Kapalama Wells

BOARD OF WATER SUPPLY

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

March 28, 1998

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OFFICE OF ENVIRONMENTAL QUALITY CONTROL

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

Dear Mr. Gill:

Subject: Finding of No Significant Impact for the Board of Water Supply's Proposed Kapalama Wells Project, Honolulu, Oahu, Hawaii, TMK: 1-6-022: 007

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

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

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

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

Attachments

cc: Brian Takeda, R.M. Towill Corp.

1998-06-08-OA-FEA-Kapalama Wells

Prepared in accordance with Chapter 343, Hawaii Revised Statutes

Final Environmental Assessment

KAPALAMA WELLS

Kapalama, Honolulu, Oahu, Hawaii

May 1998

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

RMTC
R. M. TOWILL CORPORATION
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii • 96817-4941
Voice: (808) 842-1133
Facsimile: (808) 842-1937

Final Environmental Assessment

KAPALAMA WELLS

Kapalama, Honolulu, Oahu, Hawaii
TMK: 1-6-22:07

May 1998

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

PREPARED BY:
R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817-4941

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PROJECT SUMMARY

Project:	KAPALAMA WELLS
Applicant:	City and County of Honolulu BOARD OF WATER SUPPLY 630 Beretania Street Honolulu, Hawaii 96843
Accepting Authority:	Board of Water Supply
Tax Map Key:	1-6-22: 07
Location:	Kapalama, Honolulu, Oahu, Hawaii
Project Area:	Approximately 1.023 acres
Owner:	Board of Water Supply City and County of Honolulu
Agent:	R. M. Towill Corporation 420 Waiakamilo Road, Suite 411 Honolulu, Hawaii 96817 Phone: (808) 842-1133 Facsimile: (808) 842-1937
Existing Land Uses:	Nearby school campus, preschool, and single family residential neighborhood
State Land Use District:	Urban
City and County of Honolulu Zoning Designation:	Public Facility

Chapter 1
EXECUTIVE SUMMARY

1.1 PROPOSING AGENCY AND ACTION

The Board of Water Supply (BWS), City and County of Honolulu, proposes to develop two (2) production water wells with a control building, pumps, and appurtenances at a site adjacent to the Makuakane Street entrance to the Kamehameha Schools campus (**Figure 1-1** and **Figure 1-2**). The facility will be located on an undeveloped 1.023 acre site that is approximately 3/8-mile mauka of the intersection of Likelike Highway and School Street. Only one well will be in operation at any one time, with the second well on standby. Each well is expected to produce ±2 million gallons per day (mgd).

BWS has completed exploratory drilling of the well and is obtaining hydrogeological data on the groundwater resources of the Kalihi Aquifer. Initial test data indicates the well meets Department of Health (DOH) safe drinking water standards and can meet anticipated BWS municipal requirements. This Environmental Assessment (EA) will address the conversion of the well from exploratory to production status and will describe the limited environmental impacts expected from this conversion.

1.2 PURPOSE OF ENVIRONMENTAL ASSESSMENT

City and County of Honolulu funds will be used for development. This project, therefore, is subject to preparation of environmental documentation per requirements of Chapter 200, Title 11, Hawaii Administrative Rules (HAR), and Chapter 343, Hawaii Revised Statutes. This Environmental Assessment will address the limited environmental impacts anticipated for this project.

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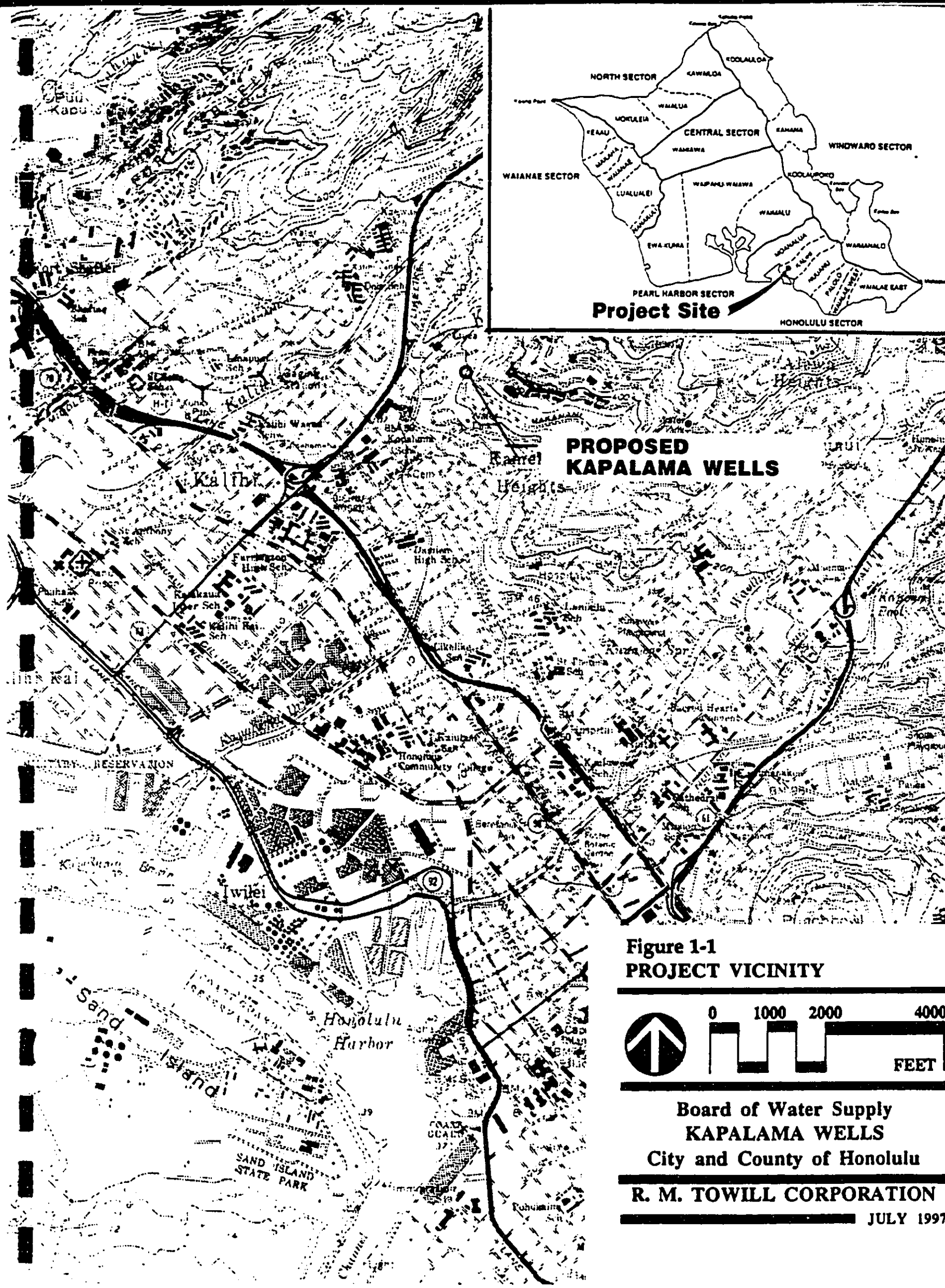

Figure 1-1
PROJECT VICINITY

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Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

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JULY 1997

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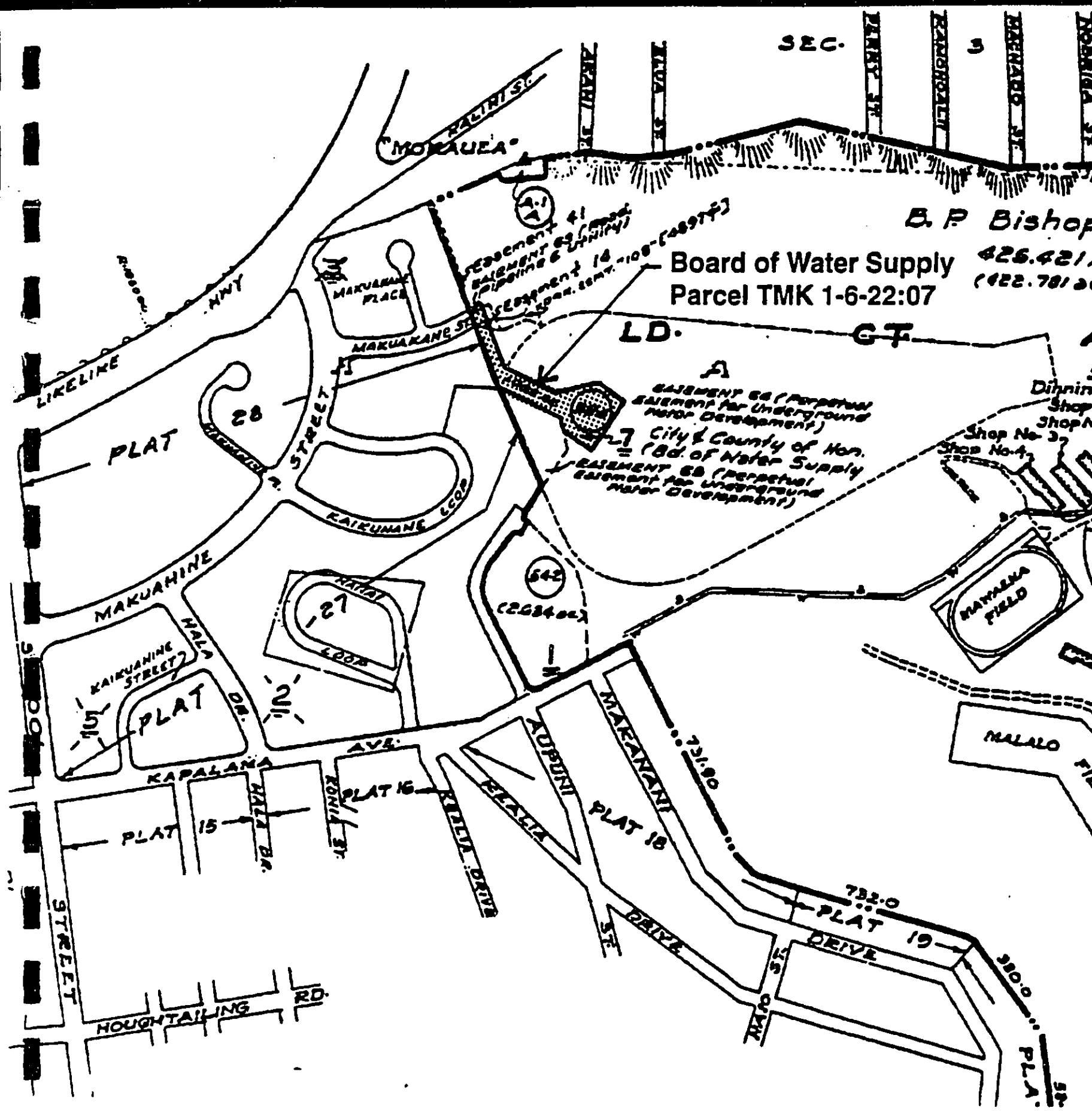

Figure 1-2
TAX MAP KEY LOCATION

NOT TO SCALE

Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

R. M. TOWILL CORPORATION
JULY 1997

A Final Environmental Assessment and accompanying Finding of No Significant Impact (FONSI) will be filed by BWS as part of the requirement for processing an EA.

1.3 PERMITS REQUIRED

Conversion of the Kapalama exploratory wells to *production wells* will require a Development Plan (DP) Public Facilities Map Amendment. Approval for this amendment was received on October 29, 1997, from the Honolulu City Council (Ordinance No. 97-60, Bill No. 59, 10/29/97).

The Commission on Water Resource Management (CWRM) will require a permanent Pump Installation Permit and Water Use Permit. These permits have been filed by BWS and are under review by CWRM. It is anticipated the decision on these permits will be obtained sometime during 1998.

DOH, Safe Drinking Water Branch, will require filing for permission to develop a potable water source with eventual connection to a public water system (Public Health Regulations, Chapter 20, Title II, Potable Water Systems).

DOH, Clean Water Branch, will require filing of National Pollutant Discharge Elimination System (NPDES) Permit(s) if there are any discharges of hydrotesting or well effluent into State waters through use of the county municipal storm sewer system. DOH, Noise and Radiation Branch, will also require filing of a Noise Permit.

As required, a grading permit from the City Department of Public Works and a building permit from the Building Department will also be obtained. It is anticipated these permits will be filed prior to construction.

BWS already has permission to use the City and County of Honolulu, municipal storm sewer system for discharges of effluent related to potable pump operation, replacement, and repair at various locations (Section 14-12.22, Revised Ordinances of Honolulu 1990, as

amended). This permit has a date of expiration of March 5, 1999. Should project activities requiring this permit occur beyond this date, a new permit for discharges to the municipal storm sewer system will need to be obtained from the City Department of Public Works.

1.4 PROJECT BENEFITS

The successful conversion of the Kapalama exploratory wells into *production wells* will facilitate integration of newly available groundwater resources into the municipal water system. The provision of this resource:

- Will meet the basic human need for water by area residents;
- Will help meet a basic requirement for future social and economic development; and,
- In conjunction with continuing efforts at conservation, will help to fulfill the legal mandate of BWS to ensure the islandwide provision of potable water.

1.5 ALTERNATIVES CONSIDERED

This environmental assessment discusses the no action alternative, the delayed action alternative, site alternatives, and source alternatives.

The no action alternative was not considered a viable option because it does not fulfill the BWS mandate to provide potable water resources for the growing City and County of Honolulu. The no action alternative may also create restrictions to new development and may result in regional water shortages.

The delayed action alternative was considered but not pursued because this alternative would delay the provision of potable water. Delayed action would also result in substantially similar environmental outcomes with higher development costs due to inflation.

No alternative sites were reviewed. The project location has already been identified as within proximity to known geologic and hydrologic resources capable of producing potable water. The proposed site was also selected based on proximity to existing transmission systems and on suitability for accommodating well drilling operations with minimal negative impacts to the surrounding area.

Source alternatives to potable groundwater have been analyzed in the *Final Draft Oahu Water Plan* (BWS, 1995). These include desalination, development of surface water and brackish groundwater sources, and recycling of treated wastewater. Although BWS is exploring development of alternative potable water sources, it does not consider currently available technologies to be feasible or practical due to high development cost and technical difficulties. (BWS, 1997).

1.6 POTENTIAL IMPACTS AND MITIGATION MEASURES

1.6.1 Groundwater Hydrology

No adverse impacts to the underlying Kalihi Aquifer are anticipated. The Kalihi Aquifer has an existing sustainable yield (SY) of 9 mgd. According to CWRM records, approximately 1.292 mgd SY remain for allocation. A shortfall of approximately .7 mgd additional capacity will therefore be required by BWS to realize the ±2 mgd goal for the Kapalama Wells.

