EXECUTIVE CHAMBERS

HONOLULU

GEORGE R. ARIYOSHI
GOVERNOR

June 28, 1984

Ms. Letitia N. Uyehara, Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Based on the recommendation of the Office of Environmental Quality Control, I am pleased to accept the revised environmental impact statement for the Kamooalii watershed wells in Kaneohe, Oahu, as a satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes.

This environmental impact statement will be a useful tool in deciding whether this project should be allowed to proceed. My acceptance of the statement is an affirmation of its adequacy under applicable laws and does not constitute an endorsement of the proposal.

When the decision is made regarding this action, I expect the proposing agency to carefully weigh the societal benefits against the environmental impact which will likely occur. This impact is adequately described in the statement, and, together with the comments made by reviewers, provides a useful analysis of alternatives to the proposed action.

With warm personal regards, I remain,

Yours very truly,

George R. Ariyoshi

cc: Board of Water Supply

Revised
Environmental Impact Statement
FOR
KAMOOALII
WATERSHED WELLS

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

CITY AND COUNTY OF HONOLULU
BOARD OF WATER SUPPLY

REVISED ENVIRONMENTAL IMPACT STATEMENT

FOR

KAMOOALII WATERSHED WELLS

Kaneohe, Oahu, Hawaii
Tax Map Key: 4-5-35:portion of 1
4-5-41:portion of 4, portion of 9
4-5-42:portion of 1

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: Governor, State of Hawaii

BOARD MEMBERS:

Yoshie H. Fujinaka, Chairman
Walter A. Dods Jr., Vice Chairman
Milton J. Agader
Michael J. Chun
Ernest A. Watari
Wayne J. Yamasaki
Paula R. Rath

Kazu Hayashida Date 4/9/84
KAZU HAYASHIDA
Manager & Chief Engineer

PREPARED BY: VTN Pacific
1164 Bishop Street, Suite 906
Honolulu, Hawaii 96813

SUMMARY

The City and County of Honolulu Board of Water Supply (BWS) is proposing to develop one production well and one standby well at each of four 10,000 square foot sites within the watershed of Kamooalii Stream. While siting of access roads, electrical lines, telephone lines, water transmission mains, and reservoirs is presently not resolved, five conceptual approaches are under consideration for connecting the Kamooalii Watershed Wells to the BWS water distribution and Hawaiian Electric Company power distribution systems.

Production from each well field is expected to range between 0.5 and 2.0 million gallons per day (mgd). First priority for use of water from the new well fields would be to service Kaneohe and Kailua. Any surplus water would be exported to Honolulu.

The entire flow of Kamooalii Stream and its tributaries Kuou, Piho, Hooleinaiwa, and Halekou currently is impounded within a 26 acre reservoir by the Ho'omaluhia Park flood control dam. As part of Ho'omaluhia Park, the Corps of Engineers also impounded Hooleinaiwa Stream to form a wildlife pond for endemic waterbirds. Water exits from the Ho'omaluhia flood control reservoir through a vertical outlet tower. After leaving the flume at the base of this tower, Kamooalii Stream is joined by another tributary, Luluku Stream. Kamooalii Stream joins Anolani Stream near Kamehameha Highway and forms Kaneohe Stream. Parts of Luluku Stream, lower Kamooalii Stream, and Kaneohe Stream have been channelized.

Kamooalii and Luluku Streams have perennial flow up to an elevation of 700 feet, while Kuou, Piho, Hooleinaiwa, and Halekou Streams are only perennial below an elevation of 300 feet. Luluku Stream's base flow now stems from high level springs and leakage from the BWS Luluku water development tunnel. However, most of the base flow of Kuou, Piho, Hooleinaiwa, Halekou, and Kamooalii Streams originates below an altitude of 250 feet from ground water seeping to the surface in Ho'omaluhia Park.

dry weather stream flow, another approach would be to pump well water into Kamooalii Stream or one of its tributaries.

Pending adoption of in-stream flow standards, the BWS is committed to preserving enough stream flow to maintain existing water levels in the 1.5 acre Ho'omaluhia wildlife pond and the 26 acre Ho'omaluhia reservoir. This will be sufficient to protect waterbird habitat and prevent fish kills in the reservoir. However, a substantial reduction of dry weather flow out of the Ho'omaluhia reservoir has the potential to make it impossible for endemic diadromous species to survive in Kamooalii Stream above inflow from Anolani Stream.

ENVIRONMENTAL IMPACT STATEMENT

FOR

KAMOOALII WATERSHED WELLS

C O N T E N T S

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TABLE OF CONTENTS (Continued)

I. DESCRIPTION OF THE PROPOSED PROJECT

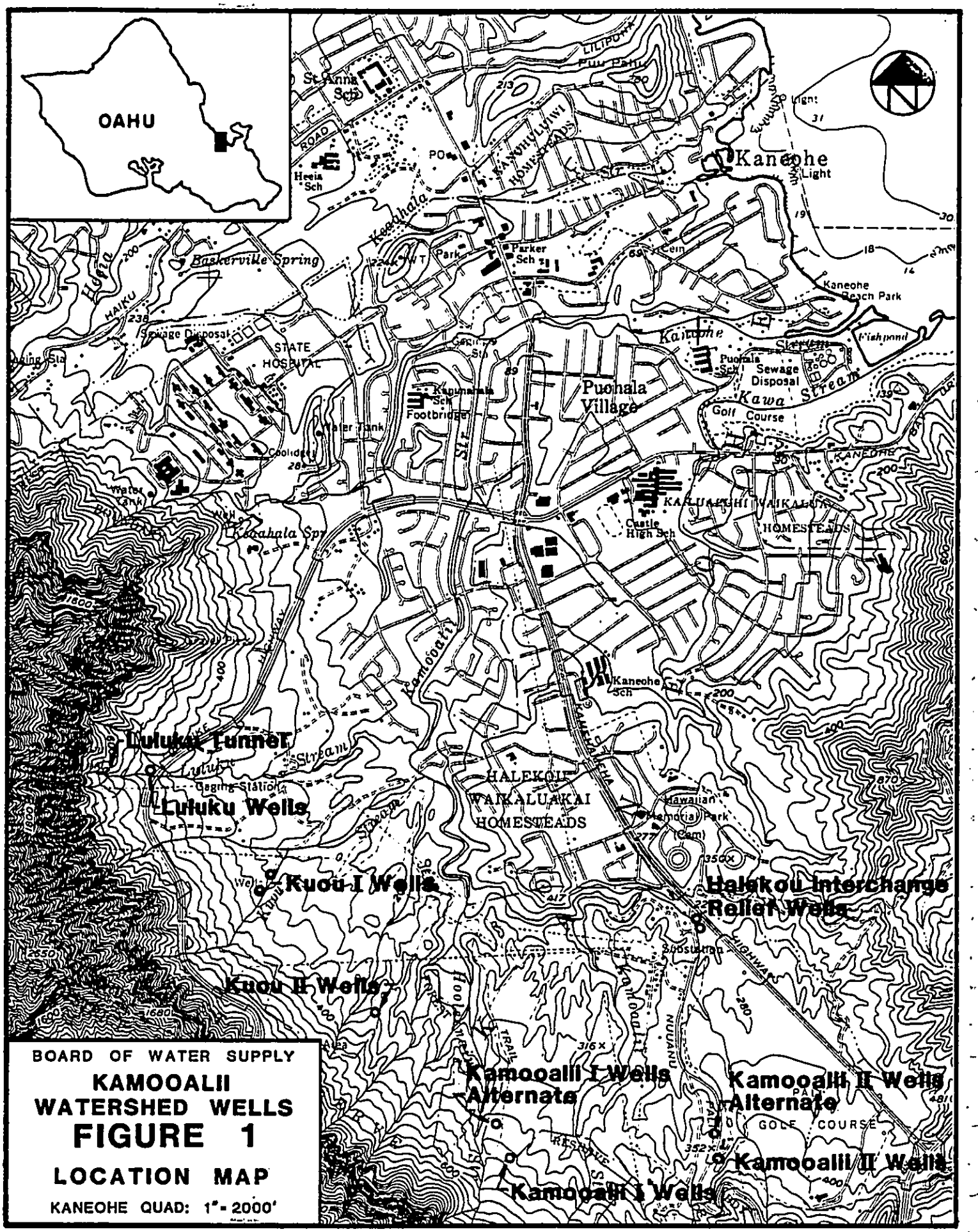
A. LOCATION

The City and County of Honolulu Board of Water Supply (BWS) is proposing to construct well fields at four 10,000 square foot sites within the watershed of Kamooalii Stream: Luluku, Kuou II, Kamooalii I, and Kamooalii II. All four sites are within the General subzone of the State Conservation District. The location of these sites is shown in Figure 1 and Plate 1. The location of the existing BWS Luluku Tunnel (DOWALD No. 2349-01) and Kuou I wells (DOWALD Nos. 2348-02 and 2348-03) and the location of the existing Department of Transportation (DOT) Halekou Interchange Relief Wells (No DOWALD Nos.) are also shown in Figure 1 and Plate 1. The Luluku Tunnel and the mauka Kuou I well (No. 2348-03) are currently the only water development facilities in use in the project area.

The Luluku well field site is located at an elevation of about 410 feet in a banana plantation immediately west of Likelike Highway and north of Luluku Stream. [Plate 2] The portal of the Luluku Tunnel [Plate.4] is about 700 feet west of the proposed site at an altitude of 530 feet. The well field site is a portion of a 421.2 acre parcel owned by Iolani School and identified by TMK:4-5-41:4. Road access to the site will be directly off Likelike Highway.

The Kuou II well field site is located at an elevation of about 350 feet on an unused grass and brush covered slope just inside the southwestern boundary of the County's Ho'omaluhia Park. [Plate 3] An existing reservoir which serves Ho'omaluhia Park is located on a knoll about 180 feet to the north. The proposed H-3 Freeway right-of-way would abut the mauka edge of the Kuou II site. The well field site is a portion of a 113.4 acre parcel owned by the City and County of Honolulu and identified by TMK:4-5-41:9. A short access road to the site will be developed from internal access roads in Ho'omaluhia Park.

There are two alternate sites for the Kamooalii I well field. Road access to either site will originate from internal access roads of Ho'omaluhia Park, go through an "equestrian" underpass which the DOT has planned under the proposed H-3 Freeway, and then proceed cross-



BOARD OF WATER SUPPLY

KAMOOALII WATERSHED WELLS

FIGURE 1

LOCATION MAP

KANEOHE QUAD: 1" = 2000'

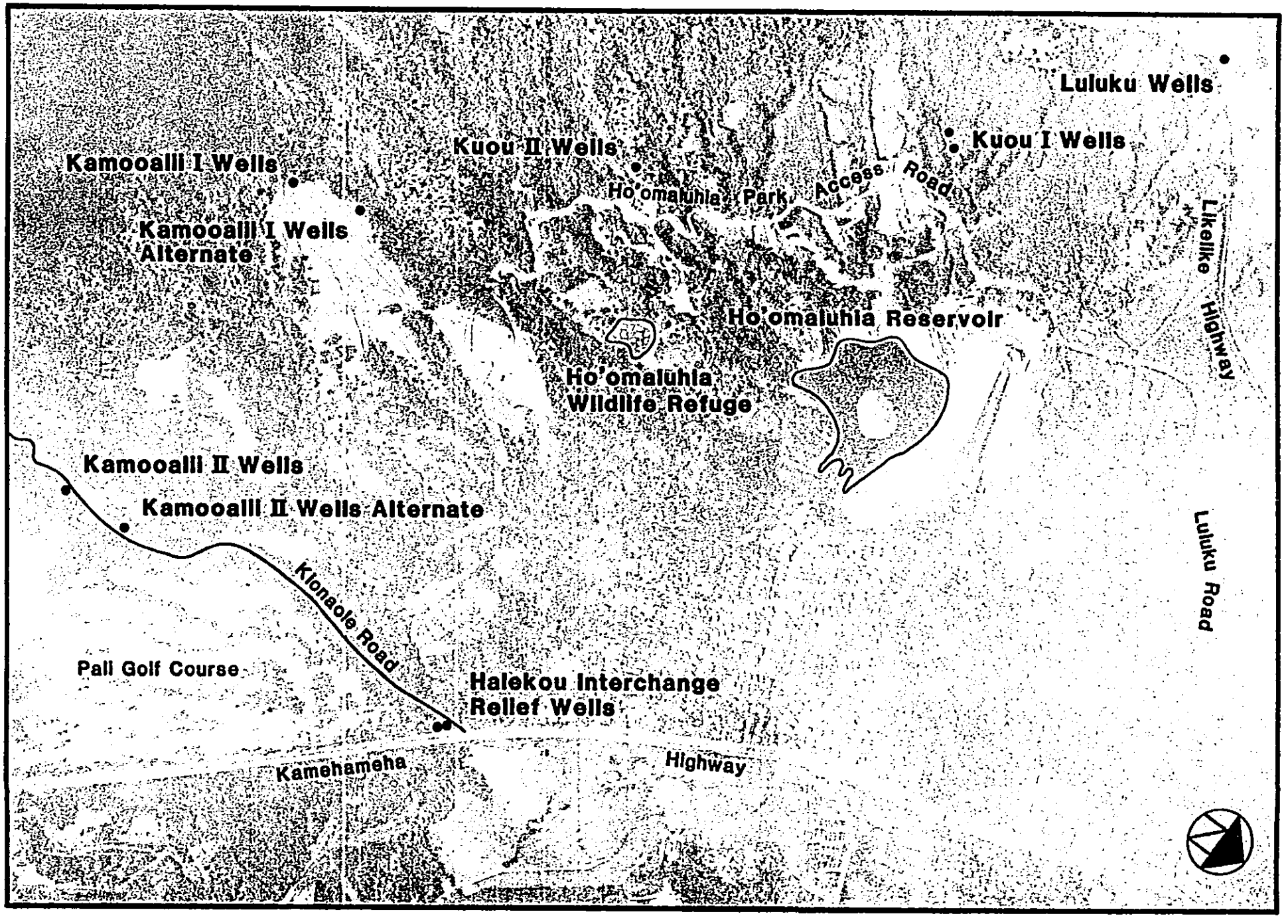


PLATE 1
WELL LOCATIONS

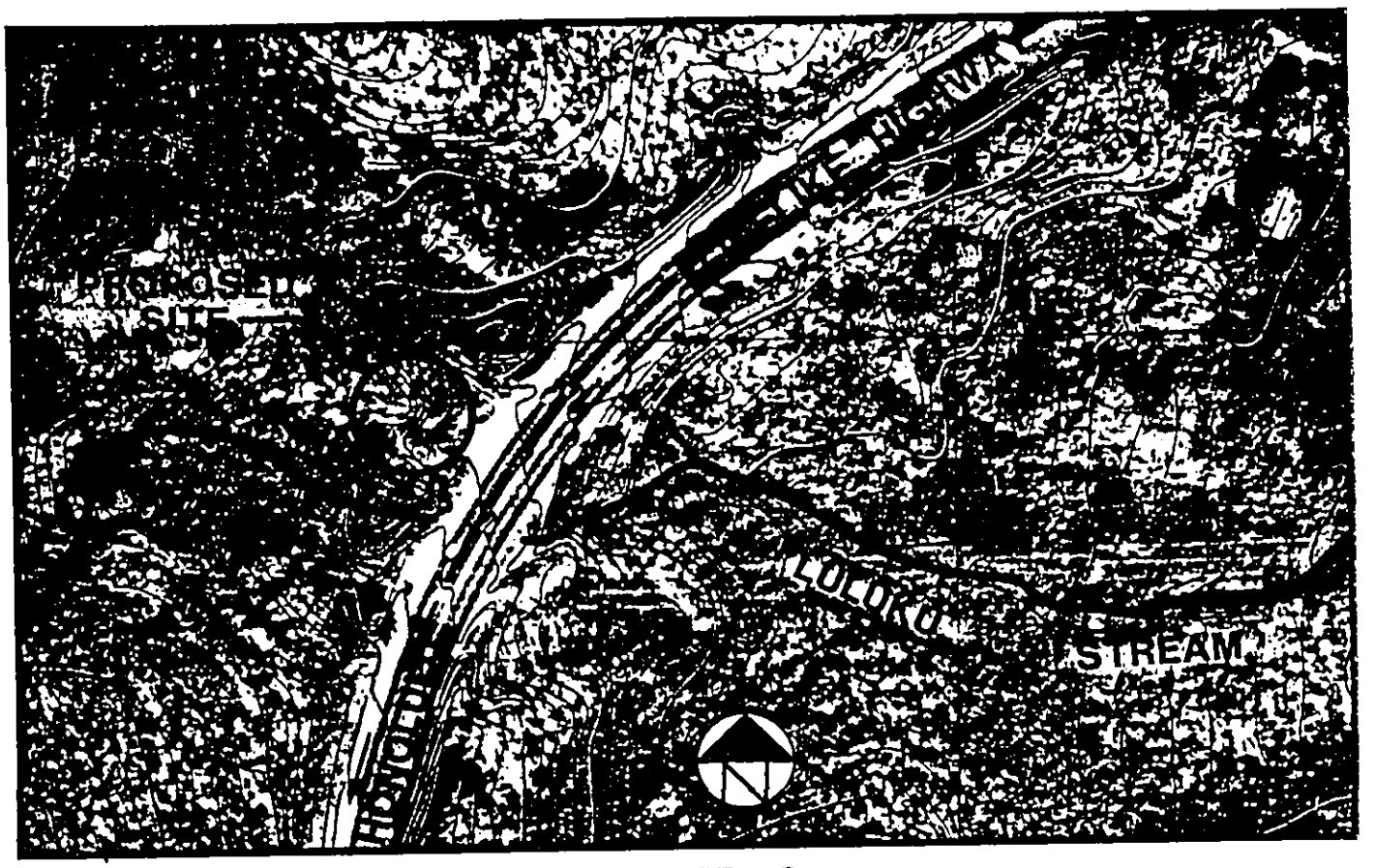


PLATE 2

LULUKU WELL FIELD SITE

PLATE 3

KUOU II WELL FIELD SITE

PLATE 4

LULUKU TUNNEL

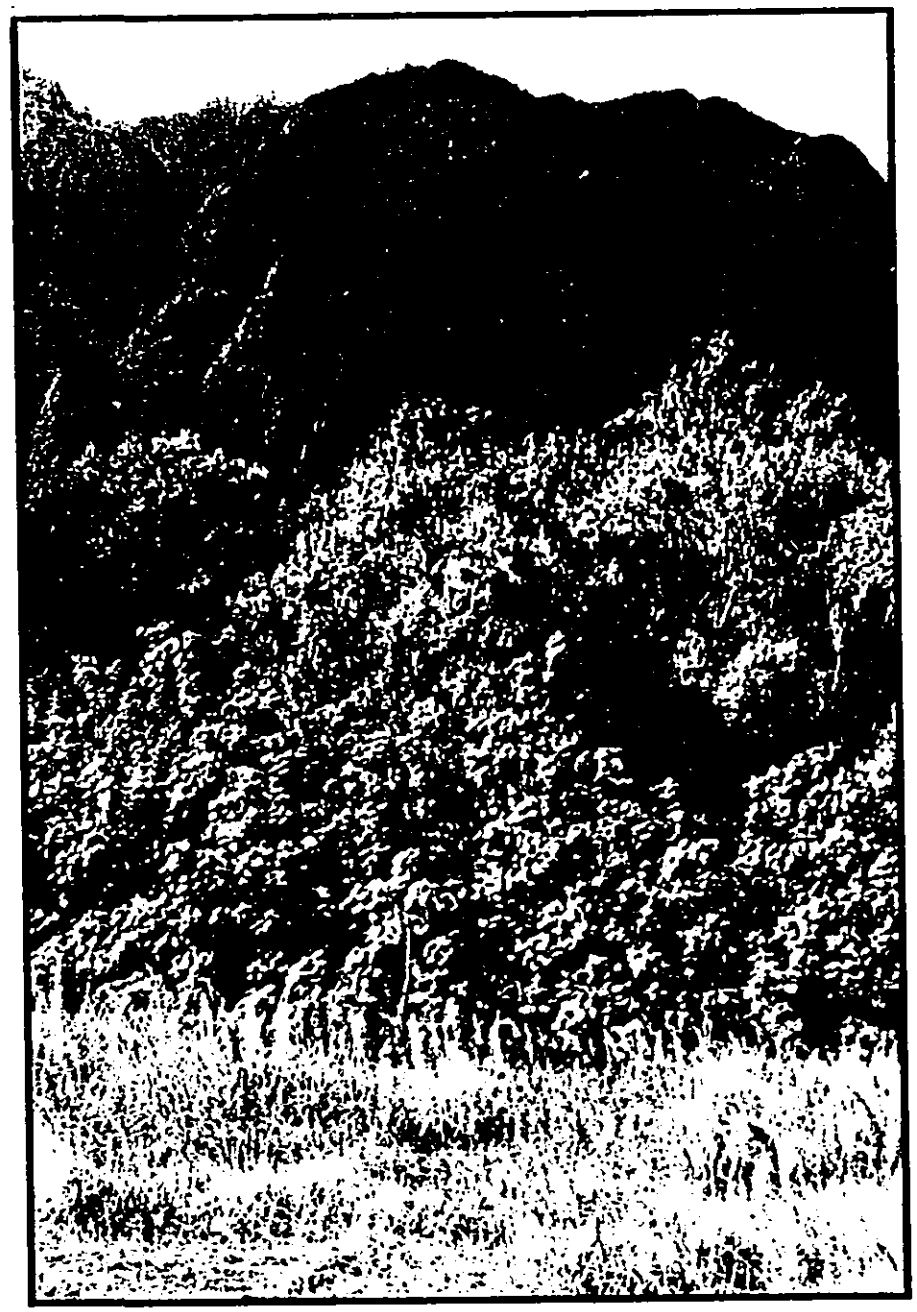


PLATE 5

KAMOOALII I WELL FIELD SITE (FIRST CHOICE)

country. Both the preferred and alternate sites for the Kamooalii I well field are a portion of a 359.3 acre parcel owned by Iolani School and identified by TMK:4-5-42:1. The preferred site is located at an elevation of about 475 feet, at the mauka edge of an unused meadow, about 1,650 feet outside of the southern boundary of Ho'omaluhia Park. [Plate 5] The alternate site is located at an elevation of about 410 feet, at the southwestern edge of the same unused meadow, about 1,100 feet outside of the southern boundary of Ho'omaluhia Park. [Plate 6]

There are two alternative sites for the Kamooalii II well field. Road access to either site will be directly off Kionaole Road. The preferred site is a portion of the 215.9 acre Pali Golf Course identified by TMK:4-5-35:1. The site is located at an elevation of approximately 370 feet on unused grass and brush lands along Kionaole Road. [Plate 7] Selection of this site is dependent upon revising the deed covenant that restricts the site for golf course use only. The alternate site for the Kamooalii II well field is a portion of a 359.3 acre parcel owned by Iolani School and identified by TMK:4-5-42:1. This site is located at an elevation of approximately 330 feet on unused grass and brush lands along Kionaole Road approximately 400 feet north of the preferred well site. [Plate 8]

B. DESCRIPTION

During the next year, up to two exploratory wells are planned at each of the four previously described sites within the watershed of Kamooalii Stream. [Figure 1] Drilling of a second exploratory well at each site may be conditional upon results from testing of an initial exploratory well. The Department of Land and Natural Resources (DLNR) will construct an access road and one exploratory well at the Kuou II site at State expense. All other exploratory wells and access roads will be constructed by the BWS.

The BWS plans to develop production facilities for the Luluku well field during FY 1984-85, for the Kuou II and Kamooalii I well fields during FY 1986-87, and for the Kamooalii II well field during FY 1987-88. The BWS will withdraw the maximum amount of water possible from

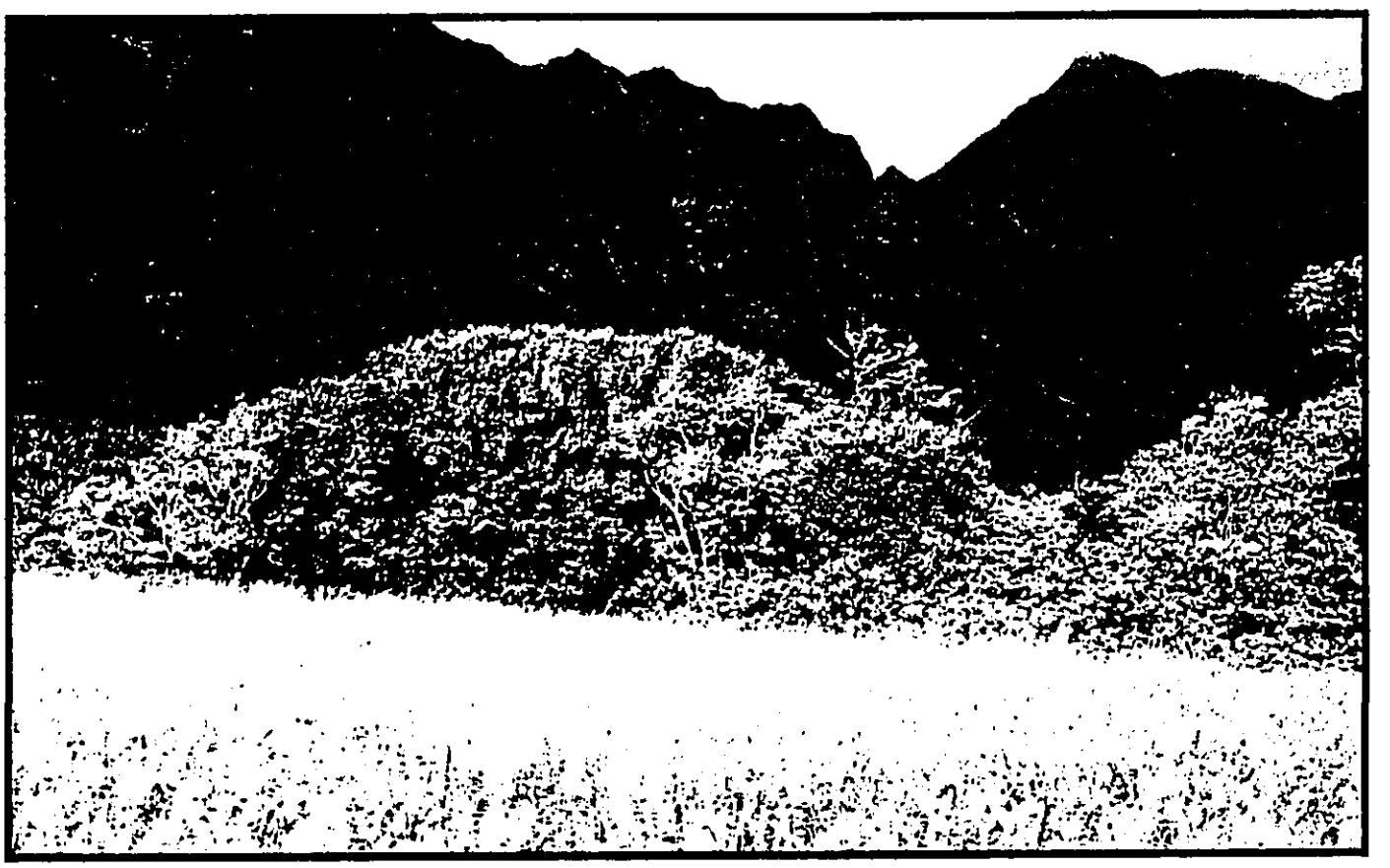


PLATE 6

KAMOOALII I WELL FIELD SITE (ALTERNATE)

PLATE 7

KAMOOALII II WELL FIELD SITE (FIRST CHOICE)

PLATE 8

KAMOOALII II WELL FIELD SITE (ALTERNATIVE)

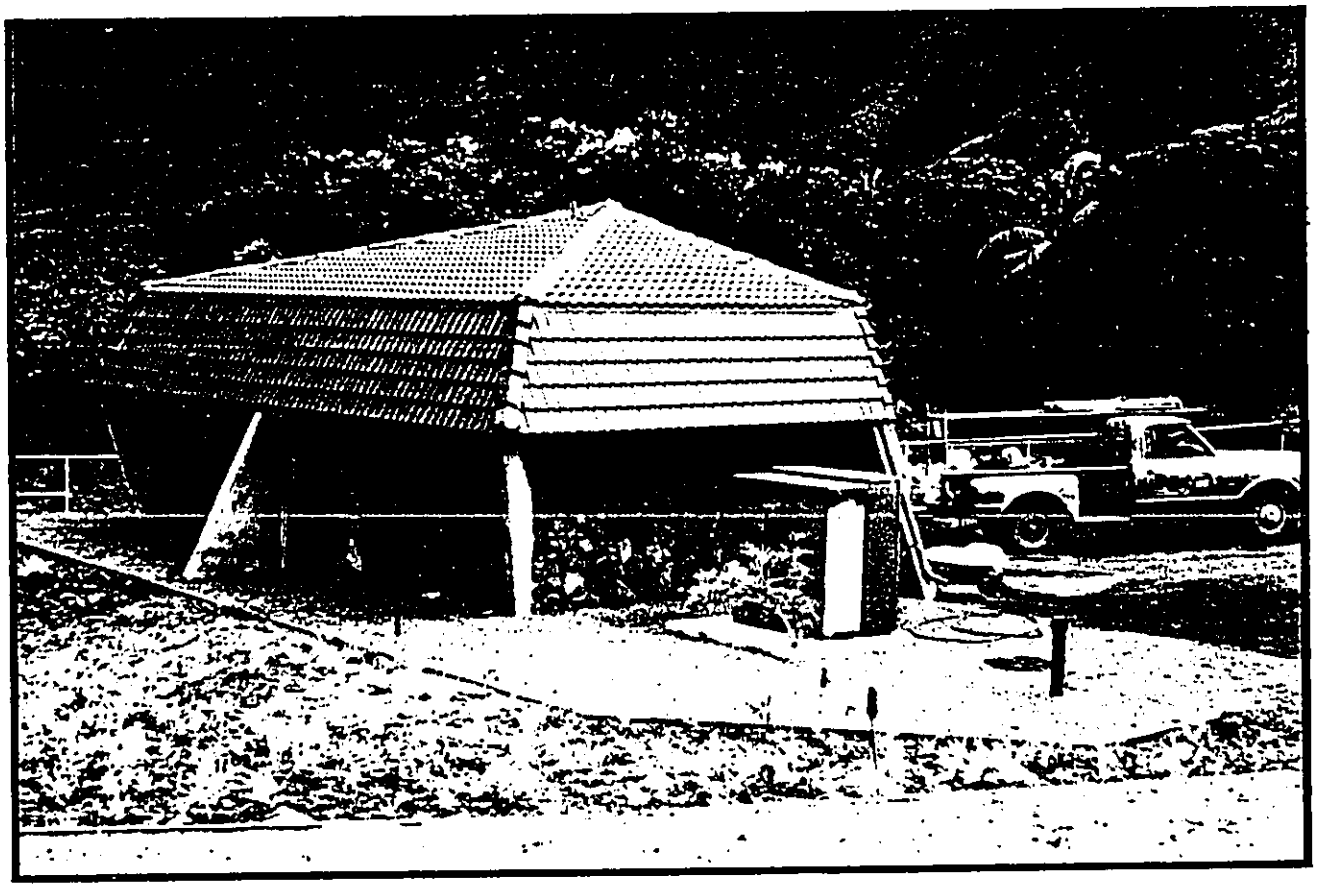


PLATE 9

TYPICAL BWS CONTROL BUILDING

each of its four well fields. Production from each well field is estimated to range between 0.5 and 2.0 million gallons per day (mgd). First priority for use of water from the new well fields would be to service Kaneohe and Kailua. Any surplus water would be exported to Honolulu. At each of the four well field sites, the BWS will usually pump water from one well at a time. Any additional well at each site will be used primarily as a backup facility to guarantee water supply when the other well is shut down for maintenance.

Stream flow will be monitored in Kamooalii Stream and its tributaries before, during, and after test pumping of the exploratory wells. Kamooalii Stream flow will also be monitored makai of the Ho'omaluhia flood control reservoir after completion of production facilities. If stream base flow is significantly reduced by development of BWS wells, then the BWS intends to take special measures to mitigate adverse impacts. If necessary during dry periods, ground water withdrawal may be partially cut back or else well water may be pumped into streams flowing through Ho'omaluhia Park.

Excluding the cost of land acquisition, assuming that one production and one standby well will be developed at all four well fields, and depending on which approach is taken for connecting the Kamooalii Watershed Wells to the BWS water distribution system, total development costs for water production are estimated to range between $12.2 and $14.4 million. More accurate cost estimates will be developed during project design.

Except for access roads, electrical lines, telephone lines, water transmission mains, and reservoirs, all production facilities will be confined within four 10,000 square foot sites. Facilities and infrastructure at each well field site will include pumps, pump mutes, electrical equipment and appurtenances, a one-story control building, piping, landscaping, irrigation systems, and fencing. A typical BWS control building is shown in Plate 9.

About 300 feet of access road will be developed for the Kuou II well field and about 3,000 feet of access road will be developed for the Kamooalii I well field. Depending on the method selected to connect the Kamooalii I and II well fields to the BWS water distribution system, about 4,500 feet of additional road may be built for maintenance of a pipeline between these well fields. Access roads

will be 20 feet wide, with 12-foot wide all-weather pavement. Road alignments will be resolved at a later date after a detailed topographic survey.

Up to four new reservoirs will be built to stabilize flow and pressure from the new BWS well fields. Conceivably, control valves might be substituted in place of reservoirs. 15 to 18 foot tall cylindrical reservoirs will be built on 10,000 to 15,000 square foot landscaped sites in the vicinity of, but not necessarily adjacent to, the existing Kuou I wells, the Kuou II well field, and either or both the Kamooalii I and II well fields. Reservoir siting will be resolved at a later date. New BWS reservoirs will be capable of serving Ho'omaluhia Park and make it possible to phase out or remove the existing park reservoir and water booster system operated by the County Department of Parks and Recreation.

Five conceptual approaches are under consideration for connecting the Kamooalii Watershed Wells to the BWS water distribution system. Because these approaches involve different routes for maintenance roads, and because it is desirable to locate electrical lines near roads (to facilitate maintenance), five conceptual approaches also are under consideration for connecting the Kamooalii Watershed Wells to the Hawaiian Electric Company (HECO) power distribution system. It is likely that Hawaiian Telephone Company will share the use of poles installed by HECO. However, alignments and easements for pipelines, electrical lines, and telephone lines will be resolved at a later date. Utility lines will be underground within Ho'omaluhia park, but will be an overhead system outside the park. The Luluku, Kamooalii I, and Kamooalii II well fields will each have a maximum power requirement of 310 Kilovoltamps (KVA) while the Kuou II well field will have a maximum requirement of 210 KVA.

All five alternatives for connecting the Kamooalii Watershed Wells to the HECO system would involve connecting the Luluku well field to the 12 KV line which provides power to the mauka Kuou I well. The new 12 KV line will cross Likelike Highway, the Luluku Interchange (H-3/Like-like), and the H-3 Freeway. All five alternatives also would involve connecting the Kamooalii II well field to an existing 12 KV line which crosses Kionaole Road. Other details about the five alternatives are linked to BWS options for assimilating the Kamooalii Watershed Wells.

All five alternatives for connecting the Kamooalii Watershed Wells to the BWS system would involve connecting the Luluku well field to an adjacent transmission main which carries water from the Luluku Tunnel. All five alternatives would involve pumping water from the Kuou II well field into a reservoir, pumping water from the Kuou I well field into a reservoir, and connecting the Kuou I and Kuou II reservoirs with a pipeline following the main Ho'omaluhia Park access road. Other details about the five alternatives are as follows:

OPTION I

Option I for assimilation into the BWS system is summarized in Plate 10A and the corresponding option for assimilation into the HECO system is summarized in Plate 10B. From the Kamooalii II well field, the pipeline will follow Kionaole Road towards Kamehameha Highway. Mauka of the H-3 right-of-way, the pipeline and a new all-weather road for pipeline maintenance will proceed cross-country to the Kamooalii I reservoir. Water from both the Kamooalii I and II well fields will be pumped into this reservoir. Water from the Kamooalii I reservoir will be carried in a pipeline which follows the Kamooalii I access road to Ho'omaluhia Park and then follows the main Ho'omaluhia Park access road to the Kuou II reservoir. Water from the Kuou II well field will be pumped into the Kuou II reservoir. A pipeline following the main Ho'omaluhia Park access road will carry water from the Kuou II reservoir to the Kuou I reservoir. Water from the Kuou I well field will be pumped into the Kuou I reservoir. To carry water from the Kuou I reservoir, it will be necessary to replace or supplement the existing 16-inch water main which carries water from the Kuou I wells to Kamehameha Highway for the BWS windward "272" system.

