BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843

January 7, 2000

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

Dear Ms. Salmonson:

Subject: Finding of No Significant Impact for the Proposed Aina Koa Well II (Formerly Waialae Nui Ridge Well), Honolulu, Oahu, Hawaii, TMK: 3-5-62: 44

The Board of Water Supply has reviewed the comments received during the public comment period which began on October 8, 1999. 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 our proposed well project be published as finding of no significant impact in the next Office of Environmental Quality Control (OEQC) Bulletin.

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

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

Very truly yours,

CLIFFORD S. JAMILE
Manager and Chief Engineer

Attachments

cc: Al Lono Lyman, CH2M Hill

Final Environmental Assessment

2000-01-23-OA-FEA

(AINA KOA WELL II)

AINA KOA, HONOLULU, OAHU, HAWAII
TAX MAP KEY: 3-5-62:44

ACCEPTING AGENCY:
CITY AND COUNTY OF HONOLULU
BOARD OF WATER SUPPLY

DECEMBER 1999

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Chapter 1
Summary and Introduction

1.1 Proposing Agency and Requested Government Action

The Aina Koa Well II, formerly referred to as the Waialae Nui Ridge Well, is identified by the State of Hawaii, Commission on Water Resource Management (CWRM) as well number 1746-04. Kamehameha Schools (formerly referred to as "Kamehameha Schools Bishop Estate" and "KSBE") drilled it as an exploratory well in April 1993. The site of the well is owned by the City and County of Honolulu, Board of Water Supply (BWS) and is identified as tax map key (TMK) 3-5-62:44. BWS and Kamehameha Schools now propose to make additional improvements to convert the Aina Koa Well II from an exploratory to a production well and connect it to the BWS system. In addition to the exploratory well, improvements would include:

- Installation of a pump, with a pumping capacity of approximately 1.0 million gallons per day (mgd)
- Construction of a control building with Supervisory Control and Data Acquisition (SCADA) interface
- Connection to the BWS municipal water system and City sewer system
- Modifications of existing piping at two BWS Reservoirs and Booster Pump Stations (identified as Aina Koa 640' Reservoir and Booster Pump Station No. 3 (TMK 3-5-56:26), and Aina Koa 405' Reservoir and Booster Pump Station No. 2 (TMK 3-5-48:25))

The Aina Koa Well II has been allocated 0.997 million gallons per day (mgd) by CWRM. Based on the CWRM allocation, the Aina Koa Well II would be capable of producing up to approximately 1.0 mgd of potable water. Following installation of the pump and accompanying facilities, the well will be integrated into the BWS's water system. The development of additional water sources is necessary in order to accommodate the demand for water from Kamehameha-Schools-sponsored projects.

Pursuant to Hawaii Revised Statutes, Chapter 343 (HRS 343) and applicable agency rules, an environmental assessment (EA) is required for this proposed project because the site is located on County-owned lands controlled by BWS. BWS is the authority for accepting this EA.

1.2 Purpose of this Environmental Assessment

Any project proposing the use of county lands or funds must comply with the environmental reporting and disclosure requirements of HRS 343.

A final environmental assessment and an accompanying negative declaration by BWS determining that the impacts of this project are not sufficient to require the preparation of an environmental impact statement and would satisfy HRS 343.

1.3 Subsequent Permits and Approvals Required

Installation and operation of permanent well facilities on the project parcel will require the following permits and discretionary approvals:

1. A Pump Installation Permit and a Water Use Permit from CWRM.

2. A Noise Permit (temporary variance), if required, from the State Department of Health, Noise and Radiation Branch, to allow for temporary increases in permitted noise levels during construction activities.

3. City and County of Honolulu construction-related permits, if required, including grading, building, and street usage permits.

1.4 Alternatives Considered

The following alternatives to the proposed production well were considered in this EA:

- No Action
- Deferred Action
- Alternative Sites

The no action alternative was not pursued because it would not meet BWS requirements that large landowners meet their potable water demand requirements by assisting the BWS with additional source development. If the BWS's water source development were curtailed, the BWS would be hampered in providing adequately for the water needs of the future population of the island, which may result in regional water shortages. Water from this well is required to fulfill additional demands from Kamehameha-Schools-sponsored projects.

The deferred action alternative was not pursued because this alternative would delay the implementation schedule and would incur higher development costs because of inflation. Delay in the proposed well would increase the risk that the projects identified as "end users" of this water would cause an undue strain on the existing water supply system or would not be able to proceed due to a lack of sufficient potable water.

This EA analyzes a possible potable groundwater source site in the Honolulu Sector, where surplus sustainable yields occur in the high-level source areas. Prior to the consideration of this site, the BWS conducted an analysis of 21 other potential sites within the Honolulu Sector for additional potable wells in its *Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii* (1986). Additional well sites were proposed in the vicinity of the Aina Koa Well II in the BWS study. Of the other sites, the Kalani Iki Well was identified as an alternative. It

is not being pursued at this time for two reasons: access to the site is through privately-owned land and its location is only approximately 200 feet from the interpreted Northeast Dike Alignment, a hydrologic barrier that might cause greater well drawdown and thus less well capacity. Additional sites were identified in the Waialae East Aquifer and have been drilled as exploratory wells, but have not been pursued by the BWS as production facilities.

Alternative source development was not pursued in this analysis since the BWS had also analyzed potential potable water source alternatives other than groundwater in its 1986 study, including desalinization, development of surface and brackish water sources, and recycling of treated wastewater. Typically, these alternative sources have considerably higher costs and technical challenges. For instance, the use of surface water has a high potential for health and safety problems and would require costly water treatment. The development of these alternatives was not considered as feasible as the development of groundwater resources.

1.5 Potential Impacts of this Project and Mitigation Measures

Construction work, primarily erection of the control building and underground piping installation, would cause minor short-term noise and fugitive dust impacts to the surrounding environment. All government rules and regulations concerning noise and fugitive dust emissions would be followed during construction to minimize minor short-term noise and air pollution impacts.

To mitigate any short-term noise impacts, contractors would comply with all of the conditions of any required noise permit. Mufflers would be used on all construction equipment. All noise-attenuating equipment would be maintained in proper operating condition and would be repaired or replaced as needed. In order to reduce noise levels from the production pump, a submersible pump will be used.

To mitigate the short-term air pollution effects of the construction activities, dust control measures would be implemented by the contractor to reduce dust levels, as necessary. Further, the contractor would properly maintain its internal combustion equipment to minimize exhaust emissions and would comply with the State of Hawaii, Department of Health Rules Title 11, Chapter 59 and 60 regarding Air Pollution Control.

Traffic impacts to Halekoa Drive and the surrounding community would be minimal. The contractor would schedule the movement of heavy trucks and vehicles to or from the site after 8:00 AM and before 3:30 PM to avoid the morning and afternoon peak traffic periods.

1.6 Determination

In accordance with HRS 343, BWS has determined that an Environmental Impact Statement (EIS) is not required for the Aina Koa Well II's exploratory drilling, installation of permanent well and related improvements, and operation, including improvements to two BWS Reservoirs and Booster Pump Stations (identified as Aina Koa 640' Reservoir and Booster Pump Station No. 3 and the Aina Koa 405' Reservoir and Booster Pump Station No. 2). These two Reservoirs and Booster Pump Station sites are located on TMK locations 3-5-56:26 and 3-5-48:25 respectively.

This determination has been made because of the absence of significant adverse impacts associated with the project and because identified impacts would be either short-term or mitigated to insignificant levels.The following summarizes the findings and reasons supporting the determination of no significant impact relative to the criteria listed in Hawaii Administrative Rules Title 11, Department of Health, 200-12.

1) "Involves an irrevocable commitment to loss or destruction of any natural or cultural resource"

   As stated in section 4.9.1 of the draft and final EA:

   > "The project will have "no effect" on historic or cultural sites. The site and surrounding area were graded in conjunction with the development of the surrounding residential subdivision. The site is not currently listed on the Hawaii Register or the National Register of Historic Places, nor has it been determined eligible for inclusion on either of these registers. There are no known traditional gathering activities and/or cultural practices affecting the subject property."

2) "Curtails the range of beneficial uses of the environment,"

   The following is stated in section 4.1.2 regarding project impacts on existing land uses:

   > "Construction and operation of the proposed Aina Koa Well II has not and will not change any of the surrounding land uses or ownership patterns. The modifications at Aina Koa 640' Reservoir and Booster Pump Station No. 3 and Aina Koa 405' Reservoir and Booster Pump Station No. 2 also will not change any of the surrounding land uses or ownership patterns."

3) "Conflicts 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 decisions, or executive orders"

   The proposed project is consistent with the Environmental Policies established in Chapter 344, Hawaii Revised Statute.

4) "Substantially affects the economic or social welfare of the community or State"

   As stated in section 4.10.2 of the draft and final EA, regarding project impacts on the socioeconomic environment:

   > "The Aina Koa Well II will have no impact upon the socioeconomic environment of the immediate neighborhood."
   >
   > "A small number of temporary construction jobs will be created by the construction; however, these jobs will likely involve people living on Oahu but outside this census tract."

5) "Substantially affects public health"

   Short-term construction impacts may affect noise and fugitive dust levels and would add to traffic on Halekoa Drive, however these impacts are not considered to be significant nor are

they considered to have a substantial impact on pubic health. Section 1.5 of the draft and final EA summarizes these impacts and the related mitigation measures:

> "Construction work, primarily erection of the control building and underground piping installation, would cause minor short-term noise and fugitive dust impacts to the surrounding environment. All government rules and regulations concerning noise and fugitive dust emissions would be followed during construction to minimize minor short-term noise and air pollution impacts."
>
> "To mitigate any short-term noise impacts, contractors would comply with all of the conditions of any required noise permit. Mufflers would be used on all construction equipment. All noise-attenuating equipment would be maintained in proper operating condition and would be repaired or replaced as needed. In order to reduce noise levels from the production pump, a submersible pump will be used."
>
> "To mitigate the short-term air pollution effects of the construction activities, dust control measures would be implemented by the contractor to reduce dust levels, as necessary. Further, the contractor would properly maintain its internal combustion equipment to minimize exhaust emissions and would comply with the State of Hawaii, Department of Health Rules Title 11, Chapter 59 and 60 regarding Air Pollution Control."
>
> "Traffic impacts to Halekoa Drive and the surrounding community would be minimal. The contractor would schedule the movement of heavy trucks and vehicles to or from the site after 8:00 AM and before 3:30 PM to avoid the morning and afternoon peak traffic periods."

Potable water quality is subject to considerable federal and state scrutiny in order to assure the protection of public health. The project is part of the BWS program to provide a safe and reliable potable municipal water supply to meet growing demand. As stated in the section 3.2 of the draft and final EA concerning alternatives considered:

> "The Aina Koa Well II was identified as part of an overall groundwater development program intended to increase the municipal water supply to meet growing demand. If the BWS's water source development program were curtailed, the BWS would be hampered in providing adequately for the water needs of the future population of the island, which could result in regional water shortages. Water from the Aina Koa Well II is required to fulfill additional demands from Kamehameha-Schools-sponsored developments.
>
> "Based on the foregoing, the Aina Koa Well II would have a beneficial impact on public health for Oahu residents and visitors."

6) "Involves substantial secondary impacts, such as population changes or effects on public facilities"

The BWS development of potable water sources is to meet demand arising from population changes over time. The development of new water sources has a minimal short-term impact on employment and thus on population.

The effect on public facilities will be to increase the municipal water supply to meet growing demand. As noted previously, if the BWS were hampered in providing adequately for the water needs of the future population of the island, regional water shortages could result. The project would thus have a beneficial impact on public facilities.

7) "Involves a substantial degradation of environmental quality"

   There are no project impacts that would degrade environmental quality.

8) "Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions."

   The project would not have any effect that is either limited cumulatively or involves a commitment for larger actions.

9) "Substantially affects a rare, threatened, or endangered species, or its habitat"

   As stated in the draft and final EA section 4.8.2 regarding impacts on biological resources: "No adverse impact to any biological resources is anticipated."

10) "Detrimentally affects air or water quality or ambient noise levels"

    The project will not detrimentally affect air or water quality or ambient noise levels. Short-term construction impacts may affect noise and fugitive dust levels and would add to traffic on Halekoa Drive, however these impacts are not considered to be significant. Section 1.5 of the draft and final EA summarizes these impacts and the related mitigation measures.

11) "Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters"

    The project will not affect or suffer damage to an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

12) "Substantially affects scenic vistas and viewplanes identified in county or state plans or studies "

    The Aina Koa II Well and related improvements will have no impact on scenic vistas and view planes identified in county or state plans or studies. All of the project improvements are either in county roadways or on existing BWS sites developed for the purpose of storing and delivering potable municipal water.

13) "Requires substantial energy consumption"

    The energy required to operate the Aina Koa II Well's pump does not represent substantial energy consumption.

1.7 Agencies and Others Consulted in Making this Assessment

The following agencies were consulted for this project:

State of Hawaii agencies

- Department of Land and Natural Resources, Commission on Water Resource Management
- Office of Environmental Quality Control

City and County of Honolulu agencies

- Department of Planning and Permitting
- Board of Water Supply

Chapter 2
Purpose and Need

2.1 Project's Purpose and Need

In 1980, the average municipal water demand on the island of Oahu was 130 mgd. The BWS's 1982 *Oahu Water Plan* projected that the island-wide average municipal water demand would increase to 156 mgd in 1990, and to 181 mgd in the year 2000. Actual BWS water usage in 1990 averaged 158 mgd, of which 156 mgd was potable water. In 1992, CWRM in its 1992 review draft of the "*Hawaii Water Plan, Oahu Water Management Plan,*" projected that municipal water demand would be between 204 to 213 mgd by the year 2010, depending on whether the upper limit of the City and County of Honolulu's General Plan population projection for Oahu is attained. Thus, additional water requirements for the year 2010 are projected to be between 48 and 57 mgd.

In addition to the general overall municipal growth, several publicly and privately sponsored developments are either currently under construction or are planned to be built soon. These large projects would place even greater demands upon the BWS water supply system. Under current BWS policy, developers of large-scale developments must work to supply the additional requirements to the BWS system. To meet the demand for water represented by Kamehameha-Schools-sponsored developments, Kamehameha Schools is developing a new source of potable groundwater within the Waialae Nui Ridge area of Oahu, located within the seaward part of the West Waialae Aquifer System.

Based on the CWRM allocation, the Aina Koa Well II would be able to pump a maximum of approximately 1.0 mgd of potable water and will be integrated into the BWS's potable water source, storage, and transmission system.

2.2 The State Water Code and the Commission on Water Resource Management

The State Water Code and CWRM were established in 1987 by the Hawaii State Legislature in Section 174-C of the HRS. CWRM was established to handle the administration of the new State Water Code.

The State Water Code established a Hawaii Water Plan consisting of four parts:

- A water resource protection plan prepared by CWRM
- Water use and development plans prepared by each county
- A state water project plan prepared by state agencies
- A water quality plan prepared by the Department of Health

As part of the Hawaii Water Plan, a study was commissioned to determine the sustainable yields of surface and groundwater sources statewide.

Under the State Water Code, CWRM created management boundaries for Water Management Areas (WMAs). WMAs were designated by CWRM for those areas where it decided, after conducting scientific investigation and research, that management of ground or surface waters or both was necessary because the water resources for those areas were threatened by existing or proposed withdrawals or diversions of water. CWRM has administrative control over the withdrawals and diversions of ground and surface waters, respectively, within a WMA and is responsible for ensuring reasonable beneficial uses of the resources in the public interest.

In designating an area for groundwater use regulation, CWRM must consider the following:

(1) *Whether an increase in water use or authorized planned use may cause the maximum rate of withdrawal from the groundwater source to reach 90 percent of the sustainable yield of the proposed water management area;*

(2) *[Whether] there is an actual or threatened water quality degradation as determined by the Department of Health;*

(3) *Whether regulation is necessary to preserve the diminishing groundwater for future needs, as evidenced by excessively declining groundwater levels;*

(4) *Whether the rates, times, spatial patterns, or depths of existing withdrawals of groundwater are endangering the stability or optimum development of the groundwater body due to upconing or encroachment of salt water;*

(5) *Whether the chloride contents of existing wells are increasing to levels which materially reduce the value of their existing uses;*

(6) *Whether excessive preventable waste of water is occurring;*

(7) *[Whether] serious disputes respecting the use of the groundwater resources are occurring; or*

(8) *Whether water development projects that have received any federal, state, or county approval may result, in the opinion of the commission, in one of the above conditions.*

Notwithstanding an imminent designation of a WMA conditioned on a rise in the rate of groundwater withdrawal to a level of 90 percent of the area's sustainable yield, CWRM, when such level reaches the 80 percent level of the sustainable yield, may invite the participation of water users in the affected area to an informational hearing for the purposes of assessing the groundwater situation and devising mitigation measures (Section 174C-44, HRS).

In designating an area for surface water use regulation, CWRM must consider the following:

(1) *Whether regulation is necessary to preserve the diminishing surface water for future needs, as evidenced by excessively declining surface water levels, not related to rainfall variations, or increasing or proposed diversions of surface waters to levels which may detrimentally affect existing instream uses or prior existing off stream uses;*

(2) *Whether the diversions of stream waters are reducing the capacity of the stream to assimilate pollutants to an extent which adversely affects public health or existing instream uses; or*

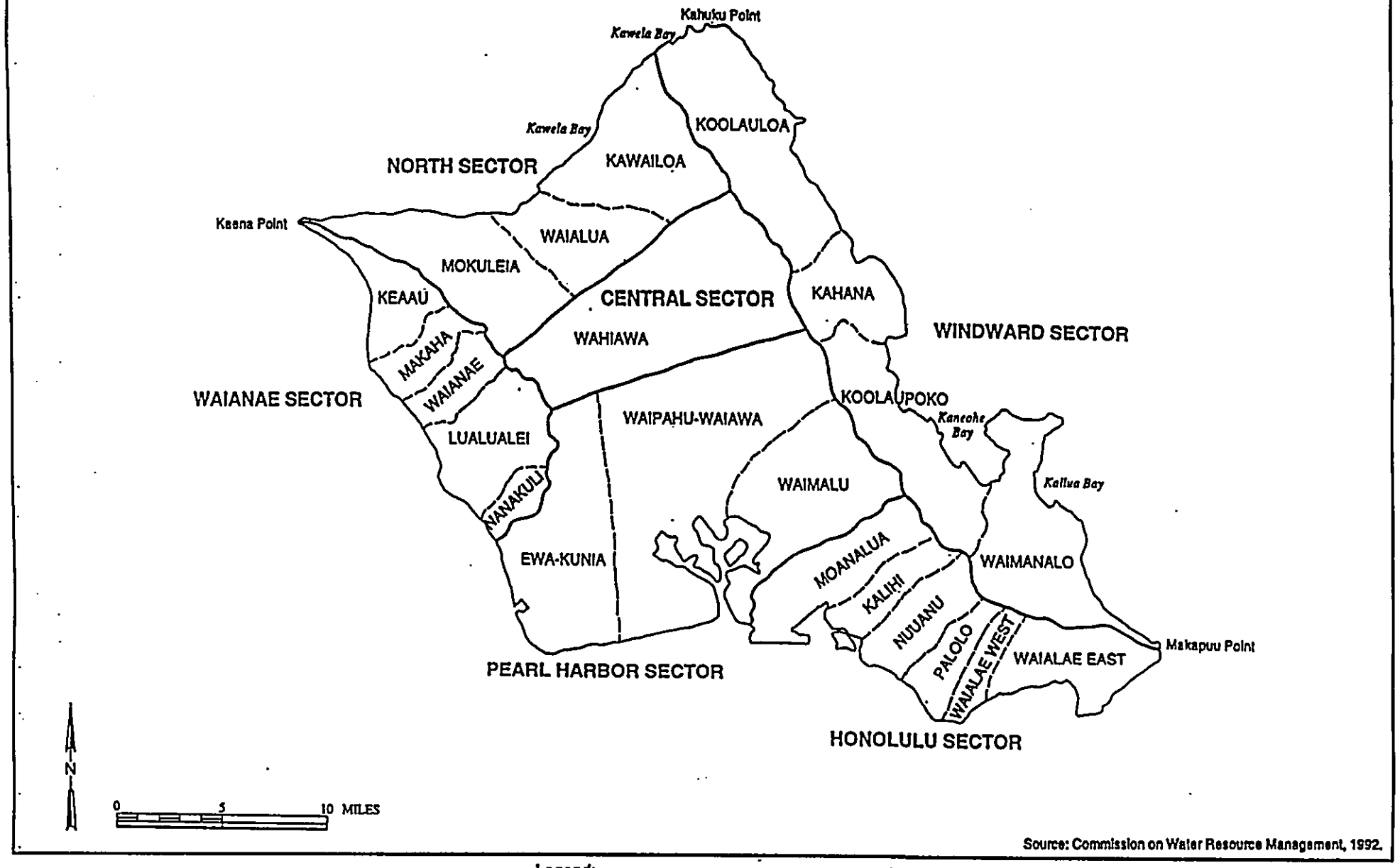
(3) *[Whether] serious disputes respecting the use of surface water resources are occurring. (Section 174C-45, HRS)*

2.3 Groundwater Sectors and Aquifers

CWRM has established, for planning and administration purposes, six groundwater sectors that encompass the entire island of Oahu (see Figure 2-1). These sectors are Honolulu, Pearl Harbor, Waianae, Central, North, and Windward. Presently, all sectors except the Waianae Sector have been designated as WMAs. The Windward Sector, which became a WMA in July 1992, is the last sector to be included as a groundwater management area on Oahu.

