife present in any given area. Not all species will necessarily be observed and information on their use of the site must be sketched together from brief observations and the available literature. The number of species and the relative abundance of each species may vary

throughout the year due to changing food resources and reproductive success. Species which are migratory will quite obviously be an important part of the faunal picture only at certain times during the year. Exotic species sometimes prosper for a time only to later disapear or become a less significant part of the faunal community (Williams 1987, Moulton et al. 1990). Thus only long term studies can provide an in-dept view of the bird and mammal populations in a particular area. The following are some general conclusions related to bird and mammal activity in the area surveyed.

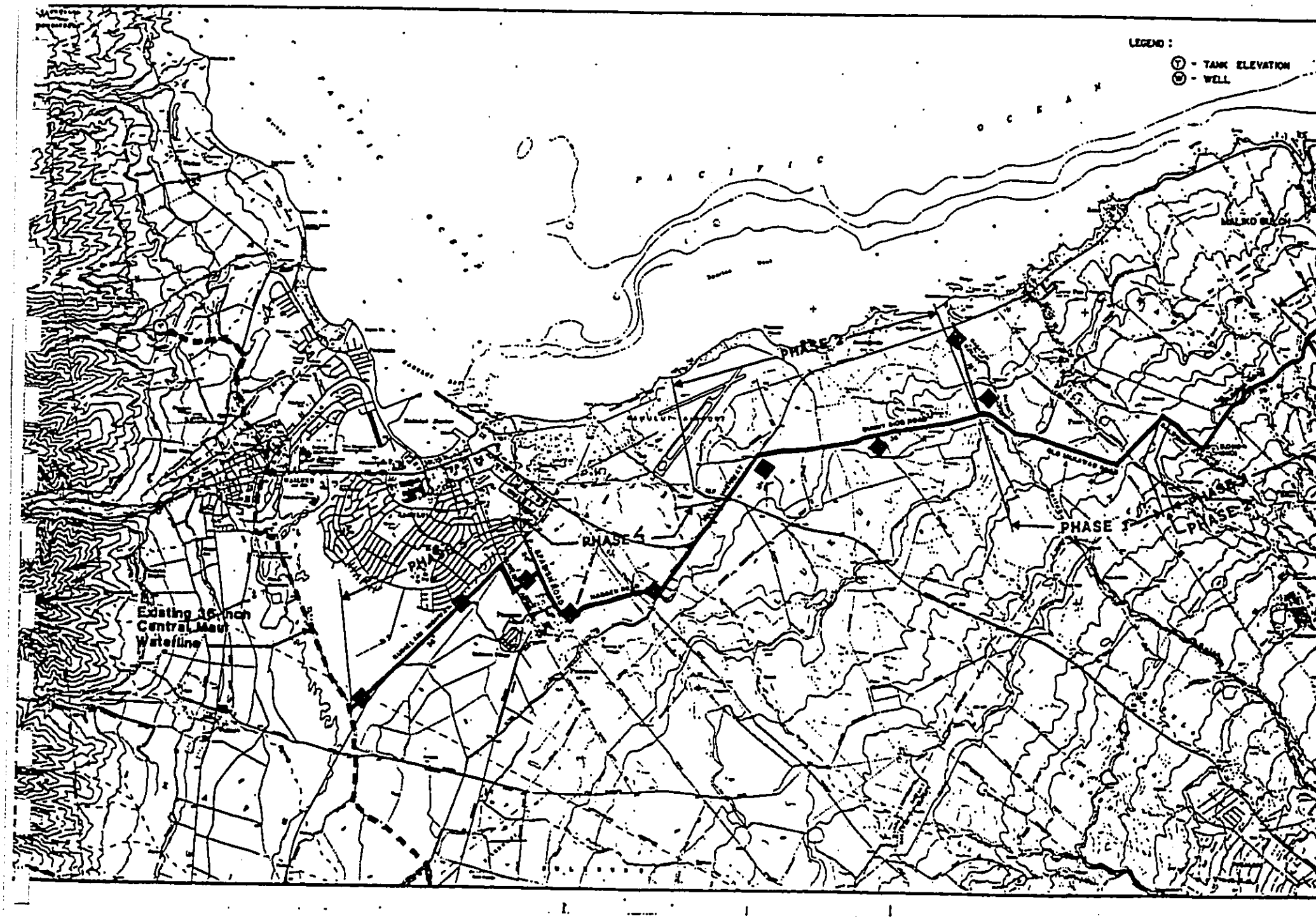
1- The lands involved in this proposal project provide a limited range of habitats which are utilized by the typical array of exotic species of birds one would expect in this region of the island. No unusual concentrations of any exotic species were discovered. However, some species typically found in this area were not recorded. This could have been due to a number of reasons such as: the survey was too brief, their numbers were so low that they went undetected or a combination of these and other factors.

2- The only native birds recorded were the Pacific Golden Plover and Black-crowned Night Heron. The low number of plover was due to time of year (most birds had migrated to the arctic by the third

week of April). Irrigation ditches and reservoirs are attractive foraging habitat for night herons.

3- Data on feral mammals were limited to observations. No unusually large concentrations were noted. No endangered species were recorded. Records of the Hawaiian Hoary Bat on Maui are limited.

4- No particularly unusual or unique habitat for wildlife was found on the survey. Sugarcane lands are common in this sector of the island as are gulches with dense second growth vegetation. The proposed project should have little or no long term measurable effect on the populations of exotic birds on Maui. The scope of the project, likewise, should not pose a serious threat to native birds like plover and night heron.


LEGEND :
T - TANK ELEVATION
W - WELL
PACIFIC OCEAN
PHASE 4
PHASE 3
PHASE 2
PHASE 1
Existing 36-inch
Central Maui
Waterline

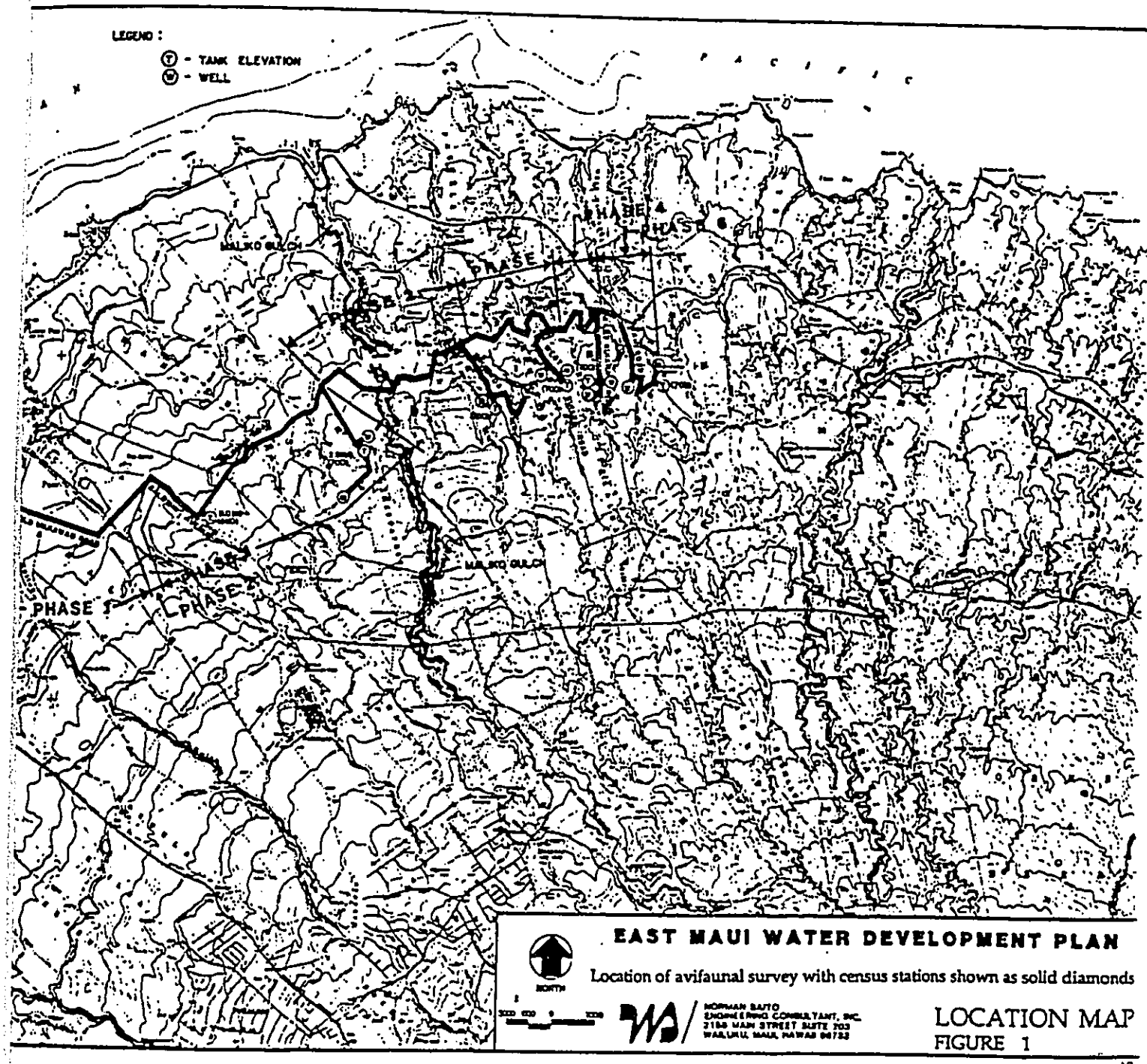

LEGEND :
T - TANK ELEVATION
W - WELL
PACIFIC
MAUI KO RIDGE
PHASE I
PHASE II
PHASE III
PHASE IV
MAUI KO GULCH
NORTH
EAST MAUI WATER DEVELOPMENT PLAN
Location of avifaunal survey with census stations shown as solid diamonds
NORMAN SAITO
ENGINEERING CONSULTANT, INC.
2158 MAIN STREET SUITE 203
WAILUKU, MAUI, HAWAII 96793
LOCATION MAP
FIGURE 1

TABLE 1

Exotic species of birds recorded on a survey of lands involved with the proposed East Maui Water Development Project, Maui.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*
Cattle Egret	Bubulcus ibis	C = 7
Ring-necked Pheasant	Phasianus colchicus	R = 3
Black Francolin	Francolinus francolinus	U = 4
Gray Francolin	Francolinus pondicerianus	C = 8
Spotted Dove	Streptopelia chinensis	C = 7
Zebra Dove	Geopelia striata	A =13
Common Myna	Acridotheres tristis	A =15
Northern Mockingbird	Mimus polyglottus	R = 2
Northern Cardinal	Cardinalis cardinalis	C = 6
Red-crested Cardinal	Paroaria coronata	R = 2
Hwamei	Garrulax canorus	C = 6
Japanese White-eye	Zosterops japonicus	A =14
Nutmeg Mannikin	Lonchura punctulata	A =15
House Finch	Carpodacus mexicanus	C = 9
House Sparrow	Passer domesticus	C = 7

(see page 13 for key to symbols)

KEY TO TABLE 1

Relative abundance = number of times observed during survey or frequency on eight minute counts in appropriate habitat.

A = abundant (ave. 10+)

C = common (ave. 5-10)

U = uncommon (ave. less than 5)

R = recorded (seen or heard at times other than on 8 min. counts. number which follows is the total individuals seen or heard).

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Appendix D

Method for Calculating Transmissivity

XXI. APPENDIX (D)

Method of Calculating Transmissitivity from Step-Drawdown Test Data

Assumptions:

1. Total drawdown is the combination of aquifer drawdown and well loss drawdown.
2. Aquifer drawdown results from laminar flow, well loss drawdown from turbulant flow.
3. Turbulant flow is porpotional to the square of the pumping rate.
4. Steady state total drawdown for each pumping rate is achieved by the end of the pumping interval.
5. The equation for total drawdown is,

$$s = aQ + bQ^2$$

In which s=total drawdown, Q is pumping rate, a is the aquifer coefficient, and b is the well-loss coeffucuent. The above expression can be re-cast as the simple linear equation,

$$s/Q = a + bQ$$

so that a becomes the intercept and b the slope.

XXI. APPENDIX (E)

Calculations On Treatment of Water Prior To Use For Potable Purposes Or Irrigation

Treating of Water From Hamakuapoko Wells 1 & 2 for Irrigation and Potable Uses

Summary of Derivation of Capital and Operating Costs

A. Alternative 1 – Pumping Treated Well Water to Reservoir No. 10

Estimated Costs with GAC Plant at Well #1

GAC Facility (GMP Assoc.)	$ 2,000,000
Connection Piping and Modification	20,000
	$ 2,020,000

Annual Amortization 10 Yr. Life @ 6% =

$ 2,020,000 x 0.1359 = 274,518

say, $ 275,000

Annual Operating Cost at Well # 2

GAC Operation (GMP Assoc. – Local Incineration)	$ 119,000
Pumping from Sea Level to Res. 10 (893')	160,000
Operation of Pumping Plant (Assume 10% of Power Cost)	16,000
Total	$ 295,000

Annual Amortization Cost	$ 280,000
Annual Operating Cost	295,300
Total	$ 575,000

B. Estimated Capital Costs for Alternate 2 – Pumping Well Water to Kamole Weir WTP (In Addition to Cost with GAC Plant at Well No. 1 and Well No. 2)

Pipeline to Kamole Weir WTP –	
12" 6,000 @ $120	$ 720,000
Booster Pumping Installation	150,000
Total	$ 870,000

Assuming a 20 year life @ 6%:

870,000 x 0.0872 = 75,864

say, 76,000

Total Annual Cost (Alternate No. 2)

Amortization Cost	$ 631,000
GAC Operation Cost	238,000
Pumping Cost	462,000
Total	$ 1,331,000

Appendix D

Method for Calculating Transmissivity

XXI. APPENDIX (D)

Method of Calculating Transmissitivity from Step-Drawdown Test Data

Assumptions:

1. Total drawdown is the combination of aquifer drawdown and well loss drawdown.
2. Aquifer drawdown results from laminar flow, well loss drawdown from turbulant flow.
3. Turbulant flow is porpotional to the square of the pumping rate.
4. Steady state total drawdown for each pumping rate is achieved by the end of the pumping interval.
5. The equation for total drawdown is,

$$s = aQ + bQ^2$$

In which s=total drawdown, Q is pumping rate, a is the aquifer coefficient, and b is the well-loss coeffucuent. The above expression can be re-cast as the simple linear equation,

$$s/Q = a + bQ$$

so that a becomes the intercept and b the slope.