OPTION 2

Option 2 is summarized in Plates 11A and 11B. Kamooalii II reservoir may need to be at a higher elevation than the Kamooalii II well field. Water from the Kamooalii II well field will be pumped into the Kamooalii II reservoir. Water from the Kamooalii II reservoir will be carried in a pipeline which follows Kionaole Road towards Kamehameha Highway, crosses the Halekou Interchange (H-3/Kamehameha), cuts back to

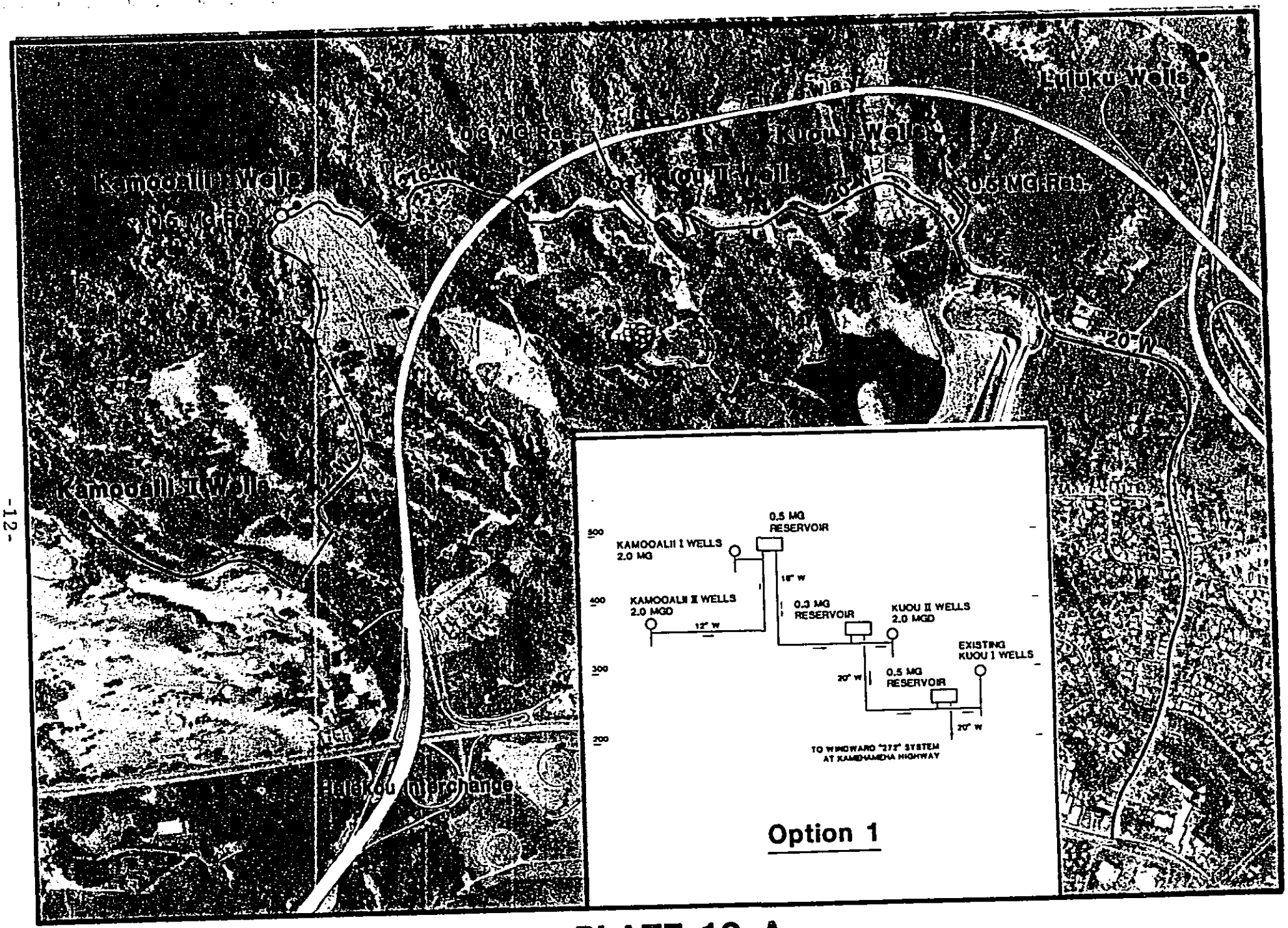


PLATE 10 A

ASSIMILATION INTO BWS SYSTEM

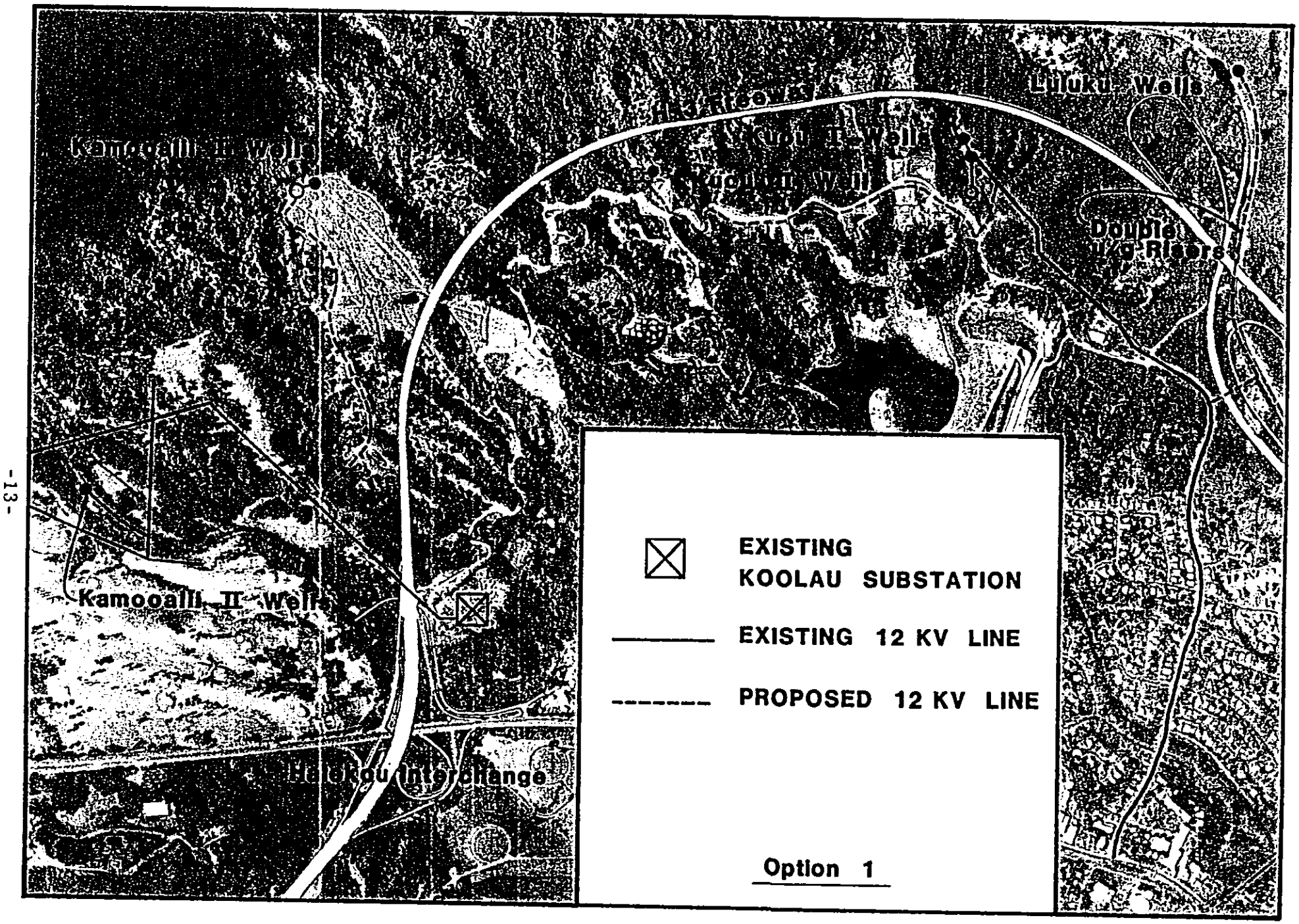


PLATE 10 B

ASSIMILATION INTO HECO SYSTEM

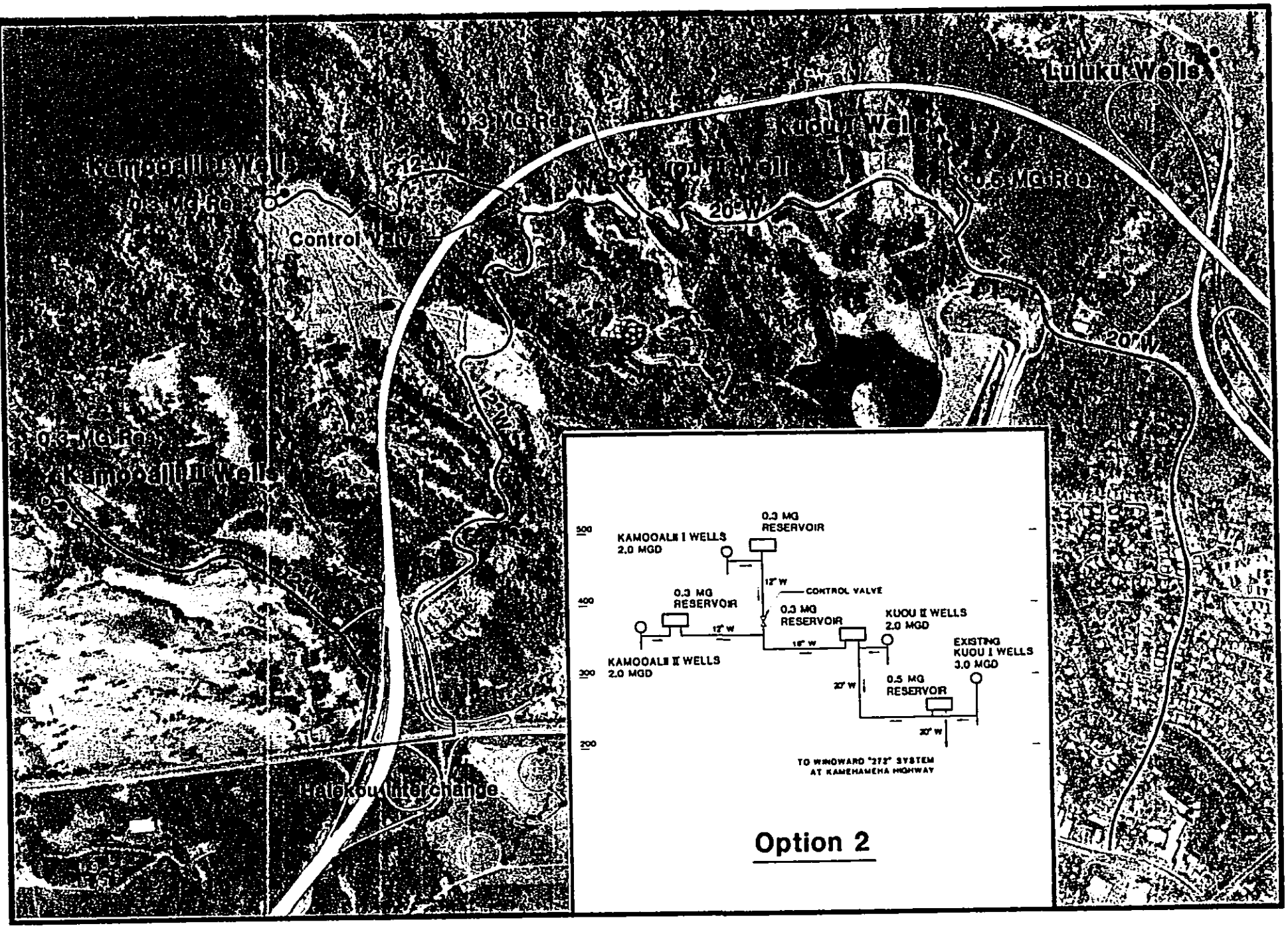


PLATE 11 A

ASSIMILATION INTO BWS SYSTEM

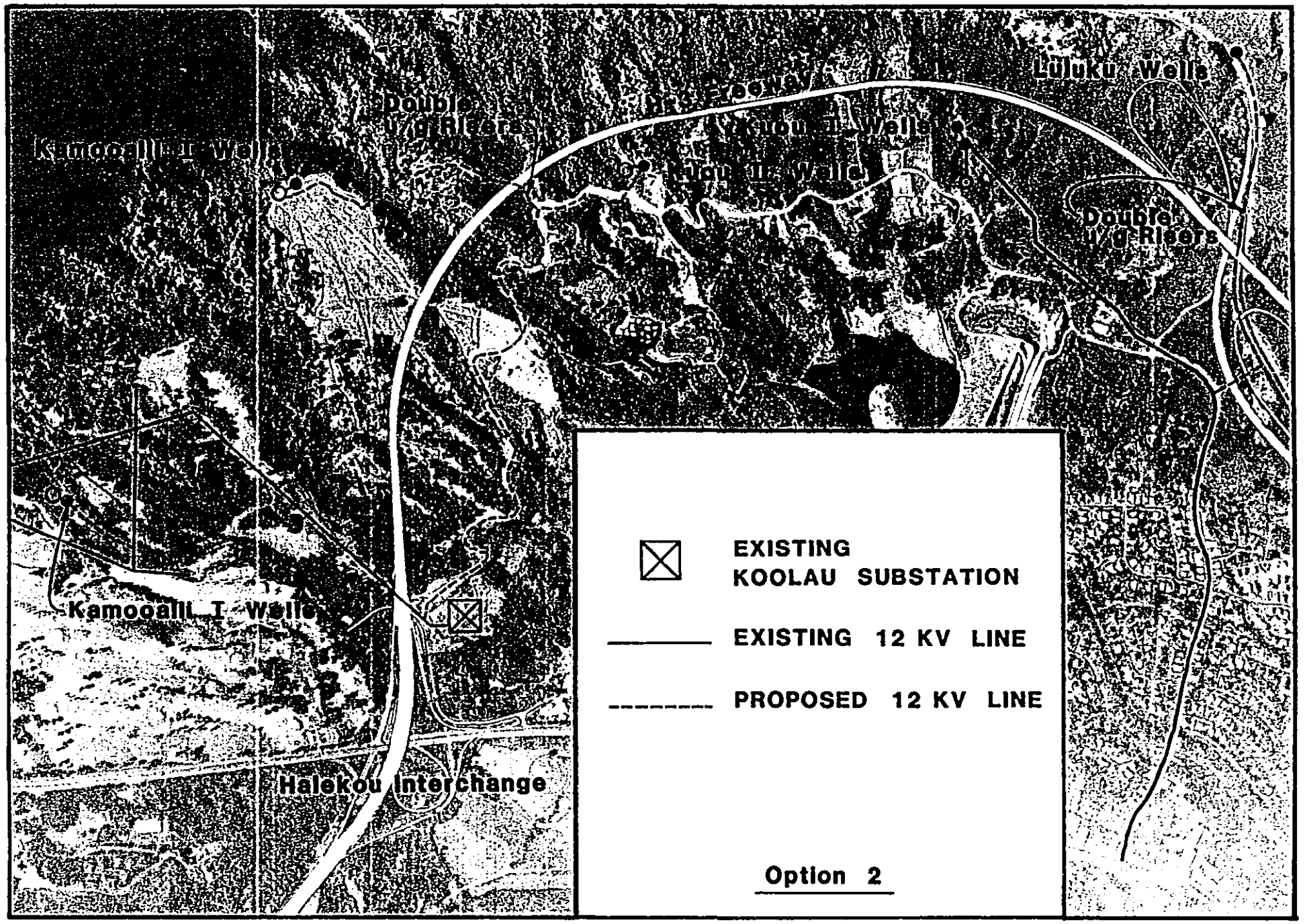


PLATE 11 B

ASSIMILATION INTO HECO SYSTEM

Ho'omaluhia Park, then follows the main Ho'omaluhia Park access road to the Kuou II reservoir. Water from the Kamooalii I well field will be pumped into the Kamooalii I reservoir. Water from the Kamooalii I reservoir will be carried in a pipeline which follows the Kamooalii I access road and connects to the pipeline to the Kuou II reservoir. Otherwise, Option 2 is identical to Option 1.

OPTION 3

Option 3 is summarized in Plates 12A and 12B. Water from the Kamooalii I well field will be pumped into the Kamooalii I reservoir. Water from the Kamooalii I reservoir will be carried to the Kamooalii II reservoir via a cross-country pipeline mauka of the H-3 right-of-way. Because the Kamooalii II reservoir will need to be at a higher elevation than the Kamooalii II well field, the route for this pipeline and ancillary all-weather maintenance road may be different than with Option 1. Pipelines and hook-ups between the Kamooalii II, Kuou II, and Kuou I wells and reservoirs and the BWS windward "272" system will be the same for Option 3 as for Option 2.

OPTION 4 (Split Flow)

Option 4 is summarized in Plates 13A and 13B. The Kamooalii I reservoir will need to be at a higher elevation than the Kamooalii I well field. Water from the Kamooalii I well field will be pumped into the Kamooalii I reservoir. Water from the Kamooalii I reservoir will be carried to Kamehameha Highway via a cross-country pipeline mauka of the H-3 right-of-way. Between the Kamooalii I reservoir and Kionaole Road, the route for this pipeline and ancillary all-weather maintenance road will be similar to Option 1; however, between Kionaole road and Kamehameha Highway, the pipeline may cut across the Pali Golf Course. Water from the Kamooalii II well field will be pumped into a pipeline which follows Kionaole Road and connects to the pipeline between the Kamooalii I reservoir and Kamehameha Highway. Water from the Kamooalii I reservoir and Kamooalii II well field will be carried in a new pipeline along Kamehameha Highway and then makai on Kalanianaole Highway to

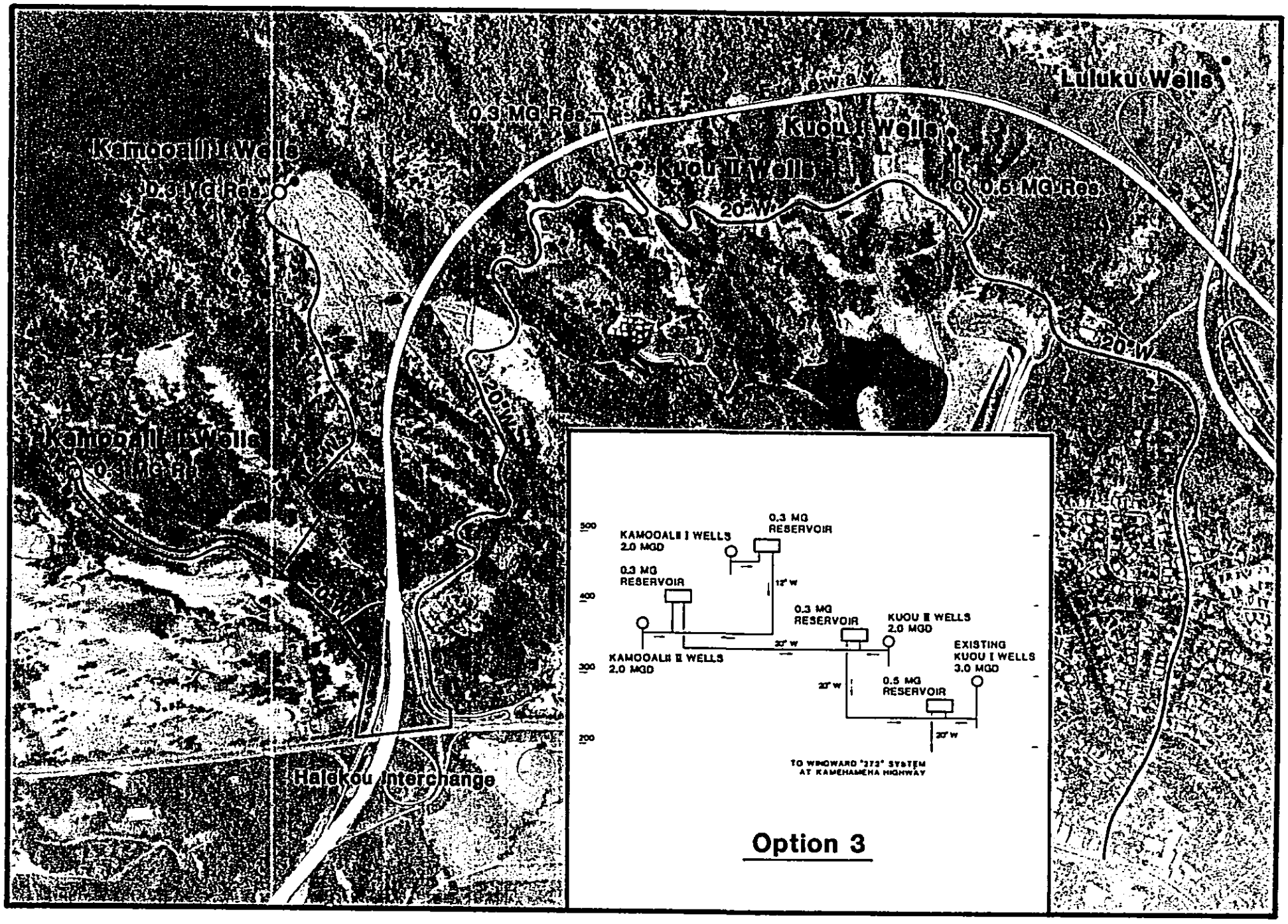


PLATE 12 A

ASSIMILATION INTO BWS SYSTEM

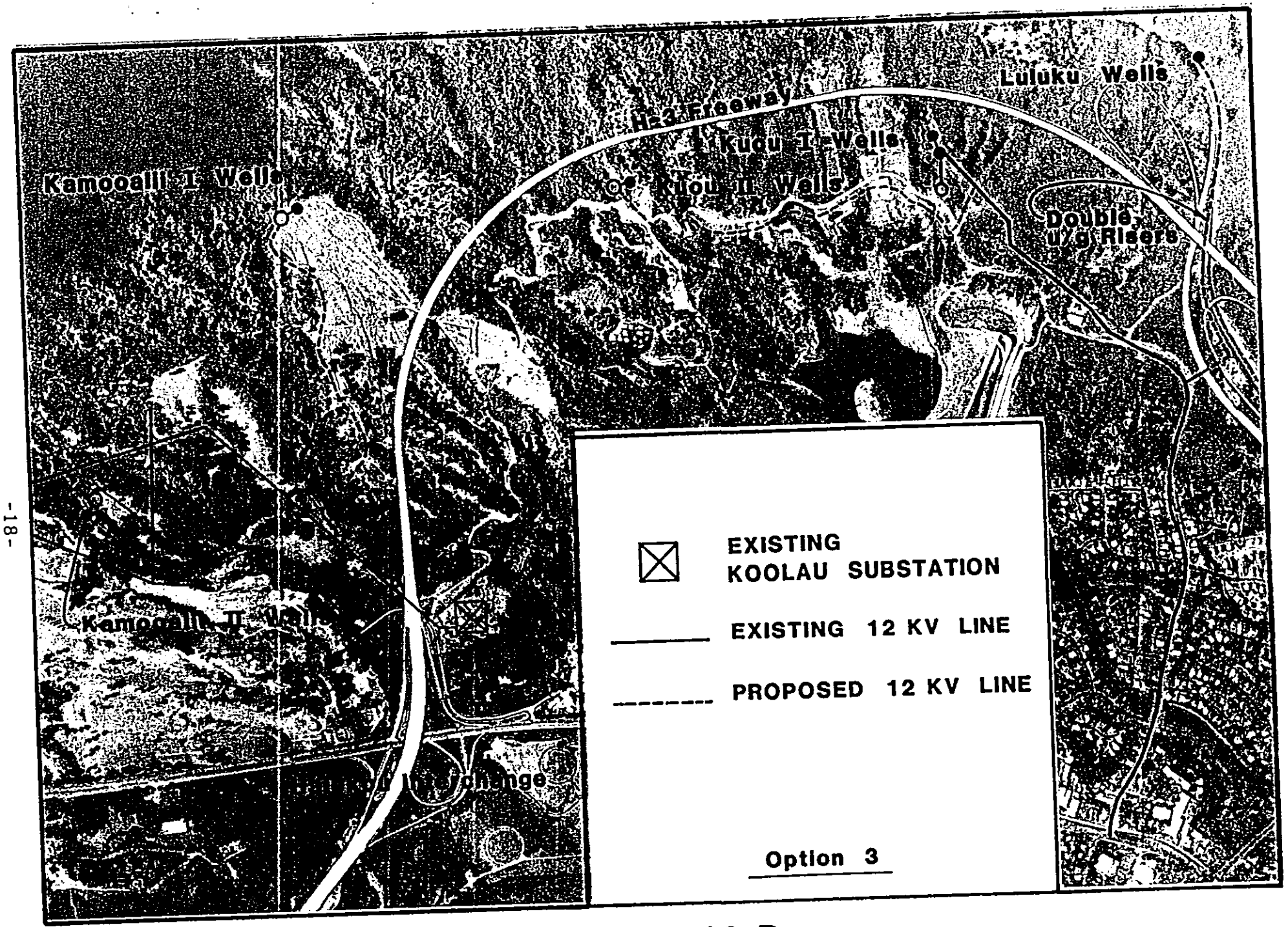


PLATE 12 B

ASSIMILATION INTO HECO SYSTEM

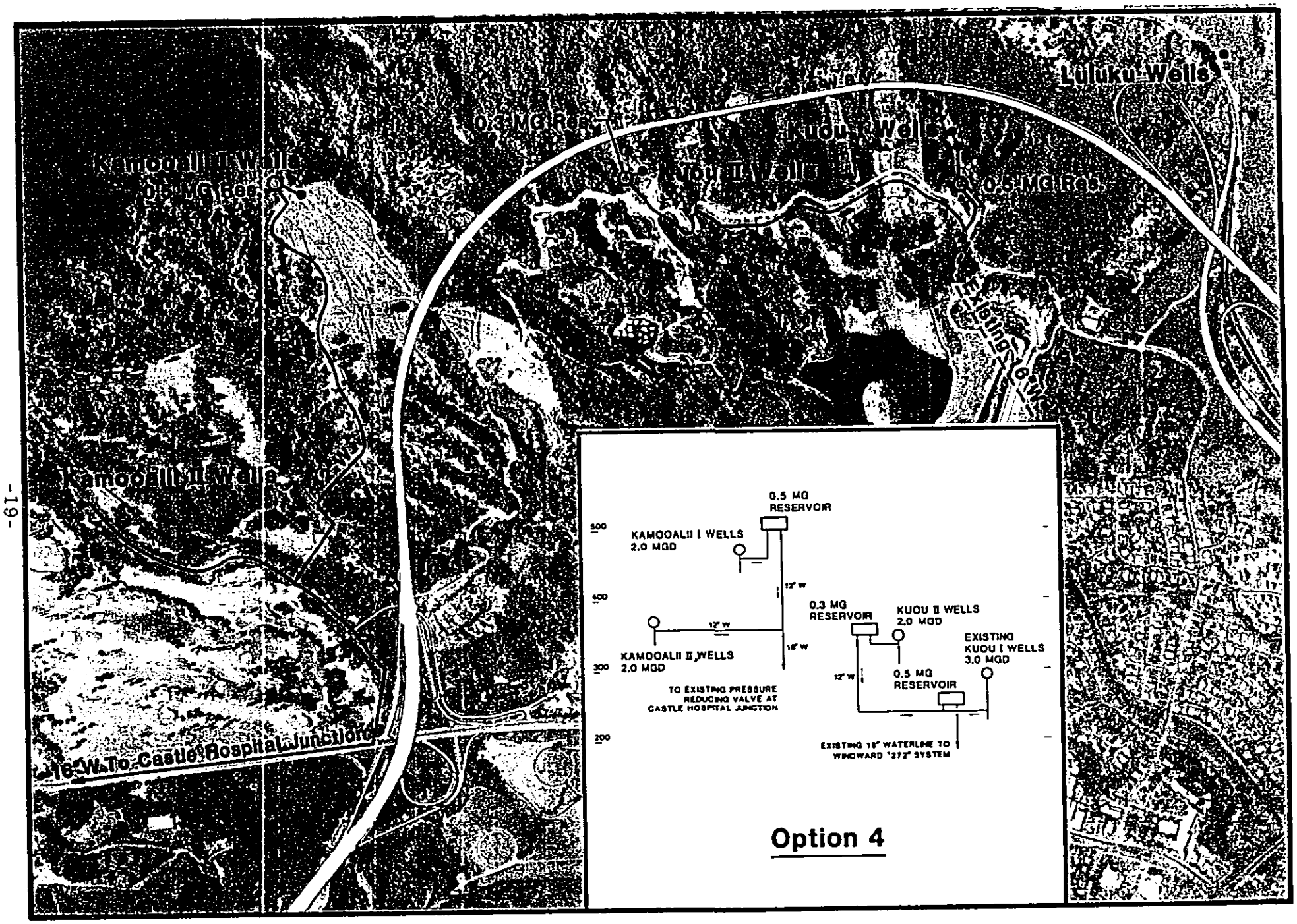


PLATE 13 A

ASSIMILATION INTO BWS SYSTEM

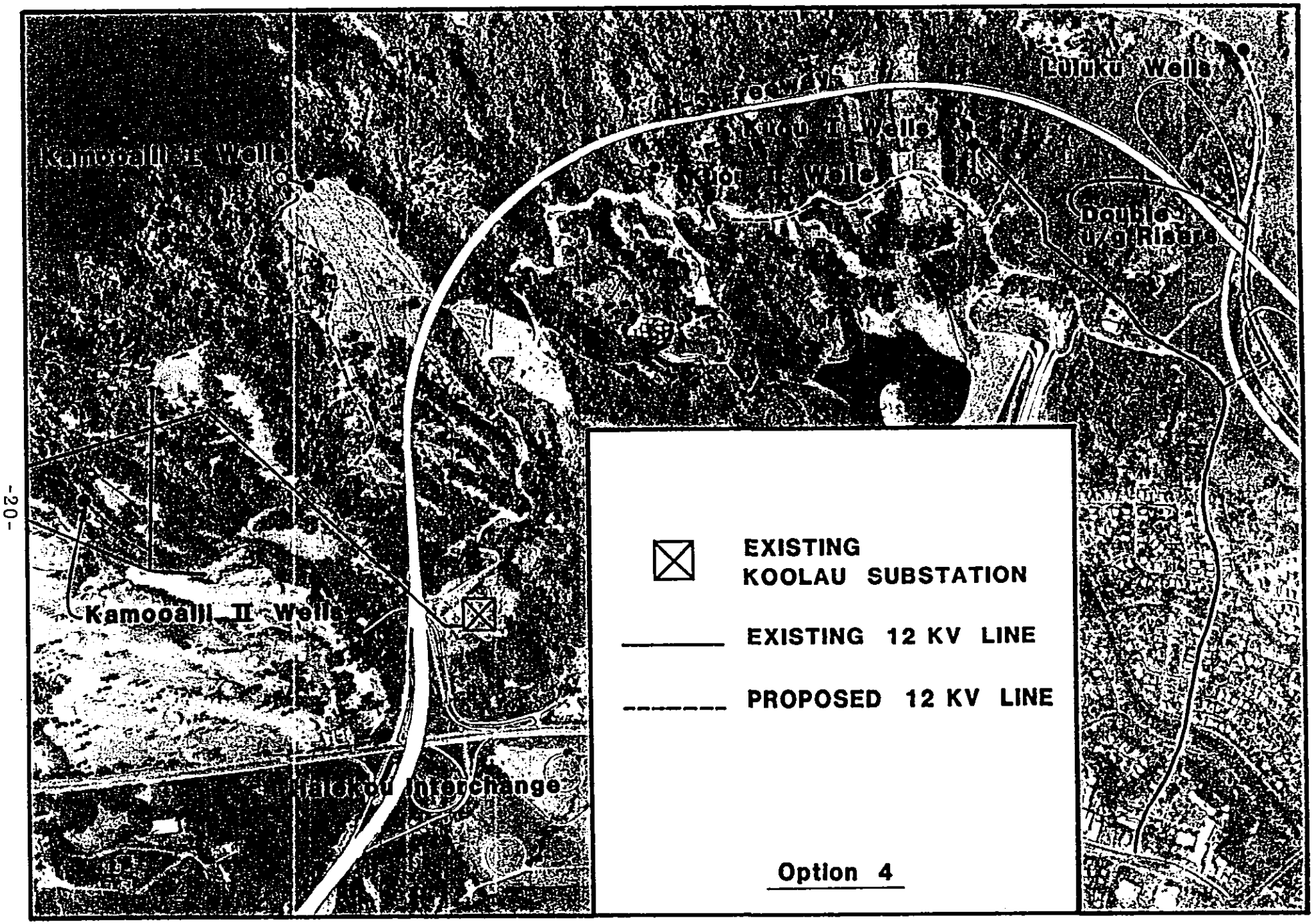


PLATE 13 B

ASSIMILATION INTO HECO SYSTEM

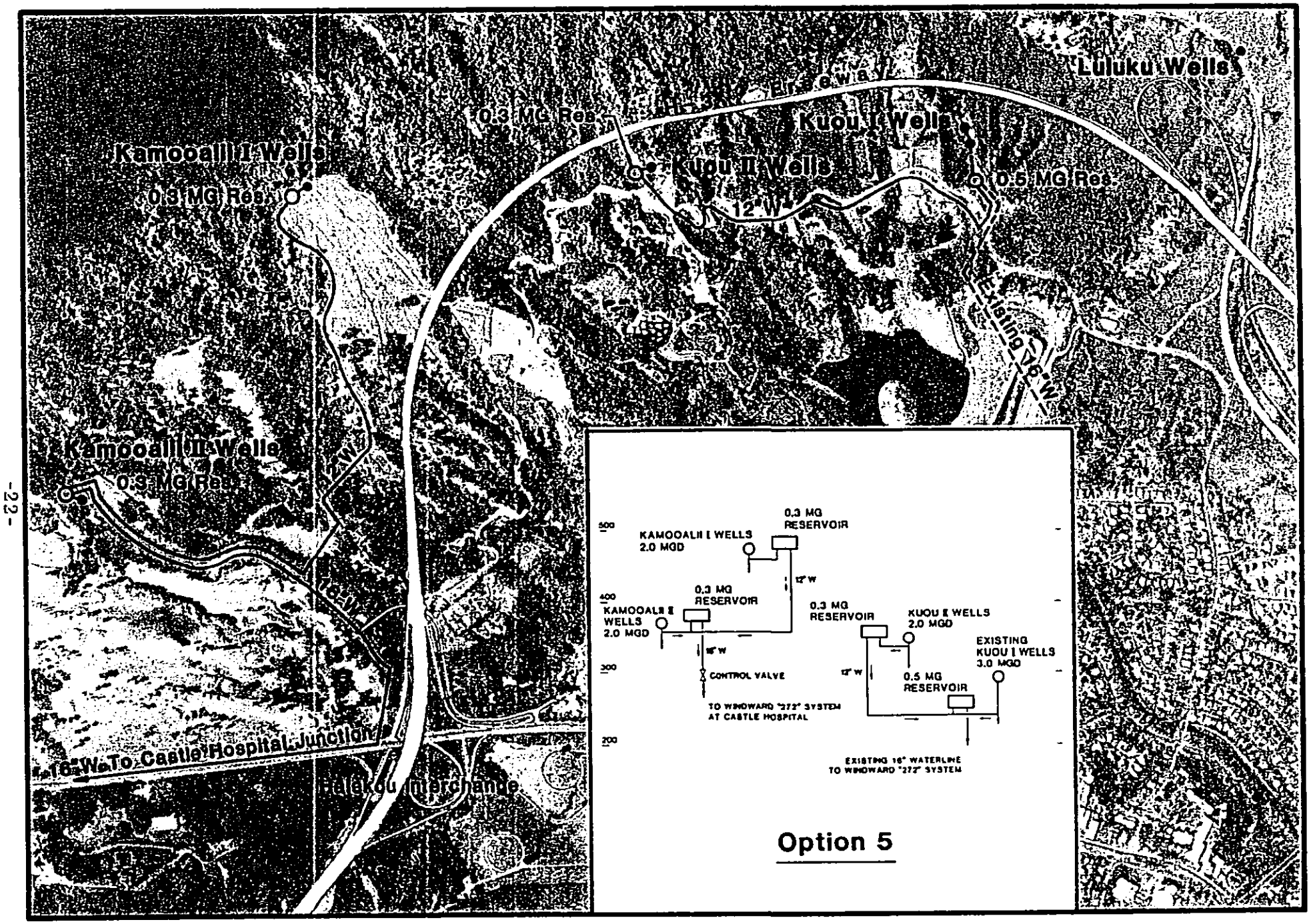
the BWS windward "272" system at Castle Hospital Junction. This new pipeline will be interconnected with the existing BWS windward "500" system pipeline on Kamehameha Highway. Pipeline routes and hook-ups between the Kuou II and Kuou I wells and reservoirs will be the same for Option 4 as for Option 1, except that the existing water main between the Kuou I wells and Kamehameha Highway will not have to be replaced or supplemented.

OPTION 5 (Split Flow)

Option 5 is summarized in Plates 14A and 14B. Water from the Kamooalii I well field will be pumped into the Kamooalii I reservoir. Water from the Kamooalii I reservoir will be carried to the Kamooalii II reservoir via a cross-country pipeline mauka of the H-3 right-of-way. The route for this pipeline and ancillary all-weather maintenance road will be similar to Option 1. Water from the Kamooalii II well field will be pumped into the Kamooalii II reservoir. Water from the Kamooalii II reservoir will be carried in a new pipeline to the windward "272" system at Castle Hospital Junction. The route for this pipeline will be similar to Option 4, but there will not be inter-connections with the "500" system pipeline on Kamehameha Highway. Pipeline routes and hook-ups between the Kuou II and Kuou I wells and reservoirs will be the same for Option 5 as for Option 4.

C. OBJECTIVES

The de facto Oahu population served by the BWS is projected to increase from 737,300 in 1980 to 912,800 in the year 2000. The BWS plans to develop water from a number of sources including the proposed Kamooalii Watershed Wells in order to accommodate projected growth. It is estimated that the average daily island-wide municipal water demand including all public, residential, commercial, industrial, and agricultural uses supplied by the BWS will increase from 130.1 mgd in 1980 to 181.0 mgd in the year 2000. The anticipated 50.9 mgd twenty-



Option 5

PLATE 14 A

ASSIMILATION INTO BWS SYSTEM

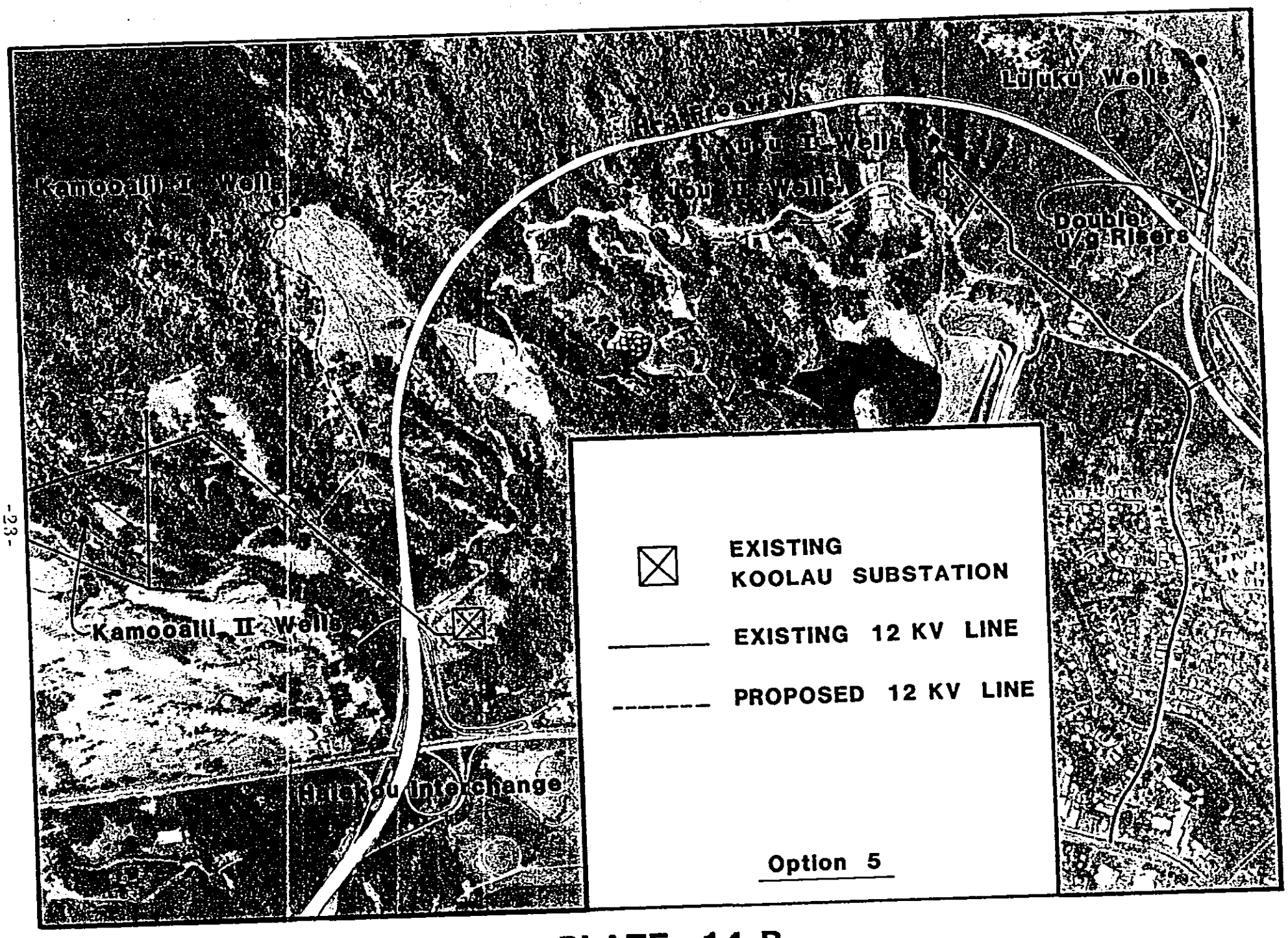


PLATE 14 B

ASSIMILATION INTO HECO SYSTEM

year increase in demand will be used primarily to meet the needs of leeward Oahu, since more growth is planned for the leeward side than the windward side of the island. These estimates are based on 1978 "II-F" population projections by the State Department of Planning and Economic Development and use assumptions about population and employment distribution provided by the City Department of General Planning.

On the average, about 32.78 and 70.19 mgd of the water supplied by the BWS to leeward Oahu in 1980 were withdrawn respectively from the Honolulu and Pearl Harbor Ground Contarol Areas (GWCAs). In 1983, a dry year, average BWS water withdrawal from these GWCAs was 42.11 and 71.88 mgd. To prevent further salt water encroachment into the Honolulu and Pearl Harbor fresh water basal lenses, the Board of Land and Natural Resources (BLNR) has limited BWS withdrawals from the Honolulu and Pearl Harbor GWCAs to an average of 38.93 and 76.95 mgd, respectively. In order to meet the increasing demand for water, water development projects in windward Oahu have been accelerated. Water from windward sources not used for windward needs will be pumped around Makapuu to Hawaii Kai. This will "free" water from leeward sources that now is used in Hawaii Kai for use elsewhere in Honolulu.