It is possible for CWRM to reallocate permitted uses from existing wells such as Jonathan Springs, which is currently unused. This would permit BWS to withdraw ±2 mgd from the proposed Kapalama Wells, until the Jonathan Springs well returns to service. The Kalihi Aquifer SY limit of 9 mgd, therefore, would be retained.

1.6.2 Surface Water Hydrology

No adverse impacts to neighboring streams or water courses are anticipated. Kalihi Stream is approximately 2,000 feet away and Kapalama Stream is approximately 400 to 500 feet away from the proposed well site. These distances in combination with presence of low

permeability alluvium separating stream surface waters from groundwater will serve to isolate any potential for impacts. In addition, the proposed wells are in the process of conversion from exploratory to production status. Consequently, pipes, valves, meters, and related fittings will be placed for permanent use on the wells with no further planned discharges which could constitute a potential impact to surface water quality.

1.6.3 Flood Zone

No impacts are anticipated. According to the Flood Insurance Rate Maps (FIRM), the project site is located in Zone X, an area that is determined to be outside of the 500 year flood plain.

1.6.4 Flora and Fauna Resources

There are no threatened or endangered species at the project site. The area consists of second growth forest and introduced species dominate the site. Consequently, there is little of botanical or faunal interest due to the developed and urbanized nature of the site. No significant negative impacts are therefore anticipated to the area's biological resources.

1.6.5 Site Access and Traffic

The project will result in a temporary increase in heavy truck traffic. The greatest impact will be during initial mobilization of equipment to the site and following construction activities when equipment is removed. Once construction equipment has been set-up, no significant impacts are expected. Removal of equipment will be scheduled during non-peak traffic periods to minimize disturbance to residents.

The contractor will schedule heavy truck activity between the hours of 8:30 am and 1:00 pm on weekdays and will suspend activity on weekends and State holidays. The contractor will also schedule heavy truck traffic to avoid periods when school traffic would be impacted. It is anticipated this would be during the hours 6:30 am to 8:30 am, and 1:00 pm to 3:00 pm. Use of major thoroughfares will also be avoided as much as possible during the morning or afternoon peak periods.

1.6.6 Surrounding Land Uses, and Scenic and Visual Resources

The small scope and scale of the proposed project is not expected to result in adverse negative impacts to scenic or visual resources. All proposed structures will be relatively small in relation to the surrounding residential makeup of the neighborhood.

1.6.7 Historic/Archaeological Resources

No adverse negative impacts are expected as the site has been extensively disturbed and is relatively devoid of archaeological features. In the unlikely event that archaeological remains are discovered, work should cease and the State Historic Preservation Division, Department of Land and Natural Resources (DLNR) notified at (808) 587-0047.

1.6.8 Noise

Potential for noise will result from clearing, grading, construction of the pump station, and operation of the well pumps. Nearby residential, pre-school, and school uses may be affected by noise levels exceeding the allowable daytime standards of 55 dBA set by the State Department of Health (DOH) through HAR, Title 11, Chapter 46, "Community Noise Control." However, no noise impacts will occur once construction activities are completed. Operation of the wells will be by submersible electrical pumps which will reduce noise levels. As required, sound attenuation measures including use of noise reducing equipment and housings will also be used to ensure no adverse noise impacts.

Kamehameha Schools campus is located approximately ±750 feet away and is separated from the project site by thick vegetative cover immediately surrounding the area. The Kamehameha Schools campus is also separated from the well site by an elevation change of approximately +80-100 feet, with landscaped areas between. It is expected that because of the characteristics of the well site, its distance from Kamehameha Schools, and the proposed use of noise attenuation equipment, that no adverse noise impacts will occur.

1.6.9 Air Quality

To mitigate impacts on air quality caused by project activities, dust control measures will be undertaken by the construction contractor. Such measures will include the use of dust

screens and water sprinkling as necessary. To minimize exhaust emissions, project contractors will properly maintain their internal combustion powered equipment. Best Management Practices (BMPs) will be provided to ensure mitigation of fugitive dust and other forms of construction related air quality impacts. These measures will assist with compliance of DOH, HAR, Title 11, Chapter 59 and 60 regarding Air Pollution Control.

1.6.10 Population and Employment

No adverse impacts to area employment are expected. The proposed project will result in creation of some jobs, however, most jobs will be provided by contractors from outside the project area.

1.6.11 Contamination Sources

Construction of the well control building, pumps, and appurtenances are not expected to constitute a source of potential groundwater contamination. All work activities will be in compliance with rules and regulations governing proper use of construction equipment and materials.

Source water from exploratory tests of Kapalama Wells have been found to be safe for potable use. Some contaminants (chlordane and dieldrin) have been discovered at the nearby Kamehameha Schools wells, which is considered a longer-term potential threat which does not now jeopardize Kapalama Wells. BWS will utilize a program of regular water quality monitoring to determine the appropriate timeframe for eventual use of a Granular Activated Carbon (GAC) treatment system to ensure compliance with DOH safe drinking water regulations. This system, if and when required, can be co-located on existing space within the Kapalama Wells site.

1.7 FINDINGS AND REASONS SUPPORTING DETERMINATION

In accordance with Chapter 343, HRS, BWS has determined that an EIS is not required for development of the Kapalama production wells. This determination has been made based

on short project duration and because any adverse impacts that would result can be reduced to insignificant levels by applying the recommended mitigation measures.

1.8 AGENCIES AND OTHERS CONSULTED

The following agencies, organizations, and parties were contacted during preparation of this EA:

STATE AGENCIES

Department of Business, Economic Development & Tourism
- Office of Planning

Department of Education

Department of Land and Natural Resources
- Commission on Water Resources Management

Department of Health
- Environmental Management Division
- Office of Environmental Quality Control

University of Hawaii
- Environmental Center

CITY AND COUNTY OF HONOLULU

Planning Department

Department of Land Utilization

Building Department

Department of Transportation Services

Board of Water Supply

PRIVATE AND COMMUNITY ORGANIZATIONS, AND ELECTED OFFICIALS

The Estate of Bernice Pauahi Bishop

Honolulu City Council

Liliha-Kapalama Neighborhood Board

Kalihi Neighborhood Board

State Senator Suzanne Chun-Oakland

State House Representative Dennis Arakaki

Chapter 2

PURPOSE AND NEED FOR THE PROPOSED ACTION

2.1 PROJECT PURPOSE AND NEED

The Kapalama Wells project is part of the BWS program to ensure the timely provision of potable water for the growing population of the City and County of Honolulu. According to the *Final Draft of the Oahu Water Plan, Fifth Edition, March 1995*, water demand on Oahu has increased over the decades, from 130.4 mgd in 1980, to 155.7 mgd in 1990. Projected future water demand will increase to 181.9 mgd by 2000 and to 204 mgd by 2010. BWS plans to develop new sources of potable groundwater to meet growing demands on Oahu and in this application, within the Kalihi Aquifer for distribution in the Kalihi-Kapalama area.

Kapalama Wells, which will consist of two (2) wells, is sited within the Kalihi Aquifer of the Honolulu Groundwater Sector. The conversion of the existing exploratory wells to production wells will be integrated into the BWS municipal source, storage and transmission system. Yield is expected be approximately ±2 mgd.

2.2 THE STATE WATER CODE AND COMMISSION ON WATER RESOURCE MANAGEMENT

The State Water Code and CWRM was established in 1987 by the Hawaii State Legislature in Section 174-C of the HRS. The 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; and,
- a water quality plan prepared by the Department of Health.

The State Water Code requires that CWRM establish management boundaries for each Water Management Area (WMA). CWRM designated WMAs are located in areas where research suggests that ground and/or surface water resources are threatened by current or future proposed withdrawals or diversions of water (BWS, 1995).

2.3 GROUND WATER SECTORS AND AQUIFERS

CWRM has established six groundwater sectors that encompass the island of Oahu to assist in planning and administration of water resources and WMAs. These six groundwater sectors include: Honolulu, Pearl Harbor, Waianae, Central, North, and Windward. These six groundwater sectors are further divided according to the boundaries of the underlying aquifers. In all sectors except Waianae, the aquifer divisions have been designated WMAs. In some cases, several individual aquifers are combined into a single WMA.

The Honolulu Groundwater Sector follows the same boundary as the Honolulu WMA and is comprised of six aquifer areas. These aquifers include: Moanalua, Kalihi, Nuuanu, Palolo, Waialae West, and Waialae East (**Figure 2-1**). The proposed Kapalama Wells site is in the Kalihi Aquifer.

2.4 SUSTAINABLE YIELD AND THE HONOLULU WATER MANAGEMENT AREA

The sustainable yield (SY) of the underlying aquifer system must be assessed to evaluate the impact of developing permanent potable groundwater. SY is the amount of groundwater that can be routinely extracted from an aquifer without adverse impacts to the quality or quantity of the water source. The Hawaii State Water Plan provides for CWRM to determine SY of surface and groundwater sources statewide. Based on the

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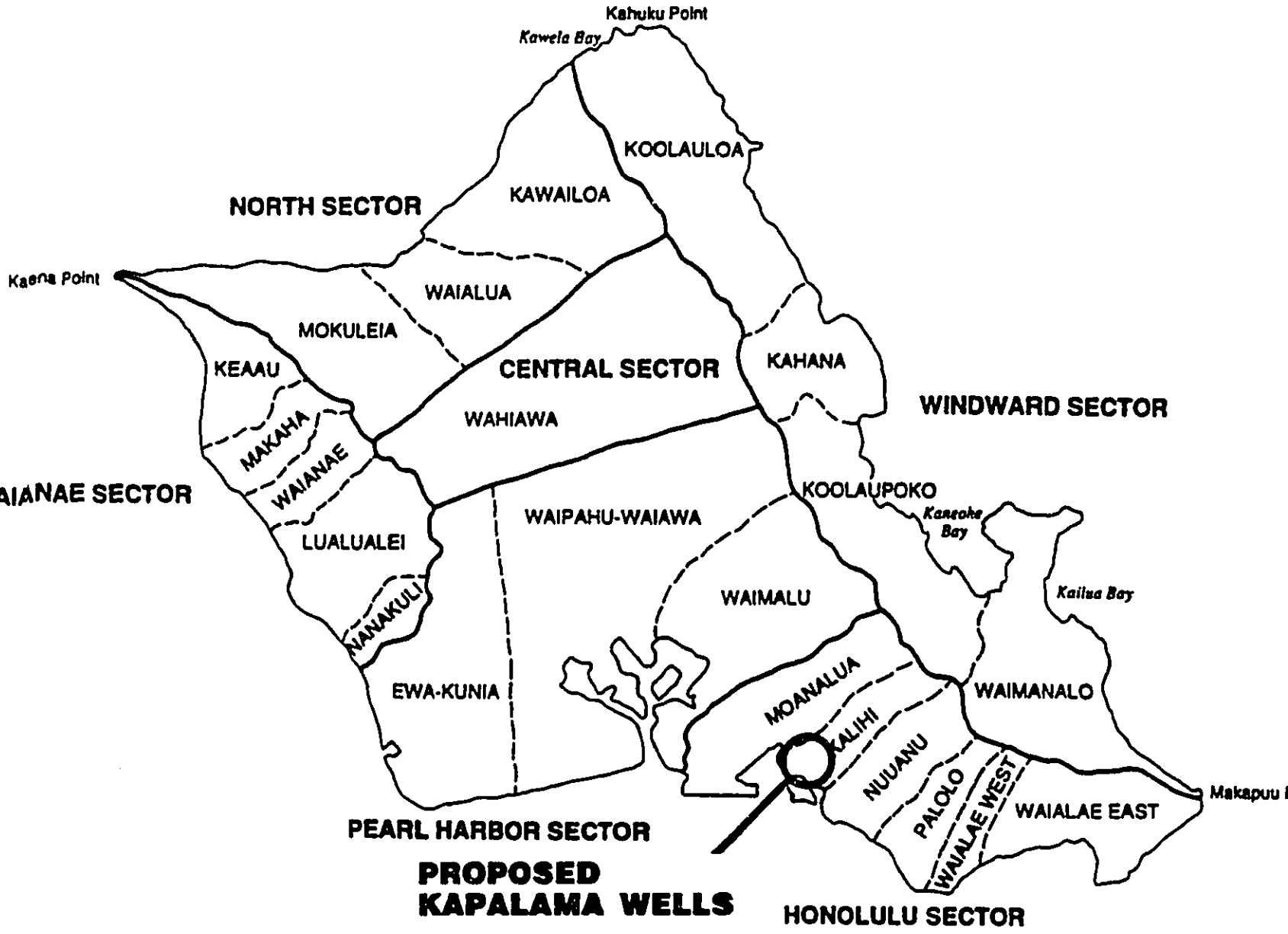

Figure 2-1
GROUNDWATER SECTORS AND AQUIFERS

Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

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JULY 1

geologic and hydrologic characteristics of various regions, CWRM produces SY estimates for each aquifer, WMA, and groundwater sector. These estimates are used to guide the development of new water resources.

The purpose of this EA is to assess the suitability of the selected site to provide sustained potable water production, estimated SY, and possible impact on the underlying aquifer as a permanent production well.

The SY of basal aquifers for each of the Hawaiian islands is always less than the average annual rate of recharge to the groundwater aquifer because of the amount of fresh groundwater that is lost by mixing with the underlying salt water. Estimating SY for the island of Oahu and for its individual aquifers is complex because the amount of 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. (BWS, 1995).

The Honolulu WMA has an estimated SY of 53 mgd and is the third largest system. The second largest WMA is Windward which provides 99 mgd, while the largest WMA is Pearl Harbor with a SY of 184 mgd. The 53 mgd yield from the Honolulu WMA represents 11.4% of the 465 mgd total SY on Oahu.

The Kalihi Aquifer has a SY of 9 mgd. According to **Table 2-1**, there are 17 existing wells with a combined permitted use of 7.708 mgd (**Figure 2-2**). This allows for an available SY allocation of 1.292 mgd (9 mgd - 7.708 mgd = 1.292 mgd).

2.5 POTENTIAL FOR REALLOCATION OF CWRM PERMITTED USES

The proposed Kapalama Wells are intended to produce approximately ±2 mgd for distribution to the Kalihi-Kapalama area through the BWS municipal system. Available SY for the Kalihi Aquifer from CWRM is 1.292 mgd, leaving an approximate .7 mgd shortfall. The following describes the potential for reallocation of the .7 mgd from other users in the Kalihi Aquifer.

Table 2-1
KALIHI AQUIFER WELLS

Well User	Well Name*	Permitted Use (mgd)	Subtotals by User (mgd)
BWS	Kalihi Pump Station	6.220	BWS
BWS	Jonathan Springs	1.000	7.220
Castle & Cooke (Dole Cannery)	Kapalama Battery	0.175	Private
Palama Settlement	Palama Settlement	0.024	Wells
Oahu Country Club	OCC Irrigation	0.060	
Bishop Estate (Kamehameha Schools)	Kamehameha A & B	0.229	0.488
	TOTALS	7.708	7.708

WATER ALLOCATION TOTALS	7.708	mgd
KALIHI AQUIFER SUSTAINABLE YIELD (SY)	9.000	mgd
POTENTIALLY AVAILABLE CWRM SY ALLOCATION	1.292	mgd

*Totals represent 9 BWS wells and 8 private user wells.