Each sector is divided into aquifers. The Honolulu Sector covers an approximately 84-square mile region that extends from Makapuu Point northwestward about 18 miles to Moanalua. The Honolulu Sector is generally bounded at its northeast edge by the ridge of the Koolau Mountains, and extends in the southwestward direction for two to eight miles down to the shoreline. From east to west, the Honolulu Sector is divided into the Waialae East, Waialae West, Palolo, Nuuanu, Kalihi, and Moanalua Aquifers.

The Waialae West Aquifer covers about 6 square miles and extends from the Koolau Mountain ridge down to the coastline near Kahala. The Aina Koa Well II is located in the *mauka* portion of the aquifer approximately 1.4 miles inland from the coastline. The site is at an approximate elevation of 850 feet, and the well was drilled to a depth of 920 feet or 70 feet below the mean sea level.



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Legend:

Groundwater Sector Boundary

Aquifer System Boundary

Figure 2-1

Groundwater Sectors and Aquifer Systems

AINA KOA WELL II

2.4 Sustainable Yield and Water Management Areas

In order to evaluate the impacts of developing an additional permanent potable groundwater source on this site, it is necessary to take into account the sustainable yield of the underlying aquifer system. Sustainable yield is the amount of groundwater that can be removed from an aquifer over a period of many years without developing serious adverse impacts to the aquifer.

Within the Hawaiian Islands, the sustainable yield of basal aquifers for each island is always less than the average annual rate of recharge to the groundwater aquifer, because a certain amount of the groundwater is lost through mixing with the underlying salt water. Estimating sustainable yield for the island of Oahu and for its individual aquifers is complex because the amount of fresh groundwater that is mixed with salt water is dependent upon the degree of aquifer confinement, lens thickness, the degree of agricultural and urban development, and numerous other factors that are not constant.

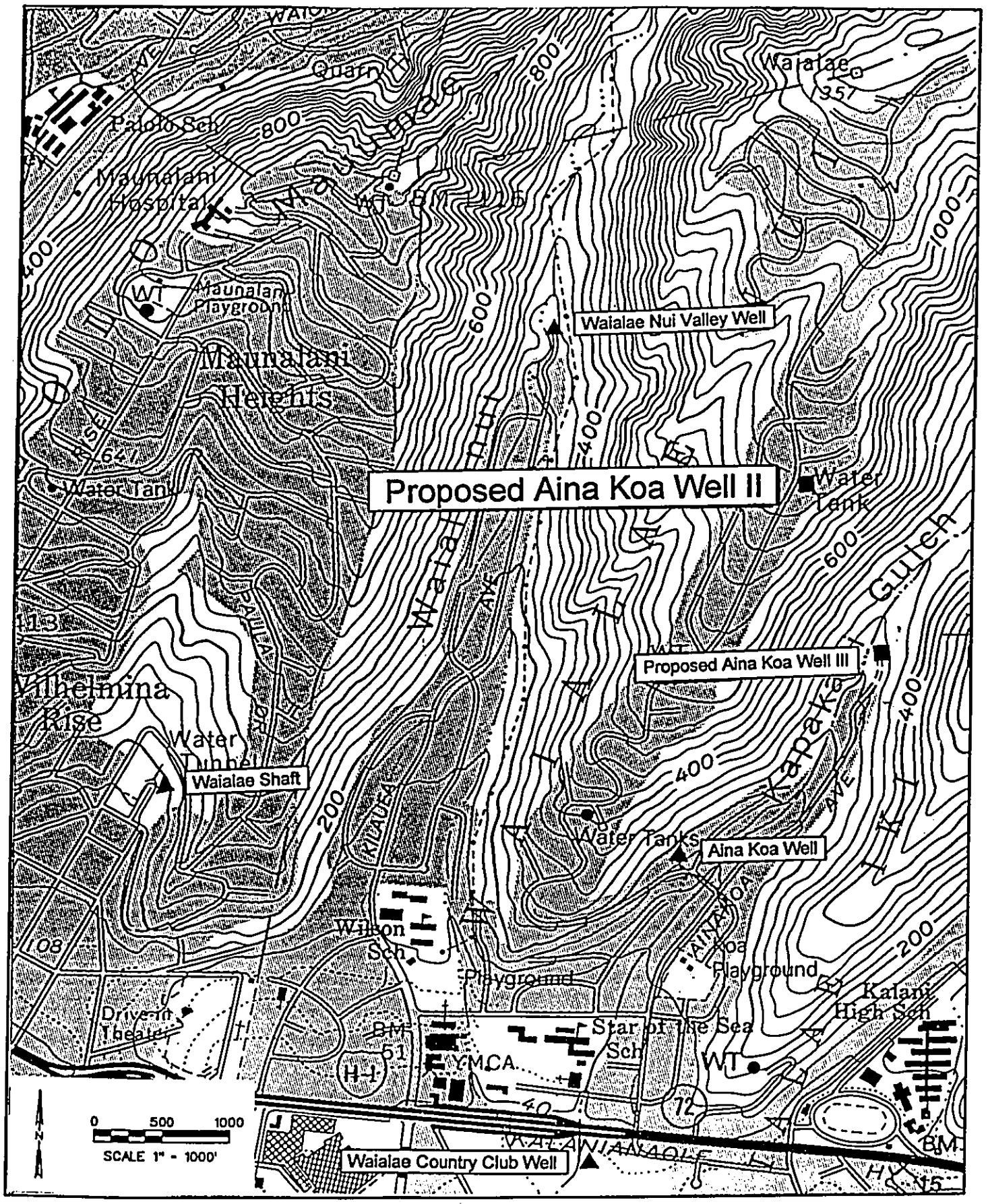
The Honolulu WMA has the second highest estimated sustainable yield of all of the Oahu aquifer systems at 53 mgd. The highest estimated sustainable yield of 184 mgd occurs in the Pearl Harbor WMA. The Honolulu WMA is also the second most heavily utilized WMA for municipal water use. In 1990, the authorized use of 40.66 mgd, or more than one-fourth of BWS's total usage of 156 mgd, was allocated from the Honolulu WMA.

The *Oahu Water Management Plan* notes that the Honolulu WMA's total estimated sustainable yield of 53 mgd is distributed among the six aquifers that constitute the Honolulu sector as follows: Waialae East Aquifer, 2 mgd; Waialae West Aquifer, 4 mgd; Palolo Aquifer, 5 mgd; Nuuanu Aquifer, 15 mgd; Kalihi Aquifer, 9 mgd; and Moanalua Aquifer, 18 mgd.

In 1990, the groundwater withdrawal from the Honolulu WMA was reported by CWRM to be 46.29 mgd, or about 87 percent of the sustainable yield of 53 mgd for this WMA. The 46.29 mgd of groundwater withdrawn in 1990 from the six aquifers in the Honolulu WMA was distributed as follows: Waialae East and Waialae West Aquifers, 0.78 mgd; Palolo Aquifer, 6.76 mgd; Nuuanu Aquifer, 16.77 mgd; Kalihi Aquifer, 9.91 mgd; and Moanalua Aquifer, 12.07 mgd.

2.5 Existing Potable Water Sources

According to the *Oahu Water Management Plan* and CWRM records, the Waialae West Aquifer contains six wells, including the one proposed, with CWRM Water Use permits (see Figure 2-2). The six wells are: Well No. 1646-01 (Waialae Country Club, private) with a CWRM Water Use permit for 0.460 mgd and a pump capacity of 600 gpm; Well No. 1746-01 (BWS, Aina Koa) with a CWRM Water Use permit for 0.480 mgd and a pump capacity of 350 gpm; Well No. 1746-02 (BWS, Waialae Iki) with a CWRM Water Use permit for 0.190 mgd and a pump capacity of 350 gpm; Well No. 1746-04 (Waialae Nui II, Kamehameha Schools developed; owned and to be operated by BWS) with a CWRM Water Use permit for 0.997 mgd and no pump currently installed; Well No. 1747-02 (BWS Waialae Shaft) with a CWRM Water Use permit for 0.160 mgd and no pump currently installed; and Well No. 1747-03 (BWS Waialae Nui) with a CWRM Water Use permit for 0.700 mgd and no pump currently installed.



Legend:

- ▲ Existing Well
- ■ Proposed Well

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Figure 2-2

Existing and Proposed Well Sites

AINA KOA WELL II

In 1992, Kamehameha Schools and the State drilled an exploratory well (Well No. 1746-03) on Kamehameha Schools land in Kapakahi Valley. The well could potentially produce 1.4 mgd and is planned to have a variable speed pump capable of pumping up to 1,000 gpm. When completed, the well would be dedicated to BWS. The well currently does not have a CWRM Water Use permit.

Records for the Waialae West Aquifer for 1996 indicate that the BWS withdrew a monthly average of 0.413 mgd from its wells, while the Waialae Country Club withdrew an average of 0.34 mgd for a total of about 0.75 mgd. There are now six wells in the Waialae West Aquifer System with CWRM allocations, with Well No. 1746-04 being permitted an allocation of 0.997 mgd on May 20, 1998. CWRM has indicated that there is currently 1.013 mgd available for allocation from this aquifer system. This number may increase if CWRM reallocates the existing allocations that are not being fully utilized.

2.6 Recommended Water System Improvements

The BWS's *Regional Assessment* addressed the impacts of developing proposed new basal groundwater, alluvial groundwater, and spring water sources in the Honolulu sector of Oahu. In the 1984 study, the BWS evaluated 21 proposed water development projects (including conventional groundwater wells, springs, or spring diversions), two proposed reservoirs, and two proposals for additional transmission pipelines totaling 11,500 linear feet (about 2.3 miles).

Within the Waialae West Aquifer, the *Regional Assessment* proposed the development of two wells, the Aina Koa Well II and the Aina Koa Well III. The Aina Koa Well III has been drilled and tested as an exploratory well and is capable of producing up to 1.4 mgd of potable water.

2.7 Aina Koa Well II (1746-04)

The Aina Koa Well II was drilled and completed as an exploratory well in 1993. Appendix A presents a report entitled "Results of Drilling and Testing Waialae Nui Ridge Well (1746-04)" prepared by Dan Lum, Water Resource Associates, May 1993. Based on a seven-day pump test, the report indicates this well has the potential of pumping 1,000 gpm or up to 1.4 mgd. The report also indicates that during the seven-day pump test, there were no effects observed on the two nearest existing wells (the Waialae Nui Valley Well and the Aina Koa Well).

Chapter 3
Preferred Action and Alternatives

3.1 Preferred Action

3.1.1 Project Description

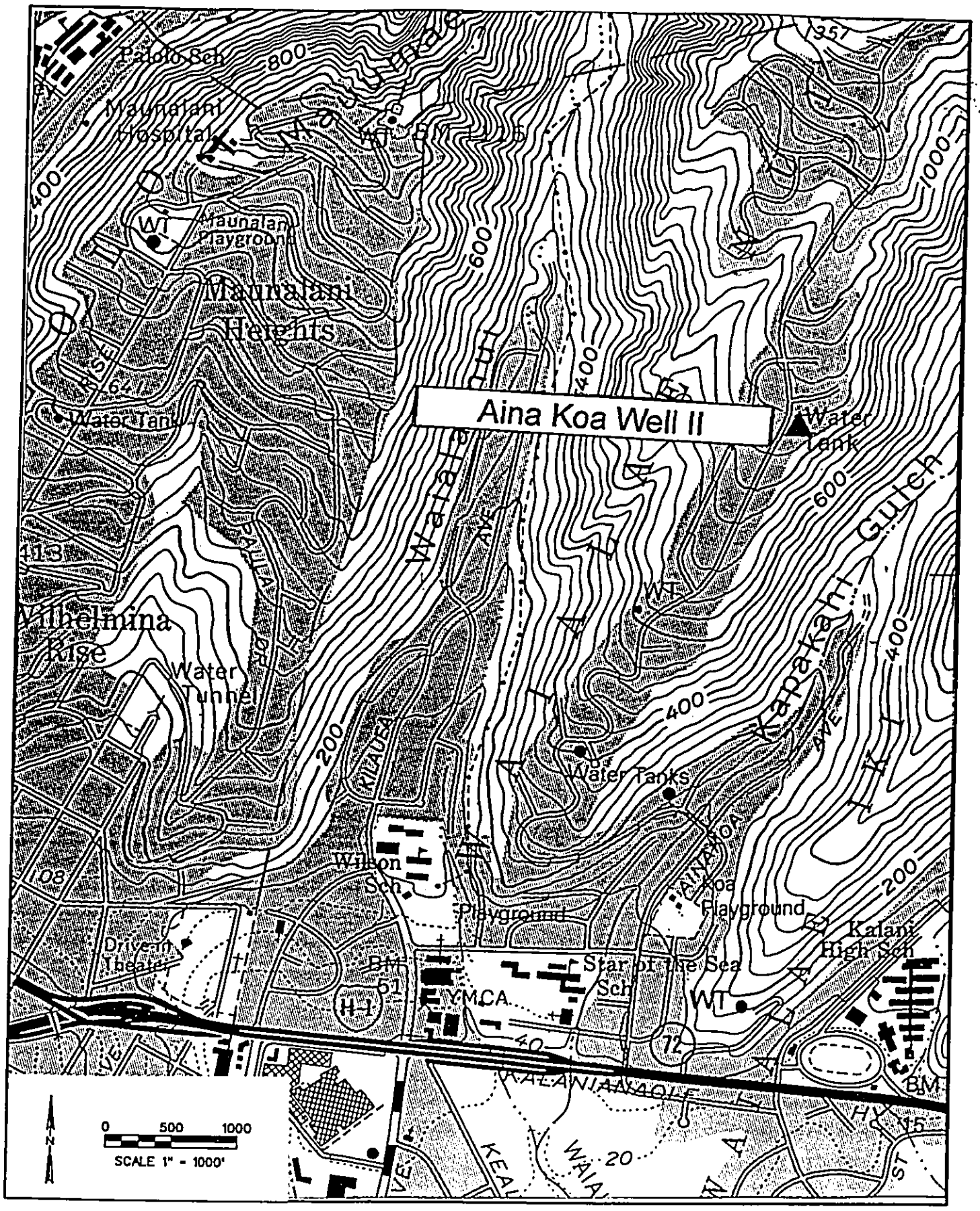
Kamehameha Schools is proposing to construct and install a production well on BWS land (see Figure 3-1). The well and related on-site improvements occupy a portion of TMK 3-5-62:44 shown in Figure 3-2. Once the Aina Koa Well II is operational, it will be dedicated to the BWS and integrated into its water supply system.

The exploratory well was drilled and tested on the site in 1993. From these tests, the proposed Aina Koa Well II is estimated to have a potential capacity of up to 1.4 mgd. Kamehameha Schools is providing all of the funding for the exploratory well and its conversion to a permanent well. The purpose of the project is to provide water to meet additional water requirements resulting from general increases in municipal demands from Kamehameha Schools sponsored projects. In addition to drilling the exploratory well, the proposed Aina Koa Well II project will consist of the following elements:

- Installation of a pump, with a pumping capacity of approximately 1.0 million gallons per day (mgd)
- Construction of a control building with Supervisory Control and Data Acquisition (SCADA) interface
- Connection to the BWS municipal water system and City sewer system
- Modifications of existing piping at two BWS Reservoirs and Booster Pump Stations (identified as Aina Koa 640' Reservoir and Booster Pump Station No. 3, and Aina Koa 405' Reservoir and Booster Pump Station No. 2)

The well is approximately 920 feet deep with the upper 870 feet consisting of a 15.25-inch diameter solid casing. The lower 14.5 feet of the well consists of an open hole. The ground elevation of the well is approximately 850 feet above mean sea level (msl). A cross section of the proposed well is shown in Figure 3-3. The pump will be submerged and pipes will be installed to hook up with the BWS water along Halekoa Drive. Underground connection piping into Aina Koa 640' Reservoir and Booster Pump Station No. 3 and Aina Koa 405' Reservoir and Booster Pump Station No. 2 from the water system will also be constructed.

A site plan for the Aina Koa Well II, Aina Koa 865' Reservoir, and Pump Station No. 4 is shown in Figure 3-4. The site plans for Aina Koa 405' Reservoir and Booster Pump Station No. 2 and Aina Koa 640' Reservoir and Booster Pump Station No. 3 are shown in Figures 3-5 and 3-6 respectively.