In the event that the BWS is unable to accommodate water demand, then the BWS will be forced to deny hook-ups or to not issue new water meters larger than 5/8" (adequate for a single family home). In effect, this would impose a moratorium on most new development until such time as new water sources are developed.

II. DESCRIPTION OF THE ENVIRONMENTAL SETTING

Areas of concern for an analysis of the potential environmental impacts of the Kamooalii Watershed Wells include the project site, Kamooalii Stream and its tributaries, and the County's Ho'omaluhia Park through which Kamooalii Stream flows. If the proposed wells significantly decrease stream flow, then there could be adverse impacts on stream fauna and on water related facilities in Ho'omaluhia Park.

A. TOPOGRAPHY AND AESTHETICS

The four well fields will be located on the northeast slopes of the Koolau Range, about 2.5 miles inland from Kaneohe Bay. Kamooalii Stream and its tributaries have carved a series of valleys between the well sites.

The Luluku well field site is within a banana field, and the other sites are within large tracts of undeveloped open space. The existing appearance of the project area and the well field sites is shown in Plates 1 through 8. The entire project area is visible from the Nuuanu Pali lookout. The Luluku well site is visible from Likelike Highway. The Kuou II and Kamooalii I well sites, reservoirs, and access roads will also be visible from parts of Ho'omaluhia Park. The Kamooalii II site will be visible from Kionaole Road.

B. LAND USE

The Luluku well site is part of a banana field mauka of Likelike Highway. The other well sites are unused open space in the watershed of Ho'omaluhia Park. The State Department of Transportation is planning to construct the H-3 Freeway around the mauka perimeter of Ho'omaluhia Park. [Plate 10A] The new freeway will be immediately mauka of the Kuou II site and makai of the other well sites.

Iolani School has proposed a large scale residential subdivision just mauka of the H-3 right-of-way, but has not received any of the

necessary development permits. The Kamooalii I, Kamooalii I Alternate, and Kamooalii II Alternate sites are within the boundaries of the proposed residential subdivision. [Ref. 3, Ref. 34, Ref. 35]

The bulk of the apple banana acreage (producing 90% of the apple bananas) in the State is located on land owned by Iolani School in the watershed of Kamooalii Stream and tributaries. [Ref. 3] As of March 1984, Iolani School has served eviction notices on all banana farmers using its lands.

C. CLIMATE

Most rain in Kaneohe results from cooling of warm moist air when the predominant northeast trade winds are deflected up by the Koolau Range. Kona (southerly) and major North Pacific storm systems occasionally bring rain to the entire island. Average annual rainfall increases from 50" near the coast to 100" near the crest of the Koolau Range between the Wilson and Nuuanu Pali tunnels. Rainfall averages 85" per year at the Kamooalii Watershed Well sites. About 70% of annual Kaneohe rainfall near the coast occurs from November through April. The average monthly temperature in Kaneohe below an altitude of 550 feet ranges from 69° to 79°. Average annual evapotranspiration decreases from about 58" near the Kaneohe coast to about 39" near the Koolau crest. Average annual rainfall on bodies of standing water in Ho'omaluhia Park (80") exceeds the average annual rate of evapotranspiration (46"). [Ref. 19, p. 8; Ref. 33, pp. 8, 9, 22]

D. SOILS

The project area is covered by well-drained silty clay soil developed on colluvium from the Koolau Range. The Soil Conservation Service has classified surface soils on the Luluku, Kuou II, Kamooalii I, and

Kamooalii I Alternate sites as Lolekaa series. Soils on the Kamooalii II site are classified as Kaneohe series, and soils on the Kamooalii II Alternate site are classified as Hanalei series. [Ref. 18, Map 60]

E. GEOLOGY AND GROUND WATER

At high elevations in windward Oahu, infiltrated rainfall is stored as ground water in the permeable basaltic lava flows of the Koolau Range between relatively impermeable intrusive basaltic dikes. Dikes are formed by molten rock which solidified in the fissures of volcanoes. Because dikes are frequently oriented at oblique angles to each other, dike compartments are thought to be shaped like irregular prisms. Dike compartments containing the highest ground water head coincide with the higher rainfall portions of the Koolau crest. Although the general pattern of ground water movement is toward the ocean, local flow directions are complicated by the shape and permeability of dike compartments and by erosion. High level ground water moves gradually from dike compartments with higher head to compartments with lower head. Water from dike reservoirs can also discharge directly into streams which have cut into the water-bearing rocks or seep through permeable alluvium and then into streams. Ultimately, ground water which is not withdrawn or lost to evapotranspiration discharges into the ocean via streams, offshore springs, or leakage through basaltic rocks and alluvium.

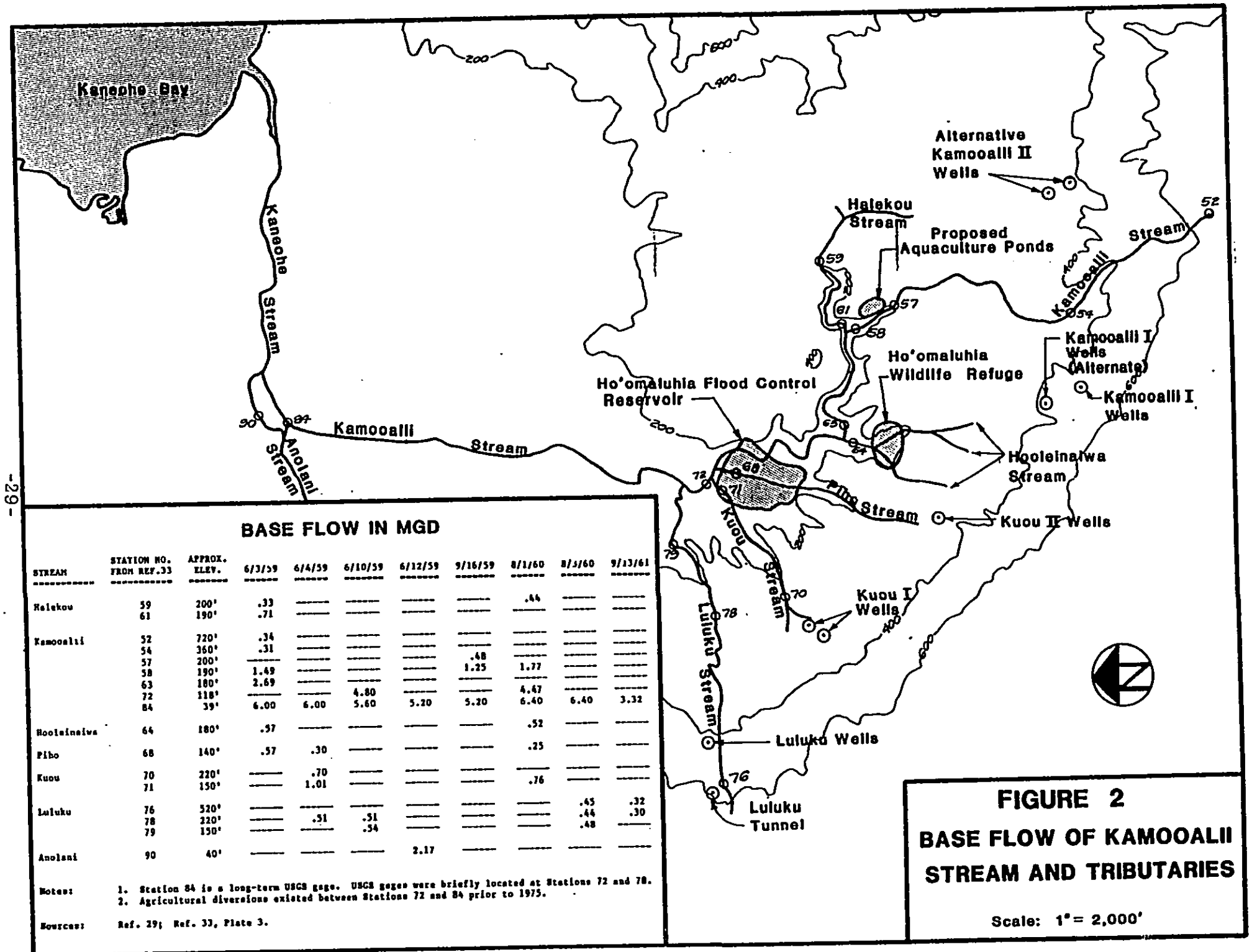
All proposed well sites are believed to be located in the marginal area of the dike zone on the slopes of the Koolau Range. The known dikes in this area are relatively far apart as compared to the dike complex makai of the project area where the caldera of the Koolau Volcano was originally located. [Ref. 33, Plate 2]

F. PERENNIAL STREAMS

1. Hydrology. The four proposed well fields are located in the watershed of Kamooalii Stream. As shown in Figure 2, Luluku, Kuou, Piho, Hooleinaiwa, and Halekou Streams are tributaries of Kamooalii Stream. Kamooalii Stream joins Anolani Stream in the vicinity of Kamehameha Highway and forms Kaneohe Stream. [Figure 1 and Figure 2] Like most perennial windward Oahu streams, the primary source of their dry weather base discharge is dike-impounded ground water. They also receive surface runoff from an extensive watershed and can gain flow from rainfall stored in unconsolidated surface alluvial material and volcanic ash overlying relatively impermeable volcanic tuff and/or alluvial conglomerates.

Kamooalii and Luluku Streams have perennial flow above an elevation of 700 feet, while Kuou, Piho, Hooleinaiwa, and Halekou Streams are only perennial below an elevation of 300 feet. [Table 1] Springs above an altitude of 500 feet occur where Kamooalii and Luluku Streams have cut into dikes that block the seaward flow of ground water stored in the Koolau Range. Luluku Stream's base flow now stems from such high level springs and leakage from the BWS Luluku water development tunnel. However, most of the base flow of Kuou, Piho, Hooleinaiwa, Halekou, and Kamooalii Streams originate below an altitude of 250 feet in Ho'omaluhia Park. Springs occur in the park where artesian ground water overflows dike compartments and seeps to the surface through water bearing alluvium, ash, and weathered rock. [Ref. 19, p. 8; Ref. 33, pp. 18, 66, Plate 3]

2. Impacts of Other Development. Because of agricultural use of stream water, construction of dams, and other water development projects, not all available measurements of stream flow are still relevant to Kamooalii Stream and tributaries. Until 1974, water was diverted from Kamooalii Stream, below inflow from Kuou Stream, for agriculture. [Ref. 32] From 1978 through 1980, the U.S. Army Corps of Engineers constructed the Ho'omaluhia flood control dam and reservoir to impound the combined flow of Kamooalii, Kuou, Piho, Hooleinaiwa, and Halekou Streams (but not Luluku Stream). [Figure 2 and Plate 1] During this three year period, dry



BASE FLOW IN MGD

STREAM	STATION NO. FROM REF.33	APPROX. ELEV.	6/3/59	6/4/59	6/10/59	6/12/59	9/16/59	8/1/60	8/3/60	9/13/61
Halekou	59	200'	.33	———	———	———	———	.44	———	———
	61	190'	.71	———	———	———	———	———	———	———
Kamooalii	52	720'	.34	———	———	———	———	———	———	———
	54	360'	.31	———	———	———	———	———	———	———
	57	200'	———	———	———	———	.48	———	———	———
	58	190'	1.49	———	———	———	1.25	1.77	———	———
	63	180'	2.69	———	———	———	———	———	———	———
	72	118'	———	———	4.80	———	———	4.47	———	———
	84	39'	6.00	6.00	5.60	5.20	5.20	6.40	6.40	3.32
Hooleinaiwa	64	180'	.57	———	———	———	———	.52	———	———
Piho	68	140'	.57	.30	———	———	———	.25	———	———
Kuou	70	220'	———	.70	———	———	———	———	———	———
	71	150'	———	1.01	———	———	———	.76	———	———
Luluku	76	520'	———	———	———	———	———	———	.45	.32
	78	220'	———	.51	.51	———	———	———	.44	.30
	79	150'	———	———	.54	———	———	———	.48	———
Anolani	90	40'	———	———	———	2.17	———	———	———	———

Notes:
1. Station 84 is a long-term USGS gage. USGS gages were briefly located at Stations 72 and 78.
2. Agricultural diversions existed between Stations 72 and 84 prior to 1975.

Sources: Ref. 29; Ref. 33, Plate 3.

FIGURE 2

BASE FLOW OF KAMOOALII STREAM AND TRIBUTARIES

Scale: 1" = 2,000'

TABLE 1
APPROXIMATE HIGHEST ELEVATION OF PERENNIAL FLOW
FOR KAMOOALII STREAM AND TRIBUTARIES

Stream	Highest Elevation of Perennial Flow	Data Source
Luluku	Above 700'	Ref. 33, Plate 3
Kuou	Under 300'	Ref. 6, Ref. 44
Piho	Under 300'	Ref. 44
Hooleinaiwa	Under 300'	Ref. 44
Halekou	Under 250'	Ref. 33, Plate 3
Kamooalii	Above 700'	Ref. 43

Note: Elevations are estimated by VTN Pacific from USGS maps.

weather stream flow was occasionally artifically interrupted. Completion of the Ho'omaluhia dam and reservoir in November 1980 has affected peak discharge, but not dry weather flow, of Kamooalii Stream. The reservoir surface elevation is normally kept at an elevation of 160 feet. [Plate 15] Water normally exits from the reservoir by spilling into a vertical outlet tower which is connected by a conduit beneath the dam to a flume designed to reduce water velocity. [Plate 16] During unusually heavy storms, an energy dissipating spillway carries flood water out of the reservoir. [Ref. 20, pp. 1-2]

As part of Ho'omaluhia Park, the Corps also impounded Hooleinaiwa Stream to form a wildlife pond. [Figure 2 and Plate 17] Excavation of a swampy area for the wildlife pond may have increased seepage of ground water into Hooleinaiwa Stream.

In 1948, the 481-foot BWS Luluku Tunnel (DOWALD No. 2349-01) was constructed near Luluku Stream at an altitude of 530 feet in order to develop dike-impounded ground water for domestic use. [Figure 2] Leakage from Luluku Tunnel flows into Luluku Stream. [Plate 4] However, the Luluku Tunnel is believed to have diverted some of the dike confined ground water which formerly discharged into Luluku Stream. [Ref. 31; Ref. 33 pp. 66, 67, 110]

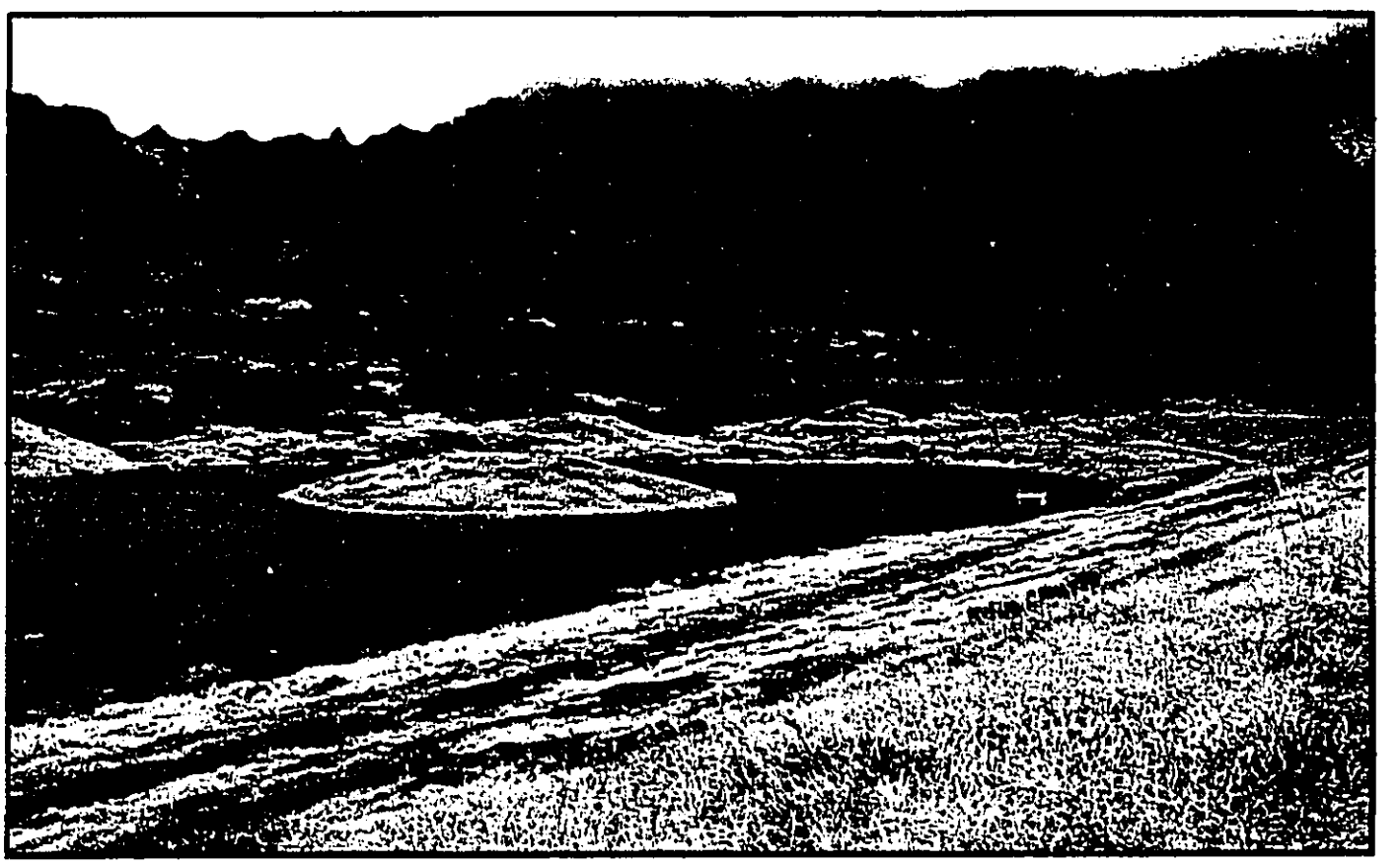


PLATE 15

HO'OMALUHIA DAM RESERVOIR

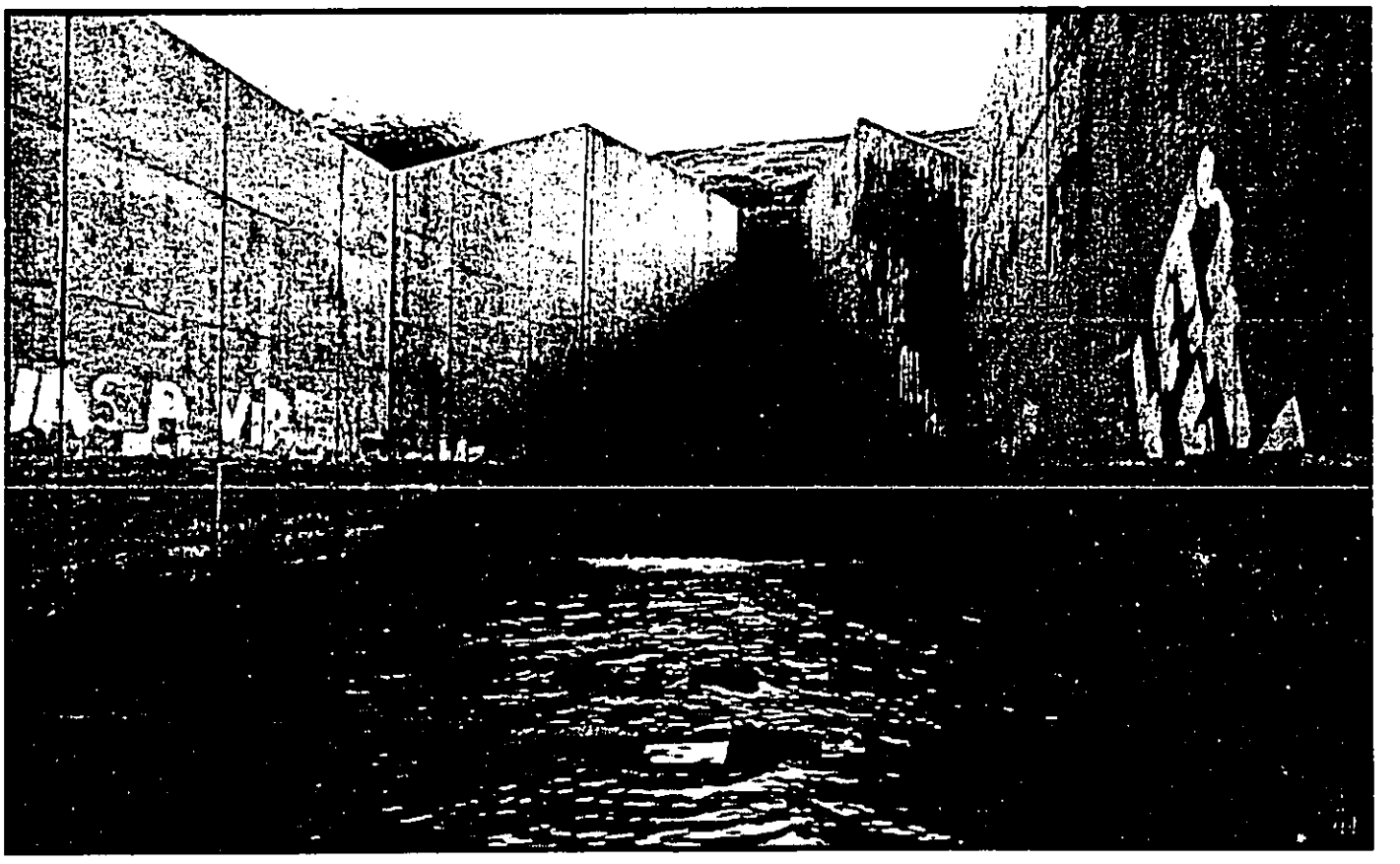


PLATE 16

HO'OMALUHIA DAM OUTLET

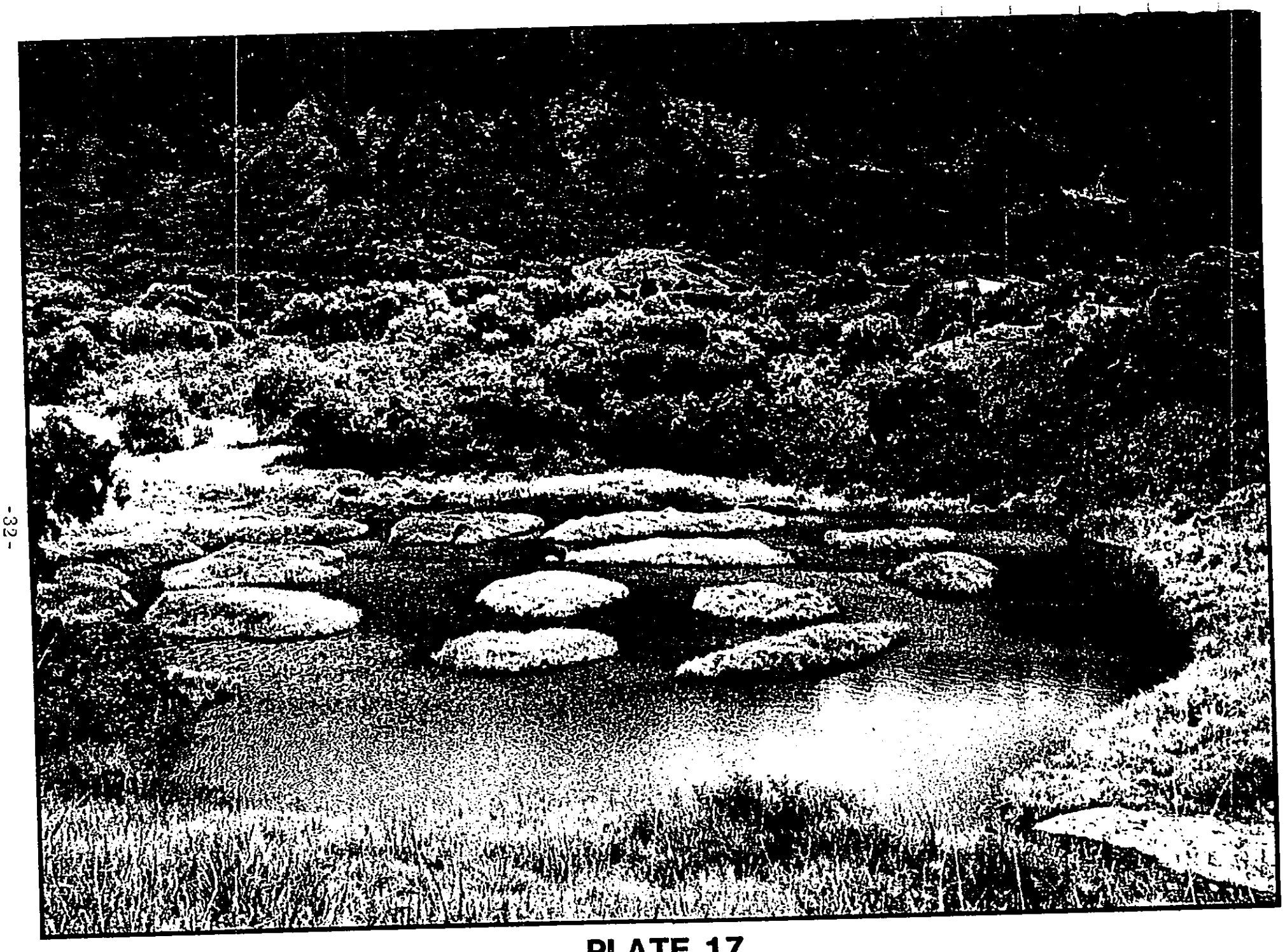


PLATE 17

HO'OMALUHIA WILDLIFE POND

Because the BWS Haiku Tunnel (DOWALD No. 2450-01) at an elevation of 550 feet is connected to the same transmission main as the Luluku Tunnel, for several decades higher pressure water from the Haiku Tunnel partially blocked Luluku Tunnel water from entering the BWS system. Since 1978, the BWS has used a back pressure valve to restrict the flow of water out of Haiku Tunnel. As shown in Table 2, the back pressure valve has increased average annual yield from the Luluku Tunnel by over 0.5 mgd. This probably has reduced leakage from the Luluku Tunnel which fed Luluku Stream.

TABLE 2

LULUKU TUNNEL YIELD

Fiscal Year	Mean Yield in MGD
1982	0.75
1981	0.78
1980	0.74
1979	0.54
1978	0.45
1977	0.18
1976	0.25
1975	0.17
1974	0.11
1973	0.21
1972	0.21

Note: The BWS purchases Luluku Tunnel water from Kaneohe Ranch.

Source: BWS

In 1955, the BWS drilled two free-flowing artesian wells near Kuou Stream at original ground elevations of 282 feet (DOWALD No. 2348-02) and 295 feet (DOWALD No. 2348-03). [Kuou I Wells in Figure 2] Although drilled into different dike compartments, both wells initially had a static head of 310 feet. Development of these

wells was observed to have dried up nearby springs at an elevation of about 310 feet which formerly contributed to the flow of Kuou Stream. Installation of a pump to increase maximum yield of the mauka well to 2 mgd in 1975 (accompanied by capping of the makai well) probably further reduced the base flow of Kuou and Kamooalii Streams. [Ref. 6]

Apart from the Luluku Tunnel and mauka Kuou I well, there are currently no other water development facilities and no known diversions of stream flow for irrigation in the watershed of Kamooalii Stream and its tributaries. However, it should be noted that in 1983, the State Department of Transportation (DOT) drilled 8 shallow alluvial Halekou Interchange Relief Wells in alluvium and ash from nearby vents of the Honolulu volcanic series (No DOWALD Number). [Figure 1] These wells tap perched artesian ground water which seeps into Halekou and Kamooalii Streams. While the BWS is not committed to their use, it would be possible to pump up to 0.75 mgd for irrigation from the two remaining Halekou Relief Wells that have not been sealed. The BWS would prepare an Environmental Assessment pursuant to Chapter 343, HRS, before developing water from these wells.

3. Stream Flow Measurements. From February 1914 to June 1916, the United States Geological Survey (USGS) intermittently monitored stream flow in Kamooalii Stream, its tributaries, and several irrigation ditches which diverted most base stream flow. Between 1959 and 1962, the USGS took several instantaneous measurements along Kamooalii Stream and its tributaries to show stream gain on days when ground water supplied all of stream base flow. USGS data and measurement points are summarized in Figure 2. Between January 1959 and October 1963, and from November 1965 to January 1980, the USGS operated a long-term gage on Kamooalii Stream at an elevation of 39 feet. [Station 84 on Figure 2] Between April 1967 and September 1970, and between January 1972 and September 1976, the USGS operated a gage on Kamooalii Stream (below inflow from Kuou Stream) at an elevation of 118 feet. [Station 72 on Figure 2] Between July 1967 and September 1971, the USGS operated a gage on Luluku Stream at an elevation of 220 feet. [Station 78 on Figure 2] And since November 1976, the USGS has operated a gage on Kamooalii Stream (below inflow from

Luluku Stream) at an elevation of 116 feet. [Not shown on Figure 2] [Ref. 27, Ref. 28, Ref. 29, Ref. 30, Ref. 32, Ref. 33]

Between 1914 and 1916, monthly mean flow into the area of the Ho'omaluhia wildlife pond has been as low as 0.16 mgd. [Table 3] Between October 1967 and September 1976, monthly mean flow into the area of the Ho'omaluhia reservoir has been as low as 2.44 mgd, and daily flow has been as low as 2.00 mgd. [Table 4] Between October 1967 and September 1971, monthly mean flow in Luluku Stream has been as low as 0.49 mgd, and daily flow has been as low as 0.37 mgd. Since 1980, all flow has been occasionally diverted with a 0.14 mgd pump. [Table 5] Below inflow from Luluku Stream, the dry weather gain of Kamooalii Stream in 1977 averaged 0.61 mgd but dropped as low as 0.13 mgd. [Table 6]

TABLE 3

MONTHLY MEAN FLOW OF HOOLEINAIWA STREAM AT 195 FEET (MGD)

Fiscal Year	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
1914	NA	NA	NA	NA	NA	NA	NA	0.48	0.38	0.56	0.78	0.54
1915	0.57	0.50	NA	0.62	0.73	0.62	0.35	0.30	0.30	NA	0.33	0.30
1916	0.29	0.16	0.22	0.25	0.81	0.52	NA	1.03	NA	0.60	0.54	0.51

Notes: 1. NA means not available.

2. The minimum flow observed was 0.1 mgd on September 13, 1915.

3. The measurement station is about 400 yards above the junction with Kamooalii Stream at the mauka edge of what has become the Ho'omaluhia Park wildlife pond.

Source: Ref. 28, pp. 128-9

TABLE 4

DRY WEATHER FLOW OF KAMOOALII STREAM AT 118 FEET (MGD)

Fiscal Year Beginning October	Annual Mean Flow	Lowest Monthly Mean Flow	Lowest Daily Flow
1967	12.79 mgd	4.13 mgd	3.55 mgd
1968	11.75 mgd	4.78 mgd	3.81 mgd
1969	4.97 mgd	3.40 mgd	3.23 mgd
1970	NA	NA	NA
1971	NA	3.44 mgd	3.04 mgd
1972	3.16 mgd	2.44 mgd	2.20 mgd
1973	6.46 mgd	2.87 mgd	2.00 mgd
1974	6.17 mgd	2.54 mgd	2.39 mgd
1975	3.77 mgd	2.60 mgd	2.39 mgd

Notes: 1. The minimum flow observed was 2.00 mgd on 10/10/73.
2. The measurement station is about 100 feet below inflow for Kuou Stream and is shown as Station 72 on Figure 2 of this EIS. The station measures all flow into what has become the Ho'omaluhia flood control reservoir.

Source: Ref. 30, Ref. 32

TABLE 5

DRY WEATHER FLOW OF LULUKU STREAM AT 220 FEET (MGD)

Fiscal Year Beginning October	Annual Mean Flow	Lowest Monthly Mean Flow	Lowest Daily Flow
1967	1.23 mgd	0.54 mgd	0.48 mgd
1968	1.38 mgd	0.76 mgd	0.44 mgd
1969	0.83 mgd	0.49 mgd	0.37 mgd
1970	1.36 mgd	0.66 mgd	0.46 mgd

Notes: 1. Since 1980, all flow is sometimes diverted with a 0.14 mgd pump.
2. The measurement station is about 0.5 miles above the junction with Kamooalii Stream and is shown as Station 78 on Figure 2 of this EIS.

Source: Ref. 30, Ref. 32, Ref. 49

TABLE 6
DRY WEATHER GAIN OF KAMOOALII STREAM
BETWEEN 116 FEET AND 39 FEET (MGD)

Monthly Mean Flow	Calendar 1977												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Ave
At 116 Ft	2.62	2.83	3.29	7.62	8.40	6.78	4.31	3.81	3.25	2.92	3.34	2.95	4.35
At 39 Ft	2.94	3.12	3.68	9.56	9.50	7.88	4.66	4.21	3.67	3.22	3.71	3.39	4.96
Net Gain	0.32	0.29	0.39	1.94	1.10	1.10	0.35	0.40	0.42	0.30	0.37	0.44	0.61
Lowest Daily Flow													
At 116 Ft	2.45	2.20	2.45	4.13	4.13	4.52	3.75	3.23	2.91	2.65	2.65	2.32	
At 39 Ft	2.58	2.45	2.58	4.26	4.46	4.84	4.07	3.75	3.36	2.91	3.10	2.71	
Net Gain	0.13	0.25	0.13	0.13	0.33	0.32	0.32	0.52	0.45	0.26	0.45	0.39	

Notes: 1. Kamooalii Stream at 116 feet is an existing USGS gage about 300 feet below inflow from Luluku Stream.
2. Kamooalii Stream at 39 feet is about 500 feet upstream from Kamehameha Highway and is shown as Station 84 on Figure 2 of this EIS.
3. On March 27, 1978, construction of the Ho'omaluhia dam briefly reduced the instantaneous flow of Kamooalii Stream to 0.39 mgd at 116 feet and 0.65 mgd at 39 feet.

Source: Ref. 32

G. HO'OMALUHIA PARK

In conjunction with and immediately mauka of a flood control dam and reservoir on Kamooalii Stream, the Army Corps of Engineers recently completed the core facilities for Ho'omaluhia Park. As planned by the Corps and the County Department of Parks and Recreation, Ho'omaluhia Park will be oriented towards low-intensity outdoor recreation including camping, hiking, fishing, and horseback riding. Since mid-

1980, the County has assumed responsibility to operate and maintain flood control and related park improvements.

There currently are two major man-made water related facilities in Ho'omaluhia Park. A reservoir with 26 acres of water surface and an average depth of 10 feet was created mauka of a 2,200 foot-long dam across Kamooalii Stream, and a wildlife pond with 1.5 acres of water surface and an average depth of 4 feet was created in a former swamp bordering Hooleinaiwa Stream. [Plate 15 and Plate 17] Both bodies of standing water are fed by rainfall and surface stream flow, and both are confined by relatively impermeable clay soils and alluvium. Ground water seeps may also feed the wildlife pond. [Ref. 19, Ref. 20, Ref. 21, Ref. 22]

Figure 2 shows the location of the reservoir and wildlife pond relative to USGS measurements of base stream flow before these facilities were constructed. It should be kept in mind that an acre-foot of water is equivalent to 0.3 million gallons.

Because of high levels of coliform bacteria, the Ho'omaluhia reservoir will not be used for swimming. Channel catfish have been successfully released in the reservoir. Recreational fishing and additional stocking of catfish have been postponed until after construction of the H-3 Freeway. This is because it may become necessary to drain both the Ho'omaluhia reservoir and wildlife pond to remove siltation resulting from construction of the H-3 Freeway and possibly the proposed Iolani School residential subdivision (if this project receives necessary permits). [Ref. 41]

Koloa ducks have been released by the DLNR Forestry and Wildlife Division at the Ho'omaluhia wildlife pond and have established small breeding populations at both the pond and the reservoir. Similar recovery programs for other endangered endemic waterbirds are being considered. [Ref. 41]

Over the next few years, the County Department of Parks and Recreation and the non-profit Ho'omaluhia Aquaculture/Agriculture Cooperative hope to jointly sponsor construction of several demonstration aquaculture ponds along Kamooalii Stream. [Figure 2] The ultimate size of aquaculture facilities will probably be less than an acre. Stream water will be piped to the ponds, and pond effluent will be

used to irrigate taro. Small tank reservoirs are planned to ensure a steady supply of water during times of low stream flow. [Ref. 41]

H. STREAM FAUNA

Hawaii's endemic stream animals include five species of fish (o'opu), two species of shrimp (o'pae), and one species of mollusk (hihiwai). (One other native species of fish and one other native species of mollusk occur naturally elsewhere in the Pacific Basin.) In addition to the native aquafauna, at least fifteen introduced species of fish and two introduced species of crustaceans are commonly found in Hawaiian streams. While the endemic species live and spawn in fresh water, hatchlings from their eggs must spend a period of development in the ocean and then migrate upstream. There is no evidence that Hawaii's endemic diadromous stream animals are capable of "homing" on their natal stream after undergoing development in the ocean. The introduced Tahitian prawn has a similar life cycle, but its larvae can develop in brackish stream estuaries.

Man-made alterations of stream channels can eliminate stream habitat and create barriers to upstream migration of endemic species. Reduction of base stream flow by water development projects also can create conditions such as crowding and warmer water which favor introduced species. [Ref. 12, pp. 27-30; Ref. 26, pp. 6-14] The entire flow of Kamooalii Stream and its tributaries Kuou, Piho, Hooleinaiwa, and Halekou currently is impounded within a 26 acre reservoir by the Ho'omaluhia Park flood control dam. Water exits from the flood control reservoir through a vertical outlet tower. After leaving the flume at the base of this tower, Kamooalii Stream flows into its natural channel and is joined by another tributary, Luluku Stream. Parts of Luluku Stream, parts of lower Kamooalii Stream, and over one-fourth of Kaneohe Stream (to which Kamooalii is tributary) have been channelized.

Prior to construction of the Ho'omaluhia flood control dam, one endemic species of shrimp (Atya bisulcata) was abundant and one endemic species of fish (Awaous stamineus) was common mauka of the

dam site in Kamooalii Stream. The same endemic species of shrimp was also common in Luluku Stream, but no endemic species of fish was present. At low elevations in Kaneohe Stream, another endemic species of shrimp (Macrobrachium grandimanus) was abundant and another endemic species of fish (Eleotris sandwicensis) was common. None of these endemic species is considered rare or endangered. Limnological surveys prior to the flood control dam also found abundant populations of the common native pond snail (Melania sp.) and a variety of introduced species including crayfish (Procambarus clarkii), mosquito-fish (Gambusia affinis), mollie (Poecilia mexicana), guppy (Poecilia reticulata), and swordtail (Xiphophorus helleri) in various parts of Kamooalii and Luluku Streams. Tahitian prawn (Macrobrachium lar) was abundant in upper Kamooalii Stream, but not present in Luluku Stream. [Ref. 12, p. 125; Ref. 26, pp. 7, 11]

Between March and May 1979, during construction of the Ho'omaluhia flood control dam, a stream fauna survey for this EIS found no endemic species of fish makai of the dam site in Kamooalii Stream. Otherwise, there was little change in the fauna present in Luluku Stream and lower Kamooalii Stream. [See Appendix B] Absence of endemic fish probably was due to construction-related interruption of stream flow in combination with siltation from construction of the dam. Hence, siltation from the future construction of the H-3 Freeway may again cause the temporary absence of endemic fish below the dam in Kamooalii Stream.