Source: Commission on Water Resource Management, Department of Land and Natural Resources, August 1997 and May 1998.

According to **Table 2-1**, there are 9 wells in use by BWS and 8 in use by private parties. Permitted allocation to BWS is 7.22 mgd and private users are permitted .488 mgd. It is possible for CWRM to reallocate permitted uses from existing wells such as Jonathan Springs, which is currently unused until BWS determines action for the termaticides in the water. This would permit BWS to withdraw ±2 mgd from the proposed Kapalama Wells, until the Jonathan Springs well returns to service.

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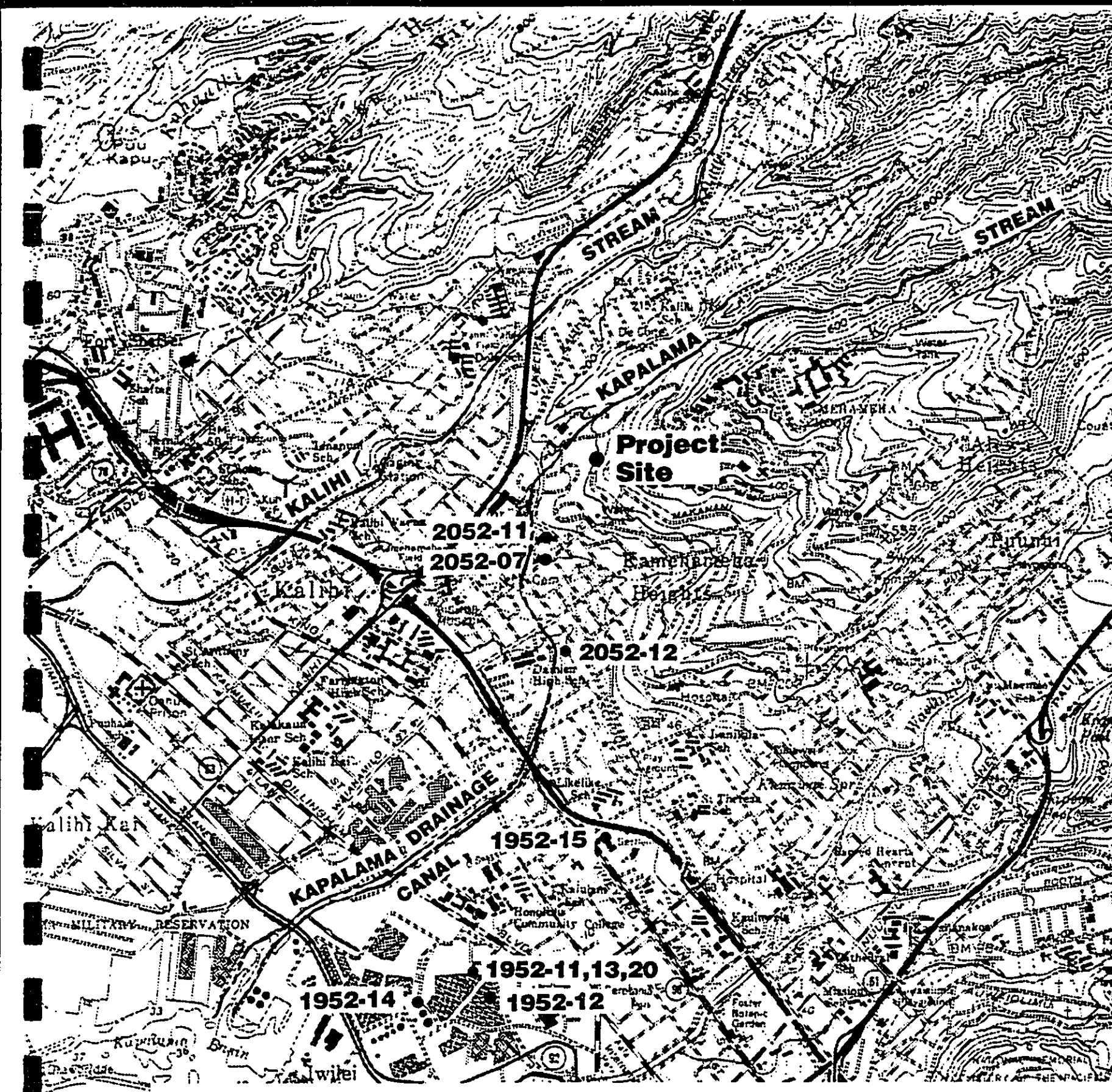

NUMBER	WELL NAME
1952-06-08, 16-19, 22	Kalihi Pump Station
1952-11, 13, 20, 21	Castle and Cooke, Dole Cannery
1952-12	Del Monte Cannery
1952-14	Honolulu Gas Company
1952-15	Palama Settlement
2052-07	Kamehameha Schools
2052-11	Kamehameha Schools
2052-12	Jonathan Springs

Figure 2-2
PROPOSED WELL SITE AND NEARBY WELLS

0 1000 2000 400

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Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

R. M. TOWILL CORPORATION

NOVEMBER 199

Chapter 3
PROJECT DESCRIPTION

3.1 PROJECT LOCATION AND SITE CHARACTERISTICS

The proposed project is located in the Kapalama section of Honolulu, adjacent to the Kamehameha Schools' Makuakane Street entrance. The location of the well is within an existing BWS, 1.023 acre site at TMK: 1-6-22:07 (**Figure 3-1** and **Figure 3-2**). The project site lies along the lower slopes of Kamehameha Heights, approximately ±400 feet southeast of Kapalama Stream and approximately 3/8 miles mauka of the Likelike Highway and School Street intersection. Elevation of the site is approximately 200 feet above mean sea level (msl). The project site is within an easement granted to BWS from Bishop Estate.

A gravel driveway located at the end of Makuakane Street (paved) provides access to the site. Adjacent to the south end of the paved Makuakane Street, there is an access road leading to a guard station at Kamehameha Schools (**Figure 3-3**). Adjacent to the BWS site there are single family residences on the makai side of the gravel access driveway and on Aupuni Street approximately 400 feet south of the proposed well site. The well site itself is an undeveloped parcel.

3.2 TECHNICAL CHARACTERISTICS

Kapalama Wells are comprised of two wells, approximately 90 feet apart and located on the northeast and southeast portions of the 1.023 acre BWS site. Yield from each well will be ±2 mgd (**Figure 3-4**). Only one well will be in operation at any one time with the second well serving as standby.

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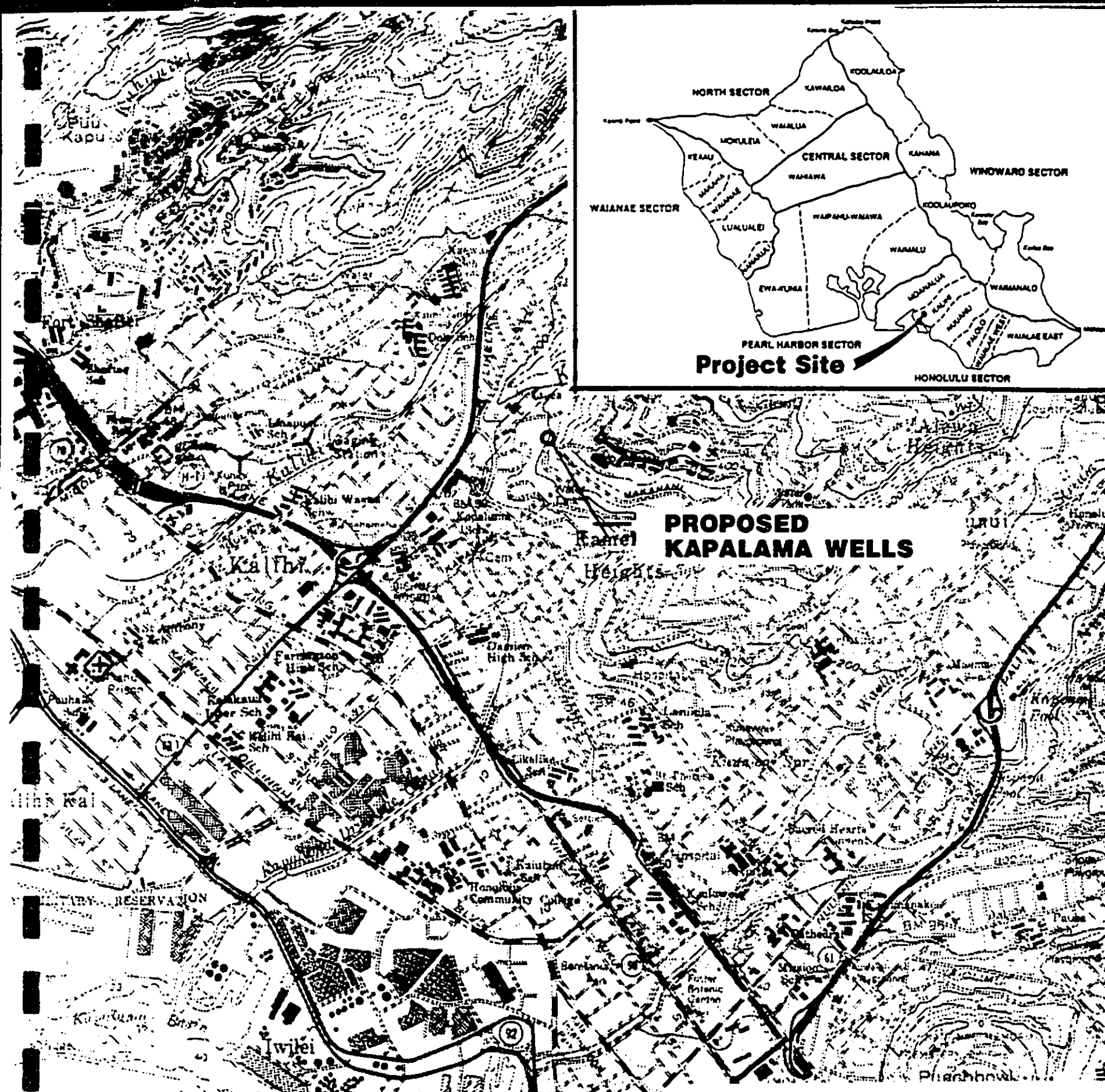

Figure 3-1
PROJECT VICINITY

Board of Water Supply
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City and County of Honolulu

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JULY 199

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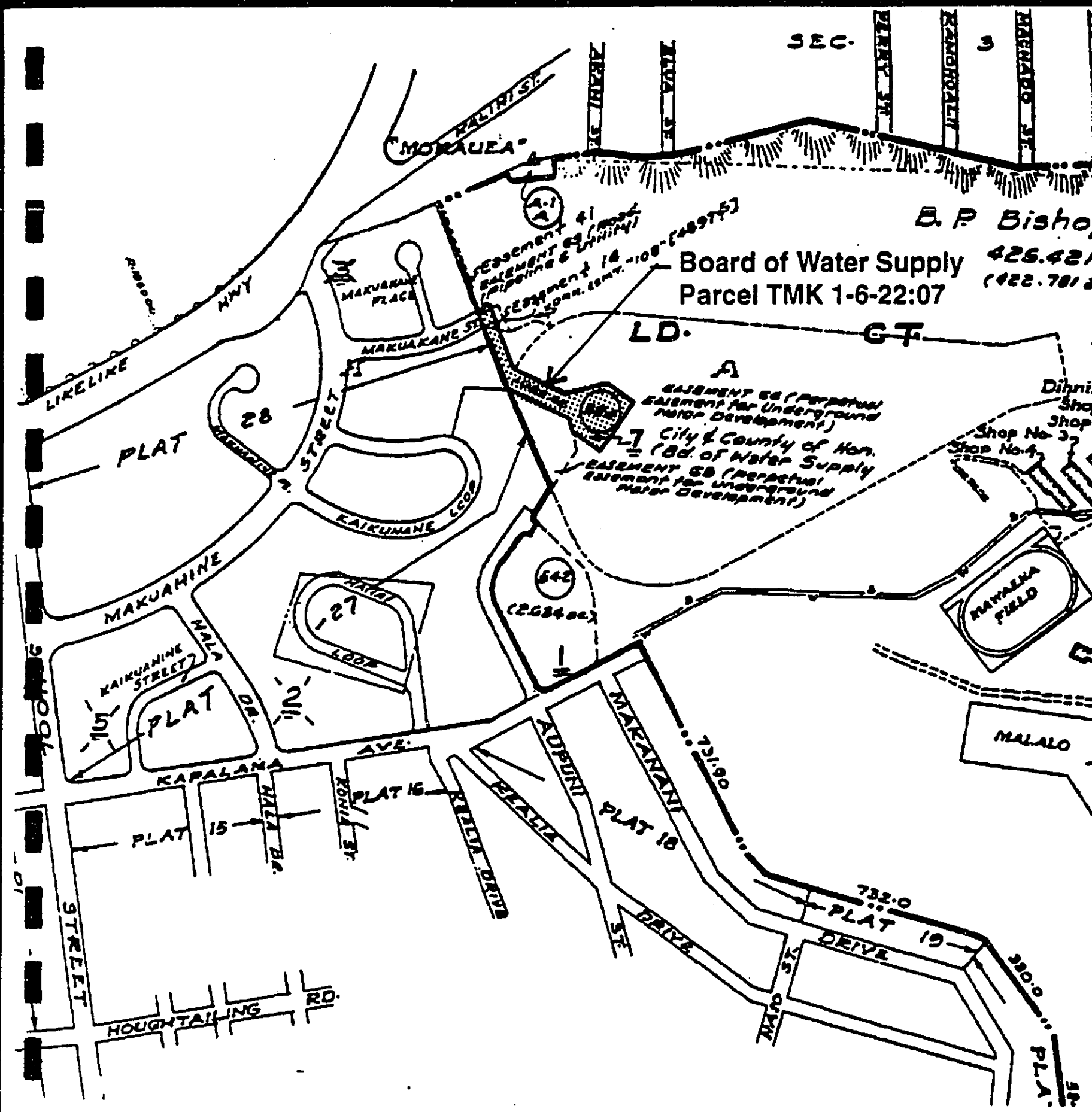