XXI. APPENDIX (E)

Calculations On Treatment of Water Prior To Use For Potable Purposes Or Irrigation

Treating of Water From Hamakuapoko Wells 1 & 2 for Irrigation and Potable Uses

Summary of Derivation of Capital and Operating Costs

A. Alternative 1 – Pumping Treated Well Water to Reservoir No. 10

Estimated Costs with GAC Plant at Well #1

GAC Facility (GMP Assoc.)	$ 2,000,000
Connection Piping and Modification	20,000
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B. Estimated Capital Costs for Alternate 2 – Pumping Well Water to Kamole Weir WTP (In Addition to Cost with GAC Plant at Well No. 1 and Well No. 2)

Pipeline to Kamole Weir WTP –	
12" 6,000 @ $120	$ 720,000
Booster Pumping Installation	150,000
Total	$ 870,000

Assuming a 20 year life @ 6%:

870,000 x 0.0872 = 75,864

say, 76,000

Total Annual Cost (Alternate No. 2)

Amortization Cost	$ 631,000
GAC Operation Cost	238,000
Pumping Cost	462,000
Total	$ 1,331,000

Appendix E

Proclamations Issued by Governor Cayetano
Dated April 1, 1998 and July 28, 1999

OFFICE OF THE GOVERNOR
STATE OF HAWAII

PROCLAMATION

By the authority vested in me as Governor by the Constitution and laws of the State of Hawaii, in order to provide relief from natural disaster damages, losses, and suffering, and to protect the health, safety, or welfare of the people, I, BENJAMIN J. CAYETANO, Governor of the State of Hawaii, hereby determine, designate, declare, and proclaim an emergency as follows:

WHEREAS, a natural disaster occurrence of extraordinary ongoing drought conditions which commenced on June 16, 1999, has caused, and is causing extensive damage and risk of damage to private and public property and is resulting in a continued threat of a serious shortage of water for domestic and agricultural uses, and for essential public services such as firefighting, in the area of upcountry Maui from Ulupalakua to Haiku, Maui, State of Hawaii ("disaster area"), thereby endangering the health, safety, or welfare of the people, and demands emergency action to prevent or mitigate loss or damage; and

WHEREAS, this disaster has created a drought emergency causing significant economic loss of agricultural commodities and significant damage to agriculture in the disaster area, including forced reduction in planting, and reduction in livestock herds, and demands immediate emergency precautionary measures designed to guard against further harm from the continuing drought; and

WHEREAS, this disaster has caused damages, losses, and suffering of such character and magnitude to have affected the health, safety, or welfare, and living conditions of a substantial number of persons, and to have affected the economy of the State, and is of such a nature as to warrant relief from the State as provided herein in order to minimize the risk of further injury, loss, and damage; and

WHEREAS, Maui County presently supplies all of its public water deliveries for the upcountry Maui area from surface water flows into two reservoir systems and, in periods of low flows into these reservoir systems, from surface flows diverted from the Wailoa Ditch through the Kamole Water Treatment Plant; and

WHEREAS, surface flows into the two upcountry Maui reservoir systems have often fallen well below the demand to supply water from the reservoir system during the current prolonged drought and Maui County has often been unable to supplement such surface flows adequately with Wailoa Ditch water, forcing the County at times to draw down reservoir levels substantially to meet demand; and

WHEREAS, recent limited rainfall has replenished the reservoir system,

but has not been sufficient to end the drought conditions prevailing on Maui County or eliminate the substantial risk that Maui County could deplete the water stored in its upcountry Maui reservoirs if abnormally dry weather persists on Maui; and

WHEREAS, Maui County is very dependent on consistent rainfall to be able to supply upcountry Maui with water because the storage capacity of the upcountry Maui reservoirs is limited to a supply of approximately twenty-four days of normal water demand, these reservoirs are currently replenished entirely with surface water flows which will fall rapidly with prolonged dry weather, and because Maui County has no currently operational ability to supplement surface water supplies with groundwater taken from water supply wells; and

WHEREAS, the National Weather Service has forecasted that there is a significant probability of below normal rainfall on Maui through September 1999 due to an unusual weather pattern; and

WHEREAS, there are two water supply wells in the upcountry Maui area, Hamakuapoko wells nos. 1 and 2 ("the water supply wells"), that Maui County could use to supplement the upcountry Maui water supply in the event that the drought persists to the extent that the upcountry Maui reservoirs are depleted; and

WHEREAS, Maui County has not yet installed the infrastructure needed to transport and deliver water from the water supply wells, which will require one to two months to complete; and

WHEREAS, the ability to deliver water from the water supply wells may be needed to avoid severe water shortages in upcountry Maui, but Maui County may be precluded from developing the infrastructure needed to deliver water from these wells in time to avoid severe water shortages by the requirement to complete environmental review pursuant to Hawaii Revised Statutes ("HRS") chapter 343 and by the requirement to adhere to procurement procedures set forth in HRS chapter 103D; and

WHEREAS, the Upcountry Drought Emergency Plan, for which the environmental review process is nearly complete, anticipates the use of the Hamakuapoko wells to address water shotages in the event of drought in Upcountry Maui; and

WHEREAS, the County represents that the completion and use of the Hamakuapoko wells is not covered by litigation in the Circuit Court of the Second Circuit, State of Hawaii, involving the environmental impact statement requirements of HRS chapter 343 for the East Maui Development Plan, and it is declared that this Proclamation is not intended in any way to circumvent any court order in that case or relieve the County of any duty to obtain clarification of or relief from that Court's

orders; and

WHEREAS, HRS section 127-10 provides that, when HRS sections 127-1 to 127-9 are not in effect, the Governor may exercise any and all powers that relate to disasters resulting from enemy attacks in order to provide other disaster relief and all provisions of the law that relate to disaster resulting from enemy attacks during such period are made applicable to other disaster relief, and, since HRS sections 127-1 to 127-9 have been indefinitely suspended and are not in effect, the provisions of HRS chapter 128, which relate to enemy attacks, are applicable to other disaster relief; and

WHEREAS, pursuant to HRS section 128-2, disaster relief and emergency functions means the preparation for and carrying out of all functions to prevent, minimize and repair injury and damage resulting, or which would result, from a disaster, and includes other functions related to protection together with all other activities necessary or incidental to the preparation for and carrying out of disaster relief functions and other powers and functions provided by HRS chapter 128.

WHEREAS, pursuant to HRS section 128-8(4), the Governor is authorized to suspend any law that impedes or tends to impede or is detrimental to the expeditious and efficient execution of, or conflict with, disaster relief or other emergency functions; and

WHEREAS, pursuant to HRS section 128-9(8), the Governor is further authorized to relieve hardship and inequities or obstructions to the public health, safety, or welfare found by the Governor to exist in the laws by suspending laws in whole or in part, or by alleviating the provisions of laws on such terms and conditions as the Governor may impose; and

NOW, THEREFORE, I, BENJAMIN J. CAYETANO, Governor of the State of Hawaii, hereby determine that a natural disaster contemplated by HRS sections 127-10, 128-8(4) and 128-9(8) has occurred and is ongoing in the disaster area, and in order to provide disaster relief, hereby proclaim and declare an emergency for the disaster area for the speedy and efficient relief from the damages, losses, and suffering resulting from the disaster, and effective the date of this Proclamation, hereby authorize and invoke HRS sections 128-8(4), **suspension of laws**, and 128-9(8), **relief of hardships, inequities**, and in order to provide emergency disaster relief, I hereby suspend the following laws during the disaster relief period established pursuant to this Proclamation:

1. **The requirement to complete environmental review** pursuant to HRS chapter 343 prior to implementation or approval of the following actions by the County of Maui, or any state or county agency: construction of all necessary appurtenances to deliver

treated water from the Hamakuapoko water supply wells nos. 1 and 2 and associated system to the Kamaole clear well/ weir reservoir for delivery to upcountry Maui.

I find that construction of the necessary appurtenances to deliver treated water from these water supply wells in time to avoid severe water shortages constitutes disaster relief or other emergency functions as contemplated herein and authorized by HRS chapter 128.

I find that the inability to construct the necessary appurtenances to deliver treated water from these water supply wells without completing environmental review pursuant to HRS chapter 343 impedes or tends to impede or is detrimental to the expeditious and efficient execution of, or conflicts with, disaster relief or other emergency functions, and I find that suspending the environmental review requirement on a limited basis as provided herein, would relieve hardships, inequities, or obstructions to the public health, safety, or welfare, and minimize economic loss, by helping to make available a reliable source of new water.

I FURTHER DECLARE that for purposes of the relief provided herein a disaster emergency relief period for the disaster area shall commence on the date of this Proclamation, and shall continue until construction of all necessary appurtenances to deliver treated water from the water supply wells is complete, but in no case after September 30, 1999.

Issued at the State Capitol, State of Hawaii, this 28 day of July, 1999.

BENJAMIN J. CAYETANO
Governor of Hawaii

APPROVED:

EARL I. ANZAI
Attorney General
State of Hawaii

Proclama.5

OFFICE OF THE GOVERNOR
STATE OF HAWAII

PROCLAMATION

By the authority vested in me as Governor by the Constitution and laws of the State of Hawaii, in order to provide relief from natural disaster damages, losses, and suffering, and to protect the health, safety, or welfare of the people, I, BENJAMIN J. CAYETANO, Governor of the State of Hawaii, hereby determine, designate, declare, and proclaim an emergency as follows:

WHEREAS, a natural disaster occurrence of extraordinary ongoing drought conditions which commenced on February 20, 1998, has caused, and is causing extensive damage and risk of damage to private and public property and is resulting in a continued threat of a serious shortage of water for domestic and agricultural uses, and for essential public services such as firefighting, in the area of upcountry Maui from Ulupalakua to Haiku, Maui, State of Hawaii ("disaster area"), thereby endangering the health, safety, or welfare of the people, and demands emergency action to prevent or mitigate loss or damage; and

WHEREAS, this disaster has created a drought emergency causing significant economic loss of agricultural commodities and significant damage to agriculture in the disaster area, including forced reduction in planting, loss of crops, reduction in livestock herds, and loss of jobs for agricultural workers, and demands immediate emergency precautionary measures designed to guard against further harm from the continuing drought; and

WHEREAS, this disaster has caused damages, losses, and suffering of such character and magnitude to have affected the health, safety, or welfare, and living conditions of a substantial number of persons, and to have affected the economy of the State, and is of such a nature as to warrant relief from the State as provided herein in order to minimize the risk of further injury, loss, and damage; and

WHEREAS, Maui County presently supplies all of its public water deliveries for the upcountry Maui area from surface water flows into two reservoir systems and, in periods of low flows into these reservoir systems, from surface flows diverted from the Wailoa Ditch through the Kamole Water Treatment Plant; and

WHEREAS, surface flows into the two upcountry Maui reservoir systems have often fallen well below the demand to supply water from the reservoir system during the current prolonged drought and Maui County has often been unable to supplement such surface flows adequately with Wailoa Ditch water, forcing the County at times to draw down reservoir levels substantially to meet demand; and

WHEREAS, recent limited rainfall has replenished the reservoir system, but has not been sufficient to end the drought conditions prevailing on Maui County or

eliminate the substantial risk that Maui County could deplete the water stored in its upcountry Maui reservoirs if abnormally dry weather persists on Maui; and

WHEREAS, Maui County is very dependent on consistent rainfall to be able to supply upcountry Maui with water because the storage capacity of the upcountry Maui reservoirs is limited to a supply of approximately twenty-four days of normal water demand, these reservoirs are currently replenished entirely with surface water flows which will fall rapidly with prolonged dry weather, and because Maui County has no currently operational ability to supplement surface water supplies with groundwater taken from water supply wells; and

WHEREAS, the National Weather Service has forecasted that there is a significant probability of below normal rainfall on Maui through June 1998 due to a persistent El Nino weather pattern; and

WHEREAS, there are four water supply wells in the upcountry Maui area, the Haiku well, the Dowling well, and Hamakuapoko wells nos. 1 and 2 ("the water supply wells"), that Maui County could use to supplement the upcountry Maui water supply in the event that the drought persists to the extent that the upcountry Maui reservoirs are depleted; and

WHEREAS, Maui County has not yet installed the infrastructure needed to transport and deliver water from the water supply wells, which will require one to two months to complete; and

WHEREAS, the ability to deliver water from the water supply wells may be needed to avoid severe water shortages in upcountry Maui, but Maui County may be precluded from developing the infrastructure needed to deliver water from these wells in time to avoid severe water shortages by the requirement to complete environmental review pursuant to Hawaii Revised Statutes ("HRS") chapter 343 and by the requirement to adhere to procurement procedures set forth in HRS chapter 103D; and

WHEREAS, it is recognized that the Circuit Court of the Second Circuit, State of Hawaii has ordered Maui County not to proceed with the East Maui Development Plan without completing an environmental impact statement meeting the requirements of HRS chapter 343 and this Proclamation is not intended in any way to circumvent this court's order; and

WHEREAS, some or all aspects of the infrastructure construction project necessary to deliver water from the water supply wells may constitute components of the East Maui Development Plan, it is further recognized that Maui County will have to apply to the Circuit Court of the Second Circuit for relief from or clarification of the court's order before proceeding with development of the infrastructure needed to deliver water from the water supply wells notwithstanding this

1. **The requirement to complete environmental review** pursuant to HRS chapter 343 prior to implementation or approval of the following actions by the County of Maui, or any state or county agency: construction of all necessary appurtenances to transport or deliver water from the water supply wells in the upcountry Maui area known as the Haiku well, the Dowling well, and Hamakuapoko wells nos. 1 and 2.

   I find that construction of the necessary appurtenances to transport or deliver water from these water supply wells in time to avoid severe water shortages constitutes disaster relief or other emergency functions as contemplated herein and authorized by HRS chapter 128.

   I find that the inability to construct the necessary appurtenances to transport or deliver water from these water supply wells without completing environmental review pursuant to HRS chapter 343 impedes or tends to impede or is detrimental to the expeditious and efficient execution of, or conflicts with, disaster relief or other emergency functions, and I find that suspending the environmental review requirement on a limited basis as provided herein, would relieve hardships, inequities, or obstructions to the public health, safety, or welfare, and minimize economic loss, by helping to make available a reliable source of new water.

2. **The procurement requirements** set forth in HRS chapter 103D in procuring any goods and services employed in constructing appurtenances to transport or deliver water from the water supply wells.

   I find that the provisions of HRS chapter 103D regarding the procurement of the goods and services needed to construct appurtenances to transport or deliver water from the water supply wells, in whole or in part, impede or tend to impede the expeditious discharge of disaster relief or other emergency functions, or that compliance with HRS chapter 103D is impracticable due to existing conditions, and I further find that suspending the procurement requirements in HRS chapter 103D on a limited basis as provided herein, would relieve hardships, inequities, or obstructions to the public health, safety, or welfare, and minimize economic loss, by helping to make available a reliable source of new water.

3. **The automatic selling price markup and residential dwelling unit tenancy termination prohibitions** under HRS section 209-9(a) because I find they impede or tend to impede or are detrimental to the expeditious and efficient execution of or conflict with disaster relief or other emergency functions, and in order to relieve hardships and inequities or obstructions to the public health, safety, or welfare, which I find to exist.

I FURTHER DECLARE that for purposes of the relief provided herein a disaster emergency relief period for the disaster area shall commence on the date of this Proclamation, and shall continue until construction of all necessary appurtenances to transport or deliver water from the water supply wells is complete, but in no case after September 1, 1998.

Issued at the State Capitol, State of Hawaii, this 1st day of April, 1998.

Benjamin J. Cayetano

BENJAMIN J. CAYETANO
Governor of Hawaii

SEAL

APPROVED:

Margery S. Bronster

MARGERY S. BRONSTER
Attorney General
State of Hawaii

Appendix F

Section 4 of the
Rules and Regulations of the
Department of Water Supply,
County of Maui,
Effective January 7, 1977.

RULES AND REGULATIONS

OF THE

DEPARTMENT OF WATER SUPPLY

COUNTY OF MAUI

EFFECTIVE JANUARY 7, 1977

RULES AND REGULATIONS
OF THE DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI

Table of Contents

RULES AND REGULATIONS NO. 4
CONTROL OF WATER USAGE DURING PERIODS OF DROUGHT

Sec. 4-1. Declaration Of Drought.

(a) Whenever the water supply becomes inadequate in any area in the county of Maui because of a period of drought, the board shall issue a proclamation declaring a drought to exist in such area.

The declaration of drought shall be published in a newspaper of general circulation in the county of Maui at least once a month during the period of the drought.

(b) Water conservation measures during a period of drought. Whenever the board declares a drought to exist in any area of the county of Maui, the director, with the approval of the board, is authorized to restrict the use of water by such appropriate schedules and measures as he may deem proper.

The schedules shall restrict the use of water by any particular user during certain hours or days of the week and within certain amounts in accordance with a schedule published in a newspaper or otherwise made known to the user by the director with the approval of the board.

The director, with the approval of the board, may prohibit the use of water for irrigation, lawns, construction, subdivision or other types of activity involving the use of water. The director, with the approval of the board, may also prohibit the installation of any new meter or new service.