In August 1983, the endemic o'opu nakea (Awaous stamineus) was common and both common and red tilapia (Tilapia mossambica) were abundant in Kamooalii Stream immediately mauka of the Luluku Road bridge. (This bridge is about 1,000 feet upstream of Sampling Station 2 on Page B-10.) No endemic species of fish was present in Luluku Stream. [Ref. 48] The red tilapia observed is a hybrid recently introduced in Hawaii for commercial aquaculture.

According to the Supplemental Environmental Statement for the Ho'omaluhia flood control dam,

> Based on knowledge of the existing fauna, the U.S. Fish and Wildlife Service concluded that existing fish and wildlife resources should not be adversely affected. The gobies and other fish now present in the stream can be expected to transit

> the uncontrolled outlet pipe and maintain their stock in the stream. Within the areas of the reservoir, their population will be controlled by competition with any fish introduced there for pole and line angling.... the rise in stream temperature below the dam, during periods of low flow, should not exceed 1.5 degrees fahrenheit. [Ref. 19, pp. 10, 11]

However, this assessment has turned out to be incorrect. The vertical tower by which water exits from the Ho'omaluhia reservoir is a total barrier to upstream migration of juvenile Awaous stamineus and Macrobrachium lar and will eventually lead to the complete absence of these species mauka of the flood control dam. This may also be the case for Atya bisulcata, even though they are capable of climbing up algae on the face of waterfalls. The reason is that there is no light for algae to grow in the middle of the covered vertical outlet tower. [Ref. 37]

Water temperatures are typically higher at the surface than at the bottom of reservoirs. Consequently, the water skimmed off the surface of the Ho'omaluhia reservoir by the vertical outlet tower is warmer than normal stream flow. It is conceivable that the reservoir has caused an increase in the temperature of Kamooalii Stream. One set of measurements taken before and after construction of the dam show a 4 degree fahrenheit increase (although unrelated factors might be involved). [Table 7] While endemic stream fauna can survive temporary exposure to temperatures as high as 90 degrees fahrenheit, warmer stream temperatures favor growth and reproduction of introduced species which compete with and prey on endemic species. [Ref. 12, Part C]

TABLE 7
LOW FLOW KAMOOALII STREAM TEMPERATURES AT 116 FEET

Date	Instantaneous Flow	Average Flow For Month	Instantaneous Temperature
9/21/77	2.78 mgd	3.25 mgd	77.9° F
9/30/81	3.17 mgd	3.51 mgd	82.0° F

Note: The Ho'omaluhia dam was built between 1977 and 1981.
Source: Ref. 32

About 1,500 channel catfish (Ictalurus punctatus) were introduced in the Ho'omaluhia reservoir in 1981 and are thriving in the warm water. Juvenile catfish have been observed in the conduit carrying water from the wildlife pond. [Ref. 38; Ref. 41] Channel catfish reach their maximum rate of growth with water temperatures between 86 and 93 degrees fahrenheit. [Ref. 12, Part C, p. 51] Although channel catfish spawn with water temperatures as high as 75 degrees fahrenheit, juvenile catfish require three months of water temperatures less than 70 degrees fahrenheit in order to mature. [Ref. 47] Therefore, catfish probably are breeding in streams and in cool water near the bottom of the reservoir.

I. WETLANDS AND WATERBIRDS

In 1900, as a result of extensive rice and taro production, the Kaneohe Bay Region contained an estimated 1,300 acres of wetlands. By 1968, because of urbanization and the decline of wetland agriculture, it is estimated that only 222 acres of wetlands remained in the watershed of Kaneohe Bay. [Ref. 26] Apart from recent man-made wetlands in Ho'omaluhia Park, there are no significant wetlands fed by Kamooalii Stream or its tributaries. Neither the 1977 Hawaiian Waterbirds Recovery Plan nor the 1977 Corps of Engineers Ornithological Survey of Hawaiian Wetlands mention the existence of waterbird habitat along Kamooalii Stream or its tributaries. [Ref. 2, Ref. 15, Ref. 17]

There are four endemic species of waterbirds in Hawaii: Hawaiian or Koloa duck (Anas wyvilliana), Hawaiian stilt (Himantopus mexicanus knudseni), Hawaiian gallinule (Gallinula chloropus sandvicencis), and Hawaiian coot (Fulica americana alai). All four species are included in the U.S. Fish and Wildlife Service list of endangered species. One other species of waterbird is native to Hawaii: the black-crowned night heron (Nycticorax nycticorax hoactli). Although relatively uncommon in Hawaii, it has a wide distribution in North and South America. [Ref. 17]

In April 1982, 38 Koloa ducks were released at the Ho'omaluhia wildlife pond, of which about a dozen have taken up permanent residence either at the pond, Ho'omaluhia reservoir, or Kamooalii Stream. Koloa ducklings have recently been observed at both the wildlife pond and reservoir. [Ref. 36, Ref. 41] Hawaiian gallinules, Hawaiian coots, and black-crowned night herons have been occasionally observed at the pond and reservoir but are not thought to have established breeding populations. [Ref. 41]

J. AGRICULTURAL USE OF SURFACE WATER

Shiroma Farm has a small dam across Luluku Stream and inserts a pump intake when water is necessary for irrigation of an apple banana orchard. The Shiromas have been pumping water from Luluku Stream as needed for about the past 15 years. In 1980, Shiroma Farm purchased a larger 100 gpm (0.144 mgd) pump. When using this pump, the Shiromas sometimes dry up Luluku Stream below their dam. This was not the case before 1980. (Probably, this is due to reduced stream flow after an increase in BWS water withdrawal from the Luluku Tunnel.) The Shiromas now run their pump for as long as 8 hours per day during the summer. [Ref. 49]

There are no other known agricultural diversions of water from Kamooalii Stream and its tributaries. [Ref. 13, Ref. 32, Ref. 49] One banana farm uses unmetered water from the Luluku tunnel pipeline for pesticide application. The BWS also provides water from the mauka Kuou I well without charge to one banana farmer because the Kuou I wells dried up nearby springs which formerly were used for pesticide application. [Ref. 40, Ref. 49]

Some apple banana farms in the watershed of Kamooalii Stream and its tributaries may be partially irrigated by ground water seeping to the surface. Unfortunately, it is not possible to evaluate the extent or importance of such seepage. Banana groves near the headwaters of Luluku Stream and groves below an elevation of 300 feet are most likely to have some benefit from dry-weather ground water springs.

K. AGRICULTURAL USE OF PESTICIDES

Apple bananas raised in the watershed of Kamooalii Stream and tributaries currently do not need subsurface application of pesticides. The banana root borer which has infested the Waimanalo area of Oahu is not yet present in the Luluku area. Nematicides are the only way to control this insect. Even when the banana root borer is not present, nematicides must be regularly used when varieties of bananas such as Williams are cultivated.

There currently is minimal risk of pesticide contamination of the ground water sources being developed. However, this might not be the case if the banana root borer attacked apple banana orchards in the project watershed, or if other varieties of bananas were cultivated, and farmers had to use nematicides.

L. VEGETATION AND WILDLIFE

Botanical and biological reconnaissance surveys for Ho'omaluhia Park, the H-3 Freeway, and the proposed Iolani School residential development have not found any rare or endangered endemic species of plants or birds in the project area. Common introduced species of plants and birds predominate throughout the area. [Ref. 1, pp. 3-25 to 3-33; Ref. 3, Appendices C and D; Ref. 19, p. 9; Ref. 34, Volume III Appendices 4(c) and 4(d)]

M. ARCHAEOLOGICAL FEATURES

Archaeological reconnaissance surveys within Ho'omaluhia Park and around the proposed H-3 right-of-way did not uncover any archaeological features in the vicinity of either the Kuou II or the alternative Kamooalii I sites. [Ref. 1; Ref. 35, Volume V Appendix H] A reconnaissance survey for this EIS did not uncover any

archaeological fatures at either the Luluku or alternative Kamooalii II sites. [See Appendix C] However, archaeological monitoring is considered necessary during any soil disturbing activities at the Luluku and Kamooalii I (Alternate) well sites.

N. AIR QUALITY AND NOISE

There are no existing significant sources of air pollution or noise near the Kuou II, Kamooalii I, and Kamooalii II well field sites. The Luluku site is next to Likelike Highway and is subject to vehicular emissions and noise. When the H-3 Freeway is built, the Kuou II site will also be subject to vehicular emissions and noise. Both Kamooalii I and Kamooalii II Alternate sites are within an area proposed for residential development by Iolani School.

O. NATURAL HAZARDS

There are no known natural hazards at the well field sites. According to County Flood Insurance Rate Maps, the entire project area is designated Zone D, which is an area of undetermined, but possible, flood hazard. [Ref. 25] While the well sites are probably not subject to significant flooding, in order to bring the Kamooalii I and Kamooalii II well fields into production, some of the options for roads and transmission mains cross Kamooalii Stream and some of its tributaries. Bridges will probably be used across stream beds.

III. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. PROJECT SITE

Structures, fences, and access roads will be built in areas that presently are open space. Landscaping and unobtrusive designs will be used to mitigate visual impacts of new BWS facilities. Electrical and telephone lines will be underground within Ho'omaluhia Park to avoid visual impacts, but utility companies will install elevated systems outside the park.

Existing vegetation at the well field and reservoir sites, access road routes, and pipeline routes will be removed. However, only common plant species will be affected. In order to minimize adverse effects to landscaping in Ho'omaluhia Park, the BWS will negotiate appropriate pipeline routes and reservoir sites with the County Department of Parks and Recreation.

Proposed facilities will allow the BWS to take over water supply for Ho'omaluhia Park and phase out a reservoir and pumps operated by the Parks Department. The new BWS access road from Ho'omaluhia Park to the Kamooalii I well field will allow horses to use an "equestrian underpass" planned under the H-3 Freeway.

It is unlikely that Hawaiian artifacts are present in areas where grading and construction will take place for the well fields. The BWS will commission archaeological reconnaissance surveys when planning access roads, water transmission mains, utility lines, and reservoirs outside Ho'omaluhia Park. BWS contracts for drilling of the Luluku and Kamooalii II (Alternate) wells will require archaeological monitoring during any soil disturbing activities. If any cultural materials are encountered during construction of BWS facilities, then construction will stop and the BWS will notify the DLNR Historic Sites Office.

Construction-related impacts such as dust and erosion will be minimized by standard mitigation measures. Erosion will be controlled by limiting the cut areas and by landscaping. Grading for and erosion from construction of BWS facilities will be negligible compared to that resulting from construction of the H-3 Freeway. Dust will be controlled by sprinkling as required. Construction noise within

Ho'omaluhia Park will occur only during daylight hours Monday to Friday. Contractors will maintain their equipment to minimize noise and exhaust emission in compliance with DOH codes.

B. AGRICULTURE

The Luluku well field will remove about 0.25 acres of apple bananas from production. The family farmers affected will also lose about 10 acres of their 35 acres of banana orchards as a result of construction of the H-3 Freeway. It is uncertain at this time whether their remaining 25 acres will be sufficient for a viable operation. [Ref. 40] They also are faced with an eviction notice from Iolani School, as are the other apple banana farmers in the project watershed. If they remain in business and are not evicted, then they will be compensated for loss of productive acreage due to BWS actions. At this time, it is not resolved whether apple banana farmers will be compensated for loss of productive acreage due to DOT actions.

The Kamooalii Watershed Wells are very unlikely to adversely affect any agricultural use of stream water or the feasibility of aquaculture ponds proposed along Kamooalii Stream. The dry-weather flow of Luluku Stream (which is used for irrigation of bananas) and the dry-weather flow of Kamooalii Stream (which is proposed for use in aquaculture ponds) originate at much higher elevations than proposed well fields.

Proposed wells may reduce seepage of ground water into Luluku-area banana groves. Unfortunately, it is not possible to evaluate either the importance of such seepage or the extent to which it might be reduced.

C. STREAM FLOW

Since ground water is the source of the base flow of Kamooalii Stream and its tributaries, removal of ground water potentially could reduce stream flow. The degree to which water withdrawal from the Kamooalii Watershed Wells would affect Kamooalii Stream is very difficult to predict since the relationship between stream flow and ground water is very complex. There are five basic ways that a well in a dike compartment could reduce stream flow:

1) If a dike compartment tapped by a well directly overflows to a stream, and if the well lowers the dike reservoir water level below the discharge point, then an immediate reduction in stream flow would occur. This effect could be anticipated if the well is close to the stream and the water level (static head) in the well prior to pumping is at a slightly higher elevation relative to a nearby spring or point of water gain within the stream bed.

2) A dike compartment that is tapped by a well might not directly discharge to a stream, but it might overflow into other dike compartments which at some lower point discharge into a stream. If this overflow is intercepted by the well, then the lower dike compartments might not have excess water to discharge to the stream. The well could thus reduce or eliminate a point of stream gain at an elevation below the static head of the well. This effect may not be detected by standard test pumping procedures but might show up only after a long period of drawdown in the dike compartment.

3) There is little evidence that streams in Koolaupoko receive direct discharge from dike compartments below an elevation of 250 feet. While a dike compartment that is tapped by a well might not directly discharge to a stream, the compartment might overflow into alluvium, colluvium, and volcanic ash which at some lower point discharge into a stream. If this overflow is intercepted by the well, then the well could reduce or eliminate a point of stream gain at an elevation below the static head of the well. This effect may not be detected by standard test pumping

procedures, but might show up only after a long period of drawdown in the dike compartment.

4) The previous three avenues of impact to stream flow are based on the idea of water overflowing the top of a dike compartment. However, water also flows through dikes. The amount of this leakage is a function, among other things, of the water pressure in dike compartments. If a well lowers the head in a dike compartment, then there would be less pressure and less water would leak out. If this leakage shows up as a spring, then the flow of the spring would be reduced.

5) In cases where water flows through dikes, if a well lowered the water level in one dike compartment, then there potentially could be greater leakage from adjacent ("upstream") compartments. Other things being equal, if two dike compartments are hydraulically connected, then the leakage between them will be proportional to their difference in head. Hence, it theoretically is possible for a well to increase leakage out of "upstream" dike compartments and thus reduce dike reservoir discharge into streams above the static head of the well. However, given the complexity of prismoidal dike reservoirs, it is much more likely for a high level well to affect stream base flow below rather than above the static head of the well.

Unlike wells, water development tunnels typically drain many dike compartments and can have far-reaching effects on springs and stream flow above the elevation of the tunnel. For example, some hydrologists believe that the Haiku Tunnel reduced the base flow of Kahaluu Stream, 2-1/2 miles away. [Ref. 33, p. 70] However, this conclusion was based on inadequate short term data.

The dynamics of ground water movement in the watershed of Kamooalii Stream are not well enough understood to predict the amount of stream flow reduction that might occur with a given rate of water withdrawal. Nevertheless, it is possible to estimate a **worst-case** loss of stream flow on the basis of the following assumptions:

1) Dike compartments discharging into Kamooalii and Luluku Streams above an elevation of 500 feet have a poor hydraulic connection with dike compartments in which the proposed well fields would be located.

2) The proposed wells will all have static heads higher than the Kuou I wells (i.e. higher than 310 feet).

3) Many dike compartments in the watershed of Kamooalii Stream, including but not limited to the proposed well field sites, leak ground water into dike compartments underneath Ho'omaluhia Park.

4) Dike compartments underneath and immediately mauka of Ho'omaluhia Park leak ground water into dike compartments makai of Ho'omaluhia Park.

5) Dike compartments underneath and immediately mauka of Ho'omaluhia Park overflow when the rate at which ground water enters them exceeds the rate at which ground water leaks out of them.

6) The source of dry weather flow in Kuou, Piho, Hooleinaiwa, and Halekou Streams and dry weather gain in the flow of Kamooalii Stream is ground water overflowing dike compartments and seeping to the surface through water bearing alluvium, volcanic ash, and weathered rock underlying Ho'omaluhia Park.

7) Seepage from the Ho'omaluhia reservoir through the Ho'maluhia dam is negligible.

Using these assumptions, the **worst-case** long-term dry-weather impact of maximum pumping of the BWS Kamooalii Watershed Wells would be to eliminate most seepage of ground water into Kamooalii Stream and its tributaries below an elevation of 300 feet. Reduction of stream flow has the potential to increase water temperature, but should not affect water quality. Luluku Stream would probably not be affected because

it gains almost no base flow below an elevation of 520 feet. [Figure 2] However, in the worst possible case, all flow into the Ho'omaluhia wildlife pond would be eliminated, flow into the Ho'omaluhia aquaculture ponds and reservoir would be reduced to less than 0.3 mgd, and Kamooalii Stream flow at an elevation of 39 feet (above inflow from Anolani Stream) would be reduced to less than 0.8 mgd. The actual reduction in base stream flow is likely to be less than this worst-case model, and conceivably could be minor, but can not be determined without long-term flow measurements after the BWS Kamooalii Watershed Wells are put into production.

In order to determine the potential for immediate impacts on base stream flow, the BWS will contract with the U.S. Geological Survey (USGS) for short-term monitoring of the flow before, during, and after test-pumping of exploratory wells within the watershed of Kamooalii Stream. The USGS will be responsible for selecting appropriate monitoring sites. In order to determine the potential for long-term impacts on base stream flow, the BWS will rely on data from an existing USGS gage on Kamooalii Stream at an elevation of 116 feet, below inflow from Luluku Stream. The BWS will also depend upon staff of Ho'omaluhia Park to point out any occasions when there is no water flow from the outlet of the Ho'omaluhia wildlife pond (which impounds Hooleinaiwa Stream). If test-pumping of exploratory wells causes immediate impacts on Luluku Stream, then the BWS will negotiate with the USGS to establish a permanent gage on Luluku Stream. If the dike reservoir penetrated by the Luluku well field is hydraulically connected with a higher dike reservoir which discharges into Luluku Stream, then pumping of these wells might affect stream flow. However, this probably will not be the case since no springs have been observed at the well field site and because the stream gains almost no base flow below an elevation of 520 feet.

Act 185, SLH 1982 (Chapter 176D, HRS), assigned responsibility to the State Department of Land and Natural Resources (DLNR) to promulgate in-stream flow standards for windward Oahu streams. At this time, because of low stream environmental quality, it is not resolved whether the DLNR will establish minimum flow standards for Kamooalii Stream and its tributaries. Regardless, the BWS intends to monitor stream flow and reduce pumpage from its wells as necessary to meet any minimum flow standards that the DLNR may establish.

The possibility exists that the amount of ground water that could be developed by the proposed wells will substantially exceed any reduction in dry weather stream flow. In such an event, another approach to maintaining stream flow would be to pump water from the Kamooalii Watershed Wells into Kamooalii Stream or one of its tributaries mauka of Ho'omaluhia Park. This kind of engineering solution would have an immediate effect on stream flow whereas there could be a substantial lag between a reduction in well pumpage and an increase in spring-fed stream flow. From the standpoint of temperature, water quality, and dissolved oxygen, it makes little difference whether ground water enters a stream from a well or natural spring.

Pending adoption of in-stream flow standards, the BWS is committed to preserving enough stream flow to maintain existing water levels in the 1.5 acre Ho'omaluhia wildlife pond and the 26 acre Ho'omaluhia reservoir. Since the rate of seepage out of the wildlife pond and flood control reservoir is not known, it is not possible to precisely quantify necessary stream flow. If there were no seepage, then it would only be necessary to replace about 0.010 feet/day in water losses from evapotranspiration: about 0.005 mgd for the wildlife pond, and about 0.09 mgd for the reservoir. [Ref. 33, p. 22]

While no measurements have been made, a crude visual estimate is that about 0.7 mgd of water seeps from a granular drain at the toe of the Ho'omaluhia dam and enters Kamooalii Stream. [Ref. 46] However, observed seepage might originate from ground water seeping to the surface beneath the dam rather than from surface water in the reservoir. The Corps of Engineers design memorandum for the Ho'omaluhia dam indicated that laboratory tests of weathered alluvium and tuff foundation materials found that their average coefficient of permeability "K" was only 0.014 feet/day. [Ref. 21, p. 20] By comparison,

> Considering the results obtained from both field and laboratory testing, a K value of ... [0.144 feet/day] was selected for seepage design through the weathered alluvium and tuff underlying the dam embankment. [Ref. 21, p. 30]

In other words, the Ho'omaluhia dam embankment is much less permeable than the soils underlying the dam, and springs which formerly fed

Kamooalii Stream in the area of the dam may now be redirected into the drain at the toe of the dam. If this interpretation is correct, then pumping of the BWS Kamooalii Watershed Wells could intercept ground water presently seeping from the drain at the toe of the dam.

D. STREAM FAUNA

Survival of channel catfish in the Ho'omaluhia reservoir is not dependent upon perennial flow out of the reservoir. Provided that the water level is maintained at 160 feet and that sediment from construction of the H-3 Freeway does not smother the reservoir, the reservoir is shallow enough that there should be ample dissolved oxygen to avoid fish kills. The only other comparable reservoir on Oahu is Lake Wilson in Wahiawa, which has had problems with fish kills. Discharge of treated sewage effluent into Lake Wilson has resulted in an artificially high population of algae-fed fish and anaerobic conditions about 6 to 10 feet from the surface. Fish kills at Lake Wilson have been caused when lower water levels crowd fish into a smaller survival zone. [Ref. 9] Similar conditions would not be found in the Ho'omaluhia reservoir.

Pending DLNR promulgation of minimum stream flow regulations, reduction of dry-weather flow out of the Ho'omaluhia reservoir and accompanying increases in stream temperature have the potential to make it impossible for endemic diadromous species to survive in Kamooalii Stream above inflow from Anolani Stream. Under existing conditions, the middle reaches of Kamooalii Stream provide moderately degraded habitat for one common endemic species of fish and one common endemic species of crustacean. [See Appendix B] Minimum flow requirements for these species are not known. They were present in January 1977 when the mean monthly flow of Kamooalii Stream (below inflow from Luluku Stream) was 2.62 mgd and the lowest daily flow was 2.45 mgd. [Ref. 26, Ref. 32]

E. WETLANDS AND WATERBIRD HABITAT

Waterbird habitat in the Ho'omaluhia wildlife pond and reservoir is not dependent upon perennial flow out of these wetlands. Endemic waterbirds would not be affected if water temperatures approached air temperatures. However, it is essential to maintain existing water levels to prevent bullrushes and cat-tails from choking open water. [Ref. 39] Provided that constant water levels are maintained, and that the resevoir and wildlife pond are not smothered by sediment from construction of the H-3 Freeway, there will be little risk of stagnation or insufficient dissolved oxygen.

F. GROWTH AND LAND USE

Production of ground water for domestic use by the Kamooalii Watershed Wells will accommodate, but not induce, development on Oahu. Net population growth on Oahu is primarily due to resident birth rates and the number of jobs on Oahu. Availability of water is a prerequisite for new development but will not directly cause people to have more children or create more employment opportunities.

While first priority for use of water from new windward BWS sources will be to meet the need of windward Oahu, any excess water can be exported to Honolulu. Water from the Pearl Harbor aquifer not needed in Honolulu could then be used in other parts of leeward Oahu.

G. UNAVOIDABLE ADVERSE IMPACTS

No significant unavoidable adverse impacts will result from construction of the Kamooalii Watershed Wells and ancillary production facilities. However, long-term use of these wells could significantly reduce the dry-weather base flow of Kamooalii Stream and tributaries. The BWS is committed to maintaining sufficient stream flow to avoid

adverse impacts to water-related facilities and waterbird habitat in Ho'omaluhia Park. The BWS also will monitor stream flow and take appropriate measures to implement any minimum flow standards that the DLNR may establish for Kamooalii Stream and tributaries.

H. COMMITMENT OF RESOURCES, FUTURE OPTIONS, AND LONG-TERM PRODUCTIVITY

Non-renewable resources that will be committed to the project include materials, labor, and land. Once production facilities are installed for the Kamooalii Watershed Wells, the BWS will be committed to using them. High level ground water in the Koolau Range is a renewable resource. Water withdrawal will not exceed sustainable yield and necessary measures will be taken to maintain any minimum stream flow standards established by the State.

I. GOVERNMENTAL POLICIES OFFSETTING ADVERSE IMPACTS

Unless sufficient water is available to meet demand, the BWS will be forced to deny hook-ups or to not issue new water meters larger than 5/8". In effect, this would impose a moratorium on most new development and delay creation of housing called for in the Oahu General Plan and the Hawaii State Plan.

IV. RELATIONSHIP OF THE PROJECT TO LAND USE PLANS, POLICIES, AND CONTROLS

The proposed Kamooalii Watershed Wells and ancillary production facilities will be in conformance with adopted land use plans and policies, and also with conditions and standards imposed by applicable land use controls. The following paragraphs describe significant plans, policies, and controls as they relate to the project.

A. STATE PLAN AND STATE LAND USE CONTROLS

The Hawaii State Plan, enacted by Act 100, SLH 1978, indicates legislative intent to:

> Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State. (Section 226-5(b)(3), HRS)
>
> Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii. (Section 226-11(b)(6), HRS)
>
> Promote the preservation and restoration of significant natural and historic resources. (Section 226-12(b)(1), HRS)
>
> Support water supply services to areas experiencing critical water shortages. (Section 226-16(b)(5), HRS)
>
> Facilitate the use of available urban lands to accommodate the housing needs in various communities. (Section 226-19(b)(6), HRS)
>
> Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimal. (Section 226-104(c)(4), HRS)
>
> Identify critical environmental areas in Hawaii to include but not be limited to the following: watershed and recharge areas;

wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreational shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources. (Section 226-104(c(5), HRS)

With respect to these State Plan policies, the Kamooalii Watershed Wells will provide a portion of the water needed to accommodate population growth indicated in the 1982 Oahu General Plan. Also, appropriate mitigation measures will be used to ensure that the project will not adversely affect rare or endangered species, natural or historic resources, wildlife habitats, high quality perennial streams, or scenic resources. A full discussion of impacts and mitigating measures is contained in Chapter III.

State land use controls to implement the State Plan are designated in Section 226-52, Hawaii Revised Statutes. These are district boundary classification by the State Land Use Commission (LUC) and Conservation District Use Permits by the Board of Land and Natural Resources (BLNR). The LUC has four classes of land use: Urban, Rural, Agricultural, and Conservation. Pursuant to Sections 205-5, 183-41, and 46-4, HRS, the BLNR regulates use of lands which the LUC has classified within the Conservation District, while the counties regulate land use in the other districts.

All four proposed well fields and most ancillary production facilities will be located on lands designated in the General subzone on subzone maps of BLNR Administrative Rules Title 13 Chapter 2. Wells and other facilities for water development are a "permitted use" within the General subzone. The BWS will comply with the specific application requirements of Title 13 Chapter 2 when developing preliminary construction plans.

B. STATE COASTAL ZONE MANAGEMENT PROGRAM

The State Coastal Zone Management (CZM) Law (Chapter 205A, HRS) explicitly requires public agencies to protect the habitat of waterbirds and diadromous stream fauna. The 1978 State CZM Program document proposed that the State Department of Health (DOH) adopt minimum stream flow regulations to protect coastal ecosystems. [Ref. 24, pp. 210-11] Because the DOH has not adopted minimum flow regulations, Act 185, SLH 1982 (Chapter 176D, HRS), assigned responsibility to the State DLNR to promulgate in-stream flow standards for windward Oahu streams.

At this time, the DLNR has not made a specific proposal concerning appropriate flow standards for any perennial stream in Hawaii. Regardless, the BWS intends to monitor stream flow and reduce pumpage from wells as necessary to meet any minimum flow standards that the DLNR may establish for Kamooalii Stream and its tributaries. Pending adoption of in-stream flow standards, the BWS is committed to maintaining existing water levels in Ho'omaluhia Park wildlife pond and flood control reservoir. Thus the BWS will achieve compliance with the Hawaii CZM Program by mitigating possible adverse impacts to waterbirds and coastal ecosystems.

C. COUNTY GENERAL PLAN AND ZONING

The Kamooalii Watershed Wells will develop water to accommodate growth and development proposed in the 1982 Oahu General Plan. However, the project will not in itself guide where population growth takes place on Oahu. Implementation of County land use plans is primarily achieved with zoning rather than with water supply because the BWS has no legal mandate to use water supply as a tool to direct growth. In the absence of any law or ordinance authorizing the BWS to refuse service when water is available, the BWS is committed to meeting all future demand.

Parts of the alternative transmission mains from the Kamooalii Watershed Wells may be located in the Urban District on lands zoned R-4 and R-5, and in the Agricultural District on lands zoned A-1. Utility mains are a permitted use pursuant to the County Comprehensive Zoning Code.

V. ALTERNATIVES TO THE PROPOSED PROJECT

There are a wide range of alternatives to the proposed project which to varying degrees could fulfill the objective of meeting future water demand. In brief, these alternatives are as follows:

A. NO PROJECT

B. ALTERNATIVE SITES

C. ISLAND-WIDE APPROACHES
   1. Conservation, Bulkheading of Tunnels, Controlling Leaks
   2. Desalinization of Brackish Water
   3. Exchanging Water with Agriculture
   4. Using Non-Potable Water for Landscaping
   5. Trapping Storm Runoff
   6. Taking Stream Water
   7. Taking Agricultural Water
   8. Increasing Water Prices

A. NO PROJECT

Over the next several decades, total Oahu water demand is projected to increase to the point where the BWS will have to seriously explore all feasible options. For this reason, the BWS has rejected the "no project" alternative in favor of a project which will provide additional water and incorporate adequate mitigation measures.

B. ALTERNATIVE SITES

There are undoubtably many other sites on Oahu where potable water can be developed. Over the next few years, both the BWS and the DLNR (DOWALD) will be conducting an extensive investigation for new sources pursuant to BWS long-range island-wide water development plans. [Ref. 4, Ref. 7] However, other well sites will not serve as alternatives to the Kamooalii Watershed Wells since these other sites will also be needed to meet the island's growing water demands.

C. ISLAND-WIDE APPROACHES

By the year 2000, easily accessible high quality ground water may not be sufficient to meet total Oahu water demand. Because of the way that Oahu's water supply system is integrated, steps can be taken on an island-wide basis to meet the growing urban demand for water. Without question, some island-wide approaches will ultimately become a necessity. Possible approaches vary widely in cost, impacts, and social acceptability. Some could feasibly serve as an alternative to the Kamooalii Watershed Wells by freeing water from the Pearl Harbor aquifer to be pumped to other parts of leeward Oahu.

1. Conservation, Bulkheading of Tunnels, Controlling Leaks. A very efficient approach to meeting future water demand is to conserve water and avoid unnecessary losses. Major possibilities include installing water saving devices, constructing or relocating bulkheads on water collection tunnels, and repairing leaky water mains.

Ordinance No. 79-27 amended the Oahu plumbing code to require installation of low-volume flush toilets and cooling water recirculating systems in new developments after November 9, 1979. Water savings could be expanded by installing water conservation devices in toilets and cooling equipment in existence prior to November 1979. While the BWS currently is not authorized by

statute or ordinance to subsidize "retrofitting" old fixtures with water saving devices, there could be merit in such a program. However, at present, there is no reliable data on the water savings that could be expected, or the actual cost of a retrofitting program.

For obvious reasons, "retrofitting" can not be forced on anyone against their wishes. From March through December 1982, the BWS gave away 130,000 shower flow restrictors for installation by Oahu homeowners. Conceivably, this program could be restarted and expanded. For example, during the intense drought of 1977, the City of Oxnard, California distributed 3,200 water conservation kits free of charge within a single geographic area. These kits contained a toilet tank dam to reduce the quantity of water flushed in the toilet, a plastic shower head flow restrictor, and dye tablets to detect leaks from toilet storage tanks. The distribution was followed a month later by a survey of 637 households receiving the water conservation kits. It was found that 63% of those surveyed had installed the devices. Follow-up studies showed that those consumers who installed the devices used 3% less water. Presumably, percentage water savings would be less after the drought when these households resume watering their yards. [Ref. 7, pp. 79, 80]

Part of Oahu's water supply comes from high level tunnels driven into the Koolau and Waianae mountains. Water trapped in the permeable basalt by impermeable lava dikes is developed by these tunnels. By bulkheading at the dikes (installing an impermeable seal in the tunnel), a tunnel would be able to store water for use during periods of high demand. Without a bulkhead, buildup of storage is not possible and the tunnel would produce only base flow year round. However, out of four tunnels with bulkheads, the procedure has been effective only at Waihee. Other attempts were unsuccessful in restoring the hydraulic integrity of the dikes which formerly controlled storage. [Ref. 33, p. 105]

In fiscal year 1982-83, approximately 10.9% of the water input into the overall BWS system was unaccounted for. This includes meter errors, non-metered uses (fire, line flushing, etc.) and an unknown amount of leakage. A survey of the Ewa-Waianae District

water distribution system in 1977-78 found that only 1% of the water carried in 50 miles of pipe was lost to leakage. The rest of the unaccounted-for water was due to meter errors and non-metered uses. Another leakage survey recently covered Sand Island. Apart from a few minor leaks, the BWS found that one "misplaced" service was the cause of the high percentage of unaccounted-for water.

2. Demineralization of Brackish Water. Large quantities of brackish ground water could be made available for domestic use if excess salt were removed. Demineralization techniques are available which, although more expensive than normal ground water development, are considerably less costly than desalting ocean water. It is estimated that in 1982, construction of an 8 mgd reverse osmosis demineralization plant to treat water from the Pearl Harbor Springs would cost approximately $11.4 million. [Ref. 7, p. 15] The total annual cost of potable water from this plant would have been approximately $1.60 per 1,000 gallons. However, 72% of this cost is for electric power. The major disadvantage with demineralization is the large amount of electric power required which, on Oahu, is produced with non-renewable fossil fuels. Apart from the environmental trade-offs necessitated by use of such resources, the cost of fuel for electric power has doubled over the last few years and will continue to escalate.

3. Exchanging Water with Agriculture. While no cost estimate is available, it potentially could be cost-effective for the BWS to exchange treated sewage effluent or brackish water for well water or Waiahole Ditch water used to irrigate sugar cane on leeward Oahu. Oahu Sugar Company (OSC) would need to agree to such an exchange, and the BWS would need to develop a new source of irrigation water for use by OSC. In addition, the Board of Land and Natural Resources would need to approve any increase in BWS pumpage of potable water from the Pearl Harbor Ground Water Control Area (GWCA) made possible by a permanent decrease in pumpage from OSC wells in the Pearl Harbor GWCA.

Without dilution, only 7 mgd of well water now used by Oahu Sugar Company could meet the Federal requirement that chloride concentration in drinking water be less than 250 ppm. [Ref. 16] However, the Waiahole Ditch supplies Oahu Sugar Company with an average of 32 mgd of potentially high quality water from water development tunnels in the Koolau Range. [Ref. 30, p. 279] Waiahole Ditch water would be suitable for domestic use if given minimal treatment or carried in pipes instead of an open ditch.

Exchange of brackish water or treated sewage effluent for high quality irrigation water poses several risks. First, ground water could possibly be contaminated or rendered unpotable if minerals, disolved solids, chemical compounds (e.g. nitrates), or infectious agents are not adequately neutralized or filtered out as the water percolates through soil. Second, cane productivity could suffer. Third, the soil could become caked with salts and become less permeable, requiring more water to leach salts out of the soil. Fourth, treated sewage effluent might clog the drip irrigation tubes used in cane fields by encouraging growth of algae or bacteria or by having a high suspended solids content.

At this time, the most feasible option would be to exchange brackish water for high quality water used to irrigate sugar cane growing above relatively impermeable marine and sedimentary deposits (caprock) on the Ewa Plain. Except in caprock areas, it is not possible to prevent return irrigation water from degrading basal water relative to chlorides and total dissolved salts. Unless percolation is restricted by caprock, it would be counterproductive to use brackish irrigation water above parts of the basal lens which are a source of drinking water.

Initial studies using secondary treated sewage effluent from Mililani Wastewater Treatment Plant for irrigation indicate that problems with cane productivity and soil retention of salts can be resolved. However, it would be necessary to upgrade the County Honouliuli Wastewater Treatment Plant (WTP) to provide secondary treatment before sizable amounts of wastewater would be available for exchange with high quality irrigation water. Because of cost, County plans at this time are only to upgrade Honouliuli WTP to provide primary treatment. An application for waiver of

secondary treatment requirements was submitted to the U.S. EPA in October 1983 under Section 301(h) of the Clean Water Act. [Ref. 50]

4. Using Non-Potable Water for Landscaping. Brackish water could potentially be used instead of potable water to irrigate landscaping and parks located above caprock. For example, the BWS is currently exploring the feasibility of developing an extensive non-potable water system to service urban development on the Ewa Plain. Outside of caprock areas, numerous shallow alluvial wells which are susceptible to contamination could potentially be developed to supply water for irrigation. For example, water from the Halekou Interchange Relief Wells could be used for irrigation of the Pali Golf Course, Hawaii Loa College, and Hawaiian Memorial Park Cemetery.

5. Trapping Storm Runoff. The economics of trapping storm runoff has not been thoroughly investigated. At some time in the future, as a means of preserving coastal water quality and preventing coral kills, the State "208" Water Quality Program may require that large scale development incorporate ponding basins to trap storm runoff. A possible variation would be joint public and private programs to install dams to slow storm runoff out of natural drainage basins such as Waikele Stream. Besides reducing siltation of near shore waters, such measures would result in more efficient recharge to Oahu's basal water supply.

The environmental benefits of on-site and land-based disposal of storm water need to be balanced against the debits. First, storm water ponding basins require large areas. While some forms of agriculture can be located in a ponding basin, most land uses are precluded. Second, ponding basins can create breeding grounds for mosquitoes. Third, ponding basins will continually require maintenance because of silt build-up from flood flows.

6. Tapping Stream Water. Surface water on Oahu could theoretically be treated and then used for human consumption.

However, there would be formidable political and legal obstacles including the policies of the Hawaii CZM Program to preserve perennial streams. Punaluu and Kahana Streams on windward Oahu are the most feasible streams for water development. Their base flows are each in the range of 9 to 10 mgd. However, development and treatment of surface water from these streams would probably be more costly than to install wells and pump the ground water which is the major source of their flow.

7. Taking Agricultural Water. Simply taking State owned water away from the sugar companies would cause severe economic hardship. The BLNR has indicated that this approach will not be authorized if there are feasible alternatives. A more reasonable approach would be to require that if sugar cane fields are replaced with houses, then water used to irrigate these fields be provided to the BWS. For example, replacement of 1,000 acres of drip-irrigated sugar cane on the Ewa Plain with houses could free over 6 mgd of non-potable water for use by the BWS. Because of OSC and Campbell Estate plans to phase out sugar cane on parts of the Ewa Plain, this option has excellent potential to supply slightly brackish water for irrigation of landscaping and fire fighting.

8. Increasing Water Prices. The rate for water assessed by the BWS is set so as to cover costs, including some development of new sources, but not to make a profit. For the first 13,000 gallons of water used in a month, all users are charged the same basic rate. In 1970, this rate was $0.34 per 1,000 gallons. In July 1980, the basic rate was $0.76 per 1,000 gallons, representing an increase of around 8% per year. Above 13,000 gallons per month, agricultural users are given a reduced rate of $0.61 per 1,000 gallons. Prior to July 1980, industrial users were also given a reduced rate. To encourage conservation, they are now charged the basic rate for all water used. Residential users continue to be charged the basic rate for all water used.

Increased water prices could lead to more efficient use of water and discourage waste. For this reason a study by the Hawaii

Institute for Management and Analysis in Government (HIMAG), recommended imposition of peak-load (i.e. higher summer) prices for municipal water users along with a price break for agricultural water users connected to the BWS system. [Ref. 10, pp. 111-114] The logic of the HIMAG recommendation is based on the assumption that the low cost of municipal water discourages the application of available water-saving technology. If this assumption is correct, then peak load pricing could delay the time when the BWS will be forced to turn to more expensive water sources such as brackish spring water. Peak load pricing has not yet been adopted, but as previously noted, the discounted rate formerly given to large industrial users has been eliminated in order to encourage water conservation.

VI. NECESSARY APPROVALS

1. Approval of this EIS by the Governor.

2. Conservation District Use Permit from the BLNR to construct the proposed wells and related infrastructure in the Conservation District.

3. Clearance from the State Historic Preservation Officer that the project will not adversely affect historic sites.

4. County permits (e.g. erosion control and building) to construct proposed facilities.

5. DOH approval of domestic use of water from the Kamooalii Watershed Wells pursuant to Title 11, Chapter 20, DOH Administrative Rules.

6. DOT permit for construction within State highway rights-of-way.

At this time, no fills are proposed in any perennial stream. However, should this be necessary when plans are more firm, then the BWS will request a Department of the Army Permit from the Corps of Engineers and a Coastal Zone Management Program Consistency Determination from the State Department of Planning and Economic Development.

VII. SUMMARY OF UNRESOLVED ISSUES

1. At this time, it is not resolved whether the DLNR will establish minimum flow standards for Kamooalii Stream and its tributaries or what such standards might be.

2. It will be necessary to monitor stream flow in order to determine cumulative impacts from long-term pumping of the BWS Kamooalii Watershed Wells. Such monitoring will take place and the BWS will take necessary measures to implement any minimum flow requirements which may be established.

3. The BWS will need to select a method for connecting the proposed Kuou II, Kamooalii I, and Kamooalii II well fields to the existing BWS water distribution system. Routes for pipelines and road access will need to be resolved along with reservoir sites. Routes for electrical and telephone lines also will need to be resolved.

VIII. ORGANIZATIONS AND PARTIES CONSULTED FOR THE REVISED EIS

[Comments and Responses are Reproduced in Appendix A]

D. **COMMUNITY**

* No response to the EIS Preparation Notice
# No response to the Draft EIS

REFERENCES

1. Bernice P. Bishop Museum Department of Anthropology. Archaeological Investigations in Upland Kaneohe. Report 76-1. Honolulu, June 1976.

2. Elliot, Margaret E. and Hall, Erin M. Wetlands and Wetland Vegetation of Hawaii. U.S. Army Engineer District, Honolulu, September 1977.

3. Environmental Communications, Inc. Final Environmental Impact Statement for the Proposed Iolani School Properties Project and Addendum. Honolulu, May 1983.

4. Honolulu, City and County Board of Water Supply. Municipal Water Use Plan - Pearl Harbor Ground Water Control Area. Honolulu, October 1981.

5. Honolulu, City and County Board of Water Supply. Revised Environmental Impact Statement for Iolekaa Well. Honolulu, May 1983.

6. Honolulu, City and County Board of Water Supply, Geology Section. Unpublished files on Kuou I Wells (DOWALD Nos. 2348-02 and 2348-03). Honolulu, various dates.

7. Honolulu, City and County Board of Water Supply. Oahu Water Plan. Honolulu, July 1982.

REFERENCES (Continued)

8. Honolulu, City and County Department of General Planning. Development Plan Land Use Analysis. Honolulu, April 1980.

9. Honolulu, City and County Department of Public Works. Environmental Impact Statement for Wahiawa STP Effluent Disposal System. Unpublished draft prepared by VTN Pacific, Honolulu, 1979.

10. Hawaii, State Department of Budget and Finance, Hawaii Institute for Management and Analysis in Government. Growth Management Issues in Hawaii. Honolulu, December 1977.

11. Hawaii, State Department of Planning and Economic Development, Research and Economic Analysis Division. The Population of Hawaii, 1980: Final Census Results. Statistical Report 143. Honolulu, March 18, 1981.

12. Hawaii, State University of, Cooperative Fishery Research Unit. Stream Channel Modification in Hawaii. Part A: Statewide Inventory of Streams: Habitat Factors and Associated Biota. FWS/OBS-78/16. U.S. Fish and Wildlife Service Office of Biological Services, Columbia, Missouri, April 1978.

13. Hawaii Agricultural Reporting Service. Agricultural Water Use - A Special Survey of Selected Water Districts - Windward Oahu. Honolulu, May 1982.

14. Hawaii Water Resources Regional Study. Hawaii Water Resources Plan. Honolulu, January 1979.

15. Hawaiian Waterbirds Recovery Team. Hawaiian Waterbirds Recovery Plan. U.S. Fish and Wildlife Service Endangered Species Program, Portland, August 1977.

16. Oahu Sugar Company Limited. Letter from David W. Ballie to Board of Water Supply. February 17, 1982.

17. Shallenberger, Robert J. An Ornithological Survey of Hawaiian Wetlands. U.S. Army Engineer District, Honolulu, December 1977.

18. U.S. Department of Agriculture, Soil Conservation Service. Soil Survey of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. U.S. Government Printing Office, Washington, D.C., August 1972.

19. U.S. Department of the Army, Corps of Engineers, Honolulu District. Coordinated Supplemental Environmental Statement, Phase II - Project Design, Kaneohe-Kailua Area, Oahu, Hawaii, Flood Control and Allied Purposes. Honolulu, March 1975.

20. U.S. Department of the Army, Corps of Engineers, Honolulu District. General Design Memorandum, Phase II - Project Design for Flood Control and Allied Purpose, Kaneohe-Kailua Area, Oahu, Hawaii. Design Memorandum No. 2. Honolulu, January 1975.

21. U.S. Department of the Army, Corps of Engineers, Honolulu District. Geology, Foundation & Embankment Design Flood Control and Allied Purposes, Kaneohe-Kailua Area, Oahu, Hawaii. Design Memorandum No. 4. Honolulu, January 1975.

REFERENCES (Continued)

22. U.S. Department of the Army, Corps of Engineers, Honolulu District. Master Plan, Ho'omaluhia Kaneohe-Kailua Project, Oahu, Hawaii. Design Memorandum No. 3. Honolulu, February 1974.

23. U.S. Department of the Army, Corps of Engineers, Honolulu District. Report on Survey for Flood Control and Allied Purposes, Kaneohe-Kailua Area, Oahu, Hawaii. Honolulu, April 1970.

24. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coastal Zone Management. Final Environmental Impact Statement and Proposed Coastal Zone Management Program for the State of Hawaii. Honolulu, August 1978.

25. U.S. Department of Housing and Urban Development, Federal Insurance Administration. Flood Insurance Rate Map City and County of Honolulu, Hawaii. Panel 90. Honolulu, September 3, 1980.

26. U.S. Department of the Interior, Fish and Wildlife Service. The Water-Dependent Fish and Wildlife Resources of the Kaneohe Bay Area. Honolulu, September 1977.

27. U.S. Department of the Interior, Geological Survey. Surface Water Supply of Hawaii July 1, 1913 to June 30, 1915. Water-Supply Paper 430. U.S. Government Printing Office, Washington D.C., 1917.

28. U.S. Department of the Interior, Geological Survey. Compilation of Surface Waters of Hawaii through June 1950. Geological Survey Water-Supply Paper 1319. U.S. Government Printing Office, Washington D.C., 1961.

REFERENCES (Continued)

29. U.S. Department of the Interior, Geological Survey, Water Resources Division. Surface Water Records of Hawaii and other Pacific Areas: 1959-65. Honolulu, various dates.

30. U.S. Department of the Interior, Geological Survey. Surface Water Supply of the United States, 1966-1970: Part 16, Hawaii and Other Pacific Areas. Geological Survey Water-Supply Paper 2137. U.S. Government Printing Office, Washington D.C., 1977.

31. U.S. Department of the Interior, Geological Survey. Tunnels and Dikes of the Koolau Range, Oahu, Hawaii, and Their Effect on Storage Depletion and Movement of Ground Water. Geological Survey Water-Supply Paper 1999-M. U.S. Government Printing Office, Washington D.C., 1971.

32. U.S. Department of the Interior, Geological Survey. Water Resources Data for Hawaii and Other Pacific Areas, Water Years 1971-81. U.S. Geological Survey Water-Data Reports. National Technical Information Service, Springfield, Virginia, various dates.

33. U.S. Department of the Interior, Geological Survey. Water Resources of Windward Oahu, Hawaii. Geological Survey Water-Supply Paper 1894. U.S. Government Printing Office, Washington D.C., 1969.

34. U.S. Department of Transportation, Federal Highways Administration and Hawaii, State Department of Transportation, Highways Division. Final Environmental Statement and Administrative Action for Interstate Route H-3 Halawa Interchange to Halekou Interchange. Honolulu, August 1972.

REFERENCES (Continued)

35. U.S. Department of Transportation, Federal Highways Administration and Hawaii, State Department of Transportation, Highways Division. Final Supplement to the Interstate Route H-3 Environmental Impact Statement. Report No. FHWA-HI-EIS-77-01-F(S). Honolulu, 1980.

36. Personal communication with Ralph Saito, Wildlife Biologist, State Department of Land and Natural Resources, Division of Forestry and Wildlife. June 23, 1983.

37. Personal communication with John Ford, Biologist, U.S. Department of the Interior, Fish and Wildlife Service. June 23, 1983.

38. Personal communication with Stan Shima, Aquatic Biologist, State Department of Land and Natural Resources, Division of Aquatic Resources. June 23, 1983.

39. Personal communication with Robert Shallenberger, Administrator, U.S. Department of the Interior, Fish and Wildlife Service, Division of Refuges and Wildlife Resources. June 23, 1983.

40. Personal communication with Tet Choi Fung, banana farmer in the Luluku area. June 21, 1983.

41. Personal communication with Martha McDaniel, Administrator, City and County Department of Parks and Recreation, Ho'omaluhia Park. June 24, 1983.

42. Personal communication with Harold Sexton, Hydrologist, U.S. Department of the Interior, Geological Survey. June 23, 1983.

43. Personal communication with Floyd Takushi, Superintendent, City and County Department of Parks and Recreation, Pali Golf Course. July 7, 1983.

44. Personal communication with Wilfred Ho, Staff, City and County Department of Parks and Recreation, Ho'omaluhia Park. July 7, 1983.

45. Personal communication with Lloyd Garrett, Statistician in Charge, Hawaii Agricultural Reporting Service. June 22, 1983.

46. Pesonal communication with James Pennaz, U.S. Army Corps of Engineers, Planning Branch, Hydraulic Section. August 9, 1983.

47. Personal communication with Jensen Lee, Oceanic Institute. August 11, 1983.

48. Personal communication with Kelly Archer. August 12, 1983.

49. Personal communication with Fred Shiroma, banana farmer in the Luluku area. December 8, 1983.

50. Personal communication with George Richardson, City and County Department of Public Works, Wastewater Management Division. March 13, 1984.

APPENDIX A

COMMENTS AND RESPONSES

RECEIVED
BD OF WATER SUPPLY
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DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

January 3, 1983

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RECEIVED
JAN 18 1983
VTN PACIFIC

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:

Thank you for the opportunity to review the Environmental Impact Statement Preparation Notice for Kamooalii Watershed Well, Kaneohe, Oahu. We offer the following comments:

A-1

a. The Department of the Army permit requirements may be applicable if the proposed includes fills in any streams.

b. The subject property is not situated within any known flood hazard areas and is designated Zone D or an area of undetermined, but possible flood hazard according to the Flood Insurance Rate Map prepared by the Federal Insurance Administration for the island of Oahu (see Enclosure 1).

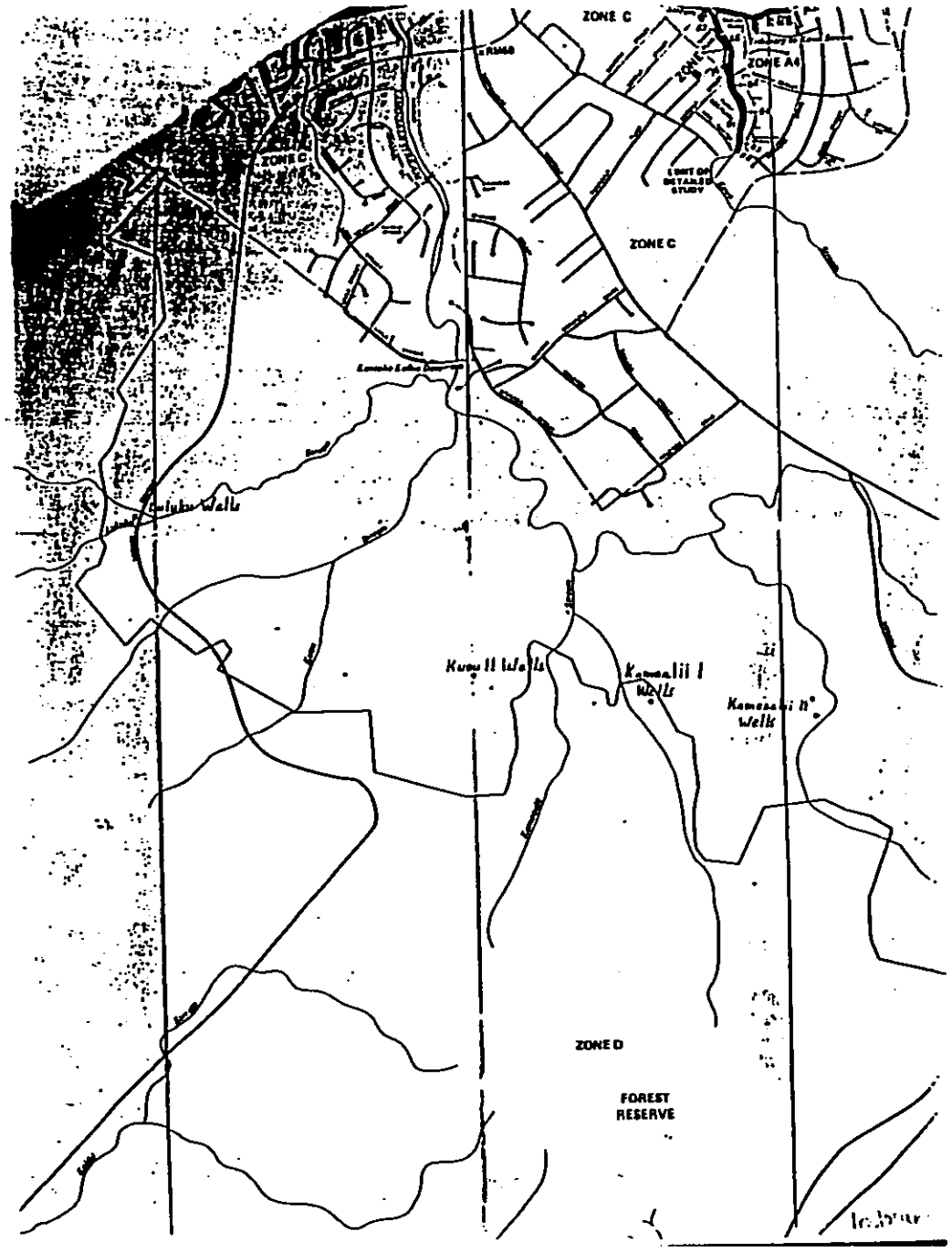
c. Alternatives that should also be addressed in the EIS are no action and an active water conservation policy.

d. With Kamooalii Stream and its tributaries directly affecting the water levels of the reservoir at Hoomaluhia Park, the EIS should consider the impact of pumping during dry periods on both the aquaculture facilities and the reservoir. Will the same mitigation measures as proposed such as cut back groundwater removal or pump water into the streams flowing through the park still be applicable?

Sincerely,

for Kisuk Cheung
Chief, Engineering Division

Enclosure



BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 11, 1983

RECEIVED
JAN 18 1983
VTN PACIFIC

Mr. Kisuk Cheung
Chief, Engineering Division
Pacific Ocean Division, Corps of Engineers
Department of Army
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Your Letter of January 3, 1983
on the Environmental Impact
Statement (EIS) Preparation
Notice for Kamooalii Watershed Wells

Thank you for your comments on the EIS Preparation Notice for our proposed water development project. Your letter will be appended to the Draft EIS.

We offer the following in response to your comments:

1. A Department of the Army permit will be submitted if the proposed project includes fills in any streams.

2. The Draft EIS will indicate that the proposed wells will be in Zone D, an area of undetermined, but possible flood hazards.

3. A "no action" alternative and water conservation policy will be discussed in the Draft EIS.

4. Consideration will be given to either reduce groundwater withdrawal or pump water into the streams as possible measures to minimize the impacts on Hoomaluhia Park's reservoir and aquaculture facilities during dry periods.

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

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

A-2

United States Department of the Interior

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

IN REPLY REFER TO:

ES
Room 6307

RECEIVED
BD OF WATER SUPPLY
JAN 13 10 24 AM '83
30143

RECEIVED 01/11/83
FEB 3 1983
VTN PACIFIC

Mgr. Hayashida
Asst. Mgr.
P.E.

Mr. Kazu Hayashida
Board of Water Supply
City and County of Honolulu
630 South Beretania
Honolulu, Hawaii

Dear Mr. Hayashida:

We have reviewed the Environmental Impact Statement (EIS) Preparation Notice for Kamooalii Watershed Wells, Kaneohe which we received on December 13, 1982. The following comments are offered for your consideration in the preparation of the EIS for the proposed action.

The Service is concerned with the project's potential to seriously reduce low flows in Kamooalii Stream and its tributaries during our "dry season", and to significantly alter the existing hydrograph. Reduction of base stream flows is expected to result in an exponential reduction of usable benthic habitat and subsequent damage to both native and introduced fishery resources. The potential for the Ho'omaluhia reservoir to support a sport fishery may also be impaired.

The Service suggests that the results of recent (post-Ho'omaluhia) surveys of stream life be included in the EIS. The document would be greatly enhanced if potential impacts on introduced fishery species, as well as indigenous fauna, were discussed in detail. Consideration must also be given to the long-term consequences of stream dewatering with regard to life history requirements of native species, recreational opportunities, and reduction of nutrient input and freshwater inflow to Kaneohe Bay.

In light of Hawaii's Minimum Streamflow Act and ongoing Federal-State efforts to determine appropriate instream flows for fish and wildlife resources on windward Oahu, we recommend that full-scale pumping be held in abeyance until adequate fishery flows can be accurately prescribed for the Kamooalii watershed. We cannot promise a "quick fix" to establishment of fishery flows; scientific research on the habitat requirements of important species must first be completed. In the interim, however, surface waters must be protected to support intrinsic values and uses.

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

The Service will support every effort and consideration to avoid adverse impacts to surface water quality and quantity. Please don't hesitate to contact me if we can be of assistance. I look forward to reviewing the EIS.

Sincerely,

Ernest Kosaka

Ernest Kosaka
Project Leader for
Environmental Services

cc: DLNR
USEWS,HO(1)

A-3

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 27, 1983

RECEIVED
FEB 3 1983
VTN PACIFIC

Mr. Ernest Kosaka
Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kosaka:

Subject: Your Letter of January 11, 1983, on the Environmental Impact Statement (EIS) Preparation Notice for the Kamooalii Watershed Wells, Kaneohe

Thank you for reviewing the EIS Preparation Notice for our proposed water development project. Your letter will be appended to the Draft EIS.

We acknowledge your concern on protecting surface water flows in the Kamooalii Watershed. A streamflow monitoring program will be coordinated with the Department of Parks and Recreation to assure adequate surface flows to meet the aquaculture and other aquatic needs of Hoomaluhia Park.

We shall inform our consultant to review and discuss your concerns with you and to make any appropriate revisions to the EIS.

Although most of the waterways upstream of the reservoir are usually dry except during periods of heavy rainfall, we will control pumpage from the proposed wells to meet "Minimum Streamflow Standards", when they are adopted.

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

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

RECEIVED
BD OF WATER SUPPLY
JAN 10 3 27 PM '83

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SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AGRICULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

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

Hqr. EA.
AM - AKC
P/E

January 7, 1983

RECEIVED
JAN 21 1983
VTN PACIFIC

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

We appreciate this opportunity to review the Environmental Impact Statement Preparation Notice for the Kamooalii Watershed Wells in Kaneohe. We understand the proposal is to construct well fields at four sites located in the Conservation district within the watershed of Kamooalii Stream: Luluku, Kuou II, Kamooalii I, and Kamooalii II.

A-4

The Department of Land and Natural Resources supports these well projects but we emphasize our concerns to protect instream flows of streams that might be affected by ground water withdrawals. DLNR is presently formulating administrative rules for the management of stream flows, authorized by the 1982 Legislature by Act 185 relating to the protection of instream uses of water in Windward Oahu. While the administrative rules are being formulated, we encourage interim instream flow management proposals, such as stated in the subject EIS Preparation Notice that "...streamflow will be monitored in Kamooalii Stream and its tributaries before, during, and after test pumping of the exploratory wells." This matter should be further described in detail on a site specific basis in the preparation of the final EIS.

Please be advised that a CDUA needs to be processed prior to the drilling of each well proposed in the EIS.

If you have any questions, please contact Mr. Robert T. Chuck at 548-7533.

Very truly yours,

SUSUMU ONO
Chairman of the Board

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 14, 1983

RECEIVED
JAN 21 1983
VTN PACIFIC

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

Dear Mr. Ono:

Subject: Your Letter of January 7, 1983, on the Environmental Impact Statement (EIS) Preparation Notice for Kamooalii Watershed Wells, Kaneohe

Thank you for reviewing the environmental document for our proposed water development project. Your letter will be appended to the Draft EIS.

We will describe the monitoring of streamflow on a site specific basis in the Draft EIS.

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

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

RECEIVED
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'83 JAN 31 3 10 PM

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

December 28, 1982

CHARLES G. CLARK
DIRECTOR OF HEALTH

JOHN F. CHALMERS, M.D.
DEPUTY DIRECTOR OF HEALTH

HENRY N. THOMPSON, M.A.
DEPUTY DIRECTOR OF HEALTH

MELVIN R. KOIZUMI
DEPUTY DIRECTOR OF HEALTH

ABELINA MADRID SHAW, M.A., J.D.
DEPUTY DIRECTOR OF HEALTH

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

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City & County of Honolulu
630 S. Beretania St.
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

Subject: Request for Comments on Proposed Environmental Impact Statement (EIS) for Kamooalii Watershed Wells, Kaneohe

Thank you for allowing us to review and comment on the subject proposed EIS. Please be informed that we do not have any comments or objections to this project at this time.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

A-5

Sincerely,

CHARLES G. CLARK
Director of Health

RECEIVED
BD OF WATER SUPPLY
JAN 31 3 34 PM '83

d30280

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

January 19, 1983

Hqs. D/S
hm JHS
P/E

CHARLES G. CLARK
DIRECTOR OF HEALTH

JOHN F. CHALMERS, M.D.
DEPUTY DIRECTOR OF HEALTH

HENRY N. THOMPSON, M.A.
DEPUTY DIRECTOR OF HEALTH

MELVIN R. KOIZUMI
DEPUTY DIRECTOR OF HEALTH

ABELINA MADRID SHAW, M.A., J.D.
DEPUTY DIRECTOR OF HEALTH

In reply, please refer to:
File: EPHS0/SAN

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

RECEIVED
FEB 10 1983
VTN PACIFIC

Dear Mr. Hayashida:

We have reviewed the Environmental Impact Statement Preparation Notice for the Kamooalii Watershed Wells, Kaneohe, Oahu, Board of Water Supply, City and County of Honolulu, that appeared in the December 23, 1982 issue of the Environmental Quality Commission Bulletin. We understand that as many as two exploratory wells are planned at each of four separate sites within the watershed of Kamooalii Stream. We also understand that the Board of Water Supply is planning to construct facilities for the eight production wells to include pumps, electrical equipment, piping, transmission mains, and other related items.

Section 11-20-29 of Chapter 20, Title 11, Administrative Rules, State of Hawaii, requires that a new source of raw water for a public water system shall be approved by the Director of Health prior to its use to serve potable water. Such approval is based upon the submission of an engineering report which satisfactorily addresses all concerns set forward in Section 11-20-29 of Chapter 20. This report must be prepared by a registered professional engineer and bear his or her seal upon submittal. I hope this information will be of use to you. Should you have any questions, contact the Drinking Water Program at 548-2235.

Sincerely,

CHARLES G. CLARK
Director of Health

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

February 4, 1983

RECEIVED
FEB 10 1983
VTN PACIFIC

Mr. Charles G. Clark, Director
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Clark:

Subject: Your Letter of January 19, 1983 on the Environmental Impact Statement (EIS) Preparation Notice for the Kamooalii Watershed Wells

Thank you for reviewing the EIS preparation notice of the proposed water development project. Your letter will be appended to the draft environmental document.

We shall prepare an engineering report and submit it for your approval in accordance with Section 11-20-29 of Chapter 20, Title II, Administrative Rules, State of Hawaii.

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

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

A-6

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

830253

GEORGE R. ARIYOSHI
HIDETO KONO
FRANK SUEMATSU

Ref. No. 6994

January 19, 1983

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

RECEIVED
FEB 8 1983
VTN PACIFIC

Dear Mr. Hayashida:

Subject: EIS Preparation Notice for Kamooalii Watershed Wells, Kaneohe, Oahu, Hawaii

We have reviewed the subject Preparation Notice and have the following comments to offer concerning the objectives and policies of the Hawaii Coastal Zone Management (CZM) Program.

Coastal Ecosystem Policy:

Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards.

The Preparation Notice indicates that the base flow of Kamooalii Stream and its tributaries may decrease due to the development of the watershed resources and that this, in turn, may adversely affect stream fauna habitats makai of the well sites. Towards assessing these potential impacts, we suggest that the EIS discuss the stream flow standards, if any, currently being developed by the Department of Land and Natural Resources for protecting instream uses in Windward Oahu.

In addition, the EIS should evaluate the possible impacts of the Iolani School Properties Project's proposals to construct a 0.5 M.G. reservoir, deep wells, pumps, pump station and transmission mains near your proposed well fields.

We have no further comments, but would appreciate the opportunity to review the completed EIS for the project.

Sincerely,

Frank Sueyoshi
for Hideto Kono

cc: Office of Environmental Quality Control

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

February 3, 1983

RECEIVED
FEB 8 1983
VTN PACIFC

Mr. Hideto Kono, Director
Department of Planning
and Economic Development
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Kono:

Subject: Your Letter of January 19, 1983,
On The Environmental Impact Statement
(EIS) Preparation Notice for
Kamooalii Watershed Wells, Kaneohe

Thank you for reviewing the EIS preparation notice for the proposed water development project. Your letter will be appended to the Draft EIS.

We offer the following in response to your comments:

1. The Draft EIS will discuss stream fauna habitats seaward of the well sites and the status of the minimum streamflow standards being developed by the Department of Land and Natural Resources.

2. The possible impacts from the proposed Iolani School Properties Project will also be included in the Draft EIS.

3. A copy of the Draft EIS will be sent to you for your review when it becomes available.

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

Very truly yours,

Kazu Hayashida
KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

A-7

GEORGE R ARIYOSHI
GOVERNOR

RECEIVED
JAN 19 3 10

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU HAWAII 96813

330126
RYOKICHI HIGASHIONNA, Ph.D
DIRECTOR

DEPUTY DIRECTORS
WAYNE J. YAMASAKI
JAMES R. CARRAS
JAMES B. McCORMICK
JONATHAN K. SHIMADA, Ph.D

IN REPLY REFER TO

HWY-PS
2.73376

January 17, 1983

RECEIVED
FEB 8 1983
VTN PACIFC

Asst. Mgr. W/C
P/E

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

Environmental Impact Statement (EIS)
Preparation Notice for Kamooalii
Watershed Wells, Kaneohe

Thank you for the opportunity to review and comment on the environmental impact assessment for your proposed water development project.

The proposed Luluku Wells appear to be outside the proposed construction of the Kaneohe Interchange and about 1000 feet southwest of the H-3 bridges over Likelike Highway. Therefore, no conflict is anticipated. It is also not likely that the pile foundations for the proposed bridges would impact this well site.

There will be no conflict between H-3 and Kuou II well site since the H-3 freeway will not encroach within Hoomaluhia Park.

The Kamooalii I well site is located 900 feet outside the Hoomaluhia Park boundary, according to the Preparation Notice. The plot of the H-3 alignment (see Figure 1 enclosed) shows that the H-3 alignment passes directly over the well site. The text further claims that access to the site would be from Hoomaluhia and that an underpass beneath the H-3 freeway would be required. The Windward Highway alignment will be under design soon and therefore, we advise that the conflict in location of the well site and the well site access requirements should be coordinated with our Highways Division and the FHWA, as soon as possible.

Morning, Must with DOT staff to confirm and discuss any ~~conflict~~ conflicts. But go ahead and answer GN letter.

There should be no conflict between the two proposed sites for Kamooalii II well field and H-3, because the well sites are remotely located away from H-3.

The proposed H-3 is being designed in cooperation with the U.S. Army Corps of Engineers' plan for the flood control dam and reservoir. Accordingly all streams traversed by H-3 will provide a capacity for surface runoff for a 200-year storm. Therefore, H-3 will not have any unexpected significant effects on the local hydrology.

The details of the H-3 highway construction, though still preliminary, are sufficient to determine the changes the highway will have on the local topography. These changes and other proposed highway features should be considered by BWS planners when determining the proposed well sites. We would be pleased to meet with your staff if there are any questions.

Very truly yours,

Ryokichi Higashionna

Ryokichi Higashionna
Director of Transportation

Enclosure

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

February 2, 1983

RECEIVED
FEB 8 1983
VTN PACIFIC

Dr. Ryokichi Higashionna, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Dr. Higashionna:

Subject: Your Letter of January 17, 1983 on the Environmental Impact Statement (EIS) Preparation Notice for Kamooalii Watershed Wells, Kaneohe

Thank you for reviewing the EIS Preparation Notice for the proposed water development project. Your letter will be appended to the Draft EIS.

We will be coordinating the water development project plans with your department to avoid any conflicts in the siting of our wells and to consider any topographic changes associated with the H-3 construction.

If you have any questions, please contact Herbert Minakami at 548-6183.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

RECEIVED
BD OF WATER SUPPLY
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GEORGE R. ARIYOSHI
GOVERNOR

859639

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRMAN

RECEIVED
JAN 14 1983
VTN PACIFIC

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822

January 4, 1983

Mgr. Dep
Chf. Eng. AM - PM
P/E

MEMORANDUM

TO: Mr. Kazu Hayashida, Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu

SUBJECT: Environmental Impact Statement (EIS)
Preparation Notice for
Kamooalii Watershed Wells, Kaneohe
THK: 4-5-41: por. 9 (Kuou II)
4-5-31: por. 1 (Kamooalii II)
4-5-41: por. 4 (Luluku)
4-5-42: por. 1 (Kamooalii I and II)

The Department of Agriculture has reviewed the subject preparation notice and offers the following comments.

A-9

Of the five well sites, one site (Luluku) is within an existing banana patch. Approximately one acre will be removed from banana cultivation to accommodate the well facilities and access road. The remaining sites are located on vacant lands.

The Department of Agriculture recommends that the potential impact, if any, of the removal of one acre of bananas on the economic feasibility of the existing banana operation receive discussion in the EIS.

Thank you for the opportunity to comment.

Jack K. Suwa
JACK K. SUWA
Chairman, Board of Agriculture

"Support Hawaiian Agricultural Products"

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 12, 1983

RECEIVED
JAN 14 1983
VTN PACIFIC

Mr. Jack K. Suwa, Chairman
Board of Agriculture
State of Hawaii
P. O. Box 22159
Honolulu, Hawaii 96822

Dear Mr. Suwa:

Subject: Your Memorandum of January 4, 1983,
On The Environmental Impact Statement
(EIS) Preparation Notice for
Kamooalii Watershed Wells

Thank you for reviewing the EIS Preparation Notice for our proposed water development project. Your memorandum will be appended to the Draft EIS.

We will include in the Draft EIS a discussion on the potential impacts that the removal of one acre from banana cultivation will have on the existing banana operation.

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

Very truly yours,

Kazu Hayashida
KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

JAN 4 3 23 PM '83

JOO023

GEORGE R. ARIYOSHI
GOVERNOR

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

Jacqueline Parnell
DIRECTOR
TELEPHONE NO
548 6915

Mgr. DLNR.
AM
P/E

January 3, 1983

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

Subject: Environmental Impact Statement Preparation Notice for Kamooalii Watershed Wells, Kaneohe, Oahu

We appreciate your reasons for preparing a full environmental impact statement for the exploration and development of this water resource and are pleased that you are approaching the subject on a watershed basis. However, as we have noted in the past, it is extremely difficult to accurately assess environmental impacts until exploratory wells have been dug. For this reason, we hope that you will make it very clear in your EIS that a supplement will be prepared after the well sites have been confirmed. We are particularly interested in the downstream impacts of water withdrawal on present instream uses, including withdrawal of water for agricultural purposes.

If you have any questions regarding this letter, please contact Roy Sakamoto of my staff at 548-6915.

Sincerely,

Jacqueline Parnell

Jacqueline Parnell
Director

cc: Bob Chuck, DLNR-DOWALD

A-10

175

February 4, 1983

Ms. Jacqueline Parnell, Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Parnell:

Subject: Your Letter of January 3, 1983, Commenting on Our Environmental Impact Statement (EIS) Preparation Notice for Kamooalii Watershed Wells

Thank you for commenting on our EIS Preparation Notice.

The EIS will address all concerns on instream use and agricultural needs. The EIS will also note our program on streamflow monitoring with the U. S. Geological Survey (USGS). This program consists of monitoring streamflows of pertinent streams before, during, and after pumping tests are performed on an exploratory well. When the well is placed into production, we would, if necessary, have USGS continue the monitoring of the streams.

After pumping tests of the exploratory well are completed and streamflow monitoring data become available, an assessment will be made as to whether we could commence work with our production well. However, if we find that the production well may have a significant effect on streamflows, adjustment to pumpage will be made to minimize the impact on streamflows as noted in the EIS.

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

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

LHYW:dsf
cc: K. Hayashida, L. Whang
83-0023

RECEIVED
BOARD OF WATER SUPPLY
JAN 13 1983

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

830008

EILEEN R. ANDERSON
MAYOR

RECEIVED
JAN 17 1983
VTN PACIFIC

WILLARD T. CHOW
CHIEF PLANNING OFFICER

RALPH PORTMORE
DEPUTY CHIEF PLANNING OFFICER

Mgr. H
AM
PIC
Coord. w/Pain
+ GP.

DGP12/82-4322

MEMORANDUM

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

VIA: Mr. Andrew I. T. Chang, Managing Director AC 1/17/83

SUBJECT: Environmental Impact Statement Preparation Notice
for Kamooalii Watershed Wells, Kaneohe

In addition to the concerns identified in the preparation notice, discussion of additional information may be necessary in the EIS for the following:

1. Because the Kuou II site is located inside the south boundary of the City's Hoomaluhia Park and access roads to Kuou II and Kamooalii I sites will be constructed off internal park roads, additional discussion may be needed on the extent of programmed park use and activities likely to be curtailed.

2. Plot plans should be shown for the individual sites with number of structures involved, their heights, locations, etc. in order to visualize the effects to be encountered in a setting consisting of large tracts of undeveloped open spaces.

3. Assurances should be given that site development and improvements (buildings and access roads) will not interfere with or disturb existing surface drainage patterns in Hoomaluhia Park or along old Pali Road.

4. In addition to well site description, there may also be a need to generally describe the alignment of future distribution or transmission lines associated with the well sites and the impacts along the corridor.

for RALPH KAHAHOTO
Planner

APPROVED:

W.T. Chow
WILLARD T. CHOW

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

RECEIVED
JAN 17 1983
VTN PACIFIC

January 11, 1983

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

FROM: KAZU HAYASHIDA
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF JANUARY 3, 1983, ON THE ENVIRONMENTAL STATEMENT PREPARATION NOTICE FOR KAHOOALII WATERSHED WELLS

A-12

Thank you for reviewing the environmental document for our proposed water development project. Your letter will be appended to the Draft Environmental Impact Statement (DEIS).

We offer the following in response to your concerns:

1. "Because the Kuou II site is located inside the south boundary of the City's Hoomaluhia Park and access roads to Kuou II and Kamoaalii I sites will be constructed off internal park roads, additional discussion may be needed on the extent of programmed park use and activities likely to be curtailed."

   Preparation of our proposed plans is being coordinated with the Department of Parks and Recreation to assure that the wells will not affect park plans or activities. A discussion on the impacts the wells may have on the park and its associated activities will be included in the DEIS.

2. "Plot plans should be shown for the individual sites with number of structures involved, their heights, locations, etc. in order to visualize the effects to be encountered in a setting consisting of large tracts of undeveloped open spaces."

   A typical plot plan will be included in the DEIS. The only structural improvements will be a hollow block building about 12 feet high, mutes over the pump motors (if needed), and a 6-foot high chain link fence. The area will be landscaped to blend the facility with the surrounding area.

3. "Assurances should be given that site development and improvements (buildings and access roads) will not interfere with or disturb existing surface drainage patterns in Hoomaluhia Park or along old Pali Road."

   When the construction plans are developed, we will inform the design consultant that site development improvements should not interfere with or disturb existing surface drainage patterns in the vicinity of each well site. We will also coordinate the preparation of the construction plans with the Department of Parks and Recreation.

4. "In addition to well site description, there may also be a need to generally describe the alignment of future distribution or transmission lines associated with the well sites and the impacts along the corridor."

   A preliminary transmission main alignment will be included in the DEIS with a discussion of the impacts along the waterline corridor.

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

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

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

RECEIVED
BD OF WATER SUPPLY
'83 JAN 10 AM 8:09
830645

EILEEN R. ANDERSON
MAYOR

RECEIVED
JAN 14 1983
VTN PACIFIC

MICHAEL M. McELROY
DIRECTOR

ROBERT B. JONES
DEPUTY DIRECTOR

LU12/82-6456(LH)

January 6, 1983

MEMORANDUM

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

FROM : MICHAEL M. McELROY, DIRECTOR

SUBJECT : ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE FOR KAMOOALII WATERSHED WELLS, KANEOHE

This is in response to your request for comments on the above EIS Preparation Notice.

1. The parcels are not in the Special Management Area or 100-year flood areas.

2. The zoning for all parcels is P-1 Preservation District. Under the Comprehensive Zoning Code, wells are permitted as a principal use in the Preservation District. However, storage or maintenance facilities are only allowed as a conditional use.

3. The State Land Use designation for all the sites is conservation. These lands are under the jurisdiction of the Department of Land and Natural Resources, and are governed by the requirements and procedures of Chapter 205, HRS, as amended.

4. We understand that the stream flow in Kamooalii Stream and its tributaries will be monitored to determine if the base stream flows are undermined by the BWS project. If the flow is reduced significantly, BWS has proposed mitigation measures for Hoomaluhia Park. Mitigation measures to protect endemic stream fauna mauka of the flood control dam have not been discussed. Since the proposed project could have a significant effect on stream fauna, this concern should be addressed.

We would appreciate receiving a copy of the Draft EIS when it is completed. Thank you for this opportunity to comment on the EIS Preparation Notice. Should you have any questions, please contact Lorene Maki of our staff at 523-4077.

MICHAEL M. McELROY
Director of Land Utilization

MMM:sl

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

RECEIVED
JAN 14 1983
VTN PACIFIC

January 12, 1983

TO: MICHAEL M. McELROY, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: KAZU HAYASHIDA
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF JANUARY 6, 1983, ON THE ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE FOR KAMOOALII WATERSHED WELLS

Thank you for reviewing the EIS Preparation Notice for our proposed water development project. Your memorandum will be appended to the Draft EIS.

The Draft EIS will include the information you provided on the Special Management Area, 100-year flood areas, County zoning, and State Land Use designation.

A discussion on endemic stream fauna mauka of the flood control dam will also be included in the Draft EIS.

A copy of the Draft EIS will be sent to you when it is completed.

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

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

pc: VTN Pacific

A-14

RECEIVED
BOARD OF WATER SUPPLY
DEC 20 11 05

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

dk82598

EILEEN R. ANDERSON
MAYOR

MICHAEL J. CHUN, Ph.D.
DIRECTOR AND CHIEF ENGINEER

WILLIAM A. BONNET
DEPUTY DIRECTOR

ENV 82-441

AM
P/E

December 17, 1982

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

Re: EIS Preparation Notice for Kamooalii Watershed Wells, Kaneohe, Hawaii

We have reviewed the subject Preparation Notice and have the following comments.

We do not have any municipal facility in the immediate project site. Construction plans should be submitted to the Division of Engineering for review. We have no objection to the proposed project.

He ke aloha pumehana,

Willi C Bonnet

for MICHAEL J. CHUN
Director and Chief Engineer

9

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

December 23, 1982

RECEIVED
DEC 30 1982
VTN PACIFIC

TO: MICHAEL J. CHUN, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM: KAZU HAYASHIDA
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF DECEMBER 17, 1982, ON THE EIS PREPARATION NOTICE FOR KAMOOALII WATERSHED WELLS

Thank you for your comments on the EIS Preparation Notice for our proposed water development project. Your letter will be appended to the draft EIS.

Construction plans will be submitted to the Division of Engineering for their review.

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

Kazu Hayashida
KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

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

RECEIVED
10 53 AM '83

EILEEN R. ANDERSON
MAYOR

ROY A. PARKER
DIRECTOR

GAIL MEE
DEPUTY DIRECTOR

IE12/82-5837

January 7, 1983

MEMORANDUM

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

FROM: ROY A. PARKER, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE FOR KAMOOALII WATERSHED WELLS, KAILUA

We have reviewed the EIS Preparation Notice and have no comments to offer.

ROY A. PARKER

A-151

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

EILEEN R. ANDERSON
MAYOR

EMIKO I. KUDO
DIRECTOR

SAM L. CARL
DEPUTY DIRECTOR

OSCAR M. ADAMINA
EXECUTIVE ASSISTANT

RECEIVED
BD OF WATER SUPPLY
JAN 18 1983

January 12, 1983

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

FROM: EMIKO I. KUDO

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE FOR KAMOOALII WATERSHED WELLS

A-16

We had inadvertently failed to comment on the EIS Preparation Notice for the Kamooalii Watershed Wells.

Inasmuch as the proposed project may have detrimental impacts on Hoomaluhia Park, we would appreciate the opportunity to review the draft and final Environmental Impact Statements.

Emiko I. Kudo
(Mrs.) EMIKO I. KUDO, Director

EIK:vc

RECEIVED
MAR 3 - 1983
VTN PACIFIC

January 13, 1983

TO: EMIKO I. KUDO, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM: KAZU HAYASHIDA
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF JANUARY 12, 1983, ON THE ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE FOR KAMOOALII WATERSHED WELLS

Thank you for reviewing the EIS Preparation Notice for our proposed water development project. Your letter will be appended to the Draft EIS.

A copy of the Draft EIS will be sent to you for review by the Environmental Quality Commission as part of the public review process when it is completed. We will send a copy of the Final EIS to you for your files.

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

KAZU HAYASHIDA
Manager and Chief Engineer

KAHALUU NEIGHBORHOOD BOARD NO. 29
c/o KAHALUU COMMUNITY CENTER
47 233 WAIHEE ROAD
KANEOHE, HAWAII 96744
THESE AREA KAHALU'U, WAIHE'E, WAIAHOLE, WAIKANE, HASIPUU AND KUALOA

"Let us not ever have an unhappy minority"

January 22, 1983

Mr. Lawrence Whang
Board of Water Supply
City & County of Honolulu
630 South Berotania Street
Honolulu, Hawai'i 96834

Draft Environmental Impact Statement Preparation Notice
Kamo'oali'i Watershed Wells
Kane'ohe, Ko'olaupoko, O'ahu, Hawai'i

Dear Mr. Whang:

This letter expresses the concerns of the Kahalu'u Neighborhood Board regarding the proposed development of Kamo'oali'i Test and Production Wells and the individual or cumulative effect these wells may have on the stream flows of Kamo'oali'i Stream and its Luluku, Ku'ou, Piho and Ho'oleinaiwa tributaries. Additionally, we are concerned about any adverse environmental or ecological impacts such well development may have on Ho'omaluhia Park.

However, we must commend you for considering the Luluku, Ku'ou and Kamo'oali'i Well proposals on a comprehensive watershed basis.

A-17 Because stream flow monitoring systems have not yet been put in place and because minimum stream flow standards have not yet been established we must again put forward our positions on Windward water resource development and diversion.

Although the Department of Land and Natural Resources has been conducting studies on Instream Uses and on Stream Flow Standards, no findings have yet been published and, of course, no standards have yet been implemented.

Furthermore, the recent December 20, 1982 Hawai'i Supreme Court decision regarding Board of Water Supply groundwater diversions and landowners' riparian and appurtenant rights to the flowing and running waters of Waihe'e Stream may have ramifications which will apply to streams islandwide. The summary of this court decision is attached.

Therefore, it is appropriate that we now repeat several of the pertinent Water Policy Statements from our Water Resources Position Statement of March 11, 1981.

"2. the Department of Land and Natural Resources immediately establish interim stream flow standards for all windward streams."

"3. development of additional windward water resources be limited by interim or permanent stream flow standards and be reserved first for windward agricultural use and next for windward suburban use."

"4. a moritorium be established on any additional diversion of windward water outside Ko'olaupoko & Ko'olauloa until establishment of permanent stream flow standards that will assure fulfillment of the policy of the State of Hawai'i to achieve ever increasing agricultural self-sufficiency."

"5. no water be taken from present agricultural users and that the appurtenant and riparian rights of water users be protected and defended to the fullest extent."

We trust that you will give our concerns your serious attention.

Sincerely,

EDWIN B. STEVENS, CHAIRMAN
KAHALU'U NEIGHBORHOOD BOARD NO. 29

Letter & Comments Authorized by Motion 9-0-0
N.B.#29 Regular Meeting 1-12-83

Attachment: Summary of Hawai'i Supreme Court Decision dtd. 12-20-82 re: Groundwater Diversion and Riparian & Appurtenant Rights to Flowing & Running Water.

Reference: N.B.#29 Water Resources Position Statement dtd. 3-11-81.

Copies:
Councilman David Kahanu
Senator Charles Toguchi
Representative Robert Nakata
Department of Land & Natural Resources
Hui Malama Aina O Ko'olau
Kane'ohe N.B.#30
Kahalu'u N.B.#29 - Chairman
- Water & Agriculture Committee
Kahalu'u Community Resource Center
Neighborhood Commission

IN THE SUPREME COURT OF THE STATE OF HAWAII

OCTOBER TERM 1982

---oOo---

CHARLES F. REPPUN, PAUL REPPUN, ROBERT S. NAKATA, and SEIYU NAKATA, Plaintiffs-Appellees, Cross-Appellants, and CLIFFORD WONG and RACHEL HALL, Plaintiffs-Intervenors-Appellees, Cross-Appellants, v. BOARD OF WATER SUPPLY, City and County of Honolulu, Defendant-Appellant, Cross-Appellee

NO. 7738

APPEAL FROM FIRST CIRCUIT COURT

HONORABLE ARTHUR S. K. FONG, JUDGE

CIVIL NO. 50121

DECEMBER 20, 1982

RICHARDSON, C.J., LUM, NAKAMURA, JJ., AND RETIRED JUSTICES OGATA AND MENOR, ASSIGNED TEMPORARILY

FILED
1982 DEC 20 PM 1:52
CLERK SUPREME COURT

A-18

Summary

Our holdings as summarized are reiterated below:

1. Riparian rights.
   a. Water rights attaching to riparian lands by virtue of HRS § 7-1 cannot be severed or extinguished by a riparian landowner's grantor. The riparian rights of each plaintiff taro farmer were therefore unaffected by language in their deeds that purported to reserve such water rights.
   b. Riparian landowners are entitled to make reasonable use of the quantity and flow of a natural watercourse and may prevent diversions that interfere with such use.
      1. The agricultural activities of the plaintiffs taro farmers constitute a reasonable use of the waters of the Waihee Stream as their mode of irrigation approximates that which has been historically utilized for the cultivation of taro. Plaintiffs are therefore entitled to the use of the waters of the Waihee Stream for the cultivation of their riparian lands with the quantity and flow that existed prior to the reduction of the flow that contributed to the damaging of their crops.

2. Appurtenant rights.

a. Appurtenant water rights are incidents of the ownership of land which, by virtue of their appurtenant nature, may not be transferred or applied to lands other than those to which the rights appertain. They may, however, be extinguished by the grantor of such lands.

b. When the same parcels of land are being utilized to cultivate traditional products by means approximating those utilized at the time of the Mahele, there is sufficient evidence to establish a presumption that the amount of water diverted for such cultivation adequately approximates the quantity of the appurtenant water rights to which that land is entitled.

c. Plaintiffs' lands possessing appurtenant water rights that were not extinguished by their grantors are therefore entitled to the quantity and flow of water which was utilized to irrigate crops prior to the diminution of the stream that damaged the crops.

3. Enjoining of groundwater diversions that interfere with established streamflow rights.

a. Where surface and groundwater can be demonstrated to be interrelated as parts of a single system, established surface water rights may be protected against diversions that injure those rights whether the diversion is of surface water or groundwater. BWS diversions that interfered with plaintiffs' established rights were therefore properly the subject of an injunction.

4. The propriety of injunctive relief against a "public use."

a. As a general rule, where water has been improperly diverted by a public entity for actual public use, a complainant may not obtain injunctive relief against the diversion of water to which a public use has attached at the time the suit is filed, unless the court finds that a public interest of substantially the same magnitude will be advanced by injunctive relief.

1) Where, however, there is a gradually increasing diversion, the critical point at which the doctrine becomes operational is when the diversion causes actual harm to the plaintiffs.

Reversed and remanded for further proceedings in accordance with this opinion.

Samuel P. King, Jr., Special Deputy Corporation Counsel, (Richard D. Wurdeman, Corporation Counsel, with him on the briefs) for Defendant-Appellant, Cross-Appellee Board of Water Supply.

William A. Richardson

Ronald Albu (Legal Aid Society of Hawaii) for Plaintiffs-Appellees, Cross-Appellants Reppuns.

Edward H. Nakamura

E. Cooper Brown for Plaintiffs-Appellees, Cross-Appellants Nakatas and Plaintiffs-Intervenors-Appellees, Cross-Appellants Wong and Hall.

Thomas S. Ogata

Benjamin Menor

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

February 3, 1983

RECEIVED
FEB 8 1983
VTN PACIFIC

Mr. Edwin B. Stevens, Chairman
Kahaluu Neighborhood Board No. 29
c/o Kahaluu Community Center
47-232 Waihee Road
Kaneohe, Hawaii 96744

Dear Mr. Stevens:

Subject: Your Letter of January 22, 1983, On The Environmental Impact Statement (EIS) Preparation Notice for Kamooalii Watershed Wells, Kaneohe

Thank you for reviewing the EIS preparation notice for the proposed water development project. Your letter will be appended to the draft EIS.

We offer the following in response to your comments:

1. Although minimum streamflow standards have not been established, we are coordinating our water development plans with the Department of Parks and Recreation to avoid conflicts with their surface water needs for Hoomaluhia Park.

2. Streamflow monitoring upstream from the dam may be implemented to insure minimum flows required by the park or as required by future streamflow standards.

3. On the basis of our commitment, the establishment of a moratorium will serve no useful purpose. For your information, we are also involved in developing water supply with the State Department of Agriculture for the Waimanalo and Waiahole agricultural parks. The new windward sources will first be allocated to agricultural and urban developments in that area.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

4. We have no intent of taking water from present agricultural users.

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

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

RECEIVED
BD OF WATER SUPPLY
Jan 24 11 13 AM '83

830188

SIERRA CLUB, HAWAI'I CHAPTER
P.O. BOX 22897 HONOLULU, HAWAI'I 96822
(808) 946-8494

January 21, 1983

Mgr. KY
AM
PIE

RECEIVED
FEB 10 1983
VTN PACIFIC

Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

Sierra Club Hawaii Chapter, Honolulu Group would like to be a consulted party in the Environmental Impact Statement for the Kamooalii Watershed Wells, Kaneohe.

We have a deep concern for Hawaii's water resource and the wise use and development to assure that demand does not exceed replacement.

Our particular concerns in regards to this Preparation Notice are:

1. The philosophy by which water is being developed and allocated. Water supply should be the determining factor and not population projections.

2. Both the esthetic and water supply impacts in regards to Hoomaluhia Park. It would hardly be suitable for the project approach roads to go through the Park. Lowering of the Streams and the Park Reservoir (Lake) would be counter to the plans which have been developed for the Park. The peace of the Park and the view planes seem also to be threatened.

3. We favor completion of Minimum Stream Flow Standards before there is further development of water wells.

Thank you for permitting us to comment.

Lola N. Mench
Lola N. Mench
Vice-Chair, Conservation Committee

A-22

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

February 7, 1983

RECEIVED
FEB 10 1983
VTN PACIFIC

Mrs. Lola N. Mench
Sierra Club, Hawaii Chapter
P. O. Box 22897
Honolulu, Hawaii 96822

Dear Mrs. Mench:

Subject: Your Letter of January 21, 1983, on the Environmental Impact Statement (EIS) Preparation Notice for Kamooalii Watershed Wells, Kaneohe

Thank you for reviewing the EIS Preparation Notice for the proposed water development project. Your letter will be appended to the Draft EIS.

We have added your organization's name to our consulted parties' list. A copy of the Draft EIS will be sent to your organization when completed.

In response to your concerns, we offer the following:

1. Our water development program is based on the preservation of our groundwater resources. Towards this end, we are working jointly with the State Department of Land and Natural Resources (DLNR) and the U. S. Geological Survey to establish the sustainable yields of our groundwater basins. Pumpage from new wells will be limited to ensure that the basins are not depleted. We will also abide with minimum streamflow standards that are to be adopted by DLNR. Our present policy of allocating water to new developments on a "first-come, first-served basis" reflects the limited water supply conditions of our existing water systems. Accordingly, we allocate water only to projects which have met all of the requirements of the City and State and are ready to proceed as evidenced by the submission of construction drawings and building permits. Our program is also based on the population projections of the State Department of Planning and Economic Development and City Development Plans.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

2. Plans for the proposed project is being coordinated with the Department of Parks and Recreation to insure compatibility with their plans for Hoomaluhia Park.

3. Streams in the vicinity of our proposed wells will be monitored before, during, and after the pumping tests are performed on each well to determine the impacts on streamflow. When minimum streamflow standards are established for streams in the area, we will implement the actions required to comply with the adopted standards. On the basis of this commitment, we find that a moratorium on development of new water sources will not serve any useful purposes.

A-23

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

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

RECEIVED
OCT 27 8 15 AM '83

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT SHAFTER, HAWAII 96858

REPLY TO ATTENTION OF

October 24, 1983

Asst. Mgr.
PIE

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

Dear Mr. Hayashida:

Thank you for the opportunity to review and comment on the EIS for Kamooalii Watershed Well, Kaneohe, Oahu. The Corps' comments dated January 3, 1983 have been acknowledged. We have no further comments.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

A-24

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

OCT 25 1983

Ms. Letitia N. Uyehara
Interim Director
Offfice of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

The Service has reviewed the Environmental Impact Statement (EIS) for the Kamooalii Watershed Wells which was forwarded with your letter of October 3, 1983. Service concerns have been adequately addressed in the EIS. We concur with the Board of Water Supply's commitment to preserve streamflow sufficient to maintain existing water levels in the Ho'omaluhia wildlife pond and reservoir. We appreciate this opportunity to comment.

Sincerely,

for Peter A. Stine
William R. Kramer
Acting Project Leader
Office of Environmental Services

cc: BWS
[redacted]
HDAR
HDP&W

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

United States Department of Agriculture

Soil Conservation Service

P.O. Box 50004
Honolulu, Hawaii
96850

November 3, 1983

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

RECEIVED
NOV 2 1 1983
VTN PACIFIC

Dear Ms. Uyehara:

Subject: Environmental Impact Statement for Kamooalii Watershed Wells
Kaneohe, Koolaupoko, Oahu

We reviewed the subject environmental impact statement as you requested.

One comment we would offer for consideration concerns the need to construct access roads to the proposed sites--mentioned on pages 38 and 39 of the document.

A-25

The design and construction of these roads should include measures to control erosion and sedimentation both during and after construction.

Thank you for the opportunity to review the document.

Sincerely,

FRANCIS C.H. LUM
State Conservationist

cc:

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

VTN Pacific
1164 Bishop Street, Suite 906
Honolulu, HI 96813

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

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

November 17, 1983

RECEIVED
NOV 21 1983
VTN PACIFIC

Mr. Francis C. H. Lum
State Conservationist
Soil Conservation Service
Department of Agriculture
P. O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Lum:

Subject: Your Letter of November 3, 1983, on the Draft Environmental Impact Statement for Kamooalii Watershed Wells

Thank you for commenting on the draft environmental impact statement for our proposed water development project. Your letter will be appended to the revised environmental document.

In response to your comment, the design and construction of the access roads to the proposed well sites will include measures to control erosion and sedimentation during and after construction.

If you have any questions, please contact Lawrence Wang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

United States Department of the Interior

GEOLOGICAL SURVEY
Water Resources Division
P.O. Box 50166
Honolulu, Hawaii 96850

November 2, 1983

RECEIVED
NOV 8 1983
WIN PACIFIC

Ms. Letitia M. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

The Environmental Impact Statement for Kamooalii Watershed Wells has been reviewed and the U.S. Geological Survey, Hawaii District office has the following comments:

1. There is very little or no discussion on the effects of wells on the water quality of streams.

2. Effects of the proposed wells on the capacity of dike storage not addressed. Will the quantity of dike water be reduced and if so, by how much over the years?

3. Page 34.--The assessment of four degrees increase in temperature before and after construction of the dam is not valid based only on one set of instantaneous measurements.

4. Page 43.--the BWS has yet to negotiate with the USGS regarding establishment of a permanent gage on Luluku Stream below an elevation of about 200 feet to measure inflow from Luluku Stream and calculate flow out of the Hoomaluhia reservoir.

We appreciate you allowing us this opportunity in reviewing this environmental impact statement on the Kamooalii Watershed Wells. If there are any questions regarding our comments, please don't hesitate to call Mr. Harold Sexton at 546-8362.

Aloha,

Stanley F. Kapustka
District Chief

cc: Mr. Kazu Hayashida, BWS, Honolulu, Hawaii 96843
WIN Pacific, Honolulu, Hawaii 96813

A-26

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 6, 1984

RECEIVED
JAN 13 19
WIN PACIFIC

Mr. Stanley F. Kapustka
District Chief
U. S. Geological Survey
P. O. Box 50166
Honolulu, Hawaii 96850

Dear Mr. Kapustka:

Subject: Your Letter of November 2, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

In response to your comments, we offer the following:

1. The revised impact statement will mention that reduction of stream flow out of the Ho'omaluhia reservoir has the potential to increase water temperature. Otherwise we do not anticipate that the wells will affect water quality.

2. The proposed vertical wells will not affect either the capacity of dikes to store water or leakage out of dike reservoirs. Withdrawal of water by production facilities may reduce leakage and overflow from dike compartments in which the wells are located and increase leakage out of higher dike compartments which are hydraulically connected. Water withdrawal will not exceed the rate at which dike reservoirs are recharged.

3. The Draft EIS mentions that unrelated factors may account for the measured increase in stream temperature after construction of the Ho'omaluhia dam.

4. The revised impact statement will indicate that if test-pumping of exploratory wells causes immediate impacts on Luluku Stream, then the department will negotiate with the U. S. Geological Survey to establish a permanent gage on Luluku Stream. If the dike

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 6, 1984

reservoir penetrated by the Luluku well field is found to be hydraulically connected with a higher dike reservoir which discharges into Luluku Stream, then pumping of the wells may affect stream flow. Otherwise, since Luluku Stream gains almost no base flow below the elevation of 520-foot elevation, the Luluku well field should not affect stream flow.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

A-27

pc: VTN Pacific

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)

13 OCT 1983

SUBJECT: Environmental Impact Statement for the Kamooalii Watershed Wells

TO: Ms Letitia N. Uyehara, Interim Director
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. The EIS is returned for your file.

ROBERT M. OKAZAKI
Chief, Engrg & Envmtl Plng Div
Directorate of Civil Engineering

1 Atch
EIS

cc: Mr Kazu Hayashida, Manager & Chief Engineer wo Atch
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96813

VTN Pacific wo Atch
1164 Bishop Street, Suite 906
Honolulu, HI 96813

RECEIVED
OCT 19 1983
VTN PACIFIC

US Department of Transportation
United States Coast Guard

Commander (dpl)
Fourteenth Coast Guard District

Prince Kalanianaole
Federal Building
300 Ala Moana Blvd
Honolulu, Hawaii 96850
Phone 546-2861

11000
Serial 594
5 October 1983

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Letitia N. Uyehara:

The Fourteenth Coast Guard District has reviewed the Environmental Impact Statement for the Kamooalii Watershed Wells and has no objection or constructive comments to offer at the present time.

Sincerely,

J. E. SCHWARTZ
Commander, U. S. Coast Guard
District Planning Officer
By direction of
Commander, Fourteenth Coast Guard District

Copy to: Board of Water Supply
VTN Pacific

A-28

RECEIVED
OCT 7 1983
VTN PACIFIC

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

IN REPLY REFER TO:
002A:QLB:jam
Ser 2219
17 OCT 1983

RECEIVED
OCT 18 1983
VTN PACIFIC

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Environmental Impact Statement (EIS)
Kamooalii Watershed Wells

The EIS for the Kamooalii Watershed Wells has been reviewed and the Navy has no comments to offer. As this command has no further use for the EIS, the EIS is being returned to the Environmental Quality Commission, by copy of this letter.

Thank you for the opportunity to review the EIS.

Sincerely,

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

Enclosure

Copy to:
Board of Water Supply, City & County of Honolulu
VTN Pacific
Environmental Quality Commission

NOV 4 1983

RECEIVED
NOV 8 1983
VTN PACIFIC

Ms. Letitia M. Uyehara
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

We have reviewed the draft environmental impact statement for the development of four well fields within the Kamooalii watershed.

We commend the Board of Water Supply's proposal to monitor stream flow and "to take special measures to mitigate adverse impacts" if "base flow is significantly reduced" by well development. We also support the proposal to cut back partially on ground water withdrawal or to pump well water into streams if necessary during dry periods.

We find no reason why the environmental impact statement should not be accepted.

Sincerely,

Edgar A. Hamasu

for SUSUMU ONO
Chairperson

cc: BWS, C&C Honolulu
VTN Pacific

A-29

GEORGE R. ARIYOSHI
Governor of Hawaii

RECEIVED
BD OF WATER SUPPLY
Nov 21 3 27 PM '83

032967

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AGRICULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

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

October 18, 1983

P/E

MEMORANDUM

TO: Mr. Gordon Soh, Planning Office

FROM: Roy K. C. Sue, State Parks Administrator

SUBJECT: EIS, Kamooalii Watershed Wells, Kaneohe, Oahu
TMK: 4-5-35: por. 1, 4-5-41: por. 4, por. 9, 4-5-42: por. 1

ARCHAEOLOGICAL CONCERNS:

Thank you for the opportunity to review the subject undertaking. The total project includes the construction of eight wells, access roads, electrical lines, water transmission mains and reservoirs in the upland Kaneohe area. Significant archaeological sites occur in the area and it is likely that the proposed undertaking will have an impact on both known and unknown sites in the area.

Therefore, we recommend that prior to any project activity that may have an effect on resources, a reconnaissance survey be conducted by a qualified archaeologist within the proposed area, and that two copies of the survey results be forwarded to our office for evaluation. Should the existence of significant resources be substantiated, we may provide additional recommendations to avoid, mitigate, or negate any adverse effects.

The paragraph regarding archaeological features on page 37, should be changed to include:

1. Plans to have a qualified archaeologist make a field reconnaissance survey of the entire project area, and to send the survey report to our office for review.

9

2. Plans to coordinate archaeological mitigation measures with our office.

3. The provision that the SHPO be contacted at 548-7460, whenever human bones and other kinds of archaeological remains are discovered during construction.

If the undertaking has any federal involvement (e.g. funding, loan guarantee, permit or license), the applicant should verify with the federal agency that the provisions of 36 CFR 800 (Advisory Council on Historic Preservation's Procedures for the Protection of Historic and Cultural Properties) are being complied with.

RECREATION CONCERNS:

All known public recreation concerns involve Hoomaluhia County Park. We note project plans are being coordinated with the park.

ROY K. C. SUE

cc: Board of Water Supply
C & C of Honolulu

A-30

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

December 7, 1983

RECEIVED
DEC 12 1983
VTN PACIFIC

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

Attention: Mr. Roy Sue

Dear Mr. Ono:

Subject: Your Internal Memorandum Of October 18, 1983, On The Kamooalii Watershed Wells

Thank you for informing us of your department's concerns on archaeological sites in the project area.

We shall address your concerns in our Revised EIS for the Kamooalii Watershed Wells and take appropriate actions when we are ready to undertake the projects.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

For KASU HAYASHIDA
Manager and Chief Engineer

pc:VTN

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

CHARLES G. CLARK
DIRECTOR OF HEALTH

In reply, please refer to:
EPHSD-SS

November 7, 1983

RECEIVED
NOV 9 1983
VTN PACIFIC

MEMORANDUM

To: Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Kamooalii Watershed Wells, Kaneohe, Koolaupoko, Oahu

A-31

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Administrative Rules, please be informed that we do not have any objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

MELVIN K. KOIZUMI

cc: VTN Pacific
Board of Water Supply

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

CHARLES G. CLARK
DIRECTOR OF HEALTH

In reply, please refer to:
EPHSD-SS

February 27, 1984

RECEIVED
FEB 29 1984
VTN PACIFIC

MEMORANDUM

To: Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Kamooalii Watershed Wells, Kaneohe, Oahu

Thank you for the opportunity to review and comment on the subject Environmental Impact Statement. We understand that the City and County of Honolulu Board of Water Supply (BWS) is proposing to develop one production and one standby well at each of four sites within the Kamooalii Stream watershed.

In January 1983, the Department of Health responded to the Environmental Impact Statement preparation route. We commented on the new source approval requirements set forth in Section 11-20-29 of Chapter 20, Title 11, Administrative Rules. The Board of Water Supply has acknowledged and responded to these comments. The Department of Health's approval pursuant to Chapter 20 is listed under Necessary Approvals in the Environmental Impact Statement.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

MELVIN K. KOIZUMI

cc: Board of Water Supply
VTN Pacific

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

GEORGE R. ARIYOSHI, GOVERNOR
STATE OF HAWAII
FRANK SKRIVANEK, DIRECTOR

Ref. No. 8348

November 8, 1983

RECEIVED
NOV 14 1983
VTN PACIFIC

MEMORANDUM

TO: Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control

FROM: Kent M. Keith, Director

SUBJECT: Kamooalii Watershed Wells, EIS, Kaneohe, Oahu

We have reviewed the subject environmental impact statement (EIS) and find that it has adequately addressed the concerns expressed in our letter of January 19, 1983, to the Board of Water Supply.

However, Section VI, Necessary Approvals, should be revised to indicate a Coastal Zone Management Federal Consistency certification from our agency will be required in conjunction with the Department of the Army permit.

Thank you for this opportunity to comment.

cc: Mr. Kazu Hayashida, Board of Water Supply
VTN Pacific

A-32

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 4, 1984

RECEIVED
JAN 11 1984
VTN PACIFIC

Mr. Kent M. Keith, Director
Department of Planning and Economic Development
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Keith:

Subject: Your Memorandum of November 8, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

The revised document will indicate that a Department of Army permit will not be required. Our response to the Corps of Engineers noted that no fills are proposed in any streams. However, should a Department of Army permit be required when our plans are more firm, we will request your review for consistency with Hawaii's Coastal Zone Management Program.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

pd: VTN Pacific

Rec'd. 10-4-83

GEORGE R. ARIYOSHI
Governor

ROY R. TAKEMOTO
Chairman

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

TELEPHONE NO.
(808) 548-6915

October 3, 1983

RECEIVED
OCT 10 1983
VTN PACIFIC

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: Kamooalii Watershed Wells

Location: Kaneohe, Koolaupoko, Oahu

Classification: Agency Action

A-33

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

Ms. Letitia N. Uyehara, Interim Director
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. Kazu Hayashida, Manager & Chief Engineer AND VTN Pacific
Board of Water Supply, City and County of Honolulu 1164 Bishop Street, Suite 906
630 South Beretania Street Honolulu, Hawaii 96813
Honolulu, Hawaii 96813

Your comments must be received or postmarked by: November 7, 1983.

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

Thank you for your participation in the EIS process. 10-5-83

No comments

Takeshi Yoshihara
Energy Div'D-DPED

cc

J.P. 0.9489

November 9, 1983

RECEIVED
NOV 16 1983
VTN PACIFIC

Ms. Letitia N. Uyehara
Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Kamooalii Watershed Wells
Kaneohe, Koolaupoko, Oahu

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

Please be informed that the project has been coordinated with our Highways Division and the site conflicts previously identified have been resolved.

However, while accesses to the sites have been permitted, the applicant would be responsible for improving the roadways for vehicular use. Construction plans must be coordinated with our Highways Division and a permit be secured for any construction work contemplated within the state highway's right-of-way.

Very truly yours,

Herbert Higashionna
Director of Transportation

DKiko

cc: Kazu Hayashida,
Board of Water Supply, C&C Honolulu
VTN Pacific
udY-P8

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

December 30, 1983

Mr. Wayne Yamasaki, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Yamasaki:

Subject: Your Department's Letter of November 9, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

A-34

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

We shall be responsible for improving all access routes to the well sites. Construction plans will be coordinated with your Highways Division and a permit will be obtained for any construction proposed within State highway rights-of-way.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
P. O. Box 22159
Honolulu, Hawaii 96822

October 14, 1983

RECEIVED
OCT 18 1983
VTN PACIFIC

MEMORANDUM

TO: Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control

SUBJECT: Environmental Impact Statement
Kamooalii Watershed Wells
TMK: 4-5-35: por. 1, 4-5-41: por. 4, por. 9
4-5-42: por. 1 Kaneohe, Oahu

The Department of Agriculture has reviewed the subject statement and offers the following comments.

We note that our concerns regarding the removal of acreage from apple banana production have been addressed. It appears that although the project itself may not have a large impact on the farmers, the cumulative effect with H-3 may be substantial. Therefore, we suggest that as a mitigating measure, the Board of Water Supply cooperate with the State Department of Transportation in relocation efforts for the affected farmers.

Thank you for the opportunity to comment.

JACK K. SUWA, CHAIRMAN
Board of Agriculture

cc: Mr. Kazu Hayashida, Board of Water Supply
VTN Pacific

"Support Hawaiian Agricultural Products"

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

October 28, 1983

RECEIVED
NOV 2 1983
VTN PACIFIC

Mr. Jack K. Suwa, Chairman
Board of Agriculture
State of Hawaii
P.O. Box 22159
Honolulu, Hawaii 96822

Dear Mr. Suwa:

Subject: Your Letter of October 14, 1983, on the Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for commenting on the environmental document for our proposed water development project. Your letter will be appended to the revised EIS.

If we find it necessary, we shall cooperate with the State Department of Transportation on any mitigating measures taken by them on the relocation of the banana farmers.

If you have any questions, please contact Lawrence Whang at 526-6138.

Very truly yours,

L.G. Rathburn

For KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

A-35

University of Hawaii at Manoa

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

8 November 1983

RECEIVED
NOV 14 1983
VTN PACIFIC

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

Dear Mr. Hayashida:

SUBJECT: Environmental Impact Statement for Kamooalii Watershed Wells, Kaneohe, Oahu, September 1983

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

1. While it was stated that surface water development would cost most than groundwater, a comparative cost breakdown would be helpful in the EIS.

2. In light of present concern over agricultural pesticide contamination, perhaps a statement can be made that in this location similar contamination is unlikely under existing land uses.

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

Sincerely,

Edwin T. Murabayashi
EIS Coordinator

ETM:jm

cc: Latitia N. Uyehara
VTN Pacific

AN EQUAL OPPORTUNITY EMPLOYER

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 10, 1984

RECEIVED
JAN 13 1984
VTN PACIFIC

Mr. Edwin T. Murabayashi
EIS Coordinator
Water Resources Research Center
Holmes Hall 283
University of Hawaii at Manoa
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Murabayashi:

Subject: Your Letter of November 8, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

In response to your comments, we offer the following:

1. A comparative cost breakdown would be valid if the water quality of the well water and surface water were known. The only cost estimate we have comparing the two methods of water development is at Hililani, where one option is to drill wells within the forest reserve and the alternative is to build a surface water treatment plant using Waiahole Ditch water. Estimated costs for each type of source development are:

Source	Construction Cost
Surface water	$5,160,000
Wells	$3,000,000

It should be noted that groundwater developed from wells require no treatment and if the wells were sited at a lower elevation, their construction

A-36

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

costs would be less. There would be no change in construction costs if the treatment plant for the surface water source was sited at a lower elevation. Costs for transmission and storage are not included in the cost estimates.

2. The revised impact statement will mention that there currently is no pesticide contamination of the groundwater sources being developed.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

University of Hawaii at Manoa

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

November 7, 1983

RE:0391

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Draft Environmental Impact Statement
Kamooalii Watershed Wells
Kaneohe, Koolaupoko, Oahu

A-37

The Kamooalii Watershed Wells project involves the development, by the Board of Water Supply, of one production and one standby water well at each of four sites within the watershed of Kamooalii Stream.

This Environmental Center review has been prepared with the assistance of Matthew Spriggs, Anthropology; Paul Ekern, Water Resources Research Center; James Parrish, Hawaii Cooperative Fisheries Research Unit; Jacquelin Miller and Mark Ingoglia, Environmental Center. The following comments are offered for your consideration.

Alternatives to the proposed project

Several alternatives are proposed which "to varying degrees could fulfill the objective of meeting future water demand."

Conservation is mentioned (p. 53) as an approach to water savings versus further development of new wells. "Retrofitting" old fixtures with water saving devices is suggested as a possible approach to water conservation, but no data on the potential water savings that could be expected, or costs of a retrofitting program are provided. We suspect that funding for retrofitting could come from a minimal increase in water prices (p. 57). This would further stimulate conservation versus simply drilling more wells. In order to evaluate the various alternatives, data on projected costs of a retrofitting program and the potential water savings that might ensue should be provided in the revised EIS.

The 12 percent unaccounted water use for 1980-81 (p. 53) seems quite significant, representing 15.6 mgd. The proposed development of four well fields are estimated to provide from 2 to 8 mgd. If leakage is responsible for most of the unaccounted water use, as is implied in the DEIS, it would seem prudent to re-institute the leak detection program and save the 12 million plus dollars otherwise required for these wells.

Archaeology

We concur that an archaeological survey should be conducted at locations where pipelines and access roads will be constructed, as proposed (p. 39). The area to be surveyed should include sufficient space to accommodate heavy machinery turning areas and construction spillover.

Although the Luluku site has been bulldozed previously, this may not exclude the possibility of archaeological features being present at the site because the area has substantial recent alluvial soil deposits. Reconnaissance surveys including Luluku should address the potential for subsurface archaeological materials.

On page 37, the H-3 and Ho'omaluhia Park archaeological surveys are mentioned as being performed "in the vicinity of" the proposed well field sites. Referring to References 1 and 35, Volume V, Appendix H it appears these surveys may have been in the vicinity of the proposed well sites but due to scale differences and unclear mapping, it is impossible to determine whether the sites have actually been surveyed. A map should be provided in the Revised EIS that clearly shows what archaeological surveys have been performed previously and their relation to the proposed well sites. Any sites not clearly surveyed as shown by the map should be surveyed and a reasonable distance around the site should be included to address construction impacts that might extend outside the immediate areas of the proposed well sites.

Impacts on stream fauna

On page 33 the DEIS states that all of Kaneohe Stream is channelized. Actually Timbol and Maciolek, 1978 indicate in Stream Channel Modification in Hawaii Part A (p. 125) that 25 percent of the channel length of Kaneohe Stream is altered. Of course this percentage has increased since 1978. How much cumulative alteration of Kamooalii and Kaneohe stream environments native species are able to tolerate is an important consideration that should be addressed in the Revised EIS. Currently, an application to fill a wetland and channelize a lower portion of Kaneohe Stream is being considered by the Army Corps of Engineers (PODCO-O Notice 1756-S). If the PODCO application is accepted and construction follows, how will the draft of wells plus further channelization effect the native stream fauna? Similar cumulative impacts on natural stream habitat has led to a continual decline in the ecological quality of Hawaiian and particularly Oahu streams. Timbol and Maciolek, 1978 note that there are no physically or biologically pristine streams on Oahu due to environmental impacts. If BWS fails to maintain adequate stream flow for native stream fauna below Hoomaluhia Dam, the steady decline of ecological stream quality that has occurred in the past will continue.

In discussing the stream fauna survey completed by Kelly Archer (Ref. 48) it should be indicated whether electroshocking was used to sample Kamooalii and Luluku streams. Electroshocking is often more efficient than visual sampling and would have given a better indication of what stream fauna is still present in the above cited streams. It would have been helpful if the report on the actual survey had been included as an appendix to the DEIS. The one paragraph presently included to describe the present stream fauna makai of the Hoomaluhia dam is insufficient to make a judgment of the present ecological quality of the stream.

On pages 49 and 50, BWS suggests they will comply with CZM law by maintaining existing water levels in Ho'omaluhia Park wildlife and flood control reservoir, pending adoption of in-stream flow standards. It should be noted that maintenance of the existing reservoir level may not prevent impact on native stream fauna makai of the dam and discussion of means to prevent adverse impact on the fauna makai of the dam is needed to demonstrate compliance with CZM requirement.

Misspellings of diadromous and Macrobrachium lar on pages 32 and 34, should be corrected and the 4° temperature difference referred to on page 34 should be designated 4° centigrade or fahrenheit.

Minimum stream flow standards

Any reduction of stream flow below present levels may effect stream fauna. Until DLNR establishes minimum stream flow standards, maintainance of Hoomaluhia reservoir levels will protect reservoir fauna but no native stream fauna in Kamooalii stream above inflow from Anolani stream (p. iii). It is our understanding that community concern has resulted in petitions to DLNR over the lack of minimum stream flow standards for Kamooalii Stream and that the controversy surrounding Kamooalii Stream has been partially responsible for a plan by DLNR to develop interim minimum flow standards for selected windward Oahu streams. Kamooalii Stream is one of a few streams that is scheduled to have interim minimum flow standards within approximately 6 months. The relationship of these interim minimum flow standards to the proposed well project should be addressed in the revised EIS. While we recognize that precise stream flow standards cannot be expected until such standards are promulgated, nevertheless some approximations can be derived.

Since the amount of water that will be pumped from the wells while still maintaining minimum stream flow as set by the interim standards may not be enough to justify the cost of drilling the wells, some analysis of the impact of these forthcoming minimum stream flow standards on this project seems essential.

Geohydrology and hydrogeologic impacts

The statements are made (p. 47) that "No significant unavoidable adverse impacts will result from the construction of the Kamooalii Watershed wells and ancillary production facilities," but that "...long-term use of the wells could significantly reduce the dry-weather base flow of Kamooalii Stream and its tributaries" (emphases added). The latter impact and its effect constitute probably the major potential deleterious impacts of the project.

The BWS proposes to minimize these impacts, if they should materialize, by "monitoring stream flow and taking apropriate measures to implement any stream flow standards that DLNR may establish for Kamooalii Stream and tributaries". It should be recognized that stream flow monitoring cannot detect stream flow reduction until after it occurs, and that the reversal of a streamflow reduction cannot be achieved immediately by reducing the draft of wells that was responsible for the reduction.

The discussion of "Geology and groundwater" in the EIS (p. 21) is very brief and very general. However, more extensive discussion of the general geology would, with one possible exception, not be pertinent to the recognition and evaluation of potential impacts of the project. Pertinent detailed hydrogeologic information such as the locations,

orientations and effects of individual dikes is not available and could not be made available except by an exploratory program more extensive than that which will be provided by the actual water development proposed. What pertinent hydrogeologic information is available is that inferred from the performance and effects of the present wells and from streamflow distribution, and these are discussed in the EIS (especially pp. 21-30).

The one exception is recognition that the eastern part of the area in which groundwater development is proposed may be underlain by part of the caldera of the Koolau volcano. The boundaries of the caldera are not well known, nor are the hydrologic differences between the rocks on the caldera and the extra caldera lavas. However, the easterninost part of the proposed wells may be drilled into caldera fill and if so may have poor yield.

Alternatives to the proposed project

Several alternatives are proposed which "to varying degrees could fulfill the objective of meeting future water demand."

Conservation is mentioned (p. 53) as an approach to water savings versus further development of new wells. "Retrofitting" old fixtures with water saving devices is suggested as a possible approach to water conservation, but no data on the potential water savings that could be expected, or costs of a retrofitting program are provided. We suspect that funding for retrofitting could come from a minimal increase in water prices (p. 57). This would further stimulate conservation versus simply drilling more wells. In order to evaluate the various alternatives, data on projected costs of a retrofitting program and the potential water savings that might ensue should be provided in the revised EIS.

The 12 percent unaccounted water use for 1980-81 (p. 53) seems quite significant, representing 15.6 mgd. The proposed development of four well fields are estimated to provide from 2 to 8 mgd. If leakage is responsible for most of the unaccounted water use, as is implied in the DEIS, it would seem prudent to re-institute the leak detection program and save the 12 million plus dollars otherwise required for these wells.

Yours truly,

Doak C. Cox
Director

cc: VTN Pacific
Kazu Hayashida
Matthew Spriggs
Paul Ekern
James Parrish
Jacquelin Miller
Mark Ingoglia

RECEIVED
OCT 18 1983
VTN PACIFIC

October 14, 1983

TO: LETITIA N. UYEHARA, INTERIM DIRECTOR
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

FROM: MELVIN M. NONAKA, FIRE CHIEF

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR KAHOOALII WATERSHED WELLS

A-47

We have reviewed the Environmental Impact Statement for the above subject matter and have no comments to offer.

MELVIN M. NONAKA,
Fire Chief

MMN:ct/MSKW
Enc.
[redacted] Mr. Kazu Hayashida
Board of Water Supply
and
[redacted]

DI-MJP

October 19, 1983

RECEIVED
OCT 25 1983
VTN PACIFIC

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Request for Comments on Proposed Environmental Impact Statement (E[S) for Kamooalii Watershed Wells

The Honolulu Police Department does not have, at this time, any objections to the proposed development of one production well and one standby well at each of four sites within the watershed of Kamooalii Stream. Although there will be some short-term, construction-related inconveniences that will impact on traffic flow and safety, we do not foresee any significant increase in the demand for police services in this area.

Sincerely,

DOUGLAS G. GIBB
Chief of Police

cc: Mr. Kazu Hayashida, BWS
VTN Pacific -

KANEOHE NEIGHBORHOOD BOARD NO. 30
c/o KANEOHE SATELLITE CITY HALL
46-024 KAM HIGHWAY
KANEOHE, HAWAII 96744

November 7, 1983

Mr. Doug Miller
VTN Pacific
1164 Bishop Street, Suite 906
Honolulu, Hawaii 96813

REFERENCE: KAMOOALII WATERSHED WELLS
BOARD OF WATER SUPPLY, HONOLULU, HAWAII

A-48

Dear Mr. Miller:

After an excellent presentation by Doug Miller of VTN Pacific at the regular October 27th meeting, the Kaneohe Neighborhood Board #30 had no major objections to the Kamooalii Watershed Wells Environmental Impact Statement. But, we wish to submit the following comments:

(1) The stream flow data that was used in the EIS appears to need updating. For example, the Luluku Tunnel pumping was increased in 1972, but no stream flow levels were included after that increase pumping date. The stream flow levels that were mentioned were before 1970. Another example can be seen in Figure 2 (Base Flow of Kamooalii Stream and Tributaries-page 22), the data on these base flows is from 1959-1961. With the State of Hawaii's Windward In-Stream Study having been released this year, aren't there more current base stream flow data available?

(2) The effect on the banana groves in this watershed were not addressed fully. For instance, the effect on subsoil saturation in the banana groves was not addressed.

(3) The EIS states that stream flows will be maintained in dry periods, if necessary, by the pumping of water into the streams. Where will the input of pumped water occur on the streams? If the stream flow drops and/or disappears mauka of the pumping, the natural mileau of the stream will be severally effected. Meanwhile, the stream makai of the pumping will have been maintained.

On behalf of the Kaneohe Neighborhood Board #30, I wish to thank you for the presentation and the opportunity to comment on this matter.

RECEIVED
NOV 9 1983
VTN PACIFIC

Aloha,

Nancy H. Clingan

NANCY H. CLINGAN
Chairman

cc: Ms. Letitia Uyehara, Interim Director, EQC
Mr. Kazu Hayashida, Chief Engineer, BWS
Mr. Chester Koga, Kahaluu Neighborhood Bd. #28

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

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January 17, 1984

RECEIVED
JAN 19 1984
VTN PACIFIC

Dr. Doak Cox, Director
Environmental Center
University of Hawaii at Manoa
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

Dear Dr. Cox:

Subject: Your Letter of November 7, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

A-39

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

In response to your comments, we offer the following:

Alternatives to the Proposed Project

"Retrofitting" old plumbing fixtures with water saving devices was tried on two occasions on Oahu. The first involved a study with the Corps of Engineers on the installation of free shower inserts and toilet tank devices in 156 volunteer households in Kaneohe for a 15-month period. Anticipated savings were 10 gallons per shower and up to 30 gallons per day for an average household. Response to questionnaires sent out was 55% with a 7% saving realized on water consumption. One out of seven responding households complained of excessive noise in showerheads on medium-high pressures and double flushings for toilets.

The second occasion occurred during March through December 1982 when the department gave away 130,000 shower flow restrictors. The results are not available.

Unaccounted-for water for 1982-1983 was 10.9%. However, only a small portion of this is due to leakage. A survey of the Ewa-Waianae District water distribution system in 1977-1978 found only 1% of the water carried in 50 miles of pipe was lost to leakage. The rest of the unaccounted-for water was

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

due to meter errors and non-metered uses such as for fighting fires, flushing water mains during chlorination and to control taste and odor problems, flushing catch basins and drainage lines, and fire flow tests.

Another leakage survey covered Sand Island which had high unaccounted-for water. Other than a few minor leaks which were repaired, we found that consumption for one misplaced service was not being accounted for in our survey. The inclusion of that figure brought that area in line with other areas.

Archaeology

Archaeological reconnaissance surveys for Ho'omaluhia Park and the H-3 Freeway did not uncover any archaeological features in the vicinity of either the Kuou II or the alternative Kamooalii I well field sites. As recommended by the Division of State Parks, the revised impact statement will include an archaeological reconnaissance survey of the Luluku and alternative (if selected) Kamooalii II well field sites. The department will contract for supplemental reconnaissance surveys when planning access roads, electrical lines, water transmission mains, and reservoirs outside of Ho'omaluhia Park. It would be premature to survey the entire "project area" at this time because final siting and alignment of production facilities will be determined at a later date.

Impacts on Stream Fauna

The revised impact statement will indicate that over one-fourth of Kaneohe Stream's channel has been altered instead of all of the channel.

Filling a wetland area and further channelization work being considered may affect stream fauna. However, any pumpage from our proposed wells should not affect stream fauna, because we will abide with minimum stream flow regulations when they are adopted by State Department of Land and Natural Resources (DLNR).

Kelly Archer's stream survey used visual sampling. Visual sampling has proven to be more reliable than electroshocking in stream fauna surveys. For more information concerning the limitations of electroshocking, contact John Ford at the U.S. Fish and Wildlife Service (546-7530).

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

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Kelly Archer is currently preparing a field and literature survey of native fauna in perennial windward Oahu streams in order to identify streams of high environmental quality. His report will be distributed for agency comments and then published in a future regional impact statement for all the department's windward water development projects. Archer's preliminary findings are that of 27 streams in the region, five are of significantly greater environmental quality: Waiahole, Kahana, Punaluu, Kaluanui, and Koloa.

The revised impact statement will correct the typographical errors you pointed out.

Minimum Stream Flow Standards

A-40

According to DLNR, they have not scheduled interim minimum stream flow standards for any windward Oahu stream and to date, have not singled out Kamooalii Stream for such standards. The subject is treated as an unresolved issue in the Draft EIS.

Geohydrology and Hydrogeologic Impacts

The draft impact statement notes on page 44 that 'there could be a substantial lag between a reduction in well pumpage and an increase in spring-fed stream flow.

The revised impact statement will mention the possibility that the Kamooalii II well field site may be located in the Koolau volcano caldera and, if so, would be partly drilled into caldera fill which may result in a poor yield from the well.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: WTN Pacific

(P)1811.3

OCT 14 1983

RECEIVED
OCT 17 1983
WTN PACIFIC

Ms. Letitia N. Uyehara
Interim Director
Office of Environmental
Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Kamooalii Watershed Wells
Environmental Impact Statement

We have reviewed the subject environmental impact statement and have no comments to offer.

Thank you for the opportunity to review the environmental impact statement.

Very truly yours,

RIKIO NISHIOKA
State Public Works Engineer

MS:jl
cc: Mr. K. Hayashida
WTN Pacific

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816

ALEXIS T. LUM
MAJOR GENERAL
ADJUTANT GENERAL

DANIEL K. C. AU
COLONEL
DEPUTY ADJUTANT GENERAL

HIENG

7 OCT 1983

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Kamooalii Watershed Wells

A-41

Thank you for providing us the opportunity to review the proposed project, "Kamooalii Watershed Wells" Environmental Impact Statement.

We have completed our review and have no comments to offer at this time.

Yours truly,

JERRY H. MATSUDA
Major, HANG
Contr & Engr Officer

cc:
Mr. Kazu Hayashida
VTN Pacific
Env. Quality Coom w/EIS

RECEIVED
OCT 12 1983
VTN PACIFIC

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

EILEEN R. ANDERSON
MAYOR

WILLARD T. CHOW
CHIEF PLANNING OFFICER

RALPH FORTMORE
DEPUTY CHIEF PLANNING OFFICER

DGP10/83-8814

October 19, 1983

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

RECEIVED
OCT 20 1983
VTN PACIFIC

Dear Ms. Uyehara:

Kamooalii Watershed Wells
Environmental Impact Statement

We have no further comments on the subject environmental impact statement. Our earlier comments have been acknowledged by the applicant and are discussed in the EIS.

Sincerely,

RALPH KAWAMOTO
Planner

APPROVED:

for WILLARD T. CHOW

cc: BWS
VTN Pacific

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 G. JONES
DEPUTY DIRECTOR

RECEIVED
NOV 4 1983
VTN PACIFIC

LU10/83-5661(JDN)

November 2, 1983

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Draft Environmental Impact Statement (EIS) for
Kamooalii Watershed Wells--Kaneohe, Oahu
Tax Map Keys 4-5-35: 1; 4-5-41: 4 & 9 and 4-5-42: 1

A-42

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

1. Archaeological Features

   Reference: Chapter II, Part L, Page 37 and Chapter III, Part A, Page 39, Paragraph 4.

   Comment: According to the Draft EIS, archaeological reconnaissance surveys did not uncover any archaeological features in the vicinity of either the Kuou II or the alternative Kamooalii I sites. However, it does not indicate whether the Luluku and Kamooalii II sites were surveyed. All sites should be surveyed prior to construction of the well fields.

2. Impacts on Agriculture

   Reference: Chapter III, Part B, Page 40.

   Comment: The Draft EIS indicates that the proposed project will have an impact on banana farmers by removing approximately 0.25 acres of bananas from production. However, no mitigation measures, i.e., compensation, are discussed.

3. Growth and Land Use

   Reference: Chapter III, Part F, Page 46 and Chapter IV, Part C, Page 50.

   Comment: The Draft EIS reports that production of ground water for domestic use by the Kamooalii Watershed Wells will accommodate, but not induce development or population growth on Oahu. Growth was assessed on an island wide basis for population (birth) and employment factors. However, increased availability of water to Windward Oahu could induce regional growth (by migration) if new development is accommodated. The Draft EIS does not address this matter.

4. Government Policies Offsetting Adverse Impacts

   Reference: Chapter III, Part I, Page 47 and Chapter IV, Part C, Page 50.

   Comment: The Draft EIS does not explain why a development moratorium would delay implementation of the Oahu General Plan and the Hawaii State Plan.

   On Page 47, it is reported that a moratorium on new development would be imposed if there is insufficient water supply and that the project will develop water to accommodate growth and development proposed in the 1982 Oahu General Plan. Then on Page 50, the Draft EIS states that the project will not in itself induce new development or guide where population growth takes place on Oahu. These findings are inconsistent.

   Although the project may not actually induce development, it is a limiting growth factor as disclosed in the first statement. It can also guide growth as evidenced by the fact that the project is required to accommodate the development and growth projected for in the the Oahu General Plan.

If there are any questions, please contact John Nakagawa of our staff at 527-5038.

Very truly yours,

MICHAEL M. McELROY
Director of Land Utilization

MMM:sl

cc: Kazu Hayashida, BWS
VTN Pacific

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

December 30, 1983

TO: MICHAEL M. McELROY, DIRECTOR
DEPARTMENT OF LAND UTILISATION

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF NOVEMBER 2, 1983, ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR KAMOOALII WATERSHED WELLS

A-43

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

In response to your comments, we offer the following:

1. The revised impact statement will include an archaeological reconnaissance survey of the Luluku and alternative Kamooalii II well field sites.

2. The revised impact statement will mention that affected banana farmers will be compensated for loss of productive acreage.

3. Water from windward sources not used for windward needs will be pumped around Makapuu to Hawaii Kai, thus "freeing" water from the leeward sources for use elsewhere in the Honolulu or Pearl Harbor Water Districts. As indicated on page 50 of the Draft EIS:

> "...The project will not in itself ... guide where population growth takes place on Oahu. Implementation of City and County land use plans is primarily achieved with zoning rather than with water supply because we have no legal mandate to use water supply as a tool to direct growth."

> If the City and County does not want residential development to take place in Windward Oahu, then the County should not zone Windward Oahu for residential development.

4. The revised impact statement will state that availability of water is prerequisite for new development and that a development moratorium will delay creation of housing called for in the Oahu General Plan and Hawaii State Plan.

If you have any questions, please contact Lawrence Whang at 527-6138.

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN N. ANDERSON
MAYOR

MICHAEL J. CHUN, Ph.D.
DIRECTOR AND CHIEF ENGINEER

MAURICE H. KAYA
DEPUTY DIRECTOR

ENV 83-355

October 13, 1983

RECEIVED
OCT 17 1983
VTN PACIFIC

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Re: EIS for Kamooalii Watershed Wells,
Kaneohe, Oahu, Hawaii

A-44 We have reviewed the subject EIS and have the following comments.

1. We have no objections to the project.

2. On the discussion of alternatives (page 55), the City and County's plan for the level of treatment at the Honouliuli WWTP includes primary treatment only. A reapplication for primary treatment for the plant will be submitted to the U. S. EPA by the end of October 1983 under Section 301(h) of the Clean Water Act.

3. If a suitable waiver is not granted for the Honouliuli plant, the City may have to raise the level of treatment approaching secondary treatment. If this occurs, one alternative for effluent disposal that will be considered is groundwater recharge in the caprock area surrounding the plant site.

Me ke aloha pumehana,

for MICHAEL J. CHUN
Director and Chief Engineer

cc: BWS
VTN Pacific
WWM

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

RECEIVED
OCT 25 1983
VTN PACIFIC

October 19, 1983

TO: MICHAEL J. CHUN, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF OCTOBER 13, 1983, TO MS. LETITIA UYEHARA ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR KAMOOALII WATERSHED WELLS

Thank you for commenting on the environmental document for the proposed water development projects. Your letter will be appended to the revised document.

We shall include in the EIS the alternatives noted in your letter.

If you have any questions, please contact Lawrence Whang at 527-6138.

For KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

ANDREW I.T. CHANG
MANAGING DIRECTOR

WILLIAM A. BONNET
DIRECTOR

DALE RIKER
DEPUTY DIRECTOR

RECEIVED
NOV 1 1983
VTN PACIFIC

October 28, 1983

TE 10/83-4011

Ms. Letitia N. Uyehara,
Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

A-45

Dear Ms. Uyehara:

Subject: EIS for Kamooalii Watershed Wells

We have reviewed the Environmental Impact Statement and have no comments.

Sincerely,

WILLIAM A. BONNET
Director

cc: Board of Water Supply
VTN Pacific

DEPARTMENT OF PARKS AND RECREATION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

EILEEN R. ANDERSON
MAYOR

EMIKO I. KUDO
DIRECTOR

SAM L. CARL
DEPUTY DIRECTOR

OSCAR H. ASAHINA
EXECUTIVE ASSISTANT

October 24, 1983

Ms. Letitia N. Uyehara
Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

RECEIVED
OCT 26 1983
VTN PACIFIC

Dear Ms. Uyehara:

SUBJECT: KAMOOALII WATERSHED WELLS

We have reviewed the Environmental Impact Statement (EIS) for the proposed Kamooalii Watershed Wells and have no objection to the proposed project provided that assurance is given to the following:

1. Adequate stream flow to the lake and pond at Hoomaluhia Park is maintained to ensure the proper interchange of fresh water.

2. Stream flow will be adequate to accommodate fishing and boating activities and our proposed aquaculture projects.

3. The design and construction of access roads within Hoomaluhia Park be discussed with Department of Parks and Recreation staff.

In regard to the five alternatives for connecting the Kamooalii Watershed Wells to the BWS water distribution, we are in favor of Options 4 or 5. These alternatives would minimize traffic congestion and relocation of trees and shrubs planted along the main roadside.

Thank you for the opportunity to review the EIS.

Sincerely yours,

(Mrs.) EMIKO I. KUDO, Director

EIK:vc

cc: BWS [redacted]

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

RECEIVED
NOV 14 1983
VTN PACIFIC

NOVEMBER 7, 1983

TO: MRS. EMIKO I. KUDO, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF OCTOBER 24, 1983, ON THE ENVIRONMENTAL IMPACT STATEMENT FOR KAMOOALII WATERSHED WELLS

A-46

Thank you for your letter of October 24, 1983, on the environmental impact statement for the proposed Kamooalii Watershed Wells. Your letter will be appended to the revised environmental document.

In response to your concerns, we offer the following:

1. "Pending adoption of in-stream flow standards, the BWS is committed to preserving enough stream flow to maintain existing water levels in the 1.5 acre Ho'omaluhia wildlife pond and the 26 acre Ho'omaluhia reservoir." (page 44)

2. We will mention in the revised document that stream flow will be maintained to accommodate fishing and boating activities and proposed aquaculture projects within Ho'omaluhia Park.

3. All design and construction of access roads within Ho'omaluhia Park will be coordinated with your departmental staff.

If you have any questions, please contact Lawrence Whang at 527-6138.

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

PB 03-056

October 18, 1983

RECEIVED
OCT 20 1983
VTN PACIFIC

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Kamooalii Watershed Wells
Kaneohe, Koolaupoko, Oahu

We have reviewed the EIS for Kamooalii Watershed Wells and have no comments.

Thank you for the opportunity to review the EIS.

Very truly yours,

ROY H. TANJI
Director and Building Superintendent

TH:jo
cc: J. Harada
Board of Water Supply
VTN Pacific

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 31, 1984

RECEIVED
FEB6 1984
VTN PACIFIC

Mrs. Nancy H. Clingan
Chairperson
Kaneohe Neighborhood
Board No. 30
c/o Kaneohe Satellite
City Hall
46-024 Kamehameha Highway
Kaneohe, Hawaii 96744

A-49

Dear Mrs. Clingan:

Subject: Your Letter of November 7, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for allowing us the time to make a presentation and reviewing the Draft EIS for the proposed water development project. Your letter will be appended to the revised impact statement.

In response to your comments to both VTN Pacific (Douglas Meller) and the Board, we offer the following:

1. Stream flow data for Kamooalii Stream and its tributaries are available for periods after 1961. Some of the data are shown in Tables 4 through 6 on pages 29 and 30 of the Draft EIS.

   Only low, stream flow data were reported as they are the only data that would be affected if pumpage of our wells should reduce stream flow. Stream flow data gathered during periods of stream diversion by agricultural uses were disregarded as being unreliable. This is because the amounts of water diverted by agricultural uses are unknown and could not be accounted for in the measured stream flow figures.

   Data from crest gages which record peak flows (flows due to intense rainfall or to storms) were also omitted since they would not reflect stream flow diversion.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

The State Department of Land and Natural Resources Instream Use Study - Windward Oahu, Report R68, reports only previously gathered and reported data. No new stream flow measurements were taken. Plate No. II-7, page 31, shows 7 stream sampling stations in service over the years. Four of the stations measured stream flow. The only stream flow station in operation today is located in the Kamooalii Stream below the inflow from Luluku Stream. Data from this station will be used "to determine the potential for long term impacts on base stream flow". If additional stations are required, the Board will contract with the U. S. Geological Survey to install the stations.

2. The proposed wells are not expected to affect subsoil saturation in the banana groves. However, should Luluku Stream contribute recharge water to Luluku Well, then subsoil saturation may be reduced within the banana groves adjacent to the stream. This area of influence cannot be estimated except from long term operating experience from the wells.

3. Stream flow is unlikely to be affected mauka of the proposed wells. If the Board finds that stream flows are affected by the pumpages, appropriate adjustments in pumpages will be made to minimize the effects on the stream flows.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

L. G. Rathburn

For KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

KAHALUU NEIGHBORHOOD BOARD NO. 29
c/o KAHALUU COMMUNITY CENTER
47-232 WAIHEE ROAD
KANEOHE, HAWAII 96744
WAIEHA BEA, KAHALU'U, WAINE'E, WAIAHOLE, KAIKANE, KAHIPUU AND KUALOA

"Let us not ever have an unhappy minority"

November 7, 1983

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawai'i 96813

RECEIVED
NOV 10 1983
VTN PACIFIC

Draft Environmental Impact Statement
Kamo'oali'i Watershed Wells
Kane'ohe, Ko'olaupoko, O'ahu, Hawai'i

Dear Ms. Uyehara:

This letter is our response to your request for comments on the Kamo'oali'i Watershed Wells Draft Environmental Impact Statement.

This Impact Statement partially addresses some of the concerns which we expressed in our response to the Preparation Notice.

Although we have no additional comments at this time, we trust that our previous response(see Reference) will again be included in the Final Environmental Impact Statement forwarded for acceptance.

Sincerely,

Mahealani Dunnagi, Vice Chair
for
Chester T. Koga, Chair
Kahalu'u Neighborhood Board No. 29

Reference: N.B.#29 letter dtd. 1-22-83 to BWS re: Kamo'oali'i Watershed Wells E.I.S. Preparation Notice together with the following attachment
Summary of Supreme Court Decision dtd. 12-20-82 re: Waihe'e Stream Water Rights

Copies: Board of Water Supply
VTN Pacific
Kahalu'u N.B.#29 - Chair(3)
Kahalu'u Community Resource Center
Neighborhood Commission

A-50

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA
HONOLULU, HAWAII 96843

EILEEN R. ANDERSON, Mayor

TOSHIE H. FUJINAKA, Chairman
HILTON J. AGADER
MICHAEL J. CHUN
WALTER A. DODS JR., Vice-Chmn.
ERNEST A. WATARI
WAYNE J. YAMASAKI

KAZU HAYASHIDA
Manager and Chief Engineer

December 30, 1983

Mr. Chester T. Koga, Chair
Kahalu'u Neighborhood Board No. 29
c/o Kahaluu Community Center
47-232 Waihee Road
Kaneohe, Hawaii 96744

Dear Mr. Koga:

Subject: Your Letter of November 7, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for reviewing the Draft EIS for our proposed water development project. All comments on the Preparation Notice included in the draft impact statement will again be included in the revised impact statement.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA,
Manager and Chief Engineer

cc: VTN Pacific

SIERRA CLUB, HAWAI'I CHAPTER Sierra Club - HAWAII CHAPTER
P.O. BOX ~~22897~~ HONOLULU, HAWAI'I ~~96822~~ P. O. Box 11070 Honolulu, HI 96828
(808) 946-8494

November 4, 1983

VTN Pacific
1164 Bishop Street, Suite 906
Honolulu, Hawai'i 96813

Dear EIS preparers:

Thank you for sending the Kamo'oali'i Watershed Wells Environmental Impact Statement to the Hawaii Chapter of the Sierra Club for our review and comments. We appreciate the opportunity to participate in the EIS process, and to make positive and negative critical comment on projects with potential environmental impact.

With regard to the proposed developments of Kamo'oali'i Watershed we have several comments. The majority are directly referable to the EIS manuscript we received, and serve to accentuate our concerns for endemic diadromous streamlife, and waterfowl-habitat at Ho'omaluhia. The final comments are philosophical and deal with the problem of water as merely a resource to expand in response to population, despite the costs to our unique endemic biota and island way of life. Water should be viewed, rather, as a substance dynamically integrated with agriculture, endemic ecosystems and the maintenance of a uniquely Hawaiian lifestyle that is not discarded lightly. Water can be viewed (and realistically so) as a factor to use as a justification to limit population, and those who control it have the responsibility of future population control in Hawaii. It is our hope that these comments are taken seriously, as they stem from Sierra Club Hawaii Chapter policy statements and positions that are meant to be educational statements, but will also be the future basis for any and all legal actions taken by the group. Forthwith, our specific comments on the EIS:

A-151

1. p.32, "H. Stream Fauna" In this section, the effect of the Ho'omaluhia dam on the endemic o'opu nakea (*Awaous stamineus*) and 'opae kala'ole (*Atya bisulcata*) was discussed, attributing the demise of those species from the Kamo'oali'i watershed above the dam to the dam's effective obstacle to seasonal diadromous movements. The EIS states on page 33 that siltation from H-3 construction may cause a "temporary absence of endemic fish below the dam in Kamo'oali'i Stream". This statement presumes that o'opu nakea will be able to re-establish in Kamo'oali'i Stream at all. They are currently effectively blocked from areas mauka of the Ho'omaluhia dam, and to the extent that these mauka areas are critical to their survival and reproduction, the present status of the o'opu in the Kamo'oali'i Stream system is questionable.

Our recommendations with regard to the current proposed project are to monitor closely and abide by DLNR minimum stream flow

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P.O. BOX 22897 HONOLULU, HAWAI'I 96822 P. O. Box 11070 Honolulu, HI 96828
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recommendations (as per page 44.), and to bear in mind that even one season's failure to ensure such flow for endemic stream fauna may result in the demise of the particular gene pool represented by the Kamo'oali'i populations of *Awaous* and *Atya*. The days of unlimited alternate stream systems for these species are over, if they ever existed. It is our responsibility to maintain our Hawaiian species independent of their legal endangered status.

2. p. 40 "C. Stream Flow" In this section, a discussion of potential stream flow interruptions or decrementation was made, outlining 5 mechanisms (three dike compartment overflow senarios and two dike flow-through scenarios) that could conceivably affect stream flow. The major problem we noted was that the actual effects on stream flow of the Kamo'oali'i project would probably not be ascertainable until well after the projects were completed and water removal was underway. We find the proposed procedures of stream level monitering adequate, with the following caveats: a) it is important that the permanent gage proposed for Luluku Stream below 200 ft. elev. (p. 43) be established, as it has been stated that degradations of stream habitat could occur well after the establishment of the project; b) the BWS must communicate effectively with the staff of Ho'omaluhia Park to ensure that they are aware of their responsibilities to report water level status of the wildlife pond; c) as dam toe seepage from Ho'omaluhia dam (p. 44-45) is significant (0.7 mgd [per the EIS ref. 21, p. 20]), it may be that this flow contributes to the maintenance of endemic stream fauna below the dam. The stated possibility that the BWS Kamo'oali'i Watershed wells may affect this flow seems justification to include the apparent status of this seepage as part of the monitering that Ho'omaluhia Park staff will be responsible for, in addition to their stated role in monitering the level of water in the wildlife pond.

3. p. 46 "F. Growth and Land Use" In this short section the EIS diverges greatly from the philosophical stance we discussed earlier in this letter. Availability of water may not directly effect birth rates or employment (p. 46), but it must be pointed out that what does affect both birthrates and employment are a myriad of indirect effects, water availability among them. To ignore this is to shirk a great responsibility. It is undeniable that water availability directly and ultimately limits the population carrying capacity of our island state. To belittle this relationship is uncalled for. We request a direct response from you addressing this particular concern, to be included in the acknowledgement of the receipt of this set of comments. The Sierra Club is very interested in the philosophical outlook of the Board of Water Supply, VTN Pacific and the Office of Environmental Quality Control and invites comments from all three.

4. p. 47 "I. Government Policies Offsetting Adverse Impacts" In

SIERRA CLUB, HAWAI'I CHAPTER
P.O. BOX 22897 HONOLULU, HAWAI'I 96822
(808)946-8494

Sierra Club - HAWAII CHAPTER
P. O. Box 11070
Honolulu, HI 96828

4. p. 47 "I. Government Policies Offsetting Adverse Impacts" In this section, the possibility of a moratorium on new development and limitations on hook-ups is precisely the point we elaborated in the last paragraph above. We might point out that the Oahu General Plan and the Hawaii State Plan are guidelines, and not quotas. There is no absolute need to fulfill the maximum projections of either plan, and in fact, the plans should be looked upon as recommendations for limitation of growth, and intelligent management of growth, rather than as mandate or license for development independent of intelligence or management. The BWS should consider seriously whether this development is truly warranted at this time, and should not look upon all moratoria on development as "bad" or "obstacles to progress". The kapu system, as you well know, is a system of moratoria intent on conservation for perpetuity. In a limited island environment, sometimes no action is the best action.

5. p. 52 "C. Island-wide Approaches" In this section, the EIS finally acknowledges the integrated nature of water resources. Extant Hawaii Chapter Sierra Club policies have addressed most of the water resource options listed on pages 52-57, and our only comment is that stated limitations on these options are not permanent; options rejected at present for current economic or environmental reasons may become feasible in the future, as economic situations change, or as new methods and technologies develop.

A-52

We note that we are one of two community level organizations that responded to the EISPN (p. 60). Because of this, we feel especially responsible for providing a critical and intelligent response to the EIS. We share with the BWS a concern for water conservation and intelligent management. We hope that the comments and criticisms listed above are useful. Thank you again for the opportunity to comment.

Aloha no,

Samuel M. Gon III
Group Conservation Chairman
Sierra Club, Hawaii Chapter
Honolulu Group

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 20, 1984

RECEIVED
JAN 30 1984
VTN PACIFIC

Mr. Samuel M. Gon III
Group Conservation Chairman
Sierra Club, Hawaii Chapter
Honolulu Group
P. O. Box 11070
Honolulu, Hawaii 96828

Dear Mr. Gon:

Subject: Your Letter of November 4, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

In response to your comments, we offer the following:

1. Arrangements shall be made with the U.S. Geological Survey (USGS) to monitor the streams. Copies of the stream flow data will then be sent to the State's Department of Land and Natural Resources (DLNR) for their information. We shall then abide with DLNR's stream flow regulation.

2. Arrangements shall be made with USGS to install a permanent gage for Luluku Stream below 200-foot elevation only if test pumping of Luluku exploratory well impacts on flow in Luluku Stream.

   Ho'omaluhia Park staff are aware of the need to monitor the water flow from the outlet of the Ho'omaluhia wildlife pond whether our wells go in or not. We will work out mitigative measures with the park staff if stream flow monitoring data show that

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

our production wells do impact the Ho'oleinaiwa Stream, which feeds the wildlife pond.

3. We acknowledge that water is a vital resource for development and growth. However, the extent to which we develop this resource is in compliance with the parameters set forth in the land use designations, area development plans, and all other environmental laws. Consequently, our water development program conforms to the applicable parameters whether the proposed uses be urban or agricultural.

4. We realize that the Oahu General Plan and the Hawaii State Plan are just guidelines. However, Area Development Plans and Land Use Commission's establishment of Urban, Agricultural, and Conservation Districts on Oahu are specific as to what can be developed. We are faced with the following:

   a. We are mandated to meet the increased water demand as the population grows on Oahu,

   b. We must comply with the DLNR designated Pearl Harbor, Honolulu, and Waialua Basins as "ground water control areas". The significance of these designations is that developable basal water is generally not available in those basins.

   c. We must explore for water elsewhere, which would initially serve the area in which the source is developed. Then any excess water would be transported where required to meet Oahu's water demands.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

   d. We are already familiar with the technology to demineralize brackish water or desalt sea water. This technology is expensive. These alternatives to ground water developments will be realized when the public is willing to bear the higher costs accompanied with increased water rates.

5. We concur that the options discussed in the section titled "Island-Wide Approaches" may have considerable promise in the future.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: ✓WTN Pacific, Ltd.

LEGAL AID SOCIETY OF HAWAII

WINDWARD BRANCH OFFICE
47-200 WAIHEE ROAD, ROOM 104
KANEOHE, HAWAII 96744

(808) 239-5707

KALI K. WATSON, ESQ.
President, Board of Directors

ALLENE K. RICHARDSON, ESQ.
Executive Director

November 8, 1983

RECEIVED
NOV 10 1983
VTN PACIFIC

Ms. Lititia N. Uyehara
Director, Office of
Environmental Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Re: Environmental Impact Statement of
Kamooalii Watershed Wells

Dear Ms. Uyehara:

I am writing on behalf of HUI MALAMA AINA O KO'OLAU regarding the above-referenced EIS. The following areas require further analysis to meet the requirements of the EQC Regulations:

A-54

1. Insufficient Analysis of Stream Flows.

Although the EIS contains summaries of stream flow data for the various streams to be affected by these well projects, no analysis is presented to show the relationship between water withdraval by existing BWS facilities and historical stream flow. Similarly, no attempt is made to quantify the probable effects of additional water withdravals upon stream flows. This oversight is curious in light of the statements in the EIS that previous diversions and water developments in the area have dried up springs and have reduced stream flow. Some attempt should be made to quantify these effects.

2. Insufficient Evaluation of Agricultural Nees and Uses of Stream Water.

The EIS states at page 36 that, according to U.S.G.S. records, the last agricultural diversion of water from Kamooalii stream and its tributaries ceased in 1974. HUI MALAMA AINA O KO'OLAU is informed that several of the Luluku banana growers rely upon the streams running through their farms for irrigation water for bananas and other crops. The data provided in the EIS should be verified and the farmers in the area should be personally contacted to determine their water usage. It should also be noted that the banana farms in the area are riparian to the streams running through them an that they have riparian water rights to the entire natural flow of these streams. Legally, therefore, the BWS has no right to divert these waters away from the sources to these streams. See Reppun v. BWS, 65 Haw. 531(1982).

In addition, some attempt should be made to determine whether the proposed water diversions will further dry up springs throughout the Luluku area. It may be that many farmers do not need to make large diversions of water from the stream beds because there are many small springs located on their lands which serve to irrigate the banana crops. If these springs are dried up as a result of BWS well diversions, these farmers will become more dependent upon diversions of stream water under their riparian rights. Thus, it is important to analyze the relationship of the well diversions not only to stream flows but also to the impacts upon small springs throughout the area.

3. Adequate Data Must Be Obtained Even If The Project Proceeds.

At page 43 of the EIS a statement is made BWS is negotiating with the U.S.G.S. to monitor stream flow in the Luluku stream. The BWS should make a commitment to monitor stream flow on all of these streams in order to carry out its promises to regulate its withdravals in the event that stream flows, agriculture, or migratory waterbirds are adversely affected. The Ho'omaluhia reservoir was built at great expense, and it would be poor public policy to allow the public benefits of the reservoir as well as the bird sanctuary to be lost because of insufficient stream flows to preserve these improvements.

CONCLUSION

HUI MALAMA AINA O KO'OLAU has long been critical of BWS projects to develop water resources in the absence of actual data showing the effects of water withdraval upon stream flows. BWS policy appears to favor investment of large sums of money to develop water withdraval facilities and to put these facilities into operation so that the public comes to depend upon these sources of water. When it is later determined that these facilities in fact do result in the diminishment of stream flows, there is a great reluctance to cut back on water withdravals because of the large capital expenditures as well as the public reliance upon an established quantity of water. Such was the case in Waihe'e where the BWS claimed that it could not cut back on its water withdravals without jeopardizing its other sources or inconveniencing the public.

HUI MALAMA has raised this concern about wells affecting the Heeia Wetlands and has yet to be appraised of any followup data to establish a relationship between water withdravals and stream flow in that area. This EIS makes many promises to cut back upon diversions in the event that waterbirds, the Ho'omaluhia reservoir, or the farmers are affected. However, there is no way to insure that these promises will be honored. Thus, the accepting authority is left to rely upon BWS promises and must make the decision whether to accept this EIS in a vacuum. Similarly,

public funds will be committed to water development without actually knowing whether there will be any harm as a result of this project.

HUI MALAMA urges the BWS to provide more complete data about the competing needs before finalizing this EIS. Furthermore, HUI MALAMA urges the Board of Land and Natural Resources to carefully consider the deficiencies in this EIS before granting a conservation district use permit for this development.

Thank you for the opportunity to comment on this EIS.

Sincerely,

RONALD ALBU
Attorney for
HUI MALAMA AINA O KO'OLAU

A-55

cc: Board of Water Supply
VTN Pacific

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 18, 1984

RECEIVED
JAN 24 1984
VTN PACIFIC

Mr. Ronald Albu
Attorney for Hui Malama
Aina O Ko'olau
Legal Aid Society of Hawaii
47-200 Waihee Road, Room 104
Kaneohe, Hawaii 96744

Dear Mr. Albu:

Subject: Your Letter of November 8, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

In response to your comments, we offer the following:

1. As indicated in the Draft EIS, in 1982, the department's Luluku Tunnel developed an average of about 0.90 mgd and the Kuou Well I developed about 2.00 mgd. At one time, most of this ground water may have shown up as stream flow. However, the only reliable way to determine impacts on streams is to correlate stream flow with rainfall in the watershed before and after installation of water wells and tunnels. Because of agricultural stream diversions, adequate "before" and "after" data is not available for computer modeling of changes in the flow of Kamooalii Stream and tributaries due to the department's facilities.

   On page 43, the Draft EIS attempts to quantify the worst case long-term dry-weather impact of maximum pumping from the proposed Kamooalii Watershed Wells, an impact which may never occur.

2. The revised impact statement will include information provided by Fred Shiroma about use of stream water by Luluku banana growers. The legal rights on stream flow diversion will be observed

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

when we are ready to proceed with the well projects.

The revised impact statement will mention that the proposed wells may reduce seepage of ground water into Luluku-area banana groves. Unfortunately, it is not possible to evaluate the extent or importance of such seepage. Banana groves above an elevation of 300 feet probably are mauka of any dry weather ground water springs.

3. The department is committed to protecting water related facilities in Ho'omaluhia Park and to implementing any instream flow standards adopted by the Department of Land and Natural Resources (DLNR), State of Hawaii. With one exception, the Draft EIS accurately describes the department's plans for stream flow monitoring. The revised impact statement will indicate that if test-pumping of exploratory wells causes immediate impacts on Luluku Stream, then the department will negotiate with the U. S. Geological Survey to establish a permanent gage in Luluku Stream to monitor the effects and then take appropriate actions. If the dike reservoir to be penetrated by the Luluku wells is hydraulically connected with a higher dike reservoir discharging into Luluku Stream, then pumping of the wells may affect stream flow. Otherwise, since Luluku Stream gains almost no base flow below the 520-foot elevation, the Luluku wells should not affect stream flow.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

A-56

c/o P. O. Box 475
Kaneohe, Hawaii 96744

November 6, 1983

RECEIVED
NOV 8 1983
VTN PACIFIC

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

The Luluku Banana Growers have reviewed the environmental impact statement for Kamooalii Watershed Wells and would like to make the following comments. We have noticed that throughout the many years we have been farming in the Luluku area, our stream flows have been reduced considerably due to water wells and increasing demand for water. The Luluku and Kuou streams which a number of us use for irrigation and pesticide spraying have been reduced drastically or dried up. Many years ago farmers along the Luluku stream growing taro had to abandon taro production due to the construction of the Luluku well causing reduced water flow. Consequently, we are concerned that additional well construction will have the same affects. Will it?

Thank you for the opportunity to comment.

Respectfully yours,

Luluku Banana Growers

cc: Mr. Kazu Hayashida
VTN Pacific
Mr. Jack Suwa
Hawaii Farm Bureau Federation
Oahu Banana Growers' Association

LULUKU BANANA GROWERS

Agnes Gonzales

Ethel Y. Higa

Anthony Sanchez

Lopez Ukeru

Stanley Abe

Richard K. Smith

Richard Fernandez Garcia

Shigeharu Shisuma

A-57

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

January 11, 1984

RECEIVED
JAN 17 1984
VTN PACIFIC

Luluku Banana Growers
c/o P. O. Box 475
Kaneohe, Hawaii 96744

Gentlemen:

Subject: Your Letter of November 6, 1983, on the Draft Environmental Impact Statement (EIS) for Kamooalii Watershed Wells

Thank you for reviewing the Draft EIS for our proposed water development project. Your letter will be appended to the revised impact statement.

The existing Luluku tunnel and Kuou Wells I have affected the flow of Luluku and Kuou Streams. As indicated in the Draft EIS, Kuou Wells II may affect Kuou Stream, but is unlikely to affect Luluku or Kamooalii Streams because of the wells' distance from the streams. Luluku Well is unlikely to affect Luluku Stream because flows originate from springs located below the well site and from leakages from Luluku tunnel. However, as noted in the Draft EIS, the department will take appropriate actions if the pumpages from the wells are found to have a significant effect on stream flows.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific

HOUSE OF REPRESENTATIVES
THE TWELFTH LEGISLATURE
STATE OF HAWAII
STATE CAPITOL
HONOLULU, HAWAII 96813

RECEIVED
NOV 7 1983
VTN PACIFIC

November 3, 1983

Ms. Letitia Uyehara
Acting Director
Office of Environmental Quality Control
550 Halekauwila St. #301
Honolulu, Hawaii 96813

Dear Ms. Uyehara,

I would like to raise one question with regards to the EIS for the Kamooalii Watershed Wells in Kaneohe. The water from these wells is intended primarily to serve the Honolulu area, as is true of most of the wells projected for Windward Oahu, because water development in most other areas of the island is severely restricted by the Groundwater Control Act.

In 1980, the Department of Land and Natural Resources, in administering the Groundwater Control Act, limited Oahu Sugar Company to 115 million gallons daily. Since that time the company has phased out 5,000 of the 18,000 acres it had in cane production. Has any consideration been given to diverting the water made available by this cutback to domestic usage? The amount should be approximately 30 mgd.

I would appreciate receiving any information you might have on this subject.

Yours truly,

Robert S. Nakata

Robert S. Nakata
Representative, 43rd District

RSN:ah

cc: Kazu Hayashida, Chief Engineer, BWS
VTN Pacific

A-58

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

November 22, 1983

RECEIVED
DEC 1 1983
VTN PACIFIC

The Honorable Robert S. Nakata
House of Representatives
The Twelfth Legislature
State of Hawaii
State Capitol
Honolulu, Hawaii 96813

Dear Representative Nakata:

Subject: Your Letter of November 3, 1983 to the Office of Environmental Quality Control on the Kamooalii Watershed Wells EIS

Thank you for your comment on our EIS.

Because the 5,000 acres of abandoned cane lands are in the ground water control area administered by Department of Land and Natural Resources (DLNR), the amount of water that may be available for other uses must be determined by DLNR. However, a major portion of the water pumped by Oahu Sugar Company is not of potable quality and, therefore, any water released by Oahu Sugar Company may not be suitable for domestic use. Until the amount and quality of water are known, the Board cannot plan for the use of the water.

If you have any other questions, please contact me at 527-6180.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Mr. Susumu Ono, DLNR
VTN Pacific
Legislative Liaison Office

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840

RICHARD L. O'CONNELL, P.E.
MANAGER, ENVIRONMENTAL DEPARTMENT
[808] 548-6888

October 28, 1983

ENV 2-1
NV/6

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Kamooalii Watershed Wells -
Environmental Impact Statement

We have reviewed the Kamooalii Watershed Wells Environmental Impact Statement and offer the following comments:

1. We have five (5) 138 kv lines consisting of wood pole structures, steel poles, and steel towers, some of which have anchoring systems located within the Kamooalii watershed area. Although no details of the proposed access roads and trenching for the new water mains are given, we request that the BWS coordinate their design with HECO wherever any of their proposed construction approaches within fifty (50) feet of HECO's facilities. This would ensure HECO that their construction will not erode or weaken the soil surrounding the anchors, steel pole foundations, steel structure grillages, or wood poles.

2. No details are available for the electrical facilities required for the pumps. Any overhead or underground power lines through the conservation district may require a separate EIS if not addressed in this EIS. It is HECO's position that it is the developer's responsibility to provide the necessary new easements as well as submit appropriate CDUA's on HECO's behalf.

3. The EIS does not address the HECO transmission circuits in the area of the proposed wells nor does it address the electrical and other infrastructures that would be required to provide service to the proposed wells. We note that HECO

was not given the opportunity to comment on the EIS Preparation Notice. Our comments would have covered these areas of concern.

Sincerely,

Richard L. O'Connell
Manager, Environmental Department

SLC:cal

cc: Mr. Kazu Hayashida
Manager & Chief Engineer
Board of Water Supply

VTN Pacific ✓

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

December 19, 1983

RECEIVED
DEC 23 1983
VTN PACIFIC

Mr. Richard L. O'Connell, P.E.
Manager, Environmental Department
Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840

Dear Mr. O'Connell:

Subject: Your Letter of October 28, 1983 Commenting on our Draft Environmental Impact Statement (EIS) for the Kamooalii Watershed Wells

A-60

Thank you for your comments on our Draft EIS.

Our responses are as follows:

1. We shall coordinate the design of our water system for the four proposed wells with HECO so as not to affect your facilities.

2. The estimated electrical power requirements have been discussed with HECO's utility engineers and we are jointly working out preliminary services for our well fields. All utility lines and appurtenances required for the operation of our facilities will be included in the Revised EIS and in our filing of the CDUA.

3. We will note in the Revised EIS that the HECO power lines serving our facilities will follow either our roadway-pipeline alignment or as recommended by HECO's utility engineers. Also, power lines will be overhead except where burial may be required.

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CITY AND COUNTY OF HONOLULU

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If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

for KAZU HAYASHIDA
Manager and Chief Engineer

cc: VTN Pacific, Inc.

APPENDIX B

AQUATIC FAUNA SURVEY

Biological Reconnaissance of Kaneohe Stream and Two of Its Tributaries; Luluku and Kamocalii, Oahu

by

Amadeo S. Timbol, Ph. D.
Aquatic Biologist

(Submitted to VTN, Honolulu)

Introduction

The Kaneohe stream system, located in Kaneohe town, is comprised of Kaneohe mainstream and six major tributaries. The headwaters lie on the windward side of the Koolau Mountain Range, within the Kaneohe Forest Reserve. Its water comes primarily from rainfall, vadose water and springs. During freshets, water cascades from the Koolaus provide several temporary, spectacular waterfalls. In general, the stream bed becomes wider downstream.

This stream system has been subjected to more alterations in the past five years than any other stream on Oahu. This is due to considerable urban development in its drainage basin which has encroached to the flood plain. The almost complete Keapuka dam which is expected to provide protection from flood had closed part of Kamocalii tributary, all of Kuou, Hooleinaiwa, and two unnamed tributaries (see Appendix A). Previous to this, nearly 25% of the total 28 km channel length had been modified (Timbol and Maciolek 1978). During this study (March through May 1979), the stream beds on Kamocalii in which Stations 2 and 3 are located (refer to Appendix A for locations) were cleaned with bulldozer and payloader. The concrete-lined channel on Luluku in which Station 4 is located was shoveled clean.

The objectives of this study are: (1) to determine the presence or absence of endangered and/or threatened species in Kaneohe mainstream and Kamocalii and Luluku tributaries; (2) to compile a list of resident aquatic and semi-aquatic macrofauna; (3) to determine macrofaunal distribution and abundances; and (4) to make an assessment of the stream system's ecological quality status on the basis of its biological and physical features.

Previous studies include those by Ford (1974), Norton (1977), U. S. Fish and Wildlife Service (1977), Norton, et al. (1978) and Timbol and Maciolek (1978).

Methods

Five stations were selected: 1 at Kaneohe Stream, 2 at Kamocalii, and 2 at Luluku. A stretch of 20 x 1 m of stream channel was pre-measured and animals which could be seen were identified and counted. Some specimens were caught with a hand net, identified and counted, and released live at the same site. Boulders, rocks, and stones were examined for native mollusks (e.g. Neritina granosa or hihiwai, Theodoxus vespertinus or vi). This

method was supplemented by walking the accessible stream channel and checking for species that have not been collected or seen.

For purposes of this report, abundant (+++) means many individuals, from 6 to 100 or more. Common (++) indicates that between 2 and 5 were observed or caught, while uncommon (+) means that only one was sighted or caught. Absent (0) means it was neither seen nor collected.

Terms used in the text are: depleted which means that the organism is still found in numbers adequate for survival but has been heavily depleted and continues to decline substantially (Miller 1972); threatened species include those which are endangered, rare, or depleted; endemic means occurring naturally in Hawaii only; indigenous means occurring naturally in Hawaii and elsewhere; introduced means that the animal was brought to Hawaii either accidentally or intentionally; and native includes both indigenous and endemic animals.

The biota list was checked for endangered and threatened species using the following list and scientific publication: USFWS List of Endangered and Threatened Species (1977), and Miller (1972).

Results and Discussion

Results of this study are based on two to three samplings in each station from March through May 1979. In stream macrofauna inventorying in Hawaii, most workers (Ford 1974, USFWS 1977, Norton et al., 1978, Timbol and Maciolek 1978) rely heavily on backpack, pulsating, electroshocking units. With this method, animals were not considered collected unless they were caught. Species seen but not caught were, however, included in the list of species. In this study, visual observation-hand netting was used. All individuals sighted were counted and included in abundance data. Each method has its advantages. Electroshocking allows detection and capture of species that are hidden diurnally (e.g. dojo or Misgurnus anguillicaudatus, Chinese catfish or Clarias fuscus). Visual observations is more "efficient" on non-secretive species such as o'opu nakea (Awaous stamineus) and poeciliids (e.g. the top-minnow or Poecilia mexicana). Such special characteristics should be taken into consideration in assessing the following results.

Results indicate at least 14 species of aquatic and semi-aquatic animals are in Kaneohe mainstream and Luluku and Kamooalii tributaries. These are: 4 fish, 2 amphibia, 4 crustacea, 1 mollusk, 1 annelid, and 2 insect species. Of these, only one species is endemic and two are indigenous or roughly, only 20% of the animal residents are native to Hawaii. Table 1 is a list of macrofauna for the stream system and Table 2 shows their distribution and abundances.

Station 1.

Located downstream of Kamehameha highway bridge by the Kaneohe Library, it is 1.7 km from the stream mouth at 20 m elevation (see Appendix B for summary of physical features of all five sampling stations). Samplings were made on natural stream bed and insect larvae were collected on concrete-lined bottom by the bridge.

Table 1. List of Aquatic Macrofauna in Kaneohe Stream and Two of Its Tributaries; Luluku and Kamooalii, Oahu (March-May 1979).

Scientific Name	Local Name	Origin	List[1]
A. Fish			
Gambusia affinis	mosquitofish	introduced	none
Poecilia mexicana	topminnow	introduced	none
Poecilia reticulata	wild guppy	introduced	none
Xiphophorus helleri	swordtail	introduced	none
B. Amphibia			
Bufo marinus	toad	introduced	none
Rana castebiana	bullfrog	introduced	none
C. Crustacea			
Atya bisulcata	o'pae kala'ole	endemic	none
Macrobrachium gandimanus	o'pae o'eha'a	indigenous	none
Macrobrachium lar	Tahitian prawn	introduced	none
Procambarus clarkii	crayfish	introduced	none
D. Mollusk			
Melania sp.	pond snail	indigenous	none
E. Annelid			
Hirudinea	leech	unknown	none
F. Insecta			
Trichoptera:			
Hydroptilidae larvae	microcaddisfly	introduced	none
Diptera: Enphididae			
Hemerodromia sp. larvae	cranefly	introduced	none

1 Refers to Endangered and Threatened Species Lists prepared by the USFWS (1977) and by Miller (1972).

Table 2. Distribution and Relative Abundances of Aquatic Macrofauna in Kaneohe Stream and Two of Its Tributaries; Luluku and Kamocalii, Oahu (March - May 1979: +++ = abundant, ++ = common, + = uncommon, 0 = absent or not seen).

Scientific Name	Sampling Station 1	2	3	4	5
A. Fish					
Gambusia affinis	++	0	+++	0	0
Poecilia mexicana	+++	+++	+++	+++	0
Poecilia reticulata	0	++	+++	++	++
Xiphophorus helleri	++	+++	+++	++	++
B. Amphibia					
Bufo marinus	+	0	+	0	0
Rana castebiana	0	0	+	0	+
C. Crustacea					
Atya bisulcata	++	0	0	0	++
Macrobrachium grandimanus	+++	0	0	0	0
Macrobrachium lar	++	0	++	0	0
Procambarus clarkii	++	++	+++	0	++
D. Mollusk					
Melania sp.	+++	+++	+++	+++	+++
E. Annelid					
Hirudinea	+++	0	+++	0	0
F. Insecta					
Hydroptilidae	++	0	0	0	0
Hemerodromia sp.	+	0	0	0	0

There were 11 species at this site. Two of these are insect larvae which properly belong to microbenthic type but are included in this report since they are the first collection on concrete-lined channel. Both insect species are uncommon even on natural stream beds. Of the remaining nine species, only three are natives (o'pae kala'ole or Atya bisulcata, o'pae o'eha'a or Macrobrachium grandimanus, and pond snail, Melania sp.). Poecilia mexicana, an introduced species, is the dominant fish, the o'pae o'eha'a is the dominant crustacean and the native pond snail, the dominant benthic animal. The endemic o'pae kala'ole have diminished in numbers from 1975 when it was abundant (Timbol and Maciolek 1978, p. 125).

Not found in this study are the endemic fishes, o'opu nakea (Awaous stamineus) and the goby-like o'opu okuhe (Eleotris sandwicensis) which have been collected previously by Ford (1974), USFWS (1977), Norton et al. (1978) and Timbol and Maciolek (1978). Since o'opu nakea is not difficult to find when present, it is possible that it is now absent at this site (Later, a probable explanation is offered for its absence). The same is true with o'opu okuhe - it is not difficult to find. Also not found in this survey but previously collected (Timbol and Maciolek 1978) is the Chinese catfish (Clarias fuscus). Since this is a species that loves to hide and therefore hard to find by visual observation and hand netting, it may still be present at this site. In addition, Ford (1974) reported the presence of the introduced ricefield eel (Monopterus albus) but has not been found since. It is possible that this species is no longer present in the stream system. Lastly, Station 1 appears to be a dumping ground for unwanted aquarium pets. Timbol and Maciolek (1978) collected a pair of South American fish, Chiclasoma sp. This survey has not turned up any fish pets but it is possible that some are present.

Station 2.

This sampling station is on Kamocalii tributary upstream of Likelike Highway and downstream of Luluku street bridge. By stream channel length, it is 1.6 km from Station 1 at about 25 m elevation. It is on natural stream bed which was "cleaned" in April with a payloader.

Only five species were found, and only one is a native (Melania sp.). Stream bed cleaning had caused the death of some resident animals but had not appreciably decreased the abundance of the topminnow (P. mexicana). It was still the dominant fish at this sampling station although the swordtail (Xiphophorus helleri) was also abundant. The introduced crayfish (Procambarus clarkii) was the dominant crustacean and the native pond snail (Melania sp.) was the dominant mollusk. No amphibians, annelids and insect larvae - animals associated with riparian vegetation and substratum - were found. This is due to the recent cleaning of the stream bed.

Station 3.

Downstream of the Kamocalii-Luluku junction, it is 1.4 km upstream from Station 2, at about 35 m elevation. The sampling station is on Kamocalii Stream, immediately downstream of the Keapuka dam spillway.

There were 10 species found at the site. Only one is native (pond snail, Melania sp.) to Hawaii. Seven of these species were abundant and one, the introduced Tahitian prawn (Macrobrachium lar), is common. Frogs and toads are uncommon, probably due to the periodic cleaning of stream banks at this site (A bulldozer was used to clean these banks in in April through May). Another noticeable change from 1975 is the increase in the leech population.

Prior to construction of the Keapuka dam, the endemic o'pae kala'ole (A. bisulcata) was abundant and the endemic o'opu nakea (A. stamineus) was common at this particular site (USFWS 1977, Timbol and Maciolek 1978). During this study, none were seen nor caught even after repeated efforts to collect them. However, the after-effects of construction activities have not adversely affected the abundances of exotic fish residents. The four poeciliid species were as abundant now.

Sometime is 1978, our attention was called by Phil Johnson, then resident of Keapuka subdivision, about a "fish kill" at Kamooalii Stream in what is between Stations 3 and 4. Among the dead fish were several o'opu nakea. Figures 1-a and 1-b are photographs taken at that time. Note that the o'opu nakea are the sizes of juveniles and young adults. To give the reader an idea of their sizes, a collection in September 19, 1975 from this particular stretch of stream channel included nine o'opu nakea ranging from 3.2 to 16.5 cm standard length, the largest of which weighed 61.5 grams, live weight.

Station 4.

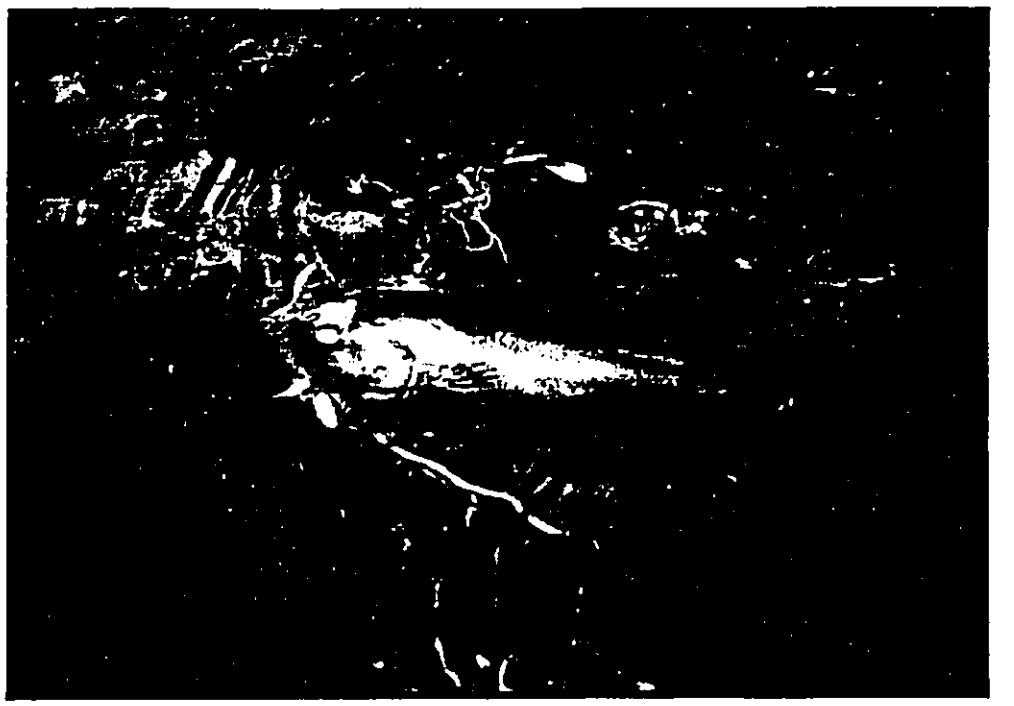
About 400 m upstream from Station 3 at about 40 m elevation, Sation 4 is on a stretch of concrete-lined channel on Luluku Stream. In March and April, the stream bed was mud and silt on concrete cement bottom. Grass lined one side of the channel. In May, the station was shoveled clean. The station is now on "algae-coated concrete cement."

Four species were found but only one was native to Hawaii (pond snail, Melania sp.). Concrete-lined channel seem to favor the topminnow (P. mexicana) as it was the only fish found in abundance. Mosquitofish (Gambusia affinis) which was abundant in Station 3, was absent at this station.

Station 5.

Situated about one-half kilometer farther upstream from Station 4 at about 48 m elevation, Station 5 is on natural stream bed of Luluku Stream. The stream is narrow (ca. 1 m wide) and the bottom is of mud and silt. Part of the station is under hau (Hibiscus tiliaceus). Other riparian vegetation includes job's tears (Coix lachryma-jobi) and California grass (Brachiaria mutica).

Five species were found and two of these species are native to Hawaii (A. bisulcata and Melania sp.). In contrast with Station 4 where no decapod crustaceans were found, two species were present at Station 5. However, except for the native pond snail (Melania sp.), none of the species was abundant.



1-a

1-b

Fig. 1. Dead o'opu nakea (Awaous stamineus), part of the 1978 "fish kill" at Kamooalii Stream. The "kill" possibly wiped out the nakea population at Kamooalii Stream downstream of the Keapuka dam construction site.

Summary and Conclusions

Some preliminary generalizations can be made in this study. There are at least 14 species of freshwater animals in Kaneohe mainstream and Luluku and Kamooalii tributaries. Only three species or about 20% of the total are native to Hawaii.

There are no endangered or threatened species in Kaneohe mainstream and Luluku and Kamooalii tributaries.

There is an increase in number of species in a downstream direction, from 5 species at Luluku to 10 at Kamooalii to 12 at Kaneohe.

Habitat alteration through direct destruction appears to be responsible for the absence of the endemic goby, o'opu nakea (Awaous stamineus). Prior to the construction of the Keapuka dam and the constant cleaning of stream beds and banks, the o'opu nakea was commonly found. Another endemic animal that appears to be on the decline is the o'pae kala'ole (Atya bisulcata).

Habitat alteration appears to favor the introduced animals. The top-minnow (Poecilia mexicana) was as abundant now as it was in 1975 when the stream was in a comparatively natural state.

The Kaneohe stream system have been given by Timbol and Maciolek (1978) an ecological quality status of III, meaning it has moderate to low natural and/or water quality. This appears to be more justified at this time since the biological quality of the stream has gone down as evidenced by the absence of endemic fish and the decrease in the population of the endemic o'pae kala'ole (Atya bisulcata). It is hoped that after the dam is completed, stream habitat destruction would cease and water quality would improve. When this happens, it is possible that the o'opu nakea (Awaous stamineus) will be able to re-establish in its former habitat and the o'pae kala'ole will increase in numbers. On the other hand, further destruction of remaining stream habitat coupled with a significant decrease in stream flow could result in further degradation of the stream system's ecological quality.

Literature Cited

Ford, J. I. 1974. Kaneohe-Keapuka Stream Survey and Flood Control Reservoir Morphology. Term paper for Zoology 470 (Limnology), Univ. Hawaii, Honolulu. Unpublished. 11 leaves.

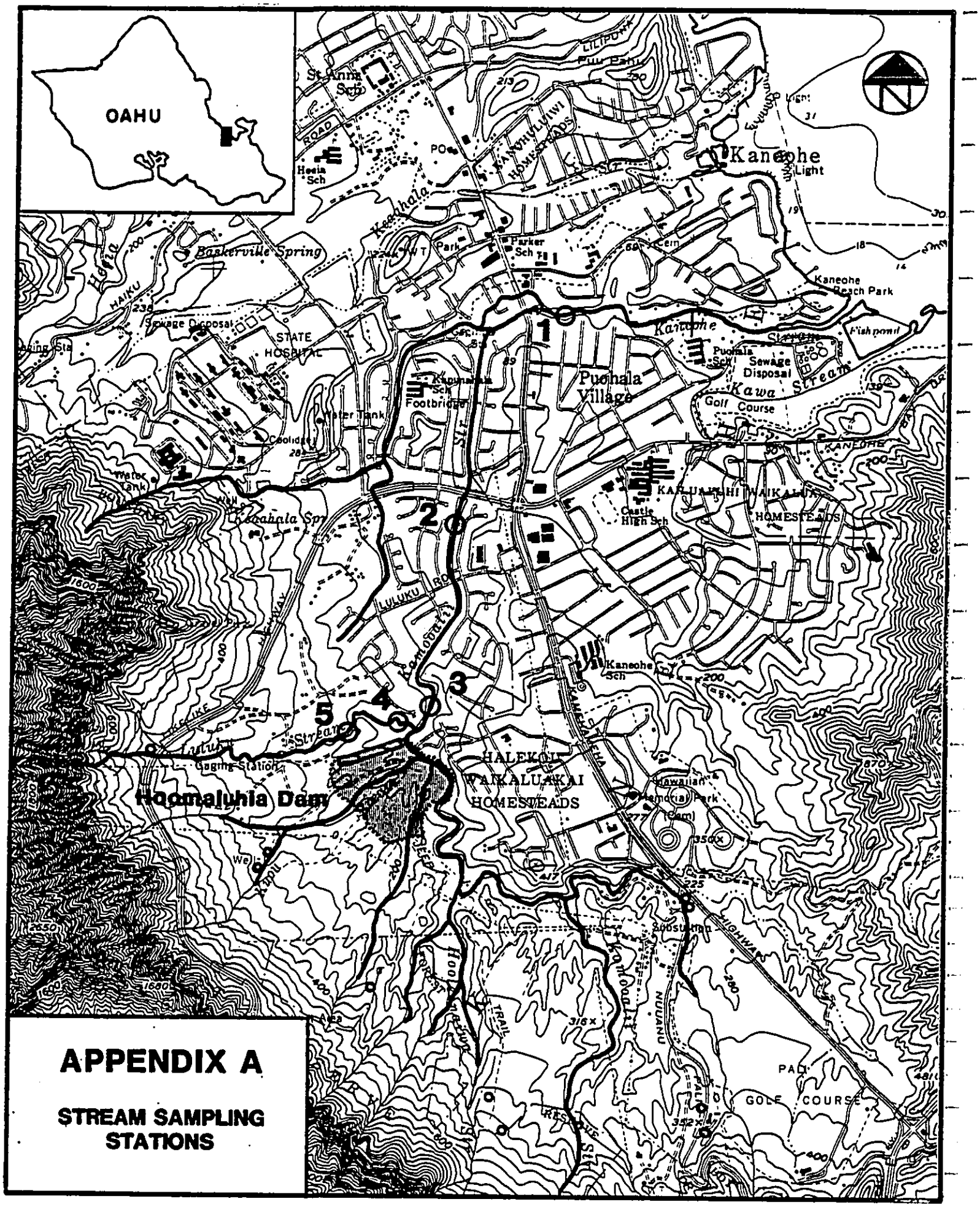
Miller, R. 1972. Threatened freshwater fishes of the United States. Trans. Am. Fish. Soc. 101:239-252.

Norton, S. E. 1977. A comparative study of fish and crustacean population in altered and unaltered Hawaiian streams. M. S. Thesis, Univ. Hawaii, Honolulu. 90 pp.

Norton, S. E., A. S. Timbol, and J. D. Parrish. 1978. Stream Channel Modification in Hawaii. Part B: Effect of Channelization on the Distribution and Abundance of Fauna in Selected Streams. FWS/OBS - 78/17. USFWS National Stream Alteration Team, Columbia, Missouri. 47 pp.

Timbol, A. S. and J. A. Maciolek. 1978. Stream Channel Modification in Hawaii. Part A: Statewide Inventory of Hawaiian Streams Including Survey of Habitat Factors and Associated Biota. FWS/OBS - 78/16. USFWS National Stream Alteration Team, Columbia, Missouri. 157 pp.

U. S. Fish and Wildlife Service. 1977. Endangered and Threatened Wildlife and Plants. Republication of List of Species. Federal Register Vol. 42, No. 135. Part V. July 14, 1977. pp. 36420-36431.


OAHU
Kaneohe
Kaneohe Light
Kaneohe Beach Park
Kaneohe Stream
Fishpond
Puohala Village
Puohala Sch
Sewage Disposal
Kawa Stream
Golf Course
Kaneohe Sch
Footbridge
Water Tank
Coolidge
Baskerville Spring
Keahala
Keahala Spr
Parker Sch
Park
Cem
Hoea Sch
St Anns Sch
PO
LILIPUNA
Pali Park
KANEOHE HOMESTEADS
KAHALUU HOMESTEADS
Castle High Sch
HALEKOU
KAKALUAKAI HOMESTEADS
Hawaiian Memorial Park
Hoomaluhia Dam
Gaging Station
Luluku
Stream
Kamooalii
Nuuanu
Pali
GOLF COURSE
Sewage Disposal
STATE HOSPITAL
HAIKU
Hoea
1
2
3
4
5
APPENDIX A
STREAM SAMPLING STATIONS

Appendix B

Some Physicochemical Characteristics of Sampling Stations in Kaneohe Stream and Two of Its Tributaries; Luluku and Kamocalii, Oahu (March - May 1979).

Sampling Station No., Location and Distance from Mouth *	Parameter		
	Water, Stream Flow	Nature of Bottom	Stream Metes
1. Kaneohe Stream 1.7 km	riffle, strong flow slightly turbid.	gravel	width = 10 m depth = 0.15 m
2. Kamocalii Stream 3.3 km	riffle, strong flow slightly turbid	gravel-silt	width = 6 m depth = 0.1 m
3. Kamocalii Stream 4.7 km	riffle, strong flow highly turbid.	gravel-silt	width = 2.7 m depth = 0.? m
4. Luluku Stream 5.1 km	riffle, slight flow slightly turbid	silt on concrete bottom	width = 1.4 m depth = 0.07 m
5. Luluku Stream 5.6 km	riffle, slight flow slightly turbid	mud-silt with rotting leaves	width = 1 m depth = 0.6 m

*Distance from mouth measured along stream channel from USGS topographic (Kaneohe) quad sheet.

APPENDIX C

ARCHAEOLOGICAL RECONNAISSANCE SURVEYS

CHINIAGO INC.
Archaeological Consulting

1040-B SMITH STREET • HONOLULU, HAWAII 96817 • TELEPHONE: (808) 521-2785

December 19, 1983

Mr. Douglas Meller
VTN Pacific
1164 Bishop Building
Suite 906
Honolulu, Hawaii 96813

Dear Mr. Meller:

On Friday, December 16, 1983, I accompanied you on an inspection of the locations of three proposed water wells in Kaneohe, Oahu. The two Kamooali'i locations are situated in the vicinity of the City and County maintenance yard on Nuuanu Pali Drive, adjacent to the Pali Golf course, and the third is situated on Luluku Stream immediately inland of Likelike Highway.

A literature search of the following sources revealed no previously-recorded archaeological or historical sites at these locations.

Rosendahl, Paul H.

1976 Archaeological Investigations in Upland Kaneohe. Department of Anthropology, Bernice P. Bishop Museum.

Handy, E. S. C.

1940 The Hawaiian Planter, Volume I. Bernice P. Bishop Museum Bulletin 161.

Sterling, Elspeth P., and Catherine C. Summers

1978 Sites of Oahu. Departments of Anthropology and Education, Bernice P. Bishop Museum.

Streck, Charles

1982 Archaeological Reconnaissance Survey for Route H-3 [Alternative A]. Kane'ohe, O'ahu, Hawai'i. Department of Anthropology, Bernice P. Bishop Museum.

Our field inspection also failed to reveal any such remains at any of the three locations. However, because the thick grass at the northernmost of the Kamooali'i locations could have obscured low walls or surficial evidence of midden deposits, we must recommend that all work at that location be monitored by an archaeologist. Monitoring will also be necessary at the Luluku site because, although nothing of archaeological or historical interest was seen on the site itself, the presence of a system of agricultural terraces on the alluvium opposite the proposed location indicates the possibility that sub-surface archaeological remains might be present.

If you have any questions, please do not hesitate to call.

Sincerely yours,

William Barrera, Jr.
President

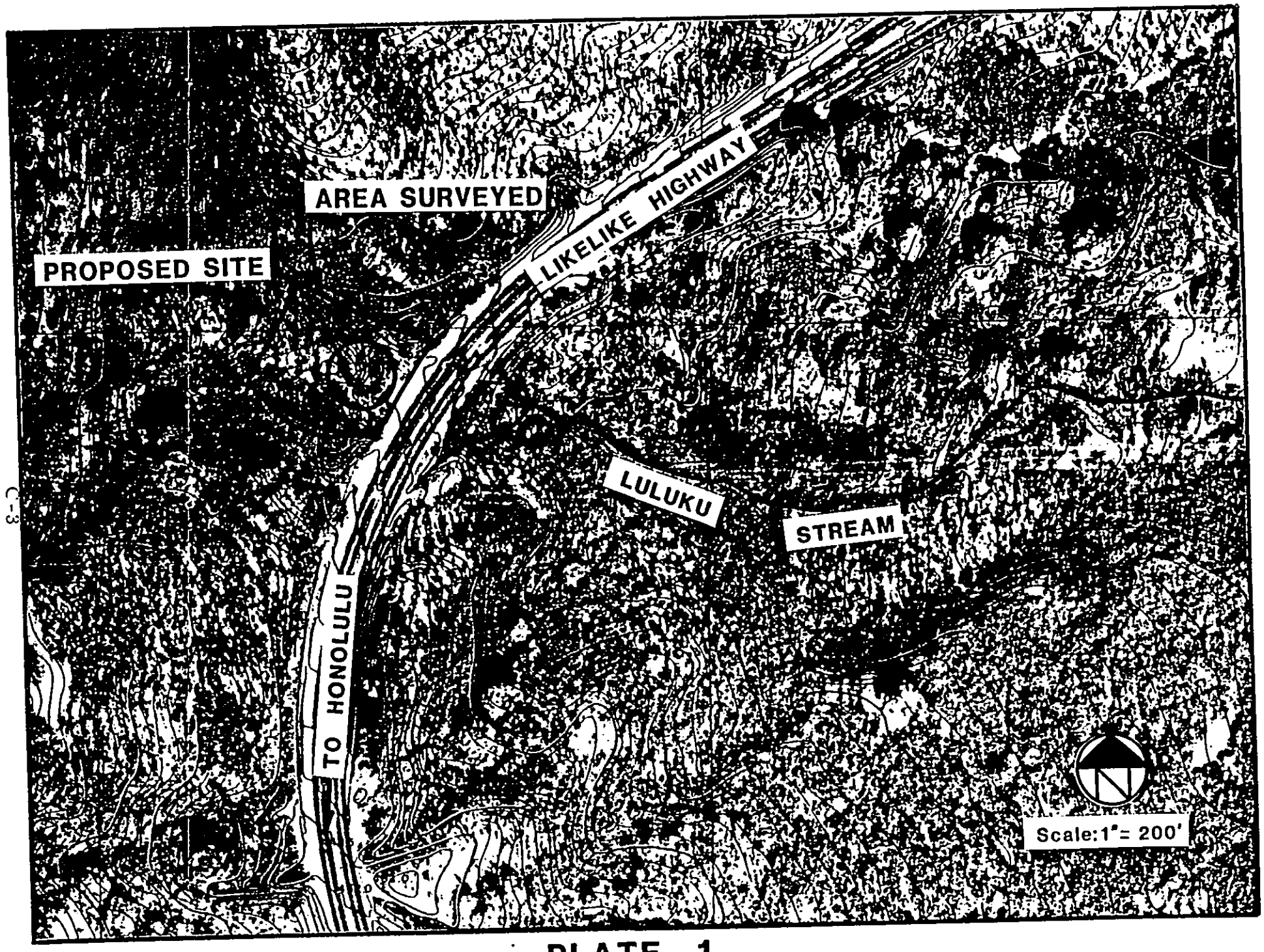


PLATE 1
LULUKU WELL FIELD SITE

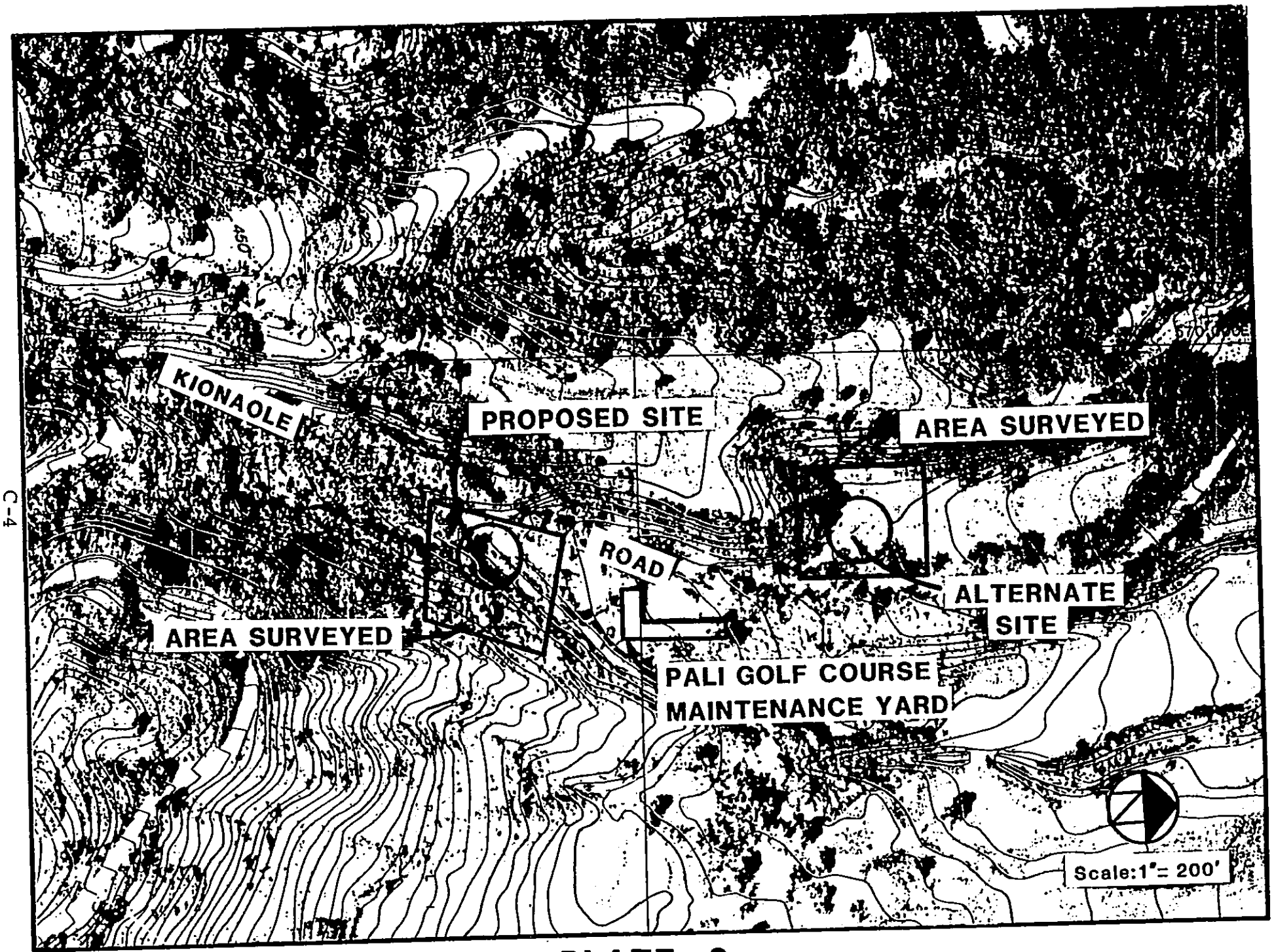


PLATE 2

ALTERNATIVE KAMOOALII II WELL FIELD SITES