

Kuou Well III

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843
PHONE (808) 527-6180
FAX (808) 533-2714



November 21, 1997

JEREMY HARRIS, Mayor
WALTER O. WATSON, JR., Chairman
MAURICE H. YAMASATO, Vice Chairman
KAZU HAYASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
JONATHAN K. SHIMADA, PhD
BARBARA KIM STANTON

RAYMOND H. SATO
Manager and Chief Engineer

Mr. Gary Gill, Director
Office of Environmental Quality Control
Central Pacific Plaza, 4th Floor
220 South King Street
Honolulu, Hawaii 96813

Dear Mr. Gill:

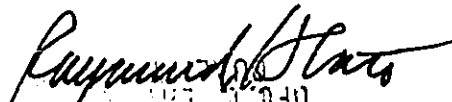
Subject: Finding of No Significant Impact for the Board of Water Supply's Proposed Kuou Well III, Kaneohe, Oahu, Hawaii, TMK: 4-5-41: 12

The Board of Water Supply (BWS) has reviewed the comments received during the public comment period which began on September 23, 1997. We have determined that the environmental impacts of this project have been adequately addressed as discussed in the final environmental assessment (EA) and are therefore, issuing a finding of no significant impact. We request that the proposed well project be published as finding of no significant impact in the next Office of Environmental Quality Control (OEQC) Bulletin.

Attached are the completed OEQC bulletin publication form and four copies of the final EA for your review.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,


RAYMOND H. SATO
Manager and Chief Engineer
11:28 52 NOV 26

Attachments

cc: Keith Uemura, ParEn, Inc.

RECEIVED

120

1997-12-08-0A-FEA-Kuou Well III

DEC 8 1997

FILE COPY

**FINAL
ENVIRONMENTAL
ASSESSMENT**

FOR

KUOU WELL III

This environmental document prepared pursuant to Chapter 343, HRS

Prepared for:
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

NOVEMBER 1997



ParEn, Inc. dba
PARK ENGINEERING

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- B. Pump Testing Data
- C. Water Quality Data
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I. EXECUTIVE SUMMARY

The Board of Water Supply (BWS) of the City and County of Honolulu is proposing to construct the Kuou Well III pumping facility at the base of the Koolau Mountain Range in Kaneohe. This facility will include a deep well pump and pump building, a separate control building, a breaker reservoir, an access road, an 8-inch transmission main and other appurtenant piping. It is expected that the facility will be capable of providing another 720,000 gallons of high quality drinking water each day to the Windward Low Service System. This system provides water to BWS customers from Kailua to Punaluu. Construction of the Kuou Well III facility is scheduled to commence in 1998 at an estimated cost of 1.9 million dollars.

In compliance with the environmental review process for developing this facility, an Environmental Assessment (EA) has been prepared. The Environmental Assessment is a preliminary document prepared to determine if a particular action has potentially significant environmental impacts. After a review of the EA by various governmental agencies and other interested organizations or individuals followed by a formal comment period, either the proposing agency or approving agency determines whether or not an Environmental Impact Statement (EIS) will be required.

Based on the findings of this EA, it has been concluded that an EIS is not required at this time. Short term impacts such as the release of dust and noise can be expected as a result of construction activity. These impacts can be mitigated by strict adherence to applicable guidelines set by the State Department of Health.

Noise generated from the operation of the pump and motor unit may have a long term impact on the area. However, the pump building containing the pump and motor unit will be silenced with a muting system. Sound levels will be reduced to conform to levels set by the State Department of Health. Another potential long term impact on the environment is the effect of groundwater withdrawals on surface water flows. Extended pumping, especially during the dryer summer months, may result in a reduction in dike fed stream flow. In order to mitigate any adverse effects on local streams, the BWS will honor instream flow standards by reducing or ceasing groundwater production as directed by the Department of Land and Natural Resources.

II. SUMMARY INFORMATION

CHAPTER 343, HAWAII REVISED STATUTES (HRS)
ENVIRONMENTAL ASSESSMENT

Proposing Agency: Board of Water Supply
City & County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Accepting Agency: Department of Land and Natural Resources

Prepared By: ParEn Inc. dba Park Engineering
567 South King Street Suite 300
Honolulu, Hawaii 96813

Project Name: Kuou Well III

Project Description: The proposed project involves the design and construction of a pump building, control building, breaker reservoir, appurtenant piping, access road and transmission main.

Project Location: Kaneohe, Oahu (See Figure 1)

Tax Map Key: 4-5-41:por. 12

Land Area: Project site approximately 9,760 square feet
Access easement approximately 12,000 square feet

State Land Use Designation: Conservation

Land Owner: City and County of Honolulu (Lessor)
Harry Yamashiro and Thelma Uechi (Lessee)

Public Facilities Map: Not Designated

DP Land Use Map: Park

Existing Usage: Banana Plantation

County Zoning: P-1, Restricted Preservation District

III. AGENCIES TO BE CONSULTED DURING THE DRAFT EA REVIEW PERIOD

Federal:

U. S. Army Corps of Engineers - Pacific Ocean Division
U. S. Department of Agriculture - Natural Resources Conservation Service
U. S. Department of the Interior
Fish and Wildlife Service
Geological Survey

State of Hawaii:

Department of Land and Natural Resources
Commission on Water Resource Management
Aquatic Resources Division
Historic Preservation Division
Land Division
Department of Health
Office of Environmental Quality Control
Environmental Management Division
Safe Drinking Water Branch
Noise, Radiation, and Indoor Air Quality Branch
Clean Water Branch
Department of Transportation
University of Hawaii - Environmental Center
Office of Hawaiian Affairs

City & County of Honolulu:

Department of Land Utilization
Department of Public Works
Planning Department
Building Department
Department of Parks and Recreation

Other:

Kaneohe Neighborhood Board No. 30
Councilman Steve Holmes
Representative Terrance Tom
Senator Marshall Ige

IV. PERMITS REQUIRED

1. Conservation District Use Application - Department of Land and Natural Resources
2. Pump Installation Permit - Commission on Water Resource Management (CWRM)
3. Water Use Permit - CWRM
4. Noise Permit - Department of Health (DOH)
5. Engineering Report - DOH
6. National Pollutant Discharge Elimination System (NPDES) Permit for Hydrotesting Water - DOH

V. PROJECT DESCRIPTION

A. Background

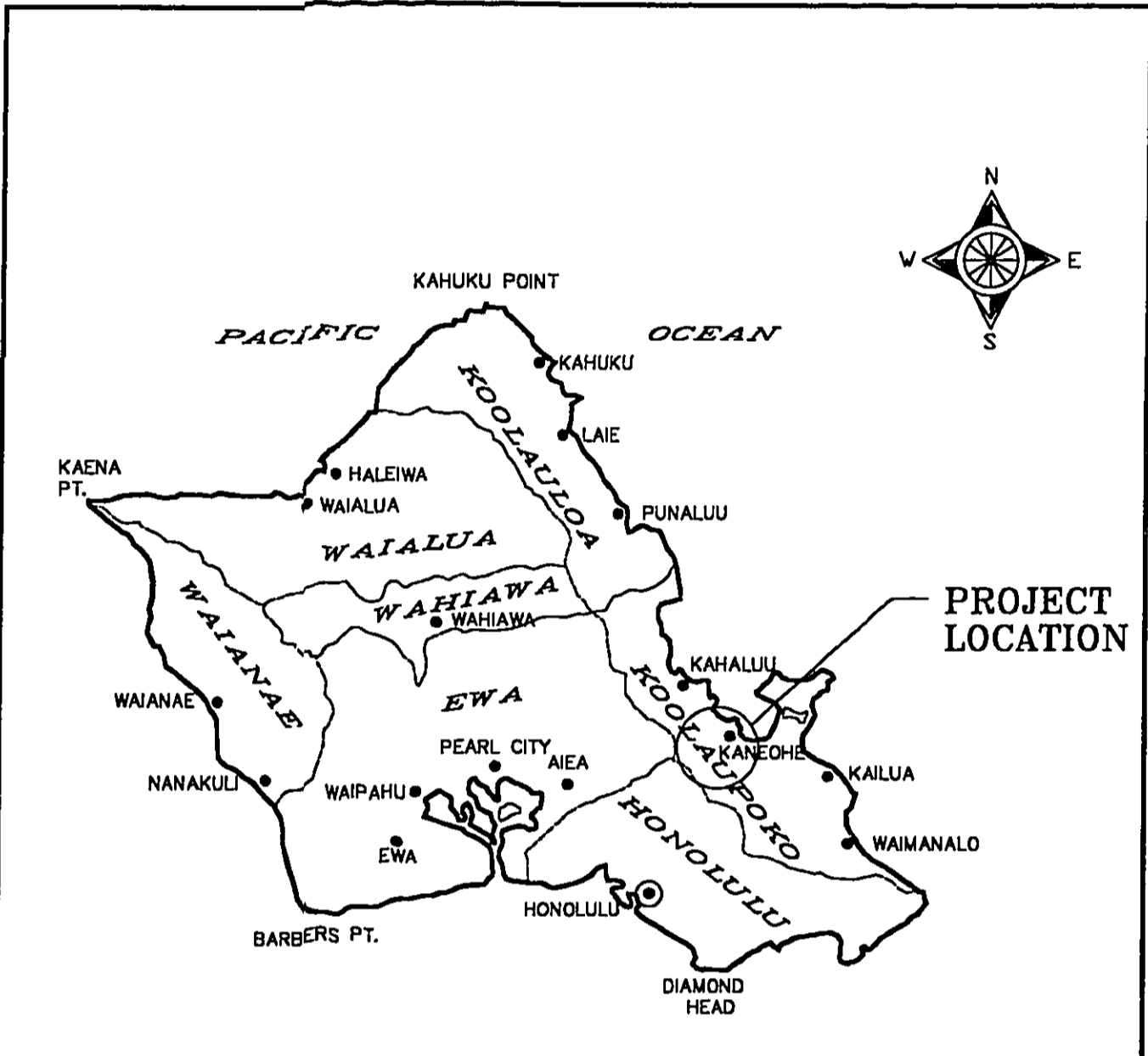
In its efforts to meet the drinking water needs of the expanding population base on the island of Oahu, the BWS is implementing its Windward Oahu Regional Water System Improvements program. The program was developed to meet the growing needs for drinking water anticipated with the increase in population, which is expected to exceed one million by the year 2000. Based on historical trends and projections for future population growth by the City and County of Honolulu's Planning Department, the additional requirements for drinking water for the island of Oahu should increase by roughly 25 million gallons per day (mgd) each decade.

Although the bulk of the population expansion will occur in the Ewa and primary urban center of Oahu, groundwater withdrawals from the Pearl Harbor and Honolulu basal aquifers are approaching the sustainable yields. In some subareas within these basal aquifers, the sustainable yields may have already been reached or exceeded. In contrast, the Windward and Northern aquifers are currently at less than 50% of the potential yield. Groundwater production from Windward sources may exceed the future demand of the Windward district, which is a low growth area according to the Development Plan. The surplus can be used to supplement drinking water needs in east Honolulu and the primary urban center. This would alleviate the need for leeward water to be exported to Honolulu and can therefore be used to meet the increased demands in Ewa. The reasonable and beneficial transport of excess water supply from Windward to East Honolulu will allow the Windward area to remain rural in accordance with the Development Plan.

Development of the Kuou Wells is part of this Windward Oahu Regional Water System Improvements program. Kuou Well III is the third and final well installation for the area adjacent to Kuou Stream in Hoomaluhia Botanical Garden. When completed, it will be capable of providing 0.72 mgd to the supply picture.

B. Project Location

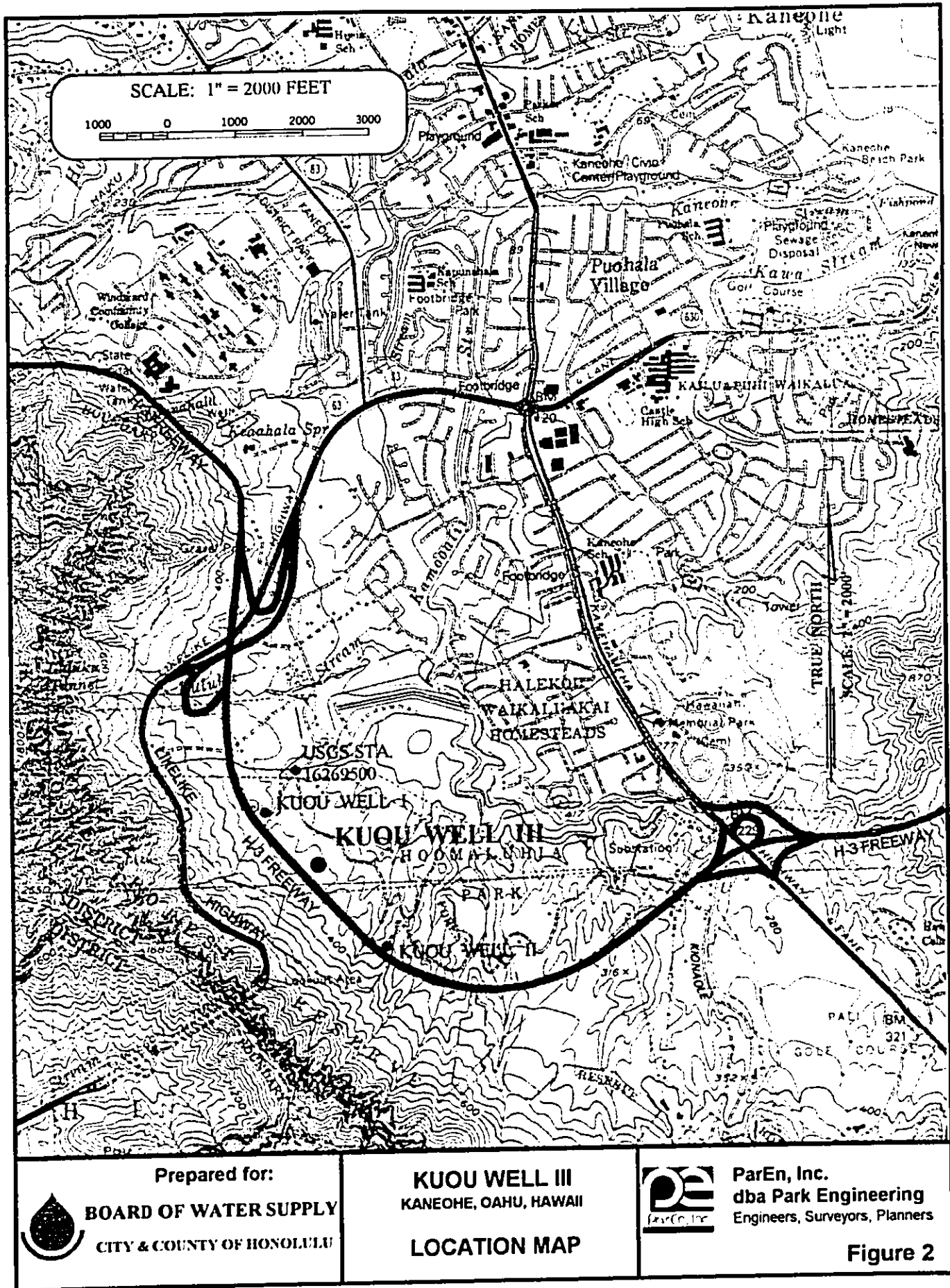
In its current state, Kuou Well III is an exploratory well located on the Windward side of the island of Oahu between Hoomaluhia Botanical Gardens and the Kaneohe Forest Reserve. It is 50 feet to the northeast of Interstate Route H-3 Right-of-Way and is approximately 4,000 feet to the south of the freeway's Likelike Interchange. The exploratory well is situated on a 5.686 acre parcel owned by the City and County of Honolulu that is currently leased to a private farmer for the cultivation of bananas. A vicinity and location map of the well site is attached as Figures 1 and 2.



ISLAND OF OAHU

NOT TO SCALE

 <p>Prepared for: BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU</p>	<p>KUOU WELL III KANEOHE, OAHU, HAWAII</p> <p>VICINITY MAP</p>	 <p>ParEn, Inc. dba Park Engineering Engineers, Surveyors, Planners</p> <p style="text-align: right;">Figure 1</p>
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C. Technical Characteristic

Plans by the BWS call for developing the exploratory well into a full production well facility. The exploratory well, which was completed in June 1995, was drilled to a depth of 566 feet with a 12-inch diameter casing measuring 230 feet in depth. An "As-Built" well section of the exploratory well is provided as Figure 3.

Development of the well into a production source entails installation of a deep well production pump and appurtenant piping and construction of a pump building, control building and breaker reservoir. All the components of the facility will be contained within a new parcel measuring 131 feet x 74.5 feet created for Kuou Well III. Access to the facility will be through a 12 feet wide road located within a new 20 feet wide access and utility easement. This access connects the facility to the main park access road for Hoomaluhia Botanical Garden. Approximately 600 linear feet of 8-inch transmission main will be placed within the easement to connect the facility to the existing 12-inch main servicing the existing Kuou Wells. A site plan for the proposed facility is provided as Figure 4.

When constructed, Kuou Well III will become a part of the BWS Windward Low Service System with an operating head of 272 feet. Well III is physically located approximately 1,000 feet southeast of Kuou Well I and 1,700 feet northwest of Kuou Well II. Upon completion of Well III, total installed pump capacity from all three Kuou Wells will increase from 4.03 mgd to 4.75 mgd. Current groundwater extraction governed by the permitted use for Kuou Wells I and II are set at 2.969 mgd and 0.245 mgd, respectively. At the present time it is not known what the permitted use for Kuou Well III will be.

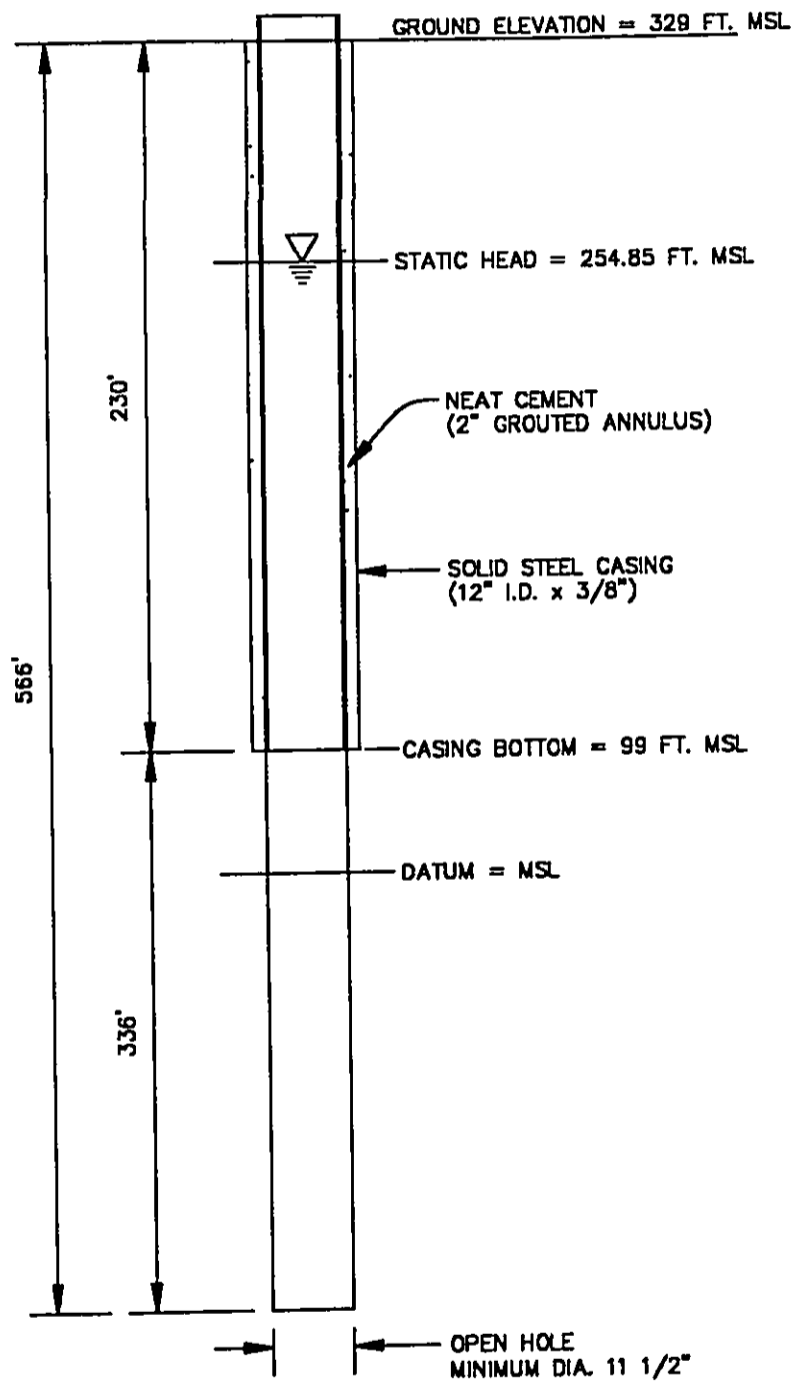
D. Socio-Economic Characteristics

An immediate economic impact of the Kuou Well III project is it will provide an estimated 1.9 million dollars of work for the construction industry. An indirect socio-economic impact results from the growth and development made possible by making additional sources of drinking water available. Completion of the project will potentially provide 0.72 mgd of water which can be used to either support the population of windward Oahu or can be exported for use in East Honolulu and the primary urban center.

E. Environmental Characteristics

There may be temporary disruptions to the environment that are normally associated with construction activity. They include clearing, grubbing and grading of the project site, noise from construction equipment, and storm runoff from the graded areas of the site. These impacts will be mitigated to comply with applicable regulations and will be discussed further in the subsequent sections.

KUOU WELL III NO 2348-06
 KANEOHE, OAHU, HAWAII
 T.M.K. 4-5-4112
 NOT TO SCALE



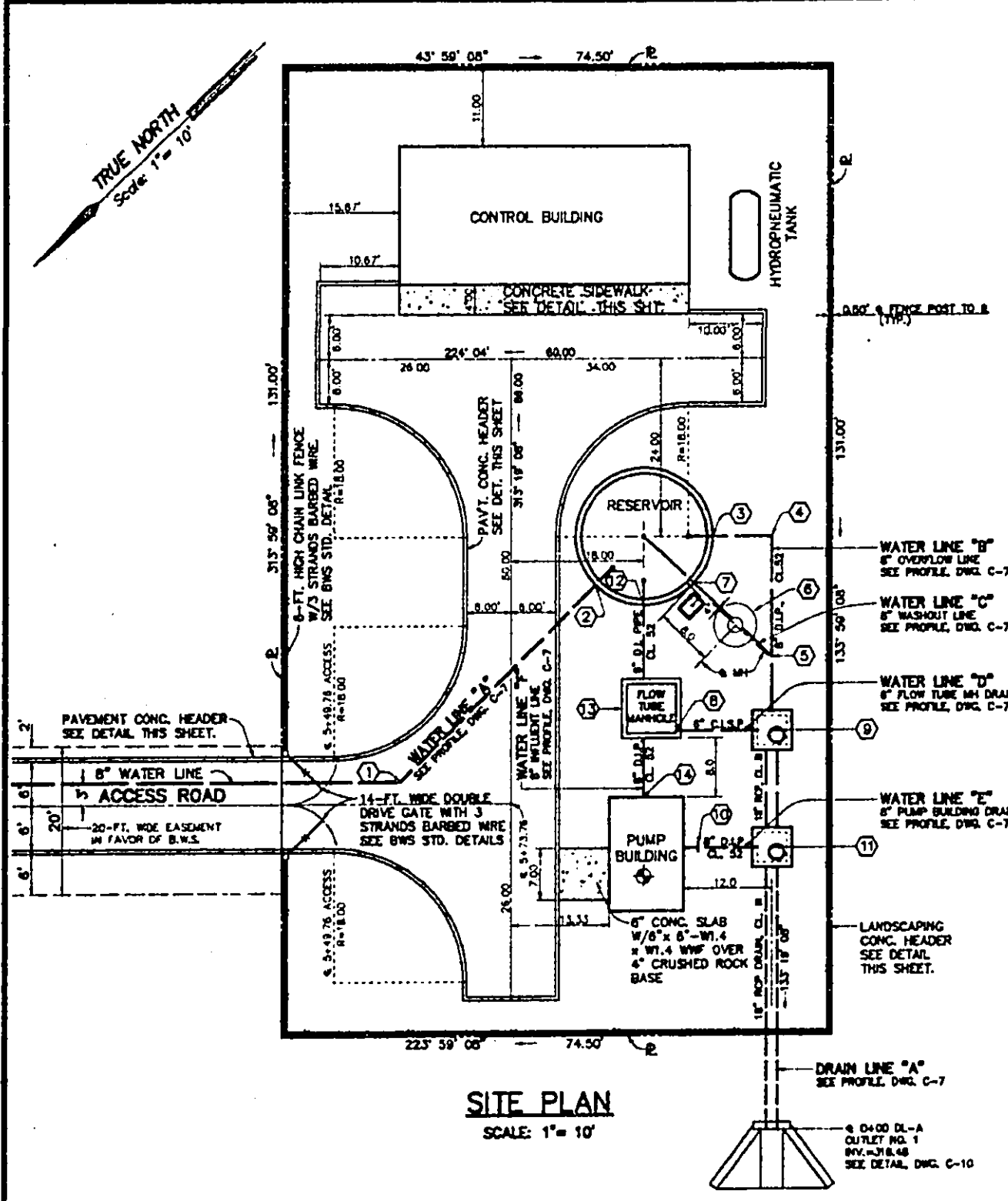
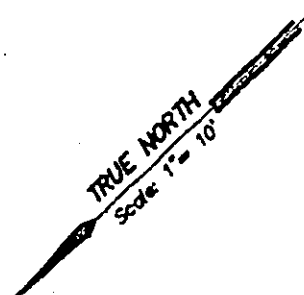
Prepared for:
BOARD OF WATER SUPPLY
 CITY & COUNTY OF HONOLULU

KUOU WELL III
 KANEOHE, OAHU, HAWAII
"AS-BUILT"
WELL SECTION



ParEn, Inc.
 dba Park Engineering
 Engineers, Surveyors, Planners

Figure 3

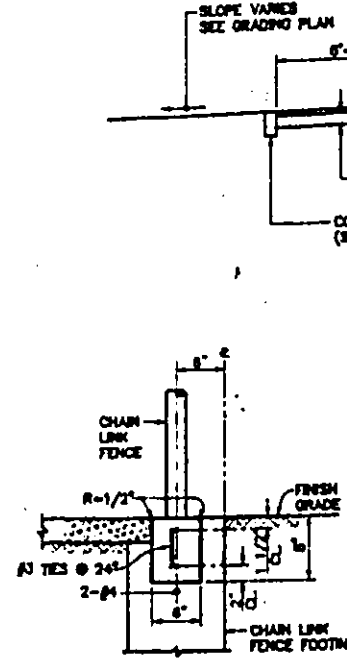


SITE PLAN
SCALE: 1" = 10'