Mail may be used to inform users of such schedules and measurers established by the director and approved by the board.

Sec. 4-2. Penalties.

(a) The director shall remove the water meters of users who violate any of the schedules or measures established and shall assess the user the sum of fifty dollars ($50.00) for reinstallation of the meter.

(b) In addition, any person violating the schedules or measurers established by the director shall be deemed guilty of a violation and, upon conviction thereof, shall be subject to a fine of not more than five hundred dollars ($500.00) for each violation.

Appendix G

Resolution No. 98-18,
Resolution Establishing
Upcountry Maui Drought Guidelines

COUNTY OF MAUI, BOARD OF WATER SUPPLY

RESOLUTION NO. 98-18

RESOLUTION ESTABLISHING UPCOUNTRY MAUI DROUGHT GUIDELINES

WHEREAS, the Board of Water Supply is organized pursuant to Maui County Charter Section 8-11.3; and

WHEREAS, the Board of Water Supply Rules and Regulations Section 4-1 allow for the declaration of droughts; and

NOW, THEREFORE, BE IT RESOLVED by the Board of Water Supply of the County of Maui

1. That the following are its Upcountry Drought Plan Guidelines:

DROUGHT WATCH

Trigger	Action
1. Average daily inflow < system demand.	1. Monitor weather forecast.
2. BWS raw water reservoir levels ≤ 101 MG or 27 at Lower Kula or 74 at Upper Kula.	2. Monitor source flows.
3. Total EMI Maliko ditch flows ≤ 204 MGD or 107 MGD at Wailoa.	3. Maintain distribution system storage tank levels.
4. Rainfall prediction in foreseeable forecast is insufficient to provide average day flows on the 2.0 MGD Upper Kula or 3.75 MGD Lower Kula System.	4. Start public service program, re: conservation.
5. Kamole demand ≥ 4 MGD.	5. No new temporary meters to be issued.
6. Lower Kula demand ≥ 4 MGD.	6. Postpone all mainline tie-ins using Upcountry water for disinfection and flushing.
	7. Request 5% reduction in usage.
	8. Press release re: declining water inventories, continuing dry weather, etc.

9. Make drought conditions available to the news media and the Board.

Note 1: Drought watch issued when at least three of the above triggers are exhibited.
Note 2: Water advisory is issued when items 1 & 2 are exhibited. Water advisory triggers action items 4 & 5.
Note 3: EMI Haiku, Lower Kula, Wailoa ditches flow across Maliko gulch.

DROUGHT WARNING

Trigger

1. Average daily inflow < system demand.
2. BWS raw water reservoir levels < 20 MG at Lower Kula or 55 MG at Upper Kula.
3. Total EMI Maliko ditch flows ≤ 55 MGD or Wailoa ditch at ≤ 30 MGD.
4. Kamole pumping ≥ 5 MGD.
5. Continued dry weather.

Action

1. Monitor weather forecast.
2. Monitor source flows.
3. Maintain distribution system tank levels at maximum.
4. 10% mandatory reduction except for services with Ag water rates which continue on 5% voluntary reduction. If the 2 wells at Hamakuapoko, Haiku, or Kapukalua are not available for use a 10% mandatory reduction will apply to all services with a 30 day delay for services with Ag water rates.
5. Shut-off temporary meters. Best efforts will be made to make non-potable water available for temporary needs.
6. Continue drought condition updates to news media and Board.
7. Postpone service tie-ins.
8. Board declaration of drought.
9. Start all available groundwater wells.

Note: Drought warning issued when at least three of the above triggers are exhibited.

DROUGHT EMERGENCY

Trigger

1. Average daily inflow < system demand.
2. Kahakapao water inventory ≤ 40 MG.
3. Lower Kula raw water reservoir level at ≤ 13.5 MG.
4. Flows at Wailoa Ditch < 15 MGD for two consecutive days.
5. Kamole pumping is ≥ 5 MGD.
6. Continued dry weather.

Action

1. Monitor weather forecast.
2. Monitor source flow.
3. Maintain distribution system tank levels at maximum.
4. 25% mandatory reduction except for services with Ag water rates shall have a 10% mandatory reduction 30 days after declaration of emergency. If the wells at Hamakuapoko, Haiku, or Kapukalua are not available for use, a 25% mandatory reduction will apply to all services with Ag water rates delayed for any balance of the 30 day delay in implementation.
5. Close inlet valve at Omaopio tank.
6. Start Lower Kula to Upper Kula pumping.
7. Start Kamole to Lower Kula pumping.
8. Increase Kamole WTP production to a maximum of 7.0 MGD.
9. Reduce Upper Kula WTP to maintenance flow only (Olinda line).
10. Press release of emergency drought notice to news media.
11. Continue drought condition updates to news media and Board.

Note 1: Board Chair or Vice Chair & Director or Deputy in the absence of Director may declare drought emergency when at least four of the above triggers are met.

Note 2: Board may also declare a drought emergency based on a review of the totality of the circumstances in the context of public health, safety, and welfare.

MAUI BOARD OF WATER SUPPLY
UPCOUNTRY DROUGHT PLAN REVERSAL GUIDELINES

DROUGHT EMERGENCY TO DROUGHT WARNING

Trigger

1. Average daily inflow > system demand.
2. Kahakapao water inventory > 40 MG.
3. Lower Kula raw water reservoir Level at 20 MG.
4. Flows at Wailoa Ditch > 15 MGD for two consecutive days.
5. Kamole pumping is < 5 MGD
6. Continued dry weather.

Action

1. Monitor weather forecast.
2. Monitor source flows.
3. Maintain distribution system tank levels at maximum.
4. 10% mandatory reduction except for services with Ag rates which will reduce to 5% voluntary reduction. If the 2 wells at Hamakuapoko, Haiku, or Kapukalua are not available for use, a 10% mandatory reduction will apply to all services.
5. Open inlet valve at Omaopio Tank.
6. Stop Lower Kula to Upper Kula pumping.
7. Stop Kamole to Lower Kula pumping.
8. Decrease Kamole WTP production to to a maximum 5.0 MGD.
9. Return Upper Kula WTP to normal flows.
10. Press release of drought warning notice in news media.
11. Continue drought condition updates to news media and Board.

Note: Drought emergency changed to drought warning when at least three of the above triggers are exhibited.

DROUGHT WARNING TO DROUGHT WATCH

Trigger

1. Average daily inflow > system demand.
2. BWS raw water reservoir levels >20 MG at Lower Kula or 55 MG at Upper Kula.
3. Total EMI Maliko ditch fows >55 MGD.
4. Kamole pumping < 5 MGD.
5. Continued dry weather.
6. Lower Kula demand < 4 MGD.

Action

1. Monitor weather forecast.
2. Monitor source flows.
3. Maintain distribution system tank levels at maximum.
4. 5% voluntary reduction.
5. Open temporary meters.
6. Continue drought condition updates to news media/Board.
7. Allow service tie-ins.
8. Continue postponing mainline tie-ins using Upcountry water.
9. Continue not to allow issuing of temporary meters.

Note: Drought warning changed to drought watch when at least three of the above triggers are exhibited.

DROUGHT WATCH TO NORMAL

Trigger

1. Average daily inflow > system demand.
2. BWS raw water reservoir levels >102 MG or 27 at Lower Kula or 74 at Upper Kula.
3. Total EMI Maliko ditch flows >204 MGD or 107 MGD at Wailoa.
4. Rainfall prediction in foreseeable forecast is sufficient to provide average day flows on the 2.0 MGD Upper Kula or 3.75 MGD Lower Kula System.
5. Kamole pumping ≤ 4 MGD.

Action

1. Monitor weather forecast.
2. Monitor source flows.
3. Maintain distribution system storage tank levels.
4. Stop public service announcements.
5. New temporary meters can now be issued.
6. Resume mainline tie-ins using Upcountry water.
7. Suspend voluntary conservation.

6. Lower Kula demand < 4 MGD.

8. Notify media of cancellation of drought condition.

9. Cancel drought condition updates.

Note 1: Drought watch cancelled when at least three of the above triggers are exhibited.
Note 2: Water advisory is issued when items 1 & 2 are exhibited. Water advisory triggers action items 4 & 8.

2. That previous resolutions and amendments are hereby rescinded.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed the seal of the Board this 18th day of August, 1998.

Robert K. Takitani, Chairperson
Maui County Board of Water Supply

Approved by:

Director of Water Supply

Approved by:

Deputy Corporation Counsel
Gary W. Zakian

CERTIFICATION

The undersigned hereby certifies that the foregoing Resolution is a true and correct copy of the Resolution adopted at the meeting of the Board of Water Supply, County of Maui, duly held on the 18th day of August, 1998.

David R. Craddick, Director
Department of Water Supply

Appendix H

Correspondances Related to the Preparation of the Final Environmental Assessment

JUL-26-99 09:44 AM MINK.AND.YUEN 945 1421 P.03

DEPARTMENT OF
HOUSING AND HUMAN CONCERNS
COUNTY OF MAUI

JAMES "KIMO" APANA
Mayor

ALICE L. LEE
Director

PRISCILLA P. MIKELL
Deputy Director

200 SOUTH HIGH STREET • WAILUKU, HAWAII 96793 • PHONE (808) 243-7805 • FAX (808) 243-7185

June 18, 1999

Mr. George A. L. Yuen, President
Mink & Yuen, Inc.
1670 Kalakaua Avenue, Suite 605
Honolulu, Hawaii 96826

Dear Mr. Yuen:

Subject: Draft Environmental Assessment for the
East Maui Drought Emergency Installations,
Hamakuapoko, Maui

We have reviewed the Draft Environmental Assessment (dated June 1999) for the East Maui Drought Emergency Installations, Hamakuapoko, Maui project, and wish to inform you that we have no comments to offer.

Thank you for the opportunity to comment.

Very truly yours,

ALICE L. LEE
Director of Housing and
Human Concerns

ETO:hs

c: Housing Administrator

TO SUPPORT AND ENHANCE THE SOCIAL WELL-BEING OF THE CITIZENS OF MAUI COUNTY

1949 - 1999: *Celebrating 50 Years of Service*

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

August 17, 1999

Ms. Alice L. Lee, Director
Department of Housing and Human Concerns
County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

RE: Draft Environmental Assessment for the Drought Emergency Installations, Hamakuapoko Well No. 1 and No. 2, Pumps and Water Mains

Dear Ms. Lee:

Thank you for reviewing the above DEA. Your indication that you have no comments to offer is appreciated.

Sincerely,

David R. Craddick
Director

AUG 2 7 1999

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JUL-26-99 09:43 AM HINK.HNU.YUEN 948 1421 P.03

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

June 25, 1999

Civil Works Technical Branch

Mr. George A.L. Yuen, President
Hink and Yuen, Incorporated
1670 Kalakaua Avenue, Suite 605
Honolulu, Hawaii 96826

Dear Mr. Yuen:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment (DEA) for the East Maui Drought Emergency Installations Project, Hamakuapoko, Maui. The following comments are provided in accordance with Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army (DA) permits.

a. Based on the information provided, a DA permit will not be required for the project.

b. The flood hazard information provided on page 33 of the DEA is correct.

Sincerely,

James K. Hatashima, P.E.
Acting Chief, Civil Works
Technical Branch

1949 - 1999: Celebrating 50 Years of Service
DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

August 17, 1999

Mr. James K. Hatashima, P.E.
Acting Chief, Civil Works Technical Branch
U.S. Army Engineering District, Honolulu
Ft. Shafter, Hawaii 96858-5440

RE: Draft Environmental Assessment for the Drought Emergency Installations, Hamakuapoko Well No. 1 and No. 2, Pumps and Water Mains

Dear Mr. Hatashima:

Thank you for your letter of July 25, 1999 regarding the DEA for the East Maui Drought Emergency Installations Project.

Your acknowledgment that the DA permit will not be required and that our flood hazard information is correct is appreciated.

Sincerely,

David R. Craddick
Director

AUG 27 1999

"By Water All Things Find Life"

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JUL-26-99 09:44 AM MINK.AND.YUEN 946 1421 P.04

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, HI 96733-6898 • (808) 871-8451

July 7, 1999

Mr. George A.L. Yuen
President
Mink & Yuen, Inc.
1670 Kalakaua Avenue, Suite 605
Honolulu, HI 96826

Dear Mr. Yuen:

Subject: Draft Environmental Assessment for the East Maui Drought Emergency Installations, Hamakuapoko, Maui

Thank you for allowing us to comment on the subject project.

In reviewing the information transmitted and our records, Maui Electric Company (MECO) at this time has no objections to the proposed project.

In 1991, MECO had received service requests for the COM Hamakuapoko Wells 1 & 2 (M121418 & M121419). The service requests were later revised in 1993.

MECO encourages that the project's consultant meet with us as soon as practical so that we may further plan for the project's electrical requirements. To discuss electrical service requirements, the consultant should contact Greg Kauhi, Distribution Engineering Supervisor, at 871-0366.

If you have any questions or concerns, please call Fred Oshiro at 872-3202.

Sincerely,

Edward Reinhardt

Edward Reinhardt
Manager, Engineering

FO:lh

1949 - 1999: Celebrating 50 Years of Service
DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

August 17, 1999

Mr. Edward Reinhardt
Manager, Engineering
Mauio Electric Company, Ltd.
P.O. Box 398
Kahului, Maui, Hawaii 96733-6898

RE: Draft Environmental Assessment for the Drought Emergency Installations, Hamakuapoko Well No. 1 and No. 2, Pumps and Water Mains

Dear Mr. Reinhardt:

Thank you for your letter of July 7, 1999 indicating that you have no objections to the proposed project.

At such time when we proceed with our engineering design we will consult with you to plan for the project's electrical requirements.

Sincerely,

David R. Craddick
Director

AUG 27 1999

"By Water All Things Find Life"

Printed on recycled paper

BENJAMIN J. CAYETANO
Governor

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512

JAMES J. NAKATANI
Chairperson, Board of Agriculture

LETITIA N. UYEHARA
Deputy to the Chairperson

Mailing Address:
P.O. Box 22159
Honolulu, Hawaii 96823-2159

Fax: (808) 973-9613

July 13, 1999

Mr. George A. L. Yuen
President
Mink and Yuen, Inc.
1670 Kalakaua Avenue, Suite 605
Honolulu, Hawaii 96826

Dear Mr. Yuen:

Subject: Draft Environmental Assessment for the East Maui Drought Emergency Installations, Hamakuapoko, Maui
Hamakuapoko Wells Nos. 1 and 2

Thank you for the opportunity to comment on the subject document.

Background:

The objective of the project is to ensure the Maui Department of Water Supply (DWS) has an alternate source of water to supply to the Upcountry Water System (UCWS) during droughts. The proposed arrangement during droughts involves DWS and Hawaiian Commercial and Sugar, Inc. (HC&S) and is summarized below:

- Hamakuapoko Wells 1 and 2 is pumped into HC&S reservoir No. 10
- Water from Kamaole Weir Water Treatment Plant is provided to UCWS
- Treated water from Hamakuapoko Wells 1 and 2 can be placed directly into UCWS
- If necessary, Hamakuapoko Wells 1 and 2 water can be pumped into HC&S reservoir No. 10 for irrigation use.

Comments:

The Department of Agriculture supports this project. It is vital to Upcountry crop and livestock agriculture and is in consonance with the Upcountry Maui Watershed Plan (March, 1997).

Should you have any questions, please contact Mr. Paul T. Matsuo, Administrator/Chief Engineer, Agricultural Resource Management Division, at 973-9475.