Figure 3-2
TAX MAP KEY LOCATION

NOT TO SCALE

Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

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JULY 199

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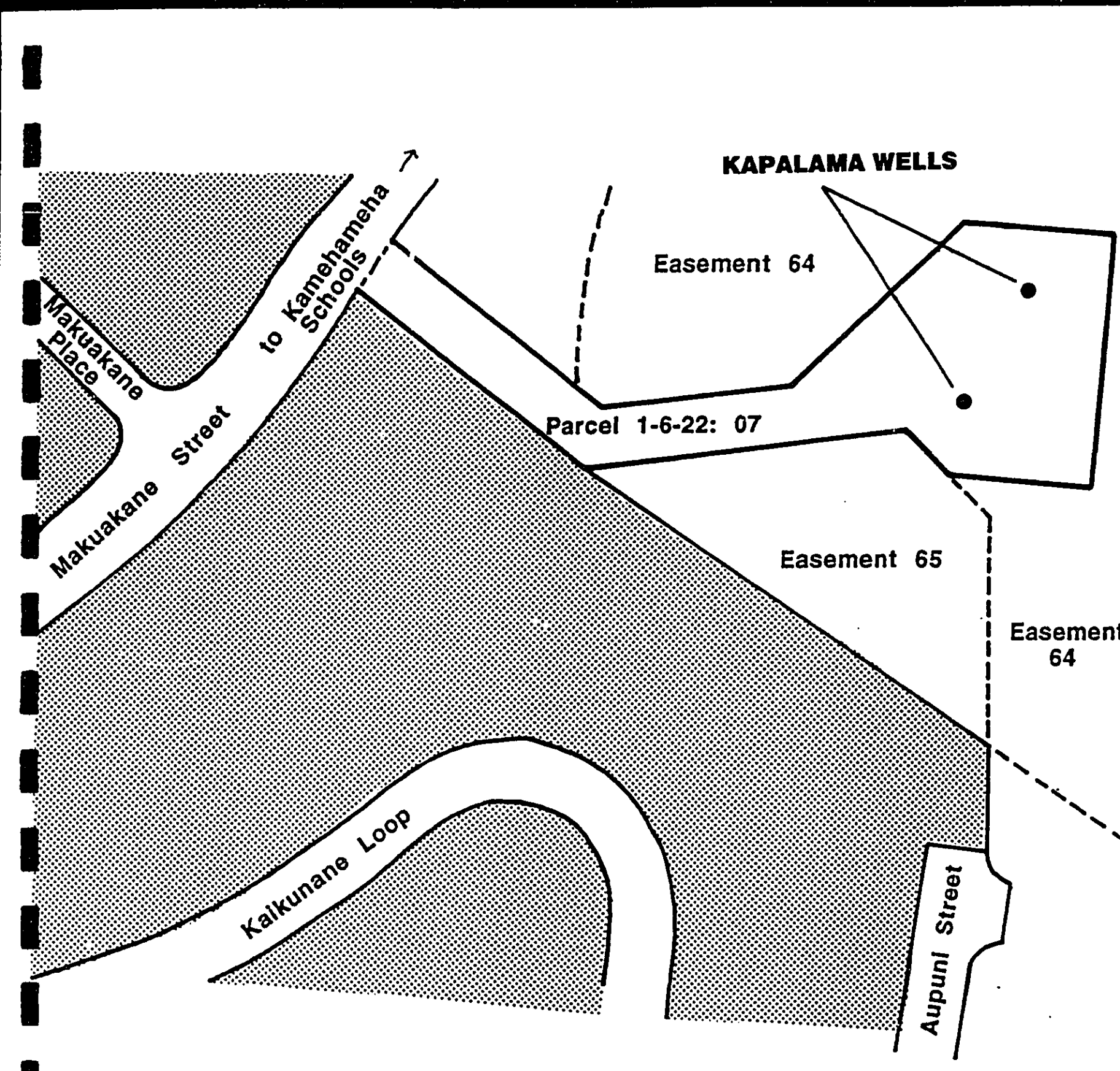

Figure 3-3
PROJECT SITE

NOT TO SCALE

Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

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JULY 1997

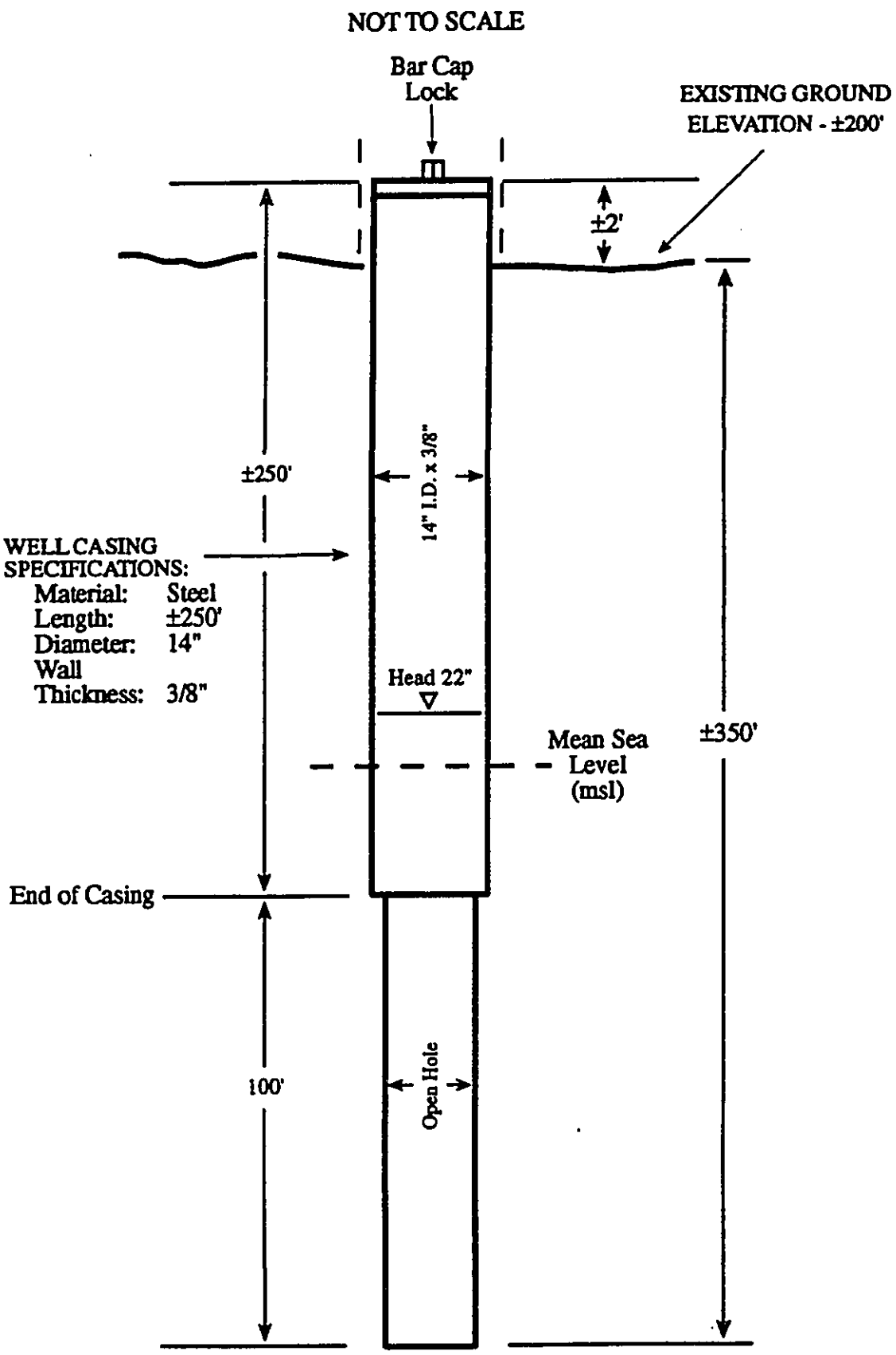

Figure 3-4
TYPICAL WELL CROSS-SECTION

Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

R. M. TOWILL CORPORATION
NOVEMBER 1997

3.2.1 General System

The project site is currently undeveloped and will require installation of equipment accessory to the wells, construction of a control building, and paving of an access road. In the future BWS may require installation of a granular activated carbon (GAC) treatment plant should detectable levels of hazardous chemicals such as chlordane and dieldrin become present. At this time, however, analysis of water samples collected during exploratory well drilling have shown no traces of these chemicals (BWS, August 26 and August 29, 1997).

The proposed wells will feed into the existing BWS 12-inch main on Makuakane Street. A water tank will not be required. Each well will be fitted with one vertical turbine pump. The submersible pump motor and discharge head will remain at grade and a column will extend down the well shaft to below water level for drawdown. The pump will be attached to a 16-inch main for connection to the existing main on Makuakane Street.

3.2.2 Pump Selection and Design Flow Requirement

Two electric pumps are proposed for connection to the wells and will be operated in a primary-standby manner such that only one well will be in operation at any one time. The pipes, valves, controls, main and support facilities are all based on one pump operation. The pumps will be alternated periodically to preclude excessive wear.

The pumps selected are vertical turbine electric pumps with the following operating parameters (figures cited are for each well):

Flow capacity:	1,400 gpm
Total Dynamic Head:	325 Feet Head
Rotational Speed:	1,770 rpm

The main has been sized to deliver water in adequate quantities and pressures under peak pumping conditions. Analysis of the wells and drawdown requirements indicate a design flow for each well at 1,400 gallons per minute (gpm), which will permit a yield of ±2 mgd.

3.2.3 Control Building

A control building will be constructed to house the necessary equipment to control the pumps. The building is proposed to be slab-on-grade construction with concrete masonry walls. The approximate dimension will be 25 feet wide x 30 feet long x 10 feet high. A 6-foot high chain-link fence will be provided around the perimeter of the site, while a 14-foot wide chain-link gate will be provided for site access. Security will be provided by appropriate use of building deadbolts, door locks, and padlocks for the gate.

3.2.4 Access Road

Access to the site is proposed by use of an asphalt concrete road. The paved road will originate from the end of Makuakane Street and will run approximately 200 feet to the well site. The pavement will be designed to accommodate a BWS utility truck.

3.3 PROJECT SCHEDULE AND ESTIMATED COST

The site is expected to require construction that would take approximately 1-year to complete. The estimated cost will be ±$1.9 Million subject to verification by an engineering construction cost estimate. Work will primarily involve installation of pumps and appurtenances; construction of a control house with necessary security measures, electrical and related control devices, and paving of an access road. The GAC treatment plant, if needed, would be installed at a future date.

It is anticipated that project financing will be through a BWS capital budget request which will be subject to review and approval by the Honolulu City Council. Administration of project funds will be through BWS.

Chapter 4
PHYSICAL AND SOCIOECONOMIC ENVIRONMENT, IMPACTS, AND MITIGATION

4.1 CLIMATE

The climate in Kapalama, Honolulu, is characterized as warm and dry. Temperatures range from 74° F in March to 80° F in September with highs in the lower 90s. Tradewinds are prevalent throughout most of the year with higher frequency during the summer months. Annual rainfall at the project site ranges between 40 to 50 inches at 200 feet above mean sea level. Rainfall above the project site in the upper reaches of the Kalihi and Nuuanu Valleys along the Koolau Mountain Range, however, averages up to 140 inches annually.

4.2 TOPOGRAPHY, GEOLOGY, AND SOILS

4.2.1 Topography

The project site is located along the lower southwestern portion of Kamehameha Heights, which extends as a slope from the Koolau Mountain Range. Kamehameha Heights lies between Kalihi Valley to the northwest and Nuuanu Valley to the southeast. Elevation is approximately 200 feet msl.

There are two streams in the project vicinity. Kapalama Stream is the closest and is within 400 to 500 feet of the northwest corner of the project site. Kapalama Stream continues downstream adjacent to the project site for approximately 3/4 mile before it enters the Kapalama Drainage Canal. Kalihi Stream is located further west approximately 2,000 feet distant from the project site. **Figure 4-1** identifies this area.

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Figure 4-1
SURFACE HYDROLOGY

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4.2.2 Geology

The island of Oahu is the result of the growth of two elongated shield volcanoes that form the current Waianae and Koolau mountain ranges. The Koolau Range was formed after the Waianae Range and continued volcanic activity long after the dormancy of the Waianae system. This activity resulted in the deposition of materials into what is now the Schofield plateau.

The walls of Kalihi Valley, including the higher elevations of Kamehameha Heights, are comprised of Koolau basalt. The floors of Kalihi Valley are comprised of a'a and pahoehoe lava over older Koolau basalt. The a'a and pahoehoe are approximately 10 to 300 feet thick along the valley floor. Alluvium is found downslope and southeast of the project site in the lower reaches of Kamehameha Heights in the areas surrounding Kapalama Stream (CH2M Hill, June 1995, and Stearns and Vaksvik, 1935).

4.2.3 Soils

Soils at the project site are composed of various classes of stony clay loam and rock land (**Figure 4-2**). According to the U. S. Department of Agriculture, Soil Conservation Service (SCS), these soil types include Kawaihapai stony clay loam (KlaB), Kawaihapai very stony clay loam (KlbC), and rock land (rRK). KlaB soils are found on the westernmost portion of the site near Kapalama Stream. KlbC soils are found further above and away from Kapalama Stream on the neareastern portion of the project site. Rock lands are located furthest away from Kapalama Stream, at the southeast corner of the project site, upland from the stream. (SCS, 1972).

KlaB is identified as having slow runoff and slight erosion hazard. KlaC is identified as having medium runoff and moderate erosion hazard. Both soil types have moderate permeability and shrink-swell potential. rRK is characterized as having exposed rock covering 25 to 90 percent of the surface and very shallow soils that are very sticky, very plastic, and with high shrink-swell potential. (SCS, 1972).