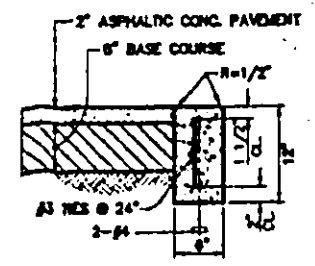
WATER AND DRAIN LINE INFORMATION

- | | | | |
|--|---|---|---|
| <p>① 6 54+58.8 ACCESS RD
0+00 EFFLUENT WL-A
1-8" 1/8 BDD
1-CONC. BLOCK
INV.=318.8</p> <p>② 6 0+37.4 WL-A
END 8" WATER
CONN. TO RESERVOIR
INV.=318.8</p> <p>③ 6 0+00 OVERFLOW WL-B
BEGIN 8" OVERFLOW
LINE AT RESERVOIR
INV.=318.8</p> <p>④ 6 0+08.1 OVERFLOW WL-B
1-8" 1/4 BDD
1-CONC. BLOCK
INV.=318.7</p> | <p>⑤ 6 0+18.3 WASHOUT WL-C
6 0+23.6 OVERFLOW WL-B
1-8" 6" WYE
1-CONC. BLOCK
INV.=318.5</p> <p>⑥ 6 0+08 WASHOUT WL-C
1-8" O.V. 180°
1-TYPE "B" MANHOLE</p> <p>⑦ 6 0+00 WASHOUT WL-C
BEGIN 8" WASHOUT LINE
CONN. AT RESERVOIR
INV.=318.8</p> <p>⑧ 6 0+00 FTH WL-D
BEGIN FLOW TUBE
MANHOLE (FTH) DRAIN
INV.=318.63</p> | <p>⑨ 6 0+13.0 FTH WL-D
6 0+34.2 OVERFLOW WL-B
6 0+53.8 DL-A
6 0" DN# 1
TOP=323.50
INV.=318.4(8")
INV.=316.75(18")
SEE DETAIL, DWG. C-10</p> <p>⑩ 6 0+00 PUMP WL-E
8" PUMP BLDG DRAIN
INV.=318.8</p> <p>⑪ 6 0+10 PUMP WL-E
6 0+38 DL-A
6 0" DN# 1
TOP=323.25
INV.=318.8(8")
INV.=316.87(18")
SEE DETAIL, DWG. C-10</p> | <p>⑫ 6 0+00 INFLUENT WL-F
BEGIN 8" INFLUENT
WATER LINE
INV.=318.8</p> <p>⑬ FLOW TUBE MANHOLE
TOP=324.30
INV.=318.8(8")
SEE DETAIL, DWG. C-8</p> <p>⑭ 6 0+24 INFLUENT WL-F
END 8" INFLUENT LINE
INV.=318.8</p> |
|--|---|---|---|

F. A. P. N. O. 1-N3-1 (39)

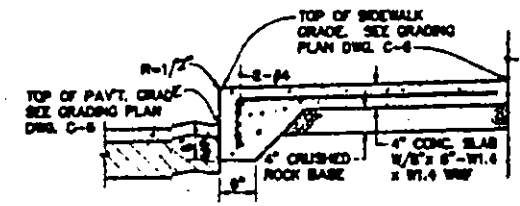


LANDSCAPING

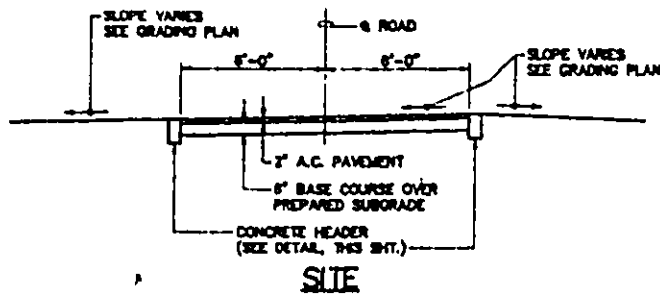


PAVEMENT

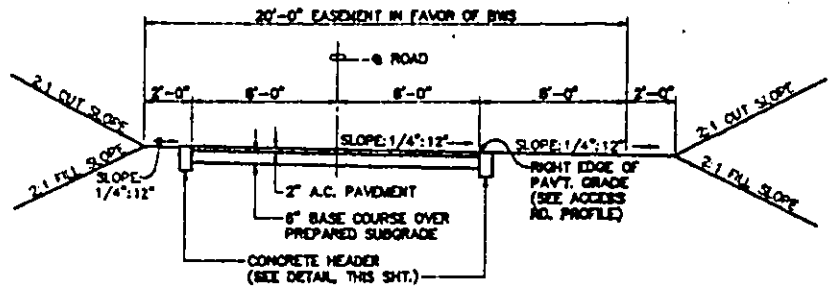
CONCRETE HEADER DETAIL
SCALE: 1" = 1'-0"



CONCRETE SIDEWALK DETAIL
SCALE: 3/4" = 1'-0"



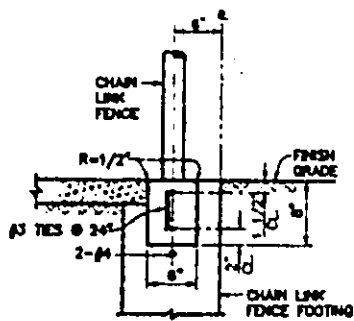
SUE



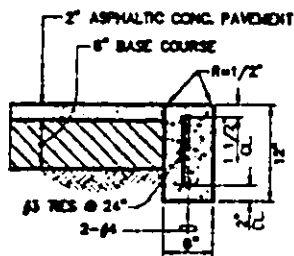
ACCESS ROAD

TYPICAL ROAD SECTIONS

SCALE: 1/4" = 1'-0"

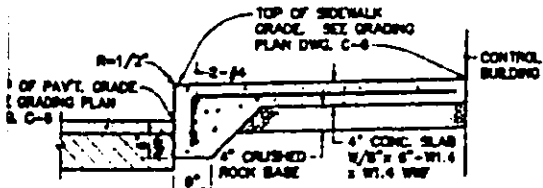


LANDSCAPING

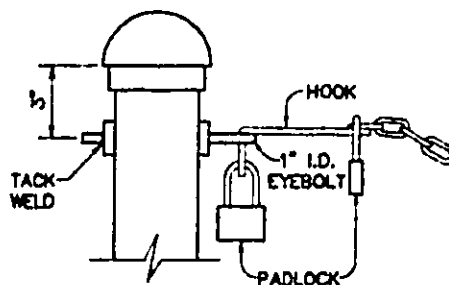


PAVEMENT

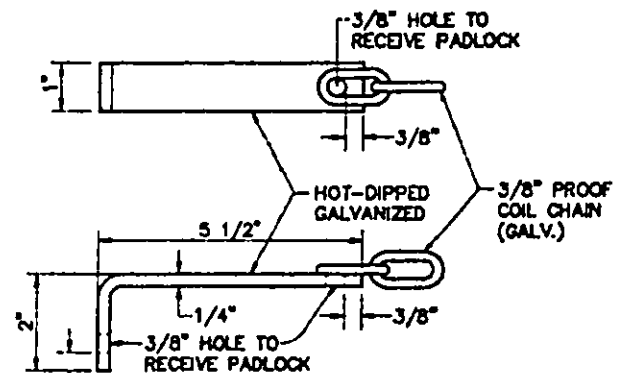
CONCRETE HEADER DETAIL 1
SCALE: 1" = 1'-0" (C-5)



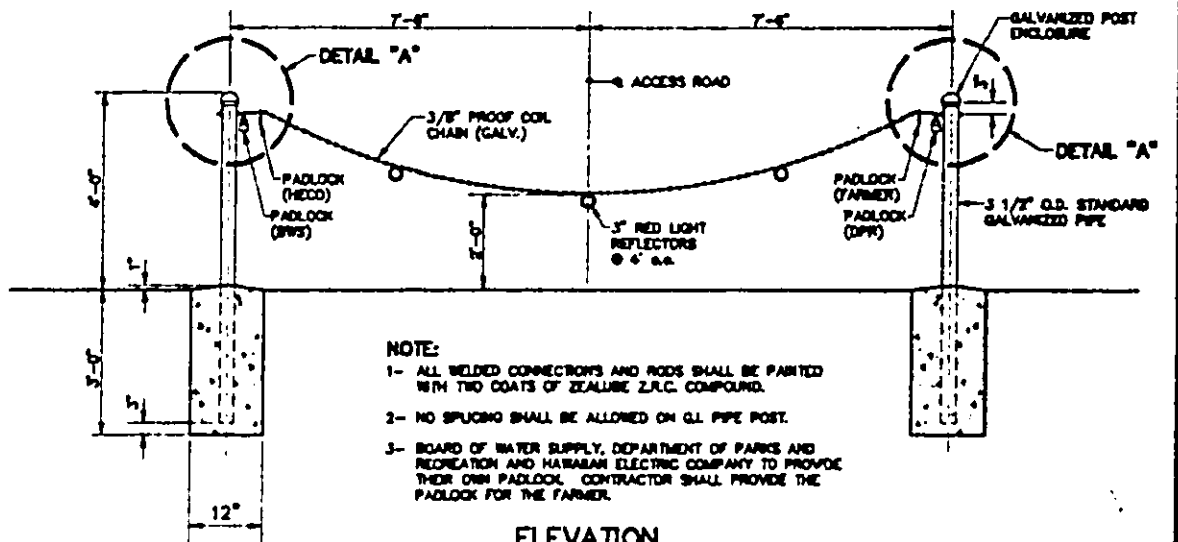
CONCRETE SIDEWALK DETAIL 2
SCALE: 3/4" = 1'-0" (C-5)



DETAIL "A"



HOOK DETAIL



ELEVATION

CHAIN GATE DETAIL 3
SCALE: 1" = 1'-0" (C-5)

- NOTE:
- 1- ALL WELDED CONNECTIONS AND RODS SHALL BE PAINTED WITH TWO COATS OF ZEA-LUBE Z.R.C. COMPOUND.
 - 2- NO SPLICING SHALL BE ALLOWED ON G.I. PIPE POST.
 - 3- BOARD OF WATER SUPPLY, DEPARTMENT OF PARKS AND RECREATION AND HAWAIIAN ELECTRIC COMPANY TO PROVIDE THEIR OWN PADLOCK. CONTRACTOR SHALL PROVIDE THE PADLOCK FOR THE FARMER.



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

DATE: _____

BOARD OF WATER SUPPLY CITY AND COUNTY OF HONOLULU	
JOB 88-148 KUOU WELL III; PUMP, RESERVOIR, CONTROL BUILDING, ELECTRICAL EQUIPMENT, TRANSMISSION MAIN, ACCESS ROAD, AND APPURTENANCES KANEONE, KOOLAUPOKO, OAHU, HAWAII	
SITE PLAN, TYPICAL ROAD SECTIONS AND DETAILS	
APPROVED: _____ DATE: _____	DATE: _____
DRAWN BY: _____ CHECKED BY: _____	FIELD NO. _____
SCALE: AS INDICATED	SHEET _____ OF _____ SHEETS

Figure 4

Noise generation from mechanical equipment is typical for this type of pumping facility. Attenuation measures will be taken by BWS to minimize the levels of noise experienced by surrounding land owners. Design of the pump building will incorporate a muting system which shall maintain noise levels below the standards set by the State Department of Health.

A potential long term impact on the environment is the effect of groundwater withdrawals on stream flows. This is an important issue for many windward water sources because of the unique hydrogeology of the area and the sometimes connection between dike leakage and flow in local streams. In this case, because Kuou Stream and other intermittent stream flows in the vicinity are perched upon alluvium, existing stream flows are not expected to be affected. Stream flow data collected prior to and during the test pumping of the Kuou Well III exploratory well has not demonstrated any correlation between pumpage and stream flows. In addition to this data, past experience with Kuou Wells I and II by BWS reinforces the concept that withdrawals from Kuou Well III will not have an impact on Kuou Stream.

VI. DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. Topography

Kuou Well III is located near the base of the nearly vertical northeast face of the Koolau range at approximately 320 feet above mean sea level. The land falls toward the northeast at an average slope of 8 percent. Figure 5 is the grading plan for the facility which shows the finish grades and the existing contours at the project site.

B. Soils

Soils in the vicinity of the well site are classified by the U.S. Department of Agriculture Natural Resources Conservation Service as Lolekaa silty clay, 3 to 8 percent slopes (LoB). Soils of this classification are common for upland areas of Kaneohe and have developed in old, gravelly colluvial and alluvial fans and terraces. They are characterized as well drained soils that have a dominantly fine textured subsoil.

A representative profile of the soil is as follows:

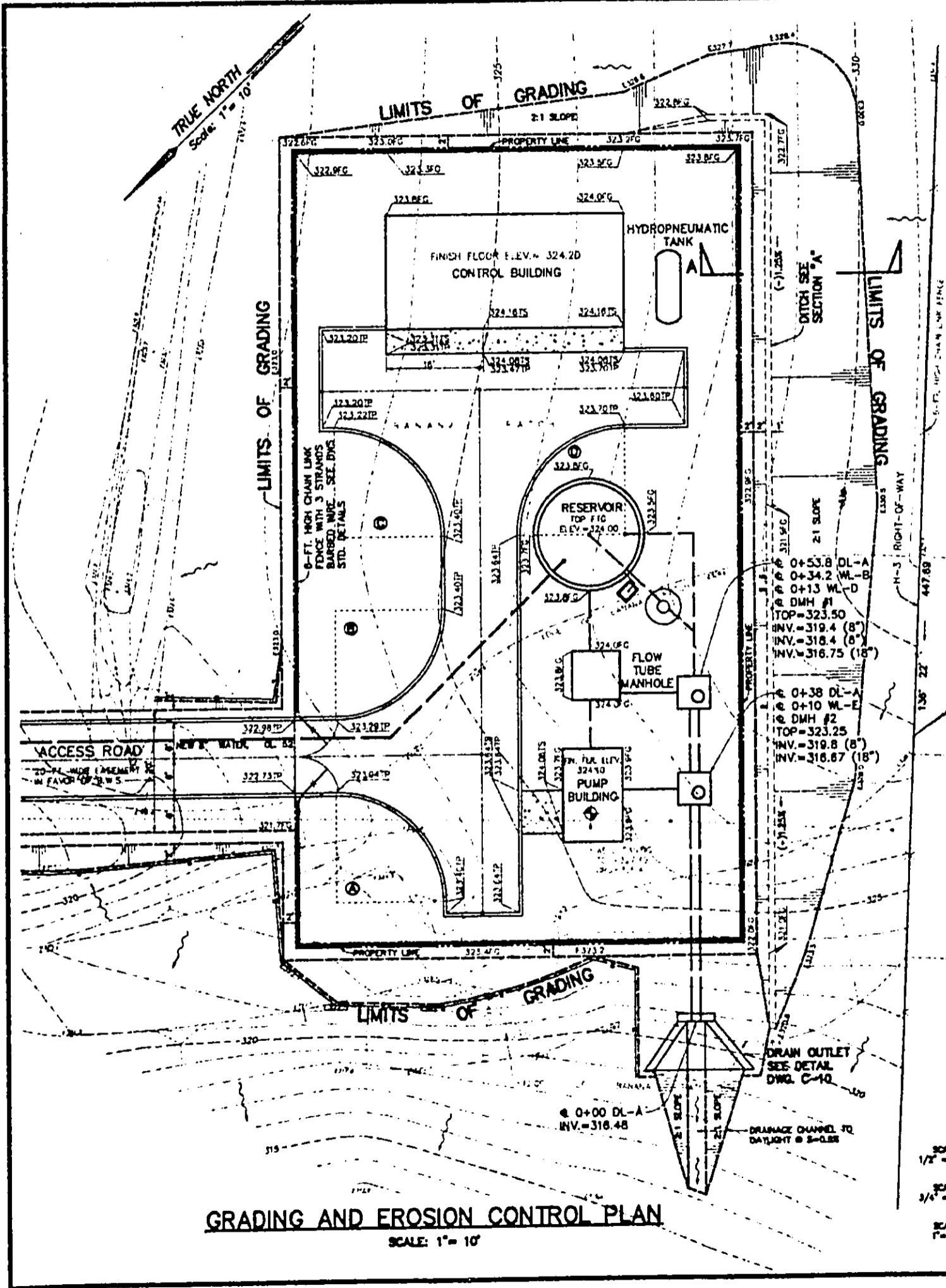
"The surface layer is dark-brown silty clay about 10 inches thick. The subsoil is 46 to more than 70 inches thick. The upper part is dark brown silty clay that has a subangular blocky structure, and the lower part is dark yellowish-brown loam that has a subangular blocky structure. The substratum is strongly weathered gravel. The soil is strongly acid in the surface layer and strong acid to extremely acid in the subsoil."

Erosion hazard for the LoB soil is slight due to its rapid permeability and slow runoff characteristics. Available water capacity for the soil is about 1.3 inches per foot. Its soil capability classification is Iie making it subject to moderate erosion if it is cultivated and not protected.

The proposed well site is on land which is presently in agricultural use. The U.S. Department of Agriculture Natural Resources Conservation Service and the Hawaii Department of Agriculture classify Lolekaa silty clay soils at slopes of less than 15 percent as prime agricultural land (Dept of Agriculture, 1977). Prime agricultural land is land with ideal characteristics for food production or other agricultural production.

C. Climate

Average monthly temperature in the vicinity of the proposed well site is approximately 75 degrees Fahrenheit. It ranges from 72 degrees in January to 78.5 degrees in August (State



GRADING AND EROSION CONTROL PLAN
SCALE: 1" = 10'

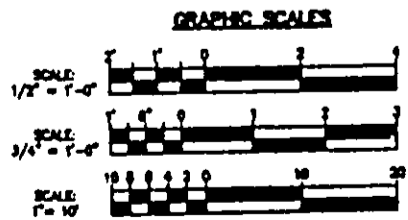
- LEGEND:**
- NEW**
 - PROPERTY LINE
 - 33 — FINISH CONTOUR
 - FINISH BANK
 - 321.10FO FINISH GROUND ELEVATION
 - 323.58TP TOP PAVEMENT ELEVATION
 - 324.47TS TOP SIDEWALK ELEVATION
 - ~ ~ ~ FLOW DIRECTIONAL LINES
 - - - LIMITS OF GRADING
 - EXISTING**
 - - - BANK
 - - - CONTOUR
 - 322.1 GROUND ELEVATION
 - TEMPORARY**
 - BELT FENCE

TEMPORARY BENCH MARK:
"□" CUT ON CONC FTG
ELEVATION = 324.89

3/8" x 3/4" x 5'-0" WOOD BATTEN
@ 6'-0" O.C. NAILED OR SCREWED
TO POSTS. FASTENERS TO BE @
6" O.C. (MAX.)
WIRE MESH (0.75"/17")
FILTER FABRIC (150# MESH)
TO WITHSTAND 220 GAL/SF.
FILL W/ NATIVE SOIL AND COMPACT
RUNOFF

TYPICAL

SILT



LEGEND:

NEW

- PROPERTY LINE
- S--- FINISH CONTOUR
- FINISH BANK
- 321.1070 FINISH GROUND ELEVATION
- 323.5670 TOP PAYMENT ELEVATION
- 324.4773 TOP SIDEWALK ELEVATION
- FLOW DIRECTIONAL LINES
- LIMITS OF GRADING

EXISTING

- BANK
- S--- CONTOUR
- E 322.1 GROUND ELEVATION

TEMPORARY

- S--- SILT FENCE

EARTHWORK NOTES:

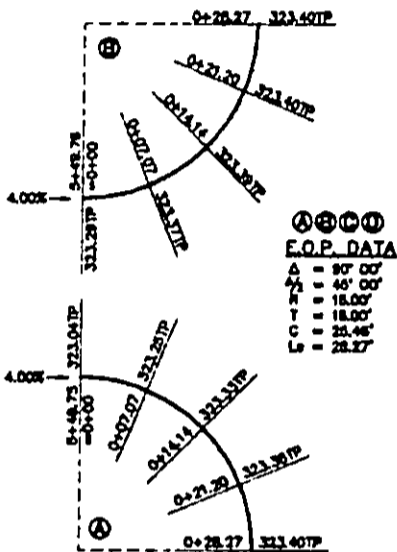
1. QUANTITIES SHOWN ARE FOR PERMIT PURPOSES ONLY AND SHALL NOT BE USED FOR BIDDING PURPOSES.
2. CONTRACTOR SHALL BE RESPONSIBLE TO COMPLETE THE GRADING WORK TO THE GRADES AND DIMENSIONS SHOWN ON THE PLANS.

EARTHWORK SUMMARY (ACCESS ROAD & WELL SITE):

EXCAVATION 1,302 C.Y.
EMBANKMENT 292 C.Y.
AREA TO BE GRADED 0.86 AC.

BEST MANAGEMENT PRACTICES (BMP) NOTES:

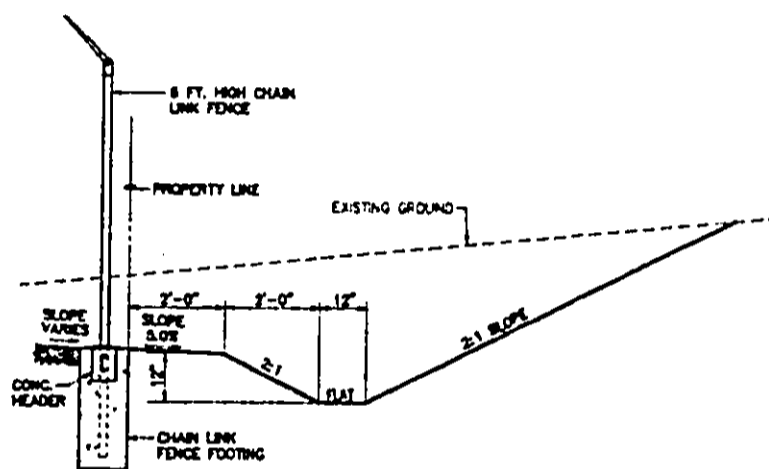
1. INSTALLATION OF SILT FENCE.
2. EXISTING CULTIVATED (BAKANA) LAND ADJUTING THE PROJECT SITE ACTS AS A BUFFER ZONE FOR RUNOFF CONTROL.



E.O.P. DATA

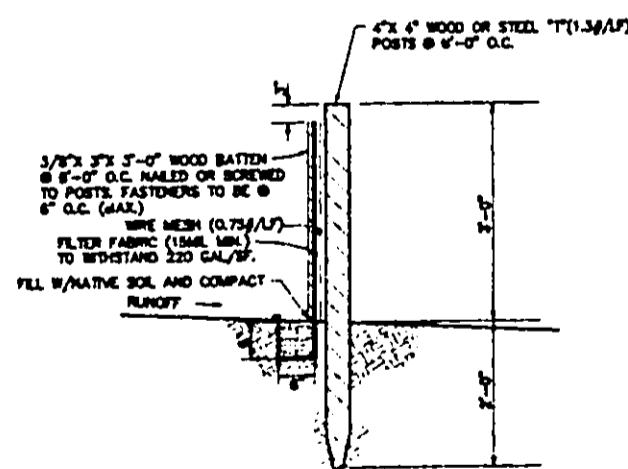
A	= 90° 00'
B	= 46° 00'
T	= 18.00'
C	= 28.46'
L	= 28.27'

EDGE OF PAVEMENT RETURNS
SCALE: 1" = 10'

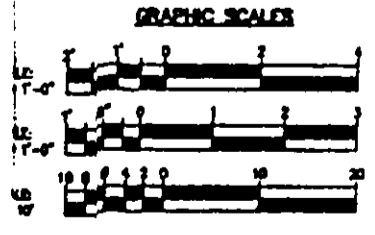


TYPICAL DITCH SECTION "A"
SCALE: 1/2" = 1'-0"

TEMPORARY BENCH MARK:
1' CUT ON CONC FTG
ELEVATION=328.89



SILT FENCE DETAIL
SCALE: 3/4" = 1'-0"



	BOARD OF WATER SUPPLY CITY AND COUNTY OF HONOLULU	
	JOB 98-148	
	KOU WELL III: PUMP, RESERVOIR, CONTROL BUILDING, ELECTRICAL EQUIPMENT, TRANSMISSION MAIN, ACCESS ROAD, AND APPURTENANCES KANEONE, KOOLAUPONO, OAHU, HAWAII	
	GRADING AND EROSION CONTROL PLAN	
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION	APPROVED: _____ DATE: _____	
DRAWN BY: AMM (ENGINEER MHI)	CHECKED BY: MHI	FILE NO. _____
PAPER, THE ONE PAGE DRAFTING	FIELD BOOK NO. _____	SCALE: AS INDICATED
		SHEET 2 OF 43 SHEETS

Figure 5

of Hawaii Data Book, 1987). Exposed to the prevailing northeast tradewinds off the ocean, the windward coast of Oahu experiences very little variation in temperature between day and night. Rainfall in the area originates when tradewinds are intercepted and forced upward by the peaks of the Koolau range. The tradewinds drop their moisture as they rise and cool. The proposed well site is in an area which receives a mean annual rainfall of about 75 inches (Atlas of Hawaii, 1973).

D. Hydrology

Kuou Stream is located approximately 1200 feet northwest of Kuou Well III. Originating high in the Koolau mountain range, Kuou Stream is an intermittent stream. It flows in a northeasterly direction through Hoomaluhia Botanical Garden and into Loko Waimaluhia Flood Control Reservoir, also known as, Hoomaluhia Reservoir. Primary sources of water for the stream are surface runoff, dike leakage and dike overflow.

Data from a U.S. Geological Survey gaging and partial water quality station are available for Kuou Stream. Station 16269500, which is located at an altitude of 220 feet above mean sea level, is used to collect instantaneous stream flows and basic water quality on a monthly interval. The location of the gaging station relative to the wells is noted on Figure 2. Median flow for water years 1990 to 1994 is 0.03 cubic feet per second. A plot of stream flow at the gaging station for this period has been plotted and is provided as Figure 6.