Legend:

▲ Existing Well

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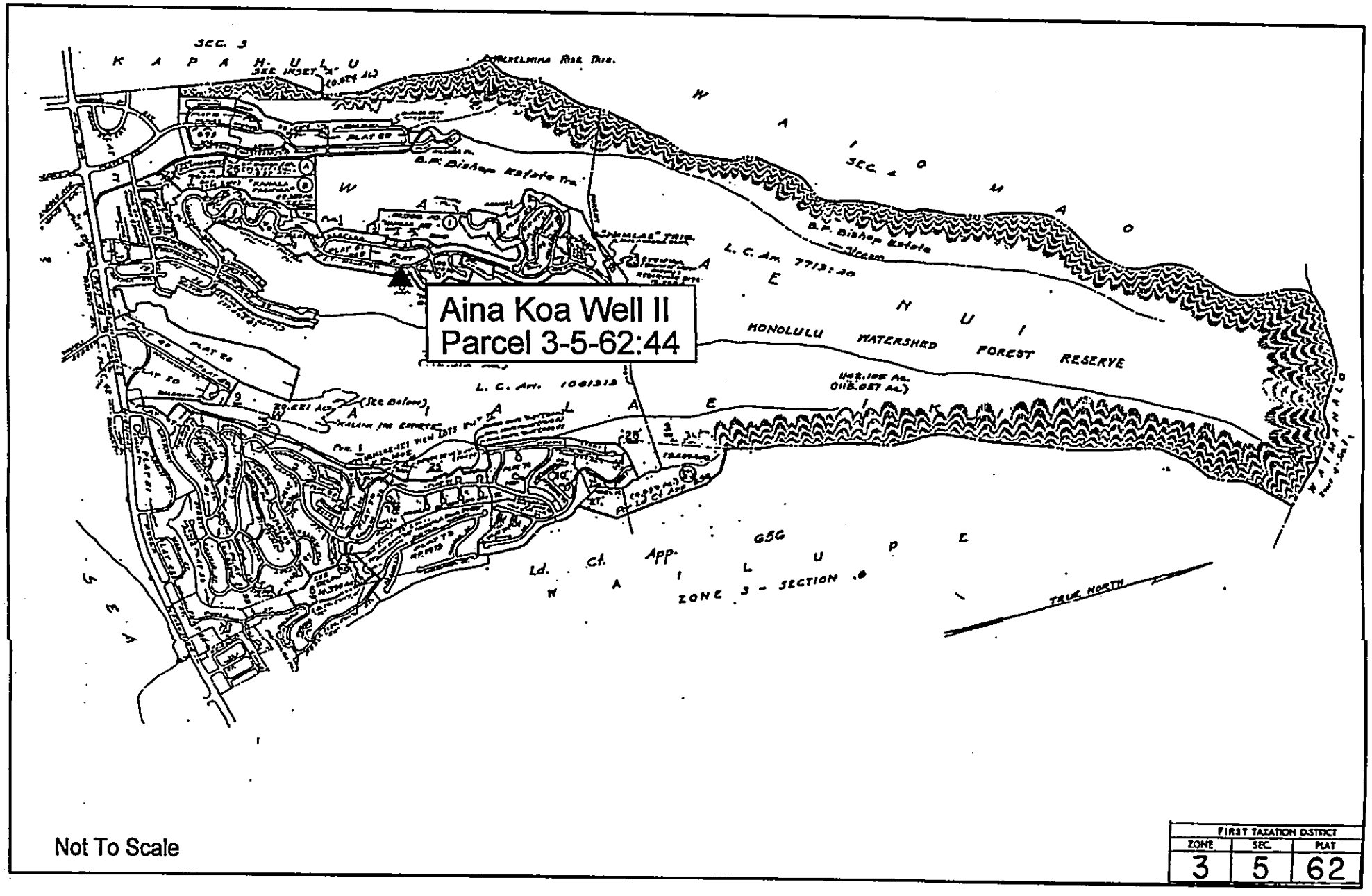
Figure 3-1
Location Map
AINA KOA WELL II



Not To Scale

CH2MHILL

Figure 3-2
Tax Map Key Location
AINA KOA WELL II

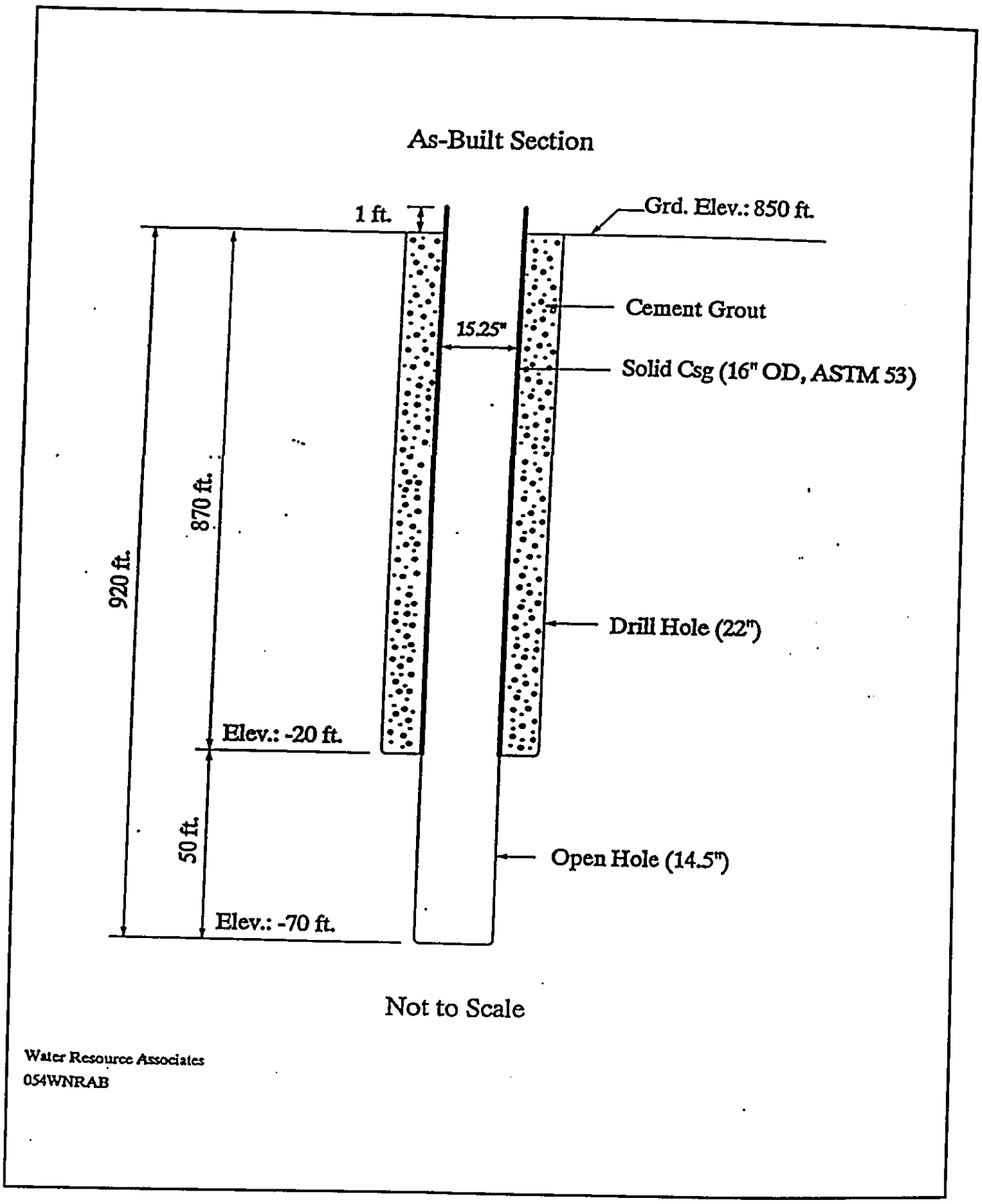


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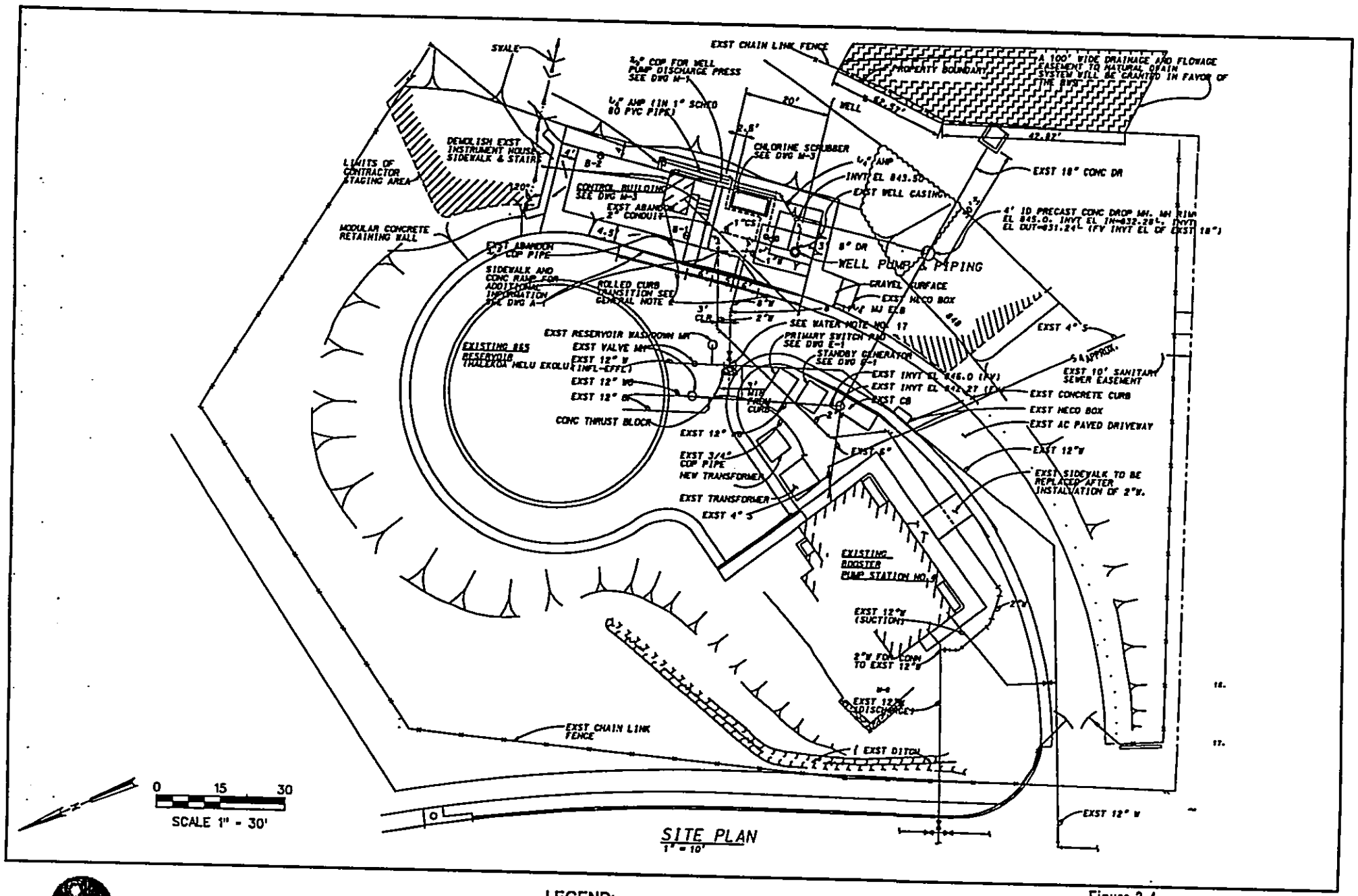
Figure 3-3
Aina Koa Well II Cross Section
AINA KOA WELL II



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LEGEND:

B-1 ⊕ BORING LOCATION AND NUMBER

PROPERTY LINE

Figure 3-4
Site Plan
Aina Koa 865' Reservoir, Booster Pump Station, and Aina Koa Well II
AINA KOA WELL II

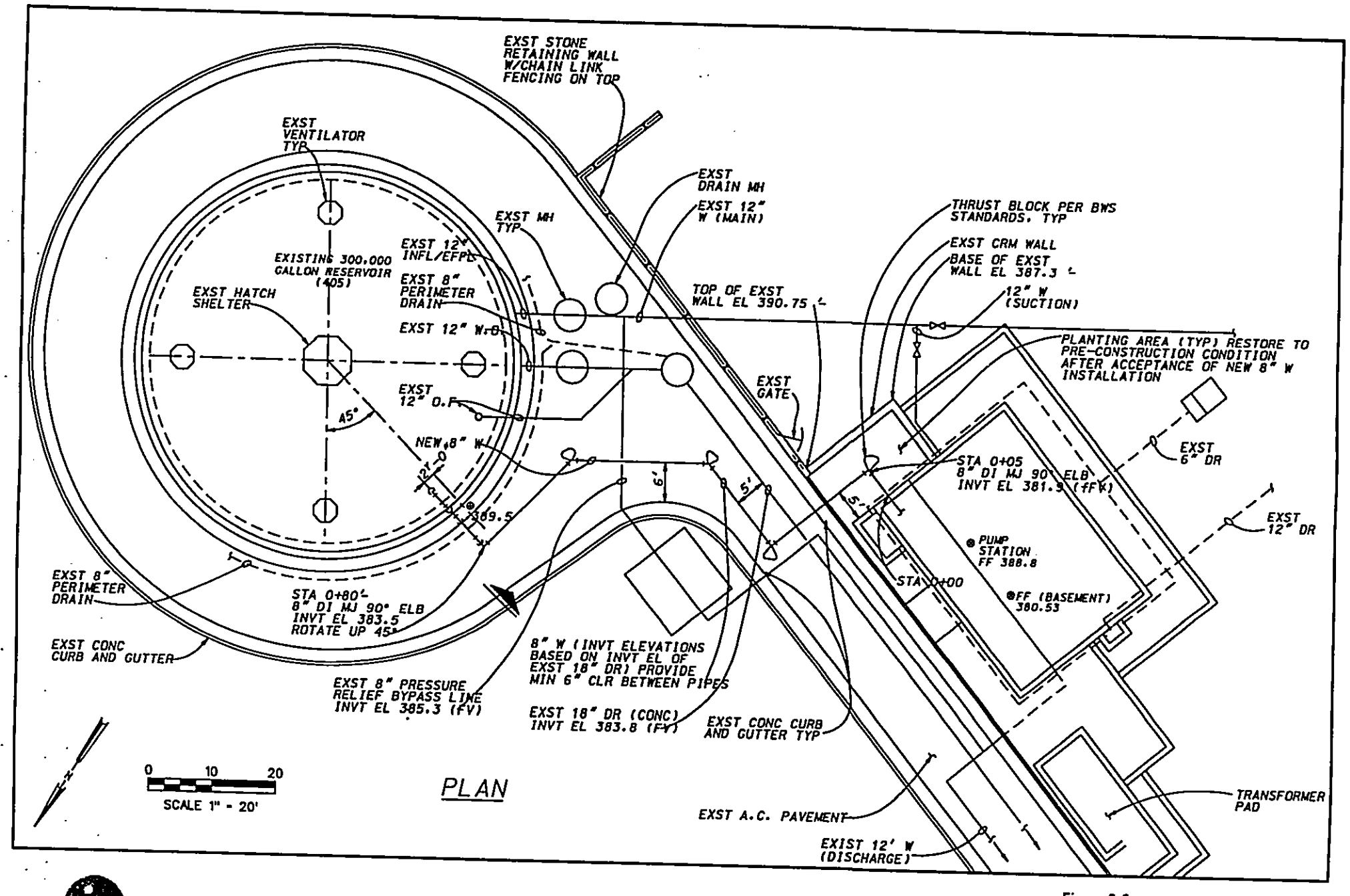

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Figure 3-5
Site Plan
Aina Koa 405' Reservoir and Booster Pump Station
AINA KOA WELL II

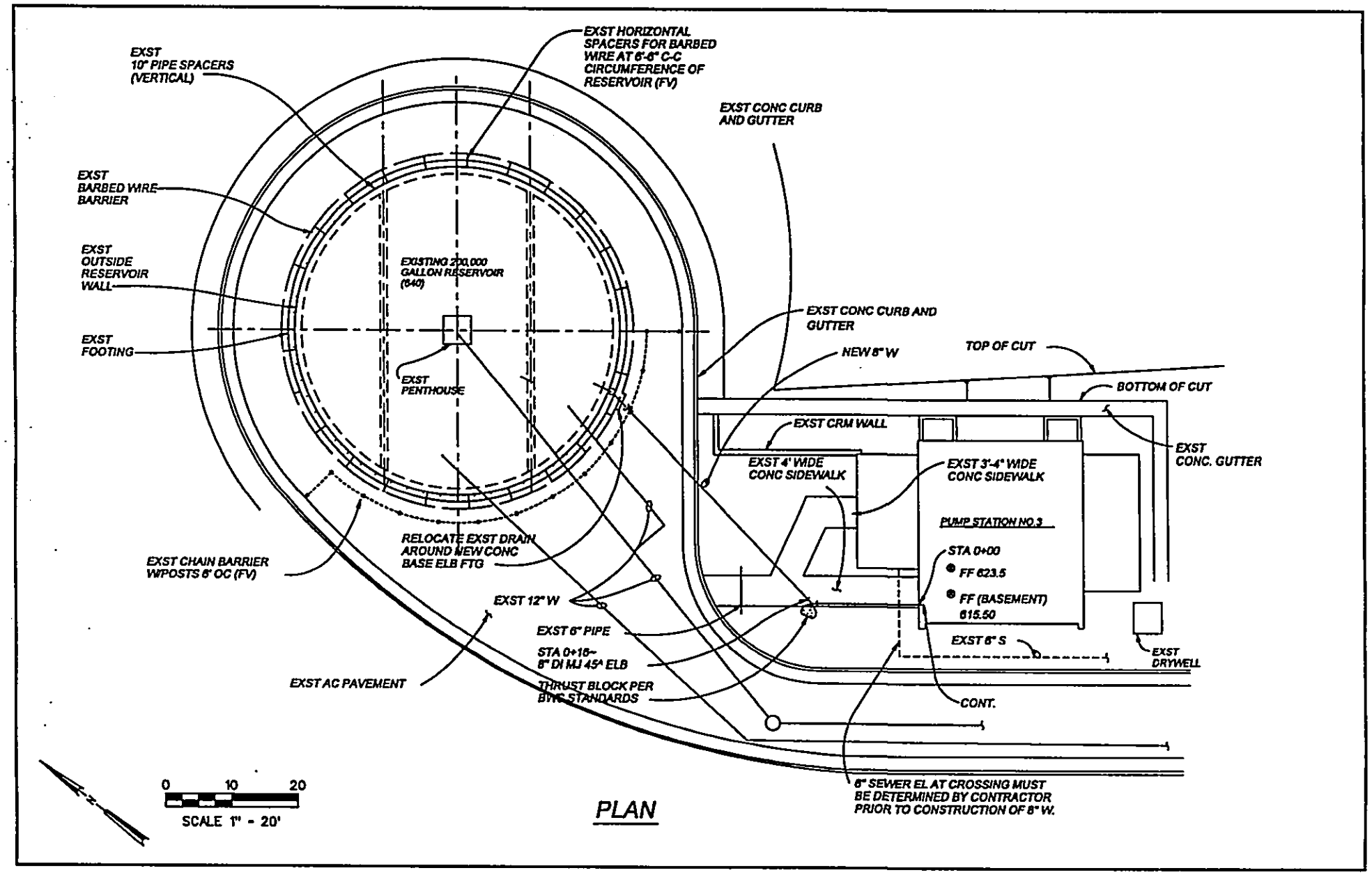

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Figure 3-6
Site Plan
Aina Koa 640' Reservoir and Booster Pump Station
AINA KOA WELL II

Construction activities will consist of pump and pipeline installation and construction of the control house. The control house will be approximately 700 square feet and will contain an electrical/control room and a chlorination room with a gaseous chlorine system utilizing chlorine cylinders. A chlorine vapor scrubber system will be included adjacent to the control building. The site is currently landscaped and disturbed areas will be replanted upon completion of the construction.

3.1.2 Project Schedule and Costs

Installation and construction of the Aina Koa Well II and associated facilities are anticipated to take approximately 24 months from acquisition of the Conservation District Use Permit. The project is anticipated to be operational by January 2002. Costs of the project are estimated at approximately $2 million.

3.2 Alternatives Considered

3.2.1 No Action

The no action alternative would consist of connecting the Aina Koa Well II to the BWS system and not installing a pump. The no action alternative was not pursued because it would not meet BWS requirements that large landowners meet their potable water demand requirements by assisting the BWS with additional source development.

The Aina Koa Well II was identified as part of an overall groundwater development program intended to increase the municipal water supply to meet growing demand. If the BWS's water source development program were curtailed, the BWS would be hampered in providing adequately for the water needs of the future population of the island, which could result in regional water shortages. Water from the Aina Koa Well II is required to fulfill additional demands from Kamehameha-Schools-sponsored developments.

3.2.2 Deferred Action

The deferred action alternative would consist of delaying implementation of this project until a later, yet unknown, date. This alternative was not pursued because it would delay the implementation schedule and would have substantially similar environmental outcomes and higher development costs because of inflation. Delay in the installation and operation of the proposed Aina Koa Well II would increase the risk that the projects identified as "end users" of this water would cause an undue strain on the existing water supply system, or would not be able to proceed due to a lack of sufficient potable water.

3.2.3 Alternative Sites

This EA analyzes a possible potable groundwater source site in the Honolulu Sector, where surplus sustainable yields occur in the higher elevations. Prior to the consideration of this site, the BWS conducted an analysis of 21 other potential sites within the Honolulu Sector for

additional potable wells in its *Regional Assessment* (1986). Of the original eight wells identified in the study, four remain as alternative sites to the Aina Koa Well II.

One well site, the Kalani Iki Well, is located in the vicinity of the Aina Koa Well II and was identified as an alternative to the Aina Koa Well II. However, this well is not being pursued at this time for the following two reasons:

1. Access to the site is through the privately-owned Kalani Iki Subdivision, and
2. Its location is only approximately 200 feet from the interpreted Northeast Dike Alignment, a hydrologic barrier that might cause greater well drawdown and thus less well capacity.

Three additional alternative sites located in the Waialae East Aquifer remain from the BWS study. All three have been drilled as exploratory wells. However, the BWS has not yet elected to develop these wells into production facilities.

Because of the deficiencies in the Kalani Iki and other well sites in the Waialae East Aquifer, they have not been preferred over the site at Waialae Nui Ridge. The Aina Koa Well II is required in addition to the existing groundwater sources in the BWS system.

3.2.4 Alternative Source Development

Alternative source development was not pursued in this analysis since the BWS had also analyzed potential potable water source alternatives other than groundwater in its 1986 study, including desalinization, development of surface and brackish water sources, and recycling of treated wastewater. Typically, these alternative sources have considerably higher costs and technical challenges. For instance, the use of surface water has a high potential for health and safety problems and would require costly water treatment. The development of these alternatives was not considered as feasible as the development of groundwater resources.