Sincerely,

JAMES J. NAKATANI
Chairperson, Board of Agriculture

upcountryh20.e

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

August 17, 1999

Mr. James J. Nakatani
Chairman, Board of Agriculture
Department of Agriculture
1428 South King Street
Honolulu, HI 96814-2512

RE: Draft Environmental Assessment for the Drought Emergency Installations, Hamakuapoko Well No. 1 and No. 2, Pumps and Water Mains

Dear Mr. Nakatani:

Thank you for your letter of July 13, 1999 and your support of the above project. We hope the completion of this project will provide the people of upcountry Maui some relief for their agricultural needs.

Sincerely,

David R. Craddick
Director

AUG 2 7 1999

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

BRUCE B. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
File:

July 14, 1999

99-125/epo

Mr. George A. L. Yuen
President, Mink & Yuen, Inc.
1670 Kalakaua Avenue, Suite 605
Honolulu, Hawaii 96826

Dear Mr. Yuen:

Subject: Draft Environmental Assessment (DEA)
Drought Emergency Installations
Hamakuapoko Wells No. 1 & No. 2
Hamakuapoko, Maui

Thank you for allowing us to review and comment on the subject project. We have the following comments to offer:

Safe Drinking Water

1. As indicated in the DEA on pages 16 and 17, Section E, Groundwater Quality, chemical analyses of both Hamakuapoko Wells No. 1 and No. 2 detected dibromochloropropane (DBCP) and Ethylene Dibromide (EDB) at concentrations that exceeded the maximum contaminant levels (MCLs). Any new potable water sources (for emergency or permanent conditional approval) with contaminants exceeding their MCLs must have appropriate treatment installed before going into operation.

2. If the water is used for irrigation only, there are no Department of Health potable water requirements to treat chemically contaminated water before application.

3. The draft environmental assessment indicates that the project might include the development of the two Hamakuapoko Wells into potable water sources. Section 11-20-29 of Chapter 20, "Potable Water Systems," requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.

4. The engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses performed by a laboratory certified in the State of Hawaii must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional tests may be required by the Director upon his review of the information submitted.

5. Section 11-20-30 requires that new or substantially modified distribution systems for public water systems be approved by the Director. However, if the water system is under the jurisdiction of the County of Maui, the Maui Department of Water Supply will be responsible for the review and approval of the plans.

If you should have any questions, please contact Ms. Queenie Komori of the Safe Drinking Water Branch, Engineering Section at 586-4258.

Water Pollution

A National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State:

a. Storm water discharges relating to construction activities, such as clearing, grading, and

excavation, for projects equal to or greater than five acres;

b. Hydrotesting water; and

c. Treated effluent from well drilling activities.

Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 30 days prior to commencement of any discharge to waters of the State.

Any questions regarding these comments should be directed to Mr. Denis Lau, Branch Chief, Clean Water at 586-4309.

Sincerely,

GARY GILL
Deputy Director
for Environmental Health

c: SDWB
MDHO

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

September 6, 1999

Mr. Gary Gill
Deputy Director for Environmental Health
Department of Health
P.O. Box 3378
Honolulu, HI 96801

RE: Draft Environmental Assessment for the Drought Emergency Installations, Hamakuapoko Well No. 1 and No. 2, Pumps and Water Mains

Dear Mr. Gill:

Thank you for your letter of July 14, 1999 with your comments on the above project.

Please be assured that when we decide to use the water from both wells for potable purposes, we will comply with all DOH requirements relative to potable water systems. We will also obtain an NPDES permit as applicable. We also appreciate your comment regarding the use of chemically contaminated water for irrigation.

Thank you again for your comments. We will consult with your Department should we proceed with this project as a source of potable water.

Sincerely,

David R. Craddick
Director

/wkt
cc: Mink & Yuen, Inc.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

COPY

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

TIMOTHY E. JOHNS, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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1999 JUL 23
DEPT. OF WATER
COUNTY OF MAUI

July 15, 1999

George Yuen, President
Mink & Yuen, Inc.
1670 Kalakaua Avenue, Suite 605
Honolulu, Hawaii 96826

LOG NO:23784
DOC NO:9907RC15

Dear Mr. Yuen:

SUBJECT: Historic Preservation Review -- Draft EA for the East Maui Drought Emergency Installations Multiple, Hamakuapoko, Maui

This letter reviews the Draft EA which was sent June 15, 1999. We understand that this has now become an emergency project given drought conditions.

We note that the portion of the Draft EA addressing historic properties (pp. 29-30) implies that no historic sites are expected. This does not quite match the archaeological survey report that is appended.

The appended archaeological inventory survey report for this project (Sinoto & Pantaleo 1992. Archaeological Inventory Survey of the East Maui Waterline Project. ... Aki Sinoto Consulting ms.) has not been previously reviewed by our Division. It is our conclusion that the report needs revision before we can agree with mitigation proposals. See Attachment for detailed comments.

In general, our limited information on site patterns for this area suggests two regions with quite different patterns. The Hamakuapoko lands had settlements and irrigated agriculture focused near the shore, perhaps with dryland fields above the cliffs. Higher upland slopes and very narrow upper valleys were probably forest lands, exploited for forest resources, birds, etc. This is a region for which the site patterns are poorly known, however. The lands roughly from Paia to the airport have a differing pattern. There were coastal settlements, but fields tended to primarily be located in the uplands where rainfall was sufficient. Higher still was the forest. This area too has not had its settlement pattern well portrayed. The report needs to better clarify these patterns for both regions.

JL 19 1999

Assuming the above portrayal of settlement patterns is accurate, much of the water lines and wells in Hamakuapoko seem likely to be in former forest lands where site density is quite low. The report clearly shows that lands here were altered by sugarcane which makes the survival of sites unlikely. Gulches areas where land was not altered were checked, and survey work found no sites, which is logical given the lack of gulch floors in the upper elevations. Given these facts and the fact that the lines are along existing roads, we agree that sites are unlikely to be present in the project areas in the Hamakuapoko region.

In the Paia to Airport area, the report states that the upper elevations have had their land surface altered by cane and modern cultivation, again making the survival of significant historic sites unlikely. The fact again that the lines are along roads also makes the presence of sites less likely, due to prior disturbance from road construction. Thus, we agree that significant sites are unlikely to be present in the project areas in the uplands in this region. However, it is mentioned that two coastal areas with water lines -- Phases 2 and 5 -- may have subsurface archaeological remains of former coastal habitation and associated burials. Unfortunately, these areas cannot be easily located on the report's maps and text. These areas need to be clearly identified on maps and in text, with solid justification for expectations (e.g., sand substrate, nearby archaeological sites, archival information). Once these areas are identified, we agree that the possibility that significant sites are present does exist, even though the lines are along roads.

Given the above and given the emergency nature of this project, we believe that the project can proceed with the following conditions to ensure impacts to any significant historic sites are appropriately mitigated:

1. The archaeological inventory survey shall be revised to address the State Historic Preservation Division's concerns, to be an acceptable report. The project can proceed with the understanding that this report will be revised.

2. We agree that some coastal areas to be impacted by this project may possibly have significant subsurface archaeological sites (such as habitation deposits and associated burials). These areas do need full-time archaeological monitoring -- to document any sites that are found and to properly treat such sites. However, the report is not clear where these areas are. The archaeological consultant shall meet with our Division's staff as soon as possible, so these areas can be clearly identified. A brief monitoring scope of work shall also be clarified in that meeting. The monitoring can then proceed for these areas of the project.

3. For the other areas of the project where sites are unlikely, we agree that having an archaeological monitor on-call is a good idea, just in case a site is found (e.g., a burial) -- to speed documentation and treatment and reduce construction slow-downs. We disagree that spot checks by an archaeological monitor are needed for these areas.

If you have any questions, please contact Dr. Ross Cordy, our Branch Chief for Archaeology (692-8025). As always, if your consulting archaeologist disagrees with our recommended revisions, have them contact our staff as soon as possible, so these disagreements can be resolved.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

RC:lm

Attachment

c: Department of Water, Maui County
Public Works Dept., Maui County

ATTACHMENT

NEEDED REVISIONS

ARCHAEOLOGICAL INVENTORY SURVEY AST MAUI DROUGHT EMERGENCY INSTALLATIONS

AKI SINOTO CONSULTING

Figure 1 -- Fold Out of Project Area

The project areas and phases cannot be identified on this map. Please clearly mark them. This can be done with high-lighting pen.

Background Section

Our minimal standards, in place since 1987, require minimally an overview of ahupua'a settlement patterns for a project area and a prediction of likely site patterns within the project area using archival research and reviewing prior archaeological work. This report does not present the settlement patterns for the ahupua'a in these areas.

1. You have multiple ahupua'a in this project area, and you may have two main topographical regions (see cover letter) -- Hamakuapoko and Paia-Airport. We recommend that you establish the major topographic regions, list ahupua'a within each region, and then portray former settlement zones within each (with supportive information). For example, Hamakuapoko is a region of gulches and adjacent uplands. List the ahupua'a with this topography. Then itemize general settlement zones -- lower gulch floodplains with housing and lo'i, seaward slopes above cliffs with dryland farms and some houses, upland slopes under forest with forest exploitation camps, upper gulches with no stream flats in forest, with camps. Cite archaeological reports which support such patterns, and archival information. You could review the Mahele awards for one or two ahupua'a in each topcgraphic region (as a sample) and document where the houses and fields were to support a pattern. If possible, show the settlement zones on a map.

2. Clarify which areas were under intensive modern cultivation (e.g., cane) -- in text an on map. This shows areas of severe land alteration.

3. p. 8, para 2. Expectations. Specify clearly (in text and on a map) where on the shore these coastal sites might be present in relation to project areas. You probably should say habitations and burials are likely -- these both being functional types of sites. Then in parentheses you can indicate the formal types of habitation remains that might be present (deposits with charcoal, shell, artifacts, pits, etc.).

4. p. 8, para 3. You need to clarify here the settlement zones in these uplands. For example, in Hamakuapoko these would be forest lands with camps likely, correct? Thus, heiau an agricultural features would not be expected. Please clarify site patterns once likely to be present. Then note with cane and roads, significant sites are unlikely to survive.

Methods

Describe your survey methods across gulches and the width of survey areas.

Findings

1. p. 9, para 4. Again, more clearly indicate the regions and settlement zones and likely sites in these intermediate-upland zones. Then note extensive disturbance makes sites unlikely to survive and the gulches had no sites.

2. p. 9, last para and 10, top para. Be specific what areas are likely to have subsurface habitation deposits and associated burials.

Mitigation Recommendations

1. Again, be specific which coastal areas are likely to possibly have sites and need monitoring.

2. For the intermediate and upland areas, we agree on-call monitor is acceptable, as a contingency. We disagree with the need to spot check. Please alter or justify.

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

September 10, 1999

Mr. Don Hibbard, Administrator
State Historic Preservation Division
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

Dear Mr. Hibbard:

Subject: DEA the Drought Emergency Installations
Hamakuapoko Wells No. 1 and No. 2

Thank you for your letter of July 15, 1999 outlining your comments on the above project. We will respond to your comments as follows.

We did not intend to imply that no historic sites are expected. We tried to point out that the archeologist, Aki Sinoto, made a surface survey of the pipeline corridor and all the gulches crossed by the water lines. He concluded that "no surface archaeological sites remain in these areas."

The pertinent area of affected by this environmental assessment more specifically centers around Phase 1 which includes the Hamakuapoko Well No. 1 and Well No. 2 and its connecting pipeline. For this Drought Emergency Installations, Hamakuapoko Wells No. 1 and No. 2, Pumps and Water Mains, the section between the wells are part of the known areas of the original study. The Drought Emergency Installations is located in mainly disturbed cane fields and previous and current pineapple cultivation. And as the study indicates that the corridor has "undergone extensive disturbances though large scale agricultural activities continuing for nearly a century. "

With regard to the East Maui Waterline Projects, we shall relay your concerns to the archeologist regarding revisions to his report. Your opinion that for areas other than the referred coastal areas where significant sites are unlikely, archaeological on call monitoring would be acceptable, just in case a site is found (e.g., a burial) and will followed. Our archaeologist will be requested to contact Dr. Ross Cordy of your staff at 692-8025 to follow up on this matter.

Your comments and recommendations are appreciated.

Sincerely,

David R. Craddick
Director

hk

COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793

David Craddick, Director
Maui County Department of Water Supply
200 So. High Street
Wailuku, HI 96793

July 16, 1999

RE: Comments and Questions on Draft Environmental Assessment for the Drought Emergency Installations Hamakuapoko Wells No. 1 and 2

I have the following comments, questions and requests for information regarding the Draft Environmental Assessment for the Drought Emergency Installations Hamakuapoko Wells No. 1 and 2. Your careful attention to my concerns is much appreciated.

I. Description of Project

Since the primary objective of the project is to provide water to the UCWS during periods of drought the following information is needed. Please provide:

A. A history of drought conditions and voluntary and mandated drought restrictions from 1987 to the present. The Draft EA only discusses "severe drought periods" between 1970 and 1987. Since 1987 additional development upcountry has impacted water service needs.

B. An assessment of the likely periods of drought in the future.

C. The amount of water that could be provided by the proposed system as a percentage of the amount that would be needed under various drought scenarios e.g. 10% restrictions, 25% restrictions over the life of the suggested improvements.

D. A more detailed description of the "nearly 9000 water services off the UWS. How many are residential, rural, agricultural. What is the average usage for each category? How will this use be impacted by the agricultural pipe line to be constructed in Kula?

E. What is meant by the statement: "It is uncertain at this time as to how long this reciprocal need for emergency water supplies will last"? (p. 4 and 5 of EA) If the reciprocal need should end how will the proposed project be impacted?

F. What is meant by the statement "Such a situation may require the DWS place all available water directly into the system." (p. 5 if the EA) Does this mean water from the wells, water from the ditch or both? What is the plan if the ditch flow is too low to supply DWS needs. Does this mean both DWS and HC&S needs?

G. What type of electrical and communication systems are planned to cross. Maliko gulch from Haiku road? What is the purpose of these systems?

H. How does this drought emergency plan interface with the East Maui Development Plan(EMDP). Will the 1 mgd provided by the Hamakuapoko wells for drought emergencies be deducted from the water to be provided by the EMDP?

I. With respect to the granulated activated carbon filters (GAC), please provide a more detailed description of the life expectancy of the filters and the way in which the expended filters will be disposed of or refreshed.

2. Description of the Affected Area

A. Please provide a more detailed description of the hydro plant at Kamole Forebay including the amount of power generated and the expected effect of the project in quantifiable loss of power.

B. Please provide a more detailed description of reservoir 10 including the amount of water lost to leakage and evaporation.

C. What is meant by "other unaccounted for water concerns"? (p. 9 of the EA)

D. The archeological assessments indicate that any important areas would probably be in the gulches. Was the dry gulch described on page 10 evaluated?

3. Consequences of Proposed Action on Water Resources

A. Please provide the following information with respect to the Pala and Haiku Aquifer systems:

i. the sustainable yield of each aquifer
ii. the location each well capable of pumping water from each aquifer together with the permitted pump capacity and its anticipated use
iii. the location of each well planned for by either public or private entities together with the anticipated pump capacity and its anticipated use
iv. the boundaries of each aquifer
v. how these wells would be impacted by the proposed project

B. Please explain the term "perched water" as used in the Draft EA and how perched water relates to stream flow.

D. Please provide the justification for the statement "...the basal lens does not contribute to stream flow except at the coast line."(p. 13 of EA) Is there any known evidence or expert opinion disputing this statement?

E. Please explain how the fact that the drawdown attained a maximum of 2.82 ft indicates that the basal acquifer is highly permeable and can accommodate substantial pumping rates without degrading water quality.

F. What are the pumping rates that can be accommodated without degrading water quality?

G. Please describe the various treatments including but not limited to "airstripping" and "filtration through activated carbon" which can remove EDB, TCP and DBCP to no detect levels explaining for each treatment what is done to dispose of the organic chemicals which are removed.