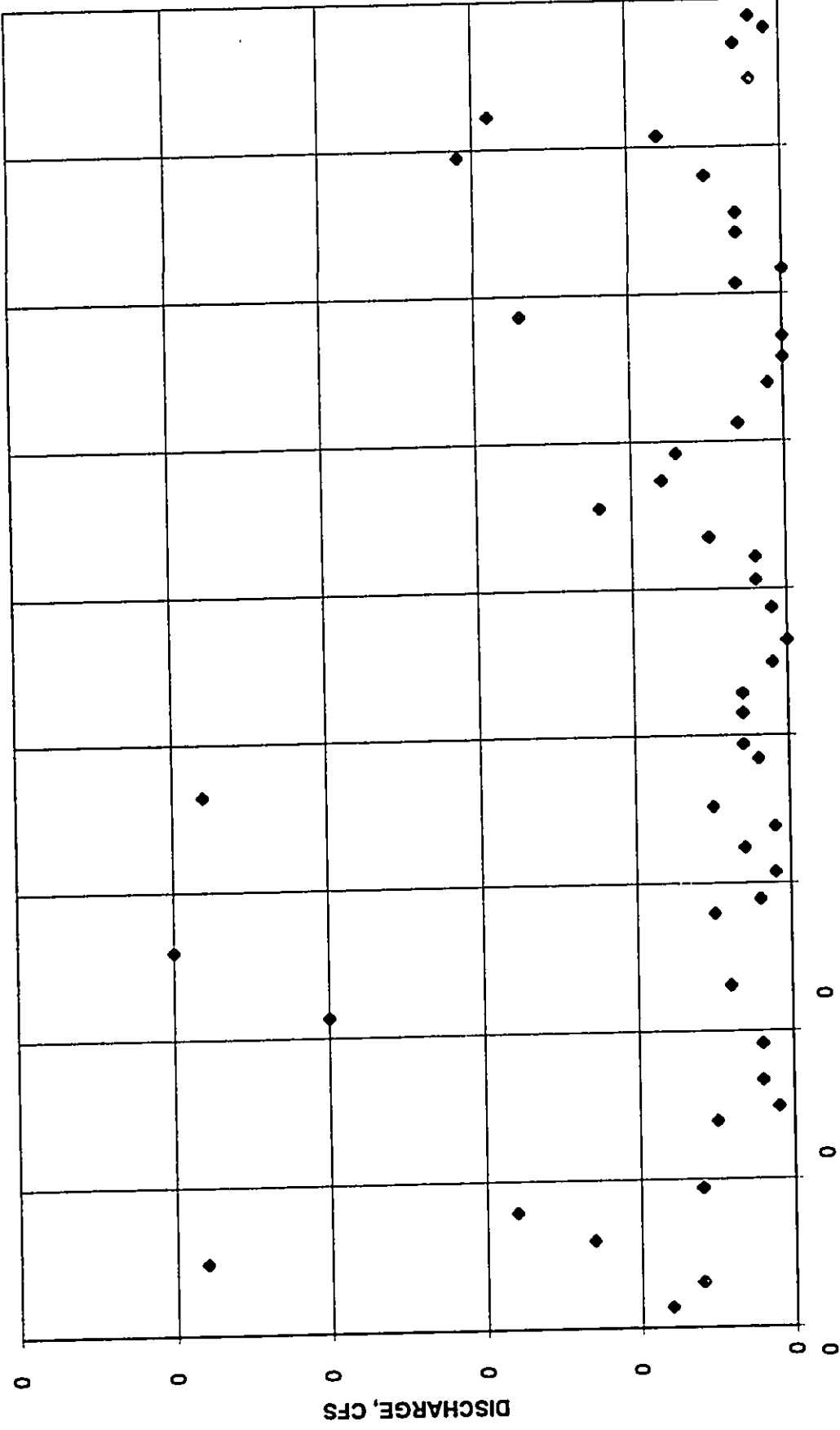
Groundwater hydrology of the area is characterized by high level dike aquifers unique to windward Oahu. Kuou Well III falls within the Koolaupoko system of the Windward Sector. Figure 7 is a map of existing and planned BWS sources in the Windward District.

The sustainable yield of 43 mgd for the Koolaupoko system was estimated by George Yuen and Associates in a 1990 study prepared for the Commission on Water Resources Management (CWRM) which was incorporated into the Oahu Water Management Plan. Data on groundwater use and sustainable yield by system has been attached in Appendix A. A water source inventory for the Koolaupoko Aquifer is also shown in this appendix with permitted use for 1996 and usage data for 1994. As of May 1997, there were a total of 18 Water Use Permits for the Koolaupoko System totaling 10.312 mgd.

Groundwater extraction data from adjacent BWS wells are tabulated below.

Well Description	1990 Use (mgd)	Permitted Use (mgd)	Pump Capacity (mgd)
Kuou Well I	2.61	2.969	3.02
Kuou Well II	0.06	0.245	1.01

**KUOU STREAM
INSTANTANEOUS DISCHARGE AT USGS STA. 16269500**

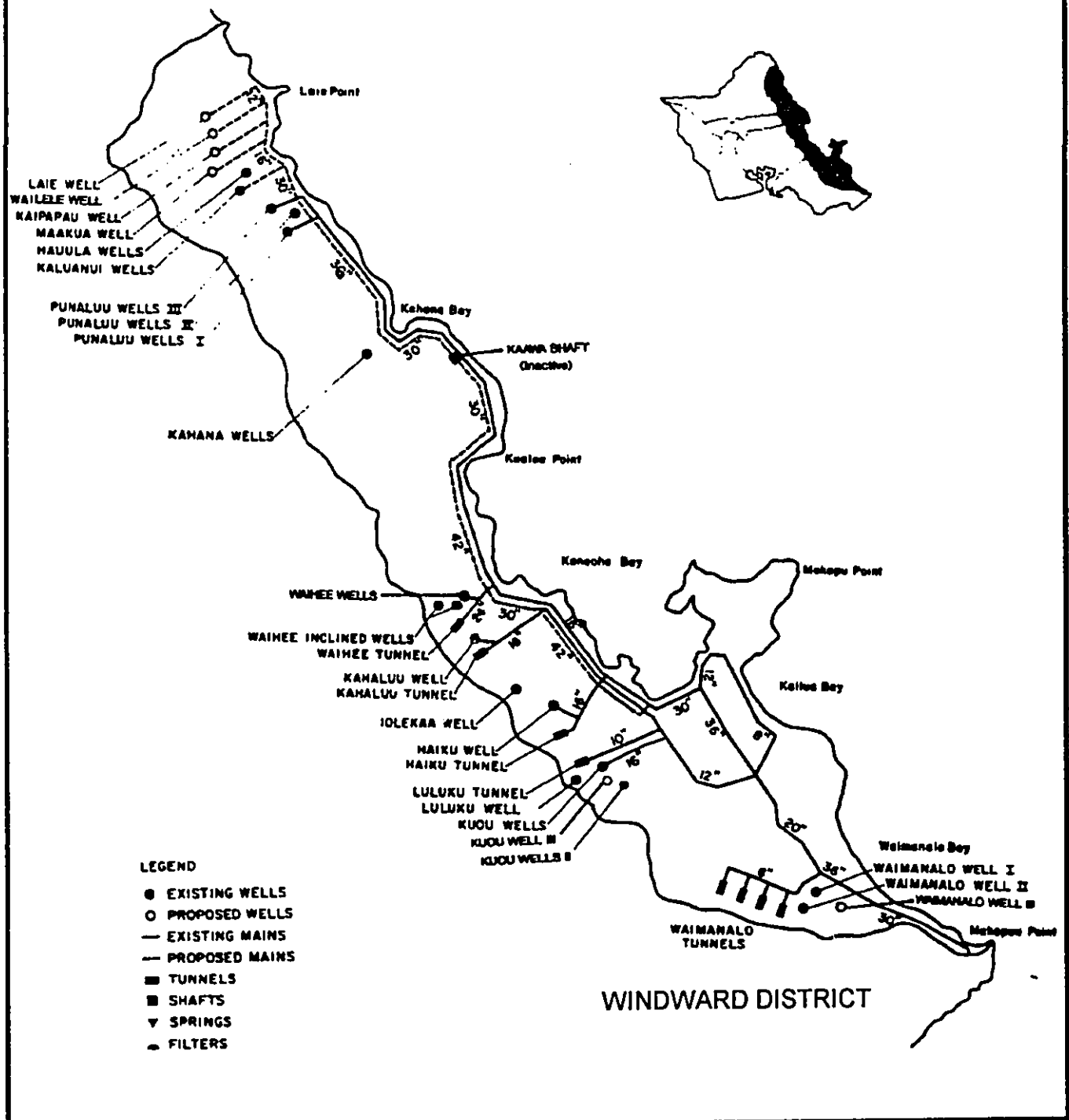


Prepared for:
BOARD OF WATER SUPPLY
CITY & COUNTY OF HONOLULU

KUOU WELL III
KANEHOE, OAHU, HAWAII

ParEn, Inc.
dba Park Engineering
Engineers, Surveyors, Planners
Figure 6

EXISTING AND PLANNED BWS SOURCES



Prepared for:
BOARD OF WATER SUPPLY
 CITY & COUNTY OF HONOLULU

KUOU WELL III
 KANEHOE, OAHU, HAWAII
WINDWARD DISTRICT
WATER SOURCES


 **ParEn, Inc.**
 dba Park Engineering
 Engineers, Surveyors, Planners

Figure 7

Installed pump capacity of Kuou Well III will be 0.7 mgd. The design discharge was determined from results of the yield testing which was conducted from July 5, 1995 through July 10, 1995. During this test, the average yield of 0.87 mgd resulted in a maximum drawdown of 132 feet. Drawdown anticipated at the design flow rate of 0.7 mgd is 87 feet. Data from the long term pumping test is included in Appendix B.

Water quality testing of Kuou Well III was performed on the final day of the pumping test. Results of the analysis confirms that the water is of high quality as there were no detectable levels of heavy metals, volatile organics, semi-volatile organics, aldicarbs, herbicides, pesticides, or EDB/DBCP. Laboratory results for water quality testing of Kuou Well III is provided in Appendix C.

E. Geology

Windward Oahu geology is the result of rift zone and caldera associated volcanic activity as well as post volcanic erosion. After the main mountain building ceased, the Koolau volcano underwent cycles of emergence and submergence associated with the glacial and interglacial stages along three rift zones. The upward thrusts occurred along three rift zones that developed into the major ridgelines extending from the volcano's summit. Volcanic subsidence resulted in the formation of the caldera. It is in these rift zones that major dike structures have developed from magma cooling in the feeder conduits for the lava flows. Dikes are characterized by high density rock in a nearly vertical orientation. In a dike complex, the formation of dikes are closely spaced.

Kou Well III is located south of Kou Stream and is expected to tap into the water bearing basalts of the Koolau marginal dike zone. The marginal dike zone is on the outer part of a dike complex in which the dike structures make up less than 10 percent of the total rock volume. Because of the dike's ability to restrain groundwater, conditions are favorable for development of dike confined water.

F. Land Use

Currently, the land surrounding the well site is classified as conservation. It is designated for park use on the Koolaupoko Development Plan Land Use Map and is zoned as Restricted Preservation, P-1.

Owned by the City and County of Honolulu, the land is currently leased to private individuals and is used for banana production.

G. Flora & Fauna

A biological assessment of the project area was performed in October 1992 by the Bishop Museum biological staff for the Kuou Well III Exploratory Well EA. In that report it was concluded that there was no native vegetation observed at the site and banana plants are the only plant in the overstory and understory.

Additional information on the animal life in the project area is extracted from the Final Environmental Impact Statement for Windward Oahu Regional Water System Improvements. Terrestrial wildlife in the area is limited to introduced species. There are no endangered species within the project limits as most endemic birds of Hawaii prefer a habitat within native forests at higher elevations.

Native aquatic wildlife consisting of fish, crustaceans, and mollusks although being adapted to life in fresh or brackish water still spend a portion of their early life cycle in the ocean. The streams and tributaries surrounding the project site flow into Hoomaluhia Reservoir, which serves as a detention basin for storm water runoff. Upstream migration of aquatic species is precluded by the outlet works of the drainage structure.

H. Historic Sites and Archaeological Resources

An archaeological inspection of the proposed well site was conducted in October of 1992 by the archaeological staff of the Bishop Museum. Findings of that archaeological inspection indicated there were no archaeological finds that exist which would be impacted. However, the determination by the State Office of Historic Preservation was that an archaeological inventory survey was to be performed to confirm the earlier findings of the 1992 inspection.

As a result, the archaeological inventory survey was conducted on April 16 and 17, 1997 by members of the Bishop Museum Department of Anthropology. Their scope of work included a surface survey, site mapping and subsurface testing. Materials excavated from two stratigraphic trenches were screened and examined for any evidence of archaeological remains. The survey concluded that there was no indication that significant cultural resources would be recovered from the project site; a finding consistent with the 1992 inspection. The inventory survey is attached as Appendix D.

VII. POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

A. Impacts During Construction

The proposed construction of the Kuou Well III pumping facility will produce temporary impacts on the environment normally associated with construction activities. These impacts will include the disturbance of soil and vegetation at the project site and an increase in dust and noise levels in the vicinity of the site.

The area of the site is anticipated to cover almost 10,000 square feet and will require the removal of banana plants within the project limits. In addition, the access road which will be in the same general location as an existing farm access road, will cover approximately 12,000 square feet and will also require the elimination of a limited number of banana plants. Although unavoidable, the impact of the area removed from banana production is only 2 percent of the total acreage currently used for banana cultivation within Hoomaluhia Botanical Garden.

Clearing, grubbing and grading activity to prepare the site for construction will require heavy equipment which may elevate noise levels in the immediate area of the well site for approximately one month. Dust levels may also be increased especially if the soil moisture content is low. As the site is not in close proximity to populated areas, the impact of noise and dust will not be a significant impact.

Best management practices will be implemented to ensure that stormwater runoff from the project site will not result in the migration of sediments and pollutants into receiving waters. Erosion control measures such as silt fences and revegetation of cleared areas will be used to minimize any adverse impacts on the environment.

Noise from the construction of the pump building, control building, and breaker reservoir should also be minimal and for a limited duration. To further mitigate any impact of noise from the construction site, all work will be done during normal construction hours, i.e. 7:30 a.m. to 3:30 p.m.

B. Long Term Impacts

Long term impacts could result from noise generated from the operation of the pumping unit and motor and from the effect of groundwater withdrawal on the base flow of nearby streams.

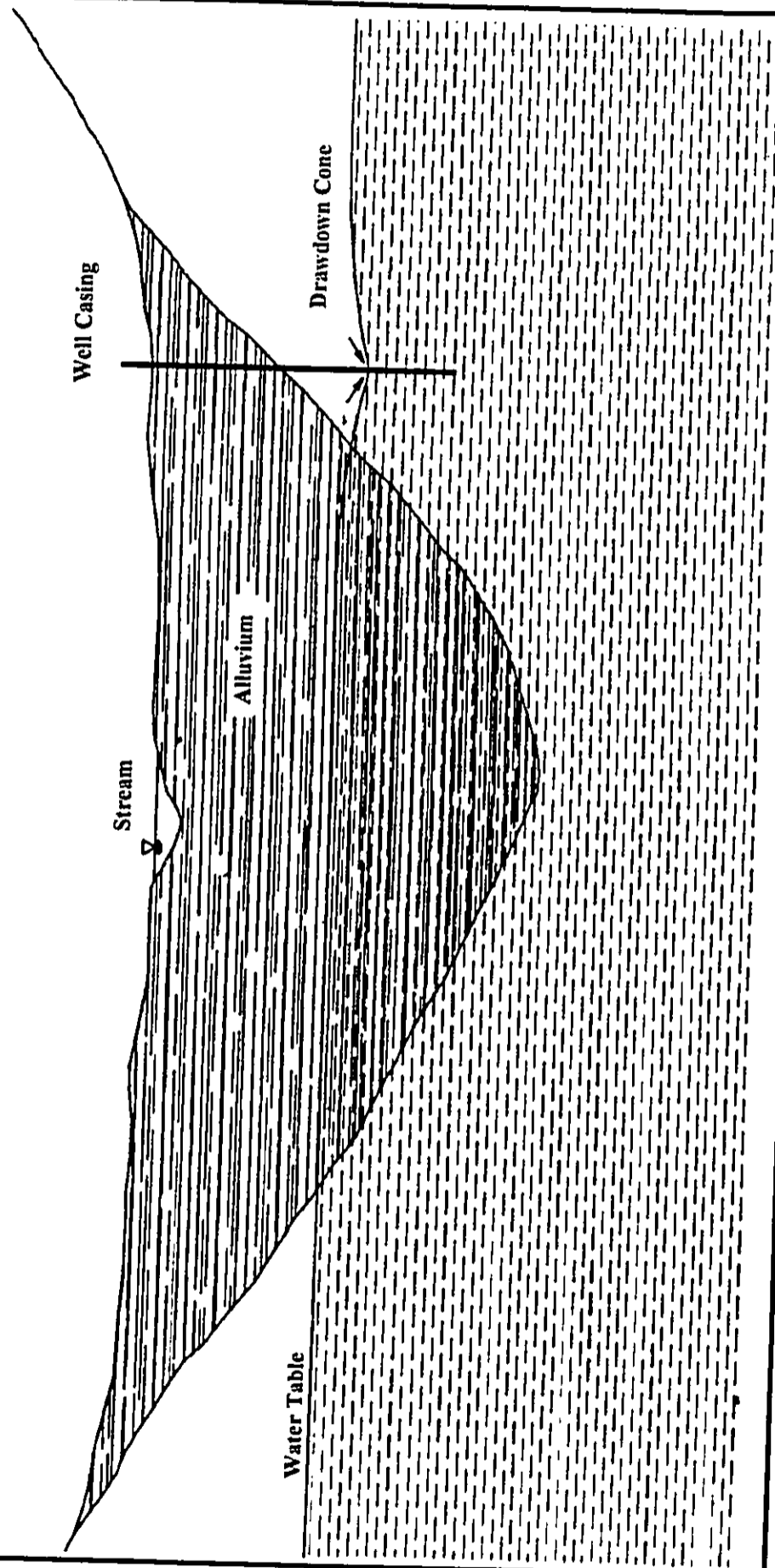
Noise from the pump is expected and will be mitigated by the construction of a mute within the pump building. Muting facilities have become standard for all Board of Water Supply pumping facilities and will significantly reduce the ambient noise levels experienced outside the pump building. Installation of a submersible pump is an

alternative solution. Upon completion of the pump building, the noise level outside the building will be monitored to ensure compliance with all applicable noise requirements. In addition, the location of the well is a considerable distance from inhabited areas and further reduces the likelihood of noise being detected by area residents.

Pumping activities are unlikely to have an impact on the base flow of Kuou and Hooleinaiwa Streams. Existing surface water is perched upon thick alluvium which confines the dike water as is shown in Figure 8. Flow data from Kuou Stream obtained before and during the pump testing of Kuou Well III exploratory well confirm that no reduction in stream flow occurred due to pumpage.

Kou Well III also appears to be distant enough from area streams so as not to have any detrimental impacts on surface water flows. However, in the event that stream flow reductions are attributed to groundwater extraction from Kou Well III, corrective measures will be taken.

STREAM FLOW UNAFFECTED BY WELL PUMPING



Prepared for:
BOARD OF WATER SUPPLY
CITY & COUNTY OF HONOLULU

KUOU WELL III
KANEHOE, OAHU, HAWAII
STREAM SECTION



ParEn, Inc.
dba Park Engineering
Engineers, Surveyors, Planners

Figure 8

VIII. ALTERNATIVES CONSIDERED

Alternatives to doing the project are: 1) do nothing, 2) find an alternative well site, 3) find an alternative source of water.

The "do nothing" approach is not acceptable because it will not satisfy the Board's goal of providing enough water to meet projected demands of the future. Conservation efforts are useful in reducing a portion of the demand for new supplies, however, it will not be enough to ensure adequate drinking water supplies to meet the demands of an increasing population.

Locating an alternative well site does not have any particular advantages over the site selected for Kuou Well III. The selected site is on land owned by the City and County of Honolulu and has much of the required infrastructure for connection into the BWS system. Alternative sites may increase costs for land acquisition and additional infrastructure work to connect a new source to existing BWS pipelines.

Alternative sources of water such as surface water, sea water or reclaimed water are possible, however, the cost of developing these water supplies into potable sources of water are much greater than for a pristine groundwater source. In addition, many of these alternative sources, although technologically possible, carry social and regulatory implications, which makes them difficult to implement and achieve.

Surface water sources are susceptible to microbial and parasitic contamination. As a result, drinking water regulations require treatment and disinfection of all surface waters. Conventional treatment involves chemical addition and operation of treatment facilities by certified water treatment operators. Alternative treatment, such as membrane filtration, has developed increasing popularity over the last several years but also requires operation by certified operators. Regardless of the type of treatment considered, capital expenditure for construction of a treatment plant and acquisition of land for a suitable site for a facility will be significant. In addition, operation and maintenance of such a facility will represent a recurring cost which generally increases over the life of the facility.

Desalination technology has been used worldwide and its application is well suited for coastal communities that experience low rainfall and do not have an abundant or reliable source of groundwater. While capital costs associated with a large scale desalination facility may be comparable to developing groundwater in rural areas, the operation and maintenance cost is approximately tenfold the cost of pumping groundwater.

The use of reclaimed water to satisfy non-potable demands such as irrigation and industrial use is being actively pursued by the City and County of Honolulu. Water reuse can serve to reduce the quantity of potable water used for non-potable needs and also provide a desirable option for the disposal of wastewater effluent. High costs associated with infrastructure development and public health concerns are limiting factors in the current availability of reclaimed water for reuse.

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Desalination technology has been used worldwide and its application is well suited for coastal communities that experience low rainfall and do not have an abundant or reliable source of groundwater. While capital costs associated with a large scale desalination facility may be comparable to developing groundwater in rural areas, the operation and maintenance cost is approximately tenfold the cost of pumping groundwater.

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IX. FUNDING AND PHASING

Funding for the Kuou Well III project is provided by the Honolulu Board of Water Supply's Capital Improvements Funds for fiscal year 1998. Approximate cost for the project is 1.9 million dollars. The project will not be phased but will be completed in its entirety.

X. DETERMINATION, FINDINGS, AND REASONS TO SUPPORT DETERMINATION

After completing an assessment of the potential environmental effects of the proposed project and consulting with other government agencies and interested parties, it has been determined that an Environmental Impact Statement (EIS) is not required. Therefore, this document constitutes a Notice of Negative Declaration.

Reasons supporting the Negative Declaration determination are as follows.

- 1) **The proposed project will not result in a loss of any natural or cultural resource;**
The project site is in a banana field within Hoomaluhia Botanical Garden and will not impact scenic views in the area. As mentioned in the archaeological inventory survey, no significant cultural resources are expected to be recovered from the site.
- 2) **It will not curtail the range of beneficial use of the environment;**
The well site will have a minimal impact on the overall beneficial use of the area which is currently used for banana production.
- 3) **It will not conflict with the State's long-term goals or guidelines (Chapter 344, HRS)**
The proposed development is consistent with the environmental policies established in Chapter 344, HRS.
- 4) **It will not substantially affect the economic or social welfare of the community;**
There will be no substantial impact on the community in terms of economic or social welfare. The project will support the availability of high quality water for the community, which in turn enhances the quality of life within the community.
- 5) **It will not substantially affect public health;**
Impacts on public health in the form of air, noise and water quality impacts will be minimal and temporary in duration during the construction of the facility. No impacts are anticipated upon completion of the facility.
- 6) **It will not involve substantial secondary impacts;**
The project will not generate population growth, however, it will support the planned population growth projected for the Windward and East Honolulu areas.
- 7) **It will not involve a substantial degradation of environmental quality;**
No substantial degradation of environmental quality is anticipated from this project. The proposed mitigative measures implemented with this project will minimize any adverse impacts associated with noise, air quality and water quality.

- 8) **It will not have a cumulative effect upon the environment or involve a commitment for larger action;**
This project is not part of a larger project which could result in a cumulative impact on the environment.
- 9) **It will not affect any rare, threatened or endangered species or its habitat;**
No endangered plant or animal species are located within the project area.
- 10) **It will not have any permanent detrimental effects on air quality, water quality, or ambient noise levels;**
Any affect on environmental quality during the construction phase will be limited in area and for a short duration.
- 11) **It will not affect an environmentally sensitive area.**
The project is not within an environmentally sensitive area and will not impact shorelines, valleys or ridges.

This Notice of Negative Declaration shall serve to meet the requirements of Chapter 343, HRS.

XI. REFERENCES

1. *Evaluation of Major Dike-Impounded Ground-Water Reservoirs, Island of Oahu*, United States Department of the Interior, Geological Survey, Kiyoshi J. Takasaki, December 1981.
2. *Final Environmental Impact Statement for Windward Oahu Regional Water System Improvements*, Board of Water Supply, City and County of Honolulu, Volumes 1 and 2, August 1988.
3. *Oahu Water Management Plan*, Commission on Water Resource Management, Department of Land and Natural Resources, State of Hawaii, May 1992.
4. *Environmental Assessment for an Exploratory Well and Access Road at Kuou Site III, Oahu, Hawaii*, Board of Water Supply, City and County of Honolulu, October 1993.
5. *Preliminary Engineering Study for Kamooalii Watershed Sources Master Plan Phase I*, Board of Water Supply, City and County of Honolulu, October 1987.
6. *Engineering Report for Kuou Well II*, Board of Water Supply, City and County of Honolulu, December 1989.
7. *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii*, United States Department of Agriculture, Soil Conservation Service in cooperation with The University of Hawaii, Agricultural Experiment Station, August 1972.

XII. COPIES OF AGENCIES' CORRESPONDENCES AND RESPONSES DURING
THE DRAFT EA REVIEW PERIOD



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
11, SHAWNEE, HAWAII 96813-3443

UNITED STATES OF AMERICA

October 16, 1997

Planning and Operations Division

Mr. Keith S. Uemura, Project Manager
Park Engineering, Incorporated
567 South King Street, Suite 300
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment (DEA) for the Kuou Well III Facility, Kaneohe, Oahu (TMK 4-5-41: 12). The following comments are provided in accordance with U.S. Army Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army (DA) permits.

- a. A site visit will be required for a jurisdictional determination. Please contact Ms. Holly Silva of our Regulatory Section at 438-9258 for further information and refer to file number 970000352.
- b. The flood hazard information provided on page 9 of the DEA is correct.

Sincerely,

Paul Mizue, P.E.
Acting Chief, Planning
and Operations Division

COPY

JEFFREY HARRIS MAN
WALTERO WATSON, JR. COMPANY
SUITE 400 YAMASATO VILLAGE
420 HATASHIMA
BELLEVUE, WA 98005
FORREST C. JAMES
JOHN W. K. SHAW
SUGAR BEACH STATION
HONOLULU, HI 96813
MANAGER AND CHIEF ENGINEER



BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
635 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813
PHONE 1581-5271-6186
FAX 1581-533-2714

November 12, 1997

Mr. Paul Mizue, P.E.
Department of the Army
Corps of Engineers
Pacific Ocean Division
Fort Shafter, Hawaii 96858-5440

Dear Mr. Mizue:

Subject: Your Letter of October 16, 1997 to ParEn, Inc. Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kuou Well III, Kaneohe, Oahu, TMK: 4-5-41: 12

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kuou Well III project.

We acknowledge that a site visit will be required for a jurisdictional determination. In addition, we note that the flood hazard information provided on page 9 of the Draft EA is correct.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Keith Uemura, ParEn, Inc.



United States
Department of
Agriculture
Natural
Resources
Conservation
Service

P.O. Box 50004
Honolulu, HI
96850

Our People...Our Islands...In Harmony

October 23, 1997

Mr. Keith S. Uemura, Project Manager
ParEn, Inc. dba Park Engineering
Suite 300, Kawajahao Plaza
567 South King Street
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

Subject: Draft Environmental Assessment (DEA) - Kuou Well II, Kaneohe, Oahu, HI

We have reviewed the above mentioned document and have no comments at this time.

Thank you for the opportunity to review this document.

Sincerely,

KENNETH M. KANESHIRO
State Conservationist

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERTANHA STREET
HONOLULU HAWAII 96843
PHONE (808) 527-6100
FAX (808) 533-2714



November 12, 1997

Mr. Kenneth M. Kaneshiro
State Conservationist
Natural Resources Conservation Service
United States Department of Agriculture
P. O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Subject: Your Letter of October 23, 1997 to ParEn, Inc. Regarding the Draft
Environmental Assessment for the Board of Water Supply's Proposed Kuou
Well III, Kaneohe, Oahu, TMK: 4-5-41-12

Thank you for reviewing the Draft Environmental Assessment for the proposed Kuou Well III project.

We acknowledge that you have no comments to offer at this time.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Keith Uemura, ParEn, Inc.

COPY

LEONARDOS, INC.
WALTER WISSOU, Sr. Owner
MARCELO TAMASATO, Vice President
MAQUINARIAS-MA
WELLESIA T. JUN
FERRIS C. ARROYO
JOYHANA S. RAMAHO
BARBARA W. STANTON
RAYMOND H. SATO
Manager and Chief Engineer

The Natural Resources Conservation Service works hand-in-hand with
the American people to conserve natural resources on public lands.

AN EQUAL OPPORTUNITY EMPLOYER

U.S. GPO: 1997-0-000-0000-0000



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

October 6, 1997

LD-NAV
REF.: 2-DEARW111.RCH

Mr. Keith S. Uemura
Project Manager
P&EN, Inc
567 S. King Street, Suite 300
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

SUBJECT: Review : Revised Draft Environmental Assessment
Project : Kuou Well III
Proposed : Construction of a production well facility equipped with a pump building, control building, 20,000 gallon reservoir and appurtenances

Applicant: Honolulu Board of Water Supply
Location : Kaneohe, Island of Oahu, Hawaii
TMK : 1-81-4-5-4-12

This is a follow-up to the Department's letter to you dated August 19, 1997 (copy attached), pertaining to the subject matter.

Our Commission on Water Resource Management, Aquatic Resource and Land Division's Planning and Technical Services do not have any additional comments to offer on the proposed Kuou Well III project.

Our Land Division's Planning and Technical Services Branch has determined that the proposed project is in an identified land use in the General Subzone (P-6: Public Purpose Uses). A Conservation District Use Permit is required.

Should you have any questions, please feel free to contact Nicholas Vaccaro of the Land Division's Support Services Branch at 537-0438.

Very truly yours,

Nicholas Vaccaro
NICHOLAS Y. UCHIDA
Administrator

c: At Large Land Board Member
Oahu District Land Office



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P.O. BOX 621
HONOLULU, HAWAII 96809
August 19, 1997

LD-NAV
REF.: DEARW111.RCH

Mr. Keith S. Uemura
Project Manager
P&EN, Inc
567 S. King Street, Suite 300
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

SUBJECT: Review : Draft Environmental Assessment
Project : Kuou Well III
Proposed : Construction of a production well facility equipped with a pump building, control building, 20,000 gallon reservoir and appurtenances
Applicant: Honolulu Board of Water Supply
Location : Kaneohe, Island of Oahu, Hawaii
TMK : 1-81-4-5-4-12

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the Kuou Well III project.

Our Commission on Water Resource Management (CWRM), Division of Aquatic Resources and Land Divisions' Planning and Technical Services Branch have the following comments to offer on the proposed project.

Commission on Water Resource Management:

1. We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

2. A Pump Installation Permit from CWRM would be required before ground water is developed as a source of supply for the project.

3. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from CWRM would be required prior to use of this source.

4. Groundwater withdrawal from this project may affect streamflows. This may require an instream flow standard amendment.

Page 2
Review DEA
Huou Well III

Division of Aquatic Resources.

1. The division has no objections to this request since the proposed project is not expected to have a significant adverse impact on aquatic resource values in this area.
2. Kuou Stream is adjacent to the proposed project site and may harbor a number of aquatic species. The upstream migration of native aquatic wildlife from ocean to this area may be hindered by the Hoomaluhia Reservoir.
3. A number of exotic species may exist in the stream. Construction activities could have short-term impacts on aquatic resources such as temporary turbidity, biota displacement and disturbance.
4. Mitigation measures should be taken during construction to prevent petroleum products, sediment and other debris from blowing, leaching, draining, or entering the aquatic environment.
5. We also suggest that site work be scheduled for periods of minimal rainfall and lands denuded of vegetation be replanted or covered as quickly as possible to control erosion.

Planning and Technical Services.

1. A conservation District Use Permit will be required for the proposed project.
2. Please contact our Land Division's Planning and Technical Services Branch. The application for a COUP can be picked up at 1151 Punchbowl Street, Room 220, Honolulu, Hawaii.

The Department of Land and Natural Resources has no other comments to offer on the proposed project at this time. Should you have any questions, please feel free to contact Nicholas Vaccaro of the Land Division at 587-0438.

HAWAII: Earth's best!

Aloha.

MICHAEL D. WILSON

c: At Large Land Board Member
Oahu District Land Office

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
430 SOUTH BERTANHA STREET
HONOLULU HAWAII 96843
PHONE (808) 537-6180
FAX (808) 533-2716



November 12, 1997

Mr. Michael D. Wilson, Chairperson
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Uchida:

Subject: Your Letter of October 6, 1997 to ParEn, Inc. Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kuou Well III, Kaneohe, Oahu. TMK: 4-5-41: 12

Thank you for reviewing the Draft Environmental Assessment for the proposed Kuou Well III project.

We provide the following response to your concerns:

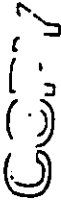
Commission on Water Resource Management:

1. The proposed project is incorporated into the County Water Use and Development Plan.
2. A Pump Installation and Water Use Permits will be obtained prior to use of this source.
3. Data obtained during test pumping of the exploratory well indicate that groundwater withdrawal should not affect nearby Kuou Stream.

Division of Aquatic Resources (DAR):

1. We acknowledge that DAR has no objections to the proposed project since it is not expected to have a significant adverse impact on aquatic resource values in the area.

For More Information - see sheet



AGRICULTURE, WATER
WALTERO PATISON, JR. CHAIRMAN
MANAGER OF WATER SUPPLY
KAZUMASA HOKI
MELISSA Y. LUI
FORESTIC SERVICE
JOHNATHAN S. SAKUMA, P.E.
PUBLIC WORKS DIVISION
RAYMOND H. SATO
Manager and Chief Engineer

Mr. Michael D. Wilson
Page 2
November 12, 1997



2. We note that construction activities may have short-term impacts on aquatic resources, such as temporary turbidity, biota displacement and disturbance. Mitigative measures such as silt fences and revegetation practices will be implemented to prevent the migration of sediments and pollutants into receiving waters.

3. Construction is anticipated to occur during drier periods.
Planning and Technical Services:

We acknowledge that a Conservation District Use Permit will be required.

If you have any questions, please contact Barry Usagawa at 577-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Keith Uemura, ParEn, Inc.

For More Information - see sheet



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

October 17, 1997

Mr. Keith S. Uemura
ParEn, Inc. dba Park Engineering
Suite 300, Kawaihāo Plaza
567 S. King Street
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

SUBJECT: Chapter 6E-8 Historic Preservation Review of a Draft
Environmental Assessment for Kuou Well III
Kanaohe, Koolauoko, Oahu TMK: 4-5-041-012

LOG NO: 20317 ✓
DOC NO: 9710SC09

Thank you for the opportunity to comment on the draft Environmental Assessment (EA) prepared for the proposed construction of Kuou Well III by the Board of Water Supply (BWS) of the City and County of Honolulu at a well site in Kaneohe, O'ahu. Our review is based on historic reports, maps, and aerial photographs maintained at the State Historic Preservation Division; no field inspection was made of the subject parcel.

According to the draft EA, the BWS proposes to build Kuou Well III at the site of an existing exploratory well. The project will include installation of a deep well production pump, appurtenant piping, a pump building, control building, and breaker reservoir.

We have no record of historic sites on the subject parcel. According to the draft report, documenting a recent archaeological inventory survey of the proposed well site, no significant historic sites were found. The field crew conducted a pedestrian survey and limited subsurface testing, and no evidence of historic sites was found. We have recently completed a review of the report and, pending the receipt of a few minor, recommended revisions, anticipate accepting the report as final. Nonetheless, we can say at this time that we believe that the proposed Kuou Well III, if constructed as shown in the draft EA, will have "no effect" on significant historic sites.

Should you have any questions, please feel free to call Sara Collins at 587-0013.

Aloha

DON HIBBARD, Administrator
State Historic Preservation Division

SC:jk

NICHOLE S. WILSON, CHIEF CLERK
BOARD OF WATER SUPPLY
SUITE 100
1615 KULIHI AVENUE
HONOLULU, HAWAII 96813
PHONE: (808) 527-6190
FAX: (808) 533-2714

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERTANNA STREET
HONOLULU, HAWAII 96813
PHONE: (808) 527-6190
FAX: (808) 533-2714



November 12, 1997

Mr. Don Hibbard, Administrator
State Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
33 South King Street
Honolulu, Hawaii 96813

Dear Mr. Hibbard:

Subject: Your Letter of October 17, 1997 to ParEn, Inc. Regarding the Draft
Environmental Assessment for the Board of Water Supply's Proposed Kuou
Well III, Kanaohe, Koolauoko, Oahu, TMK: 4-5-41-12

Thank you for reviewing the Draft Environmental Assessment for the proposed Kuou Well III project.

We acknowledge that a recent archaeological inventory survey was conducted at the site and that the proposed project will have "no effect" on any historic sites in the area. However, if archaeological remains are discovered during construction, all work will stop and your office will be contacted.

If you have any questions, please contact Barry Utagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Keith Uemura, ParEn, Inc.

COPY

KERUIMARIS MAPO
W.L. ERIC WATSON, JR. Director
MAURICE H. YAMASAKI, Vice Director
KAZUHIYASHIDA
REUSSA Y. J. LUI
FOREST C. LAURITT
JONATHAN K. SHAMODA, PhD
BARBARA KIM STANTON
RAYMOND H. SATO
Manager and Chief Engineer

BENJAMIN J. CAVETANO
DIRECTOR



STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

126 SOUTH BERTANANIA STREET
HONOLULU, HAWAII 96813
TELEPHONE (808) 541-4114
FACSIMILE (808) 541-4110

October 22, 1997

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

Dear Mr. Sato:

Subject: Draft Environmental Assessment for the Kuou Well III,
Oahu

Thank you for the opportunity to review the subject document. We
have the following comments.

1. Orientation Maps

Please provide maps that show the following:

- a) location of existing and future wells in the affected aquifer or hydrologic unit;
- b) aquifer or hydrologic unit boundary, known or assumed groundwater flowpaths, and known or assumed water level contours; and
- c) points or regions of known contamination, points of potential contamination (landfills, individual wastewater disposal systems, hazardous waste sites, dry wells and injection wells), known or assumed chloride levels at specified depths in relation to nearest or adjacent wells, and the likely wellhead protection area for the proposed well.

2. Aquifer or Hydrologic Unit Status

Please provide a description of pending installed capacity and/or use for wells within the aquifer or hydrologic unit.

Mr. Sato
Page 2

CLAY OLL
DIRECTOR

3. Contamination Analysis

Please present a record of contamination problems in the aquifer or hydrologic unit including but not limited to saltwater intrusion, turbidity, heavy metals, inorganic and organic chemicals, microbiological agents, water quality parameters (such as pH, alkalinity, calcium, conductivity and temperature), and radioactivity. If contamination exists, the sources and duration of the contamination should be listed. Water quality data from nearby wells should be presented as well as any anticipated need for treatment or filtering systems. Discuss past and existing land uses within the likely wellhead protection area and the potential for future contamination from those uses.

Any hazardous materials produced during treatment should be described. The method of handling these hazardous materials should also be disclosed.

4. Hydrologic Impact Analysis

The environmental assessment presents conflicting information (see pages 1, 7, and 13) on the potential effects of the well development on Kuo Stream. Please check the document and present the correct information. If potential impacts exist, a monitoring program for the surface waters should be included.

The EA should include pump test data on water level, extraction rates, and water quality. Similar data from nearby wells should also be included.

5. Financial and Institutional Arrangements

In some instances, a well is developed by private financing, the transfer of public lands to government or private developers, or in return for a water allocation credit to supply an urban development. The EA should include a full discussion of any institutional, financial or land use arrangements or commitments related to developing the well and delivering water to end users.

These arrangements may include the formation of public utility companies and subsequent rate-setting, the establishment of county water commitments, the co-funding of state or county water system development, an executive order or other set-aside of state lands, and purchase of land or easements by public entities.

All permits or governmental approvals required to fulfill these commitments should be listed.

Mr. Sato
Page 3

6. Watershed and Land Use Analysis

Please discuss how waters from the well will be used, and an analysis of how the proposed well development may affect land and water uses in the region. The analysis should include a discussion of the following:

- Hawaii State Water Plan and its component parts
- County General and Development Plans
- Plans for future water development within the aquifer
- Any secondary or cumulative impacts caused by promoting land uses that alter the hydrology of the source and/or end-use area
- An assessment of the well's impact on the major land owners in the region and a declaration if ceded lands are involved.
- An assessment of any impact the well development may have on small landowners or water users including farmers and kuleana residents.

7. Alternative Analysis

Please include a full list of alternatives to new groundwater development and a discussion of their related costs and benefits. The list should include but not be limited to wastewater reuse, rainfall catchment, conservation, and existing potable and nonpotable water supplies.

8. Determination

Please discuss the findings and reasons for supporting the FONSI determination based on the significant criteria listed in §11-200-12 of the EIS rules. Please see the enclosed example.

Should you have any questions, please call Jeyan Thirugnanan at 586-4185.

Sincerely,


Gary Gill
Director

Enclosure

cc: Park Engineering

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
600 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813
PHONE (808) 527 6180
FAX (808) 533 2714



November 18, 1997

COPY

KELEP HIGGINS, Chair
WALTER WATSON, Jr. Director
MARGIE H. YAMASAKI, Vice Director
KAZUYUKI KISHIMOTO
MELISSA Y. JIM
FORREST C. MURPHY
JOHNATHAN K. SHIMADA, P.E.
BARBARA K. STANTON
RAYMOND H. SATO
Manager and Chief Engineer

Mr. Gary Gill, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Your Letter of October 22, 1997 Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kuou Well III, Kaneohe, Oahu, TMK: 4-5-41:12

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kuou Well III project. The EA was formulated prior to the proposed Office of Environmental Quality Control guidelines for Well EA's.

We provide the following responses to your concerns:

1. Orientation Maps

- a. The Final EA will include a Koolauoko aquifer boundary map indicating the location of existing and future Board of Water Supply wells.
- b. Groundwater flows from high head potential to low potential. In this case, the general groundwater flowpath of the affected aquifer is from mountain to ocean.
- c. There are no known sources of contamination upgradient of the proposed well. In addition, we have no record of any contamination problems in the affected aquifer. The proposed well site should be well-protected because it is located within the City's Hoomaluhia Botanical Park, a State Conservation District.

2. Aquifer or Hydrologic Unit Analysis:

An inventory of wells, owners, permitted uses and pumpage will be provided. The list is part of the Oahu Water Management Plan for the Koolauoko region.

Mr. Gary Gill
Page 2
November 18, 1997



As indicated in our comments to the EA guidelines for wells, pump capacity in the aquifer has little utility; however, the Kuou Well III will have a 0.7 mgd pump.

3. Hydrologic Impact Analysis:

Based on test-pumping and stream monitoring data, the proposed well project is not anticipated to impact Kuou Stream. Test pump data on water levels and extraction rates and water quality data will be included in the EA.

4. Financial and Institutional Arrangements:

There are no financial or institutional arrangements or commitments related to developing the well. The well water is intended for small user growth. The well project will be financed through BWS Water System Facilities Charges for resource development.

5. Watershed and Land Use Analysis:

- a. The proposed well project is included in the Oahu Water Management Plan which is a component of the Hawaii State Water Plan. The project supports the policies of the county General and Development Plans.
- b. The proposed project is not anticipated to incur any secondary or cumulative impacts by promoting land uses that alter the hydrology of the source water end user. Water in excess of Windward's needs will be made available for East Honolulu.
- c. The proposed project is located within the State Conservation District and is not to our knowledge, on or impacting ceded lands.
- d. The proposed well project is not anticipated to impact streamflow; therefore, farmers, kuleana residents, and other surface water users should not be affected.

Pure Water ... man's greatest need - use it wisely

Mr. Gary Gill
Page 3
November 18, 1997




6. Alternative Analysis:

Alternative methods of potable and nonpotable water production will be expanded in the EA to include: conservation, desalination, surface water and reclamation.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,


RAYMOND H. SATO
Manager and Chief Engineer

cc: Keith Uemura, ParEn, Inc.

Pure Water ... man's greatest need - use it wisely

COPY

JEREMY HARRIS 2100
WALTER O. WATSON, JR. Chairman
MAURICE Y. YAMASATO Vice Chairman
KAZUO MATSUSHITA
DELORES T. J. LUI
FORESTIC MURPHY
J. PATRICIA S. SHAWDA PhD
DORIS K. IMAI STANTON
RAYMOND H. SATO
Manager and Chief Engineer

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
600 SOUTH BERTLAND STREET
HONOLULU HAWAII 96813
PHONE (808) 527-6180
FAX (808) 533-2713

LAWRENCE HARRIS
DIRECTOR

808-533-2713



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU HAWAII 96813

October 20, 1997

93-150C/epo

Mr. Keith S. Uemura
ParEn, Inc. dba Park Engineering
Kawaiahao Plaza, Suite 300
567 South King Street
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

Subject: REVISED DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
Project: Kuou Well III
Location: Hoomaluhia Botanical Garden
Kaneohe, Oahu, Hawaii
THK: (1) 4-5-41: 12

Thank you for allowing us to review and comment on the subject project. We do not have any comments to offer at this time.

Sincerely,

BRUCE S. ANDERSON, Ph.D.
Deputy Director for Environmental Health



November 12, 1997

Dr. Bruce S. Anderson
Deputy Director for Environmental Health
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Anderson:

Subject: Your Letter of October 20, 1997 to ParEn, Inc. Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kuou Well III, Kaneohe, Oahu, THK: 4-5-41: 12

Thank you for reviewing the Draft Environmental Assessment for the proposed Kuou Well III project.

We acknowledge that you do not have any comments to offer at this time.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Keith Uemura, ParEn, Inc.

RECEIVED OCT 07 1997



STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
711 HAWAIIAN BOULEVARD, SUITE 320
HONOLULU, HAWAII 96813-2416
PHONE (808) 584-1888
FAX (808) 584-1885
September 29, 1997

Mr. Keith S. Uemura
Park Engineering
567 South King Street,
Kawaiahao Plaza
Honolulu, HI 96813-3036

Subject: Draft Environmental Assessment (DEA) for Kuou Well
III, Hoomaluhia Botanical Garden, Kaneohe, Island
of Oahu.

Dear Mr. Uemura:

Thank you for the opportunity to review the Draft
Environmental Assessment (DEA) for Kuou Well III, Hoomaluhia
Botanical Garden, Kaneohe, Island of Oahu. The Board of
Water Supply proposes to construct a production well
facility equipped with a pump building, control building,
20,000 gallons reservoir, and accessory utility and access
features.

The Office of Hawaiian Affairs (OHA) has no objections
at this time to the proposed well development. A potential
impact of this well is that pumping could affect streamflow
characteristics of nearby Kuou stream. However, streamflow
data collected prior to and during the test pumping of Kuou
Exploratory Well III indicate that pumping activities will
not reduce Kuou's streamflow. Furthermore, an archaeological
survey of the area indicates a low likelihood of finding
archaeological resources.

Letter to Mr. Uemura
Page two

Please contact Lynn Lee, Acting Officer of the Land and
Natural Resources Division, or Luis A. Manrique, should you
have any questions on this matter.

Sincerely yours,

Randall Ogata
Administrator

Lynn Lee
Acting Officer,
Land and Natural
Resources Division

- LH:lm
cc Trustee Clayton Hee, Board Chair
Trustee Abraham Aiona, Board Vice-Chair
Trustee Rowena Akana, Land & Sovereignty Chair
Trustee Haunani Apoliona
Trustee Trenchy DeSoto
Trustee Moses Keale
Trustee Colette Machado
Trustee Hannah Springer

DEPARTMENT OF PLANNING
CITY AND COUNTY OF HONOLULU

RECEIVED OCT 0 0 1997

650 SOUTH KING STREET, 21ST FLOOR, HONOLULU, HAWAII 96813-3017
PHONE: (808) 523-4711 • FAX: (808) 523-4810



PAI'ANGA O HAWAII
KŪKAU
DONALD H. HARRIS
DIRECTOR

GW 9/97-1833

October 3, 1997

Mr. Keith S. Uemura, Project Manager
PartEn, Inc. dba Park Engineering
567 South King Street, Suite 300
Honolulu, Hawaii 96813-3016

Dear Mr. Uemura:

September 1997 Draft Environmental Assessment for
Kuou Well III, Kaneohe, Oahu, Hawaii

We have reviewed the above-referenced DEA for Kuou Well III. We acknowledge that you have incorporated many of the comments provided in our letter of July 30, 1997 regarding review of a previous draft of this document. We again offer the following detailed comments for your renewed consideration.

1. Regarding the PROPOSED PROJECT section. (Section V.A, pg. 5)
 - a. There is no "state Department of General Planning" in Hawaii. It appears your intended reference may be to the City's Planning Department.
 - b. Should the statement that the new parcel will be created for this project be interpreted as meaning that a formal subdivision will be made?
2. Regarding TECHNICAL CHARACTERISTICS, page 6:
 - a. Should the statement that the new parcel will be created for this project be interpreted as meaning that a formal subdivision will be made?
 - b. FIGURE 4: The title block should be corrected to indicate the project's location in Koolauapoko, not Koolauloa.

Mr. Keith S. Uemura, Project Manager
PartEn, Inc. dba Park Engineering
October 3, 1997
Page 2

Should you have any questions, please call Gordon Wood of the Planning Department staff at 527-6073.

Yours very truly,

PATRICK T. ONISHI
Chief Planning Officer

PTO:lh

cc: Ray Sato, BWS

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
633 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813
PHONE (808) 527-6100
FAX (808) 532-7114



October 23, 1997

COPY

ALBERT HARRIS, JR.
WALTERO WATSON, JR. Director
MAURICE W. YAMASAKI, M.D. Deputy
ALAN HAYASHIDA
MELISSA Y. LIU
FORESTIC ALBERT
JOYNTAKA SHIMADA, M.D.
BIBIANA KAI STANLEY

ANNOHON SATO
Manager and Chief Engineer

TO: PATRICK T. ONISHII, CHIEF PLANNING OFFICER
PLANNING DEPARTMENT
FROM: *Keith Uemura*
ANDREW H. SATO, MANAGER AND CHIEF ENGINEER,
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF OCTOBER 3, 1997 REGARDING THE DRAFT
ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED KUOU WELL III, KANEOHE,
OAHU, THIS 4-3-91, PORTION 1.

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kuou Well III project.
We provide the following responses to your concerns:

1. The Final EA will be amended to refer to the "State Office of Planning" instead of the "State Department of General Planning".
2. A formal subdivision will be made for the proposed well project after the metes and bounds are finalized.
3. The Final EA will be amended to refer to the project's location as Koaupoko instead of Koaupoko.

If you have any questions, please contact Barry Usagawa at 537-5235.

Keith Uemura
Keith Uemura, PE/EA, Inc.

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU

515 SOUTH BERETANIA STREET
HONOLULU HAWAII 96813



4-8287 HAWAII
201-000

WILLIAM D. BALFOUR, JR.
DIRECTOR
HONOLULU, HAWAII

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
530 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813
PHONE (808) 527-6100
FAX (808) 533-2714

COPY

EREMY HARRIS, MGR
WALTER WATSON, JR., CHIEF
MURICE H. YAMASATO, VICE CHIEF
KAZUHARU SUGA
KOSUJI Y. LEE
KEVIN C. ROBERT
LOUIS ANNE SHIMADA, P.D.
BARBARA VOGEL STANTON
RAYMOND H. SATO
Manager and Chief Engineer



November 12, 1997

September 24, 1997

Mr. Keith S. Uemura
ParEn, Inc.
Kawaihāo Plaza, Suite 300
567 South King Street
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

Subject: Draft Environmental Assessment for Kuou Well III
Thank you for the opportunity to review the subject document.

We are concerned about the access road to the proposed Kuou Well III at Ho'omaluhia Botanical Garden. During heavy rains, the well may flood the road and prevent access to the rest of the garden. We would like to have water bars or breakers installed to prevent the runoff of rain water onto the main road.

Please contact Mr. Carl Emura, Planner, of our Advance Planning Branch, at 527-6315 if you need further information.

Sincerely,

WILLIAM D. BALFOUR, JR.
Director

WDB:el

TO: WILLIAM D. BALFOUR, JR., DIRECTOR
DEPARTMENT OF PARKS AND RECREATION
City and County of Honolulu
FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF SEPTEMBER 24, 1997 TO PAREN, INC.
REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR
THE BOARD OF WATER SUPPLY'S PROPOSED KUOU WELL III,
KANEHOHE, OAHU

Thank you for reviewing the Draft Environmental Assessment for the proposed Kuou Well III project.

The existing drainage plan directs storm runoff away from the park access road. Site grading will direct runoff from the mauka portion of the parcel to flow away from the well access road through the low-lying banana patch areas. Runoff from the makai portion of the parcel will flow to the vicinity of the well entry gate and access road. However, the well access road will be super-elevated to facilitate runoff towards the adjacent gully that eventually crosses under the main park access road via a 60-inch reinforced concrete pipe culvert.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Keith Uemura, ParEn, Inc.

The Senate
of the
State of Hawaii

STATE OFFICE
1550 KALANIANA'OLA DRIVE
HONOLULU, HAWAII 96813



BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
530 SOUTH BERTANNA STREET
HONOLULU, HAWAII 96813
PHONE (808) 527-8195
FAX (808) 533-2714



November 12, 1997

COPY

ALBERT HARRIS, Mayor
WALTER C. WATSON, Jr., Chairman
MURICE H. YAMASATO, Vice Chairman
KAZUHIKASHIDA
MELISSA Y.J. LUM
FORREST C. MURPHY
JOHN HANIK SAMUDA, P.E.
BARBARA HUNTER
RAYMOND H. SATO
Manager and Chief Engineer

September 18, 1997

Keith S. Uemura
Park Engineering
Suite 300
Kawaihāo Plaza
567 South King Street
Honolulu, HI 96813-3036

Mr. Uemura:

Thank you for sending me a copy of the Draft Environmental Assessment for Kuou Well III in Kaneohe as proposed by the Honolulu Board of Water Supply.

I will keep in mind the October 29, 1997 schedule for comments on this draft environmental assessment.

With warm personal regards, I remain,

Sincerely,

Marshall K. Ige
State Senate

The Honorable Marshall K. Ige
The Senate
The Nineteenth Legislature
State Capitol
Honolulu, Hawaii 96813

Dear Senator Ige:

Subject: Your Letter of September 18, 1997 to ParEn, Inc. Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kuou Well III. Kaneohe, Oahu. TMK: 4-5-41: 12

Thank you for reviewing the Draft Environmental Assessment for the proposed Kuou Well III project.

We note that you have no comments to offer at this time.

If you have any questions, please contact Barry Usagawa at 527-5235.

Very truly yours,

Raymond H. Sato
RAYMOND H. SATO
Manager and Chief Engineer

cc: Keith Uemura, ParEn, Inc.

97mki538

APPENDIX A

TABLE 3-2				
GROUNDWATER USE BY AQUIFER SYSTEM AND SUSTAINABLE YIELD				
AQUIFER SECTOR/ SYSTEM	DIKE/BASAL SUSTAINABLE YIELD	1998 PERMITTED USE ¹	AVAILABLE SUSTAINABLE YIELD	1994 DIKE/BASAL USE
HONOLULU				
PALOLO	5	5.889	-0.689	5.207
NUUANU	15	15.170	-0.170	14.994
KALIHI	9	8.492	0.508	7.818
MOANALUA	18	18.570	-0.570	14.700
WAIALAE WEST	4	1.990	2.010	0.868
WAIALAE EAST	2	0.800	1.400	0.247
SUBTOTAL	53	50.511	2.489	43.832
PEARL HARBOR				
WAIMALU	45	48.379	-3.379	45.070
WAIPAHU-WAIAWA ⁵	119	110.559	8.441	71.894
EWA-KUNIA	20	17.891	2.109	15.973
MAKAIWA	0		0.000	0.000
SUBTOTAL	184	176.829	7.171	132.937
CENTRAL				
WAHIAWA	23	20.748	2.254	9.710
WAIANAE				
NANAKULI ⁶	1	0.000	1.000	0.000
LUALUALEI ⁶	3	0.300	2.700	0.306
WAIANAE ⁶	3	3.272	-0.272	2.886
MAKAHA ⁶	4	2.228	1.772	2.204
KEAAU ⁶	4	0.000	4.000	0.000
SUBTOTAL	15	5.800	9.200	5.398
NORTH				
MOKULEIA	12	6.030	5.970	2.123
WAIALUA	40	39.738	0.262	25.971
KAWAILOA	39	7.053	31.847	2.003
SUBTOTAL	91	52.821	38.179	30.097
WINDWARD				
KOOLAULO	35	18.590	16.410	11.714
KAHANA ²	13	1.101	11.899	0.715
KOOLAUPOKO ²	43	15.522	27.478	13.780
WAIMANALO ²	8	1.658	8.344	0.911
SUBTOTAL	99	36.869	62.131	27.100
EWA CAPROCK	N/A ³			
GRAND TOTAL ⁴	465	343.578	121.424	249.072

¹ Dike/Basal Permitted Use as of May 1996. Excludes highly saline to salt water use permits (chlorides > 1,000 mg/l)
² Permanent instream flow standards may reduce the availability of excess sustainable yield.
Withdrawals affecting streams require amendments to instream flow standards
³ Estimated sustainable yield is < 21 mgd due to sugar plantation closure.
⁴ Grand total of Dike/Basal uses excludes; caprock, springs and perched alluvial sources.
⁵ Waipahu-Waiawa & Waialua sustainable yields may be reduced to reflect the recharge reduction from sugar plantation closure.
⁶ Waianae is not a designated water management area, therefore, existing uses are shown in lieu of permitted use.
Source: George Yuen and Associates, 1990; DLNR and BWS records

Revised: 11/17/97

11-19-96 sfc_fm1.xls
WATER SOURCE INVENTORY BY AQUIFER SYSTEM (MGD)

USER	SOURCE	WELL NO.	PERMITTED USE		POTABLE USE		NON-POTABLE USE		COMBINED USE	DEVELOPMENT PLAN AREA	AQUIFER SYSTEM	SOURCE COMMENTS
			1996	1994	1994	1994	1990					
BWS	HAKU TUNNEL	2450-01	1,340	1,204					0,955	KOOLAUPOKO	KOOLAUPOKO	
BWS	HAKU WELL	2450-02	0,457	0,450					0,528	KOOLAUPOKO	KOOLAUPOKO	
BWS	YOLEKAA WELL	2549-01	0,153	0,188					0,210	KOOLAUPOKO	KOOLAUPOKO	
BWS	KAHALUU TUNNEL	2651-01	2,128	1,438					1,280	KOOLAUPOKO	KOOLAUPOKO	
BWS	KAHALUU WELL	2651-03	0,927	0,929					0,879	KOOLAUPOKO	KOOLAUPOKO	
BWS	KUOU WELL I	2348-02,03	2,969	2,448					2,614	KOOLAUPOKO	KOOLAUPOKO	
BWS	KUOU WELL II	2348-05	0,245	0,462					0,056	KOOLAUPOKO	KOOLAUPOKO	FUTURE
BWS	KUOU WELL III	2348-06	0,000	0,000					0,245	KOOLAUPOKO	KOOLAUPOKO	
BWS	LUALUKU TUNNEL	2349-01	0,713	0,330					0,798	KOOLAUPOKO	KOOLAUPOKO	
BWS	LUALUKU WELL	2349-02	1,011	1,017					4,777	KOOLAUPOKO	KOOLAUPOKO	
BWS	WAHIEE TUNNEL	2651-02	4,000	4,070					1,224	KOOLAUPOKO	KOOLAUPOKO	
BWS	WAHIEE INCLINED WELLS	2652-01 TO 04	1,000	1,064					0,000	KOOLAUPOKO	KOOLAUPOKO	
BWS	WAHIEE WELLS	2751-02,03	0,000	0,002					0,000	KOOLAUPOKO	KOOLAUPOKO	
DOH STATE HOSPITAL	HI STATE HOSPITAL	2448-01	0,068	0,000					0,090	KOOLAUPOKO	KOOLAUPOKO	
VALLEY OF TEMPLES	VALLEY OF TEMPLES	2560-01	0,018	0,000					0,170	KOOLAUPOKO	KOOLAUPOKO	
MIRAMIR GROUP	KOOLAUPOKO	2347-02,03	0,150					0,017	0,000	KOOLAUPOKO	KOOLAUPOKO	
CHIANG	MONTGOMERY RL	2750-08	0,002					0,025	0,000	KOOLAUPOKO	KOOLAUPOKO	
STATE HFD	WAIKOLE AG. PARK	2751-08	0,038					0,002	0,000	KOOLAUPOKO	KOOLAUPOKO	
UNITY HAWAII	MRTCHIMBURI	2653-04,05	0,075	0,100				0,000	0,000	KOOLAUPOKO	KOOLAUPOKO	
PACIFIC ATLAS HAWAII	BAY VIEW GC	3031-02	0,000					0,000	0,000	KOOLAUPOKO	KOOLAUPOKO	
VERTERANS CEMETARY	BAY VIEW GC	2447-02 TO 06	0,210					0,000	0,000	KOOLAUPOKO	KOOLAUPOKO	NEW
	HALEKOU IRRIG WELLS	2347-04 TO 09	0,000					0,000	0,000	KOOLAUPOKO	KOOLAUPOKO	NEW
TOTAL - KOOLAUPOKO			15,312	13,700			0,056		33,726			
BWS	WAIMANALO TUNNELS	2044-03,04	0,900	0,890					0,680	KOOLAUPOKO	WAIMANALO	
BWS	WAIMANALO WELL I	2045-03,05	0,000	0,002					0,122	KOOLAUPOKO	WAIMANALO	Off-Line: Alachar
BWS	WAIMANALO WELL II	1943-01	0,452	0,133					0,122	KOOLAUPOKO	WAIMANALO	
BWS, DPHL	WAIMANALO WELL III	1942-01	0,000	0,000					0,000	KOOLAUPOKO	WAIMANALO	FUTURE
STATE DOA	WAIMANALO AG PARK	2045-01,02	0,000	0,000				0,000	0,180	KOOLAUPOKO	WAIMANALO	
ROYAL HAWAIIAN CC	ROYAL HAWAIIAN CC	2146-01,03 2147-01	0,155						0,000	KOOLAUPOKO	WAIMANALO	
STATE DPHL	DHRL-RESERVE	2045-06	0,124					0,066	0,000	KOOLAUPOKO	WAIMANALO	
CAC DWM	KAILUA WWTP	2545-01	0,025						0,000	KOOLAUPOKO	WAIMANALO	
TOTAL - WAIMANALO			1,656	0,925			0,066		1,104			

- NOTES:
1. Source: DLNR, CWRM and BWS files and data.
2. Permitted Uses from CWRM as of May 1996.

APPENDIX B

KUOU EXPLORATORY WELL III NO. 2348-06

LONG TERM PUMPING TEST: 7/05/95 to 7/10/95

<u>Date Time</u>	<u>Q (gpm)</u>	<u>Drawdown (ft.)</u>	<u>Cl (ppm)</u>	<u>Temperature °F</u>	<u>Remarks</u>
7/05/95 (Wednesday) 0935					253.38' static head (airline) started pumping.
0945		91.25		71.4	
0950		110.77	18	71.4	
0955	500	115.50		71.5	
1000	643	116.66		71.5	
1005	607	117.81		71.5	
1010	621	118.97		71.5	
1015	649	120.12		71.4	
1020	644	121.28		71.5	
1030	636	124.74			
1130		126.48			
1200		127.05			
1230		128.21			
1300		129.36			
1400		130.75			
1800		132.25			
2200					
7/06/95 (Thursday) 0200		132.83			
0600		132.83	17	71.4	
1000	610	133.98			average daily rate: 614 gpm
1030	608	133.98			
1400		133.41			
1800		133.75			
2200		133.98			
7/07/95 (Friday) 0200		133.98			
0600		133.98			
1000		133.98	18	71.4	average daily rate: 608 gpm
1125	625	133.98		71.4	
1135	616	133.98			
1400		133.98			
1800		133.98			
2200		134.91			
7/08/95 (Saturday) 0200		133.98			
0600		133.98		71.4	average daily rate: 609 gpm
0925	600	133.52	19	71.4	
0945	600	133.52			
1400		133.52			
1800		133.98			
2200		133.98			
7/09/95 (Sunday) 0200		133.98			
0600		133.52			

Date Time	Q (gpm)	Drawdown (ft.)	Cl (ppm)	Temperature °F	Remarks
0930	607	132.83		71.4	average daily rate: 607 gpm
0945	607	132.83	18	71.4	
1400		133.52			
1800		133.52			
2200		133.98			
7/10/95 (Monday)					
0200		133.98			
0600		135.14			
0925	607	134.22		71.4	
0940	605	134.22	16	71.4	stopped pumping average daily rate: 607 gpm.
0945					
0945:30		105.11			
0946		82.01			
0946:30		61.22			
0947		42.74			
0947:30		33.50			
0948		32.34			
0949		30.03			
0950		28.88			
0952		27.26			
0954		25.41			
0956		24.26			
0959		22.87			
1002		21.72			
1006		20.33			
1010		19.18			
1015		17.79			
1020		17.10			
1027		15.71			
1035		14.79			
1042		13.86			
1058		12.48			
1115		11.32			
1130		10.40			
1245		7.40			

Total pumpage (120 hours): 4,384,200 gallons
 Average pumpage per day: 876,840 gallons per day
 Average pumpage rate: 609 gallons per minute

APPENDIX C

200 10/24/95

MINERAL ANALYSES

Suburban Sources

LOCATION	Hauula Well (3655-01)	Kuou Wells (2348-03)	Luluku Tunnel
Regional head, feet	18.3	-	-
Specific conductance, micromhos @ 25°C.	258	205	146
pH value	7.90	7.80	8.15
Turbidity	0	0	0.1
Color	0.5	0.5	1.1
IN PARTS PER MILLION			
Silica	34	34	24
Calcium	10.6	12.9	8.0
Magnesium	7.6	6.5	4.5
Sodium	25.2	16.8	11.9
Potassium	1.2	1.5	1.0
Bicarbonate	70	76.5	47.5
Sulfate	4.9	3.6	2.7
Chloride	36	21.5	16.5
Fluoride	0.05	0.05	0.05
Nitrate	0.5	0.4	0.4
Phosphate	0.15	0.15	0.15
Iron ) (	0.02	0.02	0.02
Manganese ) (	0.02	0.02	0.02
Copper ) (	0.02	0.02	0.02
Lead) Less than (	0.02	0.02	0.02
Arsenic ) (	0.02	0.02	0.02
Chromium ^a ) (	0.02	0.02	0.02
Total dissolved solids	190	174	117
Alkalinity	57.5	62.5	39
Total hardness	57.5	59	38.5
IN EQUIVALENTS PER MILLION			
Calcium (Ca)	0.529	0.644	0.399
Magnesium (Mg) .....	.625	.535	.370
Sodium (Na)	1.095	.732	.519
Potassium (K) .....	.031	.038	.026
Bicarbonate (HCO ₃)	1.147	1.254	.779
Sulfate (SO ₄) ^b .....	.102	.075	.056
Chloride (Cl)	1.023	.614	.473
Nitrate (NO ₃) .....	.008	.006	.006
TOTALS	4.560	3.898	2.628

a/ Hexavalent only.

b/ Includes fluoride and phosphate as PO₄.

MINERAL ANALYSES

AREA		
LOCATION	Waiahole Well 2 (2853-05)	Kuou Well II (2348-05)
Regional head, feet	None	None
Specific conductance micromhos @ 25°C	117	193
pH value	8.45	8.20
Turbidity	4.5	0.2
Color	10.2	0
IN PARTS PER MILLION:		
Dissolved oxygen	-	-
Free carbon dioxide	-	-
Silica	25	29
Calcium	5.7	12
Magnesium	4.2	7.7
Sodium	8.2	17
Potassium	0.8	1.2
Bicarbonate	40	81
Sulfate	2.4	4.0
Chloride	10	20
Fluoride	< .05	< .05
Nitrate	0.6	0.9
Phosphate	0.10	0.15
Iron	< .02	.07
Manganese)	0.02	0.02
Copper)	.02	.02
Lead) Less than	.02	.02
Arsenic)	.01	.01
Selenium)	.01	.01
Chromium ^a)	.01	.01
Total dissolved solids	97	173
Alkalinity	33	66
Total hardness	31	62
IN EQUIVALENTS PER MILLION:		
Calcium (Ca)	0.284	0.599
Magnesium (Mg) .....	.345	.633
Sodium (Na) .....	.355	.735
Potassium (K) .....	.020	.031
Bicarbonate (HCO ₃) .....	.656	1.328
Sulfate (SO ₄) ^b .....	.050	.083
Chloride (Cl) ^b .....	.288	.572
Nitrate (NO ₃) .....	.010	.015
TOTALS	2.008	3.996

a/ Hexavalent only.

b/ Includes fluoride and phosphate as PO₄.

MINERAL ANALYSES

AREA

LOCATION

Kuou XII
(2348-06)

Year..... 1995
 Date collected..... July 10
 Time collected..... 0930
 Laboratory number..... 199,875

Regional head, feet None
 Specific conductance,
 micromhos @ 25°C 236.00
 pH value 7.96
 Turbidity 0.06
 Color 0.00

IN PARTS PER MILLION

Silica 25.00
 Calcium 14.00
 Magnesium 6.40
 Sodium 28.07
 Potassium 1.10
 Bicarbonate 115.00
 Sulfate 5.80
 Chloride 16.00
 Fluoride < 0.05
 Nitrate 0.61
 Phosphate 0.14
 Iron) 0.01
 Manganese) 0.01
 Copper) 0.01
 Lead) 0.01
 Arsenic).....Less than.....(0.01
 Selenium) 0.01
 Chromium^a) 0.01
 Silver) 0.01
 Barium 0.01
 Cadmium) 0.01
 Total dissolved solids 212.17
 Alkalinity 94.00
 Total hardness 61.24

IN EQUIVALENTS PER MILLION

Calcium (Ca) 0.699
 Magnesium (Mg) 0.526
 Sodium (Na) 1.221
 Potassium (K) 0.028
 Bicarbonate (HCO₃) 1.885
 Sulfate (SO₄) 0.121
 Chloride (Cl)^b 0.458
 Nitrate (NO₃) 0.010
 TOTALS 4.948

a/ Hexavalent only
 b/ Includes fluoride and phosphate as PO₄



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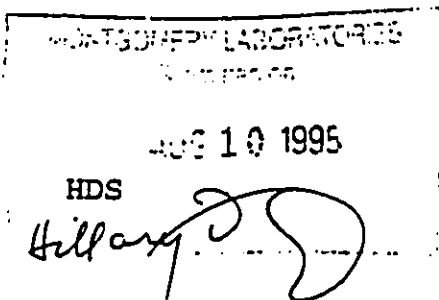
Laboratory Report

for

Honolulu, City of
Board of Water Supply Lab
630 S Beretania St

Honolulu, HI 96843

Attention: Ron Fenstemacher



Report#: 21523

Report 21523 Comment Page

Sample# 950712025
Source: KUOU III(2348-06)

Data Entry Comments

VOLATILES (524.2) Sample was analyzed one day past holding time due to instrument problem during analysis. Client plans to resample at next opportunity.



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Sample # 250712025 Sample ID KUOU III(2148-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

Laboratory Report

Honolulu, City of
Board of Water Supply Lab
630 S Beretania St

Honolulu, HI 96843
ATTN: Ron Penatenmacher

Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed
Barium, Total, ICAP	(EPA/ML 200.7) mg/l	ND			1	0.02			08-Jul-1995 jps
Beryllium, Total, ICAP	(EPA/ML 200.7) mg/l	ND			1	0.001			08-Jul-1995 jps
Cadmium, Total, GP	(MS/EPA 200.7) mg/l	ND				0.001	25-Jul-1995 WIM		29-Jul-1995 wim
Mercury	(EPA/ML 245.1) ug/l	ND				0.2	19-Jul-1995 Sub		19-Jul-1995 Sub
Nickel, Total, ICAP	(EPA/ML 200.7) mg/l	ND			1	0.01			08-Jul-1995 jps
Antimony, Total, GP	(ML/EPA 200.9) mg/l	ND				0.005	31-Jul-1995 wim		31-Jul-1995 wim
Thallium, GP	(MS/EPA 200.9) mg/l	ND				0.001	01-Aug-1995 wim		01-Aug-1995 wim



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Laboratory Report

Honolulu, City of
Board of Water Supply Lab
630 S Beretania St

Honolulu, HI 96843
ATTN: Ron Fenstermacher

Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-jul-1995 Received 12-jul-1995 Reported 09-aug-1995

**Single Determination Analytes
Quality Control**

Control	Parameter	Units	Actual	Found	%Recv
LCS1	Barium, Total, ICAP	mg/l	1.0	1.00	100
LCS2	Barium, Total, ICAP	mg/l	1.0	1.03	103
MBLK	Barium, Total, ICAP	mg/l	ND	ND	
MS	Barium, Total, ICAP	mg/l	1.0	1.03	103
MSD	Barium, Total, ICAP	mg/l	1.0	1.03	103
LCS1	Beryllium, Total, ICAP	mg/l	0.05	0.0488	98
LCS2	Beryllium, Total, ICAP	mg/l	0.05	0.0496	99
MBLK	Beryllium, Total, ICAP	mg/l	ND	ND	
MS	Beryllium, Total, ICAP	mg/l	0.05	0.0484	97
MSD	Beryllium, Total, ICAP	mg/l	0.05	0.0487	97
LCS1	Cadmium, Total, GP	mg/l	0.01	0.0095	95
LCS2	Cadmium, Total, GP	mg/l	0.01	0.0096	96
MBLK	Cadmium, Total, GP	mg/l	ND	ND	
MS	Cadmium, Total, GP	mg/l	0.01	0.0091	91
MSD	Cadmium, Total, GP	mg/l	0.01	0.0098	98
LCS1	Mercury	ug/l	1.50	1.41	94
LCS2	Mercury	ug/l	1.50	1.47	98
MBLK	Mercury	ug/l	ND	ND	
MS	Mercury	ug/l	1.50	1.50	100
MSD	Mercury	ug/l	1.50	1.49	99
LCS1	Nickel, Total, ICAP	mg/l	0.5	0.509	102
LCS2	Nickel, Total, ICAP	mg/l	0.5	0.507	101
MBLK	Nickel, Total, ICAP	mg/l	ND	ND	
MS	Nickel, Total, ICAP	mg/l	0.5	0.505	101
MSD	Nickel, Total, ICAP	mg/l	0.5	0.510	102
LCS1	Antimony, Total, GP	mg/l	0.04	0.0440	110
LCS2	Antimony, Total, GP	mg/l	0.04	0.0447	112
MBLK	Antimony, Total, GP	mg/l	ND	ND	
MS	Antimony, Total, GP	mg/l	0.040	0.0424	106
MSD	Antimony, Total, GP	mg/l	0.040	0.0428	107
LCS1	Thallium, GP	mg/l	0.008	0.00779	97

Report #: 21523



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Laboratory Report

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 630 S Beretania St

 Honolulu, HI 96843
 ATTN: Ron Fenstermacher

Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
 Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**Single Determination Analytes
 Quality Control**

Control	Parameter	Units	Actual	Found	%Recv
GC32	Thallium, GP	mg/l	0.008	0.00827	103
MBLX	Thallium, GP	mg/l	ND	ND	
NS	Thallium, GP	mg/l	0.008	0.00220	26
MSD	Thallium, GP	mg/l	0.008	0.00273	34

Report #: 21523



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Laboratory Report

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 630 S Beretania St
 Honolulu HI 96843
 ATTN: Ron Penstemacher

Sample # 250712025 Sample ID KUOU III(2348-06) Project PHASEV
 Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

AB1803 - EDB and DBCP (ML/EPA 504)

Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Dibromochloropropane (DBCP)	ug/l	ND				0.01	14-Jul-1995	ckk	20-Jul-1995	ckk
Ethylene Dibromide (EDB)	ug/l	ND				0.01	14-Jul-1995	ckk	20-Jul-1995	ckk
Data Entry	--	07/27/95					14-Jul-1995	ckk	20-Jul-1995	ckk



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Laboratory Report

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630 S Beretania St

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ATTN: Ron Fenstermacher

Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

AB1803 - EDB and DBCP (ML/EPA 504)
Quality Control

Control	Parameter	Units	Actual	Found	%Recv
LCS1	Dibromochloropropane (DBCP)	ug/l	0.10	0.10	100
LCS1	Ethylene Dibromide (EDB)	ug/l	0.10	0.1	100
LCS2	Dibromochloropropane (DBCP)	ug/l	0.10	0.11	110
LCS2	Ethylene Dibromide (EDB)	ug/l	0.10	0.11	110
MBLK	Dibromochloropropane (DBCP)	ug/l	ND	ND	
MBLK	Ethylene Dibromide (EDB)	ug/l	ND	ND	
MS	Dibromochloropropane (DBCP)	ug/l	0.10	0.11	110
MS	Ethylene Dibromide (EDB)	ug/l	0.10	0.1	100

Report #: 21523



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Sample # 250712025 Sample ID KUOU IIX(2348-06) Project PHASRV
 Sample Type Meter Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

525 Semivolatiles by GC/MS (ML/EPA 525.2)

Laboratory Report

Honolulu, City of
 Board of Water Supply Lab
 630 S Beretania St
 Honolulu HI 96843
 ATTN: Ron Fenstermacher

Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed	By
2,4-Dinitrotoluene	ug/l	ND				0.1	17-Jul-1995	rod	25-Jul-1995	crw
alpha-Chlordane	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Acmaphthylene	ug/l	ND				0.1	17-Jul-1995	rod	25-Jul-1995	crw
Alechlor	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Aldrin	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Anthracene	ug/l	ND				0.02	17-Jul-1995	rod	25-Jul-1995	crw
Atrazine	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Benz(a)Anthracene	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Benzo(a)Pyrene	ug/l	ND				0.02	17-Jul-1995	rod	25-Jul-1995	crw
Benzo(b)Fluoranthene	ug/l	ND				0.02	17-Jul-1995	rod	25-Jul-1995	crw
Benzo(k)Fluoranthene	ug/l	ND				0.02	17-Jul-1995	rod	25-Jul-1995	crw
Benzofluoranthene	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Di(2-Ethylhexyl)phthalate	ug/l	ND				0.02	17-Jul-1995	rod	25-Jul-1995	crw
Butylbenzylphthalate	ug/l	ND				0.6	17-Jul-1995	rod	25-Jul-1995	crw
Bromacil	ug/l	ND				0.5	17-Jul-1995	rod	25-Jul-1995	crw
Butachlor	ug/l	ND				2	17-Jul-1995	rod	25-Jul-1995	crw
Caffeine	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Chrysene	ug/l	ND				0.02	17-Jul-1995	rod	25-Jul-1995	crw
Fluorene	ug/l	ND				0.02	17-Jul-1995	rod	25-Jul-1995	crw
Di-(2-Ethylhexyl)adipate	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Diethylphthalate	ug/l	ND				0.6	17-Jul-1995	rod	25-Jul-1995	crw
Dieldrin	ug/l	ND				0.5	17-Jul-1995	rod	25-Jul-1995	crw
Dimethylphthalate	ug/l	ND				0.2	17-Jul-1995	rod	25-Jul-1995	crw
Dimethoate	ug/l	ND				0.5	17-Jul-1995	rod	25-Jul-1995	crw
Di-n-Butylphthalate	ug/l	ND				10	17-Jul-1995	rod	25-Jul-1995	crw
Endrin	ug/l	ND				0.5	17-Jul-1995	rod	25-Jul-1995	crw
Fluorene	ug/l	ND				0.1	17-Jul-1995	rod	25-Jul-1995	crw
Gamma-Chlordane	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
Hexachlorobenzene	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw
	ug/l	ND				0.05	17-Jul-1995	rod	25-Jul-1995	crw

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Sample # 250712025 Sample ID KUOU III(2348-06) Project PHASRV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

Laboratory Report

Honolulu, City of
Board of Water Supply Lab
630 S Beretania St

Honolulu HI 96843
ATTN: Ron Fenstermacher

525 Semivolatiles by GC/MS (ML/EPA 525.2)

Parameter	Units	Result	Conc.	Dilution	Det.Limit	Prepared	By	Analyzed
Hexachlorocyclopentadiene	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Heptachlor	ug/l	ND			0.04	17-Jul-1995	rod	25-Jul-1995 crw
Heptachlor Epoxide	ug/l	ND			0.02	17-Jul-1995	rod	25-Jul-1995 crw
Indeno(1,2,3-c,d)Pyrene	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Isophorane	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Lindane	ug/l	ND			0.02	17-Jul-1995	rod	25-Jul-1995 crw
Methoxychlor	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Metribuzin	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Molinate	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Metolachlor	ug/l	ND			0.02	17-Jul-1995	rod	25-Jul-1995 crw
trans-Nonachlor	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Pentachlorophenol	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Phenanthrene	ug/l	ND			1	17-Jul-1995	rod	25-Jul-1995 crw
Propetryn	ug/l	ND			0.02	17-Jul-1995	rod	25-Jul-1995 crw
Propachlor	ug/l	ND			0.5	17-Jul-1995	rod	25-Jul-1995 crw
Pyrene	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Simetryn	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Thiobencarb	ug/l	ND			0.05	17-Jul-1995	rod	25-Jul-1995 crw
Trifluralin	ug/l	ND			0.2	17-Jul-1995	rod	25-Jul-1995 crw
					0.2	17-Jul-1995	rod	25-Jul-1995 crw



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Honolulu , HI 96843
ATTN: Ron Fenstermacher

Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**525 Semivolatiles by GC/MS (ML/EPA 525.2)
Surrogate Summary**

Parameter	Percent Recovery	Acceptable Range
Perylene-d12	95	70 - 130

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ATTN: Ron Penstemacher

Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**525 Semivolatiles by GC/MS (ML/EPA 525.2)
Quality Control**

Control	Parameter	Units	Actual	Found	%Recv
LCS1	alpha-Chlordane	ug/l	2	2.15	108
LCS1	Acenaphthylene	ug/l	2	1.04	52
LCS1	Alachlor	ug/l	2	2.12	106
LCS1	Aldrin	ug/l	2	1.56	78
LCS1	Anthracene	ug/l	2	1.98	99
LCS1	Atrazine	ug/l	2	2.15	108
LCS1	Benzo(a)Anthracene	ug/l	2	2.15	108
LCS1	Benzo(a)pyrene	ug/l	2	1.90	95
LCS1	Benzo(b)Fluoranthene	ug/l	2	2.18	109
LCS1	Benzo(g,h,i)Perylene	ug/l	2	1.51	76
LCS1	Benzo(k)Fluoranthene	ug/l	2	2.09	104
LCS1	Di(2-Ethylhexyl)phthalate	ug/l	2	1.90	95
LCS1	Dibutylphthalate	ug/l	2	1.89	94
LCS1	Caffeine	ug/l	2	1.85	92
LCS1	Chrysene	ug/l	2	2.19	110
LCS1	Dibenz(a,h)Anthracene	ug/l	2	1.55	78
LCS1	Di(2-Ethylhexyl)adipate	ug/l	2	1.92	96
LCS1	Diethylphthalate	ug/l	2	2.15	108
LCS1	Dimethylphthalate	ug/l	2	2.01	100
LCS1	Di-n-Bucylphthalate	ug/l	2	2.11	106
LCS1	Endrin	ug/l	2	1.77	88
LCS1	Fluorene	ug/l	2	2.00	100
LCS1	gamma-Chlordane	ug/l	2	1.87	94
LCS1	Hexachlorobenzene	ug/l	2	1.89	94
LCS1	Hexachlorocyclopentadiene	ug/l	2	1.84	92
LCS1	Heptachlor	ug/l	2	2.08	104
LCS1	Heptachlor Epoxide	ug/l	2	2.29	114
LCS1	Indeno(1,2,3,c,d)Pyrene	ug/l	2	1.51	76
LCS1	Lindane	ug/l	2	1.99	100
LCS1	Methoxychlor	ug/l	2	2.39	120
LCS1	Mollinate	ug/l	2	2.00	100

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Honolulu, HI 96843
ATTN: Ron Penstemacher

Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

525 Semivolatiles by GC/MS (ML/EPA 525.2)
Quality Control

Control	Parameter	Units	Actual	Found	%Recv
LCSI	Krans-Monachlor	ug/l	2	1.92	96
LCSI	Pentachlorophenol	ug/l	8	7.65	96
LCSI	Phenanthrene	ug/l	2	1.81	90
LCSI	Pyrene	ug/l	2	2.25	112
LCSI	Simazine	ug/l	2	1.94	97
LCSI	Thiobencarb	ug/l	2	2.06	103
MBLK	alpha-Chlordane	ug/l	ND	ND	
MBLK	Acenaphthylene	ug/l	ND	ND	
MBLK	Alachlor	ug/l	ND	ND	
MBLK	Aldrin	ug/l	ND	ND	
MBLK	Anthracene	ug/l	ND	ND	
MBLK	Atrazine	ug/l	ND	ND	
MBLK	Benzo(a)Anthracene	ug/l	ND	ND	
MBLK	Benzo(a)pyrene	ug/l	ND	ND	
MBLK	Benzo(b)Fluoranthene	ug/l	ND	ND	
MBLK	Benzo(g,h,i)Perylene	ug/l	ND	ND	
MBLK	Benzo(k)Fluoranthene	ug/l	ND	ND	
MBLK	Di(2-Ethylhexyl)phthalate	ug/l	ND	ND	
MBLK	Butylbenzylphthalate	ug/l	ND	ND	
MBLK	Bromacil	ug/l	ND	ND	
MBLK	Butachlor	ug/l	ND	ND	
MBLK	Caffeine	ug/l	ND	ND	
MBLK	Chrysene	ug/l	ND	ND	
MBLK	Dibenz(a,h)Anthracene	ug/l	ND	ND	
MBLK	Di-(2-Ethylhexyl)adipate	ug/l	ND	ND	
MBLK	Diethylphthalate	ug/l	ND	ND	
MBLK	Diazinon	ug/l	ND	ND	
MBLK	Dieldrin	ug/l	ND	ND	
MBLK	Dimethylphthalate	ug/l	ND	ND	
MBLK	Dimethoate	ug/l	ND	ND	
MBLK	Di-n-Butylphthalate	ug/l	ND	0.56	

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Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

525 Semivolatiles by GC/MS (ML/EPA 525.2)
Quality Control

Control	Parameter	Units	Actual	Found	tRecv
MBLK	Endrin	ug/l	ND	ND	
MBLK	Fluorene	ug/l	ND	ND	
MBLK	gamma-Chlordane	ug/l	ND	ND	
MBLK	Hexachlorobenzene	ug/l	ND	ND	
MBLK	Hexachlorocyclopentadiene	ug/l	ND	ND	
MBLK	Heptachlor	ug/l	ND	ND	
MBLK	Heptachlor Epoxide	ug/l	ND	ND	
MBLK	Indeno(1,2,3,c,d)Pyrene	ug/l	ND	ND	
MBLK	Isophorone	ug/l	ND	ND	
MBLK	Lindane	ug/l	ND	ND	
MBLK	Methoxychlor	ug/l	ND	ND	
MBLK	Metribuzin	ug/l	ND	ND	
MBLK	Nolinata	ug/l	ND	ND	
MBLK	Metolachlor	ug/l	ND	ND	
MBLK	trans-Nonachlor	ug/l	ND	ND	
MBLK	Pentachlorophenol	ug/l	ND	ND	
MBLK	Phenanthrene	ug/l	ND	ND	
MBLK	Prometryn	ug/l	ND	ND	
MBLK	Propachlor	ug/l	ND	ND	
MBLK	Pyrene	ug/l	ND	ND	
MBLK	Sinastina	ug/l	ND	ND	
MBLK	Thiobencarb	ug/l	ND	ND	
MBLK	Trifluralin	ug/l	ND	ND	
MS	alpha-Chlordane	ug/l	2	1.87	94
MS	Acenaphthylene	ug/l	2	1.76	88
MS	Alachlor	ug/l	2	2.00	100
MS	Aldrin	ug/l	2	2.10	105
MS	Anthracene	ug/l	2	1.46	73
MS	Acetasina	ug/l	2	1.96	98
MS	Benz(a)Anthracene	ug/l	2	1.80	90
MS	Benzo(a)pyrene	ug/l	2	1.58	79

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Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**525 Semivolatiles by GC/MS (ML/EPA 525.2)
Quality Control**

Control	Parameter	Units	Actual	Found	%Recv
MS	Benzo(b)Fluoranthene	ug/l	2	1.91	96
MS	Benzo(g,h,i)Perylene	ug/l	2	1.48	74
MS	Benzo(k)Fluoranthene	ug/l	2	1.76	88
MS	Di(2-Ethylhexyl)phthalate	ug/l	2	2.23	112
MS	Butylbenzylphthalate	ug/l	2	2.00	100
MS	Caffeine	ug/l	2	1.57	78
MS	Chrysene	ug/l	2	1.90	95
MS	Dibenz(a,h)Anthracene	ug/l	2	1.41	70
MS	Di-(2-Ethylhexyl)adipate	ug/l	2	1.77	89
MS	Diethylphthalate	ug/l	2	1.89	94
MS	Dimethylphthalate	ug/l	2	1.88	94
MS	Di-n-Butylphthalate	ug/l	2	1.92	96
MS	Endrin	ug/l	2	1.71	86
MS	Fluorene	ug/l	2	1.80	90
MS	gamma-Chlordane	ug/l	2	1.97	98
MS	Hexachlorobenzene	ug/l	2	1.78	89
MS	Hexachlorocyclopentadiene	ug/l	2	1.65	82
MS	Heptachlor	ug/l	2	2.07	104
MS	Heptachlor Epoxide	ug/l	2	2.08	104
MS	Indeno(1,2,3,c,d)Pyrene	ug/l	2	1.43	72
MS	Lindane	ug/l	2	1.97	98
MS	Methoxychlor	ug/l	2	2.15	108
MS	Molinate	ug/l	2	1.77	88
MS	trans-Nonachlor	ug/l	2	1.65	82
MS	Pentachlorophenol	ug/l	2	1.77	88
MS	Phenanthrene	ug/l	2	1.94	97
MS	Pyrene	ug/l	2	2.12	106
MS	Simazine	ug/l	2	1.88	94
MS	Thiobencarb	ug/l	2	1.86	93

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Laboratory Report

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 ATTN: Ron Penstenmacher

Sample # 250712025 Sample ID KUCU III(2348-06) Project PHASEV
 Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

Aldicarb (ML/EPA 531.1)

Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed
Hydroxyacetophenone	ug/l	ND			2				24-Jul-1995 yka
Aldicarb (Temik)	ug/l	ND			0.5				24-Jul-1995 yka
Aldicarb sulfone	ug/l	ND			0.8				24-Jul-1995 yka
Aldicarb sulfoxide	ug/l	ND			0.5				24-Jul-1995 yka
Baygon	ug/l	ND			2				24-Jul-1995 yka
Carbofuran (Furadan)	ug/l	ND			0.9				24-Jul-1995 yka
Carbaryl	ug/l	ND			2				24-Jul-1995 yka
Methlocarb	ug/l	ND			2				24-Jul-1995 yka
Methomyl	ug/l	ND			2				24-Jul-1995 yka
Oxamyl (Vydate)	ug/l	ND			2				24-Jul-1995 yka



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ATTN: Ron Penstemacher

Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

Aldicarbs (ML/EPA 531.1)
Surrogate Summary

Parameter	Percent Recovery	Acceptable Range
BDNC	105	80 - 120

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ATTN: Ron Fenstermacher

Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**Aldicarb (ML/EPA 531.1)
Quality Control**

Control	Parameter	Units	Actual	Found	%Recv
LCS1	3-Hydroxycarbofuran	ug/l	20.0	20.8	104
LCS1	Aldicarb (Temik)	ug/l	20.0	23.0	115
LCS1	Aldicarb sulfone	ug/l	20.0	22.2	111
LCS1	Aldicarb sulfoxide	ug/l	20.0	22.5	112
LCS1	Baygon	ug/l	20.0	21.6	108
LCS1	Carbofuran (Puradan)	ug/l	20.0	21.6	108
LCS1	Carbaryl	ug/l	20.0	18.5	92
LCS1	Methiocarb	ug/l	20.0	18.0	90
LCS1	Methomyl	ug/l	20.0	21.4	107
LCS1	Oxamyl (Vydate)	ug/l	20.0	19.8	99
MBLK	3-Hydroxycarbofuran	ug/l	ND	ND	
MBLK	Aldicarb (Temik)	ug/l	ND	ND	
MBLK	Aldicarb sulfone	ug/l	ND	ND	
MBLK	Aldicarb sulfoxide	ug/l	ND	ND	
MBLK	Baygon	ug/l	ND	ND	
MBLK	Carbofuran (Puradan)	ug/l	ND	ND	
MBLK	Carbaryl	ug/l	ND	ND	
MBLK	Methiocarb	ug/l	ND	ND	
MBLK	Methomyl	ug/l	ND	ND	
MBLK	Oxamyl (Vydate)	ug/l	ND	ND	
MS	3-Hydroxycarbofuran	ug/l	20.0	20.2	101
MS	Aldicarb (Temik)	ug/l	20.0	20.6	103
MS	Aldicarb sulfone	ug/l	20.0	20.8	104
MS	Aldicarb sulfoxide	ug/l	20.0	21.5	108
MS	Baygon	ug/l	20.0	20.9	104
MS	Carbofuran (Puradan)	ug/l	20.0	22.0	110
MS	Carbaryl	ug/l	20.0	19.7	98
MS	Methiocarb	ug/l	20.0	20.8	104
MS	Methomyl	ug/l	20.0	21.6	108
MS	Oxamyl (Vydate)	ug/l	20.0	21.1	106

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Sample # 250712025 Sample ID KUOU III(2148-06) Project PHASEV
 Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

Herbicides by 515.1

(ML/EPA 515.1)

Laboratory Report

Honolulu, City of
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 ATTN: Ron Fenstermacher

Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed
2,4,5-T	ug/l	ND				0.2	20-Jul-1995	dcm	26-Jul-1995 wpt
2,4,5-TP (Silvex)	ug/l	ND				0.2	20-Jul-1995	dcm	26-Jul-1995 wpt
2,4-D	ug/l	ND				0.1	20-Jul-1995	dcm	26-Jul-1995 wpt
2,4-DB	ug/l	ND				2	20-Jul-1995	dcm	26-Jul-1995 wpt
Dichloroprop	ug/l	ND				0.5	20-Jul-1995	dcm	26-Jul-1995 wpt
S-Hydroxydicamba	ug/l	ND				0.2	20-Jul-1995	dcm	26-Jul-1995 wpt
Acifluorfen (qualitative)	ug/l	ND				0.2	20-Jul-1995	dcm	26-Jul-1995 wpt
Bentazon	ug/l	ND				0.2	20-Jul-1995	dcm	26-Jul-1995 wpt
Chloramben (qualitative)	ug/l	ND				0.5	20-Jul-1995	dcm	26-Jul-1995 wpt
Dalapon (qualitative)	ug/l	ND				0.5	20-Jul-1995	dcm	26-Jul-1995 wpt
2,4-Dichloroacetic acid	ug/l	ND				1	20-Jul-1995	dcm	26-Jul-1995 wpt
DCPA	ug/l	ND				0.5	20-Jul-1995	dcm	26-Jul-1995 wpt
Dicamba	ug/l	ND				0.2	20-Jul-1995	dcm	26-Jul-1995 wpt
Dinoseb	ug/l	ND				0.2	20-Jul-1995	dcm	26-Jul-1995 wpt
Pentachloropbenol	ug/l	ND				0.2	20-Jul-1995	dcm	26-Jul-1995 wpt
Picloram	ug/l	ND				0.04	20-Jul-1995	dcm	26-Jul-1995 wpt
4-Metophenol (qualitative)	ug/l	ND				0.1	20-Jul-1995	dcm	26-Jul-1995 wpt
Data Entry	--	08/04/95				0	20-Jul-1995	dcm	26-Jul-1995 wpt



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Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**Herbicides by 515.1 (ML/EPA 515.1)
Quality Control**

Control	Parameter	Units	Actual	Found	tRecv
LCS1	2,4,5-TP (Silvex)	ug/l	0.500	0.49	98
LCS1	2,4-D	ug/l	1.00	1.09	109
LCS1	Bentazon	ug/l	1.00	1.00	100
LCS2	2,4,5-TP (Silvex)	ug/l	0.500	NA	
LCS2	2,4-D	ug/l	1.00	NA	
LCS2	Bentazon	ug/l	1.00	NA	
MBLK	2,4,5-T	ug/l	ND	ND	
MBLK	2,4,5-TP (Silvex)	ug/l	ND	ND	
MBLK	2,4-D	ug/l	ND	ND	
MBLK	2,4-DB	ug/l	ND	ND	
MBLK	Dichlorprop	ug/l	ND	ND	
MBLK	5-Hydroxydicamba	ug/l	ND	ND	
MBLK	Acifluorfen (qualitative)	ug/l	ND	ND	
MBLK	Bentazon	ug/l	ND	ND	
MBLK	Chloramben (qualitative)	ug/l	ND	ND	
MBLK	Dalapon (qualitative)	ug/l	ND	ND	
MBLK	3,5-Dichlorobenzoic acid	ug/l	ND	ND	
MBLK	DCPA	ug/l	ND	ND	
MBLK	Dicamba	ug/l	ND	ND	
MBLK	Dinoseb	ug/l	ND	ND	
MBLK	Pentachlorophenol	ug/l	ND	ND	
MBLK	Picloram	ug/l	ND	ND	
MBLK	4-Nitrophenol (qualitative)	ug/l	ND	ND	
MS	2,4,5-TP (Silvex)	ug/l	0.500	0.47	94
MS	2,4-D	ug/l	1.00	1.07	107
MS	Bentazon	ug/l	1.00	0.94	94
MSD	2,4,5-TP (Silvex)	ug/l	0.500	NA	
MSD	2,4-D	ug/l	1.00	NA	
MSD	Bentazon	ug/l	1.00	NA	

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Sample # 250712025 Sample ID KUOV III(2348-06) Project PHASEV
 Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

SDWA Pesticides (ML/EPA 508)

Laboratory Report

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Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed	By
PCB 1016 Aroclor	ug/l	ND				0.1	17-Jul-1995	mbr	25-Jul-1995	dst
PCB 1221 Aroclor	ug/l	ND				0.1	17-Jul-1995	mbr	25-Jul-1995	dst
PCB 1231 Aroclor	ug/l	ND				0.1	17-Jul-1995	mbr	25-Jul-1995	dst
PCB 1242 Aroclor	ug/l	ND				0.1	17-Jul-1995	mbr	25-Jul-1995	dst
PCB 1248 Aroclor	ug/l	ND				0.1	17-Jul-1995	mbr	25-Jul-1995	dst
PCB 1254 Aroclor	ug/l	ND				0.1	17-Jul-1995	mbr	25-Jul-1995	dst
PCB 1260 Aroclor	ug/l	ND				0.1	17-Jul-1995	mbr	25-Jul-1995	dst
Alpha-BHC	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Alachlor (Alaner)	ug/l	ND				0.05	17-Jul-1995	mbr	25-Jul-1995	dst
Aldrin	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Beta-BHC	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Chlordane	ug/l	ND				0.1	17-Jul-1995	mbr	25-Jul-1995	dst
Chlorfalonil (prenil, bravo)	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Delta-BHC	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
P,P' DDD	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
P,P' DDE	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
P,P' DDT	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Dieldrin	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Endrin Aldehyde	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Endrin	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Endosulfan I (alpha)	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Endosulfan II (beta)	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Endosulfan sulfate	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Heptachlor	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Heptachlor Epoxide	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Lindane (gamma-BHC)	ug/l	ND				0.01	17-Jul-1995	mbr	25-Jul-1995	dst
Methoxychlor	ug/l	ND				0.05	17-Jul-1995	mbr	25-Jul-1995	dst
Toxaphene	ug/l	ND				0.5	17-Jul-1995	mbr	25-Jul-1995	dst
Data Entry						0	17-Jul-1995	mbr	25-Jul-1995	dst



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Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**SDWA Pesticides (ML/EPA 508)
Quality Control**

Control	Parameter	Units	Actual	Pound	%Recv
LCS1	Aldrin	ug/l	0.05	0.05	100
LCS1	p,p' DDT	ug/l	0.10	0.10	100
LCS1	Dieldrin	ug/l	0.10	0.11	110
LCS1	Endrin	ug/l	0.10	0.10	100
LCS1	Gamma-BHC (Lindane)	ug/l	0.05	0.06	120
LCS1	Heptachlor	ug/l	0.05	0.04	80
LCS2	Aldrin	ug/l	0.05	NA	
LCS2	p,p' DDT	ug/l	0.10	NA	
LCS2	Dieldrin	ug/l	0.10	NA	
LCS2	Endrin	ug/l	0.10	NA	
LCS2	Gamma-BHC (Lindane)	ug/l	0.05	NA	
LCS2	Heptachlor	ug/l	0.05	NA	
MBLK	PCB 1016 Aroclor	ug/l	ND	ND	
MBLK	PCB 1221 Aroclor	ug/l	ND	ND	
MBLK	PCB 1232 Aroclor	ug/l	ND	ND	
MBLK	PCB 1242 Aroclor	ug/l	ND	ND	
MBLK	PCB 1248 Aroclor	ug/l	ND	ND	
MBLK	PCB 1254 Aroclor	ug/l	ND	ND	
MBLK	PCB 1260 Aroclor	ug/l	ND	ND	
MBLK	Alpha-BHC	ug/l	ND	ND	
MBLK	Alachlor (Alanex)	ug/l	ND	ND	
MBLK	Aldrin	ug/l	ND	ND	
MBLK	Chlordane	ug/l	ND	ND	
MBLK	Chlorthalonil (Drconil, Bravo)	ug/l	ND	ND	
MBLK	Delta-BHC	ug/l	ND	ND	
MBLK	p,p' DDD	ug/l	ND	ND	
MBLK	p,p' DDE	ug/l	ND	ND	
MBLK	p,p' DDT	ug/l	ND	ND	
MBLK	Dieldrin	ug/l	ND	ND	
MBLK	Endrin Aldehyde	ug/l	ND	ND	
MBLK	Endrin	ug/l	ND	ND	

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Sample # 250712025 Sample ID KUOU III(2348-06) Project PHASEV
 Sample Type Water Sampled 10-Jul-1995 Reported 09-Aug-1995

Regulated VOCs plus Lists 1&3 (ML/EPA 524.2)

Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed
1,1,1,2-Tetrachloroethane	ug/l	ND			0.5				25-Jul-1995 yom
1,1,1-Trichloroethane	ug/l	ND			0.5				25-Jul-1995 yom
1,1,2,2-Tetrachloroethane	ug/l	ND			0.5				25-Jul-1995 yom
1,1,2-Trichloroethane	ug/l	ND			0.5				25-Jul-1995 yom
1,1-Dichloroethane	ug/l	ND			0.5				25-Jul-1995 yom
1,1-Dichloroethylene	ug/l	ND			0.5				25-Jul-1995 yom
1,1-Dichloropropane	ug/l	ND			0.5				25-Jul-1995 yom
1,2,3-Trichlorobenzene	ug/l	ND			0.5				25-Jul-1995 yom
1,2,3-Trichloropropane	ug/l	ND			0.5				25-Jul-1995 yom
1,2,4-Trichlorobenzene	ug/l	ND			0.5				25-Jul-1995 yom
1,2,4-Trimethylbenzene	ug/l	ND			0.5				25-Jul-1995 yom
1,2-Dichloroethane	ug/l	ND			0.5				25-Jul-1995 yom
1,2-Dichloropropane	ug/l	ND			0.5				25-Jul-1995 yom
1,3,5-Trimethylbenzene	ug/l	ND			0.5				25-Jul-1995 yom
1,1-Dichloropropane	ug/l	ND			0.5				25-Jul-1995 yom
p-Dichlorobenzene (1,4-DCB)	ug/l	ND			0.5				25-Jul-1995 yom
1,2-Dichloropropane	ug/l	ND			0.5				25-Jul-1995 yom
2-Butanone (MEK)	ug/l	ND			5				25-Jul-1995 yom
2-Chloroethylvinyl ether	ug/l	ND			1				25-Jul-1995 yom
o-Chlorotoluene	ug/l	ND			0.5				25-Jul-1995 yom
p-Chlorotoluene	ug/l	ND			0.5				25-Jul-1995 yom
4-Methyl-2-Pentanone (MIBK)	ug/l	ND			5				25-Jul-1995 yom
Benzene	ug/l	ND			0.5				25-Jul-1995 yom
Bromobenzene	ug/l	ND			0.5				25-Jul-1995 yom
Bromoethane (Methyl Bromide)	ug/l	ND			0.5				25-Jul-1995 yom
cis-1,2-Dichloroethylene	ug/l	ND			0.5				25-Jul-1995 yom
Chlorobenzene	ug/l	ND			0.5				25-Jul-1995 yom
Carbon Tetrachloride	ug/l	ND			0.5				25-Jul-1995 yom
cis-1,3-Dichloropropane	ug/l	ND			0.5				25-Jul-1995 yom



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Sample # 250712025 Sample ID KUOH III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

Laboratory Report

Honolulu, City of
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630 S Beretania St

Honolulu, HI 96843
ATTN: Ron Fenstermacher

Regulated VOCs plus Lists 1&3 (ML/EPA 524.2)

Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed
Bromoform	ug/l	ND				0.5			25-Jul-1995 yom
Chloroform (Trichloromethane)	ug/l	ND				0.5			25-Jul-1995 yom
Bromochloromethane	ug/l	ND				0.5			25-Jul-1995 yom
Chloroethane	ug/l	ND				0.5			25-Jul-1995 yom
Chloromethane (Methyl Chloride)	ug/l	ND				0.5			25-Jul-1995 yom
Chlorodibromomethane	ug/l	ND				0.5			25-Jul-1995 yom
Dibromomethane	ug/l	ND				0.5			25-Jul-1995 yom
Bromodichloromethane	ug/l	ND				0.5			25-Jul-1995 yom
Dichloromethane	ug/l	ND				0.5			25-Jul-1995 yom
Ethyl benzene	ug/l	ND				0.5			25-Jul-1995 yom
Dichlorodifluoromethane	ug/l	ND				0.5			25-Jul-1995 yom
Fluorotrichloromethane (Freon1)	ug/l	ND				0.5			25-Jul-1995 yom
Hexachlorobutadiene	ug/l	ND				0.5			25-Jul-1995 yom
Isopropylbenzene	ug/l	ND				0.5			25-Jul-1995 yom
1,1-Dichloroethane (1,1-DCB)	ug/l	ND				0.5			25-Jul-1995 yom
m,p-Xylenes	ug/l	ND				0.5			25-Jul-1995 yom
Methyl tert-butyl ether (MTBE)	ug/l	ND				0.5			25-Jul-1995 yom
Naphthalene	ug/l	ND				0.5			25-Jul-1995 yom
n-Butylbenzene	ug/l	ND				0.5			25-Jul-1995 yom
n-Propylbenzene	ug/l	ND				0.5			25-Jul-1995 yom
o-Xylenes	ug/l	ND				0.5			25-Jul-1995 yom
o-Dichlorobenzene (1,2-DCB)	ug/l	ND				0.5			25-Jul-1995 yom
Tetrachloroethylene (PCE)	ug/l	ND				0.5			25-Jul-1995 yom
p-Isopropyltoluene	ug/l	ND				0.5			25-Jul-1995 yom
sec-Butylbenzene	ug/l	ND				0.5			25-Jul-1995 yom
Styrene	ug/l	ND				0.5			25-Jul-1995 yom
trans-1,2-Dichloroethylene	ug/l	ND				0.5			25-Jul-1995 yom
tert-Butylbenzene	ug/l	ND				0.5			25-Jul-1995 yom
Trichloroethylene (TCE)	ug/l	ND				0.5			25-Jul-1995 yom



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Sample # 150712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

Regulated VOCs plus Lists 1&3 (ML/EPA 524.2)

Laboratory Report

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Parameter	Units	Result	Conc.	Rec	Dilution	Det.Limit	Prepared	By	Analyzed	By
Trichloroethylene (TCE)	ug/l	ND				0.5			25-Jul-1995	Yom
trans-1,3-Dichloropropene	ug/l	ND				0.5			25-Jul-1995	Yom
Toluene	ug/l	ND				0.5			25-Jul-1995	Yom
Vinyl chloride (VC)	ug/l	ND				0.5			25-Jul-1995	Yom
Data Entry		09/01/95				0			25-Jul-1995	Yom



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Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
 Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**Regulated VOCs plus Lists 1&3 (ML/EPA 524.2)
 Quality Control**

Control	Parameter	Units	Actual	Pound	Recv
LCS1	1,1,1-Trichloroethane	ug/l	4	NA	
LCS1	1,1,2,2-Tetrachloroethane	ug/l	4	NA	
LCS1	1,2,2-Trichloroethane	ug/l	4	NA	
LCS1	1,1-Dichloroethane	ug/l	4	NA	
LCS1	1,1-Dichloroethylene	ug/l	4	NA	
LCS1	1,2,4-Trichlorobenzene	ug/l	4	NA	
LCS1	1,1-Dichloroethane	ug/l	4	NA	
LCS1	1,2-Dichloropropane	ug/l	4	NA	
LCS1	1,1-Dichloropropane	ug/l	4	NA	
LCS1	p-Dichlorobenzene (1,4-DCB)	ug/l	4	NA	
LCS1	Benzene	ug/l	4	NA	
LCS1	cis-1,2-Dichloroethylene	ug/l	4	NA	
LCS1	Chlorobenzene	ug/l	4	NA	
LCS1	Carbon Tetrachloride	ug/l	4	NA	
LCS1	Bromoform	ug/l	4	NA	
LCS1	Chloroform (Trichloromethane)	ug/l	4	NA	
LCS1	Chlorodibromomethane	ug/l	4	NA	
LCS1	Bromodichloromethane	ug/l	4	NA	
LCS1	Dichloromethane	ug/l	4	NA	
LCS1	Ethyl benzene	ug/l	4	NA	
LCS1	Fluorotrichloromethane (Freon1)	ug/l	4	NA	
LCS1	m,p-Xylenes	ug/l	4	NA	
LCS1	o-Xylenes	ug/l	4	NA	
LCS1	o-Dichlorobenzene (1,2-DCB)	ug/l	4	NA	
LCS1	Tetrachloroethylene (TCE)	ug/l	4	NA	
LCS1	Styrene	ug/l	4	NA	
LCS1	trans-1,2-Dichloroethylene	ug/l	4	NA	
LCS1	Trichloroethylene (TCE)	ug/l	4	NA	
LCS1	Trichlorotrifluoroethane (Freon)	ug/l	4	NA	
LCS1	Toluene	ug/l	4	NA	
LCS1	Vinyl chloride (VC)	ug/l	4	NA	

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Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
Sample Type Water Sampled 10-Jul-1995 Received 12-Jul-1995 Reported 09-Aug-1995

**Regulated VOCs plus Lists 1&3 (ML/EPA 524.2)
Quality Control**

Control	Parameter	Units	Actual	Found	Recv
MBLK	1,1,1,2-Tetrachloroethane	ug/l	ND	NA	
MBLK	1,1,1-Trichloroethane	ug/l	ND	NA	
MBLK	1,1,2,2-Tetrachloroethane	ug/l	ND	NA	
MBLK	1,1,2-Trichloroethane	ug/l	ND	NA	
MBLK	1,1-Dichloroethane	ug/l	ND	NA	
MBLK	1,1-Dichloroethylene	ug/l	ND	NA	
MBLK	1,1-Dichloropropane	ug/l	ND	NA	
MBLK	1,2,3-Trichlorobenzene	ug/l	ND	NA	
MBLK	1,2,3-Trichloropropane	ug/l	ND	NA	
MBLK	1,2,4-Trichlorobenzene	ug/l	ND	NA	
MBLK	1,2,4-Trimethylbenzene	ug/l	ND	NA	
MBLK	1,2-Dichloroethane	ug/l	ND	NA	
MBLK	1,2-Dichloropropane	ug/l	ND	NA	
MBLK	1,3,5-Trimethylbenzene	ug/l	ND	NA	
MBLK	1,1-Dichloropropane	ug/l	ND	NA	
MBLK	p-Dichlorobenzene (1,4-DCB)	ug/l	ND	NA	
MBLK	1,2-Dichloropropane	ug/l	ND	NA	
MBLK	2-Butanone (MEK)	ug/l	ND	NA	
MBLK	2-Chloroethylvinylether	ug/l	ND	NA	
MBLK	o-Chlorotoluene	ug/l	ND	NA	
MBLK	p-Chlorotoluene	ug/l	ND	NA	
MBLK	4-Methyl-2-Pentanone (MIBK)	ug/l	ND	NA	
MBLK	Benzene	ug/l	ND	NA	
MBLK	Bromobenzene	ug/l	ND	NA	
MBLK	Bromoethane (Methyl Bromide)	ug/l	ND	NA	
MBLK	cis-1,2-Dichloroethylene	ug/l	ND	NA	
MBLK	Chlorobenzene	ug/l	ND	NA	
MBLK	Carbon Tetrachloride	ug/l	ND	NA	
MBLK	cis-1,3-Dichloropropane	ug/l	ND	NA	
MBLK	Bromoform	ug/l	ND	NA	
MBLK	Chloroform (Trichloroethane)	ug/l	ND	NA	

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Sample # 950712025 Sample ID KUOU III(2348-06) Project PHASEV
 Sample Type Water Sampled 10-jul-1995 Received 12-jul-1995 Reported 09-aug-1995

**Regulated VOCs plus Lists 1&3 (ML/EPA 524.2)
 Quality Control**

Control	Parameter	Units	Actual	Found	Recv
MBLK	Bromochloromethane	ug/l	ND	NA	
MBLK	Chloroethane	ug/l	ND	NA	
MBLK	Chloromethane (Methyl Chloride)	ug/l	ND	NA	
MBLK	Chlorodibromomethane	ug/l	ND	NA	
MBLK	Dibromomethane	ug/l	ND	NA	
MBLK	Bromodichloromethane	ug/l	ND	NA	
MBLK	Dichloromethane	ug/l	ND	NA	
MBLK	Ethyl benzene	ug/l	ND	NA	
MBLK	Dichlorodifluoromethane	ug/l	ND	NA	
MBLK	Fluorotrichloromethane (Freon1)	ug/l	ND	NA	
MBLK	Hexachlorobutadiene	ug/l	ND	NA	
MBLK	Isopropylbenzene	ug/l	ND	NA	
MBLK	m-Dichlorobenzene (1,1-DCB)	ug/l	ND	NA	
MBLK	m,p-Xylenes	ug/l	ND	NA	
MBLK	Methyl Tert-butyl ether (MTBE)	ug/l	ND	NA	
MBLK	Naphthalene	ug/l	ND	NA	
MBLK	n-Butylbenzene	ug/l	ND	NA	
MBLK	n-Propylbenzene	ug/l	ND	NA	
MBLK	o-Xylenes	ug/l	ND	NA	
MBLK	o-Dichlorobenzene (1,2-DCB)	ug/l	ND	NA	
MBLK	Tetrachloroethylene (PCE)	ug/l	ND	NA	
MBLK	p-Isopropyltoluene	ug/l	ND	NA	
MBLK	sec-Butylbenzene	ug/l	ND	NA	
MBLK	Styrene	ug/l	ND	NA	
MBLK	trans-1,2-Dichloroethylene	ug/l	ND	NA	
MBLK	tert-Butylbenzene	ug/l	ND	NA	
MBLK	Trichloroethylene (TCE)	ug/l	ND	NA	
MBLK	Trichlorotrifluoroethane (Freon)	ug/l	ND	NA	
MBLK	trans-1,1-Dichloropropene	ug/l	ND	NA	
MBLK	Toluene	ug/l	ND	NA	
MBLK	Vinyl chloride (VC)	ug/l	ND	NA	

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APPENDIX D

KUOU WELL III

ARCHAEOLOGICAL INVENTORY SURVEY,
KĀNE'OHE, O'AHU, HAWAI'I (TMK 4-5-41:12)

prepared by

George H. MacDonell, M.A.
P. Christiaan Klieger, Ph.D.

prepared for

ParEn, Inc.
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567 South King Street
Honolulu, HI 96813-3036

October 1997

Department of Anthropology
Bishop Museum
Honolulu, Hawai'i

Project #533

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KUOU WELL III

This project was conducted as the archaeological inventory survey for the construction and grading associated with the Board of Water Supply's Kuou Well III. The inventory survey was undertaken for ParEn, Inc., in support of the environmental assessment of the project area and focused on portions of the well site that would be impacted by grading and the construction of well support buildings. The survey and subsurface testing were designed to identify archaeological remains that might be affected by the well project. Fieldwork was conducted during April 16 and 17, 1997, by George MacDonell, Brad Evans, Inez Gordon, Sara Ili, and Michael McGuirt of the Bishop Museum Department of Anthropology.

SCOPE OF WORK

The purpose of this inventory survey was to identify and document all historic and pre-Contact sites and materials in the project area, concentrating efforts in the areas that will be most impacted by construction activities. The construction of well support buildings will involve the surface grading and removal of up to 5 feet of sediment from some portions of the well site. To determine the impact that well construction activities would have on the archaeological record, the following steps were taken:

1. A search of relevant historical documents, records, and literature was conducted to determine the types of activities that have taken place in the project area and to predict the types of archaeological remains that might be encountered.
2. Previous archaeological investigations in the Kuou vicinity were researched to determine the types and distribution of archaeological remains.
3. A surface survey was conducted on the area to be impacted to identify the presence of archaeological materials.
4. Subsurface testing was conducted to assess the potential for in situ archaeological remains in the project area.

ENVIRONMENTAL SETTING

The project area is located in the *ahupua'a* of Kāne'ohe, Ko'olau Poko, O'ahu (TMK 4-5-41:12). The site must be accessed through Ho'omaluhia Park and is in a portion of land just *mauka* of the park access road (Figure 1) which is currently leased for banana cultivation. A dirt access road and a test well are already in place at the site. Other buildings are not yet constructed. The project area measures approximately 25 by 40 m (1,000 m²) and is situated at an average elevation of 325 feet above mean sea level (100 masl). The site is approximately 3.5 km inland of Kāne'ohe Bay.

The soil in the area is classified as part of the Lolekaa series—Lolekaa silty clay with a 3–8% slope. The soil is well drained and supports pastures, orchards, homesites, and cultivation of bananas and papayas. Natural vegetation in the area consists of guava (*Psidium guajava*), Christmas berry (*Schinus terebinthifolius*), California grass (*Panicum purpurascens*), hilograss (*Paspalum conjugatum*), broomsedge (*Andropogon virginicus*), and Java plum (*Eugenia cumini*) (Foote et al. 1972; Cooray 1976; Rosendahl 1976; Allen 1987). The Kuou Well III project area is currently under banana cultivation. Soil temperatures in the project area average 70°F, and the annual rainfall averages 70–90 inches (Foote et al. 1972).

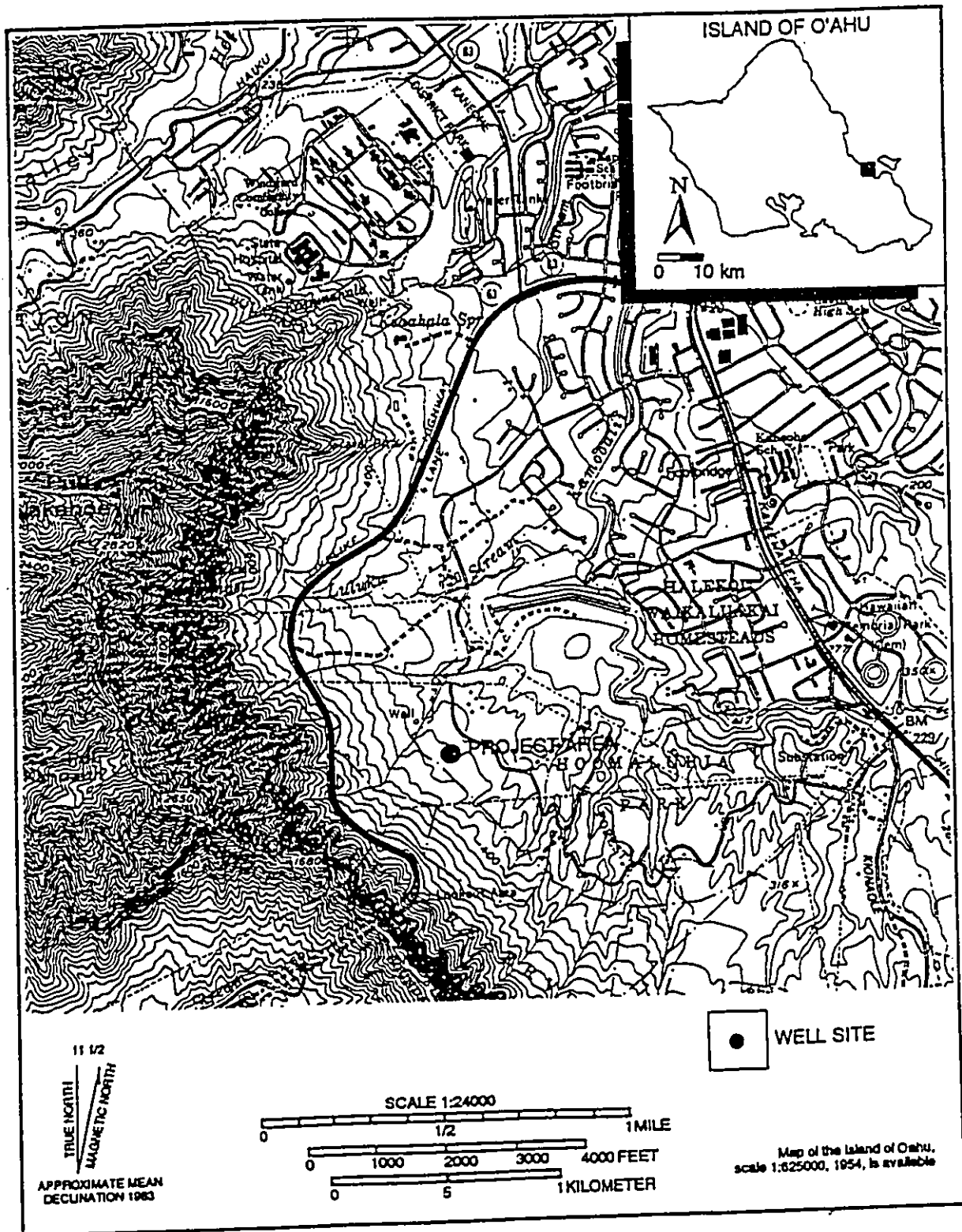


Figure 1. Location of the Kuou Well III project area.

The fauna in the vicinity of the project area is limited in species and number. Terrestrial animals noted by the field crew included only a few mongooses (*Herpestes javanicus*) and the African snail (*Achatina fulica*). Earlier investigations of the area have noticed mice (*Mus musculus*) as well as geckoes and lizards (Gekkonidae, Scincidae) (McCoy and Sinoto 1972). Feral pigs (*Sus scrofa*) have been recorded in more remote parts of the area (Rosendahl 1976).

Several species of birds were noted during the investigation including the Brazilian cardinal (*Paroaria cucullata*), common myna (*Acridotheres tristis*), and Shama thrush (*Kittacincla macroura*). Earlier investigations have also observed the Kentucky cardinal (*Richmondia cardinalis*), white eye (*Zosterops palpebrosus japonicus*), English sparrow (*Passer domesticus*), ricebird (*Munia punctulata topela*), Perkin nightingale (*Liothrix lutea*), barred dove (*Geopelia striata striata*), and cattle egret (*Bubulcus ibis*) (McCoy and Sinoto 1972; Rosendahl 1976).

HISTORICAL BACKGROUND

TMK 4-5-41:12, the project area defined as Kuou Well III, is in the 'ili of Kuou (possibly *kū'ou*, "to bow the head"; Pukui and Elbert 1986:184). This land is in the *mauka* portion of the *ahupua'a* of Kāne'ohe and is surrounded by the 'ili of Kahuauli on the northwest, Luluku on the north, and Ho'oleinaiwa on the southeast. The traditional 'ili of Kuou extends to the crest of the Ko'olau Range, with the *ahupua'a* of Kalihi extending to the southwest across the ridge.

Kuou extends over 68.39 ha (169 acres) (Lyons 1876). The original Kuou well (I) is on Kuou Stream and adjacent to Interstate Route H-3. The project area is about 300 m to the west, on the border between the old 'ili of Kuou and Ho'oleinaiwa.

A literature and document search of the Hawaii State Archives, Bishop Museum archives, and secondary sources revealed no legends that relate specifically to the 'ili of Kuou. Many Native Hawaiian tales exist, however, for the upland regions of Kāne'ohe and Kailua. Most of these involve the agricultural gods Kāne and Kanaloa, the use of streams and springs, agricultural activities, and the experiences of travelers walking from the shoreline regions to the uplands and over the passes of the Ko'olau Range toward the leeward side of O'ahu.

Whereas legends associated with Kuou are sparse, some land tenure and land use documents were found. The *ahupua'a* of Kāne'ohe, adjacent Kailua, and many other lands on O'ahu were reserved by King Kamehameha I as private lands when he conquered this island in 1795 (Interior Department, n.d. [1]). Kāne'ohe, among the most productive land segments in the Hawaiian Islands, remained the private possession of the monarch until 1848, when Kamehameha III granted the *ahupua'a* to his wife Queen Kalama. Exempted from this grant were the smaller *kuleana*, or land claims, of former tenants of the king. Kamehameha III reserved for himself vast segments of land henceforth known as the Crown Lands. Kuou itself became a Crown Land. Unlike many other 'ili throughout Kāne'ohe, Kuou apparently was not parceled into the various discontinuous segments known as *lele*. Kuou did not appear to control a fishpond by that name at the shoreline, as did many of the 'ili of Kāne'ohe.

Kuou had one Land Commission Award granted during the Great Mahele of 1848–1853, the epic land tenure revolution that remains the source of most modern land titles in Hawai'i. This award, LCA 4491, consisted of two parcels, or *'āpana*. LCA 4491.1, in the nearby *'ili* of Lulukū, consisted of a 0.10 ha housesite with an open field, or *kula*, that was probably used for a home garden (Board of Commissions to Quiet Land Titles [BCQLT] NT [Native Testimony] 4491, 9:355). The other parcel, LCA 4491.2, was a 1.6 ha section of *lo'i* (taro pondfield) that extended from the border of Kahuāuli into the *'ili* of Kuou. This second parcel appears to have been a *mo'o 'āina*, or strip of highly cultivated agricultural land. From Mahele documents, it appears that there were eleven *lo'i* in LCA 4491.2, in addition to seven weed-covered fields and "two breadfruit trees" (BCQLT NR [Native Register] 4491, 4:309). These parcels were awarded to the former tenant, Kuapuu. This claimant obtained the land from Kanihookamoku during the governorship of Liliha (1829–1830) (BCQLT FT [Foreign Testimony] 4491, 14:183). The *lo'i* appear to have been watered by Kuou Stream. The Lyons map of 1874 (Lyons 1876) mentions groves of *hala* (pandanus) and *kukui* near this parcel.

There were five other claims to land in Kuou during the Mahele, but none of these was awarded. It is possible that some of these claims were on lands presently occupied by Kuou Well I and Kuou Well III, because these pondfields are probably associated with Kuou or Piho Streams, which are components of the modern well system. Although unawarded, the claims were recorded in the Native Register documents leading to the Great Mahele. Among the claimants, Hau registered ten *lo'i*, a parcel of *kula*, a breadfruit tree, and a houseslot (BCQLT NR 4482, 4:307). Kahoohanohano had been the landlord. Keoho claimed nineteen *lo'i*, one section of *kula*, and a housesite (BCQLT NR 4484, 4:308). He had received this property in 1847 (BCQLT FT 4484, 14:184), and Kahoohanohano was the landlord. In another claim, Kekipi claimed three *lo'i*, acquired in 1846 from Keoho and Kanihokea (BCQLT NR 7536, 5:351). In addition to these pondfields, Keoa claimed a *pu'uone* (sand-banked fishpond) that he asserted he had received from Kahoohanohano during the time of the regency of Ka'ahumanu (1819–1832) (BCQLT NR 7620, 5:417). This pond may have been a *lele* of Kuou near the shoreline or a freshwater pond associated with one of the two streams in the *'ili*. The fifth unawarded claim, asserted by Iaukea, consisted of a *mo'o 'āina* named Kumuhau, a *kula*, and a small cultivated field, or *māla*. Again, this land was allegedly given by Kahoohanohano (BCQLT NR 8219, 5:510). Since the claims were not awarded, surveys were not done and thus these lands cannot be precisely located.

Not long after the Great Mahele, John Watson purchased a portion of Kuou from the Crown for \$80 (Interior Department n.d. [2]). On December 29, 1862, Watson's son David purchased the remainder of Kuou from King Kamehameha IV for \$525.

In 1877, Charles Coffin Harris, former ranching business partner of Dowager Queen Kalama on her extensive lands in Kāne'ohe and Kailua, considered filing suit against the Crown Land Commissioners for additional land. He claimed that the queen had received, through the bequest of her husband, King Kamehameha III, Kuou and other Crown Lands of Kāne'ohe and Kailua. These were in addition to those lands she previously had received in the Great Mahele in 1848. Queen Kalama's Mahele award, as private property, passed to her heir, in this case the father of King William Lunalilo, Charles Kana'ina. Harris was sole heir to Kana'ina and inherited his property upon his death. It was the opinion of the defendants' attorney that the Crown Lands were not intended to be passed on to the private heirs of the

monarch, but to the new sovereign. The unalienability of the Crown Lands prevailed in the opinion of the Supreme Court in May 1864 and became the law of the kingdom in January 1865. Harris decided not to pursue his claim, and the title to the Watson ranch remained unclouded (Interior Department 1877; Privy Council 1854, 8:332, 334, 336).

In 1894, Watson's original ranch, which extended throughout Kāne'ohe, was acquired by Joseph Mendonça and the Kaneohe Ranch Company. The next to take control of the land was Nannie Harris Brewer Rice. In 1917, Rice sold all her holdings within Kāne'ohe to Harold K. L. Castle. Castle chose to retain the name Kaneohe Ranch Company for his cattle ranching business (McCoy and Sinoto 1976:3-4, 3-7).

In October 1980, the City and County of Honolulu acquired the project area from James C. Castle et al. through Civil Case no. 50778 in 1st Circuit Court. In early 1982, Parcel 12 and other parcels were subdivided out of TMK 4-5-41:1. On January 20, 1982, the 5.866 acre Parcel 12 was leased to Ruby and Harry Yamashiro by the City and County for the cultivation of bananas. The surrounding City and County property became Ho'omaluhia Park. The Yamashiros have retained that lease to the present.

In light of the available documentation, it appears that the project area has been used primarily for agricultural and animal husbandry pursuits from the days of traditional, Native Hawaiian farming through cattle ranching to modern banana cultivation. There is no evidence that the project area was ever used for human habitation.

PREVIOUS ARCHAEOLOGICAL RESEARCH

A review of archaeological research in the Kuou area was conducted using resources at the State Historic Preservation Division and the Bishop Museum Department of Anthropology. The majority of previously recorded archaeological sites in the vicinity of Kuou Well III are traditional Hawaiian and historic agricultural terraces and earthworks, historic sites associated with road building or agriculture, and historic burials. The nearest recorded sites are State Sites 50-80-10-2144, 2145, and 2146 (Bishop Museum Sites 50-Oa-G5-74, G5-75, and G5-76). These sites, primarily basalt agricultural terraces, alignments, and channels, are *mauka* of the H-3 corridor, approximately 200 m southwest of the Kuou Well III project area. The previous archaeological work in the area can be divided into three main categories: investigations associated with the construction of Ho'omaluhia Park, research conducted in association with Interstate Highway H-3 construction, and surveys conducted for the construction of Board of Water Supply wells in the area.

Archaeological investigations associated with the Kaneohe-Kailua Flood-Control Project and the construction of Ho'omaluhia Park were first conducted in 1972 by Bishop Museum researchers. An environmental survey by McCoy and Sinoto identified two clusters of archaeological sites along Kamo'oali'i Stream which included agricultural terracing, platforms, and other earthworks as well as historic habitations (McCoy and Sinoto 1972; Rosendahl 1976). McCoy undertook test excavations of seven of the sites the following year (McCoy 1973; Rosendahl 1976). Rosendahl conducted salvage excavations of a mound site (50-Oa-G5-37) in 1975 (Rosendahl 1976). These three phases of archaeological work revealed the following sites:

Site 50-Oa-G5-37 (State Site 50-80-10-2046)

This site is an oblong earthen mound approximately 12 m long and 1.4 m high with a width of 2–2.5 m. It is on the west bank of Kamo'oali'i Stream near its confluence with Kuou Stream. In 1973 two test units were placed in the mound and excavated in natural stratigraphic layers. Small volcanic glass flakes were recovered from the excavation, and stratigraphic evidence from the mound indicated that the area had been used on multiple occasions (McCoy 1973). Salvage excavations on this site were conducted in 1975. Test excavations revealed no significant subsurface cultural deposits in the area surrounding the mound, and salvage work concentrated on the mound feature itself. Excavation revealed a total of 49 features including postholes, firepits, charcoal concentrations, and a burial. A total of 238 artifacts were recovered from the excavations, including adze flakes, basalt and volcanic glass flakes, a pounder fragment, and historic artifacts. A historic burial was also uncovered (Rosendahl 1976).

Site 50-Oa-G5-38 (50-80-10-2047)

This site is a square depression with a stone-lined earth mound in its southeast corner. A low earthen embankment forms the north and west sides of the depression. A 4 meter trench was excavated through this feature in 1973 but uncovered no cultural artifacts. The function of the site was problematic but was interpreted as a possible historic era animal enclosure (McCoy 1973).

Site 50-Oa-G5-40 (50-80-10-2049)

This site consists of a stone alignment 25 m long that most likely served as a terrace border (McCoy and Sinoto 1972).

Site 50-Oa-G5-41 (50-80-10-2050)

This site is a circular stone alignment around a Christmas berry tree. Chinese porcelain fragments found nearby indicated a historic, non-Hawaiian association (McCoy and Sinoto 1972).

Site 50-Oa-G5-42 (50-80-10-2051)

This site consists of a U-shaped cut measuring approximately 2 m on all sides. The feature is believed to be a seepage catchment well of probable Hawaiian origin (McCoy and Sinoto 1972).

Site 50-Oa-G5-44 (50-80-10-2053)

This site is a stone alignment indicative of a possible terrace. It is near the confluence of Kamo'oali'i and Kuou Streams. Scattered historic artifacts suggest a late occupation (McCoy and Sinoto 1972).

Site 50-Oa-G5-45 (50-80-10-2054)

This site consists of a stone alignment and historic habitation features. Surface collections and test excavations revealed a variety of historic artifacts including nails, metal, glass, and ceramics. The stone alignment was interpreted as a support structure for a house or lanai, and the artifacts recovered indicated a very late nineteenth or early twentieth century date (McCoy 1973).

Site 50-Oa-G5-46 (50-80-10-2055)

This site consists of a series of stone alignments indicative of a historic habitation. Three test units were excavated and uncovered additional indications of building foundation as well as glass, ceramic, and metal artifacts. The site is believed to date from the very late nineteenth or early twentieth century (McCoy and Sinoto 1972; McCoy 1973).

Site 50-Oa-G5-48 (50-80-10-2057)

This site consists of a historic burial with partial human skeletal remains that were accidentally uncovered when construction crews were bulldozing a trench in the vicinity of Kamo'oali'i and Kuou Streams. Historic metal nails and wood suggested a coffin burial (McCoy and Sinoto 1972).

Site 50-Oa-G5-49 (50-80-10-2058)

This feature is a circular depression on the top of a ridge near the edge of a modern banana patch. It measures 3 m in diameter and is 40 cm deep at its deepest point. Its origin is unknown but its function was presumed to be agricultural (McCoy and Sinoto 1972).

Site 50-Oa-G5-50 (50-80-10-2059)

This site consists of a terrace complex near one of the upper tributaries of Kamo'oali'i Stream. Two terraces appear to be culturally altered for the purposes of agriculture, but the crude nature of the terraces suggests short-term use (McCoy and Sinoto 1972).

Site 50-Oa-G5-51 (50-80-10-2060)

This site is a wall made of uniform stones that appears to be retaining the bank of Kamo'oali'i Stream (McCoy and Sinoto 1972).

Site 50-Oa-G5-52 (50-80-10-2061)

This site, in the vicinity of Site G5-51, consists of a flood control ditch that is 60 m in length with a width of 0.7–1.5 m and a variance in depth of 20–80 cm (McCoy and Sinoto 1972)

Site 50-Oa-G5-53 (50-80-10-2062)

This feature is a historic stone/concrete oven for manufacturing charcoal. The whole structure is dug into a slope and measures 6.4 m in length by 3.6 m wide by 2.25 m high (McCoy and Sinoto 1972).

Site 50-Oa-G5-54 (50-80-10-2063)

This site is a large terrace complex covering an area of approximately 50 by 25 m at the confluence of two tributaries of Kamo'oali'i Stream. The site represents utilization of natural benches with only slight modifications in retaining walls and consists of three prepared terraces on the first bench and three additional terraces on the second natural bench. Three stratigraphic trenches were placed through the site in 1973, revealing no artifacts or charcoal. The site is believed to be of pre-Contact age (McCoy and Sinoto 1972; McCoy 1973).

Site 50-Oa-G5-55 (50-80-10-2064)

This site consists of a circular stone outline approximately 8 m in diameter. A trench excavated through the feature in 1973 revealed it to be a historic charcoal preparation pit (McCoy and Sinoto 1972; McCoy 1973).

The next group of archaeological research activities in the vicinity of the project area were investigations associated with the construction of Interstate Route H-3. An archaeological reconnaissance survey of Alternative Route A for the highway was conducted by Streck in 1982, and a reconnaissance survey south of the Kāne'ohē Interchange project area was conducted by Bishop Museum anthropology staff in 1985 (Riford 1987; Allen 1987). These surveys revealed agricultural and historic features at the following sites in the vicinity of the Kuou Well III project area:

Site 50-Oa-G5-73 (50-80-10-2143)

This is a probable agricultural site consisting of a possible stone-lined firepit, basalt cobble alignments, basalt terrace alignments, and a basalt-lined *auwai* (irrigation channel). The site measures 30 by 45 m (Streck 1982).

Site 50-Oa-G5-74 (50-80-10-2144)

This site is located at an elevation of 122–128 masl and consists of a small basalt-faced terrace, extensive basalt terracing, and scattered low cobble mounds. This probable agricultural site measures 30 by 40 m (Streck 1982).

Site 50-Oa-G5-75 (50-80-10-2145)

This site is on a high ridge at approximately 130 masl and consists of a rectangular low basalt boulder and cobble alignment measuring 3 by 3 m. This feature may be associated with a series of low basalt terraces extending downslope at least 15 m to the east (Streck 1982).

Site 50-Oa-G5-76 (50-80-10-2146)

This site, situated on a gentle slope at an elevation of approximately 137 masl, consists of a series of narrow basalt-faced channels that run with the slope. Several low basalt cobble mounds are associated with these channels (Streck 1982).

Site 50-Oa-G5-77 (50-80-10-2147)

This site is upslope of Ho'omaluhia Park at an elevation of approximately 131 masl and may be contiguous with Site G5-73. The site consists of a basalt stone wall that partially dams up a small stream. This feature contains several possible basalt platforms and is associated with extensive downslope terracing. Streck identified this site as a potentially important, possibly religious site (Streck 1982).

Site 50-Oa-G5-81 (50-80-10-2151)

This site covers an area of 10 by 25 m and is in the commercial banana groves upslope from Ho'omaluhia Park at an elevation of approximately 107 masl. The site was first investigated by Streck in 1982. It consists of two distinct basalt structural remains. One feature is a low basalt stone mound. The other feature is a stepped boulder and basalt cobble rectangular terrace. The site was reinvestigated by Bishop Museum staff and was determined to be *mauka* of the H-3 project area. The site was determined to consist of several rock clearing mounds and roadways suggesting historic construction (most likely associated with banana farming activities). It was determined that some of the features may be remnants of pre-Contact agriculture which were modified historically (Streck 1982; Riford 1987).

Site 50-Oa-G5-82 (50-80-10-2152)

This probable agricultural site, identified and surveyed by Streck in May 1982, was found to cover an area of 30 by 100 m at an elevation of 122 masl. The site consists of extensive agricultural terraces, low cobble mounds, a circular basalt-lined pit, and other structural features (Streck 1982; Riford 1987).

Site 50-Oa-G5-83 (50-80-10-2153)

Located upslope of Ho'omaluhia Park at an elevation of approximately 125 masl, this site was first surveyed by Streck in 1982. This probable agricultural site consists of a stacked basalt cobble and boulder platform and a long narrow wall. The site measures 20 by 50 m (Streck 1982).

Site 50-Oa-G5-105

This site consists of a series of historic features associated with agriculture, including cement-lined depressions, recently constructed stone mounds, and scatters of historic archaeological materials. Some of the stone alignments and mounds at this site may have their origins in the pre-Contact period (Riford 1987).

Site 50-Oa-G5-106 (50-80-10-2038)

This site was first identified as the Kukuiothane Heiau by McAllister (1933) (Sterling and Summers 1978). The site is at an elevation of approximately 110 masl and covers 6,756 m². It consists of a large complex of 26 surface features: one large terrace, one long wall foundation, and 24 small mounds and alignments. Excavations in 1989 revealed definite evidence of ritual function in the vicinity of Feature 20 (the large terrace) (McAllister 1933; Riford 1987; Williams 1989).

The final group of archaeological investigations in the vicinity of the current project are those associated with Board of Water Supply wells. These reconnaissance surveys have failed to find significant archaeological sites in the vicinity of the three Board of Water Supply well sites in the Kuou vicinity.

Kuou Well II

An archaeological reconnaissance of the Kuou Well II project area was conducted by Social Research Systems Co-op in 1988. This report notes that the area had already undergone significant surface modification and that no archaeological remains were noted. The researchers assessed this project area as needing no further archaeological investigation (Social Research Systems Co-op 1988).

Preliminary Kuou Well III

A second Board of Water Supply archaeological reconnaissance in the area involved preliminary examination of the Kuou Well III project area (Dixon 1993). This survey noted that the Kuou Well III site had been completely impacted by banana agriculture and recommended that an archaeological monitor be present during construction if surface disturbances were to be minimal.

Previous archaeological research in the vicinity of the project clearly indicates a predominance of sites associated with pre-Contact as well as historic agriculture. Major archaeological features in the Kuou vicinity include agricultural terraces, mounds, and earthworks. Scatters of historic debris associated with habitation sites, charcoal manufacture, road construction, burials, and agriculture have been found in the vicinity of the project area. The nearest nonagricultural archaeological site with traditional Hawaiian origin is the Kukuio Kane heiau complex in the 'ili of Luluku.

RESEARCH METHODS

The fieldwork portion of the Kuou Well III inventory survey was conducted by Bishop Museum Department of Anthropology personnel over the course of two days and included surface survey, site mapping, and subsurface testing. A 100% coverage pedestrian survey of the vicinity was conducted to determine the extent of the project area and to identify any cultural remains on the surface. A test well and access road are currently located at the site. Other structures will be placed after the area is graded. Soil removal at the site will be minimal except for the extreme southwestern portion of the site. Therefore, areas that would receive the greatest impact from surface grading were identified, and test excavation units were laid out and mapped (Figure 2). Mapping was conducted using an EDM total station. Test units were tied into the construction project maps, with the exploratory well in place at the site used as a mapping reference point.

Two stratigraphic trenches (ST 1 and ST 2) were excavated by backhoe. These units measured approximately 3 m in length by 1 m in width and were excavated to a depth of 1-1.5 m. Soil profiles were created for one face of each stratigraphic trench. Sediments were examined and classified using a Munsell soil color chart. Excavated soil from the trenches

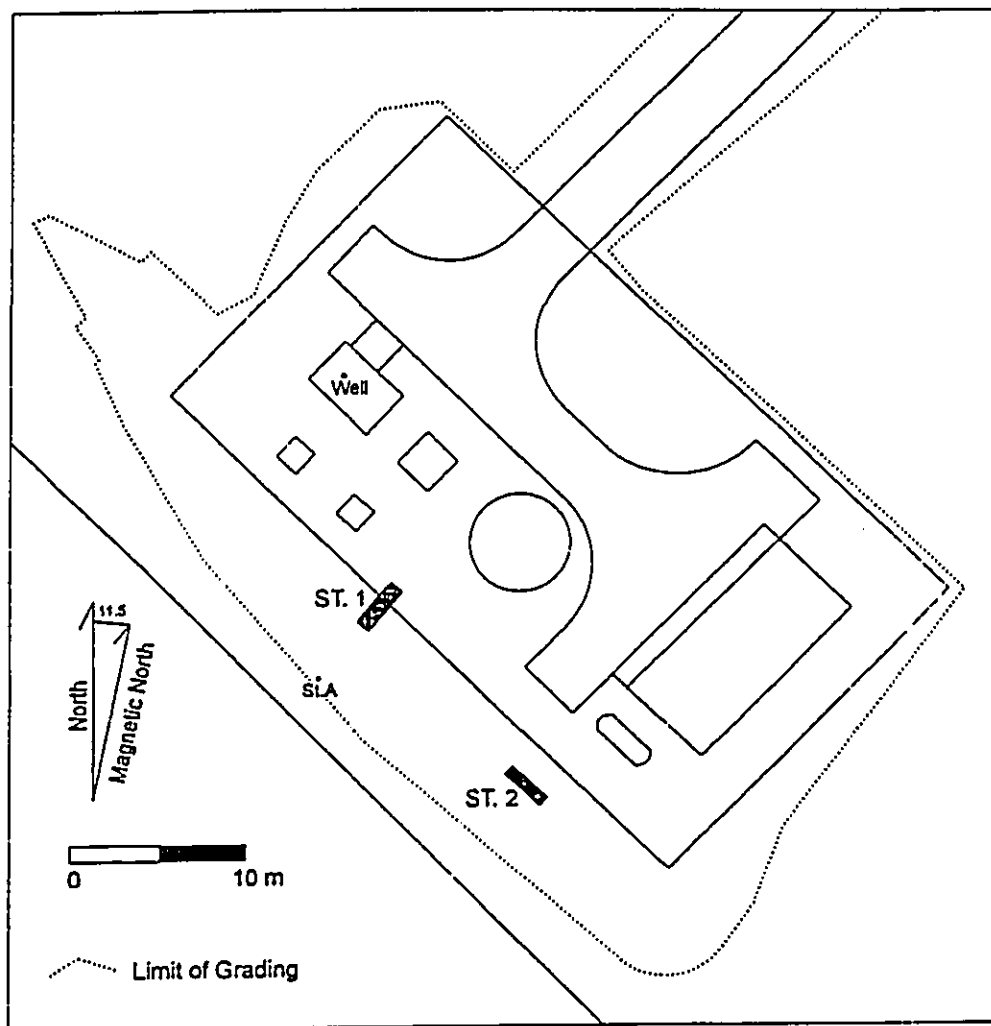


Figure 2. Site map showing the location of STs 1 and 2, Kuou Well III.

was separated by 30 cm levels and closely examined for artifacts and other cultural materials. A sample of material from each 30 cm level was screened for artifacts through a 1/4 inch mesh sieve.

FIELD RESULTS

The pedestrian survey revealed no cultural materials on the project area surface. A total of 6 m² was mechanically excavated, representing less than 1% of the project area. Soil removal during construction will vary from 0 to approximately 5 feet across the project area; both excavation units were placed in areas that will receive maximum impact from construction grading activities. No intact archaeological deposits were uncovered during test excavations.

and no artifacts or charcoal were recovered from the screening samples. Two very small pieces of charcoal were noted in ST 1.

Stratigraphic Trench 1 was excavated by backhoe to a depth of approximately 1.1 m. The southeast face of the trench was profiled and revealed a sequence of five soil layers (Figure 3).

Layer I, the surface layer, is a dark yellowish brown (10YR 4/4) sandy clay layer. The upper portion of the layer consists of decaying banana plant material. The layer ranges in depth from 10 to 22 cm and consists of approximately 10% weathered pebbles and cobbles. Layer I directly overlies Layers II and III.

Layer II is a dark yellowish brown layer (10YR 4/4) of clay loam and varies in depth from 12 to 42 cm below the ground surface. The material consists of less than 10% subrounded pebbles and approximately 25% coarse to very coarse sand. Two charcoal fragments of less than 5 mm diameter were noted in the layer profile. This layer abuts Layer III and is below Layer I and above Layer IV. Of the soil layers exposed in the two excavations, this layer would be the most likely to reveal cultural materials.

Layer III is a dark yellowish brown layer (10YR 4/4) of clay loam that abuts Layer II. This layer was located between 10 and 56 cm below the surface. The material consists of angular and subangular granules, 25% coarse sands, and pebbles and cobbles exhibiting irregular bedding planes. Cobbles in this layer average approximately 8 cm diameter and are placed irregularly. This layer abuts Layer II and is below Layer I and above Layer IV.

Layer IV is a dark yellowish brown layer (10YR 4/4) of sandy clay 30–60 cm below the ground surface. This layer consists of 10–20% granules and 30–40% pebbles. The fine

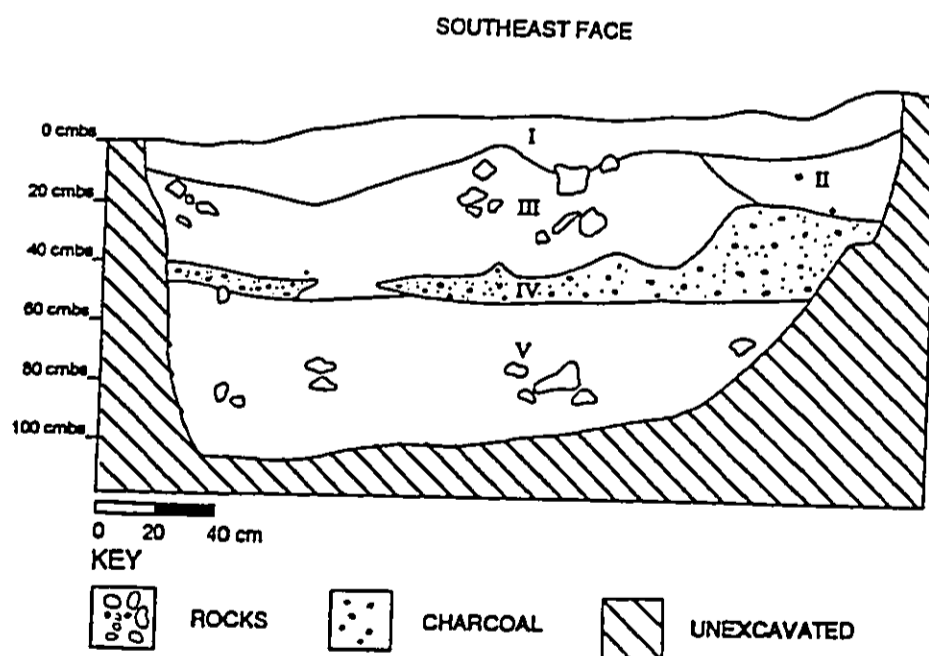


Figure 3. Soil profile of ST 1, Kuou Well III.

fraction of the sediment consists of abundant coarse to very coarse sands. Gravels in this layer tend to be horizontally bedded and regular. This layer lies below Layers II and III and above Layer V.

Layer V is an olive brown layer (2.5Y 4/4) of sandy clay. This layer is at least 60 cm below the ground surface. Layer V has a massive structure interrupted only by a few weathered basalt cobbles. This layer lies below Layer IV and was the deepest soil layer excavated in ST 1.

Stratigraphic Trench 2 was excavated by backhoe to a depth of 1.45 m. The southwest face of this trench was profiled and revealed a sequence of three soil layers (Figure 4).

Layer I is a dark gray/brown layer (10YR 3/2) of sandy clay that ranges to a depth of 23 cm below the ground surface. The upper portion of the layer contains organic material from banana cultivation. The layer consists of less than 3% rounded sand and is deposited in a parallel horizontal bed. This layer lies above Layer II.

Layer II is a dark brown layer (10YR 3/3) of sandy clay containing 40 mm gravels of rounded basalt. The sediment is composed of 10% angular sand and is deposited in a horizontal bed. This layer is 23–62 cm below the surface and lies directly below Layer I and above Layer III.

Layer III is a greenish brown layer (2.5Y 4/4) of clay at least 60 cm below the ground surface. The layer appears to have a massive structure interrupted only by a few basalt cobbles. This layer lies below Layer II and is the deepest soil layer exposed by ST 2.

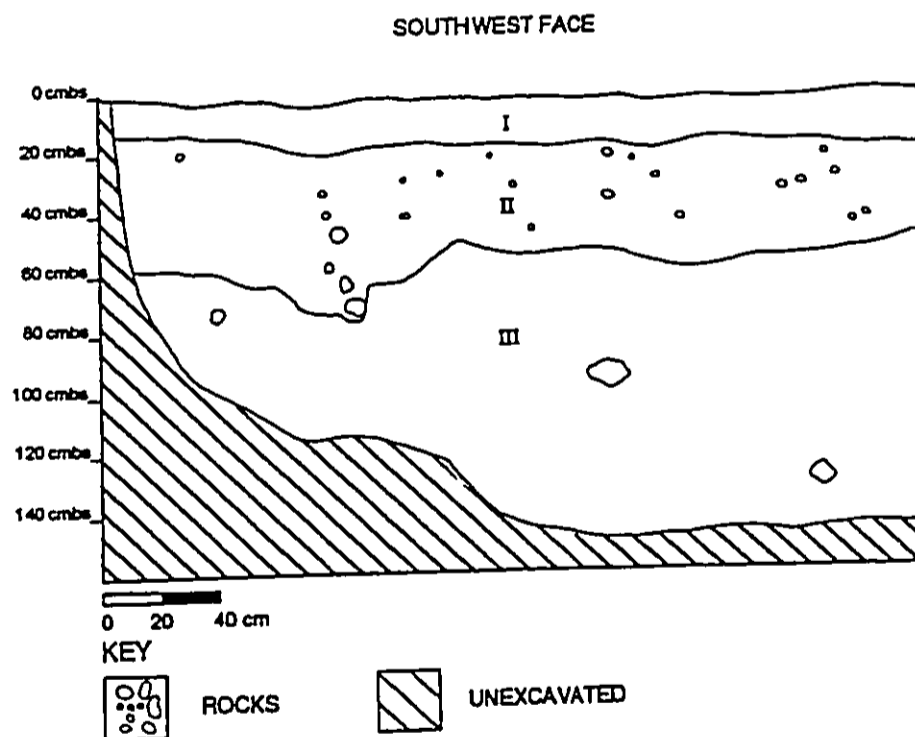


Figure 4. Soil profile of ST 2, Kuou Well III.

INTERPRETATION AND CONCLUSION

Documentary evidence, surface survey, and test excavations indicate that the probability of encountering intact archaeological deposits in the project area is quite low. From pre-Contact times through the present, the area has been used for agricultural pursuits with minimum impact from human habitation. Archaeological sites in the vicinity have produced primarily stone and earth features associated with agriculture; a few historic habitation or agricultural features have also been encountered.

Sediments recorded from the two stratigraphic trenches demonstrate similarities in depositional histories across the project area. Layer I in both trenches appears to be the same. Layers IV and V in ST 1 appear to correspond with Layers II and III, respectively, in ST 2. Layers II and III in ST 1 appear to have the greatest possibility of containing cultural materials, as indicated by their irregular deposition and traces of charcoal recovered from Layer II. Therefore, if archaeological materials are to be encountered at this site, they will likely be in these layers at a depth of 10–50 cm below the ground surface. There is, however, no present indication that significant cultural resources will be uncovered.

RECOMMENDATIONS

The site of the Kuou Well III construction activities (ca. 1,000 m²) was investigated by Bishop Museum in April 1997. Surface survey and mechanical subsurface testing revealed no cultural materials. Although minimal human activity associated with agriculture may have existed in this vicinity in the pre-Contact and historic periods, no archaeological evidence of these activities was found in the project area.

No further pre-construction archaeological or monitoring procedures are recommended. However, if construction-related excavation activities expose archaeological materials or features (including, but not limited to, buried stoneworks, evidence of human habitation, or human remains), the Historic Preservation Division of the State Department of Land and Natural Resources should be notified immediately.

REFERENCES

Allen, Jane (editor)

- 1987 *Five Upland 'Ili: Archaeological and Historical Investigations in the Kane'ohē Interchange, Interstate Highway H-3, Island of O'ahu*. Departmental Report Series 87-1, Department of Anthropology, Bishop Museum, Honolulu.

Cooray, Ranjit

- 1976 Reconnaissance Survey: Botanical Survey. In Paul H. Rosendahl, ed., *Archaeological Investigations in Upland Kaneohe*. Ms. on file, Department of Anthropology, Bishop Museum, Honolulu.

- Dixon, Boyd
1993 An Archaeological Reconnaissance of Five Board of Water Supply Wells on O'ahu, Hawai'i. Ms. on file, Department of Anthropology, Bishop Museum, Honolulu.
- Foote, Donald E., Elmer L. Hill, Sakuichi Nakamura, and Floyd Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*. USDA Soil Conservation Service, GPO, Washington, D.C.
- Interior Department, Kingdom of the Hawaiian Islands
n.d. (1) Document 395. Report of Pi'ikoi regarding Kamehameha I lands. Hawaii State Archives.
n.d. (2) Document 267. Deed to Watson. Hawaii State Archives.
1877 In the matter of C. C. Harris vs. Commissioners of Crown Lands, Supreme Court. January. Hawaii State Archives.
- Lyons, C. R.
1876 Map of Kaneohe and west Kailua. Hawaii State Survey Office, 1874. Honolulu.
- McAllister, J. G.
1933 *Archaeology of Oahu*. Bishop Museum Bulletin 104. Bishop Museum Press, Honolulu.
- McCoy, Patrick C.
1973 Archaeological Investigations along Upper Kamo'oali'i Stream, Kaneohe, Oahu. Ms. on file, Department of Anthropology, Bishop Museum, Honolulu.
- McCoy, Patrick C., and Aki Sinoto
1972 Environmental Inventory Study for Kaneohe-Kailua Flood-Control Project. Ms. on file, Department of Anthropology, Bishop Museum, Honolulu.
1976 Reconnaissance Survey: Environmental Inventory Cultural Survey. In Paul H. Rosendahl, ed., *Archaeological Investigations in Upland Kaneohe*. Ms. on file, Department of Anthropology, Bishop Museum, Honolulu.
- Privy Council, Kingdom of the Hawaiian Islands
1854 Will of Kamehameha III. 16 December. Hawaii State Archives.
- Pukui, Mary Kewena, and Samuel H. Elbert
1986 *Hawaiian Dictionary*. University of Hawaii Press, Honolulu.

- Riford, Mary
1987 Reconnaissance Survey Northwest and South of the Kane'ohē Interchange Project Area. In Jane Allen, ed., *Five Upland 'Ili: Archaeological and Historical Investigations in the Kane'ohē Interchange, Interstate Highway H-3, Island of O'ahu*. Departmental Report Series 87-1, Department of Anthropology, Bishop Museum, Honolulu.
- Rosendahl, Paul H. (editor)
1976 Archaeological Investigations in Upland Kaneohe: Survey and Salvage Excavations in the Upper Kamo'oali'i Stream Drainage Area, Kaneohe, Ko'olaupoko, Oahu, Hawaii. Ms. on file, Department of Anthropology, Bishop Museum, Honolulu.
- Social Research Systems Co-op
1988 Kuou Well II Archaeological Reconnaissance Survey. Ms. on file, State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.
- Sterling, Elspeth P., and Catherine C. Summers
1978 *Sites of Oahu*. Bishop Museum Press, Honolulu.
- Streck, Charles
1982 Archaeological Reconnaissance Survey for Route H-3 (Alternative A), Kane'ohē, O'ahu, Hawai'i. Ms. on file, Department of Anthropology, Bishop Museum, Honolulu.
- Williams, Scott S.
1989 A Preliminary Report of Test Excavations on Sites 50-Oa-G5-106 and -G5-110, Lulukū, Kane'ohē, Ko'olau pōko, O'ahu. Ms. on file, Department of Anthropology, Bishop Museum, Honolulu.