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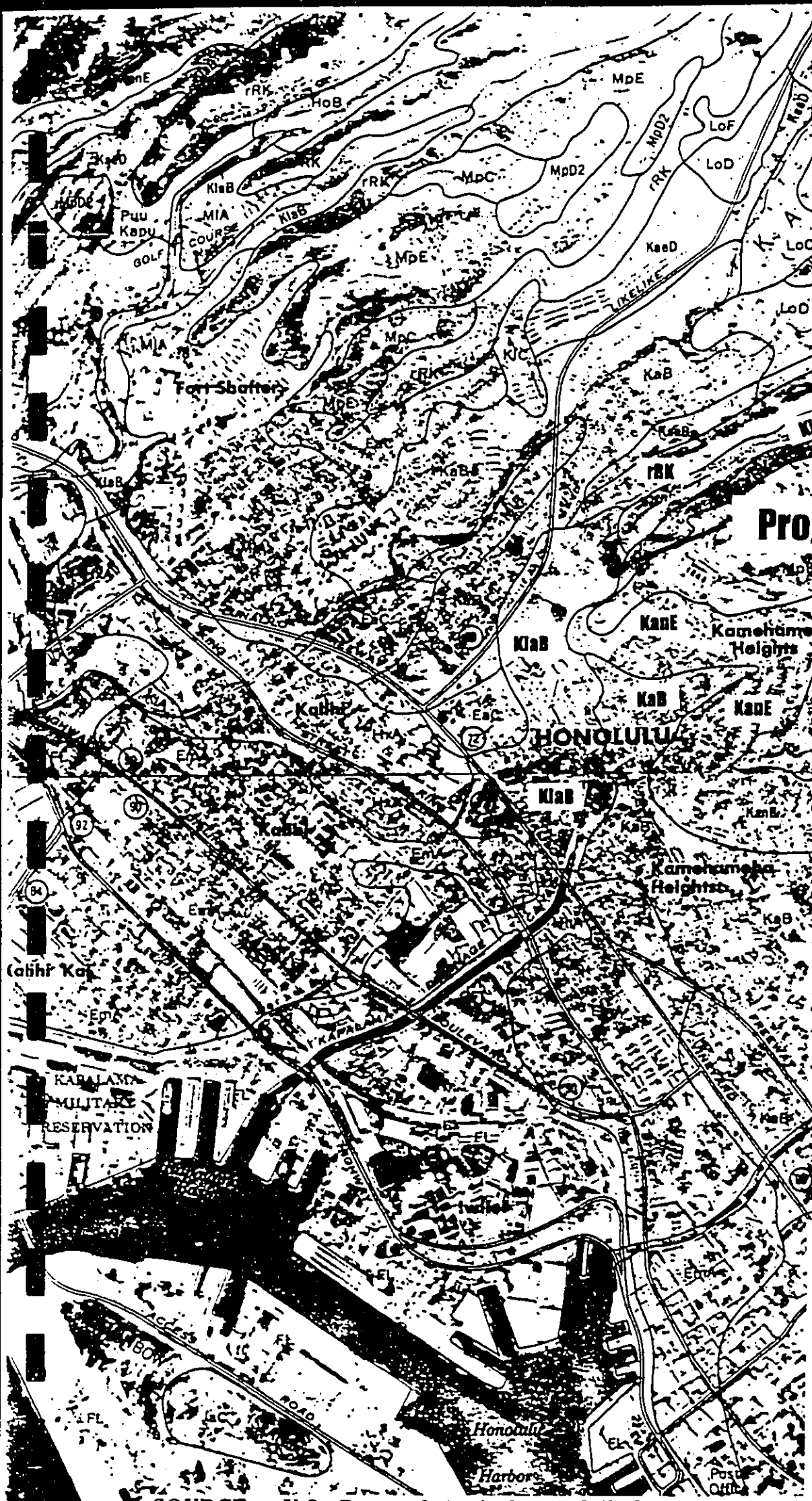

SOURCE: U.S. Dept. of Agriculture, Soil Conservation Service, & University of Hawaii. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. August 1972.

Figure 4-2
SOILS MAP

0 1000 2000 4000
FEET

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4.3 GROUNDWATER HYDROLOGY

Additional analysis on potential for groundwater hydrology impacts may be found in the attached appendices, Well Drilling Logs and Water Quality Laboratory Analysis, from the BWS Engineering Report, Kapalama Wells, Phase II, March 1998.

4.3.1 Groundwater Hydrology

The proposed Kapalama Wells are located within the Kalihi Aquifer System. According to BWS the Kalihi Aquifer consists of a thick basal lens that is hydraulically confined along the coast by caprock. The higher incidence of rainfall in the high elevation interior of the Koolaus contributes to a higher rate of groundwater recharge than in the lower elevation coastal areas. The resulting basal groundwater flows from the high elevation mountains to the lower elevation coastal areas (CH2M Hill, June 1995 and BWS, 1995). The groundwater discharges into the caprock, discharges into springs, escapes into the ocean, or is pumped through wells.

There are 17 wells that are active in the Kalihi Aquifer (**Table 4-1**). Nine wells are operated by BWS and eight wells are operated by private parties (CWRM, 1997):

Table 4-1
WELLS LOCATED IN THE KALIHI AQUIFER

Well Type and Location	Number of Wells	
BWS WELLS (9 Total)		
Kalihi Pump Station	8	
Jonathan Springs	1	
PRIVATE PARTY WELLS (8 Total)		
Castle & Cooke, Dole Cannery	4	
Palama Settlement	1	(unused)
Oahu Country Club	1	
Kamehameha School	2	
TOTAL NO. WELLS	17	

According to CWRM records for 1997, there are a total of 17 permits authorizing withdrawal of 7.708 mgd from the Kalihi Aquifer: BWS is authorized a total of 7.22 mgd from its nine wells and private users are authorized a total of .488 mgd from 8 wells. Authorized water use from the Kalihi Aquifer is therefore 7.708 mgd, which leaves 1.292 mgd available from a sustainable yield of 9 mgd. Because BWS will require a proposed withdrawal of ±2 mgd from the Kapalama Wells, a shortfall of .7 mgd will need to be met (2 mgd - 1.292 mgd = .708 mgd).

It is possible for CWRM to reallocate permitted uses from existing wells such as Jonathan Springs, which is currently unused until BWS determines action for the termaticides in the water. This would permit BWS to withdraw ±2 mgd from the proposed Kapalama Wells, until the Jonathan Springs well returns to service.

4.3.2 Impacts and Mitigation

The proposed use of the Kapalama Wells will not adversely impact the groundwater resources of the Kalihi Aquifer. BWS intends to reallocate uses from unused resources such as Jonathan Springs well. This will ensure that the CWRM authorized sustainable yield for the Kalihi Aquifer is maintained.

4.4 SURFACE WATER HYDROLOGY

Additional analysis on potential for surface water hydrology impacts may be found in the attached appendices, Well Drilling Logs and Water Quality Laboratory Analysis, from the BWS Engineering Report, Kapalama Wells, Phase II, March 1998.

4.4.1 Surface Hydrology

There are two perennial streams in the vicinity of the project site: Kalihi Stream and Kapalama Stream. Kapalama Stream, 400 to 500 feet northwest of the project site has an invert of approximately 170 feet msl and is perched atop low permeability alluvium. The low-permeability alluvium serves to isolate the near surface groundwater flowing into Kapalama Stream from basaltic groundwater found at considerably lower depths. Water

withdrawn from the aquifer at +22 feet msl therefore, is not expected to affect the near-surface water flowing into Kapalama Stream due to the 148 feet separating the intake section of the wells from the stream invert, and because of the intervening layer of alluvium. The Kapalama Wells will be cased at a depth of approximately -350 feet (-50 feet msl) within the basalt with the uncased intake portion extending from -50 feet to -150 feet (BWS, 1997 and CH2M Hill, June 1995).

Kapalama Stream and Kalihi Stream are concrete lined in the lower, makai sections. Adjacent to the project site Kapalama Stream continues downstream for approximately 3/4 miles before it is channelized into the Kapalama Drainage Canal. Kalihi Stream is interspersed with various lengths of concrete channelized sections (culvert extensions or revetments) from its location adjacent to the well site as well as further makai at its mouth.

The U.S. Geological Society (USGS) has installed stream flow gage no. 229300 approximately 1 mile upstream of the mouth of Kalihi Stream. Flow rates for Kalihi Stream averaged 10.3 cubic feet per second from 1962 to 1991. There are no USGS stream flow gaging records for Kapalama Stream.

The U.S. Fish and Wildlife Service (USFWS) in 1977 classified perennial streams into four categories based on environmental quality and the appropriate use of the stream, using State Department of Health (DOH) water quality standards (Timbol and Maciolek, 1978). The four stream categories included:

- *Pristine-Preservation Streams.* Streams of high environmental and biological quality.

- *Limited Consumptive Streams.* Streams with moderate to high quality water or natural values. Use of these streams is controlled to prevent excessive modification.

- *Exploitive-Consumptive Streams.* Streams with moderate to low natural (environmental-biological) quality and/or moderate to low water quality (because of exploitation, modification, or degradation). These streams are intended for water related recreational activities.

- *Construct-Alter Streams.* Streams that have low environmental and biological quality which may be restricted to the public for health or safety reasons.

Kalihi and Kapalama Streams were both classified as Construct-Alter Streams. Kalihi Stream is a continuous perennial stream with a length of approximately 11.2 miles, of which about 3 miles of the channel were modified with elevated culverts and revetments from 1927 to 1969. Kapalama Stream is an interrupted perennial stream with a length of approximately 5.6 miles. All 5.6 miles have been modified with linings, removal of vegetation and realignments, elevated culverts, revetments, blocked or filled in sections, and extensions of culverts from 1938 to 1965 (CH2M Hill, June 1995).

4.4.2 Impacts and Mitigation

No impacts to neighboring streams or water courses are anticipated. Kalihi Stream is approximately 2,000 feet away, and Kapalama Stream is approximately 400 to 500 feet away from the proposed well site. Kapalama Stream, which is the closest surface water, has an invert of about 170 feet above msl and is perched over low permeability alluvium. The layers of alluvium serve to isolate the near surface groundwater flowing in Kapalama Stream from entering the basaltic groundwater found at considerably lower depths (BWS, November 1997).

The Kapalama Wells are cased to a depth of 246 feet for Well No. 1 and 238 feet for Well No. 2. The bottom of the casing for both wells are approximately 50 feet below msl. The water extracted from the basalt, when the wells are being pumped, is not expected to affect the near surface water flowing in Kapalama Stream. This is due to the low permeability alluvium separating the pump intake from the stream invert. The Kapalama streambed is

perched in the thick Honolulu Series, and the alluvium is more than 150 feet above the water table.

In addition, the proposed wells are in the process of conversion from exploratory to production status. Consequently, pipes, valves, meters, and related fittings will be placed for permanent use on the wells with no further planned discharges which would constitute a source of potential surface water quality impact.

As required, all proposed grading will also comply with City and County of Honolulu erosion and sediment controls including the Revised Soil Erosion Standards and Guidelines, Ordinance #96-34.

4.5 FLOOD ZONE

4.5.1 Flood Zone

The production wells will be situated at approximately ±200 feet above msl, along the slope of Kamehameha Heights. The wells are approximately 500 feet southeast of Kapalama Stream in an area outside of the 500 year flood plain (**Figure 4-3**).

4.5.2 Impacts and Mitigation

No impacts are anticipated. According to the Flood Insurance Rate Maps (FIRM), the project site is located in Zone X, an area that is determined outside of the 500 year flood plain.

4.6 FLORA RESOURCES

4.6.1 Flora

A botanical reconnaissance survey was completed in August 1994 by Char and Associates for the BWS *Kapalama Exploratory Wells Environmental Assessment*, (CH2M Hill, 1995). The purpose of the study was to describe the vegetation at and adjacent to the proposed project site, and to search for threatened and endangered species and rare and vulnerable plants.

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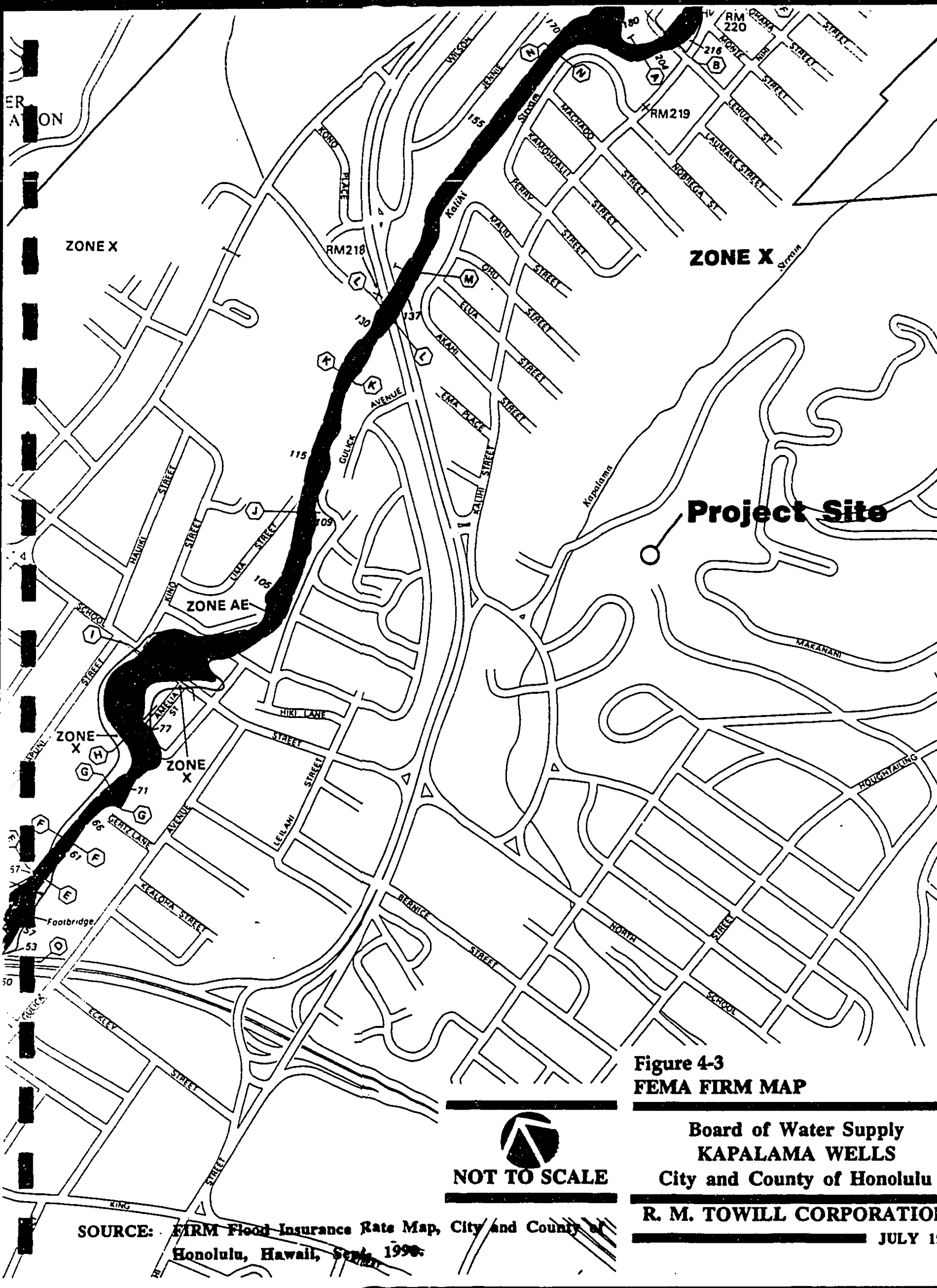

Figure 4-3
FEMA FIRM MAP

NOT TO SCALE

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JULY 1

SOURCE: FIRM Flood Insurance Rate Map, City and County of Honolulu, Hawaii, Sept. 1990.

The project site is characterized as within an urbanized land area that has been extensively disturbed in the past. Strewn throughout the site are small piles of rubbish containing lawn trimmings and household articles such as old bottles, cans, shoes, and other urban debris. The vegetation on the site is dominated by alien species such as koa haole, Guinea grass, California grass, and kiawe.