H. Please explain in detail the position of HC&S with respect to the proposal that untreated well water be used for irrigation.

I. What are the potential adverse effects of EDB, DBCP and TCP on the environment and animal life which have caused treatment to be considered for the irrigation water?

J. What are the potential adverse effects of EDB, DBCP and TCP on human life that require treatment of the water to render it potable.

K. Explain specifically which federal, state and county laws and regulations govern the disposal of the GAC filters.

L. The EA states that "the filter must be rejuvenated periodically" (p. 19 of EA) Given the anticipated pump capacity of the wells, how often would the filters need to be rejuvenated and what is that process.

4. Need for Treatment of Water before pumping to HC&S Facilities

A. Please identify the federal, state and county quality and health standards that must be met before contaminated water can be used for irrigation.

B. Please fully explain the statement "our findings are that treatment...would not be necessary." (p. 23 of EA)

C. Please fully explain the positions of HC&S and/or any governmental agencies with respect to the need for treatment of the water before it is used for irrigation.

5. Treatment of Water by GAC method

A. Please indicate the number of days of pumping that are reflected in the various cost figures provided in Tables I and II on pages 26 and 27.

B. Please explain how the number of days relates to the anticipated number of days of drought conditions.

6. Alternatives to the Proposed Actions

A. Please attach a copy of the long term plan for the Haiku and Upcountry Water systems whereby adequate water will provided to customers, residential and agricultural, alleviating the necessity for declaring "drought" conditions in the summer months and providing water to the hundreds of customers who have been waiting years for meters.

B. If this plan has not been reduced to writing please state in detail what plans are being considered other than the Hamakuapoko Wells 1 and 2. For example, is drilling a well mauka of the contamination area as Mr. Dowling did being considered? Is additional storage at Kamaole Weir being considered?

C. Please discuss increased storage capacity as an alternative. How will the expenditure of funds for the proposed project effect the possiblity of providing increased storage capacity?

D. Please explain what is meant by the statement: "The general philosophy of water conservation is meritorious but conservation is primarily an on-going process." and how this statement is relevant to the rejection of conservation as an alternative. (p. 36 of the EA)

E. Please describe in detail the public water conservation program that the DWS has implemented specifically indicating the quantity of water saved.

7. Parties Contacted in Preparation of Assessment

A. Please consult with upcountry community groups, commercial users, and farmers.

8. Archaeology

A. Appendix B to the draft EA indicates that "..any remaining archaeological sites probably exist in the gulches....include heiau trails, cairns, petroglyphs, walls, overhang shelters and agricultural features on the gulch floors. Were the gulches which will or do contain the pipes surveyed?

Thank you for your kind attention.

Sincerely,

Wayne K. Nishiki, Councilmember

cc: Genevieve Salmonson
Director, OEQC
Gary Gill, Deputy Director
Environmental Health Admin. DOH
William K.C. Wong, Chief
Safe Drinking Water Branch, DOH
Timothy Johns, Chair
Commission on Water Resource Management, DLNR

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

September 13, 1999

Honorable Wayne K. Nishiki, Councilmember
County Council, County of Maui
200 South High Street
Wailuku, Hawaii 96793

Dear Councilmember Nishiki:

Subject: Draft EA for the Drought Emergency Installations
Hamakua Wells No. 1 and No. 2 (Hamakuapoko, Maui)

Thank you for your letter of July 16, 1999 with comments and questions regarding the above project. We will attempt to answer your questions to the best of our understanding using available information and opinions. We will respond to your comments in the order presented in presented in you letter.

1A. The discussion of drought in the EA is based on the record of flow in Wailoa Ditch from 1924 through 1987. The gaging station was discontinued in 1987. The 64 year record has provided a set of statistics from which drought occurrences have been extracted, and from which the probability of an extremely dry year (average flow two standard deviations or more from the mean) is 1 in 32 years, and of a dry year (one standard deviation from the mean), such as we are now experiencing, is 1 in 6.4 years. A reasonable conclusion is that a drought is expectable about 1 in 5 years, but when that year will occur is not possible to predict. Cycles of wet and dry years are not detectable in either rainfall or stream flow records, although speculative suggestions of cycles are common. Fourier analysis, a mathematical procedure to elicit cyclicity from a record, discounts the occurrence of cycles. For the period 1987-1996 the flow record at Honopou Stream above its diversion into Wailoa Ditch can serve as an indicator of flow in the Ditch. The record is plotted on the attached graph. A scan of the record suggests that drought periods were experienced in the Summer of 1988, the Fall of 1991, and the Spring of 1995. Since the drought guidelines were adopted, a drought warning have been declared in 1996 and drought emergencies have been declared in 1998 and 1999.

1B. A detailed discussion is provided in 1A.

1C. The wells will be fitted with 500 gpm pumps (0.7 mgd) which will yield a total of 1.4 mgd under continuous 24 hour per day pumping. Because over the short tem the groundwater resource is unaffected by drought, the wells can consistently supply 1.4 mgd to the system no matter what water restrictions are imposed.

1D. There are 8,711 services in the Makawao District which is considered the UCWS, of which 561 are paying agricultural rates and 8,150 regular rates as of June 30, 1998. During the fiscal year1998, regular services consumed 1,293,455 thousand gallons and the agricultural services consumed 1,004,673 thousand gallons. With reliance on the USDA Natural Resources Conservation Service FEA, the projected consumption will be 0.7 mgd during periods of abundant water supply at the source on the Upper Kula line. During times of water shortage, agricultural water will be rationed or curtailed to conserve for domestic uses. The proposed agricultural pipeline will continue to utilize the available existing source, so impact on drought will remain unchanged.

1E. DWS, during the DEA process, have decided to pursue the complete treatment of the well water for domestic use and to supplement the UCWS with it rather than to supplement the HC&S irrigation to exchange for additional surface waters.

1F. The statement refers to water from the wells only. If the ditch flow is too low to supply DWS needs, the DWS must get along with what they have from its own system.

1G. DWS needs 480 volt power to operate the two well pumps and booster pumps. Communications easements are to be included, but alternative communication systems may be available.

1H. The wells and their potable yield of 1.4 mgd are part of the EMPlan. The "drought emergency" plan was promulgated in order to get the wells operational should a drought occur. A court-ordered SEIS for the EMPlan in which the Hamakuapoko wells are included is being prepared.

1I. In answering the questions, we refer to the work done by GMP Associates, a Honolulu Consulting Engineering firm with experience in the design and operation of GAC plants. According to their study of August, 1994, it is estimated that the granulated activated carbon needs to be changed once every six months. The filters holding the spent GAC are taken off the line and the spent GAC removed and replaced. The spent GAC is disposed of by shipping out to Oahu for incineration or burial in a landfill.

2A. The hydro electric plant at Kamole Forebay is a privately owned power plant operated by

HC&S. Since the project is to add treated water to the Kamole Water Treatment Facility clear well, this action will not impact the amount of power generated or lost. We understand that in order to operate the Hamakua hydroelectric plant, ditch flows of the order of 90 mgd is needed.

2B. The map dimensions of Reservoir No. 10 are 500 feet by 300 feet. Assuming a depth of 10 feet gives a full volume of 1.5 million cubic feet, equivalent to 11 million gallons. If the reservoir is not lined, leakage may be high. We do not have data about leakage at the reservoir, but it is likely to be significant if it is not lined. The evaporation rate in the vicinity of the reservoir is approximately 72 inches per year, or an average of 0.19726 inches per day. Over an area of 150,000 square feet, this equates to 18,444 gallons per day which is equivalent to 1.84 percent of the pumpage from the Hamakuapoko wells.

2C. In addition to evaporation and reservoir leakage, other unaccounted for water could mean leakage from the discharge line, valve, and other parts of the system.

2D. According to the archaeological survey conducted by the Aki Sinoto Consulting firm, all gulches crossed by the waterlines were surveyed. Hamakuapoko Well No. 2 is located in this dry gulch and would have been covered by the survey. The area from Well 2 to Reservoir 10 is a small gulch which was surveyed as part of Well No. 2.

3Ai. The sustainable yield in the Paia aquifer is 8 million gallons per day, while that for the Haiku aquifer is 31 mgd.

3Aii. Map showing wells in the Paia, Haiku and Makawao aquifers is enclosed.

3Aiii. Public wells planned are those listed in the EM Plan. Capacities are expected to range from 0.5 to 1.5 mgd. Additionally, the DWS may put in wells at the 1800 to 2000 feet elevation for drought backup. The capacity would be expected to be 0.5 to 2 mgd. Private wells that are as yet not being used on a regular basis include the Kaupakulua Well @ 1.66 MGD. Other private wells that may be planned at this time are unknown.

3Aiv. See attached map.

3Av. None of the wells in either the Haiku or Paia Aquifer Systems will be measurably affected by pumpage from Hamakuapoko wells. The Paia System yields non-potable brackish water. Even though other Paia wells are down-gradient of the Hamakuapoko wells, according to testing done, they will not be impacted discernibly.

3B. In Hawaiian hydrology "perched water" refers to zones of saturation resting on poorly permeable strata that are not in contact with sea water, as is the case in "basal water".

Some perched aquifers are extensive, others are small, but rarely is a perched aquifer exploitable for municipal or agricultural use. Sporadic flow in streams in the Haiku Aquifer System originate as drainage springs from perched aquifers in the Kula formation. The volume of drainage is small, and the portion that reaches a stream channel soon percolates out of sight.

3C. Omitted in the letter.

3D. The basal lens has a head (water table elevation above sea level) of about 5 feet in the mid-sector of the Haiku Aquifer System, yet the land elevation is hundreds of feet higher. Stream flow measurements made by the U. S. Geological Survey in Maliko, Kuiaha, and Kaupakulua drainages proved that none of the streams are perennial. Additional reconnaissance by Tom Nance Water Resources engineering in Maliko Gulch verified the U.S.G.S. observations. If the basal lens reached to the level of stream channels, flows would be perennial. An additional factor that invalidates the speculation that basal water ascends to high elevations is the salinity of the pumped groundwater. Were the head of the basal lens just 100 feet, for example, depth of the fresh water below sea level would approach 4,000 feet. Virtually no rate of draft would be able to entrain underlying salt water, and every well would produce water having a chloride content of 20 mg/l or less rather than the 50 to 100 mg/l now encountered.

3E. The drawdown of 2.82 feet in Hamakuapoko Well No. 1 at a rate of 712 gpm is caused chiefly by flow turbulence as water enters the well bore. Laminar drawdown in the aquifer is less than 1 foot and the hydraulic conductivity (permeability) is greater than 1000 fl/day. Under pumping stress the water moves easily through the highly permeable formation and does not distort the horizontal flow pattern to the well, which avoids upconing of salt water.

3F. Pumping rates to approximately 500 gallons per minute at each of the Hamakuapoko wells, according to well tests, will not likely appreciably induce increase in salinity of the pumped water.

3G. The recognized methods of treatment to remove EDB, DBCP, and TCP are the granulated and powdered activated carbon processes, air stripping, adsorbent resins, and membrane technology (Nanofiltration) methods. These are described as follows:

<u>Activated Carbon - Granulated and Powdered</u>

Granulated activated carbon (GAC) is used to adsorb organic molecules. Contaminated influent water is passed through a bed of GAC to allow close contact between the water and the carbon particle. The GAC retains the organic molecules and the water passes

through to a collector at the bottom of the bed. Spent carbon is disposed of either by incineration or burial in a landfill.

Powdered activated carbon (PAC) is added to a process stream to adsorb organic molecules. The spent carbon must later be removed by filtration and properly disposed of.

Air Stripping

This process involves bringing air and water into close contact. The usual water purification aeration methods are ineffective for removal of contaminants such as EDB an DBCP. The removal of such contaminants require high ration of air to water. This is achieved by backed tower aeration wherein the flow of contaminated influent water is directed downward into a tower packed with inert packing material through which a countercurrent of air is forced upward. The volatile contaminants are carried upward in the airstream and voided into the atmosphere or is treated to remove the contaminants. The purified water stream is collected at the bottom of the tower.

Adsorbent Resins

These are small beads of resins treated to selectively adsorb certain contaminants. The beads are placed in a vessel and contaminated water is continually passed through the resin until the adsorbent capacity of the beads is exhausted. The resin beads can be regenerated bu rinsing with a suitable chemical solution that removes the contaminants from the beads. The rinsing solution must then be properly disposed of.

Membrane Technology - Nanofiltration

Involves the pressurized flow of contaminated influent water through special membrane. Molecules larger than one nanometer, divalent salts, and most organic molecules with approximate molecular weights of 300 g to 1,000 g are prohibited from passing through. The process is much like the current membrane desalination methods except that the disposal of the waste stream must be closely controlled.

3H. As of this date, there is no firm agreement between HC&S and the Maui DWS on the exchange ratio of their respective supplies. However, HC&S has expressed reservation on the use of the contaminated water for irrigation, mainly because of the uncertainties of environmental laws on contamination levels related to adverse effects. As a result, HC&S feels that it would be prudent for the Maui DWS to treat the potable water for potable purposes.

3I. At the levels encountered in the Hamakuapoko wells, the potential adverse effects on the environment and animals, of EDB, DBCP, and TCP are not known. Should the water remain untreated, it will flow to the ocean causing unknown effects. The DWS is not able to assume liability for actions of others and has decided to treat the water. The State Department of Health (DOH) maximum contaminant levels (MCL) for EDB and DBCP is 40 ppt and for TCP is 500 ppt, and these standards must be met before water can be considered potable. It is not known as to the concentration of these pesticides which would be harmful to plant life but Department of Agriculture personnel feel it would have to be extremely high.

3J. The well water must be treated to meet DOH's MCLs (maximum contaminant levels) if it is to be diverted to the municipal system. The DOH in setting the MCL at 40 ppt which five times more stringent than the Federal level set at 200 ppt has made ample allowance to account for adverse affects on human life. Enclosed is the Executive Summary of a report which the DOH used to set the action levels for the pesticides.

3K. According to Mike Madsen of the Department of Health, the following are federal regulations governing the disposal of GAC filters:

40 Code of Federal Regulations (CFR), Part 60, New Sources Performance Standards (NSPS), Subpart D, Standards of Performance for Fossil Fuel-Fired Steam Generators for Which Construction is Commenced After August 1971.

40 CFR, Part 60 - NSPS, Subpart Da, Standards of Performance for Electrical Utility Steam Generating Units for Which Construction is Commenced After August 1978.

40 CFR, Part 60 - NSPS, Subpart Db, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units.

40 CFR, Part 60 - NSPS, Subpart Dc, Standards of Performance for Industrial-Commercial- Institutional Steam Generating Units.

Inquiries made of State and County offices indicated that they have no regulations and laws governing the disposal of GAC filters. The spent carbon may be incinerated or deposited in landfills under the Health Department's hazardous wastes regulations.

3L. The GMP and Associates study (August 1994), Appendix C, estimated that the carbon needs to be changed once every six months. The filters holding the spent GAC are taken off the line and the spent GAC is removed. The spent GAC is disposed of by:

1. Shipping to Oahu for incineration at a cement kiln, or

2. Burial in a landfill.

New GAC is loaded into the emptied filters and reinstalled in the process stream.

4A. We have not been able to obtain Federal, State, or County quality and health standards regarding the use of contaminated water for irrigation. However, we were informed by the State Department of Health that there is no legal prohibition on the use of chemically contaminated water for irrigation.

4B. For the level of contamination in the pumped water and the process through which the contamination took place, we interpret the Federal EPA RCRA regulations governing the use of groundwater pumped for irrigation. The Honolulu Board of Water Supply has been pumping water with higher levels of contamination than the Hamakuapoko wells with no evidence of adverse effects on their facilities.

4C. HC&S is reluctant to use the untreated water for irrigation because of vagueness or uncertainties in environmental laws. Our interpretation of the Federal EPA RCRA regulations is that it allows the use of such water for irrigation. The DWS does not plan to discharge contaminated water to possibly recharge the aquifer. The State DOH states that there is no legal prohibition against the use of this type of water for irrigation. The use of similarly contaminated water for irrigation on Oahu has been allowed for many years.

5A. Cost figures in the two tables are based on 90% availability of the sources. The wells are operational for about 330 days per year.

5B. Tables I and II are based on assumed conditions that have no relation to drought conditions.

6A. Long term plans for Haiku and Upcountry Water were discussed as part of the 1990 Water Use and Development Plan. Discussions and implementation include development of dual systems, evaluation of future reliability to meet 99% reliability to meet drought as well as maximum day demands and fire flow demands, and exploration of groundwater sources as redundant supply for drought conditions.

6B. For the upcountry water system, well development plans other than Kaupakulua Well, have not been formalized. Additional raw water storage at Kamole Weir and Lower Kula are being studied.

6C. Study being made for a raw water reservoir near the Kamole Weir from the Wailoa Ditch

and Upcountry Water Advisory Committee is reviewing possibility of a raw water reservoir near the Piiholo Water Treatment Facility.

6D. We have not rejected conservation as an alternative. We consider it a vital part of our program to conserve water throughout the year. Drought conditions require large quantities of water over relatively short periods of time. The typical water conservation program of a water department usually involves water savings steadily throughout the year. It is not geared to make large quantities of water available on short notice over short periods.

6E. A summary of the water conservation program which have been implemented includes low flow fixtures, reduction in unaccounted-for water, outdoor conservation, education of the public, drought restrictions, and increased reliability through reservoirs and wells. Enclosed are detailed descriptions of each.

7A. In the past, we had tried to consult with representative individuals and groups in upcountry Maui. In the future, we will make efforts to broaden our contacts with various groups. If you have any particular individual or groups in mind, please let us know and we will keep them listed among our contacts.

8A. According to Aki Sinoto, consulting archaeologist, "all of the gulches where the waterline crosses were inspected," (page 9 of his Archaeological Inventory Survey of the East Maui Waterline Project, Wailuku, and Makawao, Maui Island, September, 1992).

I hope we have given you satisfactory answers to you many thoughtful questions. Please let us know if we can furnish you with additional information or clarification.

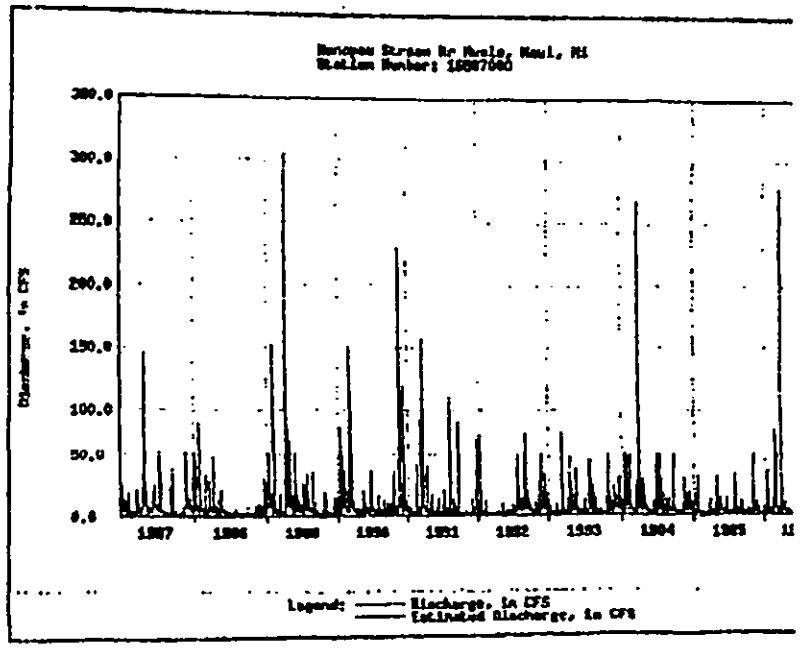
Sincerely,

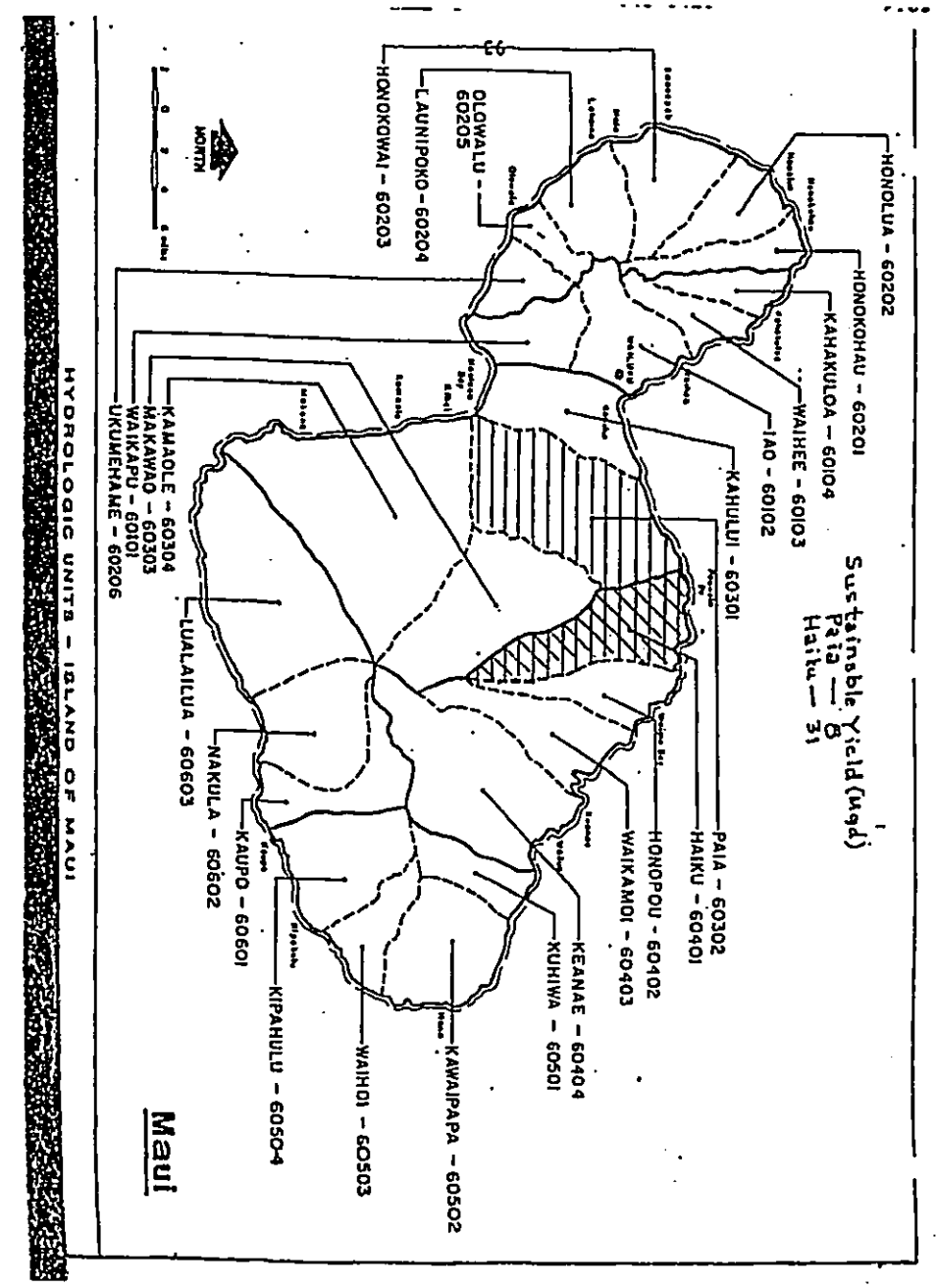
David R. Craddick
Director

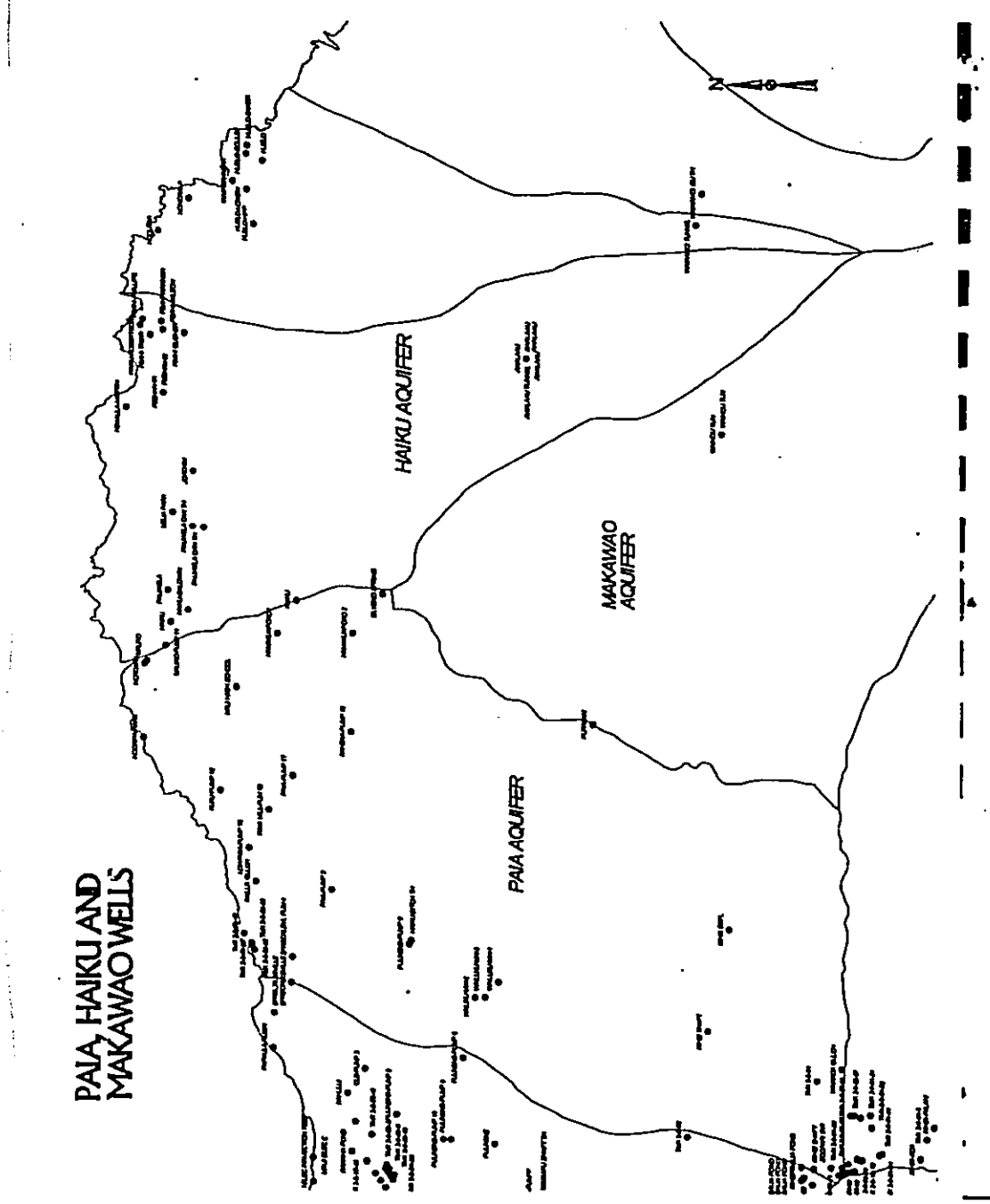
hk
enc.

USGS

Historical Streamflow Daily Values Graph for Honopou Stream Nr Huelo, Maui, Hi (16587000)







ANALYSIS OF POTENTIAL HUMAN HEALTH RISK AND APPROACHES TO SETTING ACTION LEVELS FOR PESTICIDES IN DRINKING WATER IN HAWAII

Prepared for:

Honolulu Board of Water Supply
Hawaii

and

Department of Health
State of Hawaii

and

Office of Environmental Quality Control
State of Hawaii

Prepared by:

ENVIRON Corporation
Washington, D.C.

December, 1985

For further information contact Dr. Robert G. Tardiff or Dr. Duncan Turnbull at (202) 337-7444.

1. EXECUTIVE SUMMARY

Three chemicals, ethylene dibromide (EDB), 1,2-dibromo-3-chloropropane (DBCP) and 1,2,3-trichloropropane (TCP), which are components of pesticide formulations currently or formerly used to kill nematodes in pineapple fields, have been identified at low concentrations in one or more wells that have been used to supply drinking water to communities on Oahu. The presence of these chemicals in the drinking water supply wells is of concern because two of them, EDB and DBCP, are known to cause cancer and various other toxic effects in animals. Although there is no definitive evidence that those chemicals can cause cancer in humans, it is accepted practice to assume that they have the potential to do so. The toxicity of the third chemical, TCP, has not been well studied, but its structural similarity to DBCP and other chlorinated hydrocarbons suggests that it also may be carcinogenic, though it is probably less potent than DBCP.

ENVIRON Corporation has evaluated the available toxicity data on these three chemicals and the available monitoring data to assess the levels of human exposure, and the potential risks to human health at those levels of exposure. Based on this analysis, we have determined that the risk of effects other than cancer caused by exposure to these chemicals at the levels at which they have been found in wellwater on Oahu is virtually zero. Also, except for individuals who were supplied exclusively with water from the Waipahu wells from the time that these wells first went into operation in 1970 to the time they were closed, the risk of cancer from current exposures to these chemicals is below that which is generally recognized by federal regulatory agencies as

presenting no significant public health concern. Prudent public health policy would dictate, however, that exposure to known or suspected carcinogens be reduced to the extent feasible, and at least to below the level that may produce a risk in excess of that normally considered by federal regulatory agencies as being of public health concern. This public health criterion corresponds to exposure levels in drinking water producing risk in the range of one excess cancer in 1,000,000 exposed people over a lifetime (70 years) to one excess cancer in 100,000 exposed people over a lifetime (often expressed as a risk of 10^{-6} to 10^{-5}).

To achieve this, ENVIRON recommends the establishment of Long-Term Goals of 2 ppt for EDB, 40 ppt for DBCP and 800 ppt for TCP. These are goals which are consistent with highly protective public health policy, but some may be slightly beyond current technological capabilities (e.g., 2 ppt is below the current analytical detection limit for EDB). If any of these Goals is exceeded for a prolonged period, plans should be developed for remedial action to reduce the levels reaching the consumers.

Concentrations of up to 20 ppt EDB, 400 ppt DBCP and 2,000 ppt trichloropropane are still protective of public health (even lifetime exposure at these levels would yield a risk of no more than one excess cancer in 100,000 exposed people) and are consistent with several past EPA actions. We recommend these as Long-Term Action Levels. If any of the Long-Term Action Levels is exceeded, short-term and long-term remediation plans should be formulated in a timely fashion and implemented should the elevated concentrations persist for more than several months.

ENVIRON also recommends establishing Short-Term Action Levels at 85 ppt EDB, 1,700 ppt DBCP, and 8,000 ppt trichloropropane. If concentrations in excess of these levels are found, the wells should immediately be retested; and if the level is confirmed, the supply should be shut off within 24 hours, or have an effective treatment system, such as granular activated carbon, installed within the same time period. If a treatment system is used, the water emerging from the systems should be monitored to ensure the level of the contaminant is below the Long-Term Action Level, and preferably below the Long-Term Goal.

Because the deep aquifer in the central portion of Oahu has apparently been contaminated with trichloropropane, DBCP, and, to a lesser extent, EDB, and since, at least for DBCP, the rate of hydrolysis and degradation is very low, these contaminants may be present in the aquifer for a prolonged time. In the absence of a detailed hydrogeological survey to determine sources and distribution of contaminants in the aquifer, it is not possible to determine in advance (without testing) whether any particular well is now contaminated, or may become contaminated in the future. It is, therefore, necessary to institute a monitoring program to assess the level of contamination of each well used to supply drinking water. Routine monitoring for EDB, DBCP and trichloropropane at six-month intervals is recommended. If the Long-Term Action Level is exceeded for any contaminant, however, more frequent monitoring (once or twice per month) should be conducted for that contaminant until the concentration either drops below the action level, or an effective treatment system is installed. At that time, monitoring of the <u>treated</u> water may return to once every six months.

Brief Summary of Conservation Program - Upcountry

Low Flow Fixtures
The Department has established legal requirements on new development and provision of low flow fixtures for retrofit. Ordinance # 2108 was spearheaded by the Department, and amended Title 16.20 of the Maui County Code, to require low flow fixtures in all new development. This was passed in May of 1992. Since roughly June of 1996, the Department has also distributed various low flow fixtures to consumers, free of charge. To date, roughly 4,900 showerheads and 1,160 low flow faucet aerators have been distributed upcountry. We estimate that the combined effects of these efforts result in roughly 71,000 gpd in savings, or 1% of upcountry demand. These savings should continue to grow as the program progresses.

Reduction of Unaccounted-For Water
The Department has had 2 survey ground microphones and a correlation to help pinpoint leaks for roughly the past 7 years. Recently, this old equipment has been refurbished, while 6 additional leak detection ground microphones were purchased and tested. Testing is still continuing. In previous years, leak detection has been utilized when a leak is suspected based on odd readings. Once calibration is complete, and the radio read meters free up some meter reader staff time, we intend to embark on an on-going systematic leak detection program.

Replacement of old meters with newer more accurate models also reduces unaccounted for water. Over 8,000 meters upcountry have been replaced with the new radio-read meters. Factors such as dry weather and drought restrictions can alternately exaggerate or mask the effects of this measure, so the exact amount of the impact is hard to quantify. Apparent savings seem to be in the range of ten to twenty percent of losses. Actual savings may be less, but it is at least clear that the new meters have offered a significant reduction in unaccounted-for water.

Outdoor Conservation
Between one and two thirds of water used in the home is consumed outdoors. Therefore, outdoor conservation is one of the largest opportunities for water conservation.

In order to realize this opportunity, there are several steps that must be taken. Some years ago, with a xeriscape committee, DWS and other committee members drafted a water-efficient landscape ordinance - about 85% complete. At that time, the committee determined that there was a lack in certain supporting structures that would make a landscape ordinance more effective. Specifically, these were: 1) adequate information about how to grow and propagate desirable native plants, 2) adequate information about which non-native plants were desirable, vs. those which were invasive, 3) adequate reliable suppliers of native plants, 4) a certification program to insure that sales of native plants sold were not at the expense of rare populations in the wild, 5) adequate demonstration efforts to encourage interest and marketability of appropriate landscape choices.

Since that time, the Department and other agencies and individuals have been working steadily to put these supporting structures in place. We have developed educational materials and advertising for native plants, we have worked with the USGS Biological Resources Division and the Hawaii Ecosystems at Risk Project to develop lists of and information on non-desirable plants, we have set aside funds for the Maui Botanical Gardens, as well as for other demonstration efforts that didn't progress as far, we have supported local nurseries growing native plants through our give-aways, and contracted for more supplies through the Botanical Garden when it is established. Other agencies have worked on developing certification programs for nurseries selling native plants.

Education
With every permit review, the department distributes educational materials on conserving water both indoors and in the landscape. Educational materials are also distributed at fairs & events, at water department counters, upon request to the public, and at public meetings and talks. The department has developed a landscape conservation brochure, still evolving but in use, and is in the process of developing a landscape section for its web page. The Department has been gradually increasing its conservation outreach efforts. Conservation is advertised in the newspapers and on the radio, and has purchased advertising space for movie theater screens for conservation ads.

Drought Restrictions
Voluntary and mandatory restrictions on water use significantly increase conservation during drought events.

Increasing Reliability
The Department is in the process of designing two more large source water reservoirs, and providing emergency connections between groundwater wells and the upcountry systems. Both of these capital programs will assist, not so much in conservation, but in protecting upcountry customers and mitigating drought emergencies.

HC&S

G. Stephen Holaday
Plantation General Manager, HC&S
Sr. Vice President, A&B Hawaii, Inc.

July 21, 1999

Mr. George A. L. Yuen
Mink & Yuen, Inc.
1670 Kalakaua Ave., Suite 605
Honolulu, HI 96826

Dear Mr. Yuen:

Thank you for this opportunity to comment on the Draft Environmental Assessment for the Drought Emergency Installations regarding the Hamakuapoko Wells No. 1 and No. 2 dated June, 1999. Below are our comments and concerns:

1. The draft EA proposes that the water from the two Hamakuapoko wells be pumped into HC&S' reservoir #10 and an equal amount be withdrawn by the Department of Water Supply ("DWS") from the Wailoa Ditch at the Kamole Weir treatment plant. The DWS was informed previously that this 1:1 exchange ratio was unacceptable to HC&S. A 1:1 exchange ratio would be inequitable to HC&S because reservoir #10 is unlined and seepage loss is a factor along with the approximately 220' lower elevation difference in relation to the Kamole Weir. Due to the elevation of some of our wells, we need to keep the water at the highest possible level.

2. Due to unclear environmental laws and potential adverse effects on the environment and animal life, HC&S is reluctant to accept any water into our irrigation system from the two Hamakuapoko wells which contain DBCP and other contaminants.

3. The proposed pipeline route up to the Kamole Weir treatment plant or to the existing Maunaolu water line from the two wells is acceptable as long as there is no loss of agricultural lands, no interrupting of HC&S operations, and the route is agreed to by HC&S.

In light of the above comments, it may be prudent to put the water from the two Hamakuapoko wells directly into the upcountry system with appropriate treatment. Again thank you for the opportunity to comment on the draft environmental assessment.

Sincerely,

G. Stephen Holaday
Plantation General Manager

HAWAIIAN COMMERCIAL & SUGAR COMPANY, A DIVISION OF A&B HAWAII, INC.
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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

September 6, 1999

Mr. Stephen Holaday
Plantation General Manager
Hawaiian Commercial and Sugar Company
P.O. Box 266
Puunene, Maui, Hawaii 96784

RE: Draft Environmental Assessment for the Drought Emergency Installations
Hamakuapoko Well No. 1 and No. 2, Pumps and Water Mains (Hamakuapoko, Maui)

Dear Mr. Holaday:

Thank you for your letter date July 21, 1999 expressing your concerns regarding the subject environmental assessment (EA).

We appreciate your position on the exchange ratio. We realize that we have not reached an agreement on this matter, and we propose that discussions continue with the hope of arriving at a final resolution in the near future.

At this time, the Department is pursuing treatment of Hamakuapoko Wells No. 1 and No. 2 waters by granular activated carbon (GAC). The final EA will be revised to reflect this decision.

Thank you for your thoughtful review and comments. As always, your cooperation is much appreciated.

Sincerely,

David R. Craddick
Director

/wkt
cc: Mink & Yuen, Inc.

"By Water All Things Find Life"

Printed on recycled paper

BENJAMIN J. CAYETANO
GOVERNOR

07:0175

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GENEVIEVE SALMONSON
DIRECTOR

RECEIVED
1999 JUL 26 PM 12:00
DEPT. OF WATER SUPPLY
COUNTY OF MAUI

July 21, 1999

Mr. David Craddick, Director
Department of Water Supply
County of Maui
200 South High Street
Wailuku, Hawai'i 96793

Dear Mr. Craddick:

The Office of Environmental Quality Control has reviewed a June 1999 document prepared by Mink and Yuen Inc., and entitled: "Draft Environmental Assessment for the Drought Emergency Installations, Hamakuapoko Wells No. 1 and No. 2, Pumps and Water Mains (Hamakuapoko, Maui)." We submit the following comments for your response.

1. NEED FOR A SUMMARY IN A CLEARER, NON-TECHNICAL, EASY-TO-READ WRITING STYLE

As a whole, the draft environmental assessment is very difficult to understand. The document should include a summary, written in a non-technical style which clearly identifies the parties in this plan (including those indirectly affected such as lower Kula and Hawaiian Home Lands interests), the facilities/land and/or water which they own or control, their specific roles and responsibilities, and a table showing what the specific elements of the exchange are. This summary can augment the technical information in the document by making reference to specific technical sections of the environmental assessment if the reader needs more information.

2. REGIONAL TOPOGRAPHIC MAP

The topographic information on Figure 4A is difficult to read. Please reproduce so that the elevation contours can be clearly seen along with the Wailoa Ditch System.

3. SECONDARY AND CUMULATIVE EFFECTS (BIOLOGICAL, CULTURAL, PHYSICO-CHEMICAL AND POSSIBLE HEALTH IMPACTS) OF THE PROJECT

The indirect and cumulative effects of the County's proposed exchange of water in the Hamakuapoko Wells 1 and 2 for additional water from the Wailoa Ditch system needs to be discussed. In the environmental assessment, please describe the source(s) of the Wailoa Ditch water from streams in the Ko'olau district and discuss the indirect and cumulative effects of adding more water to the ditch on Ko'olau stream biota and native cultural practices such as taro farming and riparian gathering of hihiwai (*Neritina granosa*), hapawai (*Neritina vespertina*) and other organisms.

Please also discuss direct, indirect and cumulative effects on the environment of using untreated water containing the soil fumigants ethylene dibromide, TCP's and dibromochloropropane from the two

Hamakuapoko Wells for irrigation purposes.

We are enclosing for your information and action copies of: *Content Guidelines for Biological Surveys, Ecosystem Impact Analysis and Mitigation Measures; Guidelines for Assessing Cultural Impacts;* and *Guidelines for Assessing Water Well Development Projects.*

4. DISCUSSION OF THE SIGNIFICANCE CRITERIA IN SECTION 11-200-12, HAWAI'I ADMINISTRATIVE RULES.

Page 37 contains statements which simply negate the significance criteria found in Section 11-200-12, Hawai'i Administrative Rules without providing reasons why such negation is possible. In light of any new information obtained from the above items and from other commenters, please revisit each of these significance criteria and give specific reasons why they are not significant (or significant as the case may be). A sample discussion from another environmental assessment is enclosed for your information.

Thank you for the opportunity to comment. If you have any questions, please call Mr. Leslie Segundo, Environmental Health Specialist at 586-4185.

Sincerely,

GENEVIEVE SALMONSON
Director

Enclosures

c: George A. L. Yuen, Mink & Yuen, Inc.

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

September 10, 1999

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Re: DEA for the Drought Emergency Installations -
Hamakuapoko Wells No. 1 and No. 2 (Maui)

Dear Ms. Salmonson:

Thank you for your letter of July 21, 1999 and your comments regarding the above project. The following is our response to your comments in the order presented in your letter:

1. The DEA is written in a style with explanations that are accessible to laymen with some familiarity with environmental science.

   In discussing your concerns with your staff, we understand that what is needed is a summary containing background information. The proposed action consists of utilizing the existing Hamakuapoko Well No. 1 and No. 2 with deep well pumps connecting by 8 inch pipeline to a GAC treatment facility where the ground water contaminants, DBCP and EDB, are removed and the finished water is pumped up to the Kamole Weir Water Treatment Facility clear well and further pumped into the Upcountry Water System. A detailed description is provided in the Final EA. The existing Upcountry Water System consists of three water systems of which the Kamole Weir System is considered the most reliable surface water source. The Lower Kula System receives its source water from a higher level and is supplemented by pumping from the Kamole Weir Water Treatment Facility. Hawaiian Home Lands receive its water at this level. The Upper Kula water system receives its source water from intakes which feeds Kahakapau Reservoir and can be supplemented by pumping from the Lower Kula System.

2. The regional topographic map in your reference is the USGS quadrangle which have a contour interval of 20 feet in the Hamakuapoko region and a scale of 1 inch = 2,000 feet. The primary purpose of the map is to show the well sites with relation to Kamole Weir and the Hamakuapoko Wells No. 1 and No. 2. The elevations are given in the text, Paragraph V.A. Well No. 1 is at elevation 704 and Well No. 2 is at elevation 782. The Kamole Water Treatment Facility is at elevation 1114.

3. The project involves delivering water into the Kamole Water Treatment Facility clear well. As such, the Wailoa Ditch system will not be negatively impacted as the existing treated water system is not being modified and therefore is fixed as to capacity. Water in the ditch flows westward from the collection areas in the Koolau rain forest. Water from the Hamakuapoko wells cannot travel eastward, uphill against the strong flow in the open ditch and therefore, will have no effect on biota in the Koolau streams or on any cultural practices based on stream flows east of Maliko Gulch. The flow in the ditch is existing use which is not being impacted by this action.

   The EA notes that the water from the wells must be stripped of contaminants to the State DOH maximum concentration levels (MCLs) before being used for either domestic or irrigation purposes. If the pumped water were not treated before irrigation, deleterious effects on the environment likely would be negligible. However, no investigations to validate this opinion or to prove otherwise have been made or are being contemplated. The concentration level of the contaminants is small in comparison with similarly contaminated waters in Hawaii.

4. Although the supporting information for the Findings and determination listed on pages 36 to 38 may be found in the text of the DEA, either directly or as conclusions, a detailed discussion covering the significance criteria will be included in the FEA.

Thank you for your comments.

Sincerely,

David R. Craddick
Director

hk

c: George A. L. Yuen, Mink & Yuen, Inc.

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
2550 Campus Road • Crawford 317 • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

July 23, 1999
EA:0189

Mr. David Craddick
County of Maui
Department of Water
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Craddick:

Draft Environmental Assessment
Hamakuapoko Wells No. 1 & 2 - Drought Emergency Installations
Wailuku, Maui

The above cited Draft Environmental Assessment (DEA) would augment existing water supplies during drought conditions by allowing water from the Hamakuapoko Wells numbers 1 and 2, and water from the Kamole Weir Water Treatment Plant, to be added to the existing Hawaiian Commercial and Sugar Company reservoir No. 10.

We have been assisted in this review by Richard Mayer of Maui Community College.

The known contamination of the Hamakuapoko wells with EDB, DBCP, and TCP poses some difficult environmental questions. As indicated in the DEA, if the water from these wells were to be used for potable purposes, treatment would be necessary. The DEA mentions use of GAC filters, and air stripping, however, there did not appear to be any analysis of the relative costs and effectiveness of the two methods. Since the GAC filters produce a contaminated, activated charcoal residual that in turn must be disposed at considerable cost. The relative costs and merits of other systems, particularly air stripping which has been so effective at Schofield on Oahu should be evaluated. Furthermore, if the water is not treated, as is suggested if its use is to be limited to agricultural purposes, it would seem that would risk contaminating the ground waters even more and poses a potential significant impact to non-contaminated ground waters. The argument that, "the water that percolates below the root zone will be stripped of most of the contaminants by biological and chemical reaction in the soil mass" seems unlikely. Presumably, if that were the case then the present contamination problems would not exist.

We appreciate the opportunity to comment on the DEA and look forward to your response.

Sincerely,

Jacquelin N. Miller
Associate Environmental Coordinator

cc: OEQC
Mink & Yuen, Inc.
Roger Fujioka
John Harrison
Richard Mayer

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

September 6, 1999

Ms. Jacqueline Miller
Environmental Center
University of Hawaii, Manoa
2550 Campus Road, Crawford 917
Honolulu, Hawaii 96822

RE: Draft Environmental Assessment for the Drought Emergency Installations
Hamakuapoko Well No. 1 and No. 2, Pumps and Water Mains (Hamakuapoko, Maui)

Dear Ms. Miller:

The Department is in receipt of your comments dated July 23, 1999 on the subject Draft Environmental Assessment (DEA). We have reviewed your comments and respond accordingly.

Studies conducted by GMP & Associates, an engineering consulting firm in Honolulu, concluded that the GAC treatment method is the most cost-effective under local conditions. GMP made a study, supported by pilot study data of the principal methods of treatment before arriving at their conclusion. Their studies led to their design of several GAC plants for the Honolulu Board of Water Supply, pg. 25 of the DEA, with reference to reference no. 9 and no. 10 in the list of references, has an explanation on why the GAC method was selected. The GAC method has the advantage of performance stability, operational ease, reliability, enclosed treatment, and no air emissions.

DBCP removal by packed tower stripping requires a very large tower to provide the required contract time of water and air. It has been estimated that packed tower stripping to remove 99% of DBCP costs about $7.00 per 1,000 gallons of treated water. The cost of GAC treatment at the Mililani well I is $0.31 per 1,000 gallons of treated water.

In regard to your comment on the stripping of contaminants by biological and chemical reaction in the soil mass, we wish to respond as follows:

Before withdrawing the nematocides EDB and DBCP from pineapple cultivation in the early 1980s, the rate of application varied between 3 and 11 gallons per acre per three (3) years. Assuming the lower rate was followed, the application calculates to an average of 0.039726 pounds per acre per day for DBCP (weight 14.5 pounds per gallon). On the other hand, if the Hamakuapoko well waters were to be used to irrigate sugar can, by assuming an irrigation rate of 750 gallons per acre per day and a concentration of 400 ppt for the DBCP, a total of 0.000007 pounds of DBCP per acre per day would be applied, about 6,000 times less than experienced when DBCP was still in use in pineapple cultivation. Volatization, adsorption and biological activity is likely to be able to reduce this small amount to an insignificant level.

A mass balance calculation indictes that when the nematocides were allowed, the concentration of the infiltrate percolating below the root zone would have contained 7,390,883 ppt DBCP (7,391 ppb) if none of the contaminant had been volatilized, adsorbed or broken down by biological activity. This high a level of contamination has not been detected in subsurface water or soils taken from pineapple fields, suggesting that substantial decay took place. Recent phytoremediation investigations at the Del Monte pineapple plantation super fund site in Kunia, Oahu have shown that water containing 235 ppb (235,000 ppt) DBCP is completely stripped of the contaminant during passage through about three (3) feet of soild.

Your time and efforts spent in reviewing and commenting on the subject DEA are appreciated.

Sincerely,

David R. Craddick
Director

/wkt
cc: Mink & Yuen, Inc.

ISAAC DAVIS HALL
ATTORNEY AT LAW
2087 WELLS STREET
WAILUKU, MAUI, HAWAII 96793
(808) 244-9017
FAX (808) 244-6778

July 23, 1999

Via Hand Delivery

Board of Water Supply
County of Maui
200 S. High Street
Wailuku HI 96793

Re: Draft Environmental Assessment for the Upcountry Drought Emergency Plan

Dear Board of Water Supply:

This letter is written on behalf of Coalition to Protect East Maui Water Resources, Hui Alanui o Makena, Mary Evanson and Marc Hodges. These comments are timely submitted. The Draft EA is inadequate for the following reasons.

1. The Upcountry Drought Emergency Plan

Judge Mossman entered an Order on October 23, 1998 directing the Board of Water Supply ("BWS") to prepare an Environmental Assessment ("EA") for the Upcountry Drought Emergency Plan. This Plan was attached as Exhibit "7" to the Coalition's Memorandum filed with the Court on July 24, 1998. This Plan involves the emergency use of four wells: (a) Hamakuapoko Well No. 1, (b) Hamakuapoko Well No. 2, (c) the Haiku Well and (d) the Dowling/County well.

This Draft EA only discusses the use of the two Hamakuapoko wells. This Draft EA cannot satisfy Judge Mossman's Order because it does not even begin to deal with the emergency uses of the Haiku and Dowling/County well.

2. Possibility of Drought Emergency

Comments are being submitted upon this DEA at a time when the BWS has declared a drought emergency and a proclamation of emergency is being sought from Governor Cayetano. A sober analysis of environmental impacts cannot take place in this context.

JUL-26-99 12:08 PM MINK.MND.YUEN

3. Emergency Use Only

The Upcountry Drought Emergency Plan permits pumping of the two Hamakuapoko wells only during emergency conditions. No effort has been made to discuss when emergencies have occurred in the past or the length of these emergencies. Without this information, it is impossible to determine how much pumping is anticipated to take place or over what period of time.

4. The Two Hamakuapoko Wells Are Components of the East Maui Water Development Plan

A prohibitory order was entered by Judge Mossman forbidding the implementation of the East Maui Water Development Plan until and unless a satisfactory Supplemental EIS is prepared. The use of the two Hamakuapoko wells is one phase or component of the East Maui Water Development Plan.

The Upcountry Drought Emergency Plan only contemplates the short term and temporary uses of these wells upon the satisfactory completion of the environmental process.

The environmental impacts of even short term and emergency use of the two Hamakuapoko wells have not been adequately addressed. The Draft EA does not address many of the subject matters which the BWS has already agreed must be studied in the Supplemental EIS.

At a minimum, the long-term and cumulative impacts of pumping the Hamakuapoko wells must be addressed in a more detailed and sufficient manner in the Supplemental EIS.

5. Parties Consulted

The Draft EA contains a list of parties contacted. There is no explanation for why members of the East Maui Coalition and others in East Maui were not contacted during the preparation of this Draft EA.

6. No Right to Water

The Draft EA contains no discussion of any right which the BWS does or does not have to the groundwater to be pumped. The BWS has no property right to this water. The BWS only possesses a "right of entry" which has been provided by the property owner on a short term and temporary basis only.

7. Discussion of Alternatives

There is no adequate discussion of alternatives. If the purpose of the Upcountry Drought Emergency Plan is to make an existing system more "drought-proof," the alternatives of constructing more and bigger reservoirs either in the upper system or near Wailoa Ditch has gone absolutely unexplored.

We currently understand that the only option under consideration is to construct costly treatment plants to remove the high levels of DBCP and other contaminants from the water and then to pump this treated water to the upper and lower Kula Water Systems. It is disclosed (but only in the back pages of the document) that a $2 million treatment facility to remove contaminants must be constructed at each of the two Hamakuapoko wells. These must be operated for at least 20 years at an annual operating cost of approximately $300,000 each.

It makes no sense to go forward with these expensive treatment facilities for wells to be pumped on a short term, emergency basis, especially when "drought-proofing" through the construction of non-controversial reservoirs has not even been explored. The comparative costs and benefits of each of these alternatives have not been addressed.[1]

Thank you for the opportunity to comment on this Draft Environmental Assessment. It does not prove that this project will not have significant adverse impacts and, therefore, a full EIS must be prepared. In the alternative, this Draft EA must be withdrawn, rewritten and resubmitted in a new environmental review process. We look forward to your response.

Sincerely yours,

Isaac Hall

IH/jp

cc: Coalition to Protect East Maui Water Resources
Mr. George Yuen, Mink & Yuen, Inc. 1670 Kalakaua Ave., Suite 605 Honolulu HI 96826
Office of Environmental Quality Control, 235 S. Beretania St., Suite 702, Honolulu HI 96813

[1] We hereby incorporate by reference all other comments which have been submitted.

June 15, 1999

Hui Alanui O Makena
c/o Mr. Isaac Hall
2087 Wells Street
Wailuku, Maui, Hawaii 96793

Subject: Draft Environmental Assessment for the East Maui Drought Emergency Installations, Hamakuapoko, Maui

In accordance with Chapter 343, Hawaii Revised Statutes, we transmit the subject draft environmental assessment for your review and comments. The Office of Environmental Quality Control has established a deadline of July 23, 1999 for inclusion in the final assessment.

Please send your original comments to:

Mr. George A.L. Yuen or Mr. John F. Mink
Mink & Yuen, Inc.
1670 Kalakaua Avenue, Suite 605
Honolulu, Hawaii 96826

Thank you,

George A.L. Yuen
President

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

September 10, 1999

Mr. Isaac Davis Hall
Attorney at Law
2087 Wells Street
Wailuku, Hawaii 96793

Re: Draft Environmental Assessment for Drought Emergency Installations, Hamakuapoko Wells No. 1 and No. 2, Pumps and Water Mains (Hamakuapoko, Maui)

Dear Mr. Hall:

The Department is in receipt of your comments dated July 23, 1999 on the subject Draft Environmental Assessment (DEA). We have reviewed your comments and have the following responses:

1. The drought emergency installations primarily involves the construction of Hamakuapoko Wells No. 1 and No. 2, pumps and water mains. The primary mechanism to achieve this is pump treated waters from Hamakuapoko (H'Poko) Wells No. 1 and No. 2 into a clear well at the Kamole Weir Water Treatment Plant (Kamole Weir WTP).

   The Kaupakalua well, which is part of a private development called the Kulamalu Project, is currently under construction. Upon completion of the Kaupakalua well and related appurtenances (i.e., tank, controls, etc.) it is anticipated that the Kaupakalua well will be dedicated to the Department. At this time, the developer has installed a temporary pump in the well that can be used to pump the well. All necessary water appurtenances, including provisions for disinfection, to deliver the well water into the Upcountry water system when needed in the event of a drought are available and can be installed in one to two weeks time.

   The Haiku Well is currently in use and a part of the Department's Makawao System..

2. On July 28, 1999 a Proclamation was issued by Governor Cayetano declaring a drought emergency in Upcountry Maui. The Department is continuing to complete the

environmental review process pursuant to HRS chapter 343 related to the installation of Hamakuapoko Wells No. 1 and No. 2, pumps and water mains to use the wells and GAC facility without intervention of the Governor.

3. The following are dates of Governor's Proclamations that were issued declaring a drought emergency for upcountry Maui: April 1, 1998 and July 28, 1999.

   Past drought occurrences were discussed on pp. 2-5 of the DEA. Moreover, a study of droughts based on a 64-year record (1922-1987) of Wailoa Ditch flow *(Wailoa Ditch at Kamole Weir; Analysis of Daily Record and Proposed Storage Requirement to Supply County DWS*, Mink & Yuen, Inc., March 3, 1997) yielded the following results:

   a. An extremely dry year, defined as a year with average flow less than or equal to the long-term average flow (110 mgd) less two standard deviations (1 standard deviation = 15.5 mgd), has a probability of 0.05, or once in 20 years.

   b. A dry year, defined as a year with average flow less than or equal to the long-term average flow less one standard deviation, has a probability of 0.15, or one in 6.7 years.

   c. In the 18-year period from 1970 through 1987, there were five periods of at least three consecutive months when the average ditch flow was less than half the long-term average. Three consecutive months of flow strains the water supply system of both DWS and HC&S. Assuming stability of the statistics for the 18-year period, the probability of a three-month or longer interval is 5/18, or 1 in 3.6 years. Of the five periods of poor average flow, three were for Summer-Fall months (July through October) and two for Winter months (December through March). The lowest persistent flow in the record took place in 1984 when the average from July to November was 41 mgd, but in September only 26, mgd and in October just 14 mgd. For the last two weeks of October, flow was a mere 11.6 mgd. The above statistics suggest that emergency conditions could be expected about on out of four years, and that the normal length of the mergency would be 90 days.

4. The subject DEA is being prepared to primarily address droughts. The installation of these necessary appurtenances results in a reliable, and cost effective source of water for the Upcountry area during droughts when the surface water sources are low. The use of these appurtenances during drought is short-term and not long-term.

Appropriately, any long-term impacts due to the use of these appurtenances will be addressed in the preparation of the Supplemental EIS for the East Maui Water Development Plan.

5. Your letter dated July 23, 1999 was written on behalf on the Coalition to Protect East Maui Water Resources, Hui Alanui O Makena, Mary Evanson, and Marc Hodges. With receipt of this letter, the Department assumes that the aforementioned parties have had the opportunity to review and comment on the DEA.

6. The right to the groundwater associated with the Hamakuapoko Wells No. 1 and No. 2 is an issue between the Board of Water Supply (BWS) and the property owner. Appropriate action will be taken at the time the BWS feels that this issue needs to be resolved. Until the Department has met all requirements pursuant to HRS chapter 343, funds will not be expended to purchase any property rights.

7. The Department believes the alternatives covered in the subject DEA are adequate. The construction of a reservoir to address droughts on a short-term basis is not a cost effective alternative. The drought installations are to provide Upcountry Maui a reliable source of water supply during droughts.

   Reservoirs are supplied by surface water sources that are affected by droughts. A reservoir to provide additional storage for upcountry Maui is currently being considered at a higher elevation than the Kamole Weir-WTP. Due to the planning, design, and construction time, a reservoir would be a long-term solution for the water system.

Treatment of Hamakuapoko Wells No. 1 and No. 2 water by granular activated carbon (GAC) is being pursued by the Department at this time. The final EA will be revised to reflect this decision.

Thank you for reviewing the subject DEA, your comments are appreciated.

Sincerely,

David R. Craddick
Director

/wkt
cc: Mink & Yuen, Inc.

JUL-28-99 11:18 From:DEPT HAW HOME LANDS 18085083843 T-615 P.01/01 Job-337

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

July 27, 1999

Mr. George A.L. Yuen
Mink & Yuen, Inc.
1670 Kalakaua Avenue, Suite 605
Honolulu, HI 96826

Dear Mr. Yuen:

Subject: East Maui Drought Emergency Installations, Draft Environmental Assessment, Hamakuapoko, Maui, Dated June, 1999

Thank you for the opportunity to review the subject application. The Department of Hawaiian Home Lands has no comment to offer.

If you have any questions, please call Rebecca Alakai at 586-3836.

Aloha,

Raynard C. Soon, Chairman
Hawaiian Homes Commission

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
TELEPHONE (808) 270-7816 • FAX (808) 270-7833

August 17, 1999

Mr. Raynard C. Soon, Chairman
Hawaiian Homes Commission
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaii 96805

RE: Draft Environmental Assessment for the Drought Emergency Installations, Hamakuapoko Well No. 1 and No. 2, Pumps and Water Mains

Dear Mr. Soon:

Thank you for your letter of July 27, 1999 indicating that you have reviewed our DEA for the East Maui Drought Emergency Installations. We also acknowledge that you have no comments to offer.

Sincerely,

David R. Craddick
Director

AUG 27 1999

"By Water All Things Find Life"

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P.O. BOX 621
HONOLULU, HAWAII 96809

AUG - 2 1999

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

Ref:PS:EH

Mr. George A.L. Yuen, President
Mink and Yuen, Inc.
1670 Kalakaua Avenue
Suite 605
Honolulu, Hawaii 96826

Dear Mr. Yuen:

Subject: Draft Environmental Assessment (DEA) for the East Maui Drought Emergency Installations, Hamakuapoko, Maui

We have reviewed the subject DEA document and offer the following comment for your consideration.

Engineering Branch:

The proposed project site according to FEMA Community Panel Number 15003 0195 C, is located in Zone C. This is an area determined to have minimal flooding.

Thank you for the opportunity to comment on the proposed project.

Should you have any questions or require further assistance, please contact staff planner Ed Henry at 587-0380.

Very truly yours,

TIMOTHY E. JOHNS
Chairperson

c.c. Engineering Branch

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DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
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September 6, 1999

Mr. Timothy E. Johns, Chairperson
Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Re: Draft Environmental Assessment for Drought Emergency Installations, Hamakuapoko Wells No. 1 and No. 2, Pumps and Water Mains (Hamakuapoko, Maui)

Dear Mr. Johns:

Thank you for your response on the subject draft Environmental Assessment. Your time and attention in this matter is appreciated. We understand that the project are is in a zone of minimal flooding.

Sincerely

David R. Craddick
Director

/wkt
cc: Mink & Yuen, Inc.

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