Chapter 4
Environmental Setting, Project Impacts, and Mitigation Measures

4.1 Land Use and Ownership

4.1.1 Existing Conditions

The site of the Aina Koa Well II is designated as TMK 3-5-62:44, and is located in the residential subdivision generally known as Waialae Nui. The land is owned by City and County of Honolulu, BWS. The site is currently on land developed for BWS's Aina Koa 865' Reservoir and Booster Pump Station No. 4. The site is outside the City and County of Honolulu Special Management Area.

Aina Koa 640' Reservoir and Booster Pump Station No. 3 and Aina Koa 405' Reservoir and Booster Pump Station No. 2 are also BWS facilities, and are located on separate parcels owned by the City and County of Honolulu, BWS. These sites are designated as TMK 3-5-56:26 and 3-5-48:25 respectively.

4.1.2 Project Impacts

Construction and operation of the proposed Aina Koa Well II has not and will not change any of the surrounding land uses or ownership patterns. The modifications at Aina Koa 640' Reservoir and Booster Pump Station No. 3 and Aina Koa 405' Reservoir and Booster Pump Station No. 2 also will not change any of the surrounding land uses or ownership patterns.

4.1.3 Mitigation Measures

No mitigation measures are proposed or required.

4.2 Climate and Rainfall

4.2.1 Existing Conditions

Waialae Nui Ridge is located on the southeastern portion of the Island of Oahu, bordered by Waialae Nui Gulch on the west and Kapakahi Gulch on the east. The median annual rainfall of the site is approximately 30 to 40 inches per year.

4.2.2 Project Impacts

The proposed well will have no impact on conditions related to rainfall or climate.

4.2.3 Mitigation Measures

No mitigation measures are proposed or required.

4.3 Topography

4.3.1 Existing Conditions

The Waialae Nui ridge is narrow, has steep sides, and slopes gently to the southwest. The Aina Koa Well II is located approximately 850 feet above msl. The site slopes moderately to the southeast. The site is developed with several terraces cut into the mountain for flat foundations.

The Aina Koa 640' Reservoir and Booster Pump Station No. 3 and Aina Koa 405' Reservoir and Booster Pump Station No. 2 are also located on Waialae Nui ridge at approximately 640 and 405 feet respectively.

4.3.2 Project Impacts

Installation of the proposed well and accompanying control house structure will occur on relatively level areas already existing on the site. Changes in the overall topography will be minimal and a grading plan, if required, will be prepared to prevent runoff downslope. No significant adverse impacts are anticipated to surface water from erosion.

The modifications at Aina Koa 640' Reservoir and Booster Pump Station No. 3 and Aina Koa 405' Reservoir and Booster Pump Station No. 2 will have minimal to no impact on the topography at each respective location.

4.3.3 Mitigation Measures

If required, a grading plan will be prepared prior to construction and appropriate engineering practices will be utilized to minimize erosion and runoff during installation of the well and the accompanying control house.

4.4 Geology

4.4.1 Existing Conditions

Waialae Nui Ridge is composed of gently dipping thin-bedded basalt flank flows erupted from Koolau Volcano in the vicinity of the Koolau Range. The ridge is narrow, slopes gently southwestward, has steep sides, and its surface is remnant of the eroded slopes of southeastern Oahu. The ridge is dissected by Waialae Nui Gulch on the west and Kapakahi Gulch on the east.

Based on the driller's log, the well penetrated approximately 15 feet of reddish brown clay soil and subsoil and 20 feet of weathered basalt (saprolite) below which occurs typically thin-

bedded (no more than a few tens of feet thick) aa and pahoehoe lavas to its total depth of 920 feet.

4.4.2 Project Impacts

The installation of the proposed well will have no impact on geophysical resources.

4.4.3 Mitigation Measures

No mitigation measures are proposed or required.

4.5 Groundwater Resources

4.5.1 Existing Conditions

The Aina Koa Well II taps a fresh semi-confined basal aquifer with a head of 9.3 feet in the Waialae West Aquifer System. This aquifer extends from the Kaau Rift zone (Maunalani Heights) to the Waialae Dike zone (Waialae Iki Ridge). The aquifer system includes high-level dike water near the Koolau crest and basal water near the coast.

Although the head in the vicinity of the seaward boundary of the basalt aquifer (contact with coastal caprock) is approximately nine feet, the BWS's Waialae Shaft and Aina Koa Well located in this part of the aquifer are anonymously sensitive to increasing chlorides under pumping conditions. However, test results of the more inland Aina Koa Wells II and III and Waialae Nui Valley Well show no evidence of salt water intrusion.

The Waialae West Aquifer System encompasses an area of about six square miles and its sustainable yield has been established by CWRM at 4 mgd. Groundwater in the system probably flows in a southwesterly direction, parallel to numerous dikes that have been mapped with a southwest-northeast orientation in gulches at higher elevations. However, some groundwater possibly flows southeastward across the Waialae Dike Zone into the Waialae East Aquifer System. Results of pump tests in the aquifer indicate that it has a calculated hydraulic conductivity of between 1,540 and 1,650 feet per day, comparable to the high-yield Pearl Harbor Aquifer.

The Waialae West Aquifer contains six wells, including the Aina Koa Well II, three of which are operated by the BWS. These facilities include the Waialae Shaft , the Aina Koa Well, and the Waialae Nui Valley Well. The Aina Koa Well II, developed by Kamehameha Schools, was allocated 0.997 mgd by CWRM. The Aina Koa Well III, developed by the State of Hawaii and Kamehameha Schools, was allocated 1.4 mgd by CWRM. The remaining well within the aquifer is privately owned and operated by the Waialae Country Club.

CWRM indicates that currently 1.013 mgd is available for allocation from this aquifer. This number may increase if CWRM reallocates the existing allocations that are not being fully utilized.

4.5.2 Project Impacts

The Aina Koa Well II was tested for seven days at a constant rate of 940 gallons per minute (gpm) (1.35 mgd) between April 12-19, 1993. The drawdown in the well stabilized at 11.6 feet, indicating a specific well capacity of 81.0 gpm per foot of drawdown. After the pump was shut off, the gage readings indicated the usual oscillation of water level, but from 4 to 60 minutes afterwards the gage readings were nearly static at 7.4 to 7.5 feet drawdown. Suspecting a slow gage response, the airline was momentarily disconnected and the gage re-read and at 85 minutes after pumping had stopped, the indicated well recovery was within 0.3 feet of static water level before the start of the test. This recovery was confirmed with a less accurate 0-30 psi gage.

During the pump test, the Aina Koa Well, located 3,000 feet downgradient, was shut down and used to monitor water level in the aquifer. No water level chart record was available, however no related effect or trend in water level was discernible in the Aina Koa Well. The pump test indications were that the Aina Koa Well II would be capable of producing at a rate of up to 1.4 mgd on a long-term basis with no cumulative impact on the aquifer.

The well was tested for inorganics and heavy metals and the results were all well within the limits of Public Health Drinking Water Standards. Tests for organics were all below detection limits.

The Aina Koa Well II showed no evidence of salt water intrusion during the seven-day test. The chloride content of the well remained steady at 38 ppm.

4.5.3 Mitigation Measures

No mitigation measures are proposed or required.

4.6 Surface Water Resources

4.6.1 Existing Conditions

The closest surface water body is the Kapakahi Stream located approximately 1,000 feet to the east of the Aina Koa Well II. Kapakahi Stream is an intermittent stream that flows only during periods of heavy rains. The stream acts to drain the Kapakahi Gulch into retention and flood control basins. The stream was not identified as having aquatic or riparian resources associated with it by CWRM in its 1990 *Hawaii Stream Assessment.*

4.6.2 Project Impacts

Kapakahi Stream is not fed by aquifer resources and will see no impact from groundwater withdrawal in the area. The proposed well will be located approximately 1,000 feet away from the normally dry streambed. No work is proposed within the streambed and the well will not affect the normal drainage patterns of the gulch.

4.6.3 Mitigation Measures

No other mitigation measures are proposed or required.

4.7 Natural Hazards

4.7.1 Flood Zones

The proposed Aina Koa Well II site is located approximately 850 feet above msl and approximately 100 feet from the Kapakahi Stream drainage channel. The area is listed on the Flood Insurance Rate Maps as outside the 500-year flood zone.

4.7.2 Seismic Activity

Under the Uniform Building Code (UBC), the island of Oahu is designated as Seismic Zone 1, which is the zone with the lowest potential for ground motion created by seismic events. The UBC establishes minimum design criteria for structures to resist the effects of seismic ground motion.

4.7.3 Mitigation Measures

Design of the facility will follow UBC criteria for Seismic Zone 1 or greater.

4.8 Biological Resources

4.8.1 Existing Conditions

The Aina Koa Well II site, Aina Koa 640' Reservoir and Booster Pump Station, and Aina Koa 405' Reservoir and Booster Pump Station are located on developed land which has been cleared and graded. The site was previously landscaped.

4.8.2 Project Impacts

Minimal vegetation on the site will be cleared. No adverse impact to any biological resources is anticipated.

4.8.3 Mitigation Measures

No mitigation measures are required or proposed.

4.9 Cultural Resources

4.9.1 Existing Conditions

The project will have "no effect" on historic or cultural sites. The site and surrounding area were graded in conjunction with the development of the surrounding residential subdivision.

The site is not currently listed on the Hawaii Register or the National Register of Historic Places, nor has it been determined eligible for inclusion on either of these registers. There are no known traditional gathering activities and/or cultural practices affecting the subject property.

4.9.2 Project Impacts

The development of the Aina Koa Well II will have no effect upon significant historic or cultural sites.

4.9.3 Mitigation Measures

No mitigation measures are required or proposed.

4.10 Socioeconomic Environment

4.10.1 Existing Conditions

The Aina Koa Well II site and the sites of the related improvements are located in the area generally known as Waialae Nui, within Census Tract No. 4.97. The neighborhood is in a ridge approximately 1.4 miles inland from the Kalanianaole Highway. The adjacent properties contain an older subdivision of conventional homes. The 1990 census reported median home values in the area at $450,800 and median rents of $1,000, both of which are higher than the County medians of $283,600 and $615 for home values and rents, respectively.

The area has a resident population of about 2,770 persons with a median age of 43 years. The area is stable with about 70 percent of the residents not moving between 1985 and the time of the 1990 Census. The workforce residing there consists of mostly managers and professionals with a per capita income of $30,684, significantly higher than the $21,300 per capita income for the City and County of Honolulu.

4.10.2 Project Impacts

The Aina Koa Well II will have no impact upon the socioeconomic environment of the immediate neighborhood.

A small number of temporary construction jobs will be created by the construction; however, these jobs will likely involve people living on Oahu but outside this census tract.

4.10.3 Mitigation Measures

No mitigation measures are proposed or required.

4.11 Visual Resources

4.11.1 Existing Conditions

The proposed site is located at on the east side Halekoa Drive, approximately 1.4 miles north of the coast line. The site currently contains Reservoir 865' and Booster Pump Station No. 4 which are visible from Halekoa Drive. The site is enclosed by fencing and is accessible through a locked gate located along Halekoa Drive. The site is developed and the landscaping is well-maintained. The nearest home is approximately 40 feet from the location of the well.

4.11.2 Project Impacts

The addition of the control building at the Aina Koa Well II site will have minimal impact to the aesthetics of the site. The site already contains a reservoir and booster pump station building located closer to Halekoa Drive than the proposed control building. The control building will be visible from Halekoa Drive.

The improvements at the Aina Koa 640' and 405' Reservoir sites will have minimal impact on the visual resources.

4.11.3 Mitigation Measures

No mitigation measures are proposed or required.

4.12 Air Quality and Noise

4.12.1 Existing Conditions

Air quality on Oahu is, in general, relatively clean and low in pollution, except where there are large numbers of motor vehicles or stationary sources. The occasional vehicle on the upper portion of Halekoa Drive does not create a degradation of the air quality in the area. There also are no agricultural activities or stationary sources in the vicinity that may be a source of air pollutants.

Ambient noise at and around the project site is also very low, and results mainly from the sounds of residential activities in the area.

4.12.2 Project Impacts

Construction will involve construction vehicles and equipment operations that could potentially create small amounts of fugitive dust and pollutant emissions. There will be no long-term air quality impacts once construction is completed.

In the State of Hawaii, community noise controls have been set for analyzing noise impacts pursuant to Hawaii Department of Health Rules, Title 11, Chapter 46. Allowable daytime and

nighttime noise level standards for sensitive receptors in residential, preservation, hotel, apartment, and business districts have been set under these rules. The project site is in a Class A zoning district due to its zoning as residential lands. For Class A districts, the maximum allowable daytime noise level from 7:00 AM to 10:00 PM is 55 dBA, and the maximum allowable nighttime noise level from 10:00 PM to 7:00 AM is 45 dBA.

The project will not have any long-term adverse noise impacts to any nearby sensitive noise receptors. Heavy-equipment moving, construction, and the installation of the production well will create short-term noise impacts. If additional well drilling is required, noise may result from the drill bit hitting rock. Noise will also result from the operation of the diesel engine driving the drill. There will be no long-term noise impacts after the construction is completed.

If required, a noise permit will be obtained from the Noise and Radiation Branch of the State of Hawaii Department of Health to allow for construction-related noise.

4.12.3 Mitigation Measures

To mitigate the effects of construction activities, dust control measures such as water sprinkling will be implemented by the contractor to reduce dust levels, as necessary. Further, the contractor will properly maintain its internal combustion equipment to minimize exhaust emissions, and will comply with the State of Hawaii, Department of Health Rules Title 11, Chapters 59 and 60, regarding air pollution control.

Contractors will comply with all of the conditions of the noise permit, if one is required. Mufflers will be installed on all construction equipment, and all noise-attenuating equipment will be maintained in proper operating condition and will be repaired or replaced as needed.

Noise levels from the permanent pump will be reduced to below regulatory levels by the use of a submersible pump.

4.13 Utilities and Infrastructure

4.13.1 Existing Conditions

The site is developed and the landscaping is well-maintained. Electrical, water, and sewer utilities exist on the project's parcels.

4.13.2 Project Impacts

The proposed project will create a temporary and minimal rise in traffic along Halekoa Drive. However, given the width of Halekoa Drive and its very low residential traffic volumes, no significant impact from construction traffic is anticipated.

The project will connect to the BWS municipal water system, the City sewer system, and the Hawaiian Electric Company distribution system at their nearest points along Halekoa Drive. No adverse impacts are anticipated during installation of these connections.

4.13.3 Mitigation Measures

No mitigation measures are proposed or required.

Chapter 5
Relationship to Land Use Designations and Controls

5.1 State Land Use Designations and Controls

The subject project is located within an area designated as part of the State's Urban Land Use District. A water well and related infrastructure are permitted uses in the Urban District.

The proposed project does not impact coastal resources and complies with HRS 205A relating to Coastal Zone Management. The parcel is outside the county Special Management Area.

In addition to the pump installation, a noise permit may be required from the State of Hawaii Department of Health, Noise and Radiation Branch.

5.2 City and County of Honolulu Land Use Designations and Controls

The subject parcel is designated a "public/quasi public facility" in the City and County of Honolulu's East Honolulu Sustainable Communities Plan. The City and County of Honolulu's Zoning Map designation for the site is "R-7.5" reflecting the residential zoning of the surrounding area. The Aina Koa Well II and related improvements do not require any changes to the East Honolulu Sustainable Communities Plan or to the underlying zoning designation.

If they are required, a grading permit, building permit, street usage permit, and other construction-related permits will be obtained from the City and County of Honolulu.

Chapter 6
List of Preparers

CH2M HILL

Albert Lono Lyman	Senior Environmental Planner and Project Manager with Master's degree in Business Administration and Bachelor's degree in Economics
Ian Arakaki	Project Engineer with Bachelor's degree in Civil Engineering
Ross Kaneko, P.E.	Project Engineer with Bachelor's degree in Civil Engineering
Robert T. Chuck, P.E.	Senior Reviewer with Master's degree in Civil Engineering

Chapter 7
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APPENDIX A

Appendix A

Results of Drilling and Testing Waialae Nui Ridge Well (1746-04) by Water Resource Associates

AINA KOA WELL II

DECEMBER 1999

RESULTS OF DRILLING AND TESTING WAIALAE NUI RIDGE WELL (1746-04)

Waialae, Oahu, Hawaii

Prepared for

CH2M Hill
Honolulu, Hawaii

Dan Lum
Water Resource Associates
Honolulu, Hawaii

May 1993

WATER RESOURCE ASSOCIATES
Hydrology • Geology • Engineering

May 26, 1993

MEMORANDUM

TO: Robert T. Chuck, CH2M Hill

FROM: Dan Lum

SUBJECT: **Waialae Nui Ridge Well Report**

Enclosed is our report, *Results of Drilling and Testing Waialae Nui Ridge Well, Oahu, Hawaii.*

If you need additional copies, please call me.

DAN LUM

Enc.

1124 Fort Street Mall, Suite 212 • Honolulu, Hawaii 96813 • (808) 528-0074

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RESULTS OF DRILLING AND TESTING
WAIALAE NUI RIDGE WELL (1746-04)

Waialae, Oahu, Hawaii

Description

Waialae Nui Ridge Well (1746-04) was drilled in April 1993 by Bishop Estate as an exploratory well to locate an additional source of water supply in the Waialae West Aquifer System of southeast Oahu. The well is located approximately 1.4 miles inland from the coast at an elevation of 850 feet on top of Waialae Nui Ridge (see Figure 1). The well was drilled by Roscoe Moss Co. to a total depth of 920 feet (-70 ft., msl) and cased with 16-inch O.D. x 0.375 wall thickness ASTM A-53 steel casing (see Figure 2). The casing was grouted from the ground surface to a depth of 870 ft. (-20 ft., msl).

As-Built Data

Well Name	Waialae Nui Ridge
Well Number	1746-04
Tax Map Key	3-5-62:44
Year Drilled	1993
Ground Elevation	850± ft.
Casing Diameter	16 inch O.D.
Solid Casing Depth	870 ft. (-20 ft., msl)
Perforated Casing Depth	None
Grouted Annulus	0-870 ft.
Open Hole Length	50 ft.
Total Depth	920 ft. (-70 ft., msl)
Proposed Use	Municipal
Static Head	9.33 ft., msl
Chloride	38 mg/l

Geology

Waialae Nui Ridge, on which the well is located, is composed of gently dipping thin-bedded basalt flank flows erupted from Koolau Volcano in the vicinity of the Koolau Range. The ridge is narrow, slopes gently southwestward, has steep sides, and its surface is a remnant of the eroded slopes of southeastern Oahu, having been dissected by Waialae Nui Gulch on the west and Kapakahi Gulch on the east. The well site is situated in a residential area and the vicinity has a dry climate with an annual rainfall of about 30 to 40 inches a year.

Based on the driller's log, the well penetrated approximately 15 ft. of reddish brown clay soil and subsoil and 20 ft. of weathered basalt (saprolite) below which occurs typically thin-bedded (no more than a few tens of feet thick) aa and pahoehoe lavas to its total depth of 920 ft.

Hydrology

The Waialae Nui Ridge Well is the third well drilled to develop the inland part of a thick semi-confined basalt aquifer with a head of 9.3 ft. The aquifer comprises the seaward part of the West Waialae Aquifer System which embraces a coastal sector of approximately eight square miles, extending from the Koolau crest to the ocean and laterally along the coast from the Kaau Rift zone (Maunalani Heights) to the Waialae Dike zone (Waialae Iki Ridge). The aquifer system includes high-level dike water in the mountain area toward the Koolau crest and basal water in the near coastal area.

Although the head in the vicinity of the seaward boundary of the basalt aquifer (contact with coastal caprock) is approximately 9 feet, the Board of Water Supply's Waialae Shaft (1747-02) and Aina Koa Well (1746-01) located in this part of the aquifer are anomalously sensitive to increasing chlorides under pumping conditions. However, test results of the more inland Kapakahi, Waialae Nui Ridge (1746-04), and Waialae Nui Valley (1747-03) wells show no evidence of salt water intrusion.

The Waialae West Aquifer System embraces a recharge area of about six square miles and has an estimated sustainable yield of 4 mgd (set by the Commission on Water Resource Management, March 1993). Ground water in the system presumably flows in

a southwest direction, parallel to numerous dikes which have been mapped with a southwest-northeast orientation in the gulches at higher elevations. However, some ground water presumably flows southeast across the Waialae Dike Zone into the Waialae East Aquifer System.

Utilizing data from the April 1, 1992 step-drawdown test, the calculated hydraulic conductivity of the aquifer is 1650 ft./day, comparable to the high-yield Pearl Harbor aquifer. This value also compares with the value of 1540 ft./day obtained for the Kapakahi Well.

Pumping Test Results

Drawdown. The Waialae Nui Ridge Well was successfully tested for seven days at a constant rate of 940 gpm (1.35 mgd) on April 12–19, 1993 (Figure 3). The drawdown in the well stabilized at 11.6 ft., indicating a specific well capacity of 81.0 gpm per foot of drawdown, or half that of Kapakahi Well's 161 gpm per foot of drawdown. This lower well efficiency is due to the solid casing extending 29 ft. below the water table. Of the 11.6 ft., 10.0 ft., or 86 percent, is due to friction and turbulence within the well bore and 1.6 ft. is due to aquifer drawdown, based on the April 1, 1992 step drawdown test and use of Jacob's equation, $S_{total} = BQ + CQ_2$, where B and C are well coefficients and Q is pumping rate.

Drawdown measurements were made with an airline assembly and pressure gage readable to the nearest tenth of a foot. The pressure gage was inadvertently exposed to excessive air pressure at the start of the test and its sensitivity probably was affected, based on later field checks of the airline gage. Approximately 115 hours into the test, the airline gage was momentarily disconnected and reconnected, resulting in a differential reading of 1.0 ft. After 36 hours, the gage readings returned to normal, reflecting a stabilized drawdown of 11.6 ft. throughout the remainder of the test.

Recovery. After the pump was shut off, the gage readings indicated the usual oscillation of water level, but from 4 to 60 minutes afterwards the gage readings were nearly static at 7.4 to 7.5 ft. drawdown. Suspecting a slow gage response, the airline was momentarily disconnected and the gage re-read and at 85 minutes after pumping

had stopped, the indicated well recovery was within 0.3 ft. of static water level before start of the test. This recovery was confirmed with a less accurate 0–30 psi gage. The rapid response of the aquifer to drawdown and recovery was also confirmed by the separate step drawdown test data.

Effect on Existing Wells. Pumping the Waialae Nui Ridge Well at 940 gpm for seven days had no effect on the two nearest existing wells. An airline assembly with a pressure chart recorder (read directly in feet) was installed in the Kapakahi Well, located 1400 ft. southeast (Figure 1). The chart record which covers the period before, during, and after the seven-day test, showed no discernible change (Figure 5).

A Stevens Water Level Chart Recorder with float was installed in the Waialae Nui Valley Well, located 2200 ft. northwest (Figure 1). The water level record covering the period before, during, and after the seven day test showed semi-diurnal fluctuations with peak-to-peak amplitudes of 0.05 ft. These fluctuations are believed to be related to barometric pressure effects on the aquifer rather than to tidal effects, because the peaks occur at approximately the same time of day with no discernible progression with time that would be expected from ocean tides. During the seven-day period of April 12–19, an overall 0.03 ft. downward trend was noted in the chart record. However, this water level trend is so small that it probably is related to a 0.3 ft. downward trend in the minimums of the ocean tides during this same period, rather than to an absolute drawdown of the aquifer. Similar minute trends have been observed in charts of salt water heads in deep monitor wells at Moanalua and Waipahu.

During the seven-day test, the BWS' Aina Koa Well, located 3000 ft. downgradient (southwest) was shut down and monitored, but no water level chart record was available. However, during the seven-day Kapakahi test, no related effect or trend in water level was discernible in the Aina Koa Well located 2100 ft. away.

Water Quality. The Waialae Nui Ridge Well showed no evidence of salt water intrusion during the seven-day test. The chloride content of the well remained steady at 38 ppm.

The well was tested for inorganics and heavy metals and the results were all well within the limits of Public Health Drinking Water Standards. Tests for organics were all below detection limits.

Summary

The Waialae Nui Ridge Well taps a highly permeable basalt aquifer with an estimated sustainable yield of 4 mgd. The Ridge well is one of three planned well sources which will serve the Honolulu Board of Water Supply (BWS) municipal system. The well shows no evidence of salt water intrusion and no effect on water levels in two nearby wells. It is possible that some long-term effect may occur on the salinity of the BWS' Aina Koa Well. However, any loss of its present low yield would easily be offset by the expected large gain in water supply from the three planned interior wells (Waialae Nui Ridge, Waialae Nui Valley, and Kapakahi).

Recommended Pump Capacity

Based on the above, the recommended pump capacity for the Waialae Nui Ridge Well is 1,000 gpm (1.4 mgd).

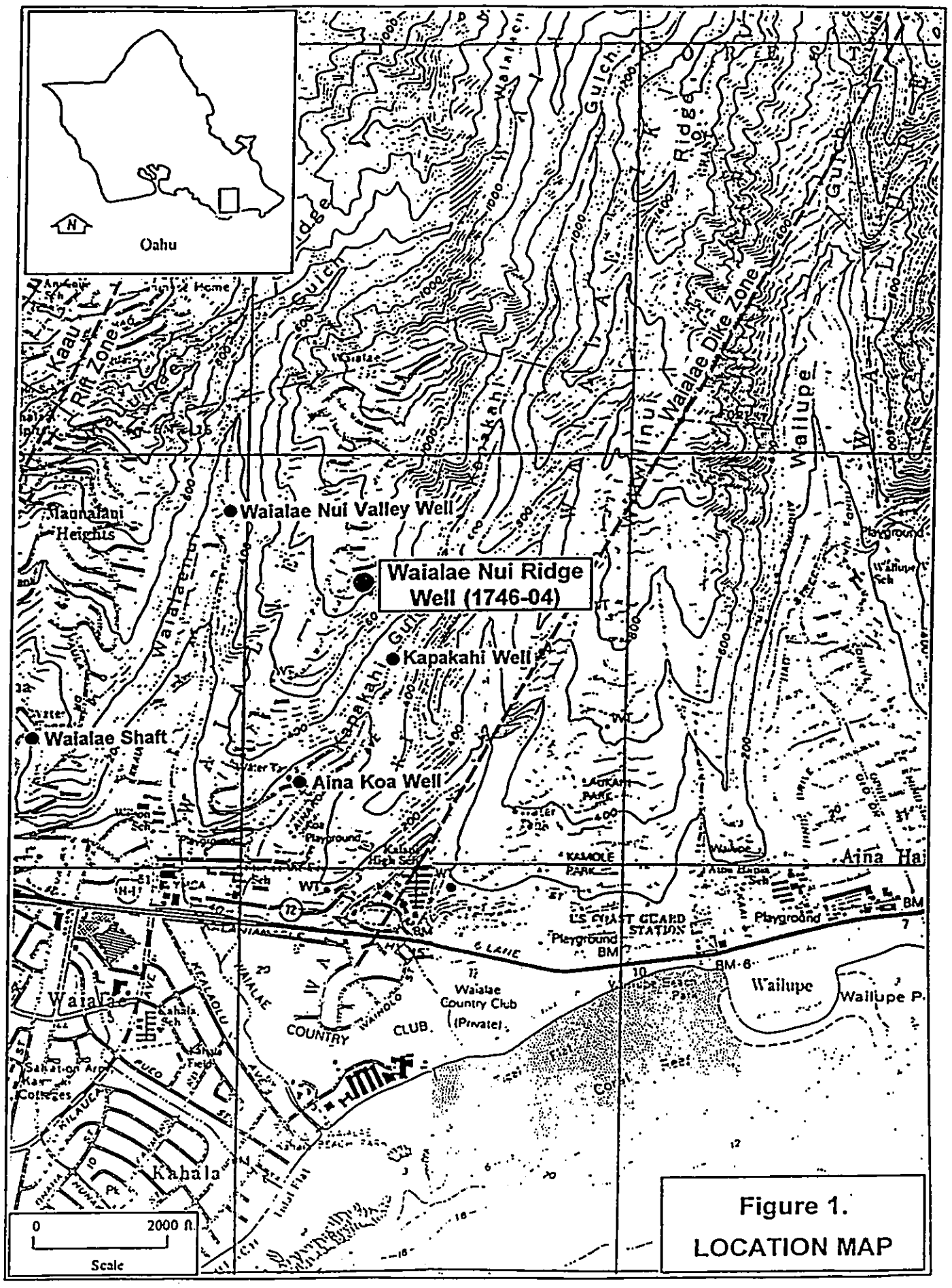
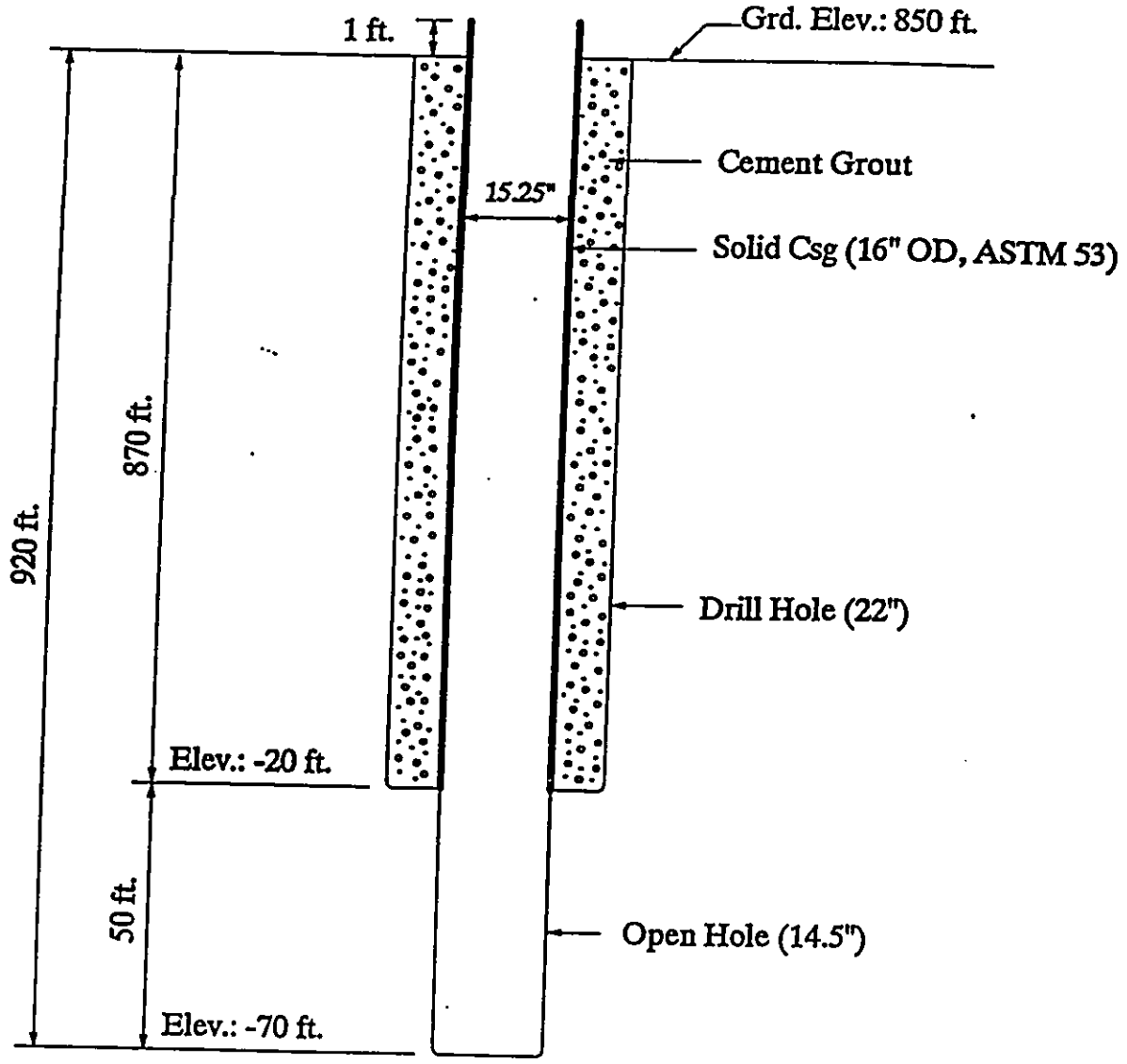


Figure 1.
LOCATION MAP

Figure 2. WAIALAE NUI RIDGE WELL (1746-04)
Waialae, Oahu

As-Built Section



Not to Scale

Water Resource Associates
054WNRAB

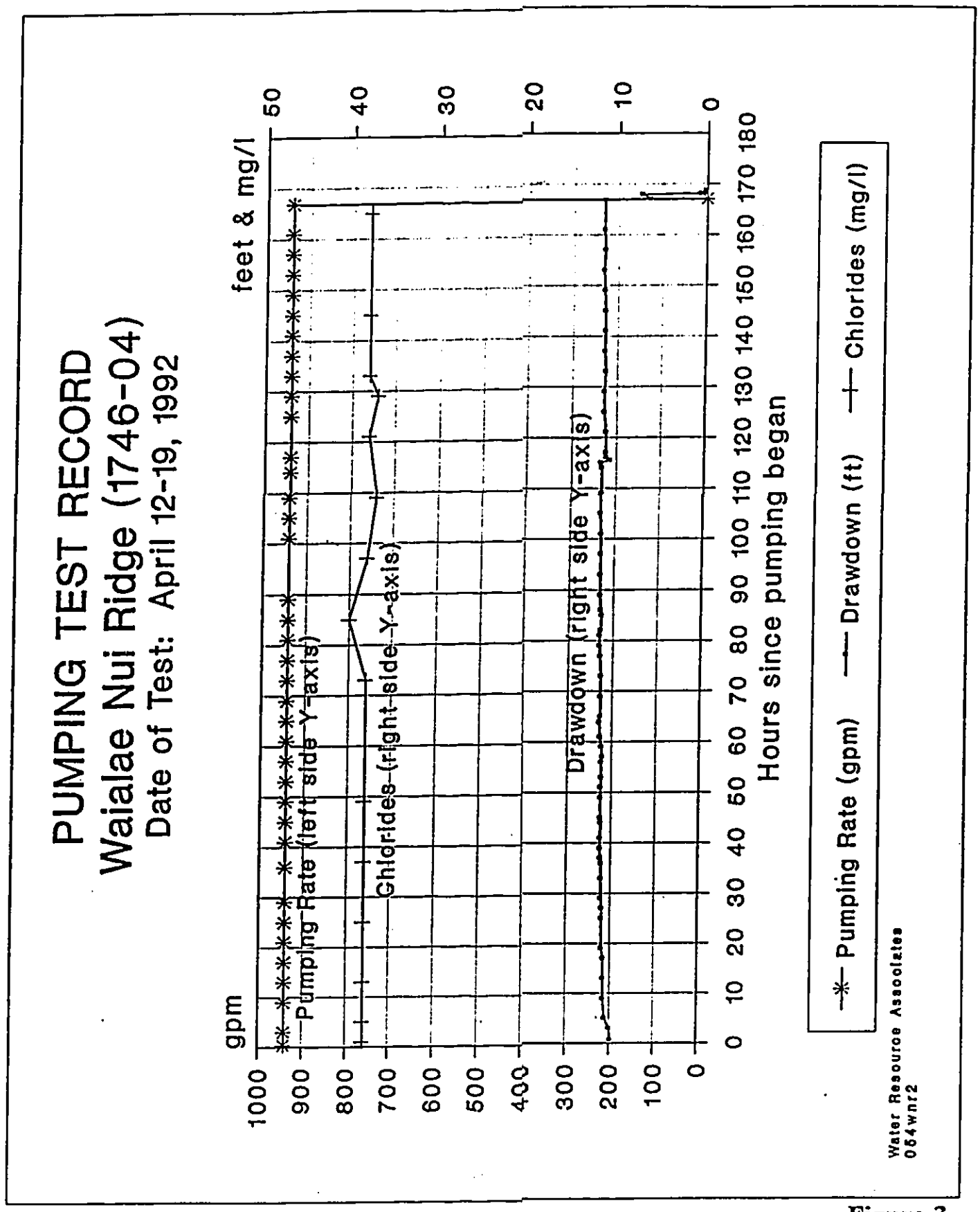

PUMPING TEST RECORD
Waialae Nui Ridge (1746-04)
Date of Test: April 12-19, 1992
gpm
feet & mg/l
Pumping Rate (left side Y-axis)
Chlorides (right side Y-axis)
Drawdown (right side Y-axis)
Hours since pumping began
Pumping Rate (gpm)
Drawdown (ft)
Chlorides (mg/l)
Water Resource Associates
084wnr2

Figure 3.

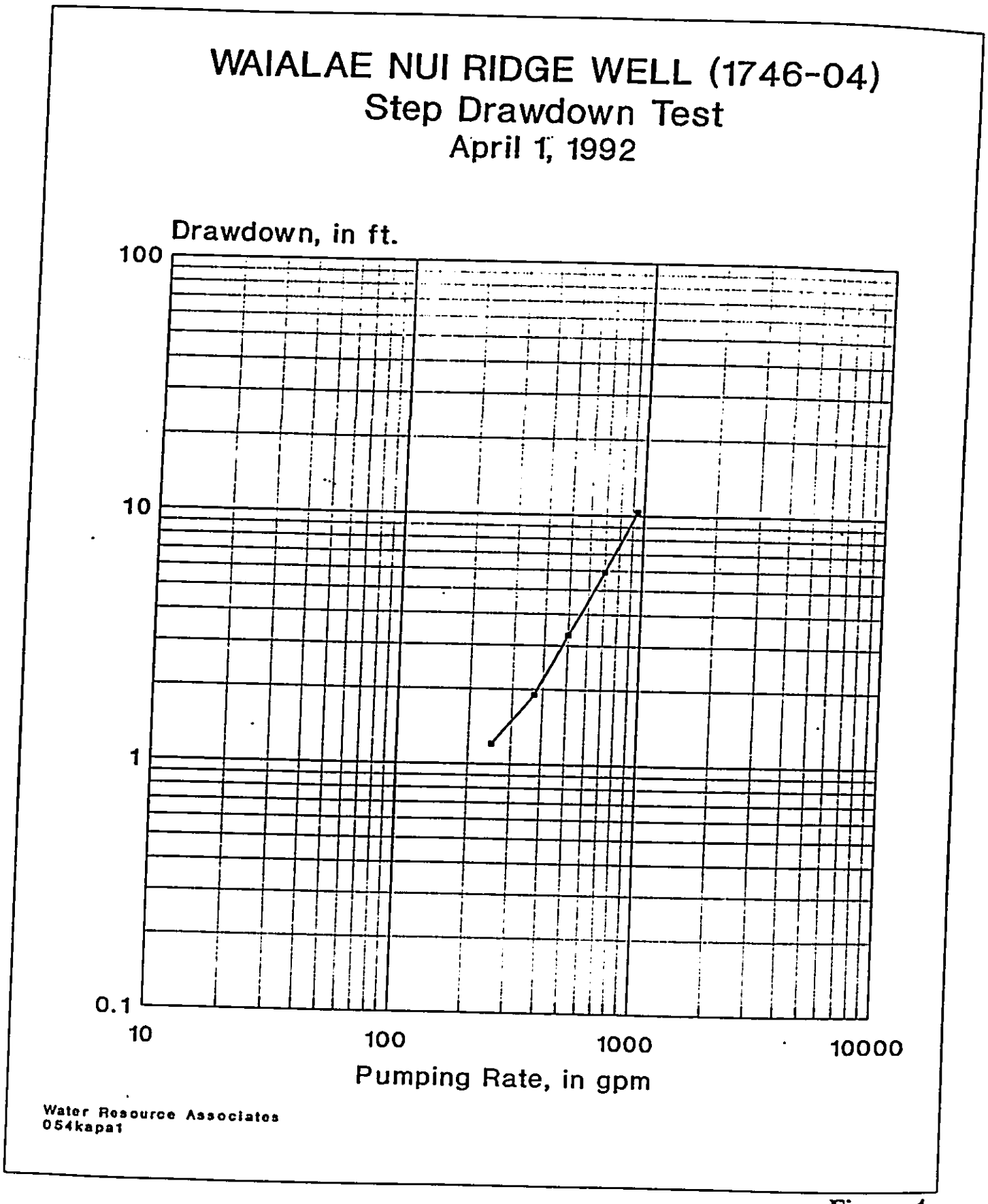

WAIALAE NUI RIDGE WELL (1746-04)
Step Drawdown Test
April 1, 1992
Drawdown, in ft.
100
10
1
0.1
10
100
1000
10000
Pumping Rate, in gpm
Water Resource Associates
054kapa1

Figure 4.

Figure 5. WATER LEVEL CHART - Kapakahi Well

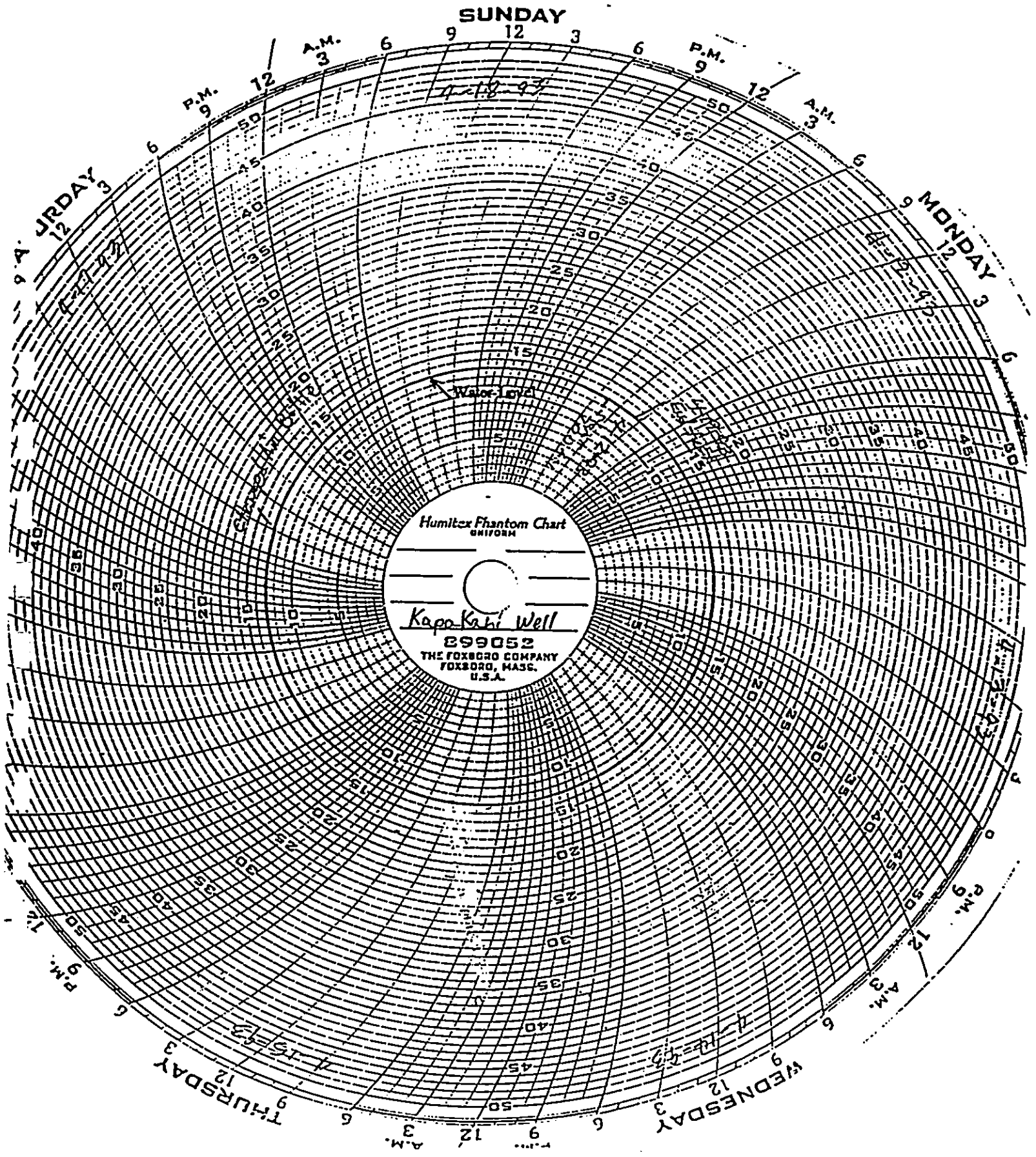


Figure 6. WATER LEVEL CHART - Waialae Nui Valley Well

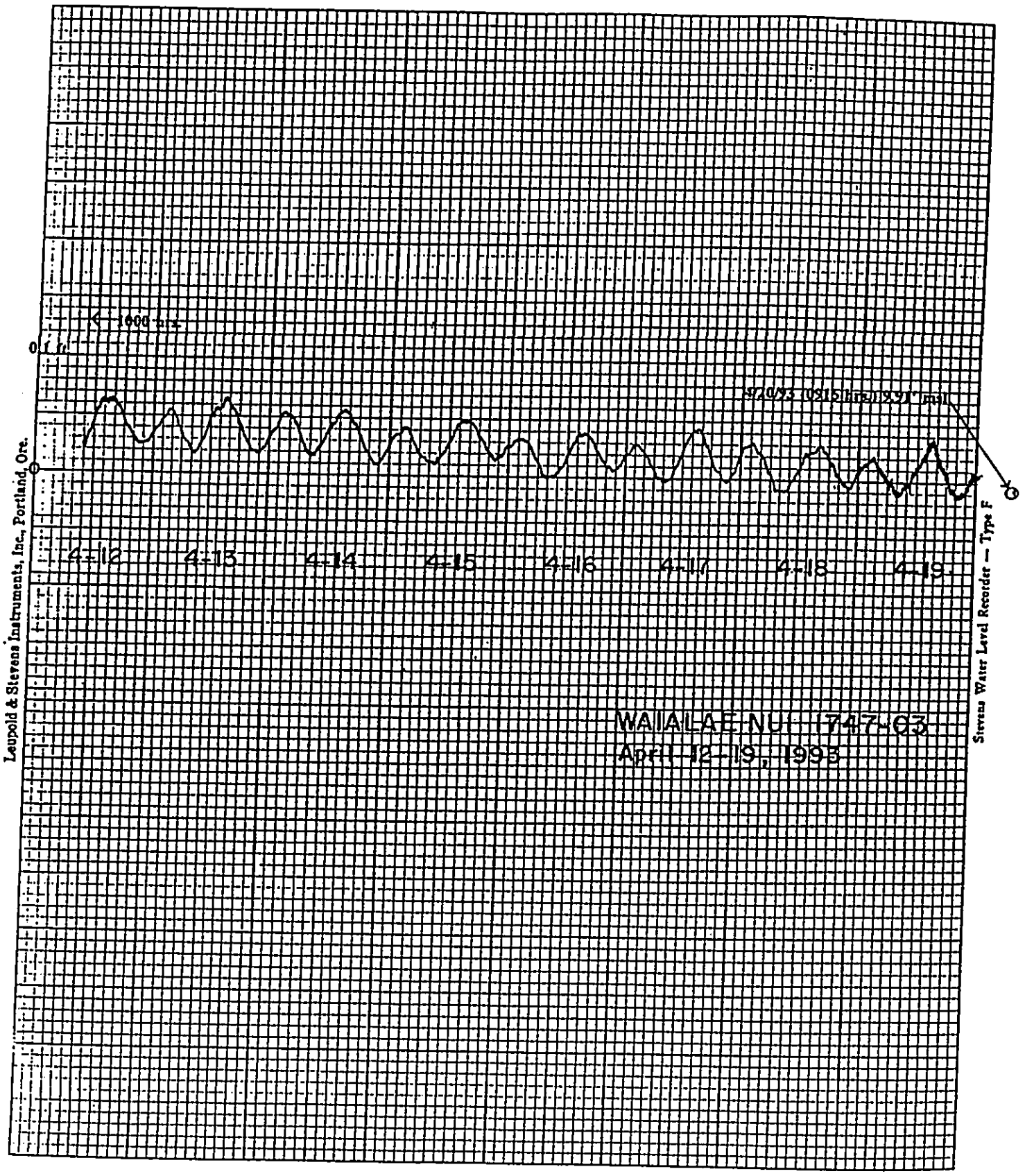


Table 1. PUMPING TEST RECORD
WAIALAE NUI RIDGE WELL(1746-04)
Waialae, Oahu
April 12-19, 1993

Depth (below ground surface):
Solid Casing: 870 ft.
Perforated Casing: None
Total Depth: 920 ft.
Discharge Measurement: Flowmeter
Drawdown Measurement: Pressure gage

Elevations (mean sea level):
Ground surface: 850 ft.
Bottom of Solid Casing: -20 ft.
Bottom of Well: -70 ft.
Static Water Level: 9.3 ft.

Date and Time	Pumping Rate (gpm)	Airline Readings (ft.)	Drawdown (ft.)	Chlorides (ppm)	Water Temp. (°F)
April 12, 1993					
12:45 pm	0	33.1	0		
12:55		32.9			
1:00	Start Pump				
1:10	940	24.10	9.0		
1:20	940	23.5	9.4		
1:30	940	23.4	9.5		
1:40	940	23.25	9.85		72.0
2:00	940	23.15	9.75	38	
3:00	940	23.05	9.85		
4:00	940	22.9	10.0		
5:00	940	22.5	10.4		
6:00	940	22.4	10.5	38	
7:00	940	22.3	10.6		
8:00	940	22.3	10.6		
9:00	940	22.2	10.7		
10:00	940	22.2	10.7		
11:00	940	22.2	10.7		
12:00 M	940	22.2	10.7		
April 13, 1993					
1:00 am	940				
2:00	940	22.2	10.7	38	
3:00	940	22.2	10.7		
4:00	940	22.2	10.7		
5:00	940	22.2	10.7		
6:00	940	22.2	10.7		
7:00	940	22.1	10.8		
8:00	940	22.0	10.9		72
9:00	940	22.0	10.9		
10:00	940	22.0	10.9		

Pumping Test Record (Cont'd)
Waialae Nui Ridge Well (1746-04)

Date and Time	Pumping Rate (gpm)	Airline Readings (ft.)	Drawdown (ft.)	Chlorides (ppm)	Water Temp. (°F)
April 13, 1993 (Cont'd)					
11:00	940	22.0	10.9		
12:00 N	940	22.0	10.9		
1:00 pm	940	22.0	10.9		
2:00	940	22.0	10.9	38	
3:00	940	22.0	10.9		
4:00	940	22.0	10.9		
5:00	940	21.9	11.0		
6:00	940	21.9	11.0		
7:00	940	21.9	11.0		
8:00	940	21.9	11.0		
9:00	940	21.9	11.0		
10:00	940	21.9	11.0		
11:00	940	21.9	11.0		
12:00 M	940	21.9	11.0		
April 14, 1993					
1:00 am	940	21.9	11.0		
2:00	940	21.8	11.1	38	
3:00	940	21.8	11.1		
4:00	940	21.7	11.2		
5:00	940	21.7	11.2		
6:00	940	21.7	11.2		
7:00	940	21.6	11.1		
8:00	940	21.6	11.1		
9:00	940	21.6	11.1		
10:00	940	21.7	11.2		
11:00	940	21.7	11.2		
12:00 N	940	21.7	11.2		
1:00 pm	940	21.7	11.2		
2:00	940	21.7	11.2	38	
3:00	940	21.7	11.2		
4:00	940	21.7	11.2		
5:00	940	21.6	11.1		
6:00	940	21.6	11.1		
7:00	940	21.6	11.1		
8:00	940	21.6	11.1		
9:00	940	21.6	11.1		
10:00	940	21.5	11.0		

Pumping Test Record (Cont'd)
Waialae Nui Ridge Well (1746-04)

Date and Time	Pumping Rate (gpm)	Airline Readings (ft.)	Drawdown (ft.)	Chlorides (ppm)	Water Temp. (°F)
April 14, 1993 (Cont'd)					
11:00	940	21.5	11.0		
12:00 M	940	21.6	11.1		
April 15, 1993					
1:00 am	940	21.6	11.3		
2:00	940	21.6	11.3		
3:00	940	21.6	11.3		
4:00	940	21.5	11.4		
5:00	940	21.5	11.4		
6:00	940	21.6	11.3		
7:00	940	21.6	11.3		
8:00	940	21.6	11.3		
9:00	940	21.6	11.3		
10:00	940	21.6	11.3		
11:00	940	21.6	11.3		
12:00 N	940	21.6	11.3		
1:00 pm	940	21.6	11.3		
2:00	940	21.6	11.3	38	
3:00	940	21.6	11.3		
4:00	940	21.6	11.3		
5:00	940	21.6	11.3		
6:00	940	21.5	11.4		
7:00	940	21.5	11.4		
8:00	940	21.4	11.5		
9:00	940	21.4	11.5		
10:00	940	21.4	11.5		
11:00	940	21.5	11.4		
12:00 M	940	21.5	11.4		
April 16, 1993					
1:00 am	940	21.6	11.3		
2:00	940	21.6	11.3	40	
3:00	940	21.5	11.4		
4:00	940	21.4	11.5		
5:00	940	21.4	11.5		
6:00	940	21.4	11.5		
7:00	940	21.4	11.5		

Pumping Test Record (Cont'd)
Waialae Nui Ridge Well (1746-04)

Date and Time	Pumping Rate (gpm)	Airline Readings (ft.)	Drawdown (ft.)	Chlorides (ppm)	Water Temp. (°F)
April 16, 1993 (Cont'd)					
8:00 am	940	21.4	11.5		
9:00	940	21.4	11.5		
10:00	940	21.4	11.5		
11:00	940	21.4	11.5		
12:00 N	940	21.4	11.5		
1:00 pm	940	21.4	11.5		
2:00	940	21.4	11.5	38	
3:00	940	21.4	11.5		
4:00	940	21.4	11.5		
5:00	940	21.4	11.5		
6:00	940	21.4	11.5		
7:00	940	21.4	11.5		
8:00	940	21.4	11.5		
9:00	940	21.4	11.6		
10:00	940	21.3	11.6		
11:00	940	21.3	11.6		
12:00 M	940	21.3	11.6		
April 17, 1993					
1:00 am	940	21.3			
2:00	940	21.3	11.6	37	
3:00	940	21.3			
4:00	940	21.3			
5:00	940	21.3			
6:00	940	21.3	11.6		
7:00	940	21.3		72	
8:00	940	21.2	11.7 (check gage by disconnecting		
9:00	940	21.8	11.1 and reconnecting at 8:30 am.		
10:00	940	21.7	11.2 Gage rdg=22.2', or 10.7' dd)		
11:00	940	21.7			
12:00 N	940	21.7	11.2		
1:00 pm	940	21.7			
2:00	940	21.7	11.2	38	
3:00	940	21.7			
4:00	940	21.7	11.2		
5:00	940	21.6			
6:00	940	21.5	11.4		
7:00	940	21.5			

Pumping Test Record (Cont'd)
Waialae Nui Ridge Well (1746-04)

Date and Time	Pumping Rate (gpm)	Airline Readings (ft.)	Drawdown (ft.)	Chlorides (ppm)	Water Temp. (°F)
April 17, 1993 (Cont'd)					
8:00	940	21.5	11.4		
9:00	940	2.15			
10:00	940	21.5	11.4	37	
11:00	940	21.5			
12:00 M	940	21.6	11.3		
April 18, 1993					
1:00 am	940	21.6			
2:00	940	21.6	11.3	38	
3:00	940	21.6	11.3		
4:00	940	21.6	11.3		
5:00	940	21.5	11.3		
6:00	940	21.5	11.4		
7:00	940	21.5	11.4		
8:00	940	21.5	11.4		
9:00	940	21.5	11.4		
10:00	940	21.5	11.4		
11:00	940	21.5	11.4		
12:00 N	940	21.5	11.4		
1:00 pm	940	21.5	11.4		
2:00	940	21.5	11.4	38	
3:00	940	21.5	11.4		
4:00	940	21.5	11.4		
5:00	940	21.4	11.4		
6:00	940	21.4	11.5		
7:00	940	21.4	11.5		
8:00	940	21.4	11.5		
9:00	940	21.3	11.5		
10:00	940	21.3	11.6		
11:00	940	21.4	11.6		
12:00M	940	21.4	11.5		
April 19, 1993					
1:00 am	940	21.4	11.5		
2:00	940	21.4	11.5	38	
3:00	940	21.3	11.5		

Pumping Test Record (Cont'd)
Waialae Nui Ridge Well (1746-04)

Date and Time	Pumping Rate (gpm)	Airline Readings (ft.)	Drawdown (ft.)	Chlorides (ppm)	Water Temp. (°F)
April 19, 1993 (Cont'd)					
4:00	940	21.3	11.6		
5:00	940	21.3	11.6		
6:00	940	21.3	11.4		
7:00	940	21.4	11.6		
8:00	940	21.3	11.6		
9:00	940	21.3	11.6		
10:00	940	21.3	11.6	38	
11:00	940	21.3	11.6		
11:55	940	21.3	11.6		72
12:00 N	Stop Pump - Recovery				
12:03 pm		26.4	6.5 (backspin stopped)		
12:04		25.4	6.5		
12:05		25.6	7.3		
12:06		25.4	7.3		
12:08		25.4	7.3		
12:10		25.4	7.3		
12:15		25.4	7.3		
12:20		25.5	7.3		
12:30		25.5	7.3		
12:45		25.5	7.3		
1:00		25.5	7.4 (Disc. & reconnect gage before		
1:10		32.1	0.8 next rdg.)		
1:15		32.6	0.3		
1:25		32.7	0.2		
1:30		32.7	0.2 (Disc. & reconnect gage before		
1:45		32.7	0.2 next rdg.)		

State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources
Division of Water Resource Management

WELL COMPLETION REPORT

INSTRUCTIONS: Please print or type and submit completed report within 30 days of well completion to the Division of Water Resource Management, P. O. Box 373, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis, if available, should also be submitted. If necessary, phone 548-7543, Hydrology, Geology Section for Assistance.

A. STATE WELL NO. 1746-04 WELL NAME Waialae Nui Ridge Well ISLAND Oahu

B. LOCATION Aina Koa #4 Booster Station Hale Koa Drive TAX MAP KEY 3-5-62:44

C. WELL OWNER Bishop Estate

D. DRILLING OR PUMP INSTALLATION CONTRACTOR Roscoe Moss Hawaii, Inc.

E. TYPE OF RIG Cable Tool DRILLER Hal Fenton and Rodney Couch

F. DATE OF WELL COMPLETION 5/13/93 DATE OF PUMP INSTALLATION _____

G. GROUND ELEVATION (msl) 850 ft.
Top of Drilling Platform (msl) 851 ft.
Height of drilling platform above ground surface 1 ft.
Bench mark and method used to determine ground elevation BWS Tank ft.

H. TOTAL DEPTH OF WELL BELOW GROUND 920'

I. HOLE SIZE:
22 inch dia. from 0 ft. to 871 ft. below ground
14½ inch dia. from 871 ft. to 920 ft. below ground
_____ inch dia. from _____ ft. to _____ ft. below ground

J. CASING INSTALLED:
15¼ in. I.D. x .375 in. wall solid section to 870 ft. below ground
_____ in. I.D. x _____ in. wall perforated section to _____ ft. below ground
Type of perforation N/A

K. ANNULUS:
Grouted from 0 ft. to 870 ft. below ground
Gravel packed from _____ ft. to _____ ft. below ground

L. PERMANENT PUMP INSTALLATION:
Pump type, make, serial No. _____ Capacity _____ gpm
Motor type, H.P., voltage, r.p.m. _____
Depth of pump intake setting _____ ft. below _____ which elevation is _____ ft.
Depth of bottom of airline _____ ft. below _____ which elevation is _____ ft.

M. PROPOSED USE Municipal

N. INITIAL WATER LEVEL 840.3 ft. below ground. Date and time of measurement 7:00 am / 8/28/92

O. INITIAL CHLORIDE _____ ppm. Date and time of sampling _____ / _____

P. PUMPING TESTS: Reference point (R.P.) used: Ground which elevation is 850 ft.

Date April 1, 1993
Start water level _____ ft. below R. P.
End water level Step Test ft. below R. P.
Depth of well Data Included ft. below R. P.

Elapsed Time (hours)	Rate (gpm)	Draw-down (ft.)	Cl- (ppm)	Temp. °F
____ to ____				
____ to ____				
____ to ____				
____ to ____				
____ to ____				
____ to ____				

Date April 12 – 19, 1993
Start water level Long Term ft. below R. P.
End water level _____ ft. below R. P.
Depth of well Data Included ft. below R. P.

Elapsed Time (hours)	Rate (gpm)	Draw-down (ft.)	Cl- (ppm)	Temp. °F
____ to ____				
____ to ____				
____ to ____				
____ to ____				
____ to ____				
____ to ____				

Q. DRILLER'S LOG:

Depth, ft.	Rock Description & Remarks	Water Level ft.
0 to 15	Red & Brown Clay	
15 to 25	Mud Rock	
25 to 35	Clay & Boulders	
35 to 135	Grey Solid Lava	
135 to 178	Brown Lava	
178 to 183	Red Cinders	
183 to 220	Brown Lava Firm	
220 to 230	Broken Brown & Grey Lava	
230 to 238	Grey & Red Cinders	
238 to 260	Broken Grey & Brown Lava	
260 to 330	Grey Lava Solid	
330 to 355	Broken Brown & Grey Lava	
355 to 392	Grey Lava Solid	
392 to 400	Broken Lava Boulders	
400 to 455	Grey Lava Hard	
455 to 470	Broken Brown Lava	
470 to 580	Grey Lava Solid	
580 to 657	Brown & Grey Lava	
657 to 680	Firm A'A'	
680 to 695	Pahoehoe	
695 to 752	Soft & Hard A'A'	
752 to 775	Pahoehoe	

REMARKS: Continuation attached

Table 2.

Q. · DRILLER'S LOG:

Depth, ft.	Rock Description & Remarks	Water Level ft.
775 to 840	Soft & Hard A'A'	
840 to 850	Loose Gravel	840'8"
850 to 895	Layered Soft & Hard AA	840'8"
895 to 920	Poures Lava	840'8"
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....

Depth, ft.	Rock Description & Remarks	Water Level ft.
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....
..... to	.....	.....

REMARKS: .....

Submitted by (print) Tracy Runnells

Title Field Superintendent

Signature Tracy Runnells

Date 5/13/93

FOR DRILLER'S USE
Job Name .....
Job No. .....

FOR OFFICIAL USE
Latitude .....
Longitude .....
Well No. .....

Table 3. CHEMICAL ANALYSES

Sample Type: Drinking Water

Sample Date: 4/19/93

Time Sampled: 1130 hrs.

Analysis	Units	Waialae Nui Ridge Well	Date/Analyst
pH	pH units	7.92	04/19 jlr
Turbidity	NTU	0.28	04/20 klm
Conductivity	µmhos/cm	318	04/19 jlr
Color	APCU	<5	04/19 jlr
Fluoride	mg/l	0.05	05/14 AL
Chloride	mg/l	37.0	04/21 klm
Alkalinity	mg $CaCO_3$/l	72	05/05 eh
Hardness	mg /l	49.2	05/18 jlf
Total Dissolved Solids	mg/l	196	04/21 klm,eh
Sulfate	mg/l	11.9	04/20 klm
Nitrate	mg N/l	0.784	04/20 dh
Nitrite	mg N/l	0.001	04/20 dh
Foaming Agents (ppm)	mg LAS/l	<0.025	04/20 lr
Metals:			
Arsenic	mg/l	<0.005	04/21 ds
Barium	mg/l	<0.05	05/05 ds
Cadmium	mg/l	<0.002	04/21 ds
Chromium	mg/l	<0.005	04/21 ds
Copper	mg/l	<0.02	04/20 ds
Mercury	mg/l	0.00020	04/23 ds
Manganese	mg/l	<0.05	04/29 ds
Lead	mg/l	<0.005	04/30 ds
Selenium	mg/l	<0.01	04/21 ds
Zinc	mg/l	<0.01	04/29 ds
Iron	mg/l	<0.1	04/29 ds
Calcium	mg/l	6.64	04/29 ds
Magnesium	mg/l	9.40	04/29 ds

JOB #: 604
DATE: 05/18/93
PAGE: 2 of 2

Analysis	Units	Waialae Nui Ridge Well	Limits of Detection	Date/Analyst
Organochlorine Pesticides & PCBs EPA Method 505	µg/l	BDL†	†	05/14 AL
Chlorophenoxy Acids Herbicides EPA Method 515.1	µg/l	BDL†	†	05/14 AL
Volitle Organics Compounds (including TTHM) EPA Method 524.2	µg/l	BDL†	†	05/14 AL
2,3,7,8 TCDD Dioxin	µg/l	BDL	0.22	05/14 AL
EPA Method 504				
EDB	µg/l	BDL	0.01	05/14 AL
DBCP	µg/l	BDL	0.02	05/14 AL
Carbamates EPA Method 531.1				
Carbofuran	µg/l	BDL	5	05/14 AL
Oxamyl	µg/l	BDL	5	05/14 AL
Radioactivity				
Gross Alpha	pCi/l	BDL	1.0	05/14 AL
Gross Beta	pCi/l	1.4 + 0.3		05/14 AL
Asbestos		BDL		05/14 AL

BDL Below Detection Limits
† see attached list
AECOS

APPENDIX B

Appendix B

Draft EA Comments and Responses

AINA KOA WELL II

DECEMBER 1999

BENJAMIN J. CAYETANO
GOVERNOR

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

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November 8, 1999

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

Dear Mr. Jamile:

Subject: Draft Environmental Assessment for the Aina Koa Well II, Oahu

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

1. **Orientation Maps**

   Please provide maps with the appropriate scale and coverage to analyze the aquifer or hydrologic unit that show the following:

   a) Contamination information: Points or regions of known contamination, points of potential contamination (landfills, individual wastewater disposal systems, hazardous waste sites, dry wells and injection wells), and likely wellhead protection area for the proposed well.

2. **Aquifer or Hydrologic Unit Status**

   Please provide the following information on the aquifer or hydrologic unit status:

   - Current installed capacity including subtotals for individual wells and/or groups of wells.
   - Pending installed capacity and/or use for other proposed wells within the aquifer.

3. Financial and Institutional Arrangements

The EA should include a full discussion of any institutional, financial or land use arrangements or commitments related to developing the well and delivering water to end users. Any or all of these arrangements and all permits or governmental approvals required to fulfill these commitments should be listed. In particular, please provide a list of KSBE-sponsored projects that will be allowed to proceed once this project is implemented.

4. Alternative Analysis

Please provide a list of alternatives to new groundwater development and discussion of their related costs and benefits. The list should include but not be limited to alternative locations, wastewater reuse, rainfall catchment, existing potable and non-potable water supplies, water conservation and Demand Side Management or Integrated Resources Planning. Show why developing a new source is more cost efficient than water conservation programs (slow-flow and low-flush retrofits, leak detection, etc.). In the case of back-up wells, there should be a discussion of the feasibility of providing a back-up pump only, rather than drilling a second well.

5. Determination

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

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

Sincerely,

Genevieve Salmonson
Director

c: CH2M HILL

6.0 DETERMINATION, FINDINGS AND REASONS FOR SUPPORTING DETERMINATION

To determine whether the proposed action may have a significant impact on the environment, the project and its expected consequences, both primary and secondary, and the cumulative as well as short– and long–term effects have been evaluated. Based on the studies performed and research evaluated, a finding of no significant impact is anticipated and is summarized below.

6.1 SIGNIFICANCE CRITERIA

According to the Department of Health Rules (11–200–12), an applicant or agency must determine whether an action may have a significant impact on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects, and its short– and long–term effects. In making the determination, the Rules establish "Significance Criteria" to be used as a basis for identifying significant environmental impacts. According to the Rules, an action shall be determined to have significant impacts on the environment if it meets any one of the following criteria:

(1) Involves an *irrevocable* commitment to loss or destruction of any natural or cultural resources;

An archaeological assessment and field reconnaissance study for the project has determined that cultural deposits and possibly historic burials may exist in the sand dunes adjacent to Farrington Highway. The Landscape Master Plan has therefore been designed to protect the cultural resources and stop the current practice of allowing unrestricted vehicular access onto these areas by limiting parking to designated areas. Planned treatments for the dune areas will include landscape plantings of low shrubs and vines consisting of coastal native species. In the event that any cultural deposits or human burials are uncovered, all work will immediately be halted and planting would shift to an area free of any cultural resources.

The proposed project will not impact scenic views of the ocean or any ridgelines from Farrington Highway or other heavily traveled roadways in the area. The visual character of the area will be enhanced by the additional landscaping with heritage trees and other coastal native plantings. The landscape plantings will also mitigate existing soil erosion. The existing three-mile park is designated as State Urban lands dedicated for Park purposes, an important natural and cultural resource. Presently, the study area is only minimally landscaped and not improved for aesthetic purposes.

(2) Curtails the range of beneficial uses of the environment;

The existing Ulehawa Beach Park has been dedicated for shoreline recreational uses for many decades. Its improvement as described by the Landscape Master Plan will enhance the range of beneficial uses of the environment.

Controlled access onto the property will directly enhance access to the shoreline while simultaneously protect the cultural and natural resources by restrictly vehicular access onto the sand dunes and beach. This shoreline has historically been used for food gathering and recreational purposes. The planned park improvements will enhance those functions.

(3) **Conflicts 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 decisions, or executive orders;**

The proposed development is consistent with the Environmental Policies established in Chapter 344, HRS.

(4) **Substantially affects the economic or social welfare of the community or state;**

The proposed project will provide a significant contribution to the Wai'anae District population by establishing an improved recreational resource. The proposed improvements are also consistent with the City's Development Plan for the area. Surrounding land use patterns will not be negatively or significantly altered, nor will unplanned population growth or its distribution be stimulated.

Consequently, development of the park improvements will provide Wai'anae coast residents with a quality recreational facility. This harmonious relationship between park and the existing community will significantly improve the quality of life for many residents.

(5) **Substantially affects public health;**

Although the public health may be affected by the short-term construction impacts which may affect air, noise, traffic and water quality, these should be insignificant especially when weighed against the positive economic, social, and quality of life implications associated with the project. Mitigation measures will be used to address impacts that could potentially affect public health.

(6) **Involves substantial secondary impacts, such as population changes or effects on public facilities;**

The improvement of this existing beach park will not have any secondary impact associated with population growth of the need for public facilities.

(7) **Involves a substantial degradation of environmental quality;**

The renovation of an exiting regional park will improve a much used natural resource. The proposed project may improve erosion control, reduce runoff into nearshore waters, and control access. There are no anticipated impacts that would degrade environmental quality. The addition of new landscaping with Hawaiian heritage plants will enhance the park environment by providing new natural materials and shade. The coastal visual resource from Farrington Highway will also be improved.

(8) **Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;**

The planned improvements to an existing park is consistent with the existing and planned urban character expressed in the Wai'anae Development Plan and is not anticipated to have a considerable effect on the environment. The committment of fiscal resources to construct the improvements will foreclose other uses of those resources.

(9) **Substantially affects a rare, threatened or endangered species or its habitat;**

Field wildlife and botanical studies indicate that there are no endangered plant or animal species located at this highly utilized beach park. The federal and state natural resource agencies have not

identified Ulehawa Beach Park as a site for monk seals or turtle nesting, however, it is possible that seals may beach there from time to time.

(10) Detrimentally affects air or water quality or ambient noise levels;

Any possible impact to near-shore ecosystems resulting from surface runoff will be mitigated by the establishment of on-site detention basins during the construction phases of development.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters;

Ulehawa Beach Park, like all other coastal parks in the State is susceptible to high wave and tsunami inundation.

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies;

The City and County of Honolulu's *Coastal View Study* identifies the Nānākuli Viewshed as a major viewshed within the Wai'anae area. Lateral coastal views which are available from all points along the shoreline are significant, especially in the Ka'ena direction due to the descending ridges which can be seen in the distance. The Pu'u o Hulu Kai / Pu'u o Hulu Uka landmark is designated as an important coastal land form. Although new landscape plantings will impact views, the overall visual resource will be enhanced. The proposed project is in conformance with both State and County plans for the area and no public facilities are designated on the Wai'anae Development Plan Public Facilities Map.

(13) Requires substantial energy consumption;

The location of the beach park is proximate to Wai'anae area communities and are all within short driving distances from the property, thereby reducing travel times and energy consumption. Construction of the proposed project will not require substantial energy consumption.

6.2 DETERMINATION

On the basis of the above criteria, and the discussion of impacts and mitigative measures contained in this document, it is anticipated that the proposed project will not have a significant negative effect on the environment and will conversely, result in positive effects to the natural, cultural, and social environments.

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CH2MHILL

January 10, 2000

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

Subject: Response to Comments on the *Draft Environmental Assessment, Aina Koa Well II, Aina Koa, Honolulu, Oahu, Hawaii, TMK 3-5-62:44*

Dear Ms. Salmonson:

This is in response to your comment letter dated November 8, 1999 regarding the *Draft Environmental Assessment (EA), Aina Koa Well II, Aina Koa, Honolulu, Oahu, Hawaii, TMK 3-5-62:44*. We have responded to your comments under five (5) separate headings that correspond to the headings in your letter.

1. Orientation Maps

Your letter asks about the wellhead protection area for the Aina Koa II well and also requests that a map be provided that shows the Aina Koa II well relative to "points or regions of known contamination, points of potential contamination (landfills, individual wastewater disposal systems, hazardous waste sites, dry wells and injection wells), and likely wellhead protections area for the proposed well."

Consultation with a representative of the Clean Water Branch, State Department of Health, indicates that the State has not yet established the wellhead protection areas for the region containing the Aina Koa II well.

CH2M HILL also reviewed State Department of Health databases related to known landfills, individual wastewater disposal systems, hazardous waste sites, dry wells, and injection wells. Our review defined the area of investigation as the portion of the Waialae East Aquifer within 1.5 miles of the well site (see accompanying map). As noted in section 4.5.1 of the draft and final EA, the aquifer extends from the Kaau Rift zone (Maunalani Heights) to the Waialae Dike zone (Waialae Iki Ridge). CH2M HILL'S review of the DOH databases indicated that there are no known landfills, individual wastewater disposal systems, dry wells, injection wells in the aquifer area, and hazardous waste sites within the aquifer and within 1.5 miles of the well.

2. Aquifer or Hydrologic Unit Status

   Your letter also requested current installed pump capacities for individual wells and/or groups of wells and pending installed capacity and/or use for other proposed wells within the aquifer. Section 2.5 of the final EA has been revised to incorporate pump capacity information.

3. Financial and Institutional Arrangements

   Your letter also requested information concerning the Kamehameha Schools (formerly referred to as "Kamehameha Schools Bishop Estate" and "KSBE") sponsored projects that will be allowed to proceed once the Aina Koa Well II is implemented. Accompanying this letter is the staff report for the State Commission on Water Resource Management's May 20, 1998 meeting and the attached Exhibit 5. Items 2 and 5 of the staff report, respectively, discuss the projects that the water requested in the Water Use Permit would supply and the State and County general plans and land use designations for the sites. As stated in item "1, a" under the heading "Recommendations," "The allocation is based on the projects listed in Exhibit 5, except for the Queens Beach GC [golf course] (TMK 139-011-002,003), Lot 9 (TMK 139-017-051), and Varsity Place (TMK 128-24-35)." As stated in item 2, the "BWS advanced water credits to Kamehameha Schools to meet imminent needs, and some of these projects are already on-line."

   With regards to your question concerning the financing arrangements for individual projects, we can respond to matters that relate to Kamehameha Schools but cannot respond to any matters concerning the financing arrangements of Kamehameha Schools' developers. Kamehameha Schools has the financial resources to undertake its financing commitments as they arise. Kamehameha Schools' developers' financing arrangements are confidential and may not be disclosed.

4. Alternative Analysis

   Your letter also focuses on alternative analysis, which was addressed in section 1.4 of the draft and final EA. A discussion of alternatives needs to consider the anticipated continued increase in demand for potable water, discussed in section 2.1 of the draft and final EA, and the BWS policy requiring developers of large-scale developments to supply the additional requirements to the BWS system, also discussed in section 2.1 of the draft and final EA.

   The following summarizes the alternatives considered with respect to no action, deferred action, and alternative well sites.

   a) The "no action" alternative was rejected as it would not meet the BWS's requirements that large landowners meet their potable water demand requirements by assisting the BWS with additional source development. If the BWS's water source development were curtailed, the BWS would be hampered in providing adequately for the water needs of the future population of the island, which may result in

regional water shortages. Water from this well is required to fulfill additional demands from Kamehameha-Schools-sponsored projects.

b) The deferred action alternative was not pursued because this alternative would delay the implementation schedule and would incur higher development costs because of inflation. Delaying the proposed well would increase the risk that the projects identified as "end users" of this water would cause an undue strain on the existing water supply system or would not be able to proceed due to a lack of sufficient potable water.

c) Prior to the consideration of the Aina Koa II well site, the BWS conducted an analysis of 21 other potential sites within the Honolulu Sector for additional potable wells in its *Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii* (1986). Additional well sites were proposed in the vicinity of the Aina Koa Well II in the BWS study. Of the other sites, the Kalani Iki well was identified as an alternative. It is not being pursued at this time for two reasons: access to the site is through privately-owned land and its location is only approximately 200 feet from the interpreted Northeast Dike Alignment, a hydrologic barrier that might cause greater well drawdown and thus less well capacity. Additional sites were identified in the Waialae East Aquifer and have been drilled as exploratory wells, but have not been pursued by the BWS as production facilities.

With regard to alternative source development, section 1.4 of the draft and final EA states:

> "Alternative source development was not pursued in this analysis since the BWS had also analyzed potential potable water source alternatives other than groundwater in its 1986 study, including desalinization, development of surface and brackish water sources, and recycling of treated wastewater. Typically, these alternative sources have considerably higher costs and technical challenges. For instance, the use of surface water has a high potential for health and safety problems and would require costly water treatment. The development of these alternatives was not considered as feasible as the development of groundwater resources."

Wastewater reuse, use of non-potable water sources, and Demand Side Management or Integrated Resources Planning are all being pursued by the BWS. The BWS is currently undertaking an extensive Integrated Resource Planning effort. BWS pursuit of the foregoing alternatives has not resulted in a decision by the BWS to halt or delay the development of new potable water wells and has not resulted in a change in the BWS policy that requires developers of large-scale developments to supply the additional requirements to the BWS system.

Conservation programs, including slow-flow and low-flush retrofits and detection of leaks, are all actively pursued by the BWS. However, BWS pursuit of these alternatives has not resulted in a decision by the BWS to halt or delay the development of new potable water wells and has not resulted in a change in the BWS policy that requires developers of large-scale developments to supply the additional requirements to the BWS system.

Although individuals may use rainfall catchment, building permits and land use approvals (such as subdivision and rezoning) still require BWS service. The possibility of individuals using rainfall catchment has not resulted in a decision by the BWS to halt or delay the development of new potable water wells and has not resulted in a change in the BWS policy that requires developers of large-scale developments to supply the additional requirements to the BWS system.

5. Determination

The following summarizes the findings and reasons supporting the determination of no significant impact relative to the criteria listed in Hawaii Administrative Rules Title 11, Department of Health, 200-12.

a) "Involves an irrevocable commitment to loss or destruction of any natural or cultural resource"

As stated in section 4.9.1 of the draft and final EA:

"The project will have "no effect" on historic or cultural sites. The site and surrounding area were graded in conjunction with the development of the surrounding residential subdivision. The site is not currently listed on the Hawaii Register or the National Register of Historic Places, nor has it been determined eligible for inclusion on either of these registers. There are no known traditional gathering activities and/or cultural practices affecting the subject property."

b) "Curtails the range of beneficial uses of the environment"

The following is stated in section 4.1.2 regarding project impacts on existing land uses:

"Construction and operation of the proposed Aina Koa Well II has not and will not change any of the surrounding land uses or ownership patterns. The modifications at Aina Koa 640' Reservoir and Booster Pump Station No. 3 and Aina Koa 405' Reservoir and Booster Pump Station No. 2 also will not change any of the surrounding land uses or ownership patterns."

c) "Conflicts 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 decisions, or executive orders"

The proposed project is consistent with the Environmental Policies established in Chapter 344, Hawaii Revised Statutes.

d) "Substantially affects the economic or social welfare of the community or State"

As stated in section 4.10.2 of the draft and final EA, regarding project impacts on the socioeconomic environment:

> "The Aina Koa Well II will have no impact upon the socioeconomic environment of the immediate neighborhood."
>
> "A small number of temporary construction jobs will be created by the construction; however, these jobs will likely involve people living on Oahu but outside this census tract."

e) "Substantially affects public health"

Short-term construction impacts may affect noise and fugitive dust levels and would add to traffic on Halekoa Drive; however, these impacts are not considered to be significant nor are they considered to have a substantial impact on pubic health. Section 1.5 of the draft and final EA summarizes these impacts and the related mitigation measures:

> "Construction work, primarily erection of the control building and underground piping installation, would cause minor short-term noise and fugitive dust impacts to the surrounding environment. All government rules and regulations concerning noise and fugitive dust emissions would be followed during construction to minimize minor short-term noise and air pollution impacts."
>
> "To mitigate any short-term noise impacts, contractors would comply with all of the conditions of any required noise permit. Mufflers would be used on all construction equipment. All noise-attenuating equipment would be maintained in proper operating condition and would be repaired or replaced as needed. In order to reduce noise levels from the production pump, a submersible pump will be used."
>
> "To mitigate the short-term air pollution effects of the construction activities, dust control measures would be implemented by the contractor to reduce dust levels, as necessary. Further, the contractor would properly maintain its internal combustion equipment to minimize exhaust emissions and would comply with the State of Hawaii, Department of Health Rules Title 11, Chapters 59 and 60 regarding Air Pollution Control."

> "Traffic impacts to Halekoa Drive and the surrounding community would be minimal. The contractor would schedule the movement of heavy trucks and vehicles to or from the site after 8:00 AM and before 3:30 PM to avoid the morning and afternoon peak traffic periods."

Potable water quality is subject to considerable federal and state scrutiny in order to ensure the protection of public health. The project is part of the BWS program to provide a safe and reliable potable municipal water supply to meet growing demand. As stated in the section 3.2 of the draft and final EA concerning alternatives considered:

> "The Aina Koa Well II was identified as part of an overall groundwater development program intended to increase the municipal water supply to meet growing demand. If the BWS's water source development program were curtailed, the BWS would be hampered in providing adequately for the water needs of the future population of the island, which could result in regional water shortages. Water from the Aina Koa Well II is required to fulfill additional demands from Kamehameha-Schools-sponsored developments.
>
> "Based on the foregoing, the Aina Koa Well II would have a beneficial impact on public health for Oahu residents and visitors."

f) "Involves substantial secondary impacts, such as population changes or effects on public facilities"

The BWS development of potable water sources is to meet demand arising from population changes over time. The development of new water sources has a minimal short-term impact on employment and thus on population.

The effect on public facilities will be to increase the municipal water supply to meet growing demand. As noted previously, if the BWS were hampered in providing adequately for the water needs of the future population of the island, regional water shortages could result. The project would thus have a beneficial impact on public facilities.

g) "Involves a substantial degradation of environmental quality"

There are no project impacts that would degrade environmental quality.

h) "Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions"

The project would not have any effect that is either limited cumulatively or involves a commitment for larger actions.

i) "Substantially affects a rare, threatened, or endangered species, or its habitat"

As stated in the draft and final EA, section 4.8.2, regarding impacts on biological resources: "No adverse impact to any biological resources is anticipated."

j) "Detrimentally affects air or water quality or ambient noise levels"

The project will not detrimentally affect air or water quality or ambient noise levels. Short-term construction impacts may affect noise and fugitive dust levels and would add to traffic on Halekoa Drive; however, these impacts are not considered to be significant. Section 1.5 of the draft and final EA summarizes these impacts and the related mitigation measures.

k) "Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters"

The project will not affect or suffer damage to an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

l) "Substantially affects scenic vistas and viewplanes identified in county or state plans or studies "

The Aina Koa II Well and related improvements will have no impact on scenic vistas and view planes identified in county or state plans or studies. All of the project improvements are either in county roadways or on existing BWS sites developed for the purpose of storing and delivering potable municipal water.

m) "Requires substantial energy consumption "

The energy required to operate the Aina Koa II Well's pump does not represent substantial energy consumption.

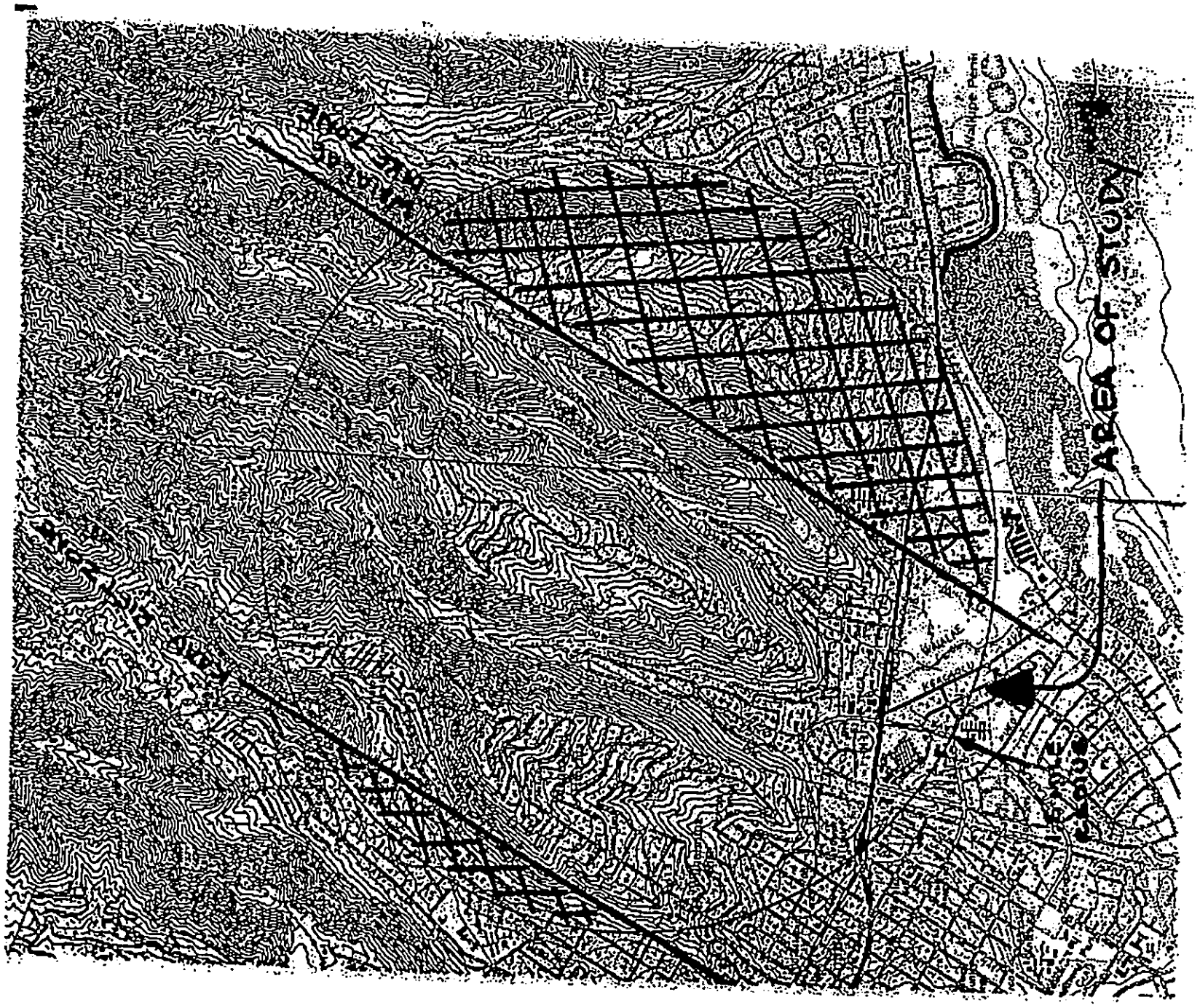
A copy of the memorandum and this response letter will be included in the *Final Environmental Assessment for the Aina Koa II Well.*

Sincerely,

CH2M HILL

Albert Lono Lyman
Senior Project Manager

cc: Mr. Clifford S. Jamile, Manager and Chief Engineer
Board of Water Supply, City and County of Honolulu



...YETANO
...R OF HAWAII

STATE OF HAWAII
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ACTING DEPUTY DIRECTOR

STAFF SUBMITTAL

for the meeting of the
COMMISSION ON WATER RESOURCE MANAGEMENT

May 20, 1998
Honolulu, Oahu

Kamehameha Schools Bernice Pauahi Bishop Estate
Honolulu Board of Water Supply
APPLICATION FOR A WATER USE PERMIT (WUP No. 468)
APPLICATION FOR A PUMP INSTALLATION PERMIT
Waialae Nui Ridge Well (Well No. 1746-04), TMK 3-5-62:44
Future Municipal Use for 1.154 mgd
Pump Installation: 1,000 GPM for Municipal Use
Waialae-West Ground-Water Management Area, Oahu

APPLICANT:

Kamehameha Schools Bernice Pauahi
Bishop Estate
567 S. King St., Ste. 200
Honolulu, HI 96813

LANDOWNER:

Honolulu Board of Water Supply
630 S. Beretania St.
Honolulu, HI 96843

LOCATION MAP: See Exhibit 1

BACKGROUND:

On August 13, 1997, a completed pump installation permit application was received from Kamehameha Schools Bernice Pauahi Bishop Estate/Honolulu Board of Water Supply (KSBE/BWS) by the Commission on Water Resource Management (Commission).

On September 8, 1997, a completed water use permit application was received from KSBE/BWS for use of 1.204 mgd of ground water for future municipal uses at various locations in Hawaii Kai, Moiliili, Kapalama, Kakaako, and Windward Oahu.

On October 8, 1997, in response to comments received from state and county agencies, the applicant submitted an amended water use permit application to correct errors and discrepancies in proposed use information.

On October 27, 1997, in response to comments received from state and county agencies on the amended application, the applicant submitted a second amended water use permit application for 1.154 mgd to correct errors and discrepancies in proposed use information.

On November 19, 1997, the Commission deferred action on the pump installation permit application pending a decision on the water use permit.

On January 14, 1998, the Commission deferred action on the water use and pump installation permit applications to the next Commission meeting on Oahu following the receipt of final review comments from the Department of Land Utilization (DLU) and the Hawaii Community Development Authority (HCDA). The Commission also specified that any further amendments to the water use permit application be disallowed.

The review comments from HCDA (Exhibit 3) were received January 9, 1998, after the January 14, 1998 staff submittal was finalized.

On April 16, 1998, review comments from DLU were received (Exhibit 4).

ANALYSIS/ISSUES:

Section 174C-49(a) of the State Water Code establishes seven (7) criteria that must be met to obtain a water use permit. An analysis of the proposed permit in relation to these criteria follows:

(1) Water availability

Through the Hawaii Water Plan, the Commission has adopted 4 mgd as the sustainable yield for the Waialae-West Aquifer System. Individual existing water use permits in this aquifer system are shown in Exhibit 2. A summary of the current ground-water conditions in the aquifer is provided in Table 1:

Table 1. Waialae-West Aquifer System

ITEM	WAIALAE-WEST AQUIFER SYSTEM (mgd)
Sustainable Yield	4
Less: Other Existing Water Use Permits (shown in Exhibit 2)	-1.990
Subtotal (Current Available Allocation)	2.010
Less: Pending Completed Applications	-0.000
Subtotal (Potential Available Allocation/Allocation Deficit)	-2.010

Table 1 shows that there is 2.010 mgd of ground water available for allocation. There are no other pending requests for a water use permit for the Waialae-West Aquifer System. A pumping test conducted in April, 1993, confirmed that the source can sustain withdrawals at the proposed pumping rate of 1,000 gpm with acceptable drawdown.

(2) Reasonable-beneficial

Section 174C-3 HRS defines "reasonable-beneficial use" is

"...the use of water in such a quantity as is necessary for economic and efficient utilization, for a purpose, and in a manner which is both reasonable and consistent with the state and county land use plans and the public interest".

The requested water will be used to supply the potable demands for the new projects shown in Exhibit 5. The source will be dedicated to the Honolulu Board of Water Supply (BWS) for incorporation into the municipal water system. BWS advanced water credits to KSBE to meet imminent needs, and some of these projects are already on-line.

Exhibit 5 contains a breakdown of the supply requirements for the various projects. The requested quantities are consistent with the guideline for domestic consumption (Hawaii Water Systems Standards, 1985). Other reasonable-beneficial use criteria are analyzed in the following sections.

(3) Interference with other existing legal uses

BWS has expressed concerns about the potential impact of this well upon other wells in the vicinity (Exhibit 6). Analysis of the pump test data using the Theis method indicates a drawdown of less than 0.5 feet at Kapakahi, Waialae Nui Valley, and Ainakoa Wells (about 1400, 2100, and 2200 feet away, respectively) over the long term (200,000 days). This translates to about a 20-foot rise in the mid-point of the transition zone. Based on the well depths, it does not appear that these wells will be adversely affected; however, this theoretical assessment should be verified with actual data. BWS water use reports show that the Waialae Shaft has not been used since 1985.

BWS has commented that KSBE will be required to provide additional peak pumping capacity within the BWS low service system to secure water credits equal to the proposed permitted use amount. The allocation of water by the BWS to developers through the water credit system is not subject to the Commission's oversight. BWS and KSBE are the only permitted users in the Waialae-West Aquifer System.

When dedicated from KSBE to BWS, BWS will have the flexibility of adjusting well pumpages pursuant to Declaratory Order DEC-ADM97-A1 (approved November 19, 1997), which allows BWS to move their well allocations around within an aquifer system. Therefore, a remedy exists for BWS should pumpage from this well affect their sources.

(4) Public interest

The reasonable-beneficial use of water for municipal uses and public water supply, where no adverse impacts to other existing legal uses will result, is deemed to be in the public interest.

(5) State & county general plans and land use designations

These proposed uses are consistent with the state general plan and state land use designations. The City Planning Department (PD) has not indicated any nonconformance with the county general plan. However, the PD and the Sierra Club have commented that the proposed Queen's Beach Golf Course requires Special Management Area (SMA) approval from the Department of Land Utilization (DLU). Until an SMA is approved, the project is not consistent with the special management area designation, and a water use permit may not be approved. The PD also commented on discrepancies between the Final Environmental Impact Statement for the Queen's Beach Golf Course and this application (Exhibit 7).

The DLU has commented that:

- A portion of the Lot Nine project is located within the SMA. Until an SMA is approved, the project is not consistent with the special management area designation, and a water use permit may not be approved.

- The development of a proposed student housing project at Varsity Place would require a rezoning from the present R-5 Residential District to A-3 High Density Apartment. This project is not consistent with the current land use designation.

(6) County land use plans and policies

The PD has commented that Section 24-1.15.(b)(3)(E) of the City's Development Plan Common Provisions provides guidelines for the development of golf courses which place a high priority on the use of non-potable water for irrigation of golf courses.

BWS has also submitted their comments on the Draft Environment Impact Statement for the proposed Queen's Beach Golf Course (Exhibit 8), which includes the following statement:

> *"Potable water from our system will not be available for irrigation of the golf course. To lower the chloride the developer should consider desalinating the sewage effluent."*

Pursuant to §174C-58(b) HRS, the authority to allocate the use of water for municipal purposes, subject to the limits of water supply allocated to the county boards of water supply in their role as water purveyors, is delegated to the BWS. In this case, the purveyor has indicated that they will not allocate water for this use; therefore, no allocation for the golf course irrigation should be granted under this application.

(7) Interference with Hawaiian home lands rights

All permits are subject to the prior rights of Hawaiian home lands. The Department of Hawaiian Home Lands (DHHL) and the Office of Hawaiian Affairs have reviewed this application. No objections or concerns regarding the proposed uses were raised.

RECOMMENDATION:

Staff recommends that the Commission:

1. Approve the issuance of an interim five-year water use permit (WUP No. 468) to Kamehameha Schools Bishop Estate/Honolulu Board of Water Supply for the reasonable and beneficial use of 996,520 gallons per day of potable water for municipal use from the Waialae Nui Ridge Well (Well No. 1746-04), subject to the standard water use permit conditions listed in Attachment B and the following special conditions:

   a. The allocation is based on the projects listed in Exhibit 5, except for the Queen's Beach GC (TMK 139-011-002,003), Lot 9 (TMK 139-017-051), and Varsity Place (TMK 128-24-35).

   b. Kamehameha Schools Bishop Estate/Honolulu Board of Water Supply shall transfer the water use permit within ninety (90) days of the effective date of the transfer of the pump station to the Honolulu Board of Water Supply, pursuant to §174C-59 Hawaii Revised Statutes.

   c. Honolulu Board of Water Supply may continue to report monthly water data on their own forms, rather than the Commission's official report forms, provided that the data continue to be submitted in a format that is acceptable to the staff.

d. This interim water use permit shall cease to become interim and shall be subject to Haw. Rev. Stat. §174C-55 upon administrative review of the quantity within 5 years, provided that all conditions of the use (including the review of the quantity which shall not be greater than the amount initially granted) remain the same.

e. In the event that the tax map key at the location of the water use is changed, the permittee shall notify the Commission in writing of the tax map key change within thirty (30) days after the permittee receives notice of the tax map key change.

2. Approve issuance of a pump installation permit for a 1,000 gpm capacity, or less, pump in the well, subject to the standard pump installation permit conditions listed in Attachment C.

Respectfully submitted,

Edwin T. Sakoda

EDWIN T. SAKODA
Acting Deputy Director

Attachment(s):
A (Water Use Permit Detailed Information)
B (Water Use Permit Standard Conditions)
C (Pump Installation Permit Standard Conditions)

Exhibit(s):
1 (Location Map)
2 (Existing Water Use Permits and 12-Month Moving Average Withdrawal)
3 (Review Comments from Hawaii Community Development Authority)
4 (Review Comments from Department of Land Utilization)
5 (Listing of Individual Projects and Supply Requirements)
6 (Review Comments from Honolulu Board of Water Supply)
7 (Review Comments from Planning Department)
8 (Review Comments from Honolulu Board of Water Supply on the DEIS)

EXHIBIT 15

Multiple TMKs to Use Requested Water

Project Name	TMK	Current Zoning	Units GLA or Net Acres	GPD/Unit or GPC/Acre	4-YEAR PROJECTED DEMAND Year 1 1998	Year 2 1999	Year 3 2001	Year 4 2002	Total GPD
Hawaii Kai									
Kaalakei 1A	139-036-002	A-2	132	300	39,600				39,600
Kaluanui 2/3	139-008-040	A-2	503	400	201,200				201,200
Kaluanui Remnant	139-008-059	A-2	34	400	13,600				13,600
Kaluanui Park	139-008-039	P-2	5 acres	4000	20,000				20,000
Na Pali Haweo	139-106-Various	R-10	132	500	66,000				66,000
Kalele Kai	139-008-030	A-2	219	400	87,600				87,600
Marina 7E, 8C	139-008-016, 038	A-2, R-5	224	400		40,000	49,600		89,600
Queen's Beach GC	139-011-002, 003	P-2	(see * below)	(see * below)	35,000				35,000
Golf Course 2/1A Resi.	139-010-001(Por.)	R-5	174	400		69,600			69,600
Kalama Commercial	139-082-061	B-2	2.4 acres	3000		7,200			7,200
Lot 9	139-017-051	B-2	1.2 acres	3000		3,600			3,600
Hawaii Kai Towne Center	139-017-Various	B-2	24.2 acres	3000	72,600				72,600
Moiliili									
Varsity Place	128-24-35	R-5	298	400	119,200				119,200
Isenberg Rentals	127-011-008, 009, 053	A-2	219	400	87,600				87,600
Isenberg Redevelopment	128-006-020, 023, 025	BMX-3	51,000 GLA	120 per 1000 sf GLA		6,120			6,120
Kakaako									
Block #2	121-030-001	MUZ-R	300	400			60,000	60,000	120,000
Block #3	121-055-004, 009, 017	MUZ-C	40	120 per 1000 sf GLA	4,800				4,800
Block #4-a	121-054-025	MUZ-R	60	120 per 1000 sf GLA		7,200			7,200
Block #12	121-059-012, 013	C	120	120 per 1000 sf GLA		14,400			14,400
Block #13	121-059-011	C	200	120 per 1000 sf GLA			24,000		24,000
Block #16	121-059-001, 003	C	50	120 per 1000 sf GLA	6,000				6,000
Kapalama									
King/Houghtailing	116-003-Various	B-2	120,000 GLA	120 per 1000 sf GLA		14,400			14,400
Windward Oahu									
Haiku 3B	146-014-005 (Por.)	Country	15 acres	3,000				45,000	45,000
TOTAL GPD					753,200	162,520	133,600	105,000	1,154,320

* 20,000 sq. ft.Golf Clubhouse x 120 per 1,000 sf GLA = 2,400
Potable water for blending of sewage effluent for golf course irrigation - 82,600