According to the study, "There are no remnant patches of sensitive native plant dominated communities (Hawaii Heritage Program, 1994). Only two native species were observed during the field studies; these are the two vines, huehue *(Cocculus trilobus)* and koali *(Ipomoea indica)*. Both are indigenous, that is, they are native to the Hawaiian Islands and elsewhere. Huehue also occurs from southeast Asia to the Himalayas, Malesia (SIC), and the Pacific; koali is pantropical (Wagner et al., 1990)."

None of the plants found during the study is a listed, proposed, or candidate threatened and endangered species as set forth in the Endangered Species Act of 1973. None of the plants is also considered rare or vulnerable (Wagner et al., 1990).

4.6.2 Impacts and Mitigation

None of the species found on the project site are considered threatened or endangered. The project site is overrun by introduced plants including koa haole. As noted in the study, "There is very little of botanical interest on the site, as it has been disturbed and is covered almost exclusively by alien species. All of the plants found on the site occur in similar lowland, disturbed habitats throughout the islands; the wild jasmine *(Jasminum flumenense)* is considered a potential noxious species. Given the findings above, no significant negative impacts to the botanical resources are expected. The proposed project will not cause any significant damage to the island population of any of the species involved. There are no botanical reasons to impose any restrictions, conditions, or impediments to the development of the new well site." (Char, 1997).

4.7 FAUNAL RESOURCES

4.7.1 Fauna

An avifaunal and feral mammal survey of the site was undertaken on August 3, 1994, by Phillip L. Bruner, Ph.D., Environmental Consultant - Faunal (Bird and Mammal) Surveys. The survey was commissioned for the BWS *Kapalama Exploratory Wells Environmental Assessment*, (CH2M Hill, 1995). The objectives of the survey were to: document occurrence of bird and mammal species on the site; determine presence or likely presence of native fauna, particularly any that are considered "endangered" or "threatened"; and evaluate the quality of the site for native wildlife, noting any special or unique resources. The following summarizes the findings of the survey.

Resident Endemic Birds. No native resident landbirds were observed during the survey. The only two species which may occur on rare occasions are the Short-eared Owl or Pueo (Asio flameus sandwichensis) and Common Amakihi (Hemignathus virens). The Pueo is a listed endangered species on Oahu by the State Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW). The Common Amakihi is one of the most abundant species of the endemic subfamily Drepanidinae. Common Amakihi are not confined to native forest but can often be seen in second growth exotic forest. They may rarely descend to forage at this site but generally occur at higher elevations.

Resident Waterbirds. No wetland habitat suitable for waterbirds occurs on the site. Accordingly, no waterbirds were observed.

Seabirds and Migratory Shorebirds. No seabirds were observed. The White Tern (Gygis alba) is listed as threatened on Oahu by DOFAW. They nest in large trees in downtown and Kapiolani Park. Another species, the Pacific Golden Plover (*Pluvialis fulva*) are known to utilize the mowed lawn areas adjoining the road unto Kamehameha Schools for foraging. This species is territorial and returns each year to the same site (Johnson et al., 1981) from August to April. It is not threatened or endangered.

None of these species however, were seen at this site at the time of the survey.

Exotic Introduced Birds. A total of eleven species of exotic birds were recorded during the field survey:

Spotted Dove *(Streptopelia chinensis)*
Zebra Dove *(Geopelia striata)*
Common Mynah *(Acridotheres tristis)*
Red-vented Bulbul *(Pycnonotus cafer)*
Red-whiskered Bulbul *(Pycnonotus jocosus)*
Northern Cardinal *(Cardinalis cardinalis)*
Red-crested Cardinal (*Paroaria coronata)*
Japanese White-eye *(Zosterops japonicus)*
House Finch *(Carpodacus mexicanus)*
White-rumped Shama (*Copsychus malabaricus)*
House Sparrow *(Passer domesticus)*

Other species which could potentially occur include the Barn Owl (*Tyto alba*), Cattle Egret (*Bubulcus ibis*), Northern Mockingbird (*Mimus plyglottus*), Red-billed Leiothrix (*Leiothrix lutea*), Japanese Bush-warbler (*Cettia diphone*), Java Sparrow (*Padda oryzivora*), and Nutmeg Mannikin (*Lonchura malabarica*). None of the observed or potentially occurring exotic species are threatened or endangered.

Feral Mammals. One non native Small Indian Mongoose (*Herpestes auropunctatus*) was seen on the west side of the property. Although not observed it is likely that rats, mice, and feral cats would be numerous in this area.

The endemic and threatened Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) was not sighted on this survey. Oahu records are limited (Tomich 1986; Kepler and Scott 1990) and data on the bat's distribution and behavior are extremely limited. It is not known whether the Hoary Bat inhabits Kalihi Valley.

4.7.2 Impacts and Mitigation

The proposed project is not expected to adversely affect faunal resources. The site consists of second growth forest and introduced birds dominate the avifauna. The site itself is not unique or of special importance to native wildlife.

The possible native birds which may occur in the area include: Pueo, White Tern, Common Amakihi, and Pacific Golden Plover. Only the Pacific Golden Plover is likely to be regularly seen at the proposed well site. This species would utilize the lawn area fronting the well site. As the project site is cleared and planted in grass it would prove attractive to plover and in time individuals could establish their winter territories at this site.

4.8 SITE ACCESS AND TRAFFIC

4.8.1 Site Access and Traffic

Primary access to the project site is by Makuakane Street, under jurisdiction of the City and County of Honolulu. Makuakane Street also serves as the south entry into Kamehameha Schools and can be accessed from Likelike Highway or School Street. Likelike Highway is a four-lane State highway with a 35-mph speed limit within the vicinity of the project site. School Street is a four-lane City and County of Honolulu roadway with a 30-mph speed limit.

According to the State Department of Transportation, average daily traffic on Likelike Highway in 1991 amounted to 72,239 trips between School Street to Kalihi Street. Traffic on Likelike Highway is 75 percent southbound during the morning peak hour and 85 percent northbound during the afternoon peak hour. Likelike Highway traffic consists of a mix of automobiles, trucks, and buses. In 1991, average daily traffic on School Street west of Likelike Highway amounted to 19,457 trips; east of Likelike Highway, average daily traffic amounted to 17,724 trips. (CH2M Hill, June 1995).

4.8.2 Impacts and Mitigation

The project will result in a temporary increase of heavy truck traffic to the site. However, no long term adverse impacts are anticipated. The recommended access to Makuakane Street and the project site will be through School Street, which has less traffic than Likelike Highway. Hours proposed for heavy truck access to the construction site will similarly be recommended at between 8:30 am and 1:00 pm to avoid the commuter traffic of Kamehameha Schools. This will also avoid the commuter traffic from residences along Makuakane Street.

BWS will require periodic access to the project site once construction is completed. Access will be necessary to periodically clear the on-site vegetation, and maintain the pumps and water mains. Potential for traffic impacts are expected to be negligible given this limited need for access, the small size of the site, and the ability to accommodate BWS vehicle parking on-site.

4.9 SURROUNDING LAND USES, AND SCENIC AND VISUAL RESOURCES

4.9.1 Land Uses, and Scenic and Visual Resources

Land uses surrounding the site include open space, privately owned single family residences, a pre-school, and the nearby Kamehameha School campus which is owned by Bernice Pauahi Bishop Estate. The project site is relatively undeveloped and situated at the end of an unpaved access road adjoining Makuakane Street. Most of the area surrounding the wells is undeveloped hillside with introduced and alien vegetation (Koa haole and Guinea grass). This area includes the Kamehameha Heights subdivision.

The overall impression of the completed project site will be of a fenced enclosure containing a low building (control building) with two water wells and an access road. Immediately surrounding the site will be existing vegetation, the Kamehameha Heights subdivision, and the entrance road to Kamehameha Schools. This location is expected to result in little to no visual impacts:

- The surrounding sloped area provides relatively unobstructed views toward Honolulu Harbor and the surrounding region. Neighboring residences, therefore, are not expected to be affected; and,

- Views toward the project site are of the Kamehameha Heights hillside. The small scope and scale of the project make the site relatively indistinguishable from the surrounding residential area with its trees and vegetation.

4.9.2 Impacts and Mitigation

The nearby residences and campus of Kamehameha Schools are not expected to be affected by the proposed project. No changes to land use or ownership will occur as a result of this proposal.

The small scope and scale of the well site is similarly not expected to result in an adverse impact to scenic or visual resources. Although the small control building on the site is expected to be observable from various local roadways, the project site is not visible from Nimitz Highway or from Sand Island Park. Similarly, adverse impacts to nearby residences or neighbors are not expected as view planes to Honolulu Harbor and the surrounding region will be largely maintained.

4.10 HISTORIC/ARCHAEOLOGICAL RESOURCES

4.10.1 Historic/Archaeological Resources

The Kapalama Ahupua'a which includes the proposed well site, was intensively utilized for various purposes during prehistoric and historic times. In the higher elevations of Kapalama on sloping ridge lines well above the proposed project site, a heiau with associated burials and a traditional cultural place (phallic stone) have been documented. At the base of the Kapalama ridgeline a holua slide was also discovered. Stretching out from the base of the ridge towards Honolulu Harbor were well watered taro fields which ran almost continuously from Iwilei, up to the hills above School Street, an area

approximately three-quarters of a mile square. The shoreline area was also known to contain fishponds. (Borthwick, Masterson, Creed, and Hammatt, March 1995).

The rich diversity of uses at Kapalama continued up to the 1880s, when the area became the site for Kamehameha Schools. Later, during the early to mid-1900s and beyond, the urban expansion of Honolulu was having a dramatic effect on the region. In 1925, Honolulu Harbor was expanded and the former taro and rice fields of the area were being converted to housing and industrial subdivision. During the last half of the 20th century, the Kapalama area continues to be urbanized with increased housing, industrial, and commercial uses. (Borthwick, Masterson, Creed, and Hammatt, March 1995).

An archaeological reconnaissance survey of the proposed Kapalama Wells site was completed on July 29, 1994. The purpose of the survey was to document the potential for discovery of archaeological or cultural remains. The survey was subject to public review in the BWS *Kapalama Exploratory Wells Environmental Assessment*, (CH2M Hill, 1995).

According to the survey report, "It was observed that the makai portion of the property, that fronting the house lot on Makua Kane Street had been previously bulldozed with the surface covered by various construction debris, probably associated with the adjacent residential development. The upslope portion of the project area appeared to be fairly undisturbed by grading, except for a 7 - 10 foot high berm for drainage control which was located just outside the upslope limits of the project area."

"No archaeological sites were encountered within the project area or in adjacent areas. Because of the small size of the project area and the fact that the boundaries were not clearly marked, the field inspection was extended beyond the limits. During the author's inspection of the steep slope outside the eastern end of the project area, a rock shelter was encountered. This rock shelter, consisting of a level area of thin soil under basalt overhang measured 260 cm. long and 130 cm. wide. The height of this shelter varied from 60 cm. in the back to 90 cm. in the front. The shelter overlooks Kapalama Valley to the west. Because of the possibility of this rock shelter being an archaeological site and the possibility

of human habitation, and particularly in view of the presence of bone fragments on the surface of the shelter, a test pit was placed within the soil deposit on August 9, 1994. This 1 m. by 50 cm. pit was excavated in the center of the shelter and all material was screened through 1/8 inch mesh. Solid bedrock was encountered from 40 to 10 cm. from the ground surface. The sediments consisted entirely of aeolian silt with a few fragments of natural basalt gravel that had fallen from the roof. No cultural material was encountered and the previously encountered bone was identified as probably dog bone by the author (Dr. Hallett H. Hammatt, Ph.D.). Because of the absence of human modification and the absence of evidence of human habitation within the thin deposits of the shelter, this overhang was determined not to be an archaeological site. This overhang is located approximately 60 ft. east of the project area boundary, just upslope of the drainage control berm previously mentioned." (Cultural Surveys Hawaii, 1994).

4.10.2 Impacts and Mitigation

No further mitigation measures are proposed as the project site is devoid of archaeological or cultural site potential. The proposal for additional development, therefore, will not impact archaeological resources. However, in the unlikely event that archaeological remains are encountered during development of the production well, work should cease in the immediate area and the DLNR, State Historic Preservation Division should be notified at (808) 587-0047 to determine significance and treatment of any findings.

4.11 NOISE

4.11.1 Noise

Regulation of noise in residential areas of Oahu are governed by the State Department of Health, HAR, Title 11, Chapter 46, "Community Noise Control." Allowable day and nighttime noise standards for sensitive receptors have been established for residential, preservation, hotel, apartment, and business districts. Existing noise levels at the site are relatively low due to the existing R-5 zoning of the site. The maximum allowable day and night noise levels in the R-5 zoning district are as follows:

Time	Allowable Levels
7:00 am to 10:00 pm	55 dBA
10:00 pm to 7:00 am	45 dBA

4.11.2 Impacts and Mitigation

Nearby areas which include residential, pre-school, and elementary to high school uses may be affected by noise. Noise will be generated by construction during clearing, grading, bulldozing, and installation of well related equipment and building structures. Mitigation measures to address these impacts include use of construction equipment appropriate to the surroundings of the area, e.g., no heavy field equipment larger than necessary; use of mufflers on construction vehicles; maintaining all equipment in good working order; and, limiting construction to weekdays during daylight hours between 8:30 am and 3:30 pm. No work shall be scheduled on federal or state holidays.

Additional noise levels may be generated by vehicular travel along Makuakane Street during the early morning and afternoon rush hours. These impacts, however, are expected to be relatively minor and only of short duration.

The Kamehameha Schools campus buildings are located approximately ±750 feet away and is separated from the project site by thick vegetative cover immediately surrounding the area. The Kamehameha Schools campus is also separated from the well site by an elevation change of approximately +80-100 feet, with landscaped areas between. It is expected that because of the characteristics of the well site, its distance from Kamehameha Schools, and the proposed use of noise attenuation equipment, that no adverse impacts due to noise will occur.

Pump equipment on production wells will be regulated for noise by DOH. Subsurface pumps will be used to reduce noise levels to below the regulatory limit.

4.12 AIR QUALITY

4.12.1 Air Quality

Air quality on Oahu is generally good due to regular presence of tradewinds. The proposed project location is exposed to northeast trades and located approximately 1,000 to 2,000 linear feet from the regularly travelled corridors of Likelike Highway and School Street. The project site, at the end of Makuakane Street, may be exposed to vehicular exhausts during the peak morning and afternoon traffic periods. However, the regular influence of tradewinds should minimize any potential for concentrated vehicular exhaust levels.

4.12.2 Impacts and Mitigation

Air quality is not expected to be adversely affected by the proposed project. During development of the production wells the construction contractor will be required to comply with State Department of Health regulations governing air quality (HAR, Title 11, Chapter 59 and 60, Air Pollution Control). This will include proper maintenance of internal combustion equipment and related use and storage of all petroleum, oils, and lubricants.

Clearing and grading will involve use of heavy construction equipment which may also generate fugitive dust. In accordance with HAR, Title 11, Chapter 60, the contractor will provide adequate control of dust from the road areas and during various phases of construction by use of means including, but not limited to, the following:

- Planning different phases of construction should focus on minimizing the amount of dust generating materials and activities. Materials transfer points and on-site vehicular traffic routes should be centralized. Potentially dusty equipment should also be located in areas of least impact;

- An adequate water source should be provided on-site prior to start-up of construction activities;

- Areas to be graded should be landscaped as soon as possible, starting from the initial grading phase;

- Control of dust should be undertaken on road shoulders, project entrances, and access roads; and,

- Adequate dust control measures should be provided during weekends, after hours, and prior to daily start-up of construction activities.

The limited scope of work is expected to result in a relatively short construction period. It is anticipated that by use of appropriate mitigation measures as described above, the potential for adverse impacts will be greatly minimized.

4.13 POPULATION AND EMPLOYMENT

4.13.1 Population and Employment

The proposed project is within City and County of Honolulu, Neighborhood Board Area No. 14 - Liliha/Kapalama (**Figure 4-4**). The population of this area is 21,235 persons comprising 6,683 households with an average household size of 3.0. This area represents approximately 2.5% of the total 1990 Oahu population of 836,231 persons. (State of Hawaii Data Book, 1995).

Employment centers include Kamehameha Shopping Center and various shops and commercial activities along School Street. Government services and employment are provided in the area by Hawaii Housing Authority (HHA), Maluhia Elderly Housing, and State Department of Health Clinics. Teaching and administration jobs are provided at Kamehameha Schools.

4.13.2 Impacts and Mitigation

The proposed project is not expected to result in adverse impacts to employment resources of the area. Development of the production wells and related structures will require

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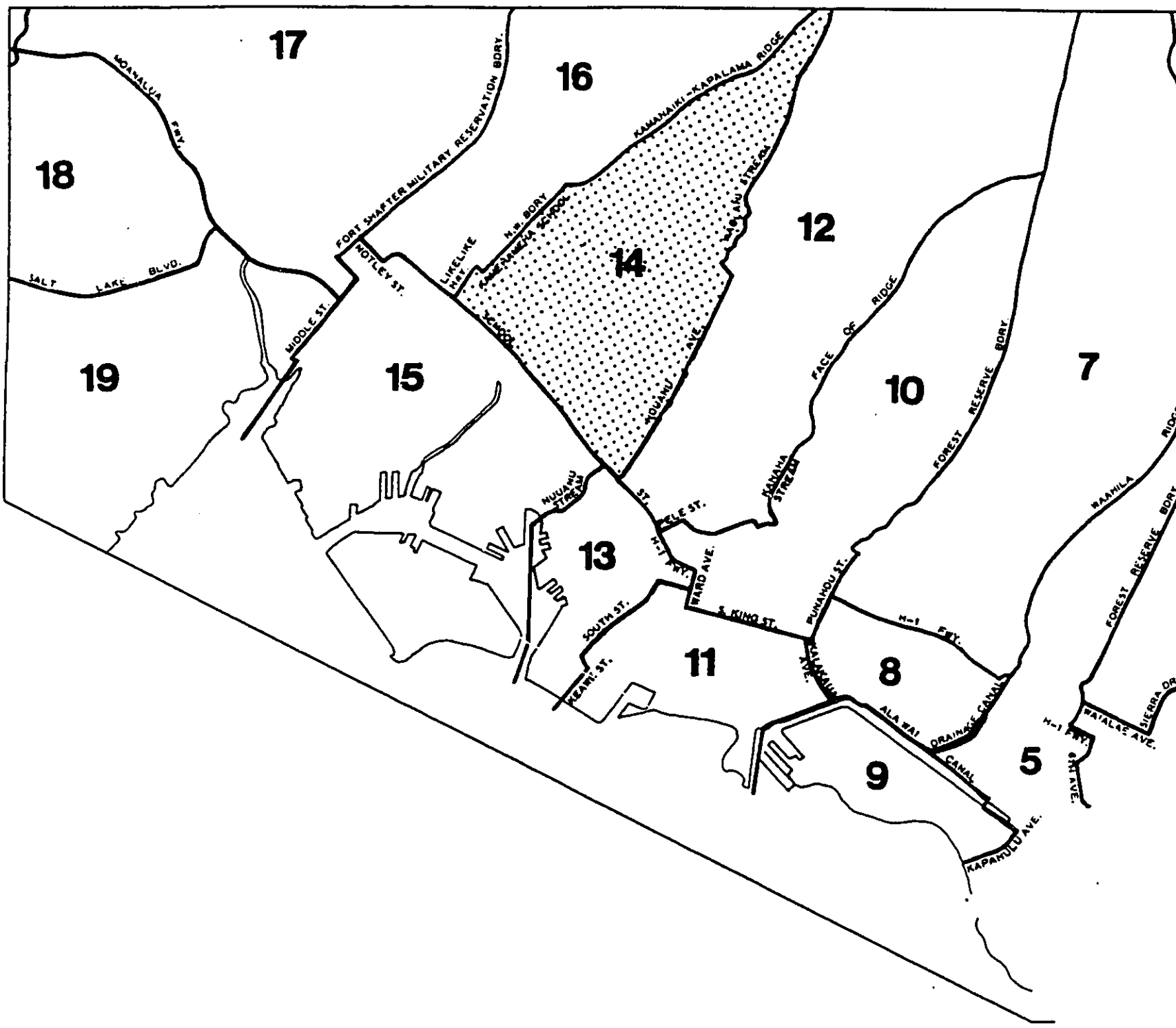


Figure 4-4
NEIGHBORHOOD BOARD
AREA NUMBER 14
LILIHA / KAPALAMA

NOT TO SCALE

Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

R. M. TOWILL CORPORATION

SOURCE: Neighborhood Statistics Program Areas.

JULY 1997

employment for construction. Most of these jobs will be temporary and undertaken by workers commuting from elsewhere. Once the project is completed, however, the well will help to sustain both the area population and future development potential of the area by ensuring the long term availability of potable water.

4.14 CONTAMINATION SOURCES

The following information is derived from the CWRM, Water Quality Plan (1990), and the Engineering Report for Kapalama Wells, Phase II, March 1998.

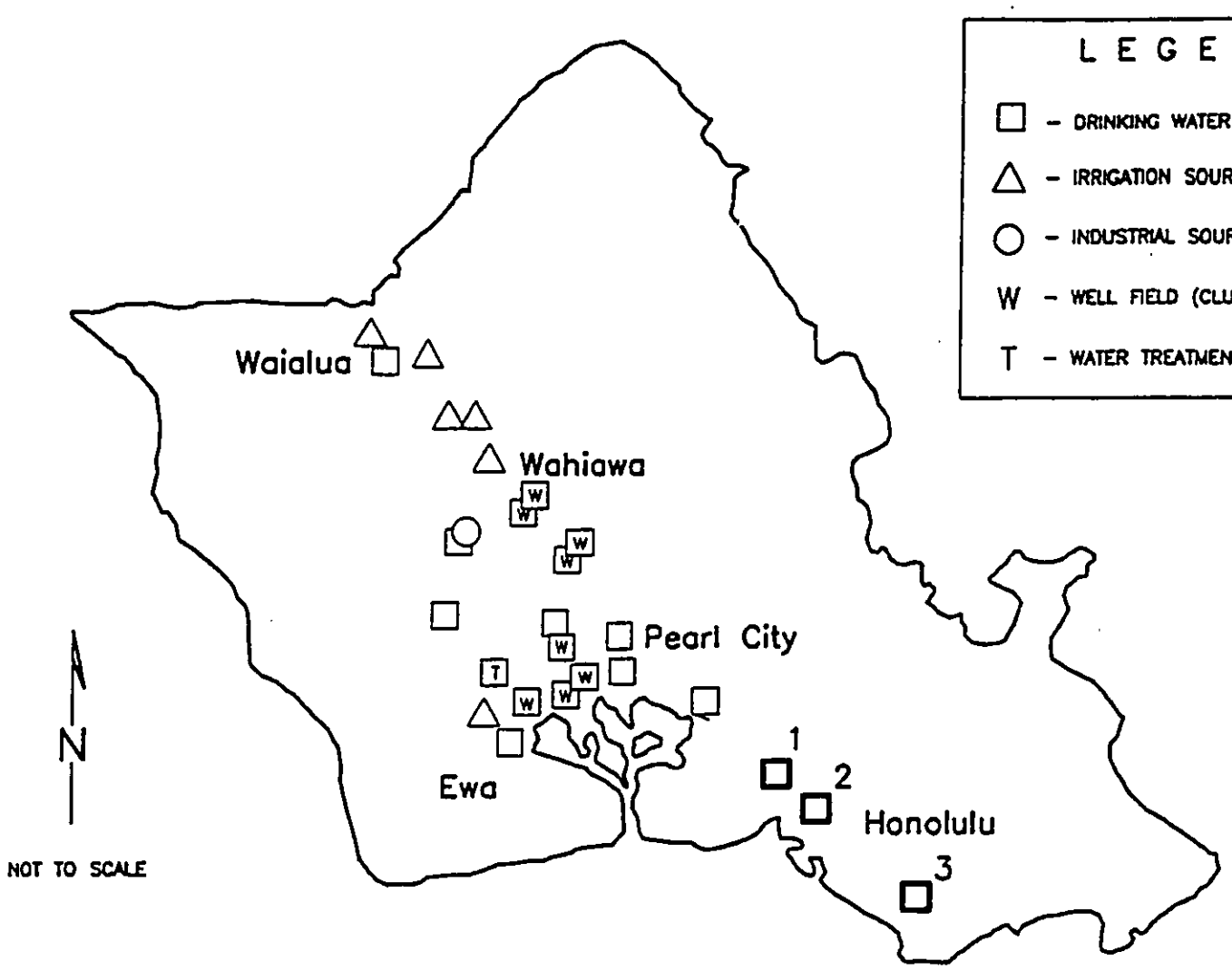
4.14.1 Known Contamination

According to CWRMs Water Quality Plan (1990), minute traces of Trichloroethylene (PCE), a substance used in solvents and dry cleaning, was detected in drinking water in the Honolulu WMA (**Figure 4-5**). The amount detected, however, 0.03 parts per billion (ppb), is considerably lower than safe drinking water standards for this substance, 5.00 ppb, and is not considered significant.

The Water Quality Plan also indicates the contaminant dieldrin was identified at concentrations exceeding the acceptable level at two locations in the Honolulu WMA (0.009 and 0.008 ppb). This contaminant, however, was not specifically detected in later water quality analyses of the well site.

The Engineering Report for Kapalama Wells, provides a water quality analysis of the well water which was performed in March and April 1997. The analysis detected a few contaminants which were either below the maximum contaminant levels (MCL) or just within detection limits. Two contaminants were discovered which are unregulated by DOH. These are Di-n-butylphthalate and Isophorone (**Table 4-2**).

According to the Engineering Report, the unregulated contaminants, Di-n-butylphthalate and Isophorone, are not expected to constitute a problem because of the characteristics of the constituents and the minute levels detected. All other contaminants were found to be well below MCL limits and within State DOH safe drinking water standards.



THIS MAP CONTAINS THE LAST CONFIRMED RESULTS FROM CONTAMINATED GROUNDWATER WELLS			
NO.	CONTAMINANT	DETECTED LEVEL (in ppb.)	APPLICABLE DRINKING WATER GUIDELINE* (in ppb.)
1	DIELDRIN:	0.009	0.002 10(-6)
2	DIELDRIN:	0.008	0.002 10(-6)
3	PCE:	0.030	5.000 pMCL

NOTES: Due to the number of wells in close proximity to each other, some sites are represented by wellfields and may contain several wells.

Possible natural contaminants such as nitrates have not been included.

*This guideline has been revised upward by DOH to 0.005 ppb (DOH, 1997).

Figure 4-5
GROUND WATER CONTAMINATION

SOURCE: Water Quality Plan, Hawaii Water Plan, Commission on Water Resource Management, State of Hawaii, June 1990

Board of Water Supply
KAPALAMA WELLS
City and County of Honolulu

R. M. TOWILL CORPORATION
FEBRUARY 1998

Table 4-2
SUMMARY OF WATER QUALITY ANALYSIS
KAPALAMA WELLS 1 AND 2

Well No.	Analyte	Result	Detection Limit	MCL	Units
1	Di-n-butylphthalate	0.5	0.50	2.0	ug/l
	Isophorone	3.4	0.50	none	ug/l
	Nitrate-N	0.6	0.10	10.0	mg/l
	Nitrate as NO3	2.6	0.44	none	mg/l
	Chromium, Total	5.5	5.00	100.0	ug/l
2	Fluoride	0.51	0.10	4.0	mg/l
	Isophorone	3.7	0.50	none	ug/l
	Nitrate-N	0.6	0.10	10	mg/l
	Nitrate as NO3	2.6	0.44	none	mg/l
	Copper, Total	100.0	50.00	1300*	ug/l
	Zinc, Total	46.0	20.00	5000**	ug/l

* Lead and Copper rule
** Secondary drinking water standards

4.14.2 Potential Sources of Contamination

Other potential sources of well contamination include use of petroleum and organochloride based constituents due to urban activities from the surrounding residential neighborhood. The nearby Kamehameha Schools Well No. 1 (State I.D. No. 2052-07) and Well No. 2 (State I.D. No. 2052-11) have detected chlordane and dieldrin. Although these constituents were not found at significant levels in the Kapalama Wells, there is potential for the Kapalama Wells to be contaminated in the future. It is expected that this threat will not be immediate, but would occur over a long period of time.

4.14.3 Impacts and Mitigation

Existing contaminant levels do not currently justify construction of a treatment plant. The water quality analysis of Kapalama Wells indicates that while some contaminants were found, the levels detected are within State DOH safe drinking water standards and therefore, well below the point at which treatment would be required. However, because there is evidence of chlordane and dieldrin in the nearby Kamehameha Schools wells,

provision has been made for future installation of a Granular Activated Carbon (GAC) treatment system at the Kapalama Wells site. This system, if and when required, can be co-located on existing space within the Kapalama Wells site.

Chapter 5

RELATIONSHIP TO LAND USE, POLICIES, AND CONTROLS OF THE AFFECTED AREA

5.1 HAWAII STATE PLAN

The Hawaii State Plan, Chapter 226, Hawaii Revised Statutes (HRS), serves as a written guide for the future long range development of the State. The Plan identifies goal, objectives, policies, and priorities for the State.

The proposed project would be in conformance to the State Plan objectives and policies for facility systems - in general,

> "(a) Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives."
>
> "(b) To achieve the general facility systems objective, it shall be the policy of this State to: (1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans." and "(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user" (HRS, Section 226-14).

The project would also conform to HRS, Section 226-16, water,

> "(a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately

accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities" (HRS, Section 226-16).

5.2 STATE WATER CODE AND COMMISSION ON WATER RESOURCE MANAGEMENT

The proposed project is consistent with the State Water Code and rules and regulations of CWRM (see Chapter 2).

The project site is within the Honolulu Water Management Area, Kalihi Aquifer. CWRM has assigned the Kalihi Aquifer a SY of 9 mgd. In accordance with Section 174-C, HRS, an application for a Pump Installation Permit and Water Use Permit have been filed with CWRM to permit use of approximately ±2 mgd from the Kapalama Wells. The request for the ±2 mgd, which must be reviewed and approved by CWRM, will be considered as part of the Kalihi Aquifer SY limit of 9 mgd.

5.3 STATE LAND USE LAW

The property is designated within the State Urban District. Uses proposed under the development would be consistent with objectives and policies of the State Land Use Law, Chapter 205, Hawaii Revised Statutes.

The State Urban District permits the development of infrastructure necessary to the maintenance of health and basic human welfare.

5.4 CITY AND COUNTY OF HONOLULU LAND USE DESIGNATIONS AND CONTROLS

According to the City and County of Honolulu, Development Plan Public Facilities Map, the subject parcel is designated Public Facility and zoned R-5, Residential, on the City's Zoning Map. The public facility use of the site is consistent with the City Land Use

Ordinance (LUO) which identifies the project as a Utility Installation, Type A, which is a permitted use in the R-5 zoning district.

Use of the site for BWS production wells will require a City Development Plan Public Facilities Map Amendment which was received on October 29, 1997 (Ordinance No. 97-60, Bill No. 59, 10/29/97).

Chapter 6
ALTERNATIVES TO THE PROPOSED ACTION

6.1 NO ACTION ALTERNATIVE

The Board of Water Supply (BWS) has a legal requirement to provide potable water to the residents of the City and County of Honolulu. The proposed project would help to meet this requirement while the no action alternative would prevent BWS from doing so. The no action alternative:

- does not address the mandate of BWS to develop safe potable water resources for the residents of the City and County of Honolulu; and
- would result in the lost opportunity to increase Oahu's existing potable resources.

6.2 DELAYED ACTION

Development of the proposed site at a later date was not considered to be viable. BWS has programmed development of the Kapalama Well as part of its overall strategy for ensuring availability of potable resources. The delayed action alternative:

- would increase the risk that population growth will generate water demands in excess of available, developed supplies; and
- result in higher future costs due to inflation.

6.3 ALTERNATIVE SITES

Groundwater resources within the Honolulu Sector, where the Kapalama Wells are located, are under restricted allocation by CWRM. For the Honolulu Sector, BWS reviewed 21 potential sites for additional potable wells in the "Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii" (BWS, 1984). The sites identified in the BWS assessment offer opportunities as new groundwater supply sources. However, BWS considers these to be additions, rather than alternatives to their well drilling program. (CH2M Hill, 1995).

Kapalama Wells is one of several future proposed wells which are part of the BWS program for supply development. Although BWS has identified additional locations for possible new wells, the Kapalama Wells site was determined to be the most viable location for development at this time. As required, future proposed wells will be developed for the Honolulu Sector as CWRM capacity becomes available.

6.4 ALTERNATIVE SOURCES

Alternatives to potable groundwater were analyzed by BWS in the *1995, Final Draft, Oahu Water Plan*. The alternatives investigated include desalination, surface and brackish groundwater development, recycling of treated wastewater and conservation of existing resources.

All alternatives, with the exception of conservation, shared high development costs, major technological challenges, and in the case of wastewater reuse, problems associated with social acceptance. Desalination, treatment of brackish and surface water, and reuse of effluent wastewater requires high cost water treatment plants. Use of alternative sources are also not without potential for environmental problems. Unrestrained removal of brackish water from an underlying aquifer can compromise and damage the transition zone between fresh and saline water. Development of surface water is also constrained due to the need to construct major new infrastructure to collect, treat, and transmit surface

sources. Use of surface sources could also reduce habitat for native and indigenous species. Wastewater reuse, while costly, has the added difficulty of gaining public acceptance. Desalination plants show some promise as new technology becomes available. Major benefits include a virtually limitless resource base, the Pacific Ocean, while a significant impediment continues to be high development costs. According to BWS,

> "Desalination: Desalination will be implemented as groundwater withdrawals approach sustainable yields. A site and technology study is currently under way. While the capital cost of a large scale desalination plant per gallon is equivalent to groundwater development in rural areas, the O&M costs at $3.00 per thousand gallons is 10 times the cost of pumping groundwater. O&M cost directly affects water rates, which we are trying to keep as low as possible.
>
> Surface Water: A 1996 Surface Water Study indicated that surface water development for potable use was not feasible, given the small, variable flows, environmental impact and the intense regulatory process involved with the instream flow standards and the monitoring requirements of the Safe Drinking Water Act.
>
> Reclamation: The reuse of sewage effluent is a promising alternative resource that is being actively pursued by the City to replace potable use for irrigation and industrial process water and to relieve the development pressure for high quality groundwater supplies. Public health concerns and high costs for dual water system infrastructure limit the extent of reuse. The city is focussing on the Ewa Plains where dual water systems can be master planned in new developments rather than the more costly alternative to redevelop existing urban areas with dual systems. Additionally, the Honouliuli Wastewater Treatment plant effluent has chloride content very suitable for irrigation. Whereas the Sand Island plant chloride contact is much to high for irrigation use." (BWS, 1997).

Conservation is also emphasized by BWS, with a stated goal of 10 percent reduction in per capita consumption by the year 2000. Conservation efforts include use of public

information programs on the limitation of Oahu's resources and benefits of conservation, use of low flow residential and commercial water fixtures, use of xeriscaping, maintenance of home plumbing fixtures (e.g., repair of leaking faucets and hoses), and periodic adjustment of water rate structures.

Although not now feasible, alternatives to potable groundwater will grow in importance as existing aquifer resources approach the limits of their sustainable yield. It is possible that one day, technology improvements will permit development of these alternatives to supplement Oahu's potable groundwater resources. In so doing, alternative source development will help to protect and preserve the future of Oahu's potable aquifer resources.

Conservation efforts will continue to play a key role in helping to reduce demand on existing groundwater supplies. Conservation alone, however, cannot be relied upon to meet all of Oahu's future water demands. Until such time that alternative source development can reliably and economically supplement existing resources, conservation in conjunction with the development of potable groundwater will remain the preferred BWS management strategy.

6.5 RECOMMENDED ACTION

The recommended action is to proceed with development of the proposed project at Kapalama, Honolulu, Oahu. The project is part of the BWS program for source development and has been carefully considered to meet the future water needs of the City and County of Honolulu.

Chapter 7

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Development of the proposed project will commit the necessary construction and human effort, and fiscal resources. Use of these resources will benefit residents and visitors to the City and County of Honolulu by ensuring safe and clean potable water.

Long-term gains resulting from the proposed project include the long term use and benefits accruing from use of this resource. The proposed project, therefore, will enhance economic productivity by making future development possible.

Chapter 8

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES BY THE PROPOSED ACTION

Development of the proposed project will involve the irretrievable loss of certain environmental and fiscal resources. However, the costs associated with the use of these resources should be evaluated in light of recurring benefits to the residents of Honolulu.

It is anticipated that the construction of the proposed project will commit the necessary construction materials and human resources (in the form of planning, engineering, construction and labor). Reuse for much of these resources is not practicable. Although labor is compensated during the various stages of development, labor expended for project development is non-retrievable.

Chapter 9
NECESSARY PERMITS AND APPROVALS

9.1 DEPARTMENT OF HEALTH

Safe Drinking Water Branch will require permission to develop a potable source with eventual connection to a public water system (Public Health Regulations, Chapter 20, Title II, Potable Water Systems).

Clean Water Branch will require filing of National Pollutant Discharge Elimination System (NPDES) Permit(s) if there are any discharges of hydrotesting or well effluent into State waters through use of the county municipal storm sewer system.

A noise permit for construction of the proposed production well and facilities will also be required from the Noise and Radiation Branch.

9.2 DEPARTMENT OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCES MANAGEMENT (CWRM)

Conversion of the exploratory well to a production well will require a Pump Installation Permit and Water Use Permit. The Pump Installation Permit would be required if a change in pumps is needed (e.g., change in drawdown capacity or type, surface or submersible) during conversion from exploratory to production status. If a change in pumps is not needed, this permit would not apply.

The Water Use Permit would be required to ensure there is sufficient available capacity within the Kalihi Aquifer to support the well. Both permits are currently on file and are pending approval by CWRM.

9.3 CITY AND COUNTY OF HONOLULU

Use of the site for a BWS production well will require a DP Public Facilities Map Amendment which was received on October 29, 1997 (Ordinance No. 97-60, Bill No. 59, 10/29/97).

The Department of Public Works will require a grading permit and the Building Department will require a building permit. It is expected that both permits will be filed prior to start of construction.

BWS already has permission to use the City and County of Honolulu, municipal storm sewer system for discharges of effluent related to potable pump operation, replacement, and repair at various locations (Section 14-12.22, Revised Ordinances of Honolulu 1990, as amended). This permit has a date of expiration of March 5, 1999. Should project activities requiring this permit occur beyond this date, a new permit for discharges to the municipal storm sewer system will need to be obtained from the City Department of Public Works.

Chapter 10

FINDINGS AND REASONS SUPPORTING DETERMINATION

In accordance with the provisions set forth in Chapter 343, Hawaii Revised Statutes, and the significance criteria in Section 11-200-12 of Title 11, Chapter 200, this assessment has determined that the project will have no significant adverse impact to water quality, air quality, existing utilities, noise, archaeological sites, or wildlife habitat. All anticipated impacts will be temporary and will not adversely impact environmental quality. According to the significance criteria:

1. *Irrevocable commitment to loss or destruction of natural or cultural resources -*

   The proposed project is not anticipated to adversely impact any natural or cultural resources. According to a previous archaeological reconnaissance survey of the proposed site, no further mitigation measures are required as the site is devoid of archaeological potential. The proposal for development of a production well therefore, will not impact archaeological resources.

2. *Curtailment of the range of beneficial uses of the environment -*

   The proposed location of the well site is relatively undeveloped and situated at the end of an unpaved access road adjoining Makuakane Street. The location of the access road will facilitate servicing the well, while the well location will help to avoid conflicts with future development of the parcel. Upon completion, the project site will be of a low building and structures, e.g., pumps, valves and fittings, accessory to the wells.

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 polices, goals and guidelines delineated in Chapter 343, HRS, and the National Environmental Policy Act. Potential sources of adverse impacts have been identified and appropriate measures developed to mitigate or minimize impacts to negligible levels.

4. *Substantially affects the economic or social welfare of the community or state -*

The proposed project is intended to ensure the long-term provision of clean, potable water necessary for the future health, welfare, and growth of the Kalihi community and the surrounding Honolulu region.

5. *Substantially affects public health -*

The proposed project will be developed in accordance with federal, state, and City and County of Honolulu, rules and regulations governing public safety and health. The primary public health concerns will involve air, water, noise, and traffic impacts. However, it is expected that these impacts can be minimized or brought to negligible levels by appropriate use of the mitigation measures described in this document.

6. *Involves substantial secondary impacts, such as population changes or effects on public facilities -*

The proposed project is part of the BWS program for development of water sources to serve the present and future population of the Kapalama-Kalihi area. The project in itself, however, will not generate new population growth.

7. *Involves substantial degradation of environmental quality -*

The proposed project will be developed in accordance with the environmental polices of Chapter 343, HRS, and the National Environmental Policy Act. The project site is on a relatively undeveloped parcel surrounded by the Kamehameha

Schools and a residential community. The proposed use will be consistent with the existing urban surroundings of the site.

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

The proposed project addresses the needs of existing and future area residents, businesses, and institutional users. Although Oahu's growing population will continue to place demands on need for more water, potable water resources are finite and limited. CWRM, which is charged with regulation of Hawaii's water resources, will ensure that permitted withdrawals are consistent with the available sustainable yield of aquifer systems such as the Kalihi Aquifer.

9. *Substantially affects a rare, threatened or endangered species or its habitat -*

There are no endangered flora or fauna species within or surrounding the project site.

10. *Detrimentally affects air or water quality or ambient noise levels*

Any potential impacts to air, water quality, or noise levels will be addressed by use of appropriate measures described in this document.

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*

The proposed project is located in an area appropriate for urban development and related use for a production well. The proposed project site itself does not possess any sensitive environmental characteristics which would detract from the proposed activity.

12. *Substantially affects scenic vistas and view planes identified in county or state plans or studies*

The production wells will be located at the end of an unpaved access road. Most of the area surrounding the site is undeveloped hillside with introduced flora. The site when constructed will contain low structures which will result in little to no visual impacts. As noted in this document: the surrounding sloped area provides relatively unobstructed views toward Honolulu Harbor and the surrounding region. The project site will not obstruct these existing views; and, views toward the site will be of the Kamehameha Heights hillside. Although it is possible that the production well site can be observed from various local roads, the project site is not visible from Nimitz Highway or from Sand Island Park.

13. *Requires substantial energy consumption*

Sufficient energy will be used to construct the production wells and connect the system to the existing BWS transmission system. Energy will also be used during the transport of construction equipment, machinery, and personnel to the project site. None of these activities are expected to result in use of energy significantly greater than similar production well projects. The location of the site, however, will facilitate access because it is within the Honolulu region.

Based on analysis and review of the above factors, it has been determined that an Environmental Impact Statement (EIS) will not be required, and that an anticipated Finding of No Significant Impact (FONSI) be issued for this project.

Chapter 11

ORGANIZATIONS AND AGENCIES CONSULTED IN THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

The following organizations and agencies were contacted during preparation of the Draft and Final Kapalama Exploratory Wells Environmental Assessments, June 1995, and Kapalama Wells Draft and Final Environmental Assessment, August 1997 and 1998:

11.1 FEDERAL AGENCIES

U.S. Army Corps of Engineers

U.S. Geological Survey

U.S. Fish and Wildlife Service

11.2 STATE AGENCIES

Department of Business, Economic Development & Tourism

- Office of Planning

Department of Education

Department of Land and Natural Resources

- Commission on Water Resources Management

Department of Health

- Environmental Management Division
- Office of Environmental Quality Control

University of Hawaii

- Environmental Center

11.3 CITY AND COUNTY OF HONOLULU

Planning Department

Department of Land Utilization

Building Department

Department of Transportation Services
Board of Water Supply

11.4 PRIVATE AND COMMUNITY ORGANIZATIONS, AND ELECTED OFFICIALS

The Estate of Bernice Pauahi Bishop
Honolulu City Council
Liliha-Kapalama Neighborhood Board
Kalihi Neighborhood Board
State Senator Suzanne Chun-Oakland
State House Representative Dennis Arakaki

Chapter 12

COMMENTS AND RESPONSES TO THE DRAFT ENVIRONMENTAