

*Kaluanui Well Addition*

**BOARD OF WATER SUPPLY**

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November 21, 1997

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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 Kaluanui Well Addition (Previously Referred to as Kaluanui Well III), Windward, Oahu, Hawaii, TMK: 5-3-11: 09

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. In addition, we request a project name change from Kaluanui Well III to Kaluanui Well Addition. The project name was originally Kaluanui Well III because it was the third exploratory well to be drilled at the BWS existing Kaluanui Well Station. Since this is the production phase of the well project, we request the project name be revised to Kaluanui Well Addition.

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

RECEIVED  
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OFFICE OF ENVIRONMENTAL QUALITY CONTROL

**Attachments**

cc: ~~Keith Uemura, ParEn, Inc.~~  
Paul Inouye, M&E Pacific Inc

119

1997-12-08-OA-FEA-Kaluanui Well  
Addition

DEC 8 1997

**FILE COPY**

**FINAL  
ENVIRONMENTAL ASSESSMENT**

**Kaluanui Well Addition**

**TMK: 5-3-11:09**

**Prepared for**

**City and County of Honolulu  
Board of Water Supply**

**November 1997**

**Prepared By**

**M&E Pacific, Inc.  
Pauahi Tower  
1001 Bishop Street,  
Suite 500  
Honolulu, Hawaii 96813**

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## **APPENDICES**

- Appendix A: Water Quality and Chemical Data
- Appendix B: Archaeological Investigation
- Appendix C: Botanical Investigation
- Appendix D: Yield-Drawdown Test Data
- Appendix E: Water Source Inventory
- Appendix F: Draft EA Distribution List
- Appendix G: Draft EA Comment and Responses

## 1.0 APPLICANT

The applicant for the Kaluanui Well Addition (referred to hereafter as the project) is the Board of Water Supply (BWS), City and County of Honolulu (CCH). This Environmental Assessment (EA) was prepared in accordance with Section 343, Hawaii Revised Statutes (HRS) and Chapter 200 of Title 11, Hawaii Administrative Rules (HAR). This EA is required due to the use of state land and county funds.

## 2.0 APPROVING AGENCY

The approving agency for a determination of significance for this Environmental Assessment is the BWS, CCH.

## 3.0 CONSULTATION LIST

The following parties were contacted during the preparation of this environmental assessment:

### Federal

Department of the Army  
Pacific Ocean Division, Corps of Engineers

### State of Hawaii

Department of Land and Natural Resources  
Water Resource Management Division  
Land Division  
Department of Health  
Safe Drinking Water Branch  
Office of Environmental Quality Control  
Office of Hawaiian Affairs

### City and County of Honolulu

Board of Water Supply  
Department of Land Utilization  
Planning Department  
Department of Public Works

## 4.0 PROJECT OBJECTIVE AND NEED

This project will provide the necessary facilities to convert Kaluanui Exploratory Well III into a production well. The proposed action is a part of an overall groundwater

development program intended to increase the municipal water supply to meet the growing demands of an increasing population. The BWS served a population of more than 900,000 in fiscal year 1995, and the island wide demand was 153 million gallons per day (mgd). These numbers are expected to increase to 973,000 and 183 mgd, respectively by the year 2005 (BWS, 1995). Much of the anticipated growth on Oahu will occur in the Honolulu District which extends from Aliamanu to Hawaii Kai. This district currently has the highest population and water demand.

The BWS would not be able to provide adequately for the future water needs of Oahu's population if the program to develop new water sources is curtailed. Inadequate municipal water supplies could result in future restrictions to development on Oahu as well as regional water shortage within the existing developed areas. The BWS has been developing and testing new water sources in the windward area to meet the growing demand. The new production well is expected to add 1.0 mgd to the BWS distribution system.

## **5.0 PROJECT BACKGROUND AND DESCRIPTION**

### **5.1 Technical Description of the Proposed Project**

The Kaluanui Well Addition is located on a densely wooded slope in Kaluanui Valley, Oahu, approximately 4,800 feet mauka (southwest) of Kamehameha Highway. The exploratory well was drilled and tested for water quality and sustainable yield between April and May of 1996. Based on the test results, BWS has recommended a pumping rate of 700 gallons per minute (gpm), or approximately 1.0 mgd for the production well to avoid aquifer overdrafting. The exploratory well is currently capped.

The preliminary layout of proposed facilities is shown on Figure 3. The actual improvements at the well site are illustrated in Figure 3A. The project mainly consists of the following:

- Installation of a new 700 gpm submersible pump and accessories at the well. The proposed well site area will be approximately 400 square yard. Access to the well site will be limited and for BWS personnel only. The nearby inactive Kaluanui Well I will be sealed and its the pumping unit will be salvaged.
- Construction of approximately 300 feet of 12-foot wide paved access road to the well site.
- Installation of approximately 500 feet of 8-inch diameter water transmission main from the well site to the control building.
- Modifications to the existing control building. Currently the building houses the control system for Kaluanui Wells I & II. As necessary, the building will be modified to accommodate the well Addition. The modifications may include adjustments to the motor control system and supervisory control system.

## 5.2 Cost of the Proposed Action

The preliminary cost estimate for the construction is \$1,750,000. 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 the BWS Water System Facilities Charges for resource development.

## 6.0 SUMMARY OF AFFECTED ENVIRONMENT

### 6.1. Location and Access

Figure 1 shows the regional location of the Kaluanui Well Addition (DOWALD No. 3554-06) in Kaluanui Valley in the district of Koolauloa, Oahu. The site is within the Sacred Falls State Park on a portion of Tax Map Key (TMK) 5-3-11:9, owned by the State of Hawaii (Figure 2).

Access to the project area is provided by a dirt road that leads inland from the Sacred Falls trail parking area. There is a paved road branches from the dirt road and leads about 800 feet to the existing control building. The Kaluanui Well Addition is about 350 feet north of the existing control building, and 300 feet away from the paved road. The current dirt access road to the proposed well will be paved in this project.

### 6.2 Topography and Climate

The project site is located on the lower slopes northwest of Kaluanui Valley. Ground elevations in the project area range from 70 to 115 feet above Mean Sea Level (MSL). The new well ground elevation is 90.8 feet MSL. The slope of the paved access road to the control building varies from 4.0% to 12%. See Figure 3 - Site Plan for contour information.

Oahu has relatively uniform day lengths and a solar angle that results in small seasonal variations. The prevailing wind is the northeasterly trade wind. The average rainfall in the project area is 75 inches per year. Heavier rainfall usually occurs during the months of November to February. Temperatures range from 60 to 80 degree Fahrenheit (University of Hawaii, 1973).

### 6.3 Infrastructure

Electrical and telephone services are already provided to the proposed well site. Utilities are available at the existing control building located approximately 350 feet to the south. Exploratory well drilling has only been performed at the well site thus far.

#### 6.4 Land Use Zoning/Ownership

The project site is located within the state Agricultural District. The parcel is not on ceded land and is exterior of the county Special Management Area (SMA, 1985). It is currently zoned P-2 General Preservation per Department of Land Utilization. The Development Plan (DP) and DP Public Facilities Map designation of this site will be WELL. BWS will coordinate with State of Hawaii Department of Land and Natural Resources (DLNR, land owner) to access and utilize easement for the new well facilities.

#### 6.5 Geology and Hydrology

The Kaluanui area is on the windward side of Oahu and is part of the northwest rift zone of the Koolau Range which extends from Kailua to Kahuku. From the dike complex of the crest area, the hydrogeologic condition changes to the marginal dike zone and finally to basal conditions near coast. Volcanic dikes are much denser and much less permeable than lava flow and cut across pre-existing lava flows. Dikes are nearly vertical and usually less than a yard thick. Compartments formed by these dikes provide storage for groundwater and infiltrated rainfall in the windward area at high elevations (VTN Pacific, 1988).

The Kaluanui Well Addition is expected to withdraw water from the Koolauloa Basal Aquifer at a rate of 1.0 mgd. The Koolauloa Basal Aquifer is a fresh water lens that is confined by caprock along 11 miles of coast from Punaluu Valley to Kahuku Point (Figure 4). The Koolauloa Basal Aquifer is recharged by dike confined high level ground water and directly by rainfall infiltration. Groundwater flows from high head potential to low potential. Therefore, the general groundwater flow path in this region is from mountain to ocean. The estimated yield of the Koolauloa Basal Aquifer is 35 mgd.

An inventory of wells, owners, permitted uses and pumpage is provided in Appendix F. This list is part of the Oahu Water Management Plan for the Koolauloa region. Existing and proposed BWS and private ground water sources are illustrated in Figure 4A.

#### 6.6 Soils

Soils at the project site are classified by the U.S. Soil Conservation Service as Waikane silty clay (WpC) with 8 to 15% slopes (USDA, 1972). Runoff on this soil is slow to medium, and the erosion hazard is slight to moderate.

#### 6.7 Water Quality

In accordance with HAR, Title 11, Chapter 20, water samples were collected and analyzed for possible contaminants in July 1996. No contaminants were found above the maximum contaminant level as set by EPA and DOH. The water quality results from Montgomery Watson Laboratories of Pasadena, California are included in Appendix A.



These results have been addressed in the engineering report currently under review by DOH.

There are no known sources of contamination upgradient of the proposed well. In addition, there has not been any record of contamination problems in the affected aquifer. The proposed well site should be well-protected since it is located within Sacred Falls State Park.

Microbiological data is not available at this time, however, they will be submitted to the state DOH after the permanent pump is installed. Note that the existing chlorination system will be upgraded if necessary to accommodate the additional flow.

#### **6.8 Natural Hazards**

Flood hazards have not been determined (Zone D) at the project site according to the Flood Insurance Rate Map of the National Flood Insurance Program. A Department of the Army permit will not be required.

Island of Oahu is in Seismic Zone 1 as designated in the 1991 edition of Uniform Building Code (UBC). In a scale of 1 to 4, structures in this zone require the least amount of earthquake protection. The BWS has adopted the design standards for Seismic Zone 3 for all structures. Design and construction of the proposed facility will be in conformance with BWS standards for earthquake protection.

#### **6.9 Archaeological and Historic Sites**

An archaeological survey for Kaluanui Exploratory Well III was conducted in November 1990 (see Appendix B). The survey located a concrete-lined *auwai* (ditch), stacked retaining wall /mound of large basalt boulders, and a double alignment of boulders in the vicinity of the project area (Figure 5). These sites (structures) are related to the agricultural activities (sugarcane cultivation) in the area until the late 1960's. The significance of these sites is related to their research potential only.

The exploratory well and temporary access road were constructed in April 1996, and there was no report of damages to the archeological sites. Since the proposed transmission main will be embedded along the access road, archeological and historic sites are not likely to be impacted. However, should evidence of archeological sites be uncovered during excavation, all construction work will cease and the State Historic Preservation Office shall be notified immediately to investigate the findings.

#### **6.10 Biological Resources**

A botanical investigation of the well site and access road was conducted on November 7, 1990 by Botanical Consultants (see Appendix C). The investigation concluded that the project site is almost entirely covered with introduced or alien vegetation. The tree layer

of the site is composed of octopus trees (*Schefflera actinophylla* (Endl.) Harms) of 26 to 28 feet, and the understory is made up of Christmas berry trees (*Schinus terebinthifolius* Raddi) of 16 to 20 feet. The ground is covered with a herb layer consisting of leaf litter, seedlings, ferns and other alien species. No threatened or endangered plant species exist in the area.

The project site is not likely to provide an important habitat for any endangered indigenous bird species, since the surrounding area is covered with introduced and alien vegetation. Introduced species of birds present in the area include doves, cardinals, owls, pheasants, thrushes, and white eyes. Introduced species of mammals in the area probably include mongooses, rats, feral cats, and feral pigs (VTN Pacific, 1984). Since the project is located approximately 1000 feet from the Kaluanui stream, stream fauna should not be affected.

#### 6.11 Air Quality and Noise

The project site is located within Sacred Falls State Park, a popular hiking area. The distance to the nearest residence is about 3,500 feet. There will be no significant sources of air pollution or noise from the proposed project. The submersible pump will be driven by an electric motor and placed in an enclosed water well having a 193-foot steel casing. Therefore, the proposed project should not have any significant impact on air quality and noise levels in the area.

#### 6.12 Stream Flow

Kaluanui Stream is the only significant surface water body in the vicinity of the project site. It is entirely located on state land acquired for Sacred Falls State Park. None of its water is diverted for agricultural or domestic use. The shortest distance from the stream to the well site is approximately 1,000 feet.

Kaluanui Stream is perennial at high elevations but is naturally intermittent at low elevations in Kaluanui Valley. The primary source of Kaluanui Stream discharge is dike-impounded ground water at high elevations. In addition, the stream collects surface runoff from a 3.5 square mile watershed and rainfall stored in unconsolidated surface alluvial material. The basal ground water is not a source of the stream flow.

The revised Environmental Impact Statement (EIS) for the Kaluanui Wells, prepared by VTN Pacific in 1984 addressed the issue of stream flow impact (if any) due to pumping of basal water. According to the EIS, on June 2 and 3, 1982, the U.S. Department of the Interior, Geological Survey (USGS) monitored Kaluanui Stream. The results showed that there was no detectable flow in the makai 3,300 feet of the stream channel below an elevation of 20 feet MSL. The implication is that Kaluanui Stream is perched over the basal aquifer on relatively impermeable alluvium which prevents the basal water from entering.

During the same period, Kaluanui Stream had a flow of about 0.28 mgd at an elevation of 110 feet MSL, but virtually no flow below an elevation of about 25 feet MSL. Apparently, the dry weather flow percolated into the stream bed alluvium. Prior to the pump test on May 23, 1996, the static head of the exploratory well was 16.82 feet MSL. If the basal ground water were able to enter the stream, then stream flow should have been detected by USGS in the Kaluanui Stream below an elevation of 16.82 feet MSL.

Impacts on the stream flow are not anticipated during production. The Kaluanui Well Addition is cased to a depth of 193 feet from the surface (102 feet below MSL). Based on the well completion report, the relative locations of the stream, alluvium, well and the water table are illustrated in Figure 7. The amount of water percolated to the stream bed alluvium is generally small comparing to the water flowing away, especially when the flow velocity is high. The limited amount of water in the alluvium runs parallel to the stream flow in layers since the conductivity in the horizontal direction is much greater than that of vertical. Therefore, the water withdrawn from the basal aquifer is not expected to impact the Kaluanui Stream flow since the intervening layers of relatively impermeable alluvium isolates the two water bodies.

The BWS measured the Kaluanui Stream discharges at five different sites (Figure 8) from May 8 to June 13, 1996. The results showed that the stream flow was not affected during pump test conducted from May 23 to 28, 1996. This is to further prove that the water withdrawn from the basal aquifer will not impact the water flowing in Kaluanui Stream. As necessary, BWS will monitor the stream flows to prevent any potential impacts in the future. Appropriate actions will be taken should any adverse effects occur.

## **7.0 PROBABLE IMPACTS AND MITIGATION MEASURES**

### **7.1 Short-term Construction Related Impacts**

Construction activities will take place within or near existing BWS facilities in a remote area. The only major earth moving operations are the trench excavations for the 8-inch transmission main and the access road construction. The fugitive dust and hydrocarbon emission from heavy vehicles will be temporary and insignificant. Other short term impacts, such as the increase in traffic, dust and noises, will also be insignificant since the scale of construction is small, and the job site is isolated. Soil erosion is a potential adverse impact, but can be minimized by preserving existing vegetation and natural buffer zones. The contractor is advised to use all applicable Best Management Practices (BMPs) and best available technologies to minimize short term construction related impacts as necessary. Additionally, discharges associated with the construction of the permanent pump and connecting pipelines will be disinfected and filtered if necessary to minimize impacts to the State receiving waters.

## **7.2 Visual Impacts**

The project site is located approximately 4,800 feet mauka of the Kamehameha Highway. It is surrounded by densely grown trees and vegetation. The discharge piping will have a low profile and the transmission water main will be buried in the ground. These objects will not be visible from Kamehameha Highway. Therefore, the visual impacts of the proposed structures is minimal.

## **7.3 Groundwater Impacts**

Test pumping of the Kaluanui Well Addition was conducted on May 23 through 28, 1996. The observation well was Well 3554-02 which is located in Kapaka Farm approximately 1,300 feet away from the testing well (Figure 6). The Yield-Drawdown test data are included in Appendix D. Although the average pumping rate was 827 gpm, the BWS has recommended a pumping rate of 700 gpm. This is based on the overall increases in mineral levels during pump test indicating that the aquifer may be sensitive to overdrafting. The lower pumping rate should reduce the groundwater impacts significantly. When in production, the BWS will monitor the changes in groundwater level to prevent overdraft of and salt water intrusion into the aquifer.

## **8.0 ALTERNATIVES TO THE PROPOSED ACTION**

### **8.1. No Action**

Implementation of this project will help satisfy the increasing water demand in the Honolulu and Windward districts of Oahu. This action is consistent with the Windward Oahu Regional Water System Improvements plan. The No Action option will impede the overall groundwater development program and potentially cause water shortage in the Honolulu and Windward districts.

### **8.2. Delayed Action**

The delayed action alternative was considered but not pursued because this alternative would delay the BWS's implementation schedule and would have substantially similar environmental outcomes. In addition, this alternative would require higher development costs due to inflation.

### **8.3. Alternative Site**

The proposed Kaluanui Well Addition is located in the close vicinity of the existing control building for Kaluanui Wells I & II. The exploratory well has been tested and proven to have high sustainable yield and water quality. To install the well elsewhere

will require additional drilling and testing. It may also involve costly land purchases and access difficulties.

#### **8.4 Desalination**

Desalination will be implemented as groundwater withdrawals approach sustainable yields. A site and technology study is currently under way. While the capital cost of a large-scaled desalination plant per gallon is equivalent to groundwater development in rural areas, the operation and maintenance (O&M) costs at \$3.00 per thousand gallons is 10 times the cost of pumping groundwater. O&M cost directly affects the water rates which should be kept as low as possible.

#### **8.5 Surface Water**

A 1996 Surface Water Study indicated that surface water development for potable use was not feasible, given the small, variable flows, environmental impact and the intense regulatory process involved with the instream flow standards and the monitoring requirements of the Safe Drinking Water Act.

#### **8.6 Reclamation**

The reuse of sewage effluent is a promising alternative resource that is being actively pursued by the City to replace potable use for irrigation and industrial process water and to relieve the development pressure for high quality groundwater supplies. Public health concerns and high costs for dual water system infrastructure limit the extent of reuse. The city is focusing on the Ewa plains rather than the more costly alternative to redevelop existing urban areas with dual systems. Additionally, the Honouliuli Wastewater Treatment Plant effluent has chloride content very suitable for irrigation. Whereas the Sand Island Plant Chloride content is much too high for irrigation use.

### **9.0 LIST OF PERMITS**

The following permits and clearances may be required as part of this project:

#### State of Hawaii:

Subdivision Application (DLU)  
NPDES Permit (DOH)  
Water Use Permit (DLNR)  
Pump Installation Permit (DLNR)  
Potable Water Source Approval (DOH)

#### City and County of Honolulu:

Grading Permit (Department of Public Works - DPW)

Building Permit, if necessary (Building Department)

Other:

## 10.0 DETERMINATION

In accordance with Chapter 343, Hawaii Revised Statutes, this Environmental Assessment has characterized the technical and environmental issues of the project, identified potential impacts and their significance. It is anticipated that the proposed project will not significantly impact the environment. Therefore, finding of no significant impact is anticipated, and an Environmental Impact Statement is not required for this project. This determination is based on the significance criteria listed in §11-200-12 of the Environmental Impact Statement Rules. Specifically, these significance criteria are addressed below:

1. The proposed project will not result in an adverse commitment, loss, or destruction of any natural or cultural resources. The proposed site is in a remote area covered with introduced grasses and vegetation.
2. The range of beneficial uses of the environment will not be curtailed.
3. The project will not conflict with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court orders or executive orders. The project is in conformance with the Oahu Water Management Plan Hawaii, Hawaii State Water Plan and the County's General and Development Plans.
4. The project will not adversely affect the economic or social welfare or the community or state.
5. The project will not adversely affect public health. The project will provide high quality groundwater to meet the increasing demand in the Windward and Honolulu districts.
6. The project will not involve adverse secondary impacts, such as population changes or effects on public facilities. The proposed project responds to current population trends.
7. The project will not involve a substantial degradation of environmental quality.
8. The project will not include considerable cumulative effect upon the environment nor involves a commitment for larger actions. The project is consistent with the Windward Oahu Regional Water System Improvements plan.

9. The project will not substantially affect a rare, threatened or endangered species, or its habitat.
10. The project will not detrimentally affect air or water quality or ambient noise levels. The pump will be driven by an electric motor and placed in a deep water well. Short-term impacts will occur during the construction phase.
11. The project will not affect an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geological hazardous land, estuary, fresh water, or coastal waters.
12. The project does not affect identified scenic vistas or view planes. The project site is surrounded by densely grown trees and vegetation.
13. The project does not require substantial energy consumption. The submersible pump will be driven by a 100 horsepower motor.

## 11.0 REFERENCES

Documents reviewed during preparation of this Environmental Assessment:

Department of Geography at University of Hawaii, 1973. Atlas of Hawaii.

Department of Water Supply, City and County of Honolulu, Annual Report and Statistical Summary, July 1, 1994 - June 30, 1995.

Department of Water Supply, City and County of Honolulu, Oahu Resident Population and Water Demand, 1990 - 2010.

Federal Emergency Management Agency, 1987. Flood Insurance Rate Map (FIRM) for City and County of Honolulu, Hawaii.

International Conference of Building Officials, 1991. Uniform Building Code.

Maguire Group, Inc., April 1991. Environmental Impact Assessment for an Exploratory Well and Access Road at Kaluanui, Oahu.

U.S. Department of Agriculture, Soil Conservation Service, August 1972. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.

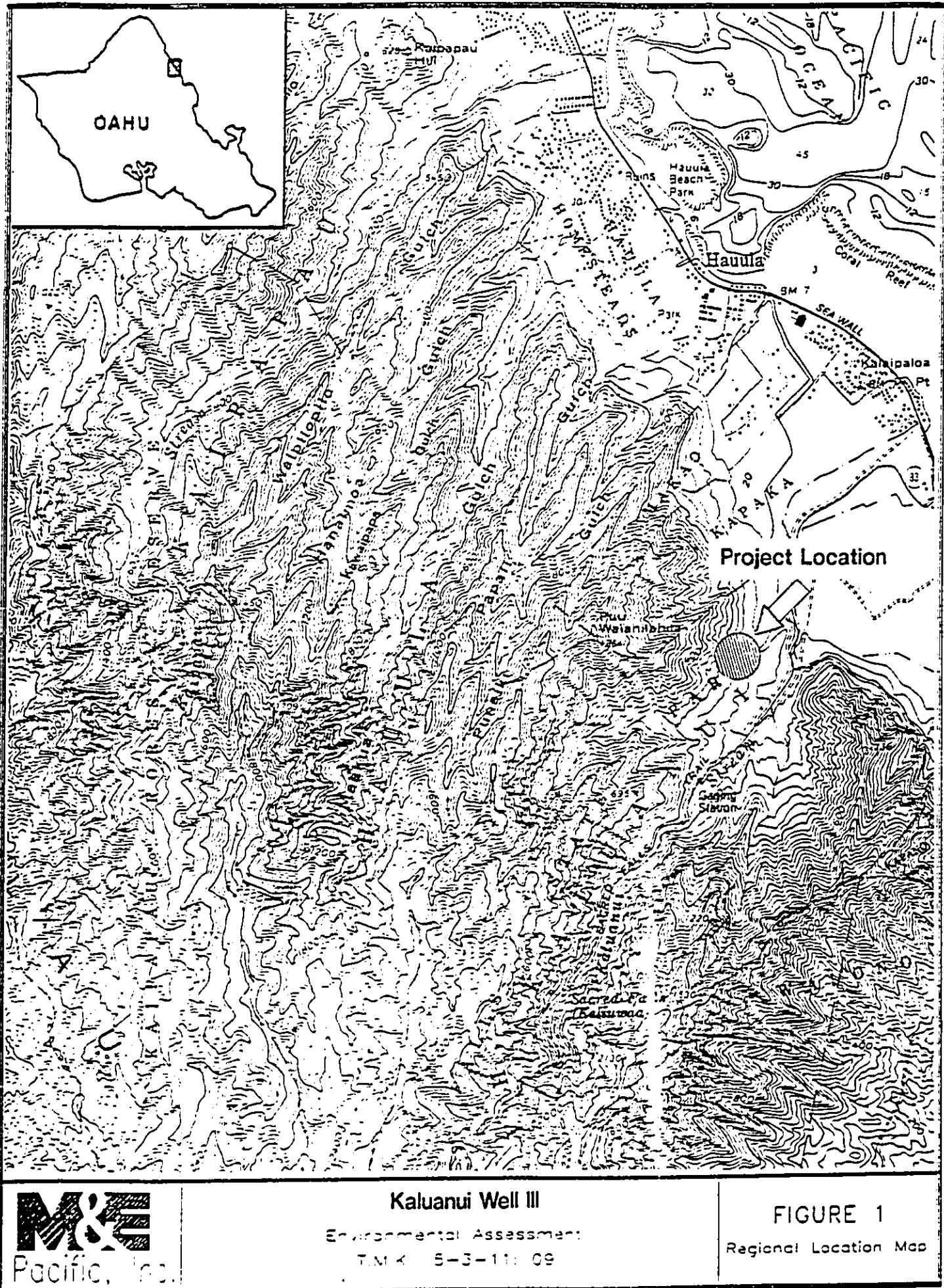
VTN Pacific, August 1988. Final Environmental Impact Statement for the Windward Oahu Regional Water System Improvements, Volume 1.

VTN Pacific, July 1984, Revised Environmental Impact Statement for the Kaluanui Wells.



## Figures

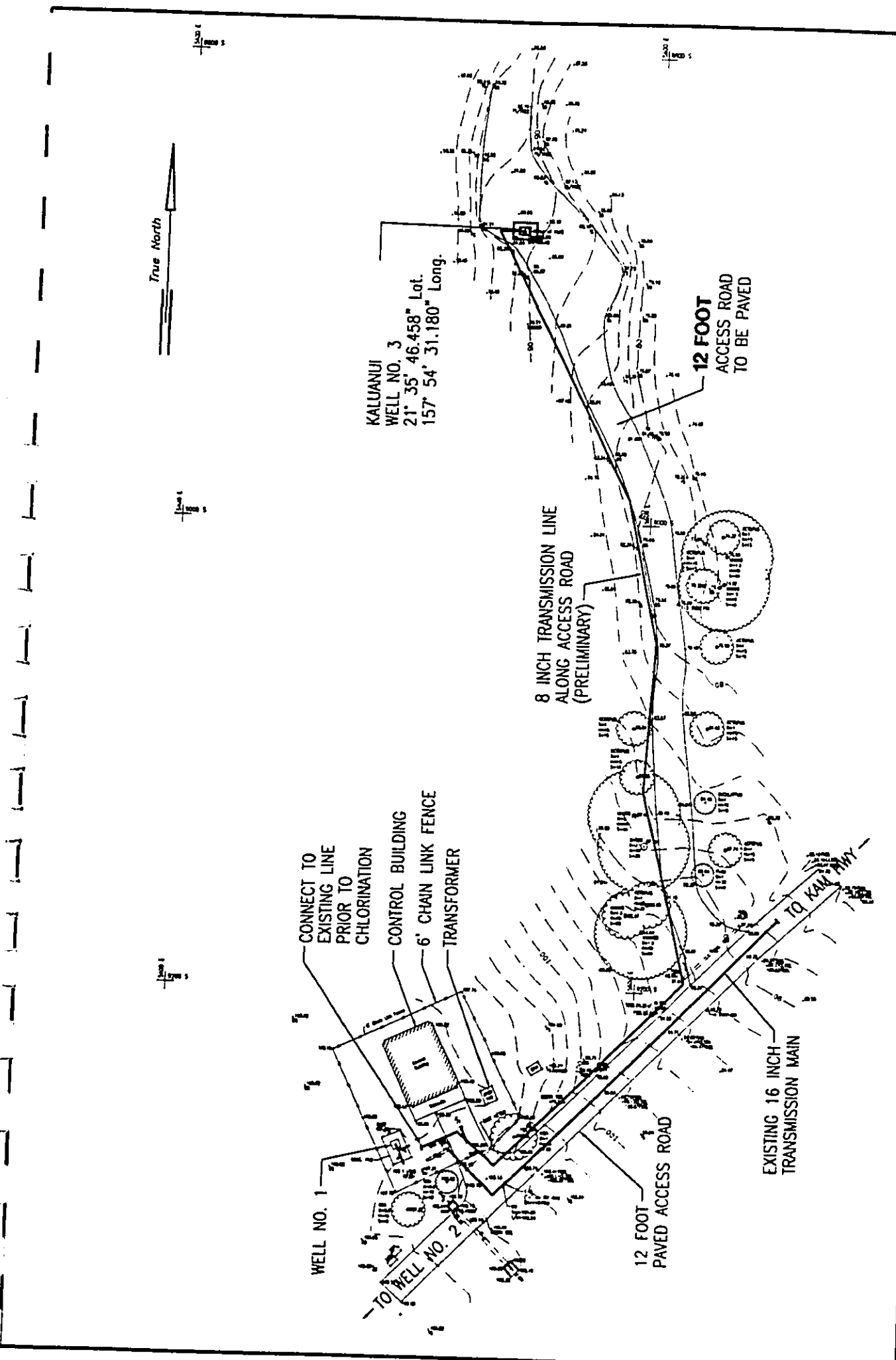
- Figure 1:.....Regional Location Map  
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Figure 8:.....Gage Location Map




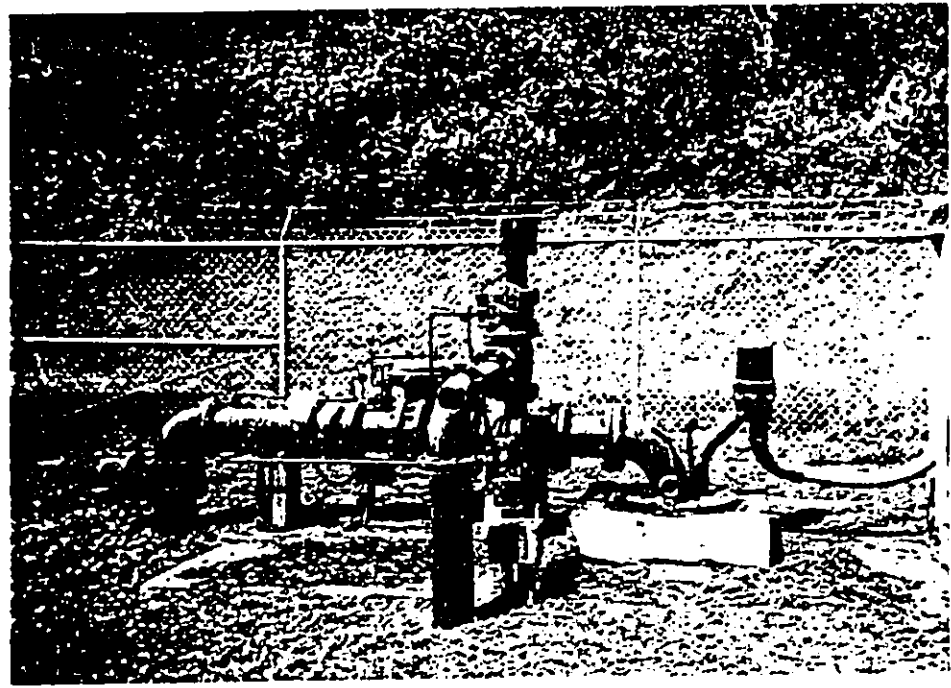
Kaluanui Well III  
Environmental Assessment  
T.M.K. 5-3-11: 09

FIGURE 1  
Regional Location Map





	<p>KALUANUI WELL III  <b>ENVIRONMENTAL ASSESSMENT</b>          T.M.K.: 5-3-11:09</p>	<p>SITE PLAN</p>	<p>FIGURE  <b>3</b></p>
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KALUANUI WELL III  
ENVIRONMENTAL ASSESSMENT  
T.M.K.: 5-3-11:09

Well Site  
Improvement  
Illustration

FIGURE  
**3A**



KAHUKU POINT

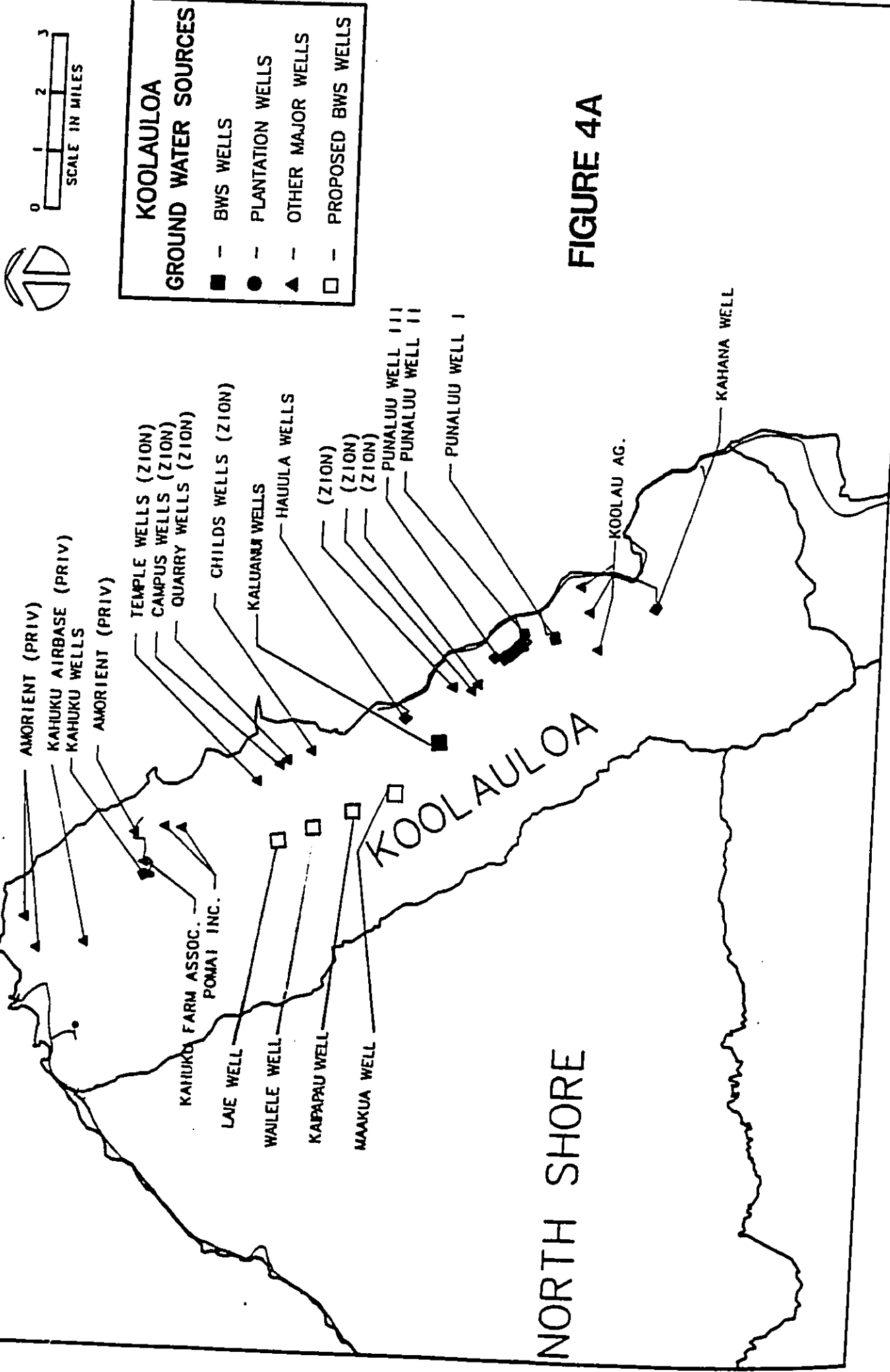
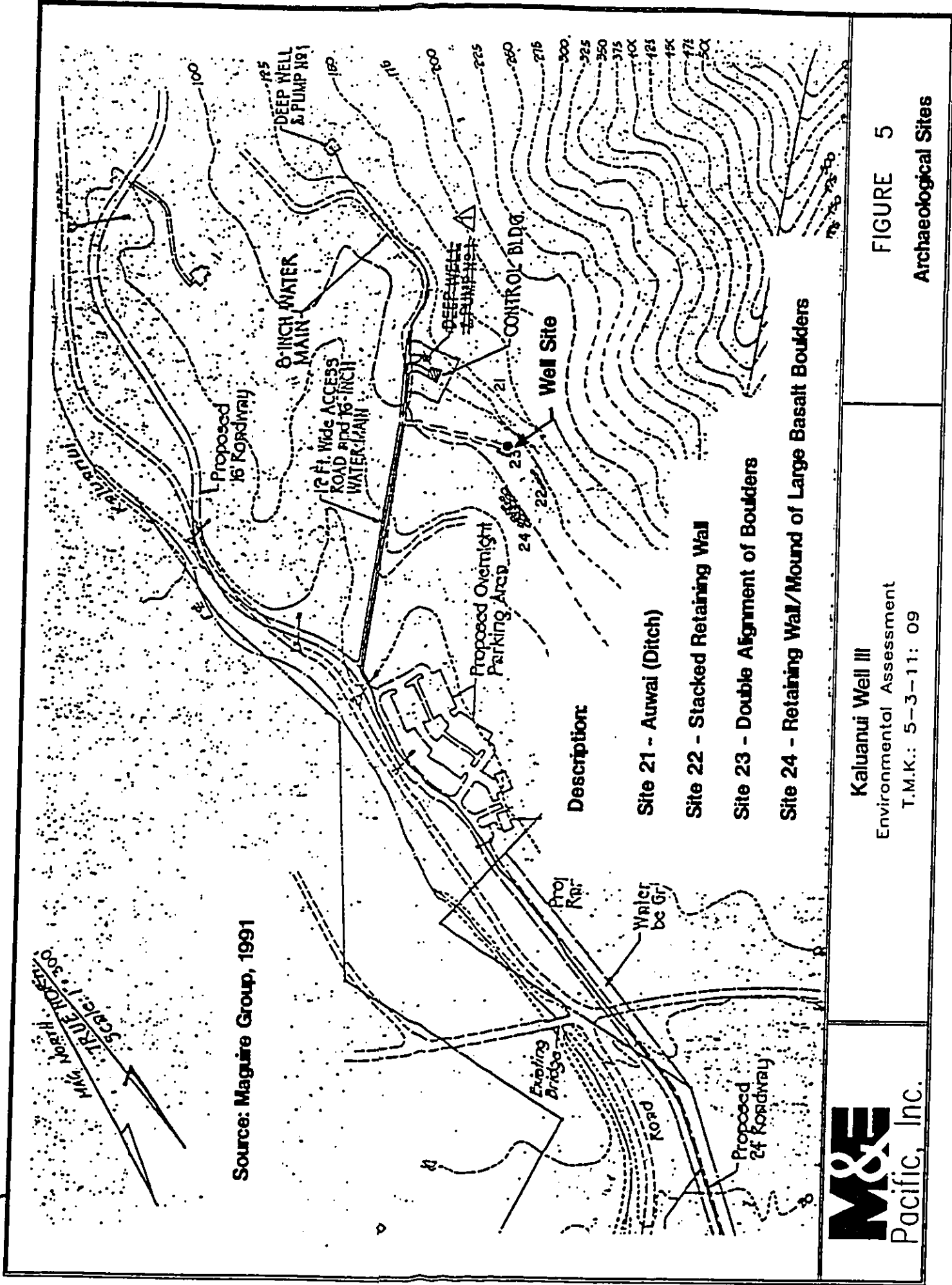


FIGURE 4A

NORTH SHORE



Source: Maguire Group, 1991

**Description:**

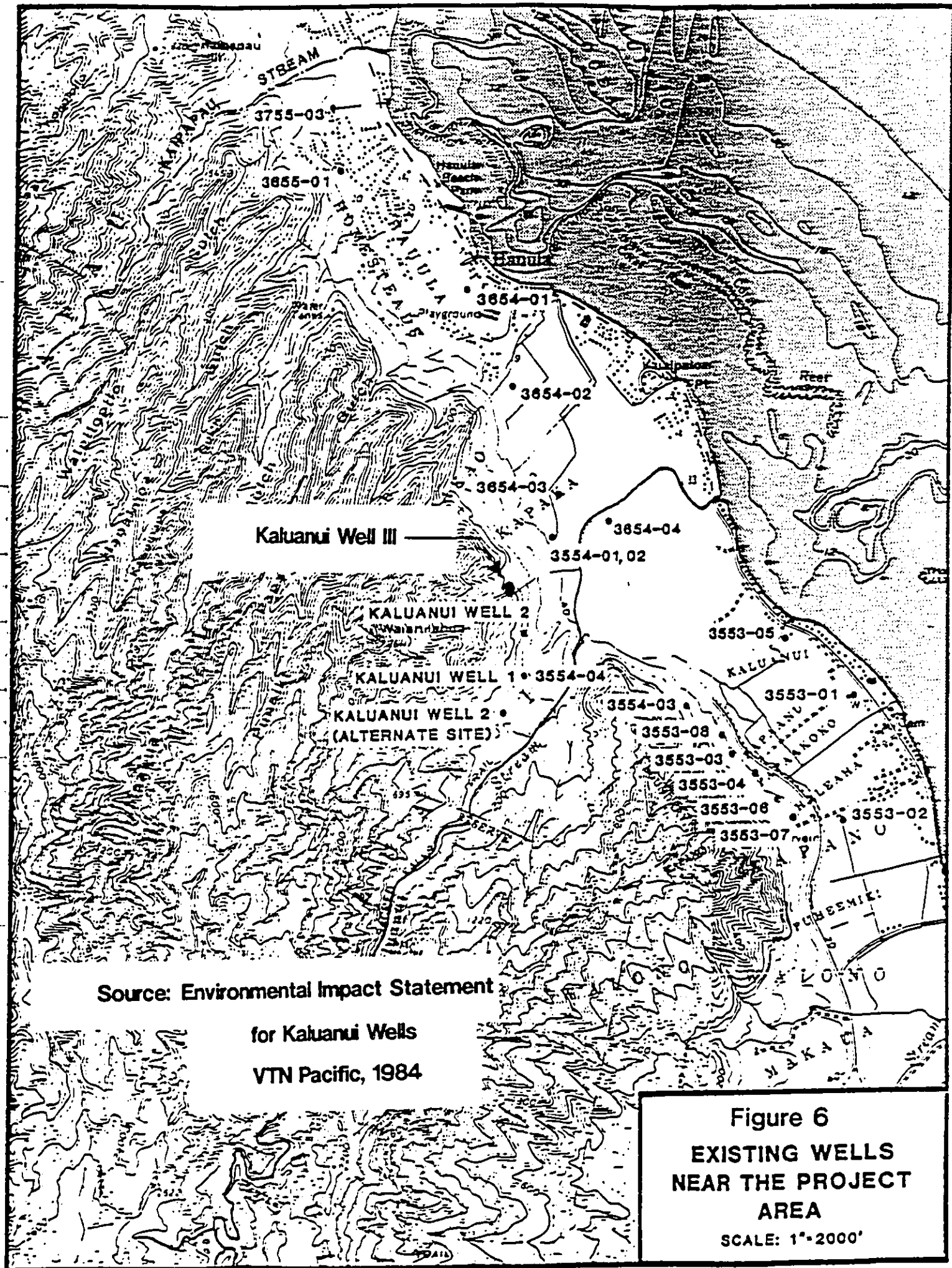
- Site 21 - Auwai (Ditch)
- Site 22 - Stacked Retaining Wall
- Site 23 - Double Alignment of Boulders
- Site 24 - Retaining Wall/Mound of Large Basalt Boulders



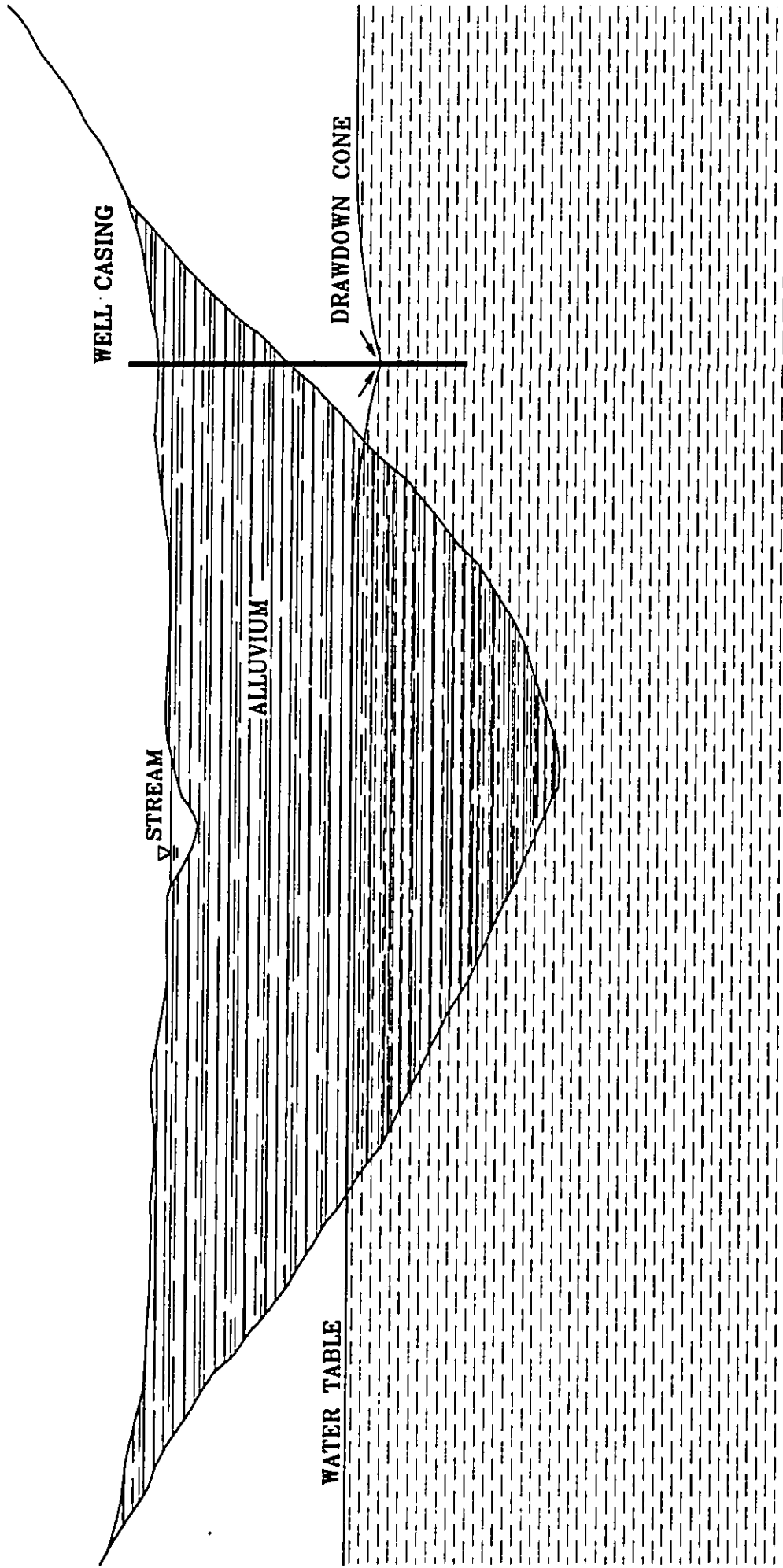
Kaluanui Well III  
 Environmental Assessment  
 T.M.K.: 5-3-11: 09

FIGURE 5  
 Archaeological Sites





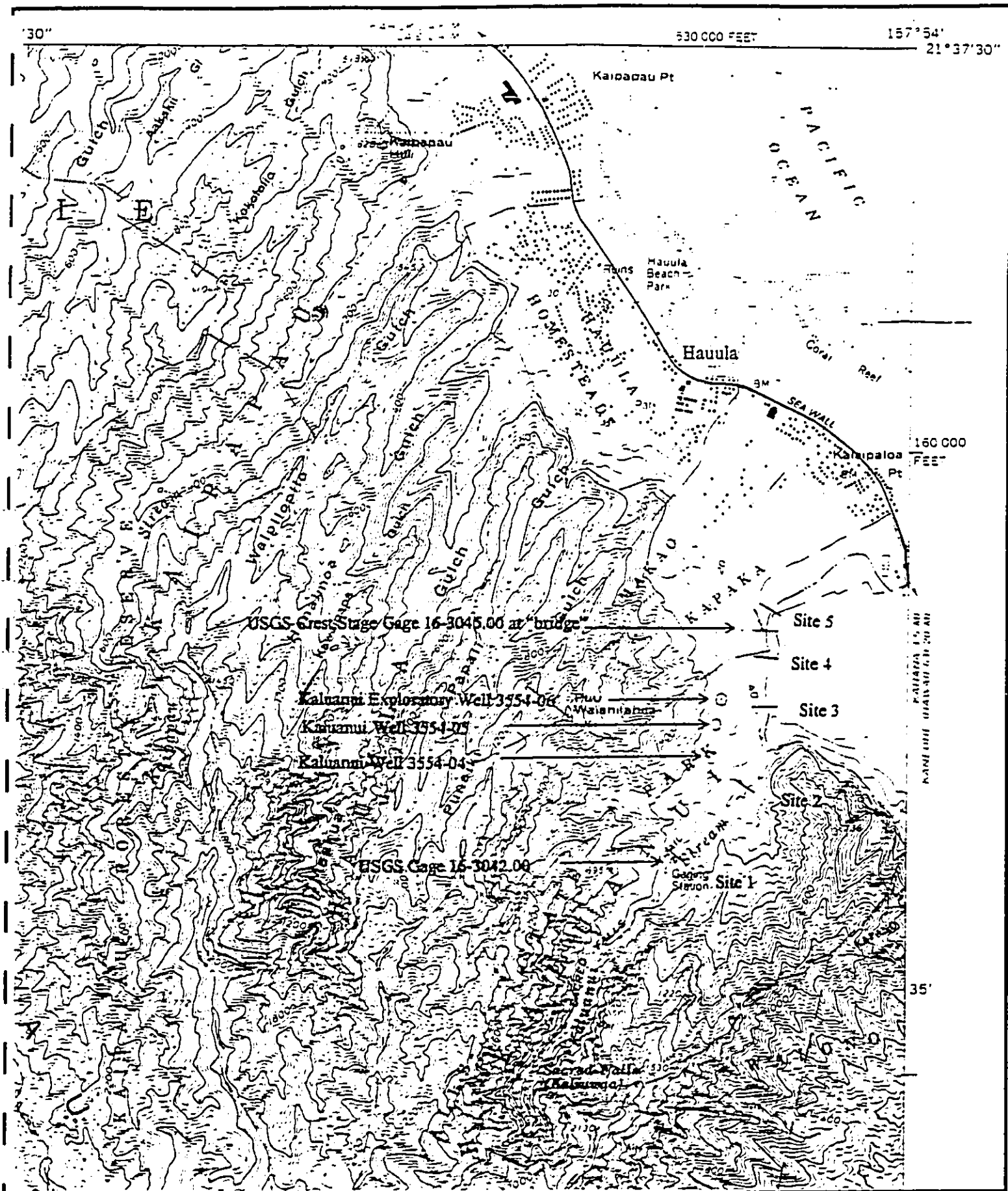
STREAM FLOW UNAFFECTED BY PUMPING WELL



KALUANUI WELL III  
ENVIRONMENTAL ASSESSMENT  
T.M.K.: 5-3-11:09

PUMPING WELL  
ILLUSTRATION

FIGURE  
7



KALUANUI WELL III  
ENVIRONMENTAL ASSESSMENT  
T.M.K.: 5-3-11:09

GAUGE  
LOCATION MAP

FIGURE  
8

## **Appendices**

Appendix A:.....	Water Quality and Chemical Data
Appendix B:.....	Archaeological Investigation
Appendix C:.....	Botanical Investigation
Appendix D:.....	Yield-Drawdown Test Data
Appendix E:.....	Water Source Inventory
Appendix F:.....	Draft EA Distribution List
Appendix G:.....	Draft EA Comment and Responses

Appendix A: Water Quality and Chemical Data

MINERAL ANALYSES

AREA

Kaluanui Well III  
(3554-06)

LOCATION

Year.....	1996
Date collected.....	May 28
Time collected.....	0930
Laboratory number.....	204,915

Regional head, feet .....	17.23
Specific conductance, micromhos @ 25°C .....	267
pH value .....	8.05
Turbidity .....	0.03
Color .....	0

IN PARTS PER MILLION

Silica .....	30
Calcium .....	12
Magnesium .....	8.6
Sodium .....	28
Potassium .....	1.4
Bicarbonate .....	95
Sulfate .....	4.9
Chloride .....	32
Fluoride .....	<0.05
Nitrate .....	0.68
Phosphate .....	0.12
Iron )	0.01
Manganese )	0.01
Copper )	0.01
Lead )	0.01
Arsenic ).....Less than.....	0.01
Selenium )	0.01
Chromium <sup>a</sup> )	0.01
Silver )	0.01
Barium )	0.01
Cadmium )	0.01
Total dissolved solids .....	213
Alkalinity .....	78
Total hardness .....	65

IN EQUIVALENTS PER MILLION

Calcium (Ca) .....	0.599
Magnesium (Mg) .....	0.707
Sodium (Na) .....	1.237
Potassium (K) .....	0.036
Bicarbonate (HCO <sub>3</sub> ) .....	1.557
Sulfate (SO <sub>4</sub> ) .....	0.102
Chloride (Cl) <sup>b</sup> .....	0.909
Nitrate (NO <sub>3</sub> ) .....	0.011

TOTALS ..... 5.158

a/ Hexavalent only

b/ Includes fluoride and phosphate as PO<sub>4</sub>



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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  
Fax: 808 527-6195

*Kalani Well III*

MONTGOMERY WATSON LABS. SUBMITTED ON  JUN 25 1996 HDS Hillary Strayer <i>Hillary Strayer</i>
---

Report#: 27265



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Report  
Comments  
#27265

**Group Comments**

(ML525) low spike recoveries for hexachlorocyclopentadiene, acenaphthylene, and aldrin in the LCS. QIR-MS-96-525-9. Result for TCDD analysis submitted by Quanterra Environmental Services.

(508) Surrogate recoveries fail high for dibutyl chlorendate surrogate; TCMX recoveries acceptable. Reference QIR-GC-96-091.



Report Summary of positive results, PR27265

		Result	MDL	UNITS
Analyzed	960530023	KALUANUI WELL III (3554-06)		
06/06/96	Data Entry	06/10/96		--
06/03/96	Chromium, Total, ICAP/MS	6.6	2.000	UGL
06/04/96	Data Entry	06/08/96		--
05/03/96	Di-n-Butylphthalate	0.5	.500	UGL
05/30/96	Nitrate	0.9	.440	MGL
05/30/96	Nitrate-N by IC	0.2	.100	MGL
06/11/96	Data Entry	06/12/96		--
05/07/96	Data Entry	06/24/96		--
06/03/96	Calcium, Flame AA	13	1.000	MGL



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**Laboratory  
Report  
#27265**

Honolulu, City of  
Ron Fenstemacher  
Board of Water Supply Lab  
630 S Beretania St  
Honolulu, HI 96843

Samples Received  
30-may-1996 10:47:56

Prepared	Analyzed	GC Batch#	Method	Analyte	Result	Units	MDL	Dilution
<b>KALUANUI WELL III (3554-06) (960530023)</b>				<b>Sampled on 05/28/96</b>				
	06/03/96	50281	( ML/EPA 215.1 )	Calcium, Flame AA	13	mg/l	1.0	1
	06/11/96	50530	( ML/SM4500-CN F)	Cyanide	ND	mg/l	0.025	1
06/04/96	06/05/96	50364	( ML/EPA 548.1 )	Endothall	ND	ug/l	5.0	1
	05/31/96	50187	( EPA/ML 340.2 )	Fluoride	ND	mg/l	0.10	1
	06/06/96	50461	( ML/EPA 547 )	Glyphosate	ND	ug/l	6.0	1
16/04/96	06/05/96	50431	( EPA/ML 245.1 )	Mercury	ND	ug/l	0.50	1
	05/30/96	50203	( ML/EPA 300.0 )	Nitrite, Nitrogen by IC	ND	mg/l	0.10	1
06/07/96	06/08/96		( EPA 1613 )	2,3,7,8 - TCDD	ND	PGL	0.54	1
				<b>525 Semivolatiles by GC/MS</b>				
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	2,4-Dinitrotoluene	ND	ug/l	0.10	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	alpha-Chlordane	ND	ug/l	0.050	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Diazinon	NA	ug/l	0.10	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Acenaphthylene	ND	ug/l	0.10	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Alachlor	ND	ug/l	0.050	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Aldrin	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Anthracene	ND	ug/l	0.020	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Atrazine	ND	ug/l	0.050	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Benzo(a)Anthracene	ND	ug/l	0.050	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Benzo(a)pyrene	ND	ug/l	0.020	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Benzo(b)Fluoranthene	ND	ug/l	0.020	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Benzo(g,i,i)Perylene	ND	ug/l	0.050	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Benzo(k)Fluoranthene	ND	ug/l	0.020	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Di(2-Ethylhexyl)phthalate	ND	ug/l	0.60	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Butylbenzylphthalate	ND	ug/l	0.50	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Bromacil	ND	ug/l	2.0	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Butachlor	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Caffeine	ND	ug/l	0.020	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Chrysene	ND	ug/l	0.020	1
15/31/96	06/03/96	50574	( ML/EPA 525.2 )	Dibenz(a,h)Anthracene	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Di-(2-Ethylhexyl)adipate	ND	ug/l	0.60	1

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 #27265

Honolulu, City of  
 (continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Diethylphthalate	ND	ug/l	0.50	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Dieldrin	ND	ug/l	0.20	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Dimethylphthalate	ND	ug/l	0.50	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Dimethoate	ND	ug/l	10	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Di-n-Butylphthalate	0.5	ug/l	0.50	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Endrin	ND	ug/l	0.10	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Fluorene	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	gamma-Chlordane	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Hexachlorobenzene	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Hexachlorocyclopentadiene	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Heptachlor	ND	ug/l	0.040	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Heptachlor Epoxide	ND	ug/l	0.020	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Indeno(1,2,3,c,d)Pyrene	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Isophorone	ND	ug/l	0.50	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Lindane	ND	ug/l	0.020	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Methoxychlor	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Metribuzin	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Molinate	ND	ug/l	0.20	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Metolachlor	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	trans-Nonachlor	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Pentachlorophenol	ND	ug/l	1.0	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Phenanthrene	ND	ug/l	0.020	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Prometryn	ND	ug/l	0.50	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Propachlor	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Pyrene	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Simazine	ND	ug/l	0.050	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Thiobencarb	ND	ug/l	0.20	1
05/31/96	06/03/96	50574	( ML/EPA 525.2 )	Trifluralin	ND	ug/l	0.10	1
			( Surrogate )	Perylene-d12	87	% Rec		
<b>AB1803 - EDB and DBCP</b>								
06/05/96	06/06/96	50365	( ML/EPA 504 )	Dibromochloropropane (DBCP)	ND	ug/l	0.010	1
06/05/96	06/06/96	50365	( ML/EPA 504 )	Ethylene Dibromide (EDB)	ND	ug/l	0.010	1
			( Surrogate )	1,2-dibromopropane	104	% Rec		



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**Laboratory  
Report  
#27265**

Honolulu, City of  
(continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
<b>Aldicarb</b>								
	06/04/96	50304	( ML/EPA 531.1 )	3-Hydroxycarbofuran	ND	ug/l	2.0	1
	06/04/96	50304	( ML/EPA 531.1 )	Aldicarb (Temik)	ND	ug/l	0.50	1
	06/04/96	50304	( ML/EPA 531.1 )	Aldicarb sulfone	ND	ug/l	0.80	1
	06/04/96	50304	( ML/EPA 531.1 )	Aldicarb sulfoxide	ND	ug/l	0.50	1
	06/04/96	50304	( ML/EPA 531.1 )	Baygon	ND	ug/l	2.0	1
	06/04/96	50304	( ML/EPA 531.1 )	Carbofuran (Furadan)	ND	ug/l	0.90	1
	06/04/96	50304	( ML/EPA 531.1 )	Carbaryl	ND	ug/l	2.0	1
	06/04/96	50304	( ML/EPA 531.1 )	Methiocarb	ND	ug/l	2.0	1
	06/04/96	50304	( ML/EPA 531.1 )	Methomyl	ND	ug/l	1.0	1
	06/04/96	50304	( ML/EPA 531.1 )	Oxamyl (Vydate)	ND	ug/l	2.0	1
			( Surrogate )	BDMC	117	% Rec		
<b>Diquat and Paraquat</b>								
	06/04/96	06/11/96	50534	( ML/EPA 549 )	ND	ug/l	0.40	1
	06/04/96	06/11/96	50534	( EPA 549 )	ND	ug/l	2.0	1
<b>Herbicides by 515.1</b>								
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.20	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.20	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.10	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	2.0	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.50	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.20	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.50	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	1.0	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.60	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.20	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.080	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.20	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.040	1
	06/06/96	06/11/96	50536	( ML/EPA 515.1 )	ND	ug/l	0.10	1
				( Surrogate )	97	% Rec		

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Report  
#27265**Honolulu, City of  
(continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
				<b>Nitrate by IC as NO3 &amp; N</b>				
	05/30/96	50205	( EPA/ML 300.0	) Nitrate-N by IC	0.2	mg/l	0.10	1
	05/30/96	50205	( ML/EPA 300	) Nitrate	0.9	mg/l	0.44	1
				<b>SDWA Pesticides</b>				
06/05/96	06/07/96	50983	( ML/EPA 508	) PCB 1016 Aroclor	ND	ug/l	0.10	1
06/05/96	06/07/96	50983	( ML/EPA 508	) PCB 1221 Aroclor	ND	ug/l	0.10	1
06/05/96	06/07/96	50983	( ML/EPA 508	) PCB 1232 Aroclor	ND	ug/l	0.10	1
06/05/96	06/07/96	50983	( ML/EPA 508	) PCB 1242 Aroclor	ND	ug/l	0.10	1
06/05/96	06/07/96	50983	( ML/EPA 508	) PCB 1248 Aroclor	ND	ug/l	0.10	1
06/05/96	06/07/96	50983	( ML/EPA 508	) PCB 1254 Aroclor	ND	ug/l	0.10	1
06/05/96	06/07/96	50983	( ML/EPA 508	) PCB 1260 Aroclor	ND	ug/l	0.10	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Alpha-BHC	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Alachlor (Alanex)	ND	ug/l	0.050	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Aldrin	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Beta-BHC	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Chlordane	ND	ug/l	0.10	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Chlorthalonil (Drconil, Bravo)	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Delta-BHC	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) p,p' DDD	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) p,p' DDE	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) p,p' DDT	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Dieldrin	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Endrin Aldehyde	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Endrin	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Endosulfan I (alpha)	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Endosulfan II (beta)	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Endosulfan sulfate	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Heptachlor	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Heptachlor Epoxide	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Lindane (gamma-BHC)	ND	ug/l	0.010	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Methoxychlor	ND	ug/l	0.050	1
06/05/96	06/07/96	50983	( ML/EPA 508	) Toxaphene	ND	ug/l	0.50	1
06/05/96	06/07/96	50983	( Surrogate	) Dibutyl Chloroendate	132	% Rec		



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**Laboratory  
Report  
#27265**

Honolulu, City of  
(continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
			( Surrogate	) Tetrachlorometaxylene	124	% Rec		
<b>T-22 Inorg+Gen Min ICPMS Mets</b>								
	06/03/96	50818	( EPA/ML 200.8	) Silver, Total, ICAP/MS	ND	ug/l	0.50	1
	06/03/96	50818	( EPA/ML 200.8	) Aluminum, Total, ICAP/MS	ND	ug/l	25	1
	06/03/96	50818	( EPA/ML 200.8	) Arsenic, Total, ICAP/MS	ND	ug/l	1.0	1
	06/03/96	50818	( EPA/ML 200.8	) Barium, Total, ICAP/MS	ND	ug/l	2.0	1
	06/03/96	50818	( EPA/ML 200.8	) Beryllium, Total, ICAP/MS	ND	ug/l	1.0	1
	06/03/96	50818	( EPA/ML 200.8	) Cadmium, Total, ICAP/MS	ND	ug/l	0.50	1
	06/03/96	50818	( EPA/MS 200.8	) Chromium, Total, ICAP/MS	6.6	ug/l	2.0	1
	06/03/96	50818	( EPA/ML 200.8	) Copper, Total, ICAP/MS	ND	ug/l	2.0	1
	06/03/96	50818	( EPA/ML 200.8	) Iron, Total, ICAP/MS	ND	ug/l	50	1
	06/03/96	50818	( EPA/ML 200.8	) Manganese, Total, ICAP/MS	ND	ug/l	2.0	1
	06/03/96	50818	( EPA/ML 200.8	) Nickel, Total, ICAP/MS	ND	ug/l	5.0	1
	06/03/96	50818	( EPA/ML 200.8	) Lead, Total, ICAP/MS	ND	ug/l	0.50	1
	06/03/96	50818	( EPA/ML 200.8	) Antimony, Total, ICAP/MS	ND	ug/l	1.0	1
	06/03/96	50818	( EPA/ML 200.8	) Selenium, Total, ICAP/MS	ND	ug/l	5.0	1
	06/03/96	50818	( EPA/ML 200.8	) Thallium, Total, ICAP/MS	ND	ug/l	1.0	1
	06/03/96	50818	( EPA/ML 200.8	) Zinc, Total, ICAP/MS	ND	ug/l	5.0	1
<b>Volatile Organic Compounds</b>								
	06/04/96	50358	( ML/EPA 502.2	) 1,1,1,2-Tetrachloroethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,1,1-Trichloroethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,1,2,2-Tetrachloroethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,1,2-Trichloroethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,1-Dichloroethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,1-Dichloroethene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,1-Dichloropropene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,2,3-Trichloropropane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,2,3-Trichlorobenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,2,4-Trichlorobenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,2,4-Trimethylbenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,2-Dichloroethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,2-Dichlorobenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,2-Dichloropropane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2	) 1,3,5-Trimethylbenzene	ND	ug/l	0.50	1

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Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
	06/04/96	50358	( ML/EPA 502.2 )	1,3-Dichlorobenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	1,3-Dichloropropane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	1,4-Dichlorobenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	2,2-Dichloropropane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	2-Chlorotoluene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	4-Chlorotoluene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Bromodichloromethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Benzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Bromobenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Bromochloromethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Bromomethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	cis-1,2-Dichloroethene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Chlorobenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Carbon tetrachloride	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	cis-1,3-Dichloropropene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Bromoform	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Chloroform	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Chloroethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Chloromethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Dibromochloromethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	1,2-Dibromo-3-chloropropane	ND	ug/l	1.0	1
	06/04/96	50358	( ML/EPA 502.2 )	Dibromomethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Dichlorodifluoromethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	1,2-Dibromoethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Ethylbenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Hexachlorobutadiene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Isopropylbenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Methylene chloride	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	m-p-Xylenes	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Methyl tert-butyl ether	ND	ug/l	5.0	1
	06/04/96	50358	( ML/EPA 502.2 )	Naphthalene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	n-Butylbenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	n-Propylbenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	o-Xylene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Tetrachloroethene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	p-Isopropyltoluene	ND	ug/l	0.50	1



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Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
	06/04/96	50358	( ML/EPA 502.2 )	sec-Butylbenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Styrene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	trans-1,2-Dichloroethene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	tert-Butylbenzene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Trichloroethene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 524.2 )	Trichlorotrifluoroethane(Freon	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	trans-1,3-Dichloropropene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Toluene	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Trichlorofluoromethane	ND	ug/l	0.50	1
	06/04/96	50358	( ML/EPA 502.2 )	Vinyl chloride	ND	ug/l	0.30	1
			( Surrogate )	Bromofluorobenzene-ELCD	84	% Rec		
			( Surrogate )	Bromofluorobenzene-PID	87	% Rec		
			( Surrogate )	Chlorofluorobenzene-ELCD	93	% Rec		
			( Surrogate )	Chlorofluorobenzene-PID	99	% Rec		





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**QC Batch #50187**

**Fluoride**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Fluoride	0.87	0.862	99.1	( 90.00 - 110.00 )	
LCS2	Fluoride	0.87	0.849	97.6	( 90.00 - 110.00 )	1.5
MBLK	Fluoride	ND				
MS	Fluoride	0.909	0.920	101.2	( 80.00 - 120.00 )	
MSD	Fluoride	0.909	0.953	104.8	( 80.00 - 120.00 )	3.5

**QC Batch #50203**

**Nitrite, Nitrogen by IC**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Nitrite, Nitrogen by IC	1.0	1.01	101.0	( 90.00 - 110.00 )	
LCS2	Nitrite, Nitrogen by IC	1.0	0.99	99.0	( 90.00 - 110.00 )	2.0
MBLK	Nitrite, Nitrogen by IC	ND				
MS	Nitrite, Nitrogen by IC	1.0	0.99	99.0	( 80.00 - 120.00 )	
MSD	Nitrite, Nitrogen by IC	1.0	0.98	98.0	( 80.00 - 120.00 )	1.0

**QC Batch #50205**

**Nitrate by IC as NO3 & N**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	Nitrate	ND				
LCS1	Nitrate-N	2.5	2.61	104.4	( 90.00 - 110.00 )	
LCS2	Nitrate-N	2.5	2.58	103.2	( 90.00 - 110.00 )	1.2
MS	Nitrate-N	2.5	2.56	102.4	( 75.00 - 125.00 )	
MSD	Nitrate-N	2.5	2.59	103.6	( 75.00 - 125.00 )	1.2

**QC Batch #50281**

**Calcium, Flame AA**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Calcium, Flame AA	50	52.7	105.4	( 90.00 - 110.00 )	
LCS2	Calcium, Flame AA	50	53.2	106.4	( 90.00 - 110.00 )	0.94
MBLK	Calcium, Flame AA	ND				
MS	Calcium, Flame AA	50	55.7	111.4	( 80.00 - 120.00 )	
MSD	Calcium, Flame AA	50	56.4	112.8	( 80.00 - 120.00 )	1.2

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QC Batch #50304		Aldicarb				
QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	3-Hydroxycarbofuran	20.0	17.5	87.5	( 85.00 - 120.00 )	
MBLK	3-Hydroxycarbofuran	ND				
MS	3-Hydroxycarbofuran	20.0	21.3	106.5	( 70.00 - 130.00 )	
LCS1	Aldicarb (Temik)	20.0	21.9	109.5	( 83.00 - 115.00 )	
MBLK	Aldicarb (Temik)	ND				
MS	Aldicarb (Temik)	20.0	21.2	106.0	( 70.00 - 130.00 )	
LCS1	Aldicarb sulfone	20.0	18.4	92.0	( 84.00 - 128.00 )	
MBLK	Aldicarb sulfone	ND				
MS	Aldicarb sulfone	20.0	21.4	107.0	( 60.00 - 130.00 )	
LCS1	Aldicarb sulfoxide	20.0	18.0	90.0	( 85.00 - 138.00 )	
MBLK	Aldicarb sulfoxide	ND				
MS	Aldicarb sulfoxide	20.0	21.6	108.0	( 70.00 - 130.00 )	
LCS1	Baygon	20.0	19.6	98.0	( 85.00 - 115.00 )	
MBLK	Baygon	ND				
MS	Baygon	20.0	21.4	107.0	( 70.00 - 130.00 )	
LCS1	Carbaryl	20.0	16.6	<u>83.0</u>	( 85.00 - 119.00 )	
MBLK	Carbaryl	ND				
MS	Carbaryl	20.0	21.5	107.5	( 70.00 - 130.00 )	
LCS1	Carbofuran (Furadan)	20.0	19.4	97.0	( 85.00 - 115.00 )	
MBLK	Carbofuran (Furadan)	ND				
MS	Carbofuran (Furadan)	20.0	21.4	107.0	( 70.00 - 130.00 )	
LCS1	Methiocarb	20.0	17.6	88.0	( 70.00 - 136.00 )	
MBLK	Methiocarb	ND				
MS	Methiocarb	20.0	22.0	110.0	( 70.00 - 130.00 )	
LCS1	Methomyl	20.0	19.2	96.0	( 85.00 - 115.00 )	
MBLK	Methomyl	ND				
MS	Methomyl	20.0	20.8	104.0	( 70.00 - 130.00 )	
LCS1	Oxamyl (Vydate)	20.0	17.5	87.5	( 85.00 - 115.00 )	
MBLK	Oxamyl (Vydate)	ND				
MS	Oxamyl (Vydate)	20.0	21.5	107.5	( 70.00 - 130.00 )	

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## QC Batch #50358

## Volatile Organic Compounds

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	1,1,1,2-Tetrachloroethane	ND				
LCS1	1,1,1-Trichloroethane	4.00	3.96	99.0	( 80.00 - 120.00 )	
LCS2	1,1,1-Trichloroethane	4.00	4.25	106.2	( 80.00 - 120.00 )	7.1
MBLK	1,1,1-Trichloroethane	ND				
MBLK	1,1,2,2-Tetrachloroethane	ND				
MBLK	1,1,2-Trichloroethane	ND				
MBLK	1,1-Dichloroethane	ND				
MBLK	1,1-Dichloroethene	ND				
MBLK	1,1-Dichloropropene	ND				
LCS1	1,2,3-Trichlorobenzene	4.00	3.32	83.0	( 80.00 - 120.00 )	
LCS2	1,2,3-Trichlorobenzene	4.00	3.51	87.8	( 80.00 - 120.00 )	5.6
MBLK	1,2,3-Trichlorobenzene	ND				
MBLK	1,2,3-Trichloropropane	ND				
MBLK	1,2,4-Trichlorobenzene	ND				
MBLK	1,2,4-Trimethylbenzene	ND				
MBLK	1,2-Dichlorobenzene	ND				
MBLK	1,2-Dichloroethane	ND				
MBLK	1,2-Dichloropropane	ND				
MBLK	1,3,5-Trimethylbenzene	ND				
MBLK	1,3-Dichlorobenzene	ND				
MBLK	1,3-Dichloropropane	ND				
MBLK	1,4-Dichlorobenzene	ND				
MBLK	2,2-Dichloropropane	ND				
MBLK	2-Chlorotoluene	ND				
MBLK	4-Chlorotoluene	ND				
LCS1	Benzene	4.00	3.63	90.8	( 80.00 - 120.00 )	
LCS2	Benzene	4.00	3.88	97.0	( 80.00 - 120.00 )	6.7
MBLK	Benzene	ND				
MBLK	Bromobenzene	ND				
MBLK	Bromochloromethane	ND				
LCS1	Bromodichloromethane	4.00	3.88	97.0	( 80.00 - 120.00 )	
LCS2	Bromodichloromethane	4.00	3.94	98.5	( 80.00 - 120.00 )	1.5
MBLK	Bromodichloromethane	ND				

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LCS1	Bromoform	4.00	3.70	92.5	( 80.00 - 120.00 )	
LCS2	Bromoform	4.00	4.03	100.8	( 80.00 - 120.00 )	8.5
MBLK	Bromoform	ND				
MBLK	Bromomethane	ND				
LCS1	Carbon tetrachloride	4.00	4.06	101.5	( 80.00 - 120.00 )	
LCS2	Carbon tetrachloride	4.00	4.31	107.7	( 80.00 - 120.00 )	6.0
MBLK	Carbon tetrachloride	ND				
MBLK	Chlorobenzene	ND				
MBLK	Chloroethane	ND				
LCS1	Chloroform	4.00	3.74	93.5	( 80.00 - 120.00 )	
LCS2	Chloroform	4.00	4.13	103.2	( 80.00 - 120.00 )	9.9
MBLK	Chloroform	ND				
MBLK	Chloromethane	ND				
LCS1	Dibromochloromethane	4.00	3.75	93.8	( 80.00 - 120.00 )	
LCS2	Dibromochloromethane	4.00	3.97	99.2	( 80.00 - 120.00 )	5.7
MBLK	Dibromochloromethane	ND				
MBLK	Dibromomethane	ND				
MBLK	Dichlorodifluoromethane	ND				
MBLK	Ethylbenzene	ND				
MBLK	Hexachlorobutadiene	ND				
LCS1	Isopropylbenzene	4.00	3.56	89.0	( 80.00 - 120.00 )	
LCS2	Isopropylbenzene	4.00	3.80	95.0	( 80.00 - 120.00 )	6.5
MBLK	Isopropylbenzene	ND				
MBLK	Methylene chloride	ND				
MBLK	Naphthalene	ND				
MBLK	Styrene	ND				
LCS1	Tetrachloroethene	4.00	3.66	91.5	( 80.00 - 120.00 )	
LCS2	Tetrachloroethene	4.00	3.87	96.8	( 80.00 - 120.00 )	5.6
MBLK	Tetrachloroethene	ND				
MBLK	Toluene	ND				
LCS1	Trichloroethene	4.00	3.58	89.5	( 80.00 - 120.00 )	
LCS2	Trichloroethene	4.00	3.86	96.5	( 80.00 - 120.00 )	7.5
MBLK	Trichloroethene	ND				
MBLK	Trichlorofluoromethane	ND				
MBLK	Trichlorotrifluoroethane(Freon	ND				
MBLK	Vinyl chloride	ND				
MBLK	cis-1,2-Dichloroethene	ND				
MBLK	cis-1,3-Dichloropropene	ND				

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MBLK	m-p-Xylenes	ND				
MBLK	n-Butylbenzene	ND				
MBLK	n-Propylbenzene	ND				
MBLK	o-Xylene	ND				
MBLK	p-Isopropyltoluene	ND				
LCS1	sec-Butylbenzene	4.00	3.56	89.0	( 80.00 - 120.00 )	
LCS2	sec-Butylbenzene	4.00	3.76	94.0	( 80.00 - 120.00 )	5.5
MBLK	sec-Butylbenzene	ND				
MBLK	tert-Butylbenzene	ND				
LCS1	trans-1,2-Dichloroethene	4.00	3.80	95.0	( 80.00 - 120.00 )	
LCS2	trans-1,2-Dichloroethene	4.00	4.06	101.5	( 80.00 - 120.00 )	6.6
MBLK	trans-1,2-Dichloroethene	ND				
MBLK	trans-1,3-Dichloropropene	ND				

**QC Batch #50364**

**Endothall**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Endothall	25	23.7	94.8	( 58.00 - 137.00 )	
MBLK	Endothall	ND				
MS	Endothall	25	23.5	94.0	( 63.00 - 126.00 )	

**QC Batch #50365**

**AB1803 - EDB and DBCP**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
DUP	Dibromochloropropane (DBCP)	ND	ND		( 0.00 - 20.00 )	
LCS1	Dibromochloropropane (DBCP)	0.10	0.09	90.0	( 60.00 - 140.00 )	
LCS2	Dibromochloropropane (DBCP)	0.10	0.10	100.0	( 60.00 - 140.00 )	11
MBLK	Dibromochloropropane (DBCP)	ND				
MS	Dibromochloropropane (DBCP)	0.20	0.20	100.0	( 60.00 - 140.00 )	
DUP	Ethylene Dibromide (EDB)	ND	ND		( 0.00 - 20.00 )	
LCS1	Ethylene Dibromide (EDB)	0.10	0.09	90.0	( 60.00 - 140.00 )	
LCS2	Ethylene Dibromide (EDB)	0.10	0.10	100.0	( 60.00 - 140.00 )	11
MBLK	Ethylene Dibromide (EDB)	ND				
MS	Ethylene Dibromide (EDB)	0.20	0.21	105.0	( 60.00 - 140.00 )	

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QC Batch #50431		Mercury				
QC	Analyte	Spiked	Recovered	yield (%)	Limits (%)	RPD (%)
LCS1	Mercury	1.50	1.39	<u>92.7</u>	( 85.00 - 115.00 )	
LCS2	Mercury	1.50	1.39	<u>92.7</u>	( 85.00 - 115.00 )	0.00
MBLK	Mercury	ND				
MS	Mercury	1.50	1.42	<u>94.7</u>	( 80.00 - 120.00 )	
MSD	Mercury	1.50	1.44	<u>96.0</u>	( 80.00 - 120.00 )	1.4

QC Batch #50461		Glyphosate				
QC	Analyte	Spiked	Recovered	yield (%)	Limits (%)	RPD (%)
LCS1	Glyphosate	50	59.4	<u>118.8</u>	( 70.00 - 130.00 )	
MBLK	Glyphosate	ND				
MS	Glyphosate	50	58.8	<u>117.6</u>	( 70.00 - 130.00 )	

QC Batch #50530		Cyanide				
QC	Analyte	Spiked	Recovered	yield (%)	Limits (%)	RPD (%)
LCS1	Cyanide	0.10	0.103	<u>103.0</u>	( 90.00 - 110.00 )	
MBLK	Cyanide	ND				
MS	Cyanide	0.10	0.098	<u>98.0</u>	( 80.00 - 120.00 )	
MSD	Cyanide	0.10	0.104	<u>104.0</u>	( 80.00 - 120.00 )	5.9

QC Batch #50534		Diquat and Paraquat				
QC	Analyte	Spiked	Recovered	yield (%)	Limits (%)	RPD (%)
LCS1	Diquat	10.0	10.1	<u>101.0</u>	( 70.00 - 130.00 )	
MBLK	Diquat	ND				
MS	Diquat	10.0	10.7	<u>107.0</u>	( 70.00 - 130.00 )	
LCS1	Paraquat	10.0	10.2	<u>102.0</u>	( 70.00 - 130.00 )	
MBLK	Paraquat	ND				
MS	Paraquat	10.0	10.7	<u>107.0</u>	( 70.00 - 130.00 )	

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## QC Batch #50536

## Herbicides by 515.1

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	2,4,5-T	ND				
LCS1	2,4,5-TP (Silvex)	0.50	0.52	104.0	( 67.00 - 120.00 )	
LCS2	2,4,5-TP (Silvex)	0.50	NA		( 67.00 - 120.00 )	0.00
MBLK	2,4,5-TP (Silvex)	ND				
MS	2,4,5-TP (Silvex)	0.50	0.48	96.0	( 42.00 - 226.00 )	
LCS1	2,4-D	1.00	0.96	96.0	( 72.00 - 127.00 )	
LCS2	2,4-D	1.00	NA		( 72.00 - 127.00 )	0.00
MBLK	2,4-D	ND				
MS	2,4-D	1.00	0.86	86.0	( 49.00 - 214.00 )	
MBLK	2,4-DB	ND				
MBLK	3,5-Dichlorobenzoic acid	ND				
MBLK	4-Nitrophenol (qualitative)	ND				
MBLK	Acifluorfen (qualitative)	ND				
LCS1	Bentazon	1.00	1.1	110.0	( 75.00 - 134.00 )	
LCS2	Bentazon	1.00	NA		( 75.00 - 134.00 )	0.00
MBLK	Bentazon	ND				
MS	Bentazon	1.00	1.0	100.0	( 70.00 - 170.00 )	
MBLK	DCPA	ND				
LCS1	Dalapon (qualitative)	6.50	7.4	113.8	( 40.00 - 160.00 )	
LCS2	Dalapon (qualitative)	6.50	NA		( 40.00 - 160.00 )	0.00
MBLK	Dalapon (qualitative)	ND				
MS	Dalapon (qualitative)	6.50	5.9	90.8	( 40.00 - 160.00 )	
LCS1	Dicamba	0.50	0.53	106.0	( 38.00 - 232.00 )	
LCS2	Dicamba	0.50	NA		( 38.00 - 232.00 )	0.00
MBLK	Dicamba	ND				
MS	Dicamba	0.50	0.50	100.0	( 38.00 - 232.00 )	
MBLK	Dichlorprop	ND				
LCS1	Dinoseb	1.00	0.50	50.0	( 0.00 - 85.00 )	
LCS2	Dinoseb	1.00	NA		( 0.00 - 85.00 )	0.00
MBLK	Dinoseb	ND				
MS	Dinoseb	1.00	0.39	39.0	( 0.00 - 85.00 )	
LCS1	Pentachlorophenol	0.50	0.51	102.0	( 36.00 - 224.00 )	
LCS2	Pentachlorophenol	0.50	NA		( 36.00 - 224.00 )	0.00

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MBLK	Pentachlorophenol	ND				
MS	Pentachlorophenol	0.50	0.32	64.0	( 36.00 - 224.00 )	
LCS1	Picloram	0.50	0.42	84.0	( 45.00 - 138.00 )	
LCS2	Picloram	0.50	NA		( 45.00 - 138.00 )	0.00
MBLK	Picloram	ND				
MS	Picloram	0.50	0.30	76.0	( 45.00 - 138.00 )	

**QC Batch #50574**

**525 Semivolatiles by GC/MS**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Acenaphthylene	2	1.28	<u>64.0</u>	( 70.00 - 130.00 )	
MBLK	Acenaphthylene	ND				
MS	Acenaphthylene	2	1.62	81.0	( 70.00 - 130.00 )	
LCS1	Alachlor	2	1.96	98.0	( 70.00 - 130.00 )	
MBLK	Alachlor	ND				
MS	Alachlor	2	1.88	94.0	( 70.00 - 130.00 )	
LCS1	Aldrin	2	1.09	<u>54.5</u>	( 70.00 - 130.00 )	
MBLK	Aldrin	ND				
MS	Aldrin	2	1.55	77.5	( 70.00 - 130.00 )	
LCS1	Anthracene	2	1.65	82.5	( 70.00 - 130.00 )	
MBLK	Anthracene	ND				
MS	Anthracene	2	1.59	79.5	( 70.00 - 130.00 )	
LCS1	Atrazine	2	2.04	102.0	( 70.00 - 130.00 )	
MBLK	Atrazine	ND				
MS	Atrazine	2	1.72	86.0	( 70.00 - 130.00 )	
LCS1	Benz(a)Anthracene	2	1.73	86.5	( 70.00 - 130.00 )	
MBLK	Benz(a)Anthracene	ND				
MS	Benz(a)Anthracene	2	1.91	95.5	( 70.00 - 130.00 )	
LCS1	Benzo(a)pyrene	2	1.57	78.5	( 70.00 - 130.00 )	
MBLK	Benzo(a)pyrene	ND				
MS	Benzo(a)pyrene	2	1.58	79.0	( 70.00 - 130.00 )	
LCS1	Benzo(b)Fluoranthene	2	1.98	99.0	( 70.00 - 130.00 )	
MBLK	Benzo(b)Fluoranthene	ND				
MS	Benzo(b)Fluoranthene	2	1.87	93.5	( 70.00 - 130.00 )	
LCS1	Benzo(g,h,i)Perylene	2	1.93	96.5	( 70.00 - 130.00 )	
MBLK	Benzo(g,h,i)Perylene	ND				
MS	Benzo(g,h,i)Perylene	2	1.78	89.0	( 70.00 - 130.00 )	

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LCS1	Benzo(k)Fluoranthene	2	1.78	89.0	( 70.00 - 130.00 )
MBLK	Benzo(k)Fluoranthene	ND			
MS	Benzo(k)Fluoranthene	2	1.80	90.0	( 70.00 - 130.00 )
MBLK	Bromacil	ND			
MBLK	Butachlor	ND			
LCS1	Butylbenzylphthalate	2	2.05	102.5	( 70.00 - 130.00 )
MBLK	Butylbenzylphthalate	ND			
MS	Butylbenzylphthalate	2	2.05	102.5	( 70.00 - 130.00 )
LCS1	Caffeine	2	1.83	91.5	( 70.00 - 130.00 )
MBLK	Caffeine	ND			
MS	Caffeine	2	1.77	88.5	( 70.00 - 130.00 )
LCS1	Chrysene	2	1.63	81.5	( 70.00 - 130.00 )
MBLK	Chrysene	ND			
MS	Chrysene	2	1.65	82.5	( 70.00 - 130.00 )
LCS1	Di(2-Ethylhexyl)phthalate	2	1.93	96.5	( 70.00 - 130.00 )
MBLK	Di(2-Ethylhexyl)phthalate	ND			
MS	Di(2-Ethylhexyl)phthalate	2	1.93	96.5	( 70.00 - 130.00 )
LCS1	Di-(2-Ethylhexyl)adipate	2	1.73	86.5	( 70.00 - 130.00 )
MBLK	Di-(2-Ethylhexyl)adipate	ND			
MS	Di-(2-Ethylhexyl)adipate	2	1.74	87.0	( 70.00 - 130.00 )
LCS1	Di-n-Butylphthalate	2	2.05	102.5	( 70.00 - 130.00 )
MBLK	Di-n-Butylphthalate	ND			
MS	Di-n-Butylphthalate	2	2.03	101.5	( 70.00 - 130.00 )
MBLK	Diazinon	ND			
LCS1	Dibenz(a,h)Anthracene	2	1.75	87.5	( 70.00 - 130.00 )
MBLK	Dibenz(a,h)Anthracene	ND			
MS	Dibenz(a,h)Anthracene	2	1.69	84.5	( 70.00 - 130.00 )
MBLK	Dieldrin	ND			
LCS1	Diethylphthalate	2	2.03	101.5	( 70.00 - 130.00 )
MBLK	Diethylphthalate	ND			
MS	Diethylphthalate	2	2.01	100.5	( 70.00 - 130.00 )
MBLK	Dimethoate	ND			
LCS1	Dimethylphthalate	2	1.87	93.5	( 70.00 - 130.00 )
MBLK	Dimethylphthalate	ND			
MS	Dimethylphthalate	2	1.69	84.5	( 70.00 - 130.00 )
LCS1	Endrin	2	2.08	104.0	( 70.00 - 130.00 )
MBLK	Endrin	ND			
MS	Endrin	2	2.00	100.0	( 70.00 - 130.00 )

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LCS1	Fluorene	2	1.95	97.5	( 70.00 - 130.00 )
MBLK	Fluorene	ND			
MS	Fluorene	2	1.93	96.5	( 70.00 - 130.00 )
LCS1	Heptachlor	2	1.91	95.5	( 70.00 - 130.00 )
MBLK	Heptachlor	ND			
MS	Heptachlor	2	1.72	86.0	( 70.00 - 130.00 )
LCS1	Heptachlor Epoxide	2	1.58	99.0	( 70.00 - 130.00 )
MBLK	Heptachlor Epoxide	ND			
MS	Heptachlor Epoxide	2	1.84	92.0	( 70.00 - 130.00 )
LCS1	Hexachlorobenzene	2	1.83	91.5	( 70.00 - 130.00 )
MBLK	Hexachlorobenzene	ND			
MS	Hexachlorobenzene	2	1.77	88.5	( 70.00 - 130.00 )
LCS1	Hexachlorocyclopentadiene	2	1.31	65.5	( 49.90 - 133.60 )
MBLK	Hexachlorocyclopentadiene	ND			
MS	Hexachlorocyclopentadiene	2	1.41	70.5	( 50.80 - 138.30 )
LCS1	Indeno(1,2,3,c,d)Pyrene	2	1.73	86.5	( 70.00 - 130.00 )
MBLK	Indeno(1,2,3,c,d)Pyrene	ND			
MS	Indeno(1,2,3,c,d)Pyrene	2	1.69	84.5	( 70.00 - 130.00 )
MBLK	Isophorone	ND			
LCS1	Lindane	2	1.81	90.5	( 70.00 - 130.00 )
MBLK	Lindane	ND			
MS	Lindane	2	1.79	89.5	( 70.00 - 130.00 )
LCS1	Methoxychlor	2	1.83	91.5	( 70.00 - 130.00 )
MBLK	Methoxychlor	ND			
MS	Methoxychlor	2	1.84	92.0	( 70.00 - 130.00 )
MBLK	Metolachlor	ND			
MBLK	Metribuzin	ND			
LCS1	Molinate	2	1.95	97.5	( 70.00 - 130.00 )
MBLK	Molinate	ND			
MS	Molinate	2	1.85	92.5	( 70.00 - 130.00 )
LCS1	Pentachlorophenol	8	8.03	100.4	( 70.00 - 130.00 )
MBLK	Pentachlorophenol	ND			
MS	Pentachlorophenol	8	7.81	97.6	( 70.00 - 130.00 )
LCS1	Phenanthrene	2	1.85	92.5	( 70.00 - 130.00 )
MBLK	Phenanthrene	ND			
MS	Phenanthrene	2	1.84	92.0	( 70.00 - 130.00 )
MBLK	Prometryn	ND			
MBLK	Propachlor	ND			

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LCS1	Pyrene	2	1.91	95.5	( 70.00 - 130.00 )
MBLK	Pyrene	ND			
MS	Pyrene	2	1.91	95.5	( 70.00 - 130.00 )
LCS1	Simazine	2	1.86	93.0	( 70.00 - 130.00 )
MBLK	Simazine	ND			
MS	Simazine	2	1.83	91.5	( 70.00 - 130.00 )
LCS1	Thiobencarb	2	1.78	89.0	( 70.00 - 130.00 )
MBLK	Thiobencarb	ND			
MS	Thiobencarb	2	1.77	88.5	( 70.00 - 130.00 )
MBLK	Trifluralin	ND			
LCS1	alpha-Chlordane	2	1.84	92.0	( 70.00 - 130.00 )
MBLK	alpha-Chlordane	ND			
MS	alpha-Chlordane	2	1.79	89.5	( 70.00 - 130.00 )
LCS1	gamma-Chlordane	2	1.92	96.0	( 70.00 - 130.00 )
MBLK	gamma-Chlordane	ND			
MS	gamma-Chlordane	2	1.78	89.0	( 70.00 - 130.00 )
LCS1	trans-Nonachlor	2	1.74	87.0	( 70.00 - 130.00 )
MBLK	trans-Nonachlor	ND			
MS	trans-Nonachlor	2	1.71	85.5	( 70.00 - 130.00 )

**QC Batch #50818**

**T-22 Inorg+Gen Min ICPMS Mets**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Aluminum, Total, ICAP/MS	200	215	107.5	( 85.00 - 115.00 )	
LCS2	Aluminum, Total, ICAP/MS	200	227	113.5	( 85.00 - 115.00 )	5.4
MBLK	Aluminum, Total, ICAP/MS	ND		0.0		
MS	Aluminum, Total, ICAP/MS	200	207.	103.5	( 70.00 - 130.00 )	
MSD	Aluminum, Total, ICAP/MS	200	214.	107.0	( 70.00 - 130.00 )	3.3
LCS1	Antimony, Total, ICAP/MS	50	49.3	98.6	( 85.00 - 115.00 )	
LCS2	Antimony, Total, ICAP/MS	50	48.3	96.6	( 85.00 - 115.00 )	2.0
MBLK	Antimony, Total, ICAP/MS	ND		0.0		
MS	Antimony, Total, ICAP/MS	50	47.7	95.4	( 70.00 - 130.00 )	
MSD	Antimony, Total, ICAP/MS	50	49.6	99.2	( 70.00 - 130.00 )	3.9
LCS1	Arsenic, Total, ICAP/MS	20	19.0	95.0	( 85.00 - 115.00 )	
LCS2	Arsenic, Total, ICAP/MS	20	18.8	94.0	( 85.00 - 115.00 )	1.1
MBLK	Arsenic, Total, ICAP/MS	ND		0.0		
MS	Arsenic, Total, ICAP/MS	20	19.4	97.0	( 70.00 - 130.00 )	

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MSD	Arsenic, Total, ICAP/MS	20	18.9	94.5	( 70.00 - 130.00 )	2.6
LCS1	Barium, Total, ICAP/MS	100	101	101.0	( 85.00 - 115.00 )	
LCS2	Barium, Total, ICAP/MS	100	97.0	97.0	( 85.00 - 115.00 )	4.0
MBLK	Barium, Total, ICAP/MS	ND		0.0		
MS	Barium, Total, ICAP/MS	100	97	97.0	( 70.00 - 130.00 )	
MSD	Barium, Total, ICAP/MS	100	96.4	96.4	( 70.00 - 130.00 )	0.62
LCS1	Beryllium, Total, ICAP/MS	5	5.32	106.4	( 85.00 - 115.00 )	
LCS2	Beryllium, Total, ICAP/MS	5	5.26	105.2	( 85.00 - 115.00 )	1.1
MS	Beryllium, Total, ICAP/MS	5	4.76	95.2	( 70.00 - 130.00 )	
MSD	Beryllium, Total, ICAP/MS	5	5.02	100.4	( 70.00 - 130.00 )	5.3
LCS1	Cadmium, Total, ICAP/MS	20	19.4	97.0	( 85.00 - 115.00 )	
LCS2	Cadmium, Total, ICAP/MS	20	19.3	96.5	( 85.00 - 115.00 )	0.52
MBLK	Cadmium, Total, ICAP/MS	ND		0.0		
MS	Cadmium, Total, ICAP/MS	20	19.4	97.0	( 70.00 - 130.00 )	
MSD	Cadmium, Total, ICAP/MS	20	19.5	97.5	( 70.00 - 130.00 )	0.51
LCS1	Chromium, Total, ICAP/MS	100	101	101.0	( 85.00 - 115.00 )	
LCS2	Chromium, Total, ICAP/MS	100	106	106.0	( 85.00 - 115.00 )	4.8
MBLK	Chromium, Total, ICAP/MS	ND		0.0		
MS	Chromium, Total, ICAP/MS	100	105.	105.0	( 70.00 - 130.00 )	
MSD	Chromium, Total, ICAP/MS	100	104.	104.0	( 70.00 - 130.00 )	0.96
LCS1	Copper, Total, ICAP/MS	100	101	101.0	( 85.00 - 115.00 )	
LCS2	Copper, Total, ICAP/MS	100	103	103.0	( 85.00 - 115.00 )	2.0
MBLK	Copper, Total, ICAP/MS	ND		0.0		
MS	Copper, Total, ICAP/MS	100	101.	101.0	( 70.00 - 130.00 )	
MSD	Copper, Total, ICAP/MS	100	101.	101.0	( 70.00 - 130.00 )	0.00
LCS1	Iron, Total, ICAP/MS	500	530	106.0	( 85.00 - 115.00 )	
LCS2	Iron, Total, ICAP/MS	500	549	109.8	( 85.00 - 115.00 )	3.5
MBLK	Iron, Total, ICAP/MS	ND		0.0		
MS	Iron, Total, ICAP/MS	500	526.	105.2	( 70.00 - 130.00 )	
MSD	Iron, Total, ICAP/MS	500	524.	104.8	( 70.00 - 130.00 )	0.38
LCS1	Lead, Total, ICAP/MS	20	20.1	100.5	( 85.00 - 115.00 )	
LCS2	Lead, Total, ICAP/MS	20	20.0	100.0	( 85.00 - 115.00 )	0.50
MBLK	Lead, Total, ICAP/MS	ND		0.0		
MS	Lead, Total, ICAP/MS	20	20	100.0	( 70.00 - 130.00 )	
MSD	Lead, Total, ICAP/MS	20	20.1	100.5	( 70.00 - 130.00 )	0.50
LCS1	Manganese, Total, ICAP/MS	50	50.9	101.8	( 85.00 - 115.00 )	
LCS2	Manganese, Total, ICAP/MS	50	52.5	105.0	( 85.00 - 115.00 )	3.1
MBLK	Manganese, Total, ICAP/MS	ND		0.0		

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MS	Manganese, Total, ICAP/MS	50	52.4	104.8	( 85.00 - 115.00 )	
MSD	Manganese, Total, ICAP/MS	50	52.1	104.2	( 85.00 - 115.00 )	0.57
LCS1	Selenium, Total, ICAP/MS	20	18.2	91.0	( 85.00 - 115.00 )	
LCS2	Selenium, Total, ICAP/MS	20	18.7	93.5	( 85.00 - 115.00 )	2.7
MBLK	Selenium, Total, ICAP/MS	ND		0.0		
MS	Selenium, Total, ICAP/MS	20	20.1	100.5	( 70.00 - 130.00 )	
MSD	Selenium, Total, ICAP/MS	20	19.4	97.0	( 70.00 - 130.00 )	3.5
LCS1	Silver, Total, ICAP/MS	50	51.2	102.4	( 85.00 - 115.00 )	
LCS2	Silver, Total, ICAP/MS	50	50.8	101.6	( 85.00 - 115.00 )	0.78
MBLK	Silver, Total, ICAP/MS	ND		0.0		
MS	Silver, Total, ICAP/MS	50	49.5	99.0	( 70.00 - 130.00 )	
MSD	Silver, Total, ICAP/MS	50	49.5	99.0	( 70.00 - 130.00 )	0.00
LCS1	Thallium, Total, ICAP/MS	20	19.4	97.0	( 85.00 - 115.00 )	
LCS2	Thallium, Total, ICAP/MS	20	19.5	97.5	( 85.00 - 115.00 )	0.51
MBLK	Thallium, Total, ICAP/MS	ND		0.0		
MS	Thallium, Total, ICAP/MS	20	19.4	97.0	( 70.00 - 130.00 )	
MSD	Thallium, Total, ICAP/MS	20	19.6	98.0	( 70.00 - 130.00 )	1.0
LCS1	Zinc, Total, ICAP/MS	100	101	101.0	( 85.00 - 115.00 )	
LCS2	Zinc, Total, ICAP/MS	100	102	102.0	( 85.00 - 115.00 )	0.99
MBLK	Zinc, Total, ICAP/MS	ND		0.0		
MS	Zinc, Total, ICAP/MS	100	104.	104.0	( 70.00 - 130.00 )	
MSD	Zinc, Total, ICAP/MS	100	104.	104.0	( 70.00 - 130.00 )	0.00

**QC Batch #50983**

**SDWA Pesticides**

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	Alachlor (Alanex)	ND				
LCS1	Aldrin	0.050	0.052	104.0	( 59.64 - 145.56 )	
LCS2	Aldrin	0.050	NA		( 59.64 - 145.56 )	0.00
MBLK	Aldrin	ND				
MS	Aldrin	0.050	0.059	118.0	( 75.56 - 142.71 )	
MBLK	Alpha-BHC	ND				
MBLK	Chlordane	ND				
MBLK	Chlorthalonil (Drconil, Bravo)	ND				
MBLK	Delta-BHC	ND				
LCS1	Dieldrin	0.100	0.121	121.0	( 65.75 - 149.79 )	
LCS2	Dieldrin	0.100	NA		( 65.75 - 149.79 )	0.00

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MBLK	Dieldrin	ND				
MS	Dieldrin	0.100	0.122	122.0	( 77.36 - 141.97 )	
MBLK	Endosulfan I (alpha)	ND				
MBLK	Endosulfan II (beta)	ND				
MBLK	Endosulfan sulfate	ND				
LCS1	Endrin	0.100	0.123	123.0	( 70.07 - 149.66 )	
LCS2	Endrin	0.100	NA		( 70.07 - 149.66 )	0.00
MBLK	Endrin	ND				
MS	Endrin	0.100	0.121	121.0	( 86.46 - 138.80 )	
MBLK	Endrin Aldehyde	ND				
LCS1	Gamma-BHC (Lindane)	0.050	0.063	126.0	( 81.57 - 148.43 )	
LCS2	Gamma-BHC (Lindane)	0.050	NA		( 81.57 - 148.43 )	0.00
MBLK	Gamma-BHC (Lindane)	ND				
MS	Gamma-BHC (Lindane)	0.050	0.062	124.0	( 88.58 - 141.42 )	
LCS1	Heptachlor	0.050	0.051	102.0	( 60.95 - 145.71 )	
LCS2	Heptachlor	0.050	NA		( 60.95 - 145.71 )	0.00
MBLK	Heptachlor	ND				
MS	Heptachlor	0.050	0.057	114.0	( 78.23 - 146.04 )	
MBLK	Heptachlor Epoxide	ND				
MBLK	Methoxychlor	ND				
MBLK	PCB 1016 Aroclor	ND				
MBLK	PCB 1221 Aroclor	ND				
MBLK	PCB 1232 Aroclor	ND				
MBLK	PCB 1242 Aroclor	ND				
MBLK	PCB 1248 Aroclor	ND				
MBLK	PCB 1254 Aroclor	ND				
MBLK	PCB 1260 Aroclor	ND				
MBLK	Toxaphene	ND				
MBLK	p,p' DDD	ND				
MBLK	p,p' DDE	ND				
LCS1	p,p' DDT	0.100	0.135	135.0	( 37.03 - 169.44 )	
LCS2	p,p' DDT	0.100	NA		( 37.03 - 169.44 )	0.00
MBLK	p,p' DDT	ND				
MS	p,p' DDT	0.100	0.127	127.0	( 57.41 - 158.86 )	

Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.

Appendix B: Archaeological Investigation

JOHN WAIHEE  
GOVERNOR OF HAWAII



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

WILLIAM W. PATY, CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES  
ROBERT K. LANGRAPH  
LUANABU TAGOMORI  
RUSSELL M. FUKUMOTO

AQUACULTURE DEVELOPMENT  
PROGRAM  
AQUATIC RESOURCES  
CONSERVATION AND  
ENVIRONMENTAL AFFAIRS  
CONSERVATION AND  
RESOURCES ENFORCEMENT  
CONVEYANCES  
FORESTRY AND WILDLIFE  
LAND MANAGEMENT  
STATE HISTORIC PRESERVATION  
STATE PARKS  
WATER AND LAND DEVELOPMENT

November 29, 1990

Mr. Kenneth Rappolt, Vice-President  
Macquire Group Inc.  
1600 Kapiolani Boulevard  
Honolulu, Hawaii 96814

Dear Mr. Rappolt:

SUBJECT: ARCHAEOLOGICAL FIELDCHECK OF PROPOSED WELL SITE WITHIN  
SACRED FALLS STATE PARK, KALUANUI, KOOLAULOA, OAHU.  
TMK: 5-3-11: 9

Please find enclosed a copy of the report on the archaeological survey conducted for the proposed well site at Sacred Falls State Park. It is our understanding that the Board of Water Supply is proposing to drill a second well approximately 200 feet to the north of the existing well and pump at Sacred Falls State Park. The archaeological survey of this project area was conducted on November 22, 1990 by State Parks archaeologists Martha Yent and Marc Smith with the assistance of Jeff McCormack from your firm.

Also attached are the two reports on the previous archaeological surveys conducted for the Board of Water Supply well sites. If you have any questions regarding these archaeological reports or the survey, please contact Martha Yent at 548-2682.

Yours very truly,

RALSTON H. NAGATA  
State Parks Administrator

Enclosure



ARCHAEOLOGICAL SURVEY:  
PROPOSED WELL SITE AT SACRED FALLS STATE PARK,  
KALUANUI, KOOLAULOA, OAHU  
(TMK: 5-3-11: 9)

Prepared by:  
Martha Yent, Archaeologist  
Division of State Parks  
Department of Land and Natural Resources

NOVEMBER, 1990

### INTRODUCTION

The Board of Water Supply is proposing to drill a second well approximately 200 feet to the north of the existing well and pump at Sacred Falls State Park, Kaluanui, Koolauloa, Oahu. The existing well and pump site are located on the west (Hauula) side of Kaluanui Stream and approximately 3,800 feet (3/4 mile) mauka (southwest) of the coastline and Kamehameha Highway (see Map 1). The paved access road to the existing well and pump site runs upslope from the dirt road and trail to the falls. Access to the proposed second well will use this existing roadway. Both the existing and proposed well sites are located at an elevation of about 110 feet above sea level (see Map 2).

A fieldcheck was conducted on November 22, 1990 by State Parks archaeologists Martha Yent and Marc Smith who were accompanied by Jeff McCormack of Maguire Group. The survey area has a dense growth of Christmas berry, Java plum, octopus trees, guava, and koa haole. There is an old roadbed that runs parallel to the contour in the project area. This road was noted on a map during the survey for the first well site in 1980 (see Map 2). A continuation of this road on the makai side of the paved access road will be used for the secondary access to the proposed well site. The proposed drilling location is just upslope of this bulldozed road.

### HISTORICAL OVERVIEW

The valley floor of Kaluanui during the prehistoric and early historic periods was probably covered by irrigated taro terraces and sweet potato was grown in the front kula lands (Handy, 1940: 91). In 1828, Levi Chamberlain toured Oahu and reported one school in Kaluanui. He also wrote that he was supplied with pig, potato, and taro at Kaluanui which supports the agricultural use of Kaluanui. The lands of Kaluanui were awarded to Victoria Kamamalu during the Great Mahele (1848). There were smaller, individual awards made on the makai, coastal plain portion of Kaluanui.

The major changes in Kaluanui Valley occurred in the early 1900s when the valley bowl and coastal plain were acquired and modified for sugarcane cultivation. Ditches and flumes were constructed on the slopes to divert water from the streams to the sugarcane fields. There is also an abandoned cane haul road that corresponds to the former railroad bed that ran across the valley. Sugarcane cultivation in Kaluanui Valley is believed to have lasted from circa 1906 until the 1950s.

### PREVIOUS ARCHAEOLOGY

The Bishop Museum survey of Kaluanui Valley in 1973 located a total of 23 sites. The sites recorded on the coastal plain, which was previously in sugarcane cultivation, included irrigation channels and ditch trails. The sites on the slopes of the valley included dryland terraces, stone mounds, habitation platforms, and additional historic irrigation ditches.

The more intensive survey of proposed park use areas was conducted by State Parks archaeologists in 1980-1981. At this time, State site number 50-80-05-290 was assigned to Kaluanui Valley with a series of consecutive numbers (290-1 through 290-20) designating the sites located during the 1973 and 1981 surveys. The 1981 survey located additional mound features and platforms. Testing conducted on several mound features indicated a lack of cultural materials and suggested that these features represent agricultural clearing mounds.

During the archaeological survey in 1980 for the first well site, several sites were identified (Barrera, 1980 and Yent & Ota, 1981). The sites included a small cobble paving or platform (290-7) and two large rock mounds (290-6). These sites were in proposed locations for the well which were not selected for construction. The present well site corresponds to well site #2 on Map 3.

#### ARCHAEOLOGICAL FINDINGS

The survey for the second well site located several features in the vicinity of the project area. The features located in 1990 have been numbered according to the earlier system. The location of these features relative to each other and the proposed well site is shown on Map 4.

Site 290-21, Feature 1. Concrete-lined auwai (ditch) running parallel to the 107 foot contour line and generally N-S. The auwai is located approximately 12 meters upslope of the bulldozed road and 7 meters upslope from the proposed well site. The ditch measures 30cm in depth and 1 meter wide with concrete only on the upper edges of the ditch alignment. There are boulders on the downslope side of the ditch which may have been a well-stacked retaining wall previously. The ditch runs to the existing well site but the makai (N) extend of the ditch was not determined. It is likely that this ditch was used to irrigate the sugarcane fields on the coastal flat at the mouth of Kaluanui Valley from Waimanamana Stream. Ditch is overgrown with Christmas berry.

Site 290-21, Feature 2. Second auwai on the 116 foot contour which runs parallel to the first auwai and is located approximately 10 meters upslope of the first auwai. This upper auwai is not concrete-lined and there is no evidence of rock-lining. The auwai is 80cm wide and 50cm deep. This auwai also runs to the existing well site and is overgrown with Christmas berry.

Site 290-22. Stacked retaining wall located about 20 meters to the northeast of the proposed well site. The wall is built parallel to the contour and measures 12 meters in length and 1.5 meter in height. Huge boulders have been used in the construction with smaller boulders and cobbles stacked between the huge boulders. Site covered by Christmas berry and guava.

Site 290-23. Double alignment of boulders about 5 meters downslope (NE) of the well site. The alignments measure about 7-8 meters in length and are 1.5 meters apart. These alignments may be related to the construction of the bulldozed road. There is no stacking or wall construction evident. The level area upslope of these alignments has been selected as the best drilling location by the geologist.

Site 290-24. Retaining wall/mound of large and huge basalt boulders on the downslope (NE) side of the bulldozed road. This site is about 10 meters makai (N) of where the proposed access road to the well site angles upslope.

Based on the proposed access to the second well site, the only site that appears to be subject to impact during the drilling project is 290-23. The drilling machinery will be setup from the bulldozed road. Therefore, site 290-21 which is about 7 meters upslope of the well site should not be affected. Likewise, sites 290-22 and 290-24 are located at least 10 meters makai (NE) of the access to the drilling site and should not be impacted.

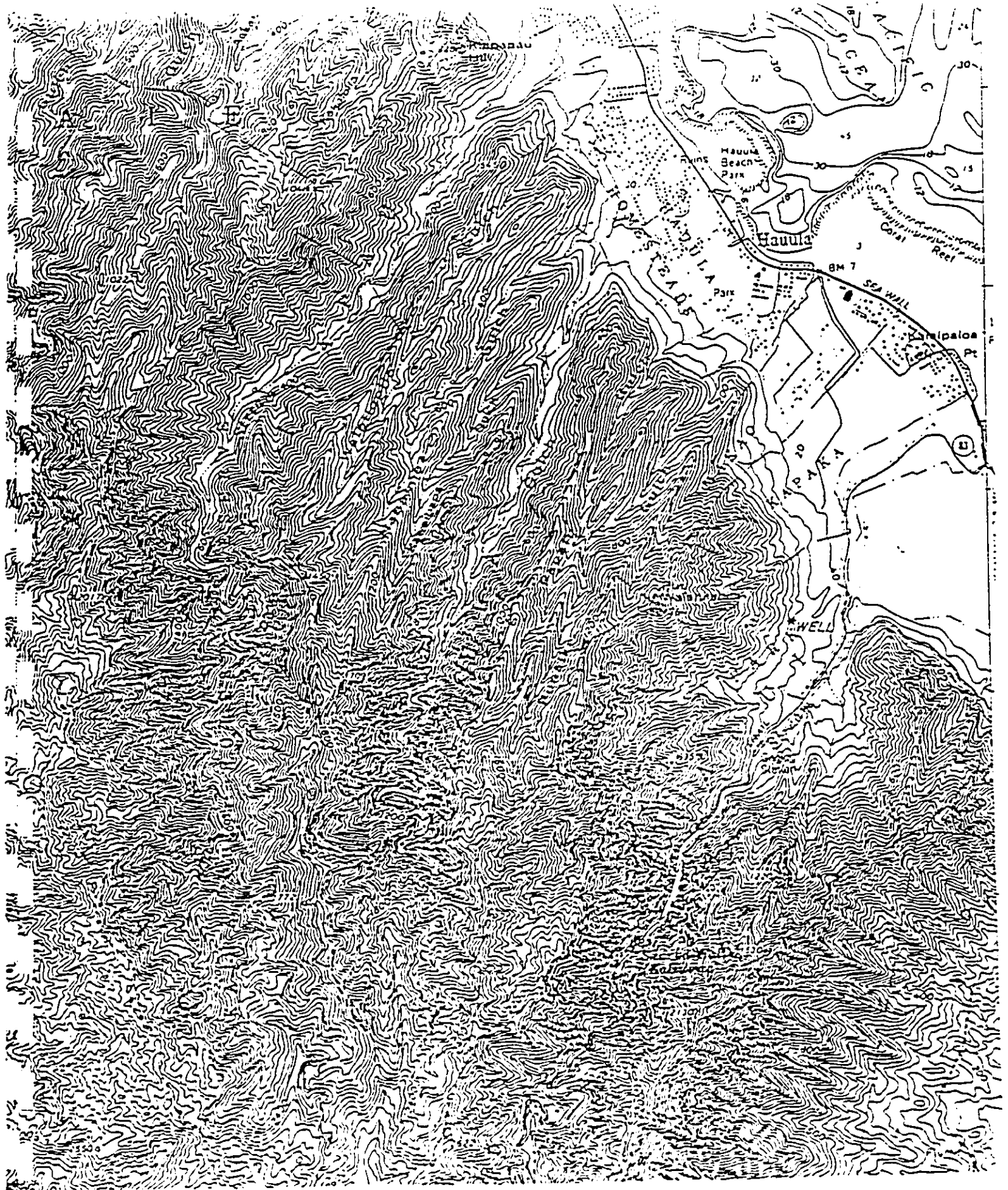
#### RECOMMENDATIONS

Sites 290-21, 290-22, and 290-24 should be flagged prior to the use of machinery in the area to prevent inadvertent damage to these sites. From the previous surveys and testing in Kaluanui Valley, it appears that these sites are related to agricultural activities. The ditches are probably historic based on the presence of concrete and were used to divert water from Waimanamana Stream to the sugarcane fields on the coastal plain. The presence of site 290-24 adjacent to the bulldozed road suggests that this feature may have been built to retain the slope on the downslope side of the road.

The significance of these sites is related to their research potential. However, based on the fact that these sites are structural features, it is not likely that testing will yield additional information. Recording of the sites during the November, 1990 fieldtrip was hampered by the density of the vegetation. Therefore, it is recommended that the State Parks archaeologists be notified when clearing work for the roadway and drilling site is to begin as this clearing may permit photographing of the archaeological sites.

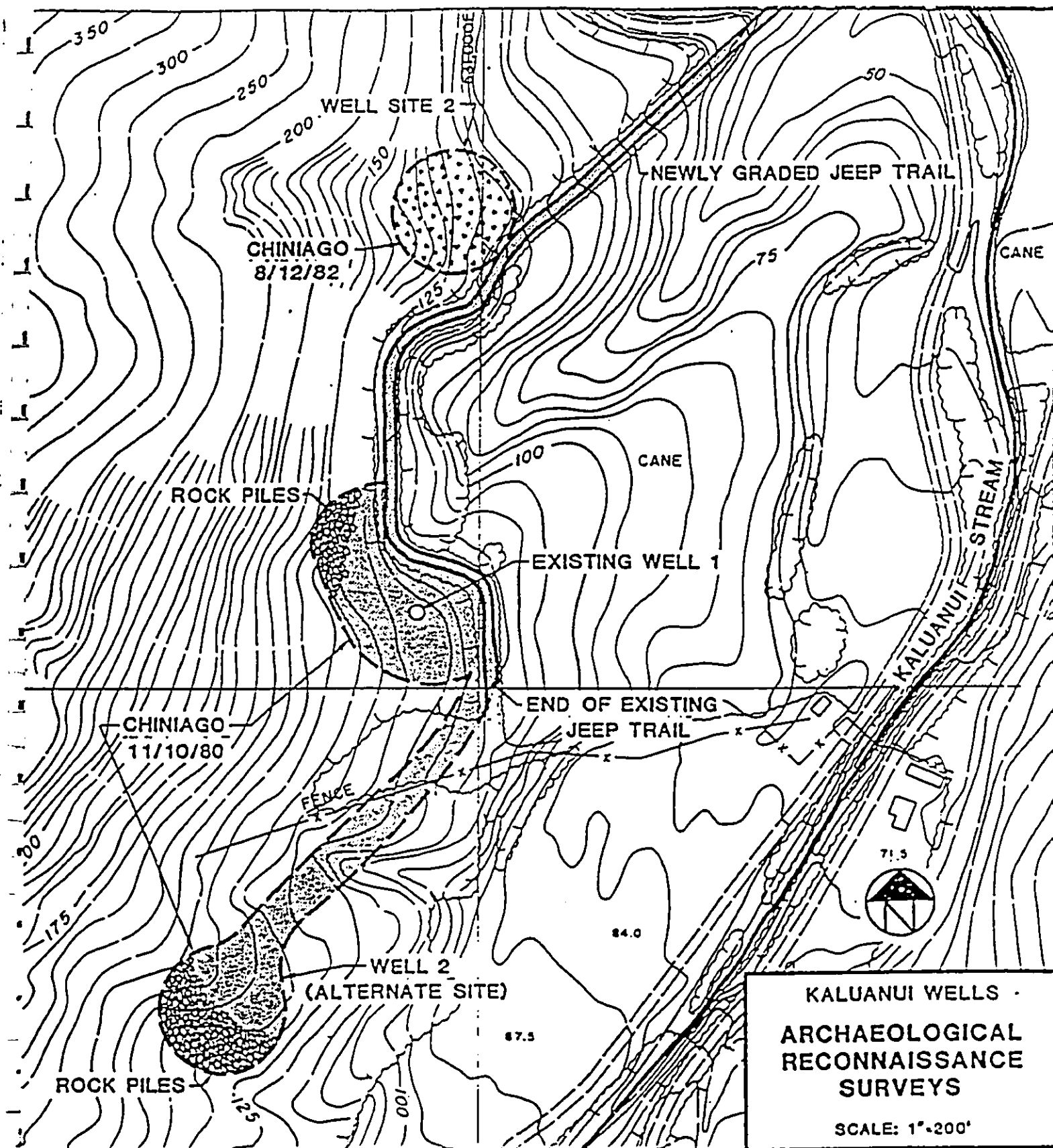
#### REFERENCES

- Barrera, William Jr.  
1980 Letter Report to Mr. Fred Proby, VTN Pacific, regarding Kaluanui well sites. November 28, 1980.
- 1982 Letter Report to Mr. Fred Proby, VTN Pacific, regarding Kaluanui Exploratory Well #2 at Sacred Falls. August 16, 1982.
- Chamberlain, Levi  
1828 Trip Around Oahu by Levi Chamberlain in 1828. Hawaiian Mission Children's Library.
- Handy, Craighill  
1940 The Hawaiian Planter, Volume 1: His Plants, Methods, and Areas of Cultivation. B.P. Bishop Museum Bulletin 161. Bishop Museum Press.
- Rosendahl, Paul  
1973 An Archaeological Walk-Through Survey of the Kaluanui Lands, Oahu. B.P. Bishop Museum report for Sakoda Realty.
- Yent, Martha and Jason Ota  
1981 Archaeological Investigations: Sacred Falls State Park, Kaluanui, Koolauloa, Oahu. Division of State Parks, Department of Land and Natural Resources. May, 1981.



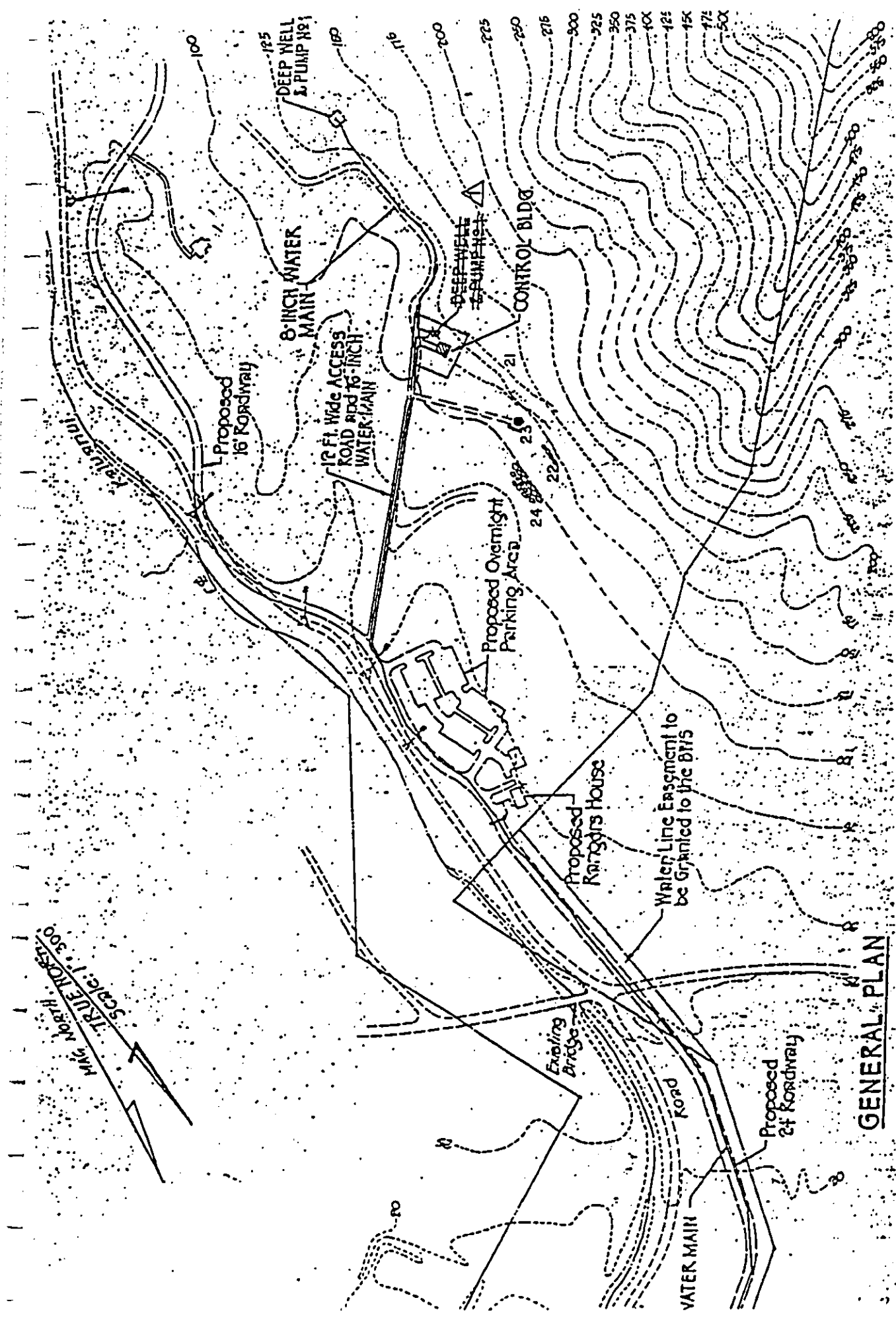
Map 1: Location of Well within Sacred Falls State Park, Kaluanui, Oahu.





**KALUANUI WELLS**  
**ARCHAEOLOGICAL**  
**RECONNAISSANCE**  
**SURVEYS**  
 SCALE: 1"=200'

MAP 3 - Location of archaeological sites located during previous surveys for well sites (taken from Barrera, 1982).



**GENERAL PLAN**

HAP 4 - Location of archaeological sites in proposed well site area (1990 survey).



## CHINIAGO INC.

Archaeological Consulting

76 N. KING STREET, ROOM 202 • HONOLULU, HAWAII 96817 • TELEPHONE: (808) 521-2785

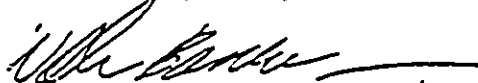
November 28, 1980

Mr. Fred Proby  
VTN Pacific  
1164 Bishop Street  
Suite 906  
Honolulu, Hawaii 96813

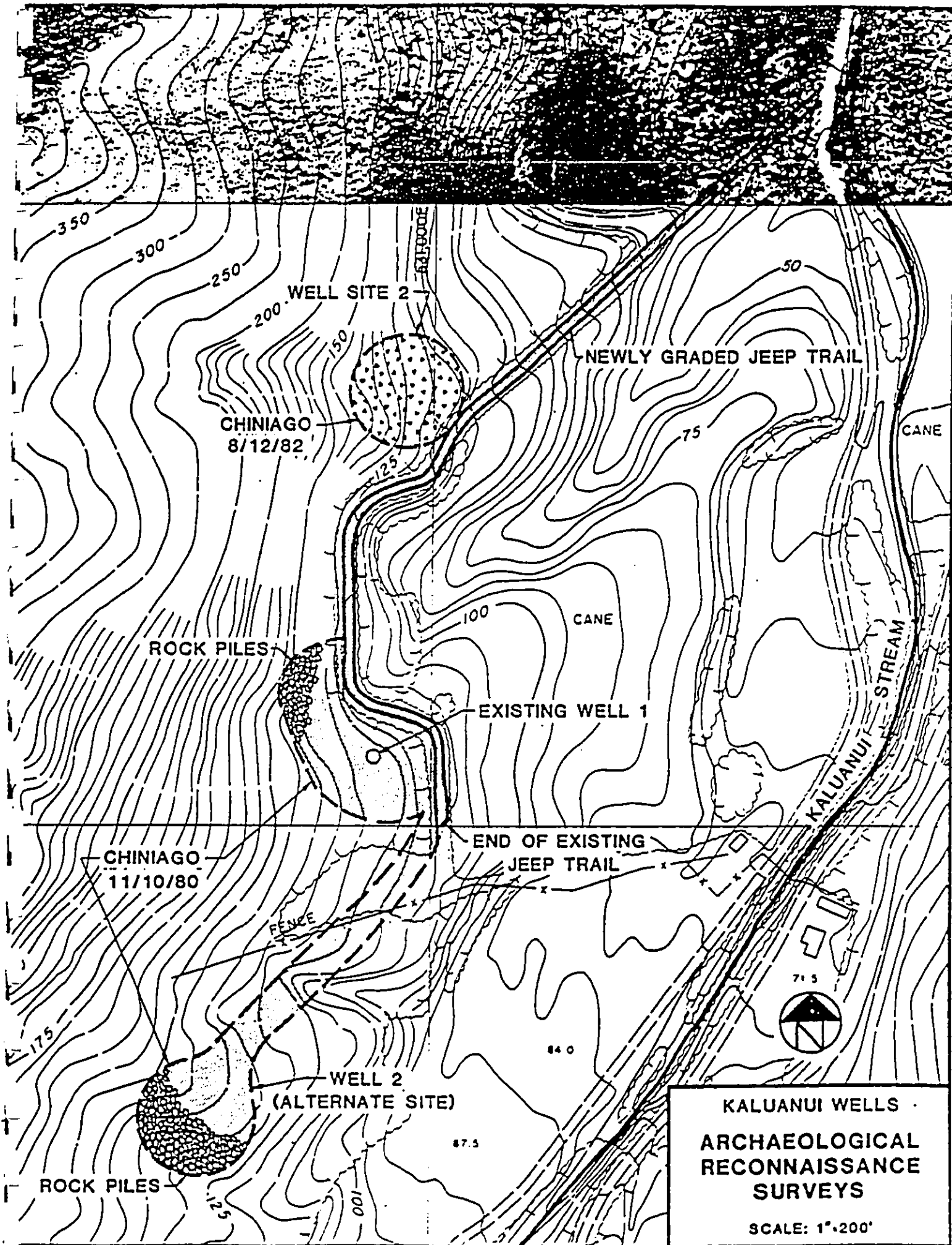
Dear Mr. Proby:

On November 10 we conducted an archaeological reconnaissance survey of two proposed well-sites at Kaluanui Valley, Oahu, each of which consisted of a 200-foot diameter circle [indicated on the enclosed map], plus a proposed roadway connecting them to the main valley access road. No definite archaeological or historical remains were found, but the presence of rock piles which may be of human origin requires that caution be exercised during construction. These remains, which are located at the northern edge of the easternmost well-site and on the western half of the westernmost well-site, should not represent any impediment to the project as there appears to be sufficient space available for the construction activities. We will be happy to show the Board of Water Supply people the locations of the areas which we recommend that they avoid.

Sincerely yours,



William Barrera, Jr.  
President



# CHINIAGO INC.

Archaeological Consulting

1040-B SMITH STREET • HONOLULU, HAWAII 96817 • TELEPHONE: (808) 521-2785

August 16, 1982

Mr. Fred Proby  
VTN Pacific  
1164 Bishop Street  
Suite 906  
Honolulu, HI. 96813

Dear Mr. Proby:

On August 12, 1982 I accompanied you, Mr. Larry Whang of the Department of Water Supply and Ms. Martha Yent of the Division of State Parks on an inspection of the proposed site of Kaluanui Exploratory Well #2 at Sacred Falls, Oahu. This letter is to confirm that nothing of archaeological or historical interest was located and that in our opinion the project may proceed as planned without fear of disturbing any such sites.

Sincerely yours



William Barrera, Jr.  
President

Appendix C: Botanical Investigation

BOTANICAL CONSULTANTS

P.O. BOX 90765  
HONOLULU, HI 96835

NOVEMBER 9, 1990

(808) 923-4193

Mr. Jeff M. McCormick - Project Manager  
Maguire Group, Inc.  
1600 Kapiolani Boulevard  
Honolulu, Hawaii 96814

Dear Mr. McCormick

As requested by the Maguire Group, Inc. on November 7, 1990 (MGI Job No. 13223), Botanical Consultants conducted a botanical survey of the proposed Kaluanui Exploratory Well No. 11 and Access Site which is located in Sacred Falls State Park, Punalu'u, Hawaii on November 8, 1990.

The Kaluanui Exploratory Well No. 11 and Access Site is at about 200 feet elevation in what appears to be long abandoned farmland. The remains of an old, concrete irrigation system and many large Mango Trees (*Mangifer indica* L.) indicate earlier human occupation of this site.

FLORA

The vegetation of the Kaluanui Well and Access site is almost entirely introduced. The scattered, emergent trees are 12 to 15 m mango, Java plum (*Syzygium cumini* (L.) Skeels), and Gunpowder or charcoal (*Trema orientalis* (L.) Blume) trees. The tree layer or canopy of the site is composed of octopus trees (*Schefflera actinophylla* (Endl.) Harms). These small trees, 7 to 8 m, provide 50 to 75% cover. The understory is made up of Christmas berry trees (*Schinus terebinthifolius* Raddi). These shrubby, 5 to 6 m trees, provide a thin, scant, 25 to 30% cover.

The ground is rocky and the herb layer is composed of leaf litter, seedlings, ferns and a wide variety of weedy, alien species. The most common taxon is laua'e-haole (*Phlebodium aureum* (L.) J. Sm). In this area it attains a height of 40 to 100 cm.

There are a few indigenous (known to exist naturally in Hawaii and other places) species. Poa or *Psilotum nudum* (L.) Griseb. was found in several places and two 'akia or fish poison (*Wikstroemia oahuensis* (A. Gray) Rock shrubs were found under the canopy.

ENDANGERED SPECIES

No proposed or listed threatened or endangered plant species were found during this survey (USFWS 1990, State of Hawaii 1990).

#### CONCLUSIONS

The proposed well site is located in an area which is almost entirely covered with introduced or alien vegetation. Botanically, there is no reason why this project cannot go forward.

#### LITERATURE CITED

- St. John, H. 1973. List of the Flowering Plants in Hawaii. Pacific Tropical Botanical Garden. Memoir 1. Lawai, Kauai.
- Wagner, W. L., D. R. Herbst, and S. Sohmer. 1990. Manual of the Flowering Plants of Hawaii. Vols. 1 & 2. University of Hawaii Press.
- State Of Hawaii 1990. Endangered and Threatened Species. DLNR.
- USFWS. 1990. Endangered and Threatened Wildlife and Plants. 50 CFR. 17.11 & 17.12. US Government Printing Office. Wash. DC.

## SPECIES LIST

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

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

meanings:

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

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

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

Locally abundant - plants found in large numbers over a limited area, for example the plants found in grassy patches.

This species list is the result of an extensive survey of this site at the beginning of the rainy season (November 1990) and it reflects the vegetative composition of the flora during a single season. Minor changes in the vegetation will occur due to introductions and losses and a slightly different species list would result from a survey conducted during a different growing season.

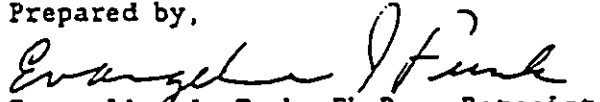
CHECKLIST OF ALL PLANTS FOUND ON THE KALUANUI EXPLORATORY WELL STUDY SITE

Scientific Name	Common Name	Abundance
FERNS AND FERN ALLIES		
PSILOTACEAE - Psilotum Family		
<i>Psilotum nudum</i> (L.) Griseb.	Moa	Occasional
POLYPODIACEAE - Polypod Family		
<i>Dryopteris dentata</i> (Forsk) C. Chr.	Oak Fern	Common
* <i>Nephrolepis exaltata</i> (L.) Schott	Sword fern	Common
* <i>Phlebodium aureum</i> (L.) J. Sm.	Laua'e fern	Abundant
MONOCOTYLEDONES		
GRAMINEAE - Grass Family		
* <i>Brachiaria mutica</i> (Forsk.) Staph	Paragrass	Locally abundant
* <i>Cenchrus echinatus</i> L.	Sandbur grass	Occasional
* <i>Oplismenus hirtellus</i> (L.) P. Beauv.	Basketgrass	Locally abundant
* <i>Panicum maximum</i> Jacq.	Guinea grass	Common
* <i>Sorghum halepense</i> (L.) Pers.	Johnson grass	Occasional
ORCHIDACEAE - Orchid Family		
* <i>Spathoglottis plicata</i> Bl.	Malayan ground orchid	Occasional
PALMAE - Palm Family		
* <i>Phoenix sylvestris</i> Roxb.	Date palm	Uncommon
DICOTYLEDONES		
ANACARDIACEAE - Mango Family		
* <i>Mangifera indica</i> L.	Mango	Common
* <i>Schinus terebinthifolius</i> Raddi	Christmas berry	Common
ARALIACEAE - Ginseng Family		
* <i>Schefflera actinophylla</i> (Endl.) Harms	Octopus tree	Common



Scientific Name	Common Name	Abundance
COMPOSITAE - Sunflower Family		
* <i>Bidens alba</i> (L.) DC	Bidens	Common
* <i>Emilia sonchifolia</i> (L.) DC	Lalac puale	Common
* <i>Erechtites hieracifolia</i> (L.) Raf	Fireweed	Occasional
* <i>Pluchea odorata</i> (L.) Cass.	Pluchea	Occasional
* <i>Sonchus oleraceus</i> L.	Pualele	Occasional
* <i>Vernonia cinerea</i> (L.) Lees.	Little ironweed	Occasional
EUPHORBIACEAE - Spurge Family		
* <i>Chamaesyce hirta</i> L.	Hairy spurge	Common
* <i>Chamaesyce hypericifolia</i> Mellsp.	Graceful spurge	Common
* <i>Phyllanthus niruri</i> L.	Niruri	Occasional
LEGUMINOSAE - Bean Family		
* <i>Chamaecrista nictitans</i> (L.) Moench	Partridge pea	Common
* <i>Crotalaria incana</i> L.	Fuzzy rattle-pod	Occasional
* <i>Desmodium incanum</i> DC	Spanish clover	Locally abundant
* <i>Indigofera suffrutcosa</i> Mill.	Indigo	Occasional
* <i>Leucaena leucocephala</i> deWit	Koa-haole	Common
* <i>Mimosa pudica</i> L.	Sensitive plant	Common
MYRTACEAE - Myrtle Family		
* <i>Syzygium cumini</i> L.	Java plum	Common
MYRSINACEAE - Myrsine Family		
* <i>Ardisia elliptica</i> Thunb.	Shoebuttan ardisia	Common
RUBIACEAE - Coffee Family		
* <i>Morindia citrifolia</i> L.	Noni	Occasional
* <i>Paederia scandens</i> (Lour.) Merr.	Maile pilau	Common
THYMELAEACEAE - 'Akia Family		
<i>Wikstroemia oahuensis</i> (A. Gray) Rock	'Akia	Occasional
ULMACEAE - Elm Family		
* <i>Trema orientalis</i> (L.) Blume	Gunpowder tree	Common

Prepared by,

  
Evangeline J. Funk, Ph.D. - Botanist

U.S. GEOLOGICAL SURVEY

Appendix D: Yield-Drawdown Test Data

KALUANUI EXPLORATORY WELL III No. 3554-06

WELL INFORMATION

Location	: TMK: 5-3-11:09
Elevation at ground	: + 90.8 ft.
Elevation at bottom of well	: -252.2 ft.
Elevation at end of casing	: -102.2 ft.
Diameter of casing	: 12.0 in. I.D.
Casing Length	: 193.0 ft.
Well Depth	: 343.0 ft.
Head	: 16.82 ft. (sounder) 5/22/96
Airline Depth	: 120.0 ft.
Pump Depth (suction)	: 129.8 ft. (approximately)
Drilling completed	: April 30, 1996
Drilling company	: Roscoe Moss Hawaii, Inc.
Date of Yield-Drawdown Test	: May 22, 1996
Date of Sustained Pumpage Test	: May 23, 1996 to May 28, 1996

### Kaluanui Exploratory Well III

Specific Capacity

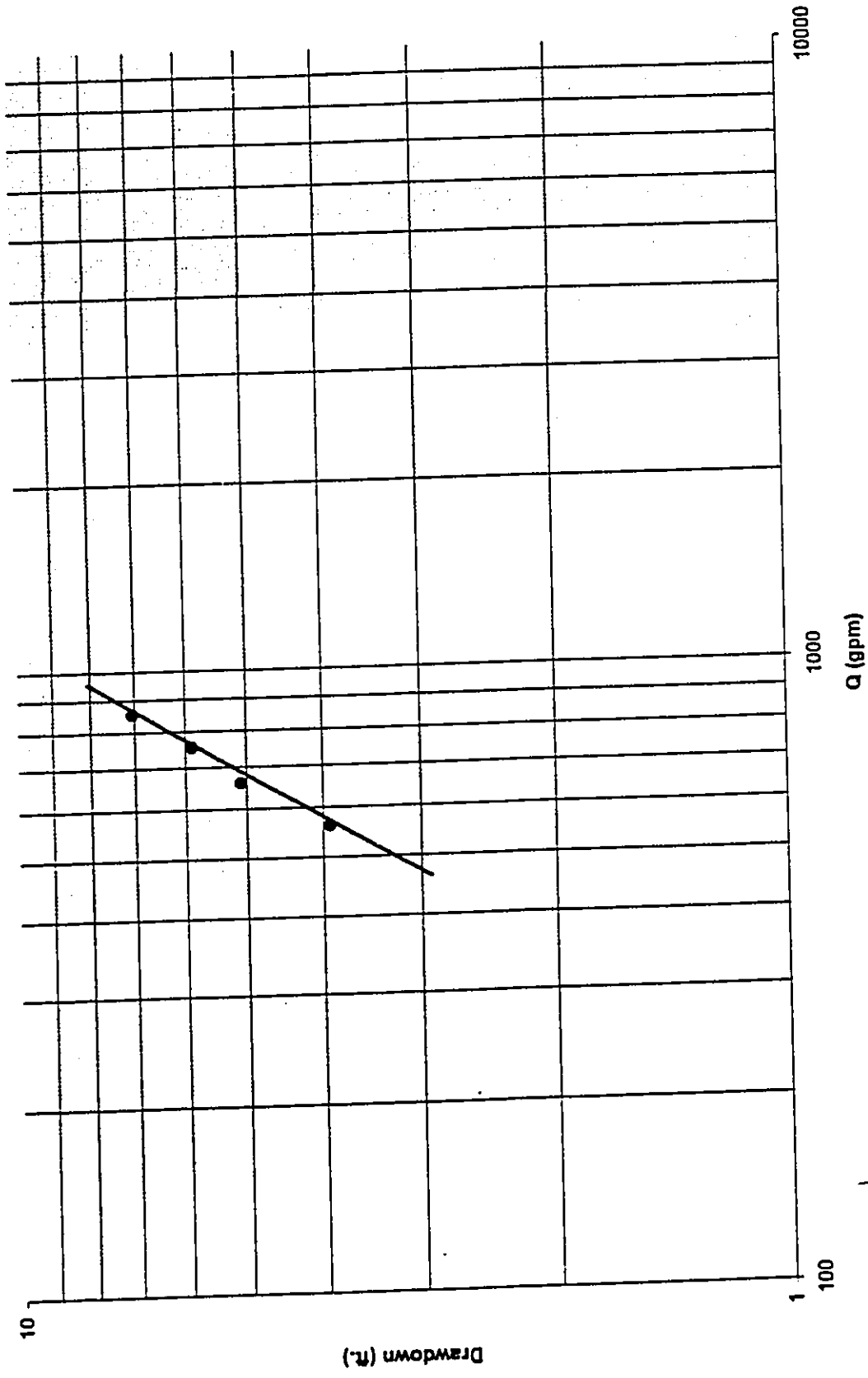


Table 1

## AQUIFER TEST DATA

County: Honolulu  
 Location: Kaluanui Exploratory Well III  
 Average Q: varies

Obs. well no.: 3554-02  
 Pumped well no.: 3554-06  
 Distance between observation and pumped well: 1300 ft.

Date	Hour	t (min)	Depth to water (ft.)	s (unadjusted) (ft.)	Adjustment $\Delta$ s(ft.)	Q (gpm)	CI	Temp $\frac{\Delta}{\text{or}}$ °F or °C	Remarks
5/22/96	9:38		74.61						static water level
Wed.	10:17		74.63						started pumping
	10:20	0							
	10:22	2				380	31	70.6	sample #1
	10:25	5							
	10:30	10	78.66	4.03				70.4	
	10:41	21				664			
	10:45	25	78.70	4.07		556			
	10:54	34						70.3	
	10:57	37							
	10:58	38	78.71	4.08		558			
	11:00	40							
	11:07	47	78.71	4.08			31	70.3	sample #2
	11:08	48				562			rate change. rate 1
	11:10	50				657			average: 562 gpm.
	11:17	57						70.2	
	11:19	59				660			
	11:20	60							
	11:23	63	79.67	5.04				70.3	
	11:30	70							
	11:33	73	79.67	5.04		660			
	11:35	75						70.2	
	11:44	84				660			
	11:45	85							
	11:47	87	79.69	5.06			31	70.2	sample #3
	11:52	92							
	11:53	93	79.68	5.05		662			rate change. rate 2
	11:55	95						70.2	average: 662 gpm.
	12:21	121							
	12:23	123	80.66	6.03		753			
	12:25	125						70.2	
	12:30	130							
	12:33	133	80.66	6.03			31	70.2	sample #4
	12:37	137							
	12:38	138	80.66	6.03		756			rate change. rate 3
	12:40	140				840			average: 756 gpm.
	12:45	145						70.2	
	12:53	153							
	12:55	155	81.82	7.19		859			
	12:57	157							

Yield-Drawdown Test



AQUIFER TEST DATA

Table 1

County: Honolulu

Location: Kaluanui Exploratory Well III

Average Q: 827 gpm

Obs. well no.: 3554-02

Pumped well no.: 3554-06

Distance between observation and pumped well: 1300 ft.

Date	Hour	t(min)	Depth to water (ft.)	s (unadjusted) (ft.)	Adjustment $\Delta$ s(ft.)	Q (gpm)	Cl	Temp $\Delta$ °F or °C	Remarks
5/23/96	10:06		74.74						static water level
Thurs.	10:20	0							start of pumping test
	10:21	1	80.31	5.57					partly cloudy, hot,
	10:22	2	80.60	5.86					light winds, dry
	10:23	3	80.69	5.95					
	10:24	4	80.78	6.04					
	10:25	5	80.88	6.14					
	10:26	6	80.89	6.15					
	10:27	7	80.91	6.17					
	10:28	8	80.92	6.18					
	10:29	9	80.92	6.18					
	10:30	10	80.92	6.18					
	10:32	12	80.90	6.16					
	10:34	14	80.89	6.15					
	10:36	16	80.89	6.15					
	10:38	18	80.91	6.17					
	10:40	20	80.91	6.17					
	10:43	23						70.2	
	10:44	24					33		sample #1
	10:45	25	80.92	6.18					
	10:46	26				765			
	10:50	30	81.54	6.80					adjusted rate @ 10:49
	10:53	33				776			
	10:55	35	81.54	6.80					
	11:00	40	81.59	6.85					
	11:05	45	81.59	6.85					
	11:10	50	81.59	6.85					
	11:15	55				798		70.1	
	11:20	60	81.60	6.86					
	11:30	70	81.60	6.86					
	11:35	75				808			
	11:39	79						70.1	
	11:40	80	81.61	6.87					
	11:50	90	81.62	6.88					diesel eng. rpm: 1390
	11:55	95				814		70.1	
	12:00	100	81.61	6.87					
	12:23	123	81.62	6.88					
	12:25	125				818			
	13:00	160	81.65	6.91		822			
	14:00	220	81.65	6.91		825			

Continuous Pumping Test

Table 1

## AQUIFER TEST DATA

County: Honolulu

Location: Kaluanui Exploratory Well III

Average Q: 827 gpm

Obs. well no.: 3554-02

Pumped well no.: 3554-06

Distance between observation and pumped well: 1300 ft.

Date	Hour	t(min)	Depth to water (ft.)	s (unadjusted) (ft.)	Adjustment $\Delta$ s(ft.)	Q (gpm)	CI	Temp $\Sigma^{\circ}\text{F}$ or $^{\circ}\text{C}$	Remarks
5/23/96	15:00	280	81.65	6.91		826			
Thurs.	16:00	340	81.65	6.91		828			
	17:00	400	81.75	7.01		830	33		sample #2
	18:00	460	81.75	7.01		830			
	19:00	520	81.75	7.01		831			
	20:00	580	81.75	7.01		833			
	21:00	640	81.75	7.01		833			
	22:00	700	81.80	7.06		833			
	23:00	760	81.80	7.06		833	33		sample #3
5/24/96	24:00	820	81.85	7.11		833			
Fri.	1:00	880	81.85	7.11		833			
	2:00	940	81.80	7.06		823			
	3:00	1000	81.80	7.06		833			
	4:00	1060	81.85	7.11		838			
	5:00	1120	81.80	7.06		833	33		sample #4
	6:00	1180	81.80	7.06		833			
	7:00	1240	81.80	7.06		834			
	8:00	1300	81.83	7.09		834			
	9:00	1360	81.85	7.11		835			
	10:00	1420	81.87	7.13		835			
	11:00	1480	81.88	7.14		835			
	11:30	1510				835	33		sample #5
	11:32	1512	81.87	7.13				70.1	cloudy, dry
	11:34	1514	81.87						
	12:00	1540				837			
	13:00	1600	81.87	7.13		835			
	13:05	1605						70.1	
	15:00	1720	81.86	7.12		838			
	18:00	1900	81.86	7.12		839			
	21:00	2080	81.85	7.11		840			
5/25/96	24:00	2260	81.85	7.11		841			
Sat.	3:00	2440	81.85	7.11		842			
	6:00	2620	81.86	7.12		833			
	9:00	2800				834			
	12:00	2980				834			
	12:34	3014						70.1	
	12:35	3015				833	33		sample #6. cloudy.
	13:38	3078						70.0	rained overnight
	13:40	3080				833			
	15:00	3160				833			

Continuous Pumping Test



AQUIFER TEST DATA

Table 1

County: Honolulu

Location: Kaluanui Exploratory Well III

Average Q: 827 gpm

Obs. well no.: 3554-02

Pumped well no.: 3554-06

Distance between observation and pumped well: 1300 ft.

Date	Hour	t(min)	Depth to water (ft.)	s (unadjusted) (ft.)	Adjustment $\Delta$ s(ft.)	Q (gpm)	Cl	Temp $\Sigma^{\circ}F$ or $^{\circ}C$	Remarks
	18:00	3340				833			
	21:00	3520				832			
5/26/96	24:00	3700				831			
Sun.	3:00	3880				831			
	6:00	4060				834			
	9:00	4240	81.85	7.11		831			RMHI rig used (dtw).
	10:50	4350	81.90	7.16					BWS instr. functional.
	11:00	4360				830	33	70.1	sample #7. cloudy.
	12:00	4420	81.91	7.17		830			damp. light winds.
	12:15	4435				830			
	12:16	4436						70.1	
	12:17	4437	81.91	7.17					
	15:00	4600	81.87	7.13		830			
	18:00	4780	81.87	7.13		830			
	21:00	4960	81.87	7.13		829			
5/27/96	24:00	5140	81.87	7.13		831			
Mon.	3:00	5320	81.87	7.13		828			
	6:00	5500	81.87	7.13		828			
	9:00	5680	81.98	7.24		828			
	10:10	5750						70.1	cloudy, partly sunny
	10:12	5752	81.98	7.24					humid
	10:15	5755					33		sample #8
	10:20	5760				828			
	11:16	5816						70.1	
	11:17	5817	81.97	7.23					
	11:20	5820				828			
	12:00	5860	81.97	7.23		828			
	15:00	6040	81.94	7.20		828			
	18:00	6220	81.98	7.24		828			
	21:00	6400	81.96	7.22		829			
5/28/96	24:00	6580	81.95	7.21		830			
Tue.	3:00	6760	81.97	7.23		828			
	6:00	6940				827			BWS instr.(dtw) malf.
	9:00	7120				827			(left exposed to rain)
	10:00	7180				827		70.0	raining, cloudy
	10:08	7188	81.92	7.18					RMHI instr.(dtw)
	10:10	7190					33		sample #9
	10:13	7193						70.2	
	10:17	7197	81.97	7.23					
	10:20	7200/0				824			stopped pumping

Continuous Pumping Test



Appendix E: Water Source Inventory

TABLE 3-2				
GROUNDWATER USE				
BY AQUIFER SYSTEM AND SUSTAINABLE YIELD				
AQUIFER SECTOR/ SYSTEM	DIKE/BASAL SUSTAINABLE YIELD	1996 PERMITTED USE <sup>1</sup>	AVAILABLE SUSTAINABLE YIELD	1994 DIKE/BASAL USE
<b>HONOLULU</b>				
PALOLO	5	5.889	-0.889	5.207
NUUANU	15	15.170	-0.170	14.894
KALIHI	9	8.492	0.508	7.818
MOANALUA	18	18.570	-0.570	14.700
WAIALAE WEST	4	1.990	2.010	0.866
WAIALAE EAST	2	0.600	1.400	0.247
<b>SUBTOTAL</b>	<b>53</b>	<b>50.511</b>	<b>2.489</b>	<b>43.832</b>
<b>PEARL HARBOR</b>				
WAIMALU	45	48.379	-3.379	45.070
WAIPAHU-WAIAWA <sup>5</sup>	119	110.559	8.441	71.894
EWA-KUNIA	20	17.891	2.109	15.973
MAKAHA	0		0.000	0.000
<b>SUBTOTAL</b>	<b>184</b>	<b>176.829</b>	<b>7.171</b>	<b>132.937</b>
<b>CENTRAL</b>				
WAHIAWA	23	20.748	2.254	9.710
<b>WAIANAE</b>				
NANAKULI <sup>6</sup>	1	0.000	1.000	0.000
LUALUALEI <sup>6</sup>	3	0.300	2.700	0.306
WAIANAE <sup>6</sup>	3	3.272	-0.272	2.886
MAKAHA <sup>6</sup>	4	2.228	1.772	2.204
KEAAU <sup>6</sup>	4	0.000	4.000	0.000
<b>SUBTOTAL</b>	<b>15</b>	<b>5.800</b>	<b>9.200</b>	<b>5.396</b>
<b>NORTH</b>				
MOKULEIA	12	6.030	5.970	2.123
WAIALUA	40	39.738	0.262	25.971
KAWAILOA	39	7.053	31.847	2.003
<b>SUBTOTAL</b>	<b>91</b>	<b>52.821</b>	<b>38.179</b>	<b>30.087</b>
<b>WINDWARD</b>				
KOOLAULOA	35	18.590	18.410	11.714
KAHANA <sup>2</sup>	13	1.101	11.899	0.715
KOOLAUPOKO <sup>2</sup>	43	15.522	27.478	13.760
WAIMANALO <sup>2</sup>	8	1.658	8.344	0.911
<b>SUBTOTAL</b>	<b>99</b>	<b>36.869</b>	<b>62.131</b>	<b>27.100</b>
EWA CAPROCK	N/A <sup>3</sup>			
<b>GRAND TOTAL</b> <sup>4</sup>	<b>485</b>	<b>343.576</b>	<b>121.424</b>	<b>249.072</b>
<sup>1</sup> Dike/Basal Permitted Use as of May 1996. Excludes highly saline to salt water use permits (chlorides > 1,000 mg/l) <sup>2</sup> Permanent instream flow standards may reduce the availability of excess sustainable yield. Withdrawals affecting streams require amendments to instream flow standards <sup>3</sup> Estimated sustainable yield is < 21 mgd due to sugar plantation closure. <sup>4</sup> Grand total of Dike/Basal uses excludes; caprock, springs and perched alluvial sources. <sup>5</sup> Waipahu-Waiawa & Waialua sustainable yields may be reduced to reflect the recharge reduction from sugar plantation closure. <sup>6</sup> 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

11-19-98 W.C. Inv. 1998  
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	1998	1994	1994	1994	1990					
<b>WINDWARD SECTOR</b>													
BWS	HAUULA WELL	3655-01	0.250	0.188					0.245	KOOLAULO	KOOLAULO		
BWS	KAHUKU WELLS	4057-15,16	0.600	0.557					0.546	KOOLAULO	KOOLAULO		FUTURE
BWS	OPANA WELL	4100-03,05	0.000	0.000					0.000	KOOLAULO	KOOLAULO		FUTURE
BWS	KAIPAPAI WELL	3856-03	0.000						0.000	KOOLAUPOKO	KOOLAULO		
BWS	KALUANUI WELLS	3504-04,06	1.093	1.003					0.000	KOOLAUPOKO	KOOLAULO		FUTURE
BWS	LAIE WELL	3858-08	0.000						0.000	KOOLAUPOKO	KOOLAULO		FUTURE
BWS	WAIKALE WELL	3853-02	0.887	0.293					0.000	KOOLAUPOKO	KOOLAULO		FUTURE
BWS	MAANUA WELL	3533-02	0.348	0.293					0.387	KOOLAULO	KOOLAULO		
BWS	PUNALUU WELL I	3533-03 TO 08	4.818	5.429					4.511	KOOLAUPOKO	KOOLAULO		
BWS	PUNALUU WELLS II	3433-08,07	1.339	0.929					1.004	KOOLAUPOKO	KOOLAULO		
BWS	PUNALUU WELL III	3855-08	1.070	0.000					1.000	KOOLAULO	KOOLAULO		
BWS	CAMPUS WELLS	3855-10	0.330	0.000					0.300	KOOLAULO	KOOLAULO		
ZION SECURITIES	CHILD'S WELLS	2854-04	0.380	0.000					0.000	KOOLAULO	KOOLAULO		
ZION SECURITIES	QUARRY WELLS	3856-03	0.690	0.000					0.280	KOOLAULO	KOOLAULO		
ZION SECURITIES	TEMPLE WELLS	3855-09	0.460	0.378					0.100	KOOLAULO	KOOLAULO		
ZION SECURITIES	PCC LAGOON	3856-07	0.090	0.000					0.480	KOOLAULO	KOOLAULO		
ZION SECURITIES	FRAWN FARM	3856-05	0.432	0.000					0.060	KOOLAULO	KOOLAULO		
ZION SECURITIES	LAIE EGGS FARM	3653-01	0.006	0.000					0.700	KOOLAULO	KOOLAULO		
ZION SECURITIES	HANOHANO	3653-03	0.013	0.000					0.100	KOOLAULO	KOOLAULO		
OTA	WHITE, RE	3855-05	0.002	0.000					0.000	KOOLAULO	KOOLAULO		
WHITE	HOLT, LW	3854-02	0.009	0.000					0.000	KOOLAULO	KOOLAULO		
HOLT	NIHPALI	3855-12	0.017	0.000					0.000	KOOLAULO	KOOLAULO		
NIHPALI	KAO	3959-07	0.302	0.000					0.187	KOOLAULO	KOOLAULO		
KAO	KULUNA RESORT 1	4158-14	0.042	0.000					0.500	KOOLAULO	KOOLAULO		
KULUNA RESORT	MALAEKAHANA CE	3858-01	0.008	0.040					0.004	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUMP 8	3857-07	0.578						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	KAWANAKOA	4058-01	0.307						0.249	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUMP 1	4057-01	0.670						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUMP 8	4057-06	0.109						0.131	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUMP 12	4057-07	1.200						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUMP 12-A	4057-10	0.028						0.023	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	SUGAR MILL PUMP	4057-04	0.208						0.147	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PALMER GC	4100-01	1.517						0.001	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUMP 15	4157-04	0.785						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	USFW 1,2,3	4157-05,06,07	0.000						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	AMOR IKKO SALT	4157-09	0.103						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	KAHUKU AIRBASE	4158-12,13	0.814						0.642	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUMP 2	4159-01	0.001						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUNAHONO (ARMY)	4159-02	0.000						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	YASTRO SALT	4258-05	0.000						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	AMOR RCA SALT 1,2	4258-06,14	0.000						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	AMOR PACT SALT 1,2	4258-12,13	0.000						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	ELC FOUNDATION	3755-03	0.019						0.000	KOOLAULO	KOOLAULO		
ELC	PUMP 3	3857-01	0.945						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE	PUMP 3A	3857-03	1.189						0.000	KOOLAULO	KOOLAULO		
CAMPBELL ESTATE													
<b>TOTAL - KOOLAULO</b>			<b>18.590</b>	<b>9.715</b>	<b>2.426</b>	<b>10.453</b>	<b>10.453</b>	<b>10.453</b>	<b>10.453</b>				

Appendix F: Draft EA Distribution List

## Draft EA Distribution List

### Federal Agencies

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

### State Agencies

- Department of Health
- Department of Land and Natural Resources
- University of Hawaii at Manoa  
Environmental Center (Dr. John Harrison)  
Water Resources Research Center
- Office of Environmental Quality Control

### City and County of Honolulu Agencies

- Department of Land Utilization
- Planning Department
- Department of Public Works

### Other Groups and Organizations

- Koolauloa Neighborhood Board No. 28
- Sierra Club, Hawaii Chapter
- Councilman Steve Holmes

Appendix G: Draft EA Comment and Responses



WATER SUPPLY

CITY AND COUNTY OF HONOLULU  
600 SOUTH BERTANJA STREET  
HONOLULU HAWAII 96813  
PHONE (808) 537-4180  
FAX (808) 533-3716



ALBERT WATSON, Mayor  
WALTER D. WATSON, Jr., Chairman  
MAYOR'S WATER ADVISORY BOARD  
KAZUO HAYASHIDA  
MELISSA J. IJUM  
KIMBERLY C. MURPHY  
JONATHAN S. SHIMADA, P.E.  
SUNSHINE STATION  
RICHARD S. SATO  
Manager and Chief Engineer

November 19, 1997

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 WATER SUPPLY PROJECT at KAHALA WAI III, KOOLAULOA, OAHU.

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

We provide the following responses to your concerns:

1. ORIENTATION MAP

- a. The Final EA will include a Koolaupua aquifer boundary map indicating the location of existing and future Board of Water Supply (BWS) wells.
- b. Groundwater flows from high head potential to low potential. In this case, the general groundwater flow path 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 Sacred Falls State Park.

2. ANALYSIS OF HYDROLOGIC UNIT ANALYSIS

An inventory of wells, cessars, permitted uses and pumpage will be provided. The list is part of the Oahu Water Management Plan for the Koolaupua region. As indicated in our comments to the EA guidelines, pump capacity in the aquifer has little utility.

3. 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 project will be financed through the BWS Water System Facilities Charge for resource development.

4. MAINTAINED AND LAND USE ANALYSIS

- a. The proposed well project is in conformance with the Oahu Water Management Plan Hawaii State Water Plan and the County's General and Development Plans.
- b. The proposed project is not anticipated to incur any secondary or cumulative impacts by promoting land use that alter the hydrology of the source and/or end user. Water in excess of Windward's needs will be made available for East Honolulu.
- c. The proposed project is located within state lands, but not within ceded lands.



Mr. Gary Gill  
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- d. The proposed well project is not anticipated to impact stream flow based on test pumping and stream flow gauging. The City, farmers, Kulaena residents and other surface water users should not be affected.

5. ALTERNATIVE ANALYSIS

Alternative methods of potable water production are much more costly than groundwater development. However, BWS has investigated these alternatives in the Oahu Water Management Plan and other specific studies.

- a. Desalination: Desalination will be implemented as groundwater withdrawal approach sustainable yield. A site and technology study is currently under way. While the capital cost of a large-scale desalination plant per gallon is equivalent to groundwater development in rural areas, the operation and maintenance costs are much higher. Groundwater development costs are \$7.00 per thousand gallons in 10 times the cost of pumping groundwater. OAH Cost directly affects water rates, which we are trying to keep as low as possible.

- b. Surface Water: A 1996 Surface Water Study indicated that surface water development for potable use was not feasible, given the small, variable flow and the impact and the intense regulatory process involved with the instream standards and the monitoring requirements of the Safe Drinking Water Act.

- c. Reclamation: The reuse of sewage effluent is a promising alternative resource that is being actively pursued by the city to replace potable use for irrigation and industrial process water and to relieve the development pressure for high quality groundwater supplies. Public health concerns and high costs for dual water supply infrastructure limit the extent of reuse. The city is focusing on the reuse of effluent where dual water systems can be water planned in new developments rather than the more costly alternative to redevelop existing urban areas with dual systems. Additionally, the Honolulu wastewater treatment plant effluent has chlorides content very suitable for irrigation. Whereas the Sand Island plant chloride content is much too high for irrigation use.

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

Very truly yours,

RAYMOND H. SATO  
Manager and Chief Engineer

cc: Paul Inouye, M&E Pacific, Inc.

