BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU

630 SOUTH BERETANIA

HONOLULU, HAWAII 96843

COPY

December 28, 1982

TO: HONORABLE EILEEN R. ANDERSON, MAYOR

VIA: ANDREW I. T. CHANG, MANAGING DIRECTOR

FROM: KAZU HAYASHIDA, BOARD OF WATER SUPPLY

SUBJECT: FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR WAILUPE WELL

We recommend your acceptance of the EIS for our proposed water development project. The EIS complies with all the requirements of Chapter 343, Hawaii Revised Statutes.

According to Chapter 343, your acceptance is a formal determination that the EIS adequately describes identifiable environmental impacts and satisfactorily responds to comments received during the review of the statement.

The Wailupe Well project would add 0.2 million gallons of water to the Honolulu Water District.

We have enclosed a copy of the environmental document for your information.

If you have any questions, please contact me at 548-6180.

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

Enc.

CONCUR:

Andrew I. T. Chang
Managing Director

ACCEPTED:

Eileen R. Anderson
Eileen R. Anderson, Mayor
City and County of Honolulu

Revised Environmental Impact Statement for the Wailupe Well Water Development Project

TMK: 3-6-19:35

October 1982

BOARD OF
WATER SUPPLY

CITY AND COUNTY
OF HONOLULU

CITY AND COUNTY OF HONOLULU
BOARD OF WATER SUPPLY

REVISED
ENVIRONMENTAL IMPACT STATEMENT
FOR THE
WAILUPE WELL WATER DEVELOPMENT PROJECT

TMK: 3-6-19:35

This Environmental Document Is Submitted
Pursuant To Chapter 343, HRS

PROPOSING AGENCY:

BOARD OF WATER SUPPLY
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

ACCEPTING AUTHORITY:

Mayor, City and County of Honolulu

BOARD MEMBERS:

Yoshie H. Fujinaka, Chairman
Robert A. Souza, Vice Chairman
Milton J. Agader
Michael J. Chun
Walter A. Dods, Jr.
Ryokichi Higashionna
Donna M. Howard

Kazu Hayashida 12/10/82
KAZU HAYASHIDA Date
Manager and Chief Engineer

PREPARED BY:

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677 Ala Moana Blvd., Suite 1016
Honolulu, Hawaii 96813

OCTOBER 1982

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SECTION I
SUMMARY

A. PROJECT DESCRIPTION

The Board of Water Supply (BWS) proposes to, put into production the Wailupe Valley exploratory well. This well capacity is rated at 0.2 million gallons per day (mgd) of potable water. It is located on an existing BWS reservoir site at the eastern end of Wailupe Valley. It will have an associated control building and will be connected to an existing transmission main between the two existing reservoirs. Water from this well will be developed for local domestic use.

B. DESCRIPTION OF THE ENVIRONMENTAL SETTING

Wailupe Valley is a narrow, deep, finger-shaped valley located 3 miles east of Diamond Head. The valley floor extends inland over 13,000 feet before sharply rising in elevation to over 2,500 feet at the crest of the Koolau Range. The ridges bordering the valley barely exceed 1,000 feet in elevation.

The soils of the valley floor are composed of clays, silty clays, clay loams, stony clay loams and stony silty clay loams. The flora of the valley are classified as non-commercial forest land and non-forest vegetation. The residential area is abundant with a variety of ornamentals. The fauna are limited to introduced species but the valley may be visited for foraging purposes by the pueo or Hawaiian owl.

The valley itself is the site of Aina Haina, a residential subdivision that began in the 1950's. Population has remained stable and there has been little change in the lifestyle.

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

The project site is within land designated as urban on the State Land Use District Boundary Map. According to the City and County of

Honolulu's General Plan, the site for the Wailupe Well has already been used for two BWS reservoirs.

The proposed action does not conflict with the general objectives and specific terms of the land use plans, policies and controls of the State Land Use Commission.

D. PROBABLE IMPACTS OF THE PROPOSED ACTION AND MITIGATIVE MEASURES PROPOSED

The principal beneficial impact will be the planned increase of 0.2 mgd of domestic water to meet the demand requirements of the BWS.

The adverse physical impacts expected from the project are those short-term impacts normal to any construction activity of a similar nature. Temporary increases in noise levels, air pollution from dust and vehicular emissions, disruption of traffic and inconvenience to tenants of the valley and users of valley roads are to be expected. Dust control measures, such as sprinkling, will be implemented to reduce dust levels. Noise control devices to lessen vehicular noise will be required for all construction equipment. Compliance with the conditions of a noise permit required by the Department of Health will be required to control noise levels.

A long term adverse impact will be the visual effect of the control building and well. Landscaping and architectural measures with the control structures and wells will soften the visual impact. The two existing BWS concrete reservoirs on the site will remain the dominant structures from a visual perspective.

E. PROBABLE ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

The unavoidable adverse environmental impacts are those short term, construction related, physical effects of air pollution from dust and vehicular emissions, noise from construction equipment and inconveniences to residential traffic.

The long term adverse impact, unavoidable because of the nature of the project, is the relatively insignificant visual impact from the associated control building.

F. ALTERNATIVES

Election of the "no project" alternative would deny the development of one of the needed water source development projects on the BWS list of required projects.

Alternate well locations within Wailupe Valley have been considered. They would require more construction, increasing the environmental impacts of the project as well as its cost. Additional sites for water are also being developed in other valleys in the Honolulu District.

Future alternate sources, including reuse of wastewater and demineralization, are under continuing study by the BWS. They all involve much higher capital and operating costs, making groundwater much more favorable for development at the present time.

Continued water conservation practices by the BWS will alleviate the wasteful use of water. The BWS has a three part conservation program which includes resource conservation, water system conservation and consumer conservation. Resource conservation involves watershed protection, rules and regulations, hydrologic observation and surveillance and optimal resource utilization. The water system conservation portion of the program affects the transmission and distribution of water supplies. This involves various means of metering all water entering the BWS system and its consumption, detecting leaks and controlling them and emergency procedures during power or mechanical failures which put stress on water sources. An important aspect of conservation identified by the BWS involves the consumer. This portion of the water conservation program includes a continuing

program of public information and persuasion, voluntary and mandatory controls by the BWS during low groundwater periods and household water saving devices.

Included under the program of optimal resource utilization is the concept of water exchange. Because the quality of Oahu's groundwater resources varies from sea water to almost pure rain water, the idea behind the water exchange system is to match water quality to use. This would reserve the best water for municipal uses and lower quality water for other suitable purposes, such as agricultural use.

SECTION II
PROJECT DESCRIPTION

A. INTRODUCTION

The project proposed by the Board of Water Supply consists of the development of groundwater within Wailupe Valley. This involves the conversion of an existing exploratory well, drilled and tested by the Division of Water and Land Development (DOWALD) of the State Department of Land and Natural Resources (DLNR), to a viable production well. The well will then be put into service at its rated capacity of 0.2 million gallons per day (mgd). The water pumped from this well will be discharged directly into the transmission main which connects two on-site 0.3 mg BWS water reservoirs to the existing water distribution system in Wailupe Valley. Water from the well not immediately required for use will be pumped to the reservoirs for storage. The project is part of the BWS's plan to augment water resources within the Honolulu Water Use District.

B. PROJECT OBJECTIVE

The objective of the proposed project is the development of groundwater within Wailupe Valley to assist in meeting the increasing domestic demand in the Honolulu Water Use District.

C. BACKGROUND

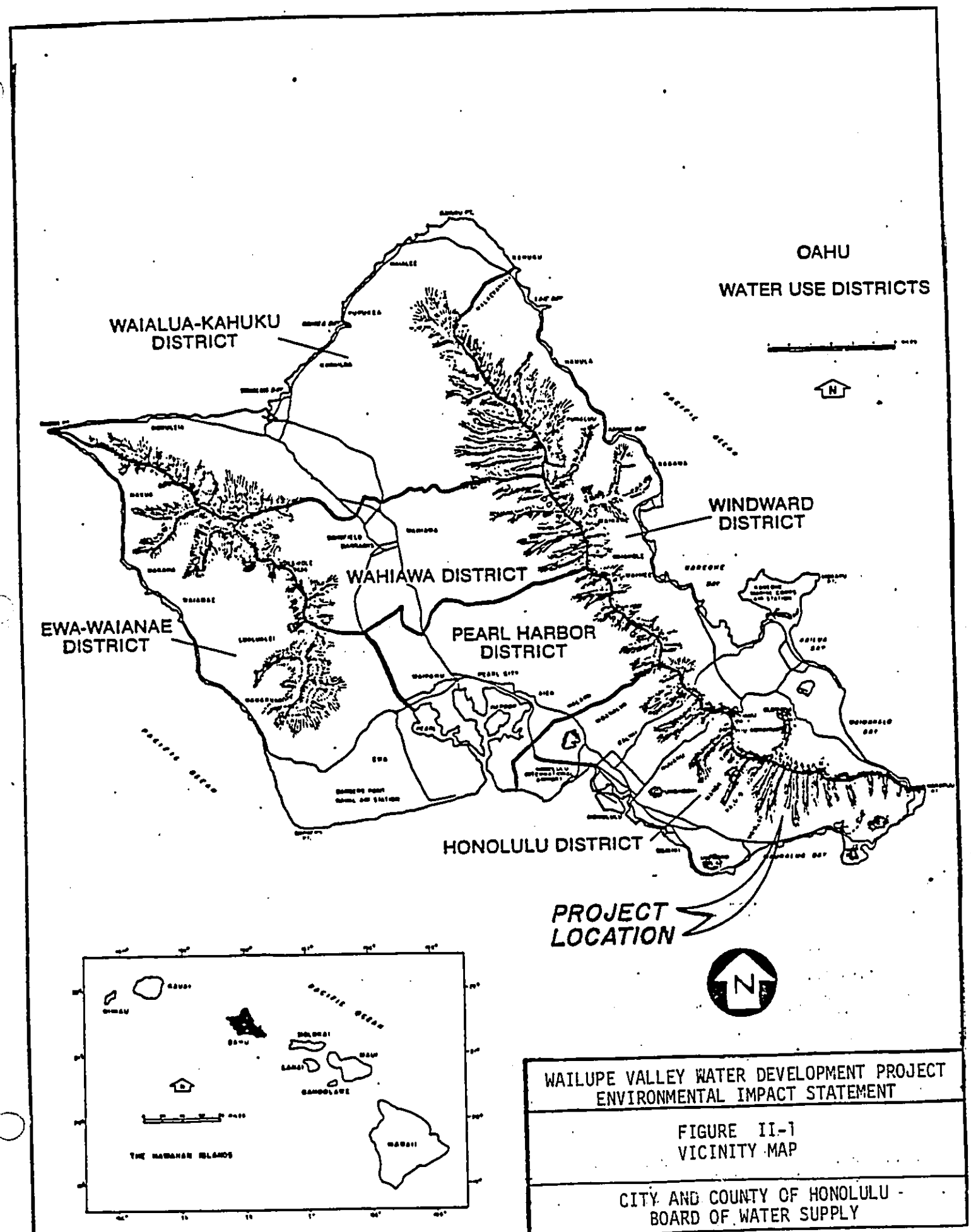
Nearly all fresh water on Oahu is presently obtained from groundwater sources. Oahu has a geological structure which results in locally complex hydrologic conditions. Impervious dikes, caprock and basaltic aquifers allow a large quantity of fresh groundwater to be stored. It has been computed by the BWS that an average of 650 mgd of rain water infiltrates into the ground to recharge this source.

Of the 700 mgd (including return irrigation) that does infiltrate into the ground, hydrologists estimate the dependable yield of our groundwater resources is between 480 and 630 mgd, assuming a recovery factor

greater than 75 percent of the latter quantity. This is the amount of groundwater that can be withdrawn daily without depleting or harming the system.

During the 1979 calendar year, the total pumped from groundwater resources of Oahu was approximately 408 mgd of which 134 mgd was drafted by the BWS, 222 mgd was used for sugar irrigation, and 60 mgd was consumed by predominantly military and private industrial users. The groundwater drafted by the BWS is expected to increase from 130 mgd in 1978 to about 192 mgd in 2000. The amount of groundwater that may be safely drawn from Oahu's groundwater resources is estimated at 480 to 630 mgd. Assuming that the quantity consumed by other users (sugar, military, industry) remains approximately constant at 280 mgd, the lower "limit" (480 - 280 = 200 mgd) on the amount of groundwater that can be efficiently extracted by the BWS will be reached around the turn of the century.

Due to the island's geological structure, terrain, and population distribution, there are water use districts with more developable groundwater sources than the demand within the area and vice versa. With the projected growth of the population, the total island-wide water demand will approach the total amount of groundwater that can be safely extracted. Thus, the full development of groundwater within each district is necessary to meet the island's needs. Although the island is divided according to water use districts (Figure II-1), it is the water system that determines what area a given source will serve. A water system can join two or more water use districts and the water extracted from each district goes into its associated water system to provide for the needs of that system. Presently, the Windward Water Use District is connected to the same system that services Honolulu and the Pearl Harbor Water Use Districts. Future BWS plans call for the joining of all the water systems into a single, integrated and island-wide system which will effectively interconnect each water use district.



WAILUPE VALLEY WATER DEVELOPMENT PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE II-1
VICINITY MAP

CITY AND COUNTY OF HONOLULU -
BOARD OF WATER SUPPLY

In order to meet the projected water demands on the Island of Oahu, the BWS has proposed the installation of a variety of water development facilities (generally wells) in each of the six water use districts as summarized in the Oahu Water Plan, July 1975. This plan, however, is based on population projections formulated in 1975. It is presently being updated using the State's II-F population projection series.

In the State Water Commission's report entitled, "Hawaii's Water Resources: Directions for the Future," January 1979, priority recommendations were outlined (Appendix B) for State administrative and legislative implementation. The report emphasizes the importance of the development of new and alternative water sources on Oahu. The Hawaii Kai area which includes the proposed Wailupe well site has been cited as an area with available water supplies as noted: "Moderate supplies are available in the Mokuleia, Waianae and Hawaii Kai areas."

Recent court decisions on water rights in Waihee Valley, Windward Water Use District, have caused the BWS to reevaluate its proposed schedule for source development. Realizing that it would not be able to develop as much groundwater in Waihee Valley, the BWS has made a reevaluation of its source development plans for the Honolulu and Windward Water Use Districts. Recommendations on source development, published by the BWS, are given in a report entitled "Honolulu and Windward Water District's Water Supply Status, December 1977." While not included in the report, the proposed Wailupe Well fits into the revised source development plans of the BWS to meet the water needs as reflected in the City's Development and General Plans.

The BWS is expediting the development of potential water sources in the Honolulu district to keep up with projected population demands. Table II-1 indicates the existing water development facilities for the Honolulu Water Use District. Table II-2 lists additional sources

Table II-1

HONOLULU DISTRICT WATER SUPPLY, 1979

District Sources	Withdrawal (mgd)
Moanalua Wells	4.08
Kalihi Shaft	6.66
Kalihi Station	3.82
Beretania Station	6.27
Wilder Wells	4.50
Kaimuki Station	3.68
Palolo Wells	1.22
Waialae Shaft	0.18
Aina Koa Well	0.40
Waialae Iki Well	0.19
Subtotal Pumped Sources	31.00
Kalihi Gravity	0.21
Nuuanu Tunnels	0.96
Alewa Heights Springs	0.16
Makiki Springs	0.35
Manoa Tunnel	0.34
Palolo Tunnel	0.27
Subtotal Gravity Sources	2.29
Total District Production	33.29
Imported Supply	
From Windward District	0.12
From Pearl Harbor	42.96
Total Imported	43.08
TOTAL DISTRICT WATER SUPPLY	76.37

Reference: Board of Water Supply
City and County of Honolulu
"Municipal Water Use Plan
Pearl Harbor, Ground Water Control
Area," October 1980

TABLE II-2

1981 - 1990 GROUNDWATER DEVELOPMENT

	Projects	Capacity (mgd)	Year On Line
1.	Haiku Well	1.0	1984
2.	Iolekaa Well	0.3	1984
3.	Wailupe Well	0.2	1984
4.	Kaluanui Wells	2.0	1985
5.	Waianae Well I	1.0	1985
6.	Kahaluu Well	1.0	1985
7.	Luluku Well	1.0	1985
8.	Makaha Wells II	1.0	1986
9.	Jonathan Springs Well	1.0	1986
10.	Kahuawai Springs	0.2	1986
11.	HeCo Waiau Project	5.0	1986
12.	Punaluu Well IV	0.5	1987
13.	Waimanalo Well II	1.0	1987
14.	Makaha Wells III	1.5	1987
15.	Kaipapau Well	1.0	1987
16.	Punaluu Well VA	1.0	1987
17.	Wailele Well	1.5	1987
18.	Laie Well	1.3	1987
19.	Kuou Well II	0.5	1987
20.	Manoa Well II	0.5	1987
21.	Maakua Well	0.5	1987
22.	Kahana Well II	0.5	1987
23.	Manoa Well I	0.5	1987
24.	Makaha Wells IV	1.0	1988
25.	Waialae Nui Well	0.4	1988
26.	Kamooalii Well I	0.5	1988
27.	Kaaawa Well I	0.5	1988
28.	Hakipuu Well	0.5	1988
29.	Kahana Well III	2.0	1988
30.	Makaha Wells V	1.0	1989
31.	Punaluu Well VC	1.0	1989
32.	Kaaawa Well II	0.5	1989
33.	Mokuleia Well	1.0	1989
34.	Kawailoa Well	0.25	1989
35.	Punaluu Well VD	1.0	1990
36.	Waimea Well	0.25	1990
	Total	33.90	

scheduled for development during the period 1981-1990. These are mainly small sources ranging from 0.50 to 2.0 mgd per well.