TABLE 3-2  
BY AQUIFER SYSTEM AND SUSTAINABLE YIELD

AQUIFER SECTOR/ SYSTEM	OVERBASAL SUSTAINABLE YIELD	1984 PERMITTED USE <sup>1</sup>	AVAILABLE SUSTAINABLE YIELD	1984 DIRECT/ BASAL USE
HONOLULU				
PALOLO	5	5 649	-0 689	5 207
MULIWAU	15	15 170	-0 170	14 894
KALIHI	8	8 492	0 508	7 818
MOANALUA	18	18 570	-0 570	14 700
WAIKALAE WEST	4	1 990	2 010	0 866
WAIKALAE EAST	2	0 600	1 400	0 247
SUBTOTAL	55	50 511	3 439	43 832
PEARL HARBOR				
WAIMALU	45	48 379	-3 379	45 070
WAIKAIHUA-WAIKAIHUA	119	110 559	8 441	71 884
EWA-KUPUNA	20	17 893	2 109	15 873
MAKANA	0	0 000	0 000	0 000
SUBTOTAL	184	176 831	7 171	132 837
CENTRAL				
WAIKAIHUA	23	20 746	2 254	8 710
WAIKAIHUA				
WAIKAIHUA	1	0 000	1 000	0 000
LUUALALEI	3	0 300	2 700	0 308
WAIKAIHUA	3	3 272	-0 272	2 486
MAKANA	4	2 228	1 772	2 204
KEAAU	4	0 000	4 000	0 000
SUBTOTAL	15	5 850	8 200	5 383
NORTH				
MOKULEIA	12	8 030	5 870	2 123
WAIKALAE	40	38 739	0 262	25 871
KAWAIAHA	39	7 053	31 847	2 003
SUBTOTAL	91	53 821	38 179	30 007
WINDWARD				
KOOLAUPOKO	35	18 590	18 410	11 716
MAKANA	3	1 101	1 099	0 715
KOOLAUPOKO	43	15 522	27 478	13 760
WAIMANALO	7	1 454	6 344	0 811
SUBTOTAL	88	36 667	62 331	27 102
EWA CAPROCK				
INVA <sup>3</sup>				
GRAND TOTAL	4	343 578	121 424	249 072

1. Data based on permitted use as of May 1986. Excludes 1984 water use permits (circulars #1,000 mgd)  
 2. Permitted maximum flow standards may reduce the availability of excess sustainable yield.  
 3. Withdrawals affecting recharge require amendments to treatment filter standards.  
 4. Estimated sustainable yield is <math>C\_{10}</math> mgd due to higher production capacity.  
 5. Grand total of Direct/Basal uses includes, correct, springs and permitted alluvial sources.  
 6. Waikele/Waikele & Waikele sustainable yields may be reduced to reflect the recharge reduction from higher production capacity.  
 7. Waikele is not a designated water management area, therefore, adding uses are shown in May of permitted use.  
 Source: Geopac Youth and Associates, 1980; DUMI and BWS records.

Revised: 11/17/87

11-19 86 WY, Honolulu  
WATER SOURCE INVENTORY BY AQUIFER SYSTEM (MGD)

USER	SOURCE	WELL NO.	PERMITTED USE 1984	FUTABLE USE 1984	NON-POTABLE USE 1984	COMBINED USE 1984	DEVELOPMENT PLAN AREA	AQUIFER SYSTEM	SOURCE COMMENTS
<b>WINDWARD SECTOR</b>									
BWS	HAUOLA WELL	3450-01	0.250	0.160		0.245	KOOLAUPOKO	KOOLAUPOKO	
BWS	KAHUKU WELLS	4007-18,18	0.000	0.367		0.346	KOOLAUPOKO	KOOLAUPOKO	
BWS	OPANA WELL	4100-03,05	0.000	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	FUTURE
BWS	KAPAPALI WELL	3850-03	0.000			0.000	KOOLAUPOKO	KOOLAUPOKO	FUTURE
BWS	KALIUMU WELLS	3544-04,05	1.083	1.003		0.000	KOOLAUPOKO	KOOLAUPOKO	FUTURE
BWS	LAIE WELL	2622-08	0.000			0.000	KOOLAUPOKO	KOOLAUPOKO	FUTURE
BWS	WAIKALAE WELL	2604-09	0.000			0.000	KOOLAUPOKO	KOOLAUPOKO	FUTURE
BWS	MAKANA WELL	2653-07	0.887			0.000	KOOLAUPOKO	KOOLAUPOKO	FUTURE
BWS	PUNALUU WELL 1	2553-02	0.348	0.290		0.387	KOOLAUPOKO	KOOLAUPOKO	
BWS	PUNALUU WELLS #	2553-03 TO 06	4.618	3.429		4.511	KOOLAUPOKO	KOOLAUPOKO	
BWS	PUNALUU WELLS #	2453-08,07	1.379	0.929		1.004	KOOLAUPOKO	KOOLAUPOKO	
BWS	PUNALUU WELLS #	2453-08,07	1.079	0.749		1.000	KOOLAUPOKO	KOOLAUPOKO	
ZION SECURITIES	CAMPUS WELLS	2685-08			0.000	0.000	KOOLAUPOKO	KOOLAUPOKO	
ZION SECURITIES	CHURCH WELLS	2685-10			0.000	0.000	KOOLAUPOKO	KOOLAUPOKO	
ZION SECURITIES	QUARRY WELLS	2684-04	0.330	0.849		0.620	KOOLAUPOKO	KOOLAUPOKO	
ZION SECURITIES	TEARLE WELLS	2684-03	0.380	0.378		0.290	KOOLAUPOKO	KOOLAUPOKO	
ZION SECURITIES	POC LAGOON	2683-08	0.880			0.100	KOOLAUPOKO	KOOLAUPOKO	
ZION SECURITIES	PRATT FARM	2686-07	0.480			0.400	KOOLAUPOKO	KOOLAUPOKO	
ZION SECURITIES	LAKE EGGS FARM	2686-05	0.080			0.080	KOOLAUPOKO	KOOLAUPOKO	
HANOHANO	HANOHANO	2683-01	0.432	0.000		0.700	KOOLAUPOKO	KOOLAUPOKO	
OTA	OTA	2463-03	0.006	0.000		0.100	KOOLAUPOKO	KOOLAUPOKO	
WHITE	WHITE, NE	2635-05	0.013	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	
HOLT	HOLT, LW	2634-02	0.002	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	
HNPALI	HNPALI	2634-12	0.009	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	
KAO	KAO ARTESIAN	2634-07	0.017	0.000		0.100	KOOLAUPOKO	KOOLAUPOKO	
KULUNA RESORT	KULUNA RESORT 1	4158-14	0.382			0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	MALAEKANA CREEK	2704-03	0.042	0.040		0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP #	2637-07	0.008			0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	KAWAIAHA	4026-01	0.878			0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP #	4027-01	0.307		0.219	0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP #	4027-02	0.670		0.000	0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP #	4027-07	0.109		0.131	0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP 12	4027-18	1.200		0.000	0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	SLIDER MILL PUMP	4027-04	0.028		0.023	0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	SALMER DC	4100-01	0.208		0.167	0.100	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP 15	4157-04	1.517		0.001	0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	USFW 1,2,3	4157-06,08,07	0.795	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	AMOR RICA SALT	4157-06	0.000	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	KAWAIAHA	4158-12,13	0.105	0.069		0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP 2	4199-01	0.814		0.842	0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUNAHONO (ARMY)	4199-02	0.001	0.013		0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	T ASTRO SALT	4258-06	0.000	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	AMOR RICA SALT 1,2	4258-08,14	0.000	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	AMOR RICA SALT 1,3	4258-12,13	0.000	0.000		0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	ELC FOUNDATION	2704-03	0.019			0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP 3	2637-03	0.945			0.000	KOOLAUPOKO	KOOLAUPOKO	
CAMPBELL ESTATE	PUMP 3A	2637-03	1.199			0.000	KOOLAUPOKO	KOOLAUPOKO	
<b>TOTAL - KOOLAUPOKO</b>			<b>14 560</b>	<b>9 715</b>	<b>2 478</b>	<b>10 463</b>			

**BOARD OF WATER SUPPLY**

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



October 31, 1997

**COPY**

FRUIT HARRIS, Mayor  
WALTER D. WATSON, Jr., Chairman  
MARCUS M. KAMATA, Vice-Chairman  
KATHY M. MATHIAS  
MELISSA Y. MATHIAS  
FORREST C. LAIBINIS  
JOHN W. K. SHIMADA, P.O.  
BARBARA ANN STANTON  
RAYMOND H. SATO  
Manager and Chief Engineer

P

PLANNING DEPARTMENT

**CITY AND COUNTY OF HONOLULU 973547**

850 SOUTH KING STREET, 8TH FLOOR • HONOLULU, HAWAII 96813-3017  
PHONE: (808) 522-5711 • FAX: (808) 522-4950



JEREMY HARRIS  
Mayor

PATRICK ONISHI  
Chief Planning Officer  
DONALD HARRIS  
Deputy Chief Planning Officer  
GW 9/97 1893

PE

TO: PATRICK T. ONISHI, CHIEF PLANNING OFFICER  
PLANNING DEPARTMENT  
FROM: *Raymond Sato*  
RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER  
BOARD OF WATER SUPPLY

SUBJECT: YOUR MEMORANDUM OF OCTOBER 22, 1997 TO M&E PACIFIC, INC.  
REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE  
PROPOSED KALUANUI WELL III, KOOLAULOA, OAHU, HAWAII.  
IMK: 5-3-11: 09

October 22, 1997

Mr. Paul Inouye, Project Manager  
M & E Pacific, Inc.  
1001 Bishop Street, Suite 500  
Honolulu, Hawaii 96813

Kaluanui Well III, Koolauloa, Oahu  
Draft Environmental Assessment (DEA)

We have reviewed the subject DEA. The proposed project is consistent with provisions of the General Plan, the Development Plans, and the Development Plan Land Use Map for Koolauloa. An amendment to provide a symbol for this project on the Koolauloa Development Plan Public Facilities Map is currently in process, and passed third reading before the City Council on October 15, 1997.

If you should have any questions or concerns, please do not hesitate to contact Gordon Wood of the Planning Department staff at 527-6073.

Yours very truly,

*Patrick T. Onishi*  
PATRICK T. ONISHI  
Chief Planning Officer

PTO:lh

c: Ray Sato, BWS

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

We acknowledge that the proposed project is consistent with the provisions of the General Plan, the Development Plans and the Development Plan Land Use Map for Koolauloa. We note that an amendment to provide a symbol for this project on the Koolauloa Development Plan Public Facilities Map is currently in process, and passed third reading before the City Council on October 15, 1997.

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

c: Paul Inouye, M&E Pacific, Inc.

11-11-97 10:00 AM

RECEIVED NOV 07 1997

DEPARTMENT OF LAND UTILIZATION  
**CITY AND COUNTY OF HONOLULU**

540 SOUTH KING STREET 7TH FLOOR - HONOLULU HAWAII 96813  
PHONE (808) 522-4414 FAX (808) 527-8733



JAN PAUL SULLIVAN  
DIRECTOR  
LORITA L.C. CHEE  
DEPUTY DIRECTOR  
97-06953(ST)  
'97 EA Comments Zone 5

October 22, 1997

Mr. Paul Inouye, Project Manager  
M&E Pacific, Inc.  
Pauahi Tower, Suite 500  
1001 Bishop Street  
Honolulu, Hawaii 96813

Dear Mr. Inouye:

Draft Environmental Assessment (DEA) For  
Development of Kalaanui Well III  
Koolaupoko, Oahu  
Tax Map Key: 5-3-11: por. 09

We have reviewed the DEA transmitted by your letter dated September 22, 1997, for the development of the above-referenced well and offer the following comments:

1. Section 5.1 Technical Description, should be revised to include an elevation illustration of the actual improvements proposed at the well site. This section should also describe the size of the proposed area for these improvements.
2. Section 6.3 Infrastructure, should clarify whether electric and telephone services are already provided to the proposed well site. It is our understanding that utilities are available at the existing control building located approximately 150 feet to the south, and that ONLY exploratory work has been conducted at this location thus far.
3. Section 6.4 Land Use Zoning/Ownership, should be expanded to disclose that the proposed site is currently zoned P-2 General Preservation. This section should also include the Development Plan (DP) and DP Public Facilities Map designation of this site.

Mr. Paul Inouye, Project Manager  
Page 2  
October 22, 1997

Thank you for the opportunity to comment. Should you have any questions, please contact Steve Tagawa of our staff at 523-4817.

Very truly yours,

JAN PAUL SULLIVAN  
Director of Land Utilization

JNS:am

cc: State Office of Environmental Quality Control

97-06953(ST).am

RECEIVED OCT 23 1997

RECEIVED NOV 20 1997

**COPY**

**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 12, 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

TO: JAN SULLIVAN, DIRECTOR  
DEPARTMENT OF LAND UTILIZATION

FROM: *Raymond H. Sato*  
RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER  
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF OCTOBER 22, 1997 TO M&E PACIFIC, INC., REGARDING THE  
DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED KALUANUI WELL III,  
KOOLAULOA, OAHU, HAWAII, TMK: 5-3-11: 09

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kaluanui Well III production facility.

We provide the following responses to your concerns:

1. An elevation representation along with the size of the actual improvements proposed at the well site will be incorporated within Section 5.1, Technical Description, of the Final EA.
2. Section 6.3, Infrastructure, will be revised to indicate that electrical and telephone services are already provided to the proposed well site. Utilities are available at the existing control building located approximately 350 feet to the south. Exploratory well drilling has only been performed at the well site thus far.
3. Section 6.4, Land Use Zoning/Ownership, will be expanded to disclose that the proposed site is currently zoned P-2 General Preservation. In addition, the Development Plan (DP) and DP Public Facilities Map designation will be specified.

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

~~cc:~~ Paul Inouye, M&E Pacific, Inc.



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

ATTENTION OF

October 16, 1997

Planning and Operations Division

Mr. Paul Inouye, Project Manager  
M&E Pacific, Incorporated  
1001 Bishop Street, Suite 500  
Honolulu, Hawaii 96813

Dear Mr. Inouye:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment (DEA) for the Kalaanui Well III Project, Koolauloa, Oahu (TMK 5-3-11: 9). 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. Based on the information provided, a DA permit will not be required for the project. Should you require any further information, please contact our Regulatory Section at 438-9258 and refer to file number 970000350.
- b. The flood hazard information provided on page 4 of the DEA is correct.

Sincerely,

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

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU  
630 SOUTH BERTANUA STREET  
HONOLULU HAWAII 96843  
PHONE (808) 527-6190  
FAX (808) 533-2714



October 27, 1997

Mr. Paul Mizue, P.E.  
Planning and Operations Division  
Department of the Army  
Pacific Ocean Division, Corps of Engineers  
Fort Shafter, Hawaii 96858-3440

Dear Mr. Mizue:

Subject: Your Letter of October 16, 1997 to M&E Pacific, Inc. Regarding the Draft Environmental Assessment for the Proposed Kalaanui Well III, Koolauloa, Oahu, Hawaii. TMK: 5-3-011: 009

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

We acknowledge that a Department of the Army permit will not be required for the proposed project and that you concur with the floor hazard information.

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

Very truly yours,

FOR RAYMOND H. SATO  
Manager and Chief Engineer

cc: Paul Inouye, M&E Pacific, Inc.

COPY

JEREMY HARRIS, M.D.  
WALTERO HANSON, B. Sc.D.  
MUNICHIRO HIRASATO, Ph.D.  
MUSSEY H. J. JUD  
KUNISADA K. KAWANO  
KIMIKAZU K. KAWANO  
DAIICHI K. KAWANO  
BARBARA KIM STANTON  
RAYMOND H. SATO  
Manager and Chief Engineer

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For Water - see if there is

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STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
LAND DIVISION  
PO BOX 611  
HONOLULU HAWAII 96809

October 13, 1997

REF.: WELL1111.RCM

LD-NAV

Mr. Paul Inouye  
Project Manager  
M & E Pacific, Inc.  
A Metcalf & Eddy Company  
1001 Bishop Street, Suite 500  
Pauahi Tower  
Honolulu, Hawaii 96813

Dear Mr. Inouye:

SUBJECT: Review : Draft Environmental Assessment  
Project : Kaluanui Exploratory Well III  
Proposal : Establish necessary facilities to convert  
the Kaluanui Exploratory Well III into a  
Production well  
Purpose : to satisfy the growing water demand for the  
Honolulu and Windward District  
Applicant: Board of Water Supply  
Location : Kaluanui Valley, Island of Oahu, Hawaii  
TMK : 1-3-1-11-09

Thank you for the opportunity to review and comment on the  
subject: Draft Environmental Assessment for the Kaluanui Exploratory  
Well III project.

The Department of Land and Natural Resources has no comments  
to offer on the subject matter at this time.

Should you have any questions, please contact Nicholas Vaccaro  
of our Land Division's Support Services Branch at 587-0438.

Very truly yours,

*William Young*  
DEAN Y. UCHIDA  
Administrator

c: Oahu Land Board Member  
At Large Land Board Member  
Oahu District Land Office

COPY

RAYMOND H. SATO  
Manager and Chief Engineer  
M&E PACIFIC, INC.  
1001 BISHOP STREET, SUITE 500  
PAUHAHI TOWER  
HONOLULU, HAWAII 96813  
PHONE (808) 527-6190  
FAX (808) 533-2714



October 27, 1997

BOARD OF WATER SUPPLY  
CITY AND COUNTY OF HONOLULU  
600 SOUTH BERETANGA STREET  
HONOLULU HAWAII 96843  
PHONE (808) 527-6190  
FAX (808) 533-2714

Mr. Dean Uchida, Administrator  
Department of Land and Natural Resources  
State of Hawaii  
P. O. Box 621  
Honolulu, Hawaii 96809

Dear Mr. Uchida:

Subject: Your Letter of October 13, 1997 to M&E Pacific, Inc. Regarding the Draft  
Environmental Assessment for the Proposed Kaluanui Well III, Koolauloa, Oahu,  
Hawaii. TMK: 1-3-1-11-09

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

We acknowledge that you have no comments to the proposed well development.

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

Very truly yours,

*Barry Usagawa*  
FOR RAYMOND H. SATO  
Manager and Chief Engineer

cc: Paul Inouye, M&E Pacific, Inc.



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

October 10, 1997

97-068A/epo

Mr. Paul Inouye, Project Manager  
M&E Pacific, Inc.  
Paahai Tower, Suite 500  
1001 Bishop Street  
Honolulu, Hawaii 96813

Dear Mr. Inouye:

Subject: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)  
Project: Kaluanui Well III (STATE WELL NO. J-3554-06)  
Location: Kaluanui Valley, Oahu, Hawaii  
TMK: (1) 5-3-11: 9

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

1. Hawaii Administrative Rules (HAR), Title 11, Chapter 20, "Rules Relating to Potable Water Systems," Section 11-20-29 requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29. The Honolulu Board of Water Supply has submitted an engineering report for the Kaluanui Well III which is now under review.
2. In the subject DEA, Section 9.0, List of Permits, should be revised as follows:

State of Hawaii:  
Subdivision Application (DLU)  
NPDES Permit, if necessary (DOH)  
Water Use Permit (DLNR)  
Pump Installation Permit (BOH - DLNR)  
Potable Water Source Approval (DOH)

Should you have any questions on these comments, please contact Mr. Stuart Yamada of the Safe Drinking Water Branch at 586-4258.

Mr. Paul Inouye, Project Manager  
October 10, 1997  
Page 2

97-068A/epo

Water Pollution

1. The applicant should contact the Army Corps of Engineers to identify whether a federal permit (including a Department of Army permit) is required for this project. If a federal permit is required, then a Section 401 Water Quality Certification is required from the State Department of Health, Clean Water Branch.
2. A National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State:
  - a. Storm water discharges relating to construction activities, such as clearing, grading, and excavation, for projects equal to or greater than five acres;
  - b. Storm water discharges from industrial activities;
  - c. Construction dewatering activities;
  - d. Noncontact cooling water discharges less than one million gallons per day;
  - e. Treated groundwater from underground storage tank remedial activities; and
  - f. Hydrotesting water.
3. Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 30 days prior to commencement of any discharge to waters of the State.

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

Sincerely,

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

c: SDWB  
CWB

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**BOARD OF WATER SUPPLY**

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



October 27, 1997

**COPY**

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

Bruce S. Anderson, Ph.D.  
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 10, 1997 to M&E Pacific, Inc., Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kaluanui Well III, Koolauloa, Oahu, TMK: 5-3-11: 09

Thank you for your letter regarding the Draft Environmental Assessment (EA) for the Board of Water Supply's proposed Kaluanui Well III project.

We provide the following responses to your concerns:

1. We acknowledge that the engineering report for the proposed project is currently under review by the Department of Health (DOH).
2. Section 9.0, List of Permits, of the Final EA will be revised as follows:

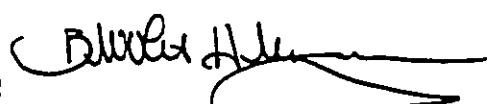
State of Hawaii:

Pump Installation Permit (Department of Land and Natural Resources)

Potable Water Source Approval (DOH)

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

Very truly yours,

  
FOR  
RAYMOND H. SATO  
Manager and Chief Engineer

cc: Paul Inouye, M&E Pacific, Inc.



STATE OF HAWAII  
 OFFICE OF HAWAIIAN AFFAIRS  
 711 KAPOLANU BOULEVARD SUITE 500  
 HONOLULU HAWAII 96813-5269

PHONE (808) 584-1848  
 FAX (808) 584-1865

October 01, 1997

Mr. Paul Inouye  
 M&E Pacific, Inc.  
 1001 Bishop Street  
 Suite 500 Paahahi Tower  
 Honolulu, HI 96813

Subject: Draft Environmental Assessment (DEA) for Kaluanui  
 Well III, Koolaulao, Island of Oahu.

Dear Mr. Inouye:

Thank you for the opportunity to review the Draft Environmental Assessment (DEA) for Draft Environmental Assessment (DEA) for Kaluanui Well III, Koolaulao, Island of Oahu. The Board of Water Supply is seeking to convert the Kaluanui Exploratory Well III into a production well. The proposed conversion is part of an overall effort to increase the agency's capacity to meet growing urban water demands.

The Office of Hawaiian Affairs (OHA) has no objections at this time to the proposed production well. According to the DEA, the well apparently bears no adverse impacts on adjacent lands nor upon existing flora or fauna and no known archaeological remains exist in the area. Furthermore, the well will neither significantly affect nearby scenic resources nor air quality. Moreover, water pumping will not significantly impact the sustainable yield of the Koolaulao aquifer system nor affect waterflow of nearby Kaluanui stream. Apparently the basal aquifer and the Kaluanui stream are physically separated by layers of relatively impermeable alluvium which makes water pumping uneventful.

Letter to Mr. Inouye  
 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

LM:lm

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

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**BOARD OF WATER SUPPLY**

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



October 27, 1997

**COPY**

JEREMY HARRIS Mayor

WALTER O. WATSON, JR. Chairman  
MAURICE H. YAMASATO Vice Chairman  
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BARBARA KIM STANTON

RAYMOND H. SATO  
Manager and Chief Engineer

Mr. Randall Ogata, Administrator  
Office of Hawaiian Affairs  
State of Hawaii  
711 Kapiolani Boulevard, Suite 500  
Honolulu, Hawaii 96813-5249

Dear Mr. Ogata:

Subject: Your Letter of October 1, 1997 to M&E Pacific, Inc. Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kaluanui Well III, Koolauloa, Oahu, TMK: 5-3-11: 09

Thank you for your letter regarding the Draft Environmental Assessment for the Board of Water Supply's proposed Kaluanui Well III project.

We acknowledge that you have no objections to the proposed well project. Pumpage from the Kaluanui Well station should not affect stream flow within Kaluanui Stream since the basal aquifer and Kaluanui Stream, in the lower reach, are physically separated by relatively impermeable alluvium. Test pumping and stream gaging procedures were conducted, as part of this project.

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

Very truly yours,

FOR RAYMOND H. SATO  
Manager and Chief Engineer

cc: Paul Inouye, M&E Pacific, Inc.

RECEIVED OCT 31 1997