To meet the projected demand beyond the year 2000, alternate freshwater sources must be developed. The BWS is evaluating the following sources for future development:

1. Exchange of potable water used for irrigation with water of lower non-potable quality but still suitable for irrigation.

2. Collection and treatment of surface runoff.

3. Demineralization of brackish sources.

4. Wastewater reclamation for irrigation.

5. Desalination of sea water.

Due to the higher capital and operational cost involved in developing these sources, the complete utilization of the available groundwater are planned before any large scale development of the alternate sources. Section VII provides additional information on the status of these long-range development alternatives.

Meanwhile, the BWS is undertaking a program of water conservation consisting of three mutually supportive aspects. These are resource conservation, water system conservation and conservation by the consumer. Together these three will help to preserve Oahu's valuable water.

Resource conservation involves the protection of watersheds to preserve the origin of the resource. Rules and regulations ensure the proper development of the resources and safeguards them against contamination and overdraft. A fundamental part of this program is hydrologic observation and surveillance. The data received aids in

intelligent and informed decisions regarding operations and development. Water studies also benefit. As competition for groundwater resources grow, the BWS is emphasizing optimal resource utilization. This includes the concept of water exchange. Here, the quality of the water is best matched to its use. An example is the use of Oahu's best water for municipal uses and lower quality water for other uses such as golf course, medial strip and landscape irrigation. The dual use of water will also amplify the resource base. An example is wastewater treatment plants. Water is first utilized for domestic uses and after for sugar cane irrigation. Thus, water processed in this method not only supplements crop irrigation but also contributes to groundwater recharge. However, care must be taken to apply the water in suitable areas to avoid adverse effects on potable groundwater resources.

Water system conservation concerns the transmission and distribution of water supplies. The metering of water entering the water system and of water consumption enables the BWS to account for water supplies. A leak detection system was initiated in 1976 which surveys the water system for leaks. This allows the BWS to initiate repairs quickly thus limiting and reducing losses. Benefits arising from this program include indications of poor soil conditions, the need for changes in materials, standards and construction practices and the need for pipe replacements. In the event of power and/or mechanical failures, the BWS policy is that no consumer is deprived of water service if possible. Therefore, any breaks or other damages to the system are repaired as quickly as possible with minimum stress on water sources. The water system is designed for reliability and where possible multiple sources are interconnected. These factors coupled with knowledgeable personnel reduce the severity and duration of emergencies to a minimum.

Consumer conservation is fostered through various means. Public involvement is encouraged through information and persuasion. This is

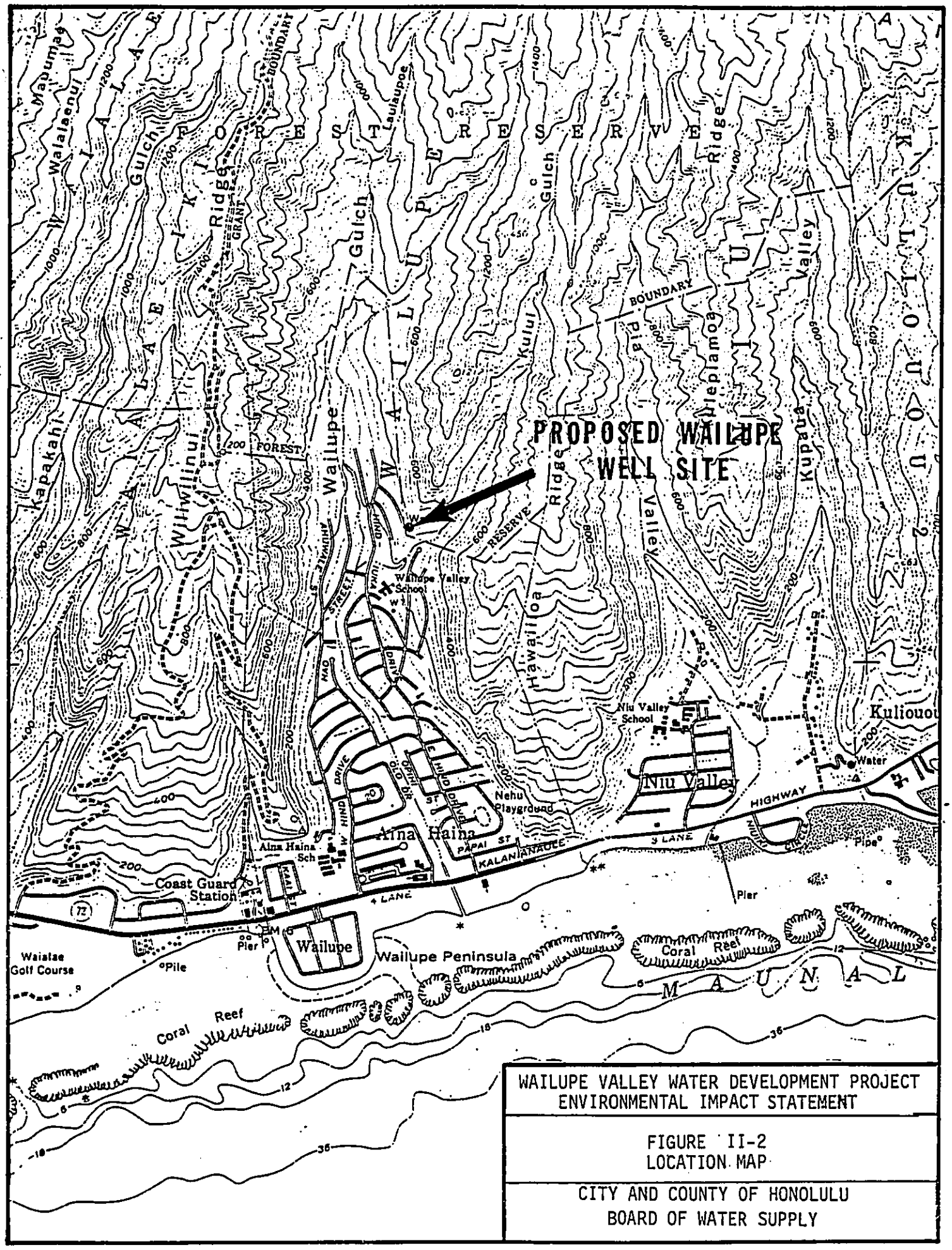
exemplified by meetings held with school officials, classes for children and discussions with the public. In 1978, amendments to Chapter III of the BWS rules and regulations provided for progressively restrictive measures as groundwater levels decline. These measures include voluntary conservation measures, mandatory irrigation restrictions and water allotments and restricted use of water depending on the low level condition. Household water saving devices are also incorporated into the consumer conservation program along with revisions to the Plumbing Code. The code requires water flow control devices, low volume flush toilets, and recirculation of cooling water in all new construction.

D. DESCRIPTION

The BWS is presently proposing the conversion of an existing exploratory well to a production water well within Wailupe Valley (Figure II-2). The well is sited on the same location as two existing BWS reservoirs (Figure II-3).

The drilling and testing of the exploratory phase of the well development has been performed by DOWALD of the State DLNR. The exploratory well consists of a hole size of 14 inches and a depth of 435 feet, from a ground elevation of 379± feet msl. The well was test pumped at a constant discharge rate of 350 gpm for 5 days and was then pumped at a constant discharge rate of 300 gpm for another 3 days (12 hours per day). An initial test rate of 250 gpm and 300 gpm had been prematurely aborted. The final results from the 5-day test recently completed are as follows:

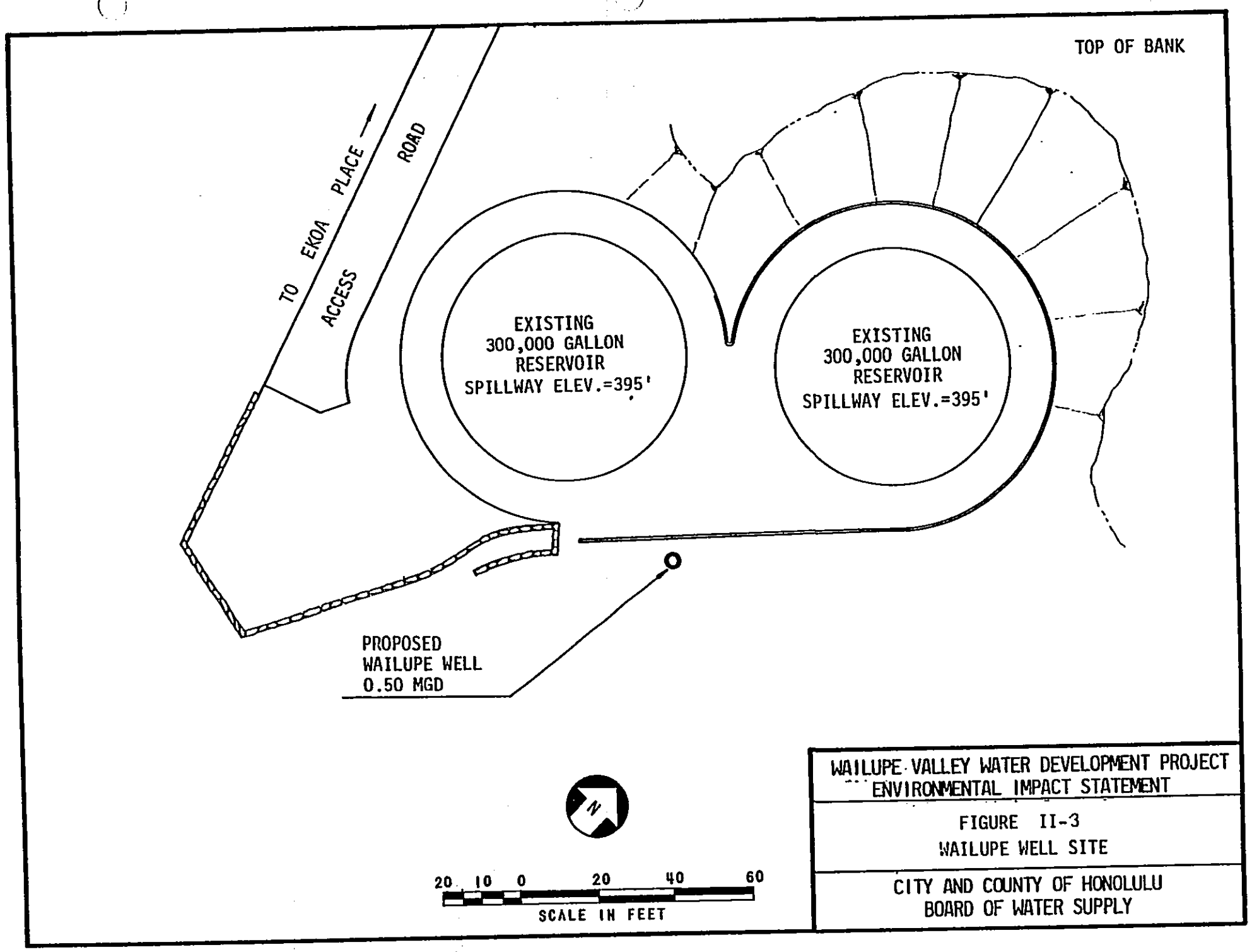
- At 250 gpm, drawdown = 6.2± feet
- At 300 gpm, drawdown = 8.0± feet



WAILUPE VALLEY WATER DEVELOPMENT PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE II-2
LOCATION MAP

CITY AND COUNTY OF HONOLULU
BOARD OF WATER SUPPLY



WAILUPE VALLEY WATER DEVELOPMENT PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE II-3
WAILUPE WELL SITE

CITY AND COUNTY OF HONOLULU
BOARD OF WATER SUPPLY

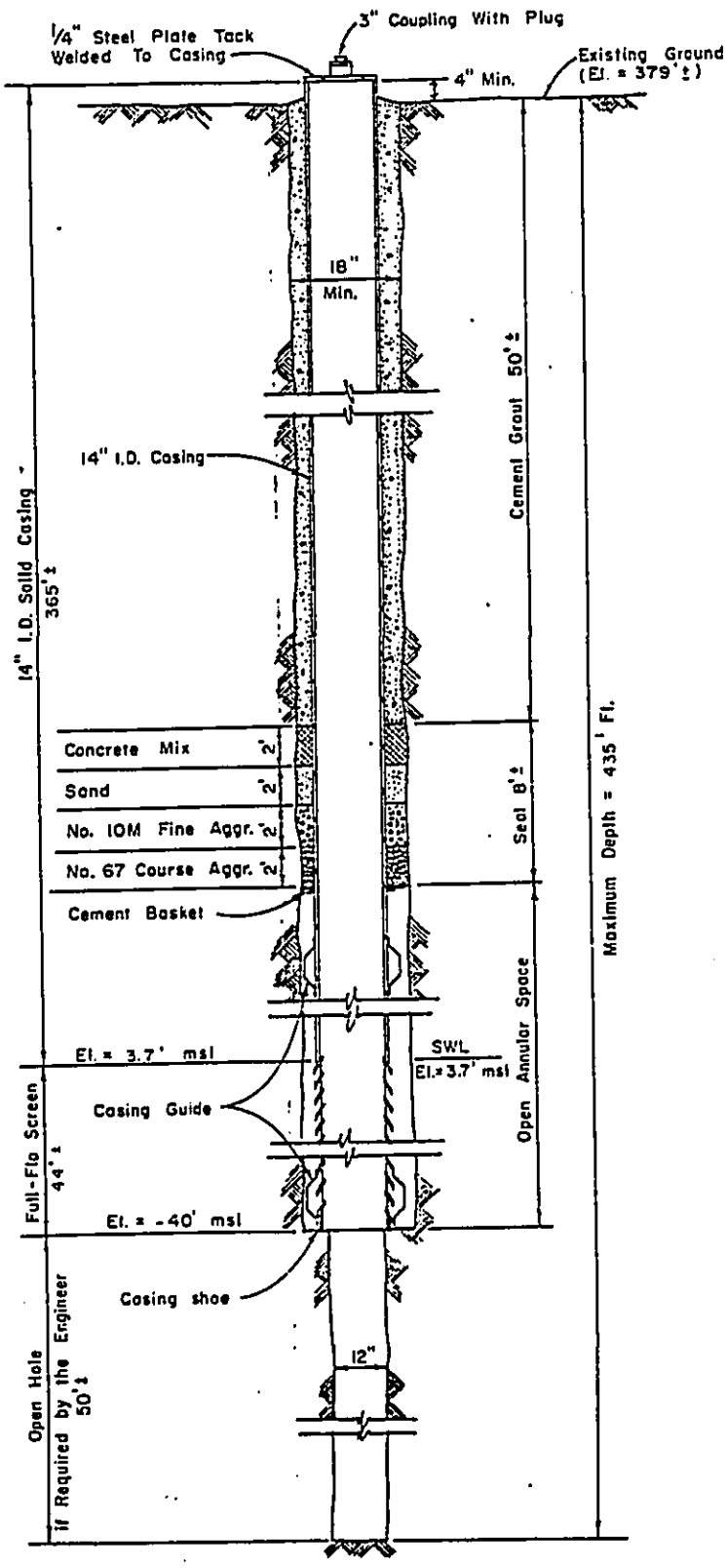
- At 350 gpm, drawdown* = 12.2± feet
- Chloride content of water = 75 mg/l
- Temperature of water = 19.5°C (67.1°F)

*During pumping test No. 2, the drawdown increased asymptotically 2.7 feet during the five days, to a final 14.9 ft. below static water level. From a semi-log plot of the drawdown data, it is estimated that drawdowns would be 16.8± ft. after 30 days, 17.6± ft. after 60 days, and 18.1± ft. after 90 days of pumping at a sustained rate of 350 gpm. Surprisingly, the recovery of the water level in the well was almost instantaneous and complete minutes after the end of the 5-day test. The well recovered to 0.4 feet of static water level to 0.3 feet after 9 minutes, and to 0.2 feet after 90 minutes.

Extensive testing of the well for water quality and quantity has now been completed. The exploratory well can now be converted into a production well and put into service at its rated capacity. The anticipated 0.2 mgd well will discharge directly into the transmission main which connects the two on-site BWS water reservoirs (0.3 mg capacity each) to the existing water distribution system in Wailupe Valley. Water not immediately required by users will be pumped to the reservoirs. The existing reservoirs provide water for the upper reaches of the valley.

A control building will be required. This is typically a small but attractive concrete block building constructed to house the control equipment, chlorination system, gauges, etc. Power and telephone cables to the control building and well will be easy to install since power lines are already in place for the two reservoirs next to the well. High voltage power for the well pump will have to be installed since the existing on-site power supply is inadequate. A new access road is not required because the road (Ekoa Place) to the reservoirs is adequate both for the reservoirs and the new well.

The development of the exploratory well (Figure II-4) into a production well includes the installation of a permanent BWS pump. Pump operation will be on an intermittent basis to meet the water



WAILUPE VALLEY WATER DEVELOPMENT PROJECT
ENVIRONMENTAL IMPACT STATEMENT

FIGURE II-4
WELL CONSTRUCTION

CITY AND COUNTY OF HONOLULU
BOARD OF WATER SUPPLY

demands of Wailupe Valley. The maximum daily pumpage duration will be about 16 hours at a rate of 100 to 150 gpm.

The chain link fence already installed around the reservoir site will restrict access to the well and control building during and after construction.

E. FUNDING

Construction of the facility is scheduled to begin in Fiscal Year 1982 at an estimated cost of $484,000. The monies will be from the Board's Capital Improvement Project's budget.

SECTION III
DESCRIPTION OF THE ENVIRONMENTAL SETTING

A. PHYSICAL CHARACTERISTICS

1. Climate

a. General

Hawaii's mild and equable climate is a direct consequence of its location in the northern fringe of the Tropic of Cancer. This places the Hawaiian Islands within the belt of cooling northeasterly tradewinds and is also responsible for the slight variation in the amount of energy received from the sun. Additionally, the ocean acts to decrease large temperature swings. The range of temperature between day and night averages about 7 degrees. During the summer, the day time temperature averages in the mid 80's while the night time temperature is in the low 70's. In the winter, the average day time temperature is in the high 70's and the night time temperature is in the mid 60's.

On Oahu, the average temperature in the lowlands is 75°F, decreasing 4°F with each 1,000 feet increase in elevation. January and August are the coldest and warmest months, averaging 75°F and 78°F, respectively. A record high temperature of 96°F has been recorded in the Waianae district; however, temperatures rarely exceed 90°F. Minimum temperatures hover around 50°F.

Oahu is the third largest island in the Hawaiian Island chain. On the windward side of Oahu, the Koolau Mountain range has elevations generally in the range of 2,000 to 2,500 feet. The highest peak is Puu Konahuanui at 3,150 feet. On the leeward side, the higher Waianae Mountain range has elevations generally in the range of 2,000 to

3,000 feet and includes Mount Kaala with an elevation of 4,020 feet, the highest on Oahu. These mountains determine the rainfall distribution of Oahu and therefore the distribution of water resources.

There are parts of the Koolau Range that average over 300 inches of rain a year. This rainfall sustains the irrigation of cane fields and the water supply for Honolulu. East of the Koolau Mountains the coastal rainfall averages between 30 and 50 inches of rain a year. Central Oahu receives about 35 to 40 inches. The Honolulu area receives about 24 inches a year but this amount increases to about 60 or 70 inches by moving inland 2 miles. The driest area is the coast west of the Waianae Mountains where rainfall averages about 20 inches a year. However, these are only long-term averages and the rainfall variations from year to year are considerable. This is also true for month to month values but the trend is more rain over the entire island during the winter months from large scale cyclonic disturbances that move in when the trades are absent or weakened.

On Oahu, the northeasterly tradewinds prevail 90 percent of the time from May to October but drops in frequency to 50 percent from November to April. Severe weather is uncommon in Hawaii. The "winter" season from October to April brings intense rain that can cause localized flash flooding. Thunderstorms are infrequent and usually mild. A few tropical cyclones have struck the island since 1950.

b. Wailupe Valley

The climate in Wailupe Valley is subtropical with temperatures averaging around 74°F. Winds are predominantly from

the northeast, blowing in at speeds of 10 to 25 knots. Occasional storms create strong southerly winds in excess of 30 knots.

Wailupe Valley has a median average rainfall of 32 inches per year along the coast. The Koolau crest which charges Wailupe Stream has a median average rainfall of 60 inches per year. Rainfall in the project area averages 35 inches per year (Figure III-1).

2. Geology

a. General

Oahu is comprised of the Waianae and Koolau Ranges connected by the Schofield Plateau which lies between the two mountain ranges. Both ranges are the results of deeply eroded basaltic volcanoes. The eroded remains of the Koolau shield volcano stretches in a nearly straight northwest-southeast line for 37 miles from the most northerly to the most southerly tips of the island. It forms Oahu's main mountain range. The older Waianae Volcano is represented by an arcuate mountain range extending a distance of 20 miles. It constitutes the western bulwark of the island.

The peaks of the Koolau Range generally average about 2,500 feet in elevation. The highest point, Puu Konahuanui, which overlooks Nuuanu and Manoa Valleys in Honolulu, rises to 3,150 feet. The Waianae peaks are somewhat higher, averaging nearly 3,000 feet, including the highest point of the island, Mt. Kaala.

b. Wailupe Valley

Wailupe is a narrow, deep, finger-shaped valley located three miles east of Diamond Head. The valley floor extends

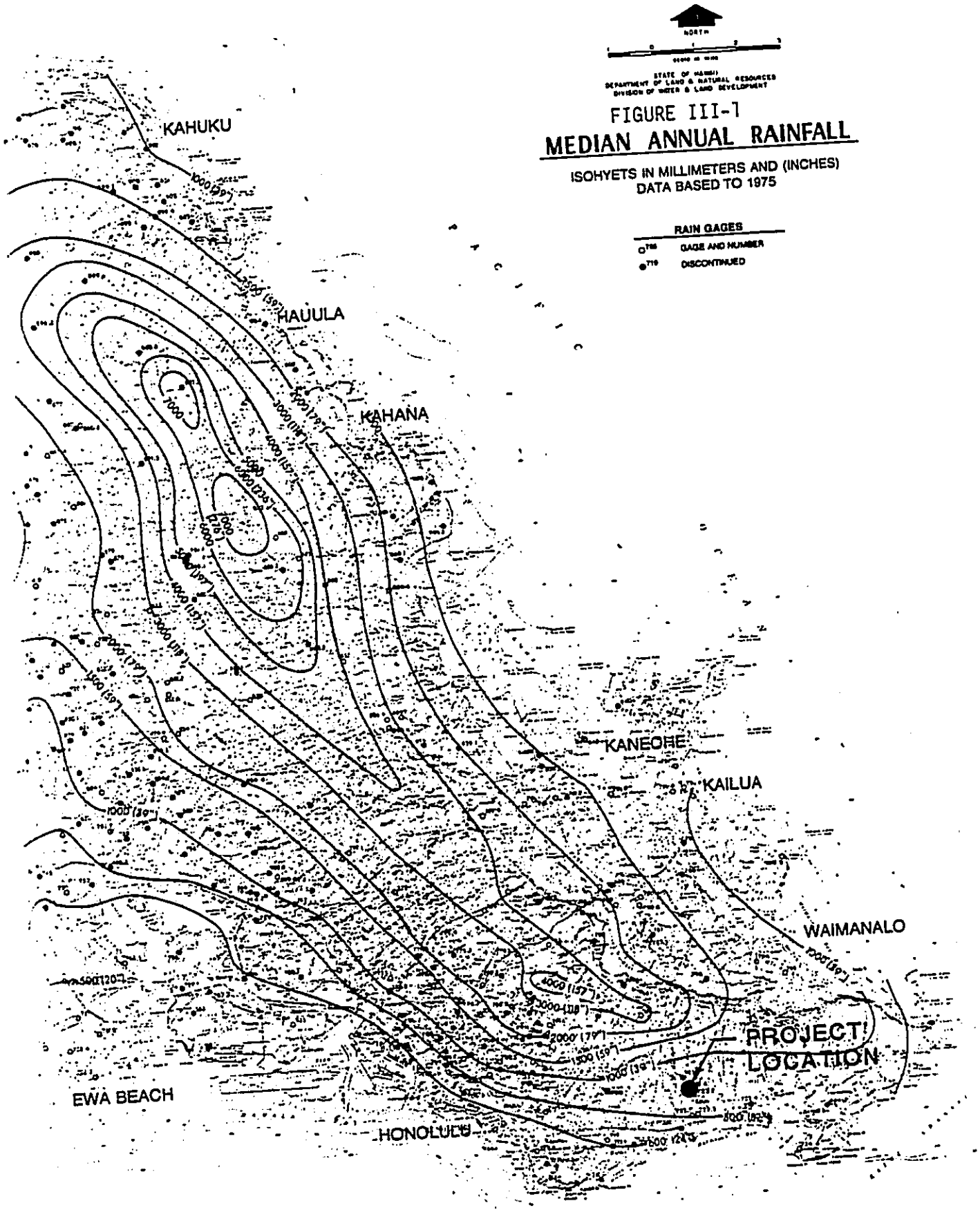


FIGURE III-1

MEDIAN ANNUAL RAINFALL

ISOHYETS IN MILLIMETERS AND (INCHES)
DATA BASED TO 1975

RAIN GAGES

- ○ 716 GAGE AND NUMBER
- ● 719 DISCONTINUED

inland over 13,000 feet before sharply rising in elevation to over 2,500 feet at the crest of the Koolau Range. The ridges bordering the valley barely exceed 1,000 feet in elevation.

The valley was carved by stream erosion. The flat floor of the valley was created by the submergence and subsequent reemergence of the island. The sediments deposited during this period formed the valley floor that exists today with alluvial deposits as well as possible interbedded marine deposits.

The floor of Wailupe Valley is composed primarily of unconsolidated noncalcareous deposits with small deposits of consolidated calcareous marine sediments found at the mouth of the valley. Further in, at higher elevations, are deposits of consolidated noncalcareous material. The ridges on either side of the valley are composed of basalts belonging to the Koolau volcanic series put down during the Tertiary and early Pleistocene Ages. There are a number of dikes associated with the valley but all are located far above the valley in the Forest Reserve Area.

Parts of the area where the valley is located is affected by a phenomenon known as mass transfer. This is the movement of material down the side slopes of valleys under the influence of gravity. This is apart from the transportation of material by tributary streams. It is a natural erosion process and is generally slow so long as structures and activities are confined to the valley floor. It is seldom a source of serious trouble. However, the incursion of dwellings, etc., up the valley sides with steep cuts for roads aggravates the condition.

3. Hydrology

In Stearns and Vaksvik's Geology and Groundwater Resources of Oahu, Wailupe Valley is near the eastern boundary of artesian area 5. The caprock in this area slopes toward the valley and is replaced by permeable coral at Wailupe Peninsula. At this point a spring discharges into the ocean. The source of water for the spring is supplied by an overflow of basal water.

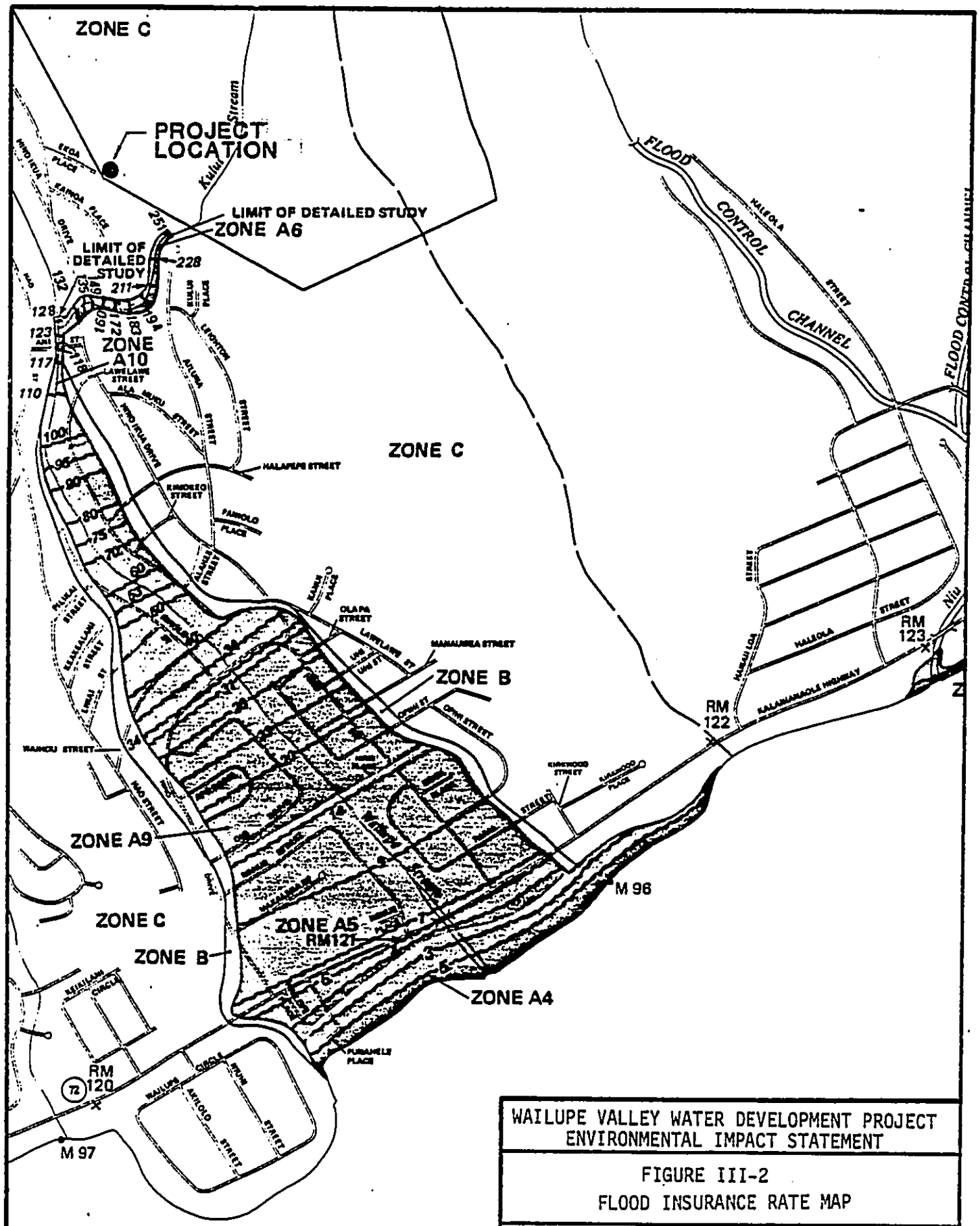
Wailupe Stream is the only water course in Wailupe Valley. Charged by rainfall in the Koolau crest, it is an intermittent stream formed by the converging of several small tributaries into one. As measured in November of 1973, it has an annual maximum discharge of 436 cfs. It is also fed by other intermittent streams in Laulaupoe and Kului Gulches in the upper reaches of the forest reserve. Groundwater in Wailupe is stored in the form of a basal freshwater lens.

Due to the lack of a perennial flow, Wailupe Stream does not sustain a population of either native or exotic fisheries. Because of this and the fact that the proposed project draws from basal water, no fisheries will be impacted.

Recharge of the Wailupe Valley basal groundwater is accomplished locally plus an unknown amount of underflow from neighboring valleys. Although the amount of rainfall the valley receives is less than 60 inches per year, rain from winter storms contributes heavily to recharge in the area.

4. Flood Control

According to the Flood Insurance Rate Map (FIRM) published by the Federal Insurance Administration, Wailupe Valley is variously zoned depending on the locale (Figure III-2). The Wailupe Well project site is located in a non-flood plain area and where no



WAILUPE VALLEY WATER DEVELOPMENT PROJECT ENVIRONMENTAL IMPACT STATEMENT
FIGURE III-2 FLOOD INSURANCE RATE MAP
CITY AND COUNTY OF HONOLULU BOARD OF WATER SUPPLY

special flood hazards are expected. The designaton given to the project area is Zone C which is defined as "areas of minimal flooding."

5. Water Resources

a. General

The occurrence of water on Oahu is part of a complex cycle beginning with the evaporation of moisture from the sea. Rainfall over the land mass due to condensation of the moisture is either returned to the atmosphere by evaporation or transpiration, transported back to sea as surface runoff, or infiltrated into the ground.

The volcanic rocks and their residual soils possess great capacities in the absorption and percolation of water. About one-third of it infiltrates into the ground, creating the large groundwater bodies on which Oahu depends for its water supply.

Three characteristic occurrences of groundwater have been recognized, the most extensive being the fresh basal lens. This body of water floats on denser seawater under much of the southern Honolulu Coastal Plain and the northern portion (Waialua to Punaluu) of the island. Although largely untapped, but of singular importance in some areas, groundwater is restrained between volcanic dikes (impermeable vertical rock structures) in the rugged core of the mountains. The third type, which is of minor significance on Oahu, is perched groundwater, held up on horizontal impermeable beds such as weathered volcanic ash or a sill.

Drilled wells are now the most important means of groundwater development. They are used almost exclusively by the BWS since the well water is a reliable source and does not require treatment before use.

BWS wells tapping the basal lens have been and will continue to be of primary importance in groundwater development. Water occurring in alluvial deposits have not been exploited in the past due to the ease which basal supplies could be developed. Under proper circumstances, however, development of alluvial water with gravel-packed well-screens has been demonstrated to be economically feasible.

Shafts which skim water from the top of the basal lens have been employed since the early part of the century. The shafts behave as horizontal wells with high replenishment rates. By skimming the top of the basal lens, the lens is least subject to degradation by seawater.

Wearing away by chemical weathering and stream erosion of the summit areas of the Waianae and Koolau shield volcanoes has exposed dikes of the rift zones. Tunnels are used to develop the water stored in the dike compartments, and hence, the origin of the name "dike tunnel" or "high level" tunnel.

Although the island is deeply incised by many stream valleys, the amount of perennial stream flow actually reaching the sea is comparatively minor. Storm flows may be very heavy, but little of it is recharged at this time. Surface water in the forest reserve areas is of good quality, but except in a few regions, its reliable flow is insufficient to justify exploitation.

From the brief discussion above, it is obvious that Oahu, although not a large island, has complex water resources requiring a great deal of study and care in developing. Each water district is unique in these resources.

Of the large quantities (408 mgd) of groundwater used daily, on Oahu, the BWS is responsible for only 134 mgd, or about 30 percent. An additional 25 mgd satisfy all military requirements. Another 35 mgd meet industrial and other requirements, independent of the BWS distribution systems. Plantation agriculture, consisting almost exclusively of irrigated sugarcane, consumes the remainder, a little over 58 percent of the total withdrawal.

The BWS average daily withdrawal of about 130 million gallons is obtained from 72 separate water supply stations, including 165 individual producing units. Groundwater accounts for 99.7 percent of the total volume of water distributed by the BWS. Wells and shafts tapping basal groundwater provide 88.6 percent of the total, while high level tunnels contribute 11.1 percent. The remaining 0.3 percent is divided between stream and spring water.

The Island of Oahu is divided into six water use districts as shown on Figure II-1. These districts constitute water regions selected by considering the natural environment as well as their water distribution systems.

b. Wailupe Valley

Wailupe Valley has two 0.3 mg capacity water reservoirs located near the eastern end of the valley. These reservoirs are hooked up to the existing water distribution system which provides water for the upper reaches of the valley including Aina Haina.

The latest consumption records for the area served by the two reservoirs show a consumption range of 175,000 to 216,000 gallons per day. Aina Haina is a stable community and little development has occurred in the valley thus

maintaining a fairly constant consumption rate in recent years.

Wailupe Valley is included in the Waialae-Hawaii Kai Subarea of the Honolulu GWCA. The sustainable yield as regulated by the BLNR is 5.0 mgd. The certified yield at present is 1.100 mgd. There are 4 wells in the subarea currently being used. Three are municipal wells operated by the BWS. They are Aina Koa, Waialae Iki Station and Waialae Shaft. The fourth well is private, the user being the Waialae Country Club. They are no other active wells within Wailupe Valley itself.

6. Soils

The Soil Conservation Service has identified 13 soil types in Wailupe Valley. The ridges on either side of the valley are composed of rockland while the land stretching towards the Koolau crest is classified as rough mountainous land. The valley floor is a mixture of clays, silty clays, clay loams, stony clay loams and stony silty clay loams with sand and coral near the ocean.

The soil in the area of the project site is classified as Lualualei extremely stony clay, 3 to 35 percent slopes (LPE). The Lualualei series to which it belongs consists of well-drained soils on the coastal plains, alluvial fans and talus slopes. These soils developed in alluvium and colluvium and are found on nearly level and gently sloping ground. Elevations range from 10 to 125 feet. Rainfall for this soil series annually averages 18 to 30 inches but is as low as 10 inches on Lanai and as high as 50 inches on Kauai. The mean annual soil temperature is 75°F. The Lualualei soil series are geographically associated with Honouliuli, Jaucas and Kekaha soils.

LPE soil is found on talus slopes with a slope range of 3 to 35 percent. However, in most places, the soil is moderately sloping to steep. This soil is similar to Lualualei clay, 0 to 2 percent slopes (LuA) which is described as follows:

> In a representative profile the surface layer, about 10 inches thick, is very dark grayish-brown, very sticky and very plastic clay that has prismatic structure. The next layer, 37 to more than 42 inches thick, is very dark grayish-brown, very sticky and very plastic clay that has prismatic structure. In addition, it has gypsum crystals. The soil is underlain by coral, gravel, sand, or clay at depths below 40 inches. This soil cracks widely upon drying. It is neutral in the surface layer and medium acid to moderately alkaline in the underlying layers.
>
> Permeability is slow. Runoff is slow, and the erosion hazard is no more than slight. The available water capacity is about 1.4 inches per foot of soil. In places roots penetrate to a depth of 5 feet or more. The shrink-swell potential is high.

LPE differs in that there are many stones on the surface and in the profile. It is impractical to cultivate this soil unless the stones are removed. This type of soil is generally used for pasture. Runoff is medium to rapid and the erosion hazard is moderate to severe.

B. BIOLOGICAL CHARACTERISTICS - FLORA AND FAUNA

According to DLNR's forest type maps, Wailupe Valley is classified into two forest types. The ridges on both sides of the valley are designated as non-commercial type and non-forest. Vegetation is of the haole koa-guava-lantana type and may include the following: haole koa, guava, lantana, klu, java plum, hau, kolea, crotolaria, christmas

berry and associated shrub species. These are the predominant lower elevation shrub types and may occur singly or in combination. The area surrounding the project site is dominated by a dense growth of haole koa. The two existing reservoirs at the well site are also surrounded by this plant.

Wailupe Valley is an area that has been extensively developed in single-family homes. Because of this, the birds found in the valley are those common to areas of urban development. Introduced species of birds that are frequently seen include bulbuls, shama thrush, lace-necked and barred doves, Brazilian and red-necked cardinals, house sparrows, mynahs and white-eyes (mejiro). There are no endangered or native Hawaiian species identified for the area surrounding the project site. However, the possibility exists that the Hawaiian Pueo (Asio flammeus sandwichensis) may utilize the area for foraging.

Due to the development of the valley, the animals found are those common to urban areas. These include the domestic pets of the inhabitants and strays often found in such areas. Other animals such as the mongoose, rat and mouse are probably found also. Although feral pigs are inhabitants of the valley, it is unlikely that they would venture down from the Forest Reserve above.

C. SOCIO-ECONOMIC CHARACTERISTICS

1. Population

Oahu has become the most highly developed and urbanized island in the State. The total resident population of Oahu in 1975 has been estimated at approximately 705,000. The growth rate is expected to continue at approximately 1-1/4 percent per year. The latest population projections (II-F series) for Oahu by General Plan areas are presented in Table III-1. The Wailupe Valley area is included in the population project for the Aina Koa- Hawaii Kai General Plan Area.

TABLE III-1

POPULATION PROJECTION (II-F) FOR OAHU
GENERAL PLANNING AREAS

General Plan Area	1975	1985
Honolulu	302,121	352,888
Aiea-Pearl City	100,981	109,581
Ewa-Makakilo	21,464	26,447
Aina Koa-Hawaii Kai	40,532	45,627
Kailua	42,104	44,809
Kaneohe-Ahuimanu	53,936	62,223
Waipahu-Crestview	15,169	16,600
Mililani-Waipio	28,682	37,066
Wahiawa	36,364	37,156
Waimanalo	8,520	10,203
Kahaluu-Kahuku	14,203	15,190
North Shore	10,231	11,462
Waianae Coast	31,027	33,557
TOTAL	705,334	802,806

Source: Land Use Forecast for Oahu (1975-1985), June 1978, Steven C. K. Young and Alan M. Voorhees & Associates, Inc.

Wailupe Valley is the site of Aina Haina, a residential subdivision that was developed in the early 50's. The community is relatively stable with only a slight increase in the number of homes and a slight decrease in the population. The lifestyle of single-family residential is expected to change very little in the future. If all of the valley's areas designated residential according to the City and County of Honolulu's General Plan were developed, the number of houses and the population would increase.

2. Land Use

As determined by the State Land Use Commission, Wailupe Valley falls into two land use zones. The area designated as urban extends from the mouth of the valley up to the Forest Reserve boundary. It basically encompasses the valley floor. The ridges on either side of the valley and the land stretching beyond to the Koolau crest are designated as conservation. The land in this zone is predominantly Forest Reserve land. The existing reservoir site which includes the new well falls within the Forest Reserve boundary but is located on urban designated land.

The City and County of Honolulu has classified the area surrounding the Wailupe Well project site as "R-4." This zoning code is defined as residential with a minimum lot size of 7,500 square feet. The project site itself is designated as P-1 or preservation.

3. Economic

The economy of Oahu, the most highly developed of all the Hawaiian Islands, is supported by a diverse industry, ranging from various agricultural products to its thriving tourist industry. The island's favorable topography, specifically its two natural harbors, accounts for Oahu's dominance as the focal point of the Hawaiian chain.

Tourism, Hawaii's largest export industry, has provided the impetus for community-wide development of service related facilities. Major regional shopping centers have been created to meet the needs of visitors and residents alike. Ala Moana and, in more recent years, Pearlridge, fall into this category. Sub-regional centers such as Kahala Mall in east Honolulu and several others on the windward side of Oahu, and the creation of community and convenience shopping centers are also signs of maturing economic structure on the island. The State's business and financial center has gained in importance with the proliferation of highrise office buildings in the central business district over the last ten years. This has provided a high degree of centralization downtown. However, Waikiki is now nearly fully developed and limits have been imposed on future expansion of hotels and apartments in the area. Attempts to create new destination areas outside of Waikiki have met with limited success.

Residential housing has brought about intensive redevelopment of central Honolulu as the center for highrise condominiums. Lowrise and single family housing units dominate the outlying areas.

Agricultural activities on the island are concentrated primarily in two high cost crops that compete directly with foreign imports; pineapple and sugar. Attempts at diversification are confronted with the realities of a limited sales market and the absence of economies of scale. The State's largest crops are export oriented. Highly perishable crops are grown primarily for local consumption.

It is within the foregoing context that the many studies which have attempted to find new diversification for the island economy have all concluded that the tourist industry, a service export industry, must be the primary source of growth for Oahu and the State for at least the next ten years.

4. Social

Wailupe Valley is the site of a residential community with over 80 percent of the homes owner-occupied. The valley is distinguished by the low level of unemployment and above average income of its residents. The Aina Haina Shopping Center at the mouth of the valley is the local center of commercial activity.

Life can be described as suburban. The majority of the adults residing in Wailupe Valley work in Honolulu, commuting daily along Kalanianaole Highway. Wailupe Valley is a relatively old community with a median population age of over 27 years. The properties in the valley are characterized by homes and landscaping in excellent condition.

D. ARCHAEOLOGICAL/HISTORICAL CHARACTERISTICS

The name Wailupe is given to a land section, circle, place, beach park, valley, gulch, elementary school, playground, peninsula, and naval radio station. The name literally means kite water reflecting an ancient Hawaiian tradition which prescribed the flying of kites only in prescribed areas with this area being one of them.

Due to a lack of archaeological surveys in Wailupe, the DLNR Historic Sites Office have no archaeological sites recorded for the valley although various historical accounts do mention them. According to E.S.C. Handy in The Hawaiian Planter, there is a possibility that a loi or irrigated terrace might have once existed. However, John K. Clarke, a kamaaina whose account Handy refers to, says that he never saw any signs of terraces or heard of taro being cultivated in the area. Kawauoha Heiau was completely destroyed some years ago but is reported as being a structure 75 feet square. The exact location of the heiau is unknown. It has been described in the 1907 Hawaiian Annual as being located "just above Puu Hua, at the foot of the hill Hawaii Loa." Similarly, an unu or altar of Kawauoha was mentioned in a letter to the Land Commissioners in 1847. Wailupe fishpond covered an

area of 41 acres but was destroyed when it was filled and eventually became known as Wailupe Peninsula.

DLNR records show that the project site is not listed on either the Hawaii or National Historic Registers of Historic Places and is not eligible for inclusion on the National Register.

SECTION IV

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

A. GENERAL

The land use controls for the project site are as follows:

1. State of Hawaii

   The reservoir and well site is on land designated Urban by the State.

2. City and County of Honolulu

   The land is zoned as P-1 (Preservation).

B. THE HAWAII STATE PLAN

An objective of the Hawaii State Plan is to provide water to "adequately accommodate domestic, agricultural, commercial, industrial, recreational and other needs within resource capacities." To accomplish this objective, State policies are as follows:

1. Relate growth activities to existing and potential water supply.

2. Support research and development of alternative water sources.

3. Reclaim and encourage the productive use of runoff water and wastewater discharges.

4. Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.

5. Support water supply services to areas experiencing critical water problems.

6. Promote water conservation practices.

In relation to the Hawaii State Plan, the proposed Wailupe Well project is consistent with its objectives and policies. Should further development occur in Aina Haina, a reliable water source will be available to accommodate the growth. It will also increase the Honolulu Water District's water resources and lessen the need for water to be pumped from either the windward or the heavily utilized Pearl Harbor Water Districts.

C. CITY AND COUNTY OF HONOLULU GENERAL PLAN

It is the City and County's objective to provide an adequate supply of water to meet the needs of Oahu's people. The policies implemented to achieve this objective are as follows:

1. Maintain an adequate supply of water for both future residents and future visitors.

2. Maintain an adequate supply of water for future agricultural and industrial needs.

3. Encourage the development of new technology which will reduce the cost of providing water and the cost of waste disposal.

4. Encourage a lowering of the per capita consumption of water and the per capita production of waste.

The Wailupe Well project is consistent with the objective and policies of the City and County's General Plan. It is especially applicable to the first policy in providing for future residents and visitors.

D. U. S ARMY ENGINEER DISTRICT - HONOLULU FLOOD CONTROL

Wailupe Stream is under the jurisdiction of the Department of the Army in matters pertaining to flood control. According to this agency, the project will not require a permit from them.

E. HONOLULU GROUNDWATER CONTROL AREA

On February 27, 1981, the Honolulu aquifer was declared a Designated Groundwater Control Area (GWCA) by the DLNR. This area is subdivided into two major groundwater subareas: the Moanalua-Kaimuki Subarea and the Waialae-Hawaii Kai Subarea. This designation was based on:

"(1) the planned 7 mgd withdrawal in the next two or three years by the Honolulu BWS from the Honolulu District and its relationship to the 42 mgd Pearl Harbor GWCA water being transported to Honolulu,

(2) the withdrawal and use activities in the Honolulu District would affect the Land Board's management of the Pearl Harbor GWCA,

(3) the possible effect of increased withdrawals in the Honolulu District upon existing private wells located makai and along the fringes of the basal lens, and

(4) the urgency of imposing State controls before withdrawals equal or exceed the sustainable yield of the basal aquifer to give major water users ample lead time to orderly plan their developments according to available water supplies."

The Honolulu GWCA is subdivided into 2 major subareas each with an established sustainable yield. The Moanalua-Kaimuki Subarea has a sustainable yield of 55 mgd and the Waialae-Hawaii Kai Subarea has a sustainable yield of 5 mgd. Certification of withdrawal rates for each subarea was accomplished on September 11, 1981. The Moanalua-Kaimuki Subarea was certified at 41.827 mgd and the Waialae-Hawaii Kai Subarea was certified at 1.100 mgd. The withdrawal of remaining groundwater supplies is subject to permit application to the Board of Land and Natural Resources (BLNR) whose authority all GWCA's are under.

The proposed Wailupe Well is within the Waialae-Hawaii Kai Subarea and therefore must comply with the regulations governing the Honolulu GWCA. The subarea presently has 3 BWS wells and 1 private well accounting for the certified 1.100 mgd withdrawal.

The projected withdrawal of 0.2 mgd of the Wailupe Well is therefore well within the sustainable yield established for this subarea.

F. STATE ENVIRONMENTAL POLICY ACT

The State Environmental Policy Act, Chapter 344, Hawaii Revised Statutes, was enacted to conserve Hawaii's Natural Resources in such a manner that the people of the State and their environment "can exist in productive harmony, and fulfill the social, economic, and other requirements of the people of Hawaii." Enhancement of the quality of life partially fostered by "establishing a commitment on the part of each person to protect and enhance Hawaii's environment and reduce the drain on renewable resources."

The establishment of the Honolulu GWCA is an effort on the part of the State to realize these goals of the Environmental Policy Act. The Wailupe Well Development Project will be under the BLNR management and control of Honolulu's groundwater resources.

SECTION V

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES TO MINIMIZE ADVERSE IMPACTS

A. INTRODUCTION

The proposed project will generate potential long term and short term environmental impacts. Some will be beneficial and others adverse. Most of the short term impacts will be generated by the construction of the facilities. The potential long term impacts will arise from the use of the facilities.

B. DISCUSSION OF IMPACTS FROM THE PROPOSED PROJECT

1. Short Term Impacts From Construction

The use of conventional construction equipment will create short-term impacts to the local environment. Noise, air, and visual impacts, although limited to daylight hours, are often termed nuisance problems but are unavoidable. The length of construction, contingent on the extent and phasing of developments, will therefore dictate construction related impacts. Activities are typically scheduled during the week days from 7:30 a.m. to 4:00 p.m. As the project site is in proximity to residences, it is safe to assume that the people living nearby will be somewhat affected by the construction.

a. Dust and Emissions

Dust and vehicular emissions will be generated during construction of the control building. Dust control measures, such as sprinkling will be implemented to reduce dust levels when they become unacceptable.

b. Noise

Construction equipment will raise noise levels. The project's operations must conform to the State Department of Health's Public Health Regulations, Chapters 44A and 44B. A noise permit will be required from the Noise and Radiation Branch

of the Department of Health and the Contractor must comply with the conditions issued with the permit. Mufflers for noise control will be required for all construction equipment. All noise attenuating equipment will be maintained in proper operating condition and will be repaired or replaced as needed.

c. Traffic

Construction of the proposed facilities will require the use of Wailupe Valley road network. Construction equipment will use the roads to haul away small amounts of surplus excavation material and bring in construction materials required for construction of the proposed facilities. The increased traffic from construction vehicles will not be significant but may cause some minor inconveniences to valley residents.

Residents of the valley will be apprised of pending construction by the Board. The Contractor will be required to keep roads open to traffic at all times and to use proper construction signs, barricades, and flagmen to control traffic and any other devices necessary to insure minimum inconvenience and maximum safety to valley users.

d. Economic

The short term economic impact resulting from construction will be beneficial in that it will provide jobs to local construction personnel. Local material suppliers and retail businesses may also benefit from the increased activities.

e. Social

The social quality of life for residents of Wailupe Valley near the new well site may be slightly impaired during construction. They will have to contend with some construction noises, an increase in dust levels and construction vehicles on the roads.

f. Archaeological

There is always the possibility of uncovering previously unidentified archaeological sites during construction. The Contractor will be required to exercise caution and to report any such finds to the State Historic Preservation Office. However, as the project site is within the confines of a previously impacted area where cuts up to 20 feet wide wre made, finding such a site is highly unlikely.

2. Long Term Impacts

Due to the nature of the proposed facilities, long term impacts will be associated with the presence and use of the well and control building.

a. Technical

Development of a new water source for consumption near the location of use will effect significant savings in the energy now required to pump potable water into Wailupe Valley.

Withdrawal of basal water from the well will have no adverse effect upon stream flow or the existing groundwater situation. As Wailupe Stream is some distance from the project site and is fed by rainfall in the Koolau crest, it is unlikely that the new groundwater well will have any effect on its surface water flow.

Wailupe Well is in the Waialae-Hawaii Kai Subarea of the Honolulu GWCA. The sustainable yield as regulated by DLNR is 5.0 mgd. The certified yield including that for the proposed well would be 1.300 mgd. The nearest existing wells are in the Waialae District. Therefore, Wailupe Well is not expected to affect the safe yield of the Honolulu Aquifer.

Although the Lualualei soil series has a high shrink-swell potential, no adverse impacts are anticipated on the well or its companion control building. Bedrock, according to the Soil Conservation Service, is usually found at depths greater than 5 feet. The well will be grouted to a depth of 50 feet.

b. Environmental

The principal beneficial impacts will be the development of the new water source for Wailupe Valley and the reduced pumping (energy consumption) to transmit a lesser volume of Pearl Harbor Basin water to Wailupe Valley.

Long term impacts associated with the proposed water development could adversely affect water, noise, and visual qualities. The effect of the well upon the basal lens water will be monitored and evaluated even though the well flow is relatively small and no adverse effects are anticipated. The effect on the basal lens cannot be determined completely and careful monitoring of water quality is necessary to ensure the integrity of the aquifer. Localized small increases of noise levels due to pumping are to be expected. The equipment, however, will be situated away from residential and recreational areas, and moreover, are not substantial noise sources. Mutes for noise reduction will be installed over the wells if noise levels are excessive (Chapter 44B, Public Health Regulations). Proper location, landscaping, and color scheming of the control building structure will reduce or eliminate effects upon the visual surroundings.

c. Economic

On a long-term basis, the development of Wailupe Well could help meet additional demands made of the system. This

valley is zoned urban by the State Land Use Commission and designated residential in the City's development plans.

d. Social

For the residents of Wailupe Valley, the immediate availability of a water source would give them some independence from the existing outside sources. Should a major break occur in the water transmission system serving the valley, most of the residents would still continue to receive water service since the well would pump directly into their water supply. Hence, Wailupe would not suffer as great an inconvenience as the rest of the consumers being served from the same water transmsission system.

3. Proposed Mitigative Measures

The mitigative measures proposed for the water development facilities would include (1) using the existing access road and reservoir site, (2) minimizing the amount of construction activity required at the well site, and (3) locating and minimizing the facilities so as to mitigate noise and visual impacts where possible.

The existing regulations for dust, air pollution, noise and erosion control during construction will be implemented to minimize the adverse short-term construction impacts.

SECTION VI

PROBABLE ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED

A. UNAVOIDABLE SHORT TERM ADVERSE IMPACTS

The unavoidable short term adverse impacts are those related to construction activities. Temporary air pollution from dust, vehicular emissions, noise from construction equipment and inconvenience to resident and visitor traffic will occur.

B. UNAVOIDABLE LONG TERM ADVERSE IMPACTS

The long term adverse impacts, which are unavoidable because of the nature of the project, will be the visual impact and physical land changes and the subsurface groundwater change caused by the well. The noise generated at the well site will be minimized by sound attenuators. Proper landscaping will blend the well and control building into their surroundings. Minimum impacts to the groundwater aquifer are anticipated since the well must operate within the safe withdrawal limits to be determined by the Department of Land and Natural Resources, State of Hawaii.

C. RATIONALE FOR PROCEEDING

The short term impacts are conventional in nature and will be controlled through the application of existing regulations controlling the construction industry. The development of Wailupe Well will add flexibility to the system serving Wailupe Valley. On February 27, 1981, the Board of Land and Natural Resources (BLNR) established the Honolulu Ground Water Control Area for the Honolulu Water District. This Control Area is subdivided into two major groundwater subareas. The first encompasses the area from Moanalua to Kaimuki and has a sustainable yield of 55 mgd. The second is from Waialae to Hawaii Kai and has a sustainable yield of 5 mgd. The sustainable yield for both subareas is its certified use as designated by the BLNR. At present, only 1.100 mgd is withdrawn for the Waialae to Hawaii-Kai water

control area subzone. These come from the BWS's Waialae shaft, Aina Koa well and Waialae Iki well; and the Waialae Country Club's well. If no wells are contemplated to come on line until 1984, then a valuable resource will not be efficiently used, thereby putting unnecessary stress on the Windward and Pearl Harbor Water Districts that now help supply water to the Honolulu Water District. The transformation of Wailupe Well from an exploratory well to a production well will help alleviate the water situation.

SECTION VII

ALTERNATIVES TO THE PROPOSED ACTION

A. NO PROJECT

The "no project" alternative would result in the continued deficit of water capacity versus projected demand. The amount of water available to meet present and future domestic demands on Oahu is dependent upon the Board's ability to develop new water sources. The Wailupe Well Water Development project is intended to provide additional capacity to help meet this deficit.

B. ALTERNATE WELL LOCATIONS

The reservoir site is considered ideal because of City ownership, existing access and available ground area. An alternate site was considered on the eastern slope of nearby Wiliwilinui Ridge and approximately 1-1/2 miles inland. This site was rejected because of its small size, steep slopes and the close proximity of homes.

C. FUTURE ALTERNATIVE WATER SOURCES

The following is an excerpt from the Honouliuli Wells Environmental Impact Statement Preparation Notice which describes the future alternative sources of water other than groundwater.

"FUTURE ALTERNATIVE SOURCES OF WATER[1]

A. WATER EXCHANGE PROGRAM

This program would consist of an exchange of water between Oahu Sugar Co. and the Board of Water Supply. Presently, Oahu Sugar is using approximately 40 to 50 mgd of domestic quality water for sugarcane irrigation. The BWS would trade water of lower quality for this potable water on a one-to-one basis. The lower quality water for exchange would come from any of the potential sources listed below. In addition, another 20 mgd could be converted to domestic use if this water were to be blended with water of lower mineral content; thus, from 40 to 70 mgd would be available for exchange.

1. Sewage Effluent [6.1]

It is estimated that approximately 33 mgd of sewage effluent would be available for use in the exchange program. About 25 mgd could be supplied by the Honouliuli WWTP, and about 8 mgd by the Mililani STP. It would be mixed with higher quality water on a ratio of one part effluent to three parts water and then used for drip irrigation.

The existing Mililani Sewage Treatment Plant is located on the West Bank of Kipapa Gulch, 15,000 feet north of the Oahu Sugar Co. mill in Waipahu. The effluent is presently discharged into Kipapa Stream and flows down to Pearl Harbor. The most feasible way to use this effluent for sugarcane irrigation is to pump it from the plant to the Waiahole Ditch, about 8,000 feet mauka.

The Honouliuli WWTP is the other sewage treatment plant in this cane growing area that can furnish cane irrigation water. It will be located outside the east boundary of Barbers Point Naval Air Station, about 4,000 feet south of the Ewa Plantation mill. To make this effluent available for cane irrigation, it is necessary to pipe it about 20,000 feet toward the present location of Ewa shaft, although it may be applied to the cane fields on the plain surrounding the WWTP. However, piping the effluent to Ewa shaft will make its application more widespread, affording opportunities for selective applications and dilution.

The cost of supplying the sewage effluent has been estimated at $0.09 per thousand gallons for the Mililani STP and $0.13 per thousand gallons for the Honouliuli WWTP [6.2]. Studies by the University of Hawaii Water Resources Research Center indicate that the 1-3 mixture ratio is adequate to meet State Department of Health standards and sugar needs as well [6.3].

[1]SOURCE: City and County of Honolulu, 1979, Board of Water Supply, Honouliuli Wells Environmental Impact Statement, Notice of Preparation.

2. Pearl Harbor Springs [6.4]

The average discharge of water from the Pearl Harbor Springs is about 55 mgd. About 13 mgd of this is pumped to sugarcane fields, and the remaining 42 mgd discharges into the sea after flowing through water cress or other wetland crops [6.5]. Thus, spring water could be captured and used for additional cane irrigation, or possibly mixed with effluent and then applied.

Three major springs are located at Kalauao, Waiau, and Waiawa. They were used in the past for irrigation, and redevelopment of the springs would be feasible. To regain the use of the springs for sugarcane irrigation, these waters must be collected and pumped westward to the cane growing areas. A more feasible scheme would also encompass an integrated pipeline pumping system involving all three spring areas and two surface streams -- Waikele and Waiawa. Assuming that the pumping installations are sized to accommodate the lower flows expected during the summer months, up to 40 mgd of water suitable for cane irrigation can be delivered to cane growing areas from the three spring areas and the two surface streams. It is estimated that the cost of supplying water from the springs will be approximately 12 cents per thousand gallons [6.6].

3. West Loch Reservoir [6.7]

Another alternative which has been suggested is to dam West Loch to create a reservoir to capture flood flows from Waikele Stream.

Although the dry weather flow is presently being used for irrigation, flood flows rush into West Loch unused because there is no large storage basin to capture them.

A large storage reservoir in West Loch would make it possible to store the high flows during the rainy months for use during the drier summer months. A dam extending 2,700 feet on a bearing of north 75 degree east from Nichol's Point to Waipio Peninsula can form a 2.3 billion gallon reservoir. Using existing hydrographic data, the proposed reservoir would be able to sustain a flow of about 10 mgd.

To deliver the stored flood water, an intake structure pumping station and pipeline would have to be constructed. Delivery of this source of water to the Waikele area would require a pipeline of 16,500 feet long. Consequently, this would be a relatively expensive source, at $0.68 per thousand gallons [6.8], and the environmental impacts would need to be studied in some detail before proceeding. Trapping of sediments in the reservoir would shorten the useful life span of the reservoir unless periodic dredgings were performed.

4. Brackish Water

Brackish water wells are another potential source of irrigation water. These could be developed in the caprock of the Ewa plain or Waianae coast. As long as the chloride content is below 1,000 ppm, the water would be suitable for this use. Some 20 mgd is presently being drafted from this area for irrigation.

B. BRACKISH WATER DEMINERALIZATION

Brackish water in the caprock and transition zone comprises a large potential water source presently unused due to excessive mineral content. Caprock water occurs in the Ewa plain and Waianae coastal areas. In the Ewa area, chloride content of the water ranges up to 2,000 ppm and total dissolved solids (TDS) up to 4,000. Transition zone wells are located along the shoreline of Pearl Harbor and in the Metropolitan area of Honolulu. The two most advanced demineralization processes are electrodialysis and reverse osmosis.

1. Electrodialysis

In electrodialysis, brackish water is pretreated and filtered, and then forced through an electrically-charged stack of selectively permeable membranes. The mineral salts in the water separate into positively-charged and negatively-charged ions that pass through the membranes, leaving fresh water behind [6.9]. After chlorination, this product water is suitable for domestic use.

A single stack may contain as many as 600 membranes and pass up to 250,000 gallons per day of product water. To obtain higher feed-to-product concentration ratios, multiple stacks in stages (series) are required. The number of stages selected is based on feed water hardness (calcium and magnesium concentration), total dissolved solids (TDS), temperature and the presence of any particularly troublesome ions [6.10]. The conceptual design of the process is shown in Figure 6-1.(Editor's Note - All figures herein mentioned are not included.)

Operational problems include corrosion, scale formation, and a phenomenon known as "concentration polarization," which limits the portion of dissolved solids that can be removed in a single stack to 50 percent of the dissolved solids in the feed water. Pretreatment of the feed water and the addition of acid can aid in control of these problems.

The salt composition of the waste brine is nearly the same as that of the feed water, and the concentration can usually be built up to levels acceptable for disposal into the sea or coastal injection wells [6.11].

Two major operating and maintenance costs are membrane replacement and electric power. The life expectancy of electrodialysis membranes is about five years if they are properly cared for. Electric power is required to pump the fluid streams through the stacks and force the ions through the membranes. About eight kwhr per 1,000 gallons of product per 1,000 ppm salt reduction are typical at economical current densities and without feed pre-heating. Of this power demand, 3 kwhr are for pumping and 5 kwhr are the processed power requirements. The energy requirement is nearly in direct proportion to the salt removal rate [6.12].

Electrodialysis has provided municipal water for about 10 years in plant sizes up to about 2 mgd.

2. Reverse Osmosis [6.13]

Osmosis occurs if two solutions of different concentration, but in the same solvent, are separated from one another by a semi-permeable membrane that allows the passage of the solvent but not the solute. The phenomenon of osmosis is that the solvent flows from the dilute solution to the more concentrated solution until the pressure on the more concentrated side of the membrane rises to a value known as the "osmotic pressure difference" between the two solutions. Reverse osmosis occurs when a pressure greater than the osmotic pressure difference is applied to the more concentrated solution and the solvent is forced to flow into the dilute solution. The principals of osmosis and reverse osmosis are illustrated in Figure 6-2.

In practice, brackish water is pretreated and filtered and then raised to operating pressures (usually 400 to 600 psi) and fed into reverse osmosis modules containing membranes. Part of the feed water passes through the membranes into the product water stream. The more concentrated feed stream with reduced flow then flows into other modules, where more water is added to the product water stream. A conceptual design of the process is shown in Figure 6-3. It can be seen from the design that the process is such a simple one that only mechanical force is required for its operation.

All currently available membranes allow some of the salt to pass through into the product water. The amount of salt passing through the membrane is proportional to the salt concentration at the membrane face; therefore, higher concentration feed waters produce a lower quality product. In a multi-stage operation, the concentration of feed water will at some stage become so great that the product water produced in that stage will be unacceptable; thus, with feed waters of higher concentration (between 2,500 and 10,000 ppm total dissolved solids), only one or two stages may be the maximum that can be used.

Operational problems include the fact that with continuing operation, the water production rate tends to decline due to membrane compaction and membrane fouling by scale and contaminants. This production decline can be as high as 20 to 30 percent in a single year for high pressure (up to 1,000 psi) plants, for low pressure, less than 300 psi, plant compaction is generally insignificant.

The salt composition of waste brine is nearly the same as the feed water, as in the case for electrodialysis.

The major operating cost is electric power consumption for pumping. The power demand is typically about 400 kw per million gallons per day production capacity for low concentration feed water. This increase is about 600 kw per mgd for high concentration feed waters. The higher the recovery ratio, the less the energy required at per unit volume of production since less water is pressurized.

The major maintenance cost is the high pressure pump, which should be provided as multiple parallel pumps with standby capacity to improve plant availability. The high maintenance costs have been attributed to the high pressured corrosive fluids and entrained particulate matter.

Reverse osmosis plants have been used for several years to produce municipal water, many of them in Florida. Most of them are less than 1 mgd; however, in the City of Cape Coral, Florida; a 4.7 mgd plant went on line in March, 1977. It utilizes six reverse osmosis modules, each with 22 membranes and a 500,000 gallon per day capacity. The feed water carries approximately 1,250 ppm of total dissolved solids (TDS), while the product water contains less than 65 ppm. With an operating cost of 59 cents per thousand gallons and an allocation of 22 cents per thousand gallons to cover amortized capital costs, a total production cost of 81 cents per thousand gallons was obtained in late 1977 [6.14].

Four reverse osmosis pilot units have been tested on Oahu at the following locations: Mililani Sewage Treatment Plant, Wahiawa Sewage Treatment Plant, Well 82-2A (located on the Diamond Head side of the Neil Blaisdell Center Exhibition Hall), and Well 119 (located at Honolulu Gas Company in the Iwilei District near Honolulu Harbor). Raw sewage, primary effluent and final effluent from conventional sewage treatment plants, as well as brackish groundwater from both basaltic and reef limestone aquifers were then field tested at 600 psig operating pressure [6.15].

The operation on wastewaters suffered from the problem of performance decline. However, the operation with brackish water yielded promising results. The solute rejection was high and maintained almost unchanged throughout the test period.

Based on a cost model developed for estimating desalting costs by reverse osmosis plants with spiral-wound modules (one type of module), product water costs in Hawaii were estimated at 83.7 cents, 63.4 cents, and 49.7 cents per 1,000 gallons for 1, 10 and 50 mgd plants, respectively [6.16].

A 10 mgd reverse-osmosis plant treating water of the quality found in the Ewa plain can be built for about $8 million and operate at about $0.40 to $0.50 per 1,000 gallons [6.17]. Capital and operating costs of a like-sized electrodialysis plant are comparable. If Waiau and Waiawa springs were used as sources (with 1,000 TDS), a 10 mgd reverse osmosis plant could operate at about $0.25 to $0.30 per 1,000 gallons [6.18].

Table 6-1 gives a further comparison of these two demineralization methods. Neither has any clear advantage over the other and the final selection of one process may depend upon operational considerations.

The BWS is presently proposing a 1 mgd reverse osmosis pilot plant to be built in 1982. To be located at Hawaiian Electric Company property in Waiau, the plant would operate from two to three years. The Board would learn the true costs of constructing and operating a demineralization plant. The BWS has applied for federal funding and was selected as fifth of 37 applicants by the Office of Water Research and Technology.

If a large scale reverse osmosis plant or other costly alternative is used in future years, then the water rates will have to be restudied and may possibly increase.

C. SURFACE WATER [6.19]

In the past surface streams on Oahu have not been used for domestic sources due to the ready availability of reliable, high quality, groundwater sources. The diversion of the flow from Lulumahu Ditch in Nuuanu Valley into a modified slow sand filter is the single example of a surface water source presently in use. Raw water quality is excellent except during rainy periods.

The more typical surface stream will probably require more extensive treatment, including the usual purification processes consisting of coagulation, flocculation, sedimentation, filtration and chlorination. The desirable points of diversion typically occur far from existing distribution-transmission works and would require relatively large initial outlay of capital as well as continual treatment costs. Pumping costs will vary from case to case.

Two large windward streams, Kahana and Punaluu, present the best opportunities for surface water development. In both cases the streams largely represent the outflow of groundwater and thus present the

potential of groundwater development first. This potential in both cases should be thoroughly examined before resorting to surface water development because there are considerable economic and operational advantages to groundwater development. After all the groundwater potentials have been developed, the remaining stream flow can be developed via treatment plants.

A third possible surface source is the Kalauao Spring area in Aiea. It is the only one of the Pearl Harbor Springs that presently yields water that meets mineral quality standards for potable water, but needs purification to meet all other standards. The highly developed nature of surrounding land as well as the close proximity of two major highways are negative factors because of the potential for contamination beyond the capability of treatment processes. Flow varies from 10 to 15 mgd.

In addition to the above three potential major surface sources, there are a number of smaller streams in Central Oahu and Honolulu that have some potential. In central Oahu, Waialua Sugar Company is presently diverting Kaukonahua, Helemano, Poamoho and Opaeula Streams into its irrigation system. All of these streams have domestic water supply potential if given adequate treatment.

Kalihi, Nuuanu and Waiakeakua (Manoa) Streams in Honolulu have some potential for surface water development. The combined mean flows during June, 1973, was about 5.5 mgd. The option of combining the flows for centralized treatment must be weighed against high transmission costs in an urbanized setting. The straight line distance between Kalihi and Waiakeakua is on the order of 20,000 feet; however, the alternative of three separate treatment plants would cost more to operate.

Yield from surface sources can be substantially increased if large storage reservoirs are available to capture flood flows. However, local experience with reservoirs has not been good. The only successful reservoir is Lake Wilson in Wahiawa where local geology is favorable for water storage.

The more typical situation in stream valleys shows narrow elongated valley floors covered with relatively impervious strata with valley sides exposing considerable bare bedrock. Large reservoirs in such a valley would probably hold water at shallow depths but would prove to be leaky as more of the valley sides were submerged.

Diversion of stream flows with minimal storage appears to be more economically feasible, but stream yields will not be large because flood flows must necessarily be passed through due to lack of storage. Also capture of flood flows will result in rapid silting of the reservoir and loss of storage.

D. DESALTING OF SEA WATER

This alternative would use techniques similar to demineralization of brackish water, but utilizing feed water of higher salinity (15,000 to 20,000 ppm). Numerous studies have shown the cost of desalting sea water to be two to three times as much as demineralizing brackish waters [6.20]. Technical development of desalting methods continues to improve and lower product water costs. However, rising energy costs and inflation tend to negate these gains. This source of domestic water will continue to be a viable choice, although an expensive one.

E. WASTEWATER RECLAMATION [6.21]

The direct reuse of reclaimed wastewater is at the far end of a scale of uses that includes industrial, aesthetic and agricultural applications. There has been an understandable reluctance to accept direct recycling of treated wastewater for human consumption in the past. Historically, there are two emergency instances where virtually direct reuse was practiced by the necessity for these two cases has long since passed. Direct reuse is presently practiced only at Windhoek, South Africa.

In all of the three above cited instances, dire necessity dictated the direct use, albeit with some dilution. The only alternative was to do without water. While wastewater would be used for irrigation, it is unlikely that direct reuse will occur since so many other alternatives are available.

F. BLENDING

Another technique which could be used here is that of blending water of high quality with water of lower quality. Water from the more brackish Pearl Harbor Springs could be blended with high quality water to meet domestic water quality standards.

G. INDIVIDUAL DEMINERALIZATION UNITS [6.22]

A final alternative is the use of compact desalting units for residential use. There would be some opportunity to use these in areas having only saline water sources. Each dwelling unit would purify only water needed for drinking and cooking. Sanitary uses would be met by the saline supply.

Some home desalting units are already in use, and a similar situation exists in Bermuda where many homes have catchment basins above their homes for fresh water, with brackish water supplying their other needs. It may be expected that such dual water supply systems will increase in use over the next 10 to 30 years.

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SECTION VIII

THE RELATIONSHIP BETWEEN LOCAL SHORT TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY

The proposed Wailupe Valley Well will result in no permanent loss of land area. The use of the land area is reversible, i.e., the surface facilities can be removed and the area returned to its natural state if so desired at some future time. The project will not result in short term gains at the expense of long term losses or vice versa due to the careful development planned by the BWS. The proposed action will not prevent the implementation of future options. The BWS has the choice of altering the project site to meet future needs. This includes the addition of more wells or the closing of the existing well. As there is no permanent loss of land, the BWS could also restore the land by demolishing all existing facilities and landscaping the site.

The project will also give the BWS time to test the feasibility of proposed alternatives. By developing an additional water source to meet the demands of the City and County of Honolulu for a longer period, the BWS buys more time for the research and development of future alternative sources for water. The well will provide a much needed source of domestic water for the near future requirement. The project will not limit the beneficial uses of the environment or pose any long term risk to health and safety.

SECTION IX

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

City and County funds, labor, and materials, will be irreversibly committed to the project. More funds will be required for operation and maintenance. No other commitment of resources is considered irreversible or irretrievable. The land can be reclaimed if it becomes desirable to do so and no irreversible effect is expected on Wailupe Stream or the groundwater system.

SECTION X

AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENT POLICIES ARE THOUGHT TO OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

There are no significant long term adverse impacts expected. The adverse impacts of construction are all short term and can be mitigated. The long term impacts are basically minor and visual in nature and can be deemed necessary to accommodate the planned growth of Oahu's population. The impact upon Wailupe Stream cannot be determined in advance but no significant adverse impacts are expected. The development of the well is in accordance with the 1977 City and County of Honolulu's General Plan because it supports the projected growth of Honolulu with minimal adverse environmental effects.

SECTION XI

SUMMARY OF UNRESOLVED ISSUES

At this time there are no unresolved issues from the standpoint of environmental impacts.

SECTION XII
LIST OF NECESSARY PERMITS

A. CITY AND COUNTY OF HONOLULU

Building Permit

B. STATE OF HAWAII

Noise Permit (DOH)

Water Use Permit (DLNR)

Potable Water Source (DOH)

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APPENDICES

APPENDIX A

PRIORITY RECOMMENDATIONS OF THE STATE WATER COMMISSION[1]

1. Continue and intensify conservation programs undertaken by the County water departments and the military to stabilize or reduce per capita consumption of municipal water.

2. Control further development of ground water from the Pearl Harbor Basin and tributary sources by application of the Ground Water Use Act (Chapter 177, HRS). As an immediate interim measure, impose a moratorium on increase export of water from the Pearl Harbor Area.

3. To meet projected municipal water demands on Oahu, emphasize the development of new surface and ground water sources and alternative sources, together with research to improve development methods.

4. State and County Governments take into account the finite limitations of Oahu's water resources in establishing policies that influence the rate of population increase and related urban development

5. The State Legislature adopt a permit system to control the development and use of Hawaii's surface and ground water resources in order to prevent depletion and quality deterioration, and provide for an independent "Water Use Control Board" to administer the program.

6. The legislature authorize the formulation of a comprehensive water code by a designated agency to define explicitly water rights in Hawaii and to delineate the role of government in water management.

7. Accelerate and improve programs for gathering and utilizing information on water resources, including sustainable yields, water demands, water conservation opportunities, methods and costs of water development, and assessment of environmental impacts of development.

8. Upgrade municipal water services in rural communities to minimum delivery, quantity, and quality standards.

9. Provide irrigation water for diversified agriculture wherever practicable, and assure the continuing availability of water for agriculture in general.

10. Establish a comprehensive statewide program for minimum streamflow control to provide and protect water resources for ecological, aesthetic, and recreational uses.

[1]SOURCE: State Water Commission. 1979. Hawaii's Water Resources: Directions for the Future. State Water Commission, Honolulu, Hawaii.

11. Utilize the State functional plan on water resources (when formulated) to guide State funding of water programs and projects, considering State cost-sharing in and support of bond financing for County projects, coordination of federal funding of State and County programs and projects, promotion of conservation programs, and support of research programs by agencies benefitting from the results.

12. Balance the rate of urban development with the rate of municipal water development.

13. Optimize island-wide water development on Oahu, considering the island's full range of hydrologic potentials and limitations and reasonable costs.

14. Optimize island-wide water development on Maui, considering the island's full range of hydrologic potentials and limitations and reasonable costs.

APPENDIX B

ORGANIZATIONS AND PERSONS CONSULTED

State of Hawaii, Department of Health
State of Hawaii, Department of Land and Natural Resources
Kahaluu Neighborhood Board
Sierra Club - Hawaii Chapter

APPENDIX C

COMMENTS AND RESPONSES TO THE EIS PREPARATION NOTICE

KAHALUU NEIGHBORHOOD BOARD NO. 29
c/o KAHALUU COMMUNITY CENTER
47 232 WAIHEE ROAD
KANEOHE, HAWAII 96744
[illegible]

"Let us not ever have an unhappy minority"

14th February 1981

Mr. Larry Whang
BOARD OF WATER SUPPLY
CITY & COUNTY OF HONOLULU
830 S. Beretania Street
Honolulu, Hawaii 96843

ENVIRONMENTAL IMPACT ASSESMENT: WAILUPE WELL DEVEL. PROJECT

ALOHA:

The Kahalu'u Neighborhood Board #29 is concerned over the apparent casualness with which exploratory wells are transposed into production facilities. A full scale production well seems to be the result of this and other negative declarations.

The committment for a production well seems to be assured at the point that the exploratory well is authorized by the department.

An exploratory well with a bore size much less than that of a production well would be more in keeping with a negative declaration. The Kahalu'u Neighborhood Board recommends bore reduction for exploratory wells or else an EIS.

Please add the Board as a consultant party for purposes of the EIS -- exploratory or production.

Thank you,

Elwin L. Spray
Chairman
Kahalu'u Neighborhood Board

April 6, 1981

Mr. Elwin L. Spray, Chairman
Kahalu'u Neighborhood Board
c/o Kahaluu Community Center
47-232 Kaihee Road
Kaneohe, Hawaii 96744

Dear Mr. Spray:

Subject: Your Letters of February 14, 1981, on the Environmental Impact Assessments for Punaluu Exploratory Well IV, Wailupe Well Development Project, Nakaha Exploratory Wells IV and V, and Punaluu Exploratory Wells V

Thank you for your letters of February 14, 1981, on the Environmental Impact Assessments for Punaluu Exploratory Well IV, Wailupe Well Development Project, Nakaha Exploratory Wells IV and V, and Punaluu Exploratory Wells V.

We appreciate your interest and concern about our water development projects. The purpose of drilling an exploratory well is to gather information on the quality and quantity of water that can be safely developed and on the probable effects, if any, on streamflows. If the test results indicate that it is not possible to install a production well at the site, then the exploratory well is sealed, and the project is terminated. Consequently, there is no impact on the environment. This is the reason for filing a negative impact statement for the exploratory well phase of a project and an EIS for subsequent phases, if any.

In areas where we anticipate a good source of water, we drill a hole that is larger in diameter. This is done so that a pump of adequate capacity can be installed to determine the quantity of water that is actually available. Another benefit of using a larger diameter bore is to give us an accurate account on impacts, if any, on streamflow from the induced pumping stresses.

Enclosed are copies of the environmental impact assessments for the production well portion of the various projects. We have added your organization's name to our consulted parties list.

If you have any questions, please contact Lawrence Whang at 548-5221.

Very truly yours,

For KAZU HAYASHIDA
Manager and Chief Engineer

Encl.

MHS/LHYH/HH:lm
cc: K. Hayashida
L. Whang

P-239/81
P-240/81
P-241/81
P-242/81

19 February 1981

Dear Mr. Whang:

Please consider this a request to be a consulted party for the Wailupe Well Development Project EIS.

Mahalo,

Susan E. Miller

Susan E. Miller
Conservation Chairman, Honolulu Group
Sierra Club - Hawai'i Chapter
P. O. Box 22897
Honolulu, Hawai'i 96822

February 26, 1981

Ms. Susan E. Miller
Sierra Club - Hawaii Chapter
P. O. Box 22897
Honolulu, Hawaii 96822

Dear Ms. Miller:

Subject: Your Postcard of February 19, 1981 on the Wailupe Well Development Project EIS

Thank you for your note of February 19, 1981 on the Wailupe Well Development Project EIS.

We have added your organization's name to our consulted parties list for the proposed well development project.

Enclosed is a copy of the environmental impact assessment for the project.

If you have questions or require additional information, please call Laurence Whang at 548-5221.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

Encl.

HHS:lm
cc: K. Hayashida
L. Whang

81-052.1

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

GEORGE A. L. YUEN
Director of Health

JOHN F. CHALMERS, M.D.
Deputy Director of Health

HENRY H. THOMPSON, M.A.
Deputy Director of Health

MELVIN S. KOZUMI
Deputy Director of Health

ABELINA AJDAIO SHAW, M.A., J.D.
Deputy Director of Health

In reply, please refer to:
File: EPHSD/San

February 25, 1981

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Hayashida:

SUBJECT: WAILUPE WELL DEVELOPMENT PROJECT

This letter is pursuant to notice of the subject project in the February 8, 1981 issue of the EQC Bulletin.

It is our understanding that although exploratory in nature, this well may, if proven feasible, be used to provide 0.5 mgd to Wailupe Valley area.

Please be advised that in the event that the decision is made to use the well as a new source of potable water or if, based on the results of testing, other new sources are to be developed in the area that Section 29, Chapter 49, Public Health Regulations requires Department of Health approval of all new potable water sources serving public water systems as defined. Such approval is based upon the submission of an engineering report adequately addressing all concerns set down in Section 29, Chapter 49, Public Health Regulations.

Sincerely,

THOMAS E. ARIZUMI
Supervisor
Drinking Water Section
Sanitation Branch
Environmental Protection and
Health Services Division

MJH:dnn

March 12, 1981

Mr. George A. L. Yuen
Director
Department of Health
P. O. Box 3378
Honolulu, Hawaii 96801

Attention: Mr. Thomas Arizumi

Dear Mr. Yuen:

Subject: Your Letter of February 25, 1981, on the Wailupe Well Development Project EHS Preparation Notice

Thank you for commenting on our proposed well project.

We will submit an engineering report in accordance with Section 29, Chapter 49, Public Health Regulations, for your approval before the well is used as a new source of domestic water.

A copy of the assessment is enclosed for your information.

If you have questions or require additional information, please call Lawrence Chang at 548-6221.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

Enc.
MHS:lm
cc: K. Hayashida
Engineering
L. Chang
81-561

APPENDIX D

COMMENTS AND RESPONSES TO THE EIS

020589

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

SUSUMU ONO,
BOARD OF LAND & NAT
EDGAR A. P
RIGHTS TO THE

DIVISIONS:
AQUACULTURE DEV
PROGRAM
AQUATIC RESOURCE
CONSERVATION AN
RESOURCES ED
CONVEYANCES
FORESTRY AND W
LAND MANAGEMENT
STATE PARKS
WATER AND LAND

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

APR 23 1982

Honorable Eileen Anderson
Mayor, City & County of Honolulu
Honolulu Hale
Honolulu, Hawaii 96813

Dear Mayor Anderson:

This is to offer comments on the Environmental Impact Statement (EIS) prepared for the Wailupe well project.

The well was drilled and tested by this department. It has proven to be a new potable water source for southeast Oahu, and will serve to ease dependence on water sources in Pearl Harbor. The Board of Water Supply proposes to put this well into production, and for this reason has caused the EIS to be prepared.

The project will have no impact on fisheries. Wailupe Stream is an intermittent stream. It is dry most of the time and flows only during heavy rainfall. Its flow is not sustained by any groundwater source. Therefore, a well can have no effect on its flow.

Due to the lack of archaeological surveys in Wailupe, we are unaware of any historic, archaeologic, or paleontologic resources in this area. Our records indicate that the well is not on property listed with either the Hawaii or National Registers of Historic Places, or even eligible for inclusion with the National Register.

Sincerely,

SUSUMU ONO, Chairman
Board of Land and Natural Resources
and
State Historic Preservation Officer

cc: ✓Board of Water Supply

May 11, 1982

Mr. Susumu Ono, Chairman
State Board of Land and
Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: Your Letter of April 23, 1982, on the Draft Environmental Impact Statement for Wailupe Well

Thank you for reviewing the draft environmental impact statement (EIS) for our proposed water development project. Your letter to the Mayor, which will be appended to the revised environmental impact document, has been referred to us for reply.

We shall incorporate the information on fisheries and Wailupe Stream, as noted in your letter, in the revised EIS.

If you have any questions, please contact Lawrence Whang at 548-5221.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Eileen R. Anderson, Mayor
Managing Director

MHS:mi
cc: K. Hayashida
L. Whang
82-989

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

PODED-PV

3 May 1982

Honorable Eileen Anderson
Mayor of the City and County of Honolulu
630 South King Street
Honolulu, HI 96813

Dear Mayor Anderson:

Thank you for the opportunity to review the Environmental Impact Statement (EIS) for the Wailupe Well Water Development Project, sent to us on 5 April 1982. Based on our review, we provide the following comments.

a. A Department of the Army permit is not required for this project.

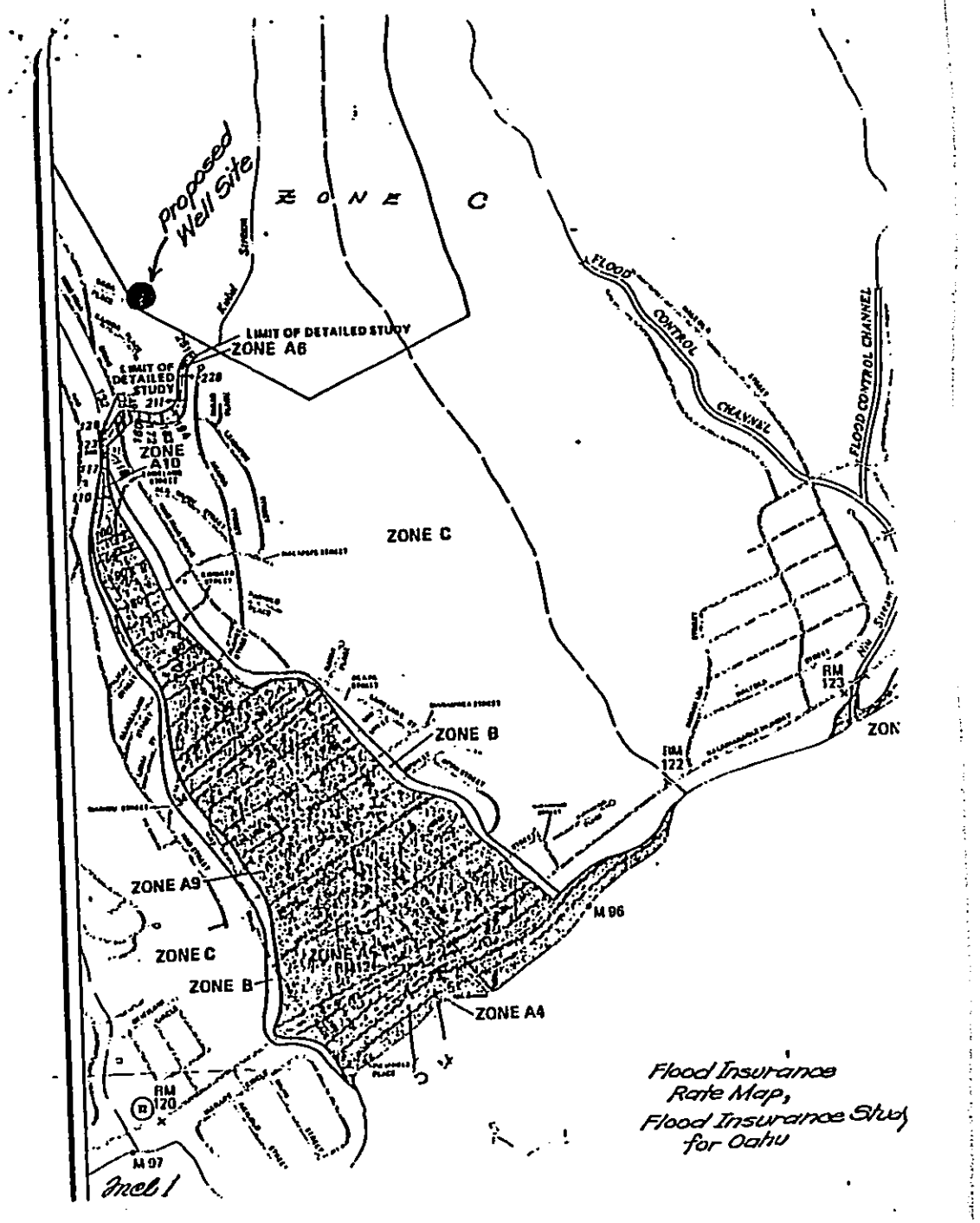
b. The proposed Wailupe Well Site and attendant facilities are not located in a designated flood plain or special flood hazard area. The site is designated Zone C, or area of minimal flooding, according to the Flood Insurance Study for the island of Oahu prepared by the Federal Insurance Administration. Inclosure 1 is the Flood Insurance Rate Map or flood hazard map for the Wailupe area.

Sincerely,

EDMUND A. THAL
Major, Corps of Engineers
Deputy District Engineer

1 Incl
As stated

CF: w/o incl
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843



BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

May 18, 1982

Major Edmund A. Thal
Deputy District Engineer
U. S. Army Engineer District
Department of the Army
Fort Shafter, Hawaii 96858

Dear Major Thal:

Subject: Your Letter of May 3, 1982, on the Draft Environmental Impact Statement for the Wailupe Well Water Development Project

Thank you for reviewing the draft environmental impact statement of our proposed water development project. Your letter to the Mayor, which will be appended to the revised environmental document, has been referred to us for direct reply.

The revised environmental document will mention that the project site is within Zone C, of the Flood Insurance Rate Map. We shall also note that a Department of Army Permit will not be required for this project.

If you have any questions, please contact Lawrence Whang at 548-5221.

Very truly yours,

For KAZU HAYASHIDA
Manager and Chief Engineer

cc: Eileen R. Anderson, Mayor
Managing Director
HM Towill Corp.

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

82-1062

EILEEN R. ANDERSON
MAYOR

WILLARD T. CHOW
CHIEF PLANNING OFFICER

RALPH PORTMORE
DEPUTY CHIEF PLANNING OFFICER

DGP4/82-1198

May 5, 1982

MEMORANDUM

TO: Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply

SUBJECT: EIS for Wailupe Well Development Project

We would have had no objections to the filing of a Negative Declaration for the proposed project.

Under Section VII, ALTERNATIVES TO THE PROPOSED ACTION, the correct word is DESALINATION rather than DESALINIZATION of SEA WATER (p. VII-13).

Thank you for affording us the opportunity of reviewing your impact statement.

Clarence Tom

CLARENCE TOM
Chief
Project Assessment Branch

APPROVED:

W T Chow

WILLARD T. CHOW

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

June 1, 1982

TO: DR. WILLARD T. CHOW
CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

ATTN.: CLARENCE TOM

FROM: KAZU HAYASHIDA
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF MAY 5, 1982, COMMENTING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT OF OUR WAILUPE WELL PROJECT

Thank you for your memorandum. The attached pages VII-11 and VII-13 show our revisions.

If you have any questions, please contact Lawrence Whang at 548-5221.

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

Attach.

cc: R. M. Towill Corporation

University of Hawaii at Manoa

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

Office of the Director

May 7, 1982

RE:0350

Mayor Eileen Anderson
City and County of Honolulu
630 South King Street
Honolulu, Hawaii 96813

Dear Mayor Anderson:

Draft Environmental Impact Statement
Wailupe Well Water Development Project
Wailupe Valley, Oahu

The Environmental Center has reviewed the draft EIS for the Wailupe Well Water Development Project with the assistance of Paul Ekern, Agronomy and Soils; Matthew Spriggs, Anthropology; Jacquelin Miller and David Peterson, Environmental Center. The following comments and questions were prepared regarding this document.

Well Characteristics and Operation

The pumping data given on page II-6 is somewhat confusing. It is not clear as to whether there were one or two pump tests. If two tests were conducted, were they both step-drawdown tests or was one of a constant discharge nature?

More water quality data (other than a single chloride reading, page II-6) would also assist in evaluating the well. In particular an itemization of all quality parameters and the change in constituent levels with each step of one step-drawdown test would be helpful.

A summary of actual pump operation is also suggested. Will the well be pumped on an intermittent basis to fill the reservoirs, subsequently allowing hydraulic head recovery? If so, what is the anticipated duration of pumping each time?

The well construction in Figure II-4, page II-7, calls for a 14 inch i.d. casing which is somewhat larger than normally needed to pump 350 gpm. Therefore, do long-term plans call for enlarging the pump at this site sometime in the future?

Hydrology

The discussion of water resources in Chapter III, Section A-4, provides a comprehensive description of the groundwater hydrology for the island of Oahu, but does not address the local hydrologic regime of Wailupe Valley. Substantive matters to be considered in assessing local water resources are:

1. What is the source of basal groundwater to be tapped by the proposed well? Are subterranean waters replenished solely through local recharge of precipitation, or does subsurface flow from adjacent valleys also occur?

2. If recharge of rainfall is the only groundwater source, does the annual rate of replenishment indicate a safe yield that equals or exceeds the proposed rate of well pumpage?

Ongoing research at the University of Hawaii suggests that little if any recharge occurs in nonirrigated areas where average annual precipitation is less than 60 inches. Isohyetal maps of the Wailupe Valley area indicate that mean annual rainfall even at the highest points of the Koolau Range barely approaches 60 inches. For this reason, the ability of the local basal lens to provide significant water supplies without net depletion of fresh water is dependent upon lateral movement of groundwater from adjacent valleys. Such movement is possible only if direct hydraulic interconnection occurs with neighboring regions, i.e., no isopiestic barriers between valleys exist.

Taking such concerns into consideration, more elaborate discussion of local hydrologic conditions is recommended. Further explantion of local geology, including maps of inter-valley dikes, if any, would assist in this objective. Inclusion of an isohyetal map, perhaps in the climate section of Chapter III, is also suggested.

Section A-4 of Chapter III also fails to address the possibility of neighboring wells in Wailupe Valley. If no wells currently exist that may be potentially affected, a statement to that effect should be included in the EIS.

As stated in Section B-2 of Chapter V, potential impact on the groundwater quality of the basal lens aquifer can only be fully assessed through careful and continual monitoring. However, more explicit information on quality changes during the step-drawdown testing, as recommended in the previous section, would at least indicate if there is any justifiable need for concern.

Figure II-4 indicates a static water level of about 10 feet above mean sea level, while pumping data on page II-7 suggests that drawdowns may approach 18 feet under a sustained discharge of 350 gallons per minute. The resulting dynamic water level during pump operation can, therefore, potentially reach a level of 8 feet below sea level. Consequent upconing of the underlying fresh water-salt water boundary may also occur with the potential existing for increased dissolved salt concentrations. Pump operation may have a major effect on the degree of mixing at the salt-fresh water interface. For this reason, we believe that the discussion of environmental effects in Chapter V should include a more quantitative evaluation of potential quality effects and the influence of proposed well operation.

Archaeology

The archaeological discussion of page III-13 lacks detail and supportive information necessary for making appropriate assessment of potential impacts. Items of particular concern and recommended measures to correct these shortcomings are:

1. Reference is made to certain observations by a John C. Clarke, with regard to the absence of archeological features. It would be helpful in evaluating such a statement to know the qualification of Mr. Clarke, i.e., is he a long-term resident of the area, a local historian or graduate archeologist, or some other authority which qualifies him to provide useful accounts of the area's history?

2. To assist in evaluating the archaeological significance of the region, it would be useful to indicate where the Kawanoha Heiau and altar (page III-13) were supposedly located, i.e., in the vicinity of the well, at the mouth of the valley or elsewhere.

For this and similar projects, a reference to land records showing former use of the site and neighboring areas is also suggested. Such measures help in evaluating the likelihood of prehistoric remains on the site. If, for instance, it is reported that someone owned "lo'i" on the project land in the 1850's, then it would imply that prehistoric agricultural exploitation was practiced.

Statements in Chapter V, page V-3, indicate that no archaeological findings were made at the project site during construction. There is no mention, however, as to how the site was altered and to what extent excavation took place. Therefore, as an extra precaution, we recommend that the state dispatch one of the Historic Preservation Office archaeologists to inspect the site prior to well construction activity.

Economic

An explicit comparison of costs for the proposed well with those of continuing to import water has not been provided. Discussions of this matter, in the interest of evaluating the economic benefits and/or drawbacks of the project, are suggested for Chapters V (Environmental Impacts) and VII (Alternatives to the Proposed Action).

Yours truly,

Doak C. Cox
Director

cc: Board of Water Supply
Office of Environmental Quality Control
Paul Ekern
Matthew Spriggs
Jacquelin Miller
David Peterson

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

June 8, 1982

Dr. Doak C. Cox, Director
Environmental Center
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

Dear Dr. Cox:

Subject: Your Letter of May 7, 1982, on the Draft Environmental Impact Statement for Mailupe Well Water Development Project

Thank you for reviewing the draft environmental impact statement for our proposed water development project. Your letter has been referred to us for direct reply by the Mayor and it will be appended to the revised environmental document.

In answer to your comments, we offer the following:

Well Characteristics and Operation

1. *The pumping data given on page II-6 is somewhat confusing. It is not clear as to whether there were one or two pump tests. If two tests were conducted, were they both step-draudown tests or was one of a constant discharge nature?*

The pumping data will be revised. The well was test pumped at a constant discharge rate of 350 gpm for five days and was then pumped at a constant discharge rate of 300 gpm for another three days (twelve hours per day).

2. *More water quality data (other than a single chloride reading, page II-6) would also assist in evaluating the well. In particular an itemization of all quality parameters and the change in constituent levels with each step of one step-draudown test would be helpful.*

A summary of the data obtained during the test pumping is attached for your information.

3. *A summary of actual pump operation is also suggested. Will the well be pumped on an intermittent basis to fill the reservoirs, subsequently allowing hydraulic head recovery? If so, what is the anticipated duration of pumping each time?*

Pumpage from the well will be on an intermittent basis to meet the water demands in Wailupe Valley. The maximum daily pumpage duration would be about sixteen hours at a rate of 100 to 150 gpm.

4. *The well construction in Figure II-4, page II-7, calls for a 16 inch t.d. casing which is somewhat larger than normally needed to pump 350 gpm. Therefore, do long-term plans call for enlarging the pump at this site sometime in the future?*

We have no plans for enlarging the pumps at this site. Although the well is capable of pumping at 300 gpm, the basal head conditions favor a lower rate. A pump of 100 to 150 gpm capacity is being considered for the well.

Hydrology

The discussion of water resources in Chapter III, Section A-4, provides a comprehensive description of the groundwater hydrology for the island of Oahu, but does not address the local hydrologic regime of Wailupe Valley. Substantive matters to be considered in assessing local water resources are:

1. *What is the source of basal groundwater to be tapped by the proposed well? Are subterranean waters replenished solely through local recharge of precipitation, or does subsurface flow from adjacent valleys also occur?*

Local recharge plus an unknown amount of underflow into Wailupe Valley contributes to the basal groundwater source tapped by the well.

2. *If recharge of rainfall is the only groundwater source, does the annual rate of replenishment indicate a safe yield that equals or exceeds the proposed rate of well pumpage?*

As mentioned previously, the groundwater source for the well is from local recharge and underflow from adjacent valleys.

Ongoing research at the University of Hawaii suggests that little if any recharge occurs in nonirrigated areas where average annual precipitation is less than 60 inches. Isohyetal maps of the Wailupe Valley area indicate that mean annual rainfall even at the highest points of the Koolau Range barely approaches 60 inches. For this reason, the ability of the local basal lens to provide significant water supplies without net depletion of fresh water is dependent upon lateral movement of groundwater from adjacent valleys. Such movement is possible only if direct hydraulic interconnection occurs with neighboring regions, i.e., no isopiestic barriers between valleys exist.

Due to the presence of coastal springs, recharge does occur in Wailupe Valley. Although an annual average rainfall of less than 60 inches would seem to make recharge marginal or non-existent, rain from winter storms contribute heavily to recharge in the area. Also, an unknown amount of underflow from adjacent valleys would prevent depletion of the fresh water lens.

Taking such concerns into consideration, more elaborate discussion of local hydrologic conditions is recommended. Further explanation of local geology, including maps of intervalley dikes, if any, would assist in this objective. Inclusion of an isohyetal map, perhaps in the climate section of Chapter III, is also suggested.

More discussion on local hydrologic conditions will be incorporated into the revised document. Also, additional explanation on local geology and an isohyetal map will be included in the applicable sections of the revised document.

Section A-4 of Chapter III also fails to address the possibility of neighboring wells in Waiupe Valley. If no wells currently exist that may be potentially affected, a statement to that effect should be included in the EIS.

There are no other active wells in the valley. This information will be included in the revised document.

As stated in Section B-2 of Chapter V, potential impact on the groundwater quality of the basal lens aquifer can only be fully assessed through careful and continual monitoring. However, more explicit information on quality changes during the step-drawdown testing, as recommended in the previous section, would at least indicate if there is any justifiable need for concern.

Although a step-drawdown test was not performed on the exploratory well, the chloride data obtained during the pump test indicate pumpage should be less than 300 gpm. We plan a pumping rate of 100 to 150 gpm for the well.

Figure II-6 indicates a static water level of about 10 feet above mean sea level, while pumping data on page II-7 suggests that drawdowns may approach 18 feet under a sustained discharge of 350 gallons per minute. The resulting dynamic water level during pump operation can, therefore, potentially reach a level of 8 feet below sea level. Consequent upconing of the underlying fresh water-salt water boundary may also occur with the potential existing for increased dissolved salt concentrations. Pump operation may have a major effect on the degree of mixing at the salt-fresh water interface. For this reason, we believe that the discussion of environmental effects in Chapter V should include a more quantitative evaluation of potential quality effects and the influence of proposed well operation.

Figure II-4 will be corrected to indicate a static water level of 3.7 feet above mean sea level.

We concur with you that pump operation can cause upconing and increasing the thickness of the salt-fresh water interface. By installing a pump of 100 to 150 gpm, we hope to minimize the potential for groundwater degradation.

Archaeology

The archaeological discussion of page III-18 lacks detail and supportive information necessary for making appropriate assessment of potential impacts. Items of particular concern and recommended measures to correct these shortcomings are:

1. *Reference is made to certain observations by a John C. Clarke, with regard to the absence of archaeological features. It would be helpful in evaluating such a statement to know the qualification of Mr. Clarke, i.e., is he a long-term resident of the area, a local historian or graduate archeologist, or some other authority which qualifies him to provide useful accounts of the area's history?*

2. *To assist in evaluating the archaeological significance of the region, it would be useful to indicate where the Kawanoha Heiau and altar (page III-18) were supposedly located, i.e., in the vicinity of the well, at the mouth of the valley or elsewhere.*

The identity of Mr. John K. Clarke will be incorporated into the revised document. Mr. Clarke is mentioned in Sites of Oahu by Elspeth Sterling and Catherine C. Summers. Although not mentioned by name, Mr. Clarke is referred to as a "kamaaina" in Native Planters in Old Hawaii by E.S. Craighill Handy and Elizabeth Green Handy.

We were unable to get a detailed location of the Kawanoha Heiau. In the 1907 Hawaiian Annual the heiau was described as being sited "just above Puu Hua, at the foot of hill Hawaii Loa."

For this and similar projects, a reference to land records showing former use of the site and neighboring areas is also suggested. Such measures help in evaluating the likelihood of prehistoric remains on the site. If, for instance, it is reported that someone owned "lo'i" on the project land in the 1850's, then it would imply that prehistoric agricultural exploitation was practiced.

We will include information on historical land use if it is available.

Statements in Chapter V, page V-8, indicate that no archaeological findings were made at the project site during construction. There is no mention, however, as to how the site was altered and to what extent excavation took place. Therefore, as an extra precaution, we recommend that the state dispatch one of the Historic Preservation Office archaeologists to inspect the site prior to well construction activity.

Our statement on page V-3 says that finding an unidentified archaeological site when we construct the new facility will be unlikely.

The site was graded to accommodate the construction of the two existing reservoirs in 1951 and 1961. Cuts up to 20 feet were made in the vicinity of the proposed well site.

Due to the original grading work at the site, we do not feel a site inspection by the Historic Preservation Office is warranted. As noted on page V-3, the contractor will be required to exercise caution and to report any archaeological findings to the State Historic Preservation Officer.

Economic

An explicit comparison of costs for the proposed well with those of continuing to import water has not been provided. Discussions of this matter, in the interest of evaluating the economic benefits and/or drawbacks of the project are suggested for Chapters V (Environmental Impacts) and VII (Alternatives to the Proposed Action).

A cost comparison between importing water and constructing the new well is not justified. As mentioned in the draft EIS, the project is needed to meet increasing water demand.

Some of the water serving the Wailupe area may be imported from the Pearl Harbor District. However, since the Pearl Harbor District aquifer has been designated as a groundwater control area, very little additional water can be imported.

Although water could also be imported from the Windward District, almost all of the water developed in the Windward District is being used in that district.

If you have any questions, please contact Lawrence Whang at 548-5221.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

Attach.

cc: Eileen R. Anderson, Mayor
Managing Director
R.M. Towill

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

CHARLES G. CLARK
DIRECTOR

TELEPHONE NO.
548-6915

May 20, 1982

The Honorable Eileen Anderson
Mayor of the City and County of Honolulu
City Hall
Honolulu, Hawaii 96813

SUBJECT: Environmental Impact Statement for Wailupe Well, Honolulu, Oahu

Dear Mayor Anderson:

We have reviewed the subject statement and offer the following comments for your consideration:

PAGE II-2

(1) The EIS indicates that if the quantity of consumption will remain the same, the limit of 200 million gallon daily could be extracted from the Board of Water Supply. A discussion should also be given on the worst case. That is to say, worst conditions should be discussed to determine if the amount would be the safe yield for water withdrawal.

PAGE II-3

(2) The EIS refers to the Oahu Water Plan of 1975 for installation of water facilities in each of the six water use districts. It should be pointed out that the figures used in the water plan does not reflect the new population projections, series II-F. The reference should be clarified.

There should be discussion on the impact of declaring Honolulu a groundwater control district and how it would affect the proposed action.

PAGE III-9

3) Lualualei soil series in places where roots penetrate to depths of five feet or more, there is a high shrink-swell potential. The impact of the soil on the well's soil stability should be discussed. In addition, if a building is to be constructed in conjunction with the wells, the impact on the building should be discussed.

WATER USE

4) Although the EIS discusses the water use on Oahu, the demand for the area and the areas to be served should be discussed in the EIS.

IMPACT ON GROWTH

5) Water is a major constraint to growth. Its secondary impacts may be as significant as the primary impacts. EIS Regulation 1:42 c. states,

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

Therefore, the EIS should discuss whether the proposed project will stimulate growth within the Wailupe area and in Honolulu in general.

STATE ENVIRONMENTAL POLICY ACT

6) The State Environmental Policy Act, Chapter 344, Hawaii Revised Statutes, should be discussed in relationship to the proposed action.

GROUNDWATER CONTROL

7) The EIS is unclear whether additional water drafting is permitted within the groundwater district. Because Honolulu has been declared a groundwater control district and since additional drafting may affect the water table, there should be discussion as to why the project proposes to draft from that district.

We trust that these comments will be helpful to you in preparing the revised EIS. An attached sheet lists the commenting agencies and organizations.

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

Yours truly,

Charles G. Clark
Director

Attachment

cc: BWS with attachment

LIST OF COMMENTING PARTIES

State Energy Office	May 8, 1982
*Department of Human Concerns	April 12, 1982
*Department of Defense	April 7, 1982
*Environmental Center	May 7, 1982

*comment previously forwarded to BWS

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
ENVIRONMENTAL QUALITY COMMISSION
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

ROY R. TAKEMO
CHAIRMAN

TELEPHONE #:
(808) 548-6915

April 2, 1982

Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 343, Hawaii Revised Statutes and the Rules and Regulations of the Environmental Quality Commission:

Title: Makawao-Kula Water Treatment Plants

Location: Makawao and Kula, Maui

Classification: Agency Action

Your comments or acknowledgement of no comments on the EIS are welcomed. Please submit your reply to the accepting authority or approving agency:

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

Please send a copy of your reply to the proposing party:

Mr. William S. Haines, Director
Department of Water Supply
County of Maui
P.O. Box 1109
Wailuku, Hawaii 96793

Your comments must be received or postmarked by: May 8, 1982.

If you have no further use for this EIS, please return it to the Commission.

Thank you for your participation in the EIS process. 82:313

State Energy Division has no comments.

Edward J. Greaney
Chief, Conservation Branch

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

June 10, 1982

Mr. Charles G. Clark, Director
Department of Health
State of Hawaii
550 Halekauwila St., Room 301
Honolulu, Hawaii 96813

Attention: Office of Environmental Quality Control

Dear Mr. Clark:

Subject: Your Letter of May 20, 1982, on the Draft Environmental Impact Statement for Wailupe Well

Thank you for reviewing the draft environmental impact statement for our proposed water development project. Your letter to the Mayor has been referred to us for direct reply and will also be appended to the revised environmental document. We have the following response to your comments:

Comments to Paragraph 1:

The safe yield of all groundwater resources is estimated to be between 480 and 630 million gallons per day (mgd). We are using the lower figure of 480 mgd in the EIS.

We do not feel that the safe yield of the aquifer will be exceeded. The only worse case would be for private, military and agricultural users to increase their draft. However, over the past few years, their draft has remained fairly constant.

Comments to Paragraph 2:

We will clarify the references to the Oahu Water Plan. Our groundwater development schedule is shown on Table II-2 and the series II-F population projections are shown on Table III-1.

The Honolulu aquifer was declared a Designated Groundwater Control Area by the Department of Land and Natural Resources on February 27, 1982. So far, the only impact on the proposed project is that it must comply with the requirements of Chapter 166, HRS. A discussion on the designation of the Honolulu aquifer as a groundwater control area will be included in the revised EIS.

Comments to Paragraph 3:

According to the soil survey by the Soil Conservation Service bedrock is usually found at depths greater than five feet.

The high shrink-swell potential will have no adverse impacts on the well which is grouted to a depth of 50 feet. We also anticipate no adverse impacts on the proposed control building.

Comments to Paragraph 4:

The proposed well will pump into the distribution system served by the two reservoirs located at the end of Ekoa Place. Our latest consumption records for the area served by these two reservoirs show consumption ranging from a low of 175,000 to a high of 216,000 gallons per day. Since very little development has taken place in the valley in recent years, consumption has remained fairly constant.

Comments to Paragraph 5:

Our water development project will not stimulate growth in Wailupe Valley. The proposed source capacity is about equal to the average existing water demand in the upper portion of the valley. Water from other sources would then be used to meet other demands within the district.

Growth in Wailupe and elsewhere is dictated by zoning; not water.

Comments to Paragraph 6:

The relationshop of the proposed action to the State Environmental Policy Act will be discussed in the revised EIS.

Comments to Paragraph 7:

The Honolulu Groundwater Control Area was divided into two subareas: the Moanalua-Kaimuki Subarea and the Waialae-Hawaii Kai Subarea. Drilling of the well was permitted because existing pumpages in the area is less than the sustainable yield established for the subarea.

The proposed well is sited in an area where we anticipate no detrimental effects to nearby wells or the groundwater aquifer.

If you have any questions, please contact Lawrence Whang at 548-5221.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Eileen R. Anderson, Mayor
Managing Director
W. H. Towill

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

29 April 1982

Mayor Eileen Anderson
City & County of Honolulu
630 South King Street
Honolulu, Hawaii 96813

Dear Mayor Anderson:

Subject: EIS for the Wailupe Well Water Development,
TMK 3-6-19:35, February 1982

We have reviewed the subject EIS and offer the following comments:

1. There are 22 references cited in Section VII, but only 14 are listed on p. VII-15. If the rest are found, please send us a copy.

2. P. VII-3, para. 1. The Honouliuli WWTP is located south (not north) of the Ewa Plantation Hill.

Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi
EIS Coordinator

ETM:ja

cc: H. Gee
Y.S. Fok
Board of Water Supply

AN EQUAL OPPORTUNITY EMPLOYER

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

June 15, 1982

Dr. L. Stephen Lau, Director
Water Resources Research Center
University of Hawaii
2540 Dole Street
Honolulu, Hawaii 96822

Attention: Mr. Edwin T. Murabayashi

Dear Dr. Lau:

Subject: Your Letter of April 29, 1982, on the Environmental Impact Statement (EIS) for the Wailupe Well Water Development

Thank you for reviewing the Wailupe Well Water Development EIS. We are replying to your letter to the Mayor of April 29, 1982.

Our responses to your comments are as follows:

1. "There are 22 references cited in Section VII, but only 14 are listed on p. VII-15. If the rest are found, please send us a copy."

The additional 8 references were inadvertently omitted from the Draft EIS. These references will be listed on a new page VII-16.

6.15 Chang, Bei - Jiann, R.M.F. Young and J.C.S. Chow. 1973 Application of Reverse Osmosis Technology to Hawaiian Low Quality Waters. Technical Report No. 73 University of Hawaii Water Resources Research Center, Honolulu, Hawaii.

6.16 I bid 6.14
6.17 Op. Cit. 6.1
6.18 Op. Cit. 6.1
6.19 Op. Cit. 6.1
6.20 Op. Cit. 6.9
6.21 Op. Cit. 6.1
6.22 Hawaii Water Resources Regional Study. 1977. Hawaii Water Resources Plan (Review Draft). Hawaii Water Resources Regional Study, Honolulu, Hawaii.

2. "P. VII-3, para. 1. The Honouliuli WWTP is located south (not north) of the Ewa Plantation Mill."

We concur and will make the change.

If you have any questions, please contact Lawrence Whang at 548-5221.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Eilden R. Anderson, Mayor
Managing Director
W. M. Towill

BWS

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

ROBERT K. MASUDA
DIRECTOR

April 13, 1982

MEMORANDUM

TO: HONORABLE EILEEN R. ANDERSON, MAYOR

VIA: ANDREW I. T. CHANG, MANAGING DIRECTOR 4/14

FROM: ROBERT K. MASUDA, DIRECTOR 4/14

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE WAILUPE WELL WATER DEVELOPMENT PROJECT

The proposed project will not have any impact on our parks and recreation facilities.

Thank you for the opportunity to review the Environmental Impact Statement.

RKM:vc

cc: BWS

April 14, 1982

MEMORANDUM

TO: Honorable Eileen R. Anderson, Mayor

FROM: Joseph K. Conant

SUBJECT: Wailupe Well Water Development Project
Wailupe Valley, Oahu
TMK: 3-6-19: 35

We have reviewed the environmental impact statement (EIS) for the subject project and have no comments.

We are retaining a copy of the EIS for our files.

JOSEPH K. CONANT
Original Signed

JOSEPH K. CONANT

cc: Board of Water Supply

020904

HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860

IN REPLY REFER TO:
002:09P2:SH:ci
Ser 986
16 APR 1982

The Honorable Eileen Anderson
Mayor of Honolulu
City Hall
Honolulu, Hawaii 96813

Dear Mayor Anderson:

Environmental Impact Statement (EIS)
Wailupe Well Water Development Project

The subject EIS, forwarded by the Environmental Quality Commission, has been reviewed, and the following are provided for your reference:

a. The Wailupe Well is remote from the center of U. S. Navy activity and has no direct effect upon our requirements.

b. Under "Future Alternative Sources of Water" (page VII-3), there are two citations. These are Pearl Harbor Springs, and the proposal for a West Loch Reservoir. Neither of these require comment.

As requested, the EIS will be returned to the Environmental Quality Commission.

Thank you for the opportunity to review this EIS.

Sincerely,

M. M. DALLAM
CAPTAIN, CEC, U. S. NAVY
FACILITIES ENGINEER
BY DIRECTION OF THE COMMANDER

Copy to:
State EQC (w/EIS)
BWS C&C HONO

020903

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
FORT SHAFTER, HAWAII 96858

APZV-Gry

16 APR 1982

Honorable Eileen Anderson
Mayor of City and County of Honolulu
530 South King Street
Honolulu, Hawaii 96813

Dear Mayor Anderson:

The Environmental Impact Statement (EIS) for the Wailupe Well Water Development Project TMK: 3-6-19:35 has been reviewed and we have no comments to offer. There are no Army installations or activities in the vicinity of the proposed project.

Thank you for the opportunity to comment on the EIS.

Sincerely,

Original signed by
ADOLPH A. HIGHT
COL, EN
Director of Engineering and Housing

Copy Furnished:
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN BOARD OF AGRICULTURE

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

April 20, 1982

MEMORANDUM

To: Mayor Eileen Anderson
City and County of Honolulu

Subject: Wailupe Well Water Development Project
Environmental Impact Statement

The Department of Agriculture has reviewed the subject Environmental Impact Statement and does not have any comments to offer.

Thank you for the opportunity to comment.

Sincerely,

Jack K. Suwa

JACK K. SUWA
Chairman, Board of Agriculture

cc: Board of Water Supply

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

ROY A. PARKER
DIRECTOR

TE-4/82-1279

April 20, 1982

MEMORANDUM

TO: HONORABLE EILEEN R. ANDERSON, MAYOR

VIA: ANDREW I. T. CHANG
MANAGING DIRECTOR

FROM: ROY A. PARKER, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR WAILUPE WELL WATER DEVELOPMENT PROJECT

We have reviewed the EIS and have no comments.

Roy Parker

ROY A. PARKER

cc: Board of Water Supply

GEORGE R. ARIYOSHI
Governor

ROY R. TAKEMOTO
Chairman

TELEPHONE NO.
(808) 548-6915

STATE OF HAWAII
ENVIRONMENTAL QUALITY COMMISSION
550 HALEKAUWILA ST.
ROOM 301
HONOLULU, HAWAII 96813

Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 343, Hawaii Revised Statutes and the Rules and Regulations of the Environmental Quality Commission:

Title: Wailupe Well Water Development Project

Location: Wailupe Valley, Oahu

Classification: Agency Action

Your comments or acknowledgement of no comments on the EIS are welcomed. Please submit your reply to the accepting authority or approving agency:

Mayor Eileen Anderson
City and County of Honolulu
630 South King Street
Honolulu, Hawaii 96813

Please send a copy of your reply to the proposing party:

Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Your comments must be received or postmarked by: May 8, 1982.

If you have no further use for this EIS, please return it to the Commission.

Thank you for your participation in the EIS process. 82:312

State Energy Division has no comments.

Edward J. Greaney
Chief, Conservation Branch

GEORGE R ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

Kamamalu Building 250 South King St Honolulu Hawaii • Mailing Address P O Box 2359 Honolulu Hawaii 96804

April 22, 1982

Ref. No. 4653

COPY

The Honorable Eileen R. Anderson
Mayor
City and County of Honolulu
Honolulu, Hawaii 96813

Dear Mayor Anderson:

Subject: Environmental Impact Statement for the Wailupe Well Water Development Project

We have reviewed the subject EIS and find that it has adequately identified the major impacts which can be anticipated to result from the proposed project.

Thank you for the opportunity to comment on this matter.

Sincerely,

Hideto Kono

cc: Board of Water Supply
City and County of Honolulu

RECEIVED
BD OF WATER SUPPLY
54 PM '82

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15TH AIR BASE WING (PACAF)
HICKAM AIR FORCE BASE, HAWAII 96853

REPLY TO ATTN OF: DEEV (Mr Yamada, 449-1831) 22 APR 1982

SUBJECT: Environmental Impact Statement for the Wailupe Well Water Development Project

TO: Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

1. This office has reviewed the subject EIS and has no comment relative to the proposed project.

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your project and thank you for the opportunity to review the document.

WILLIAM T. MORIOKA
Chief, Engrg & Envmtl Plng Div
Directorate of Civil Engineering

Cy to: Honorable Mayor Eileen Anderson
City and County of Honolulu
630 South King Street
Honolulu, HI 96813

Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96813

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

APR 29 1982

Honorable Eileen Anderson
Mayor, City and County of Honolulu
630 South King Street
Honolulu, Hawaii 96813

Re: Wailupe Well Water Development Project, Wailupe Valley, Oahu

Dear Mayor Anderson:

We have reviewed the subject EIS and have no comments to offer at this time. However, we would appreciate being informed of future water development activities in Wailupe and elsewhere on Oahu.

Sincerely yours,

Lucian Kramer
Acting Project Leader
Office of Environmental Services

cc: NMFS - WPPO
HDF&G
EPA, San Francisco
Board of Water Supply

APR 30 8 31 AM '82

MAY 3 8 32 AM '82

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

EILEEN R. ANDERSON
MAYOR

MICHAEL M. McELROY
DIRECTOR

ROBERT B. JONES
DEPUTY DIRECTOR

LU4/82-1744(LC)

May 4, 1982

MEMORANDUM

TO : KAZU HAYASHIDA, MANAGER & CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM : MICHAEL M. McELROY, DIRECTOR

SUBJECT : WAILUPE WELL WATER DEVELOPMENT PROJECT

We have no comments on the above document.

We feel it adequately assesses impact on the surrounding area.

Thank you for the opportunity to comment.

for MICHAEL M. McELROY
Director of Land Utilization

MMM:sl

United States Department of Agriculture
Soil Conservation Service
P. O. Box 50006
Honolulu, HI
96850

May 4, 1982

Mayor Eileen Anderson
City and County of Honolulu
630 South King Street
Honolulu, HI .96813

Dear Mayor Anderson:

Subject: Wailupe Well Water Development Project EIS
TMK: 3-6-19:35

We have reviewed the subject EIS and have no comments to make.

Thank you for the opportunity to review the document.

Sincerely,

STRATFORD L. WHITING
District Conservationist

cc: Kazu Hayashida, Manager and Chief Engineer, Board of Water Supply

The Soil Conservation Service is an agency of the Department of Agriculture

SCS-AS-1
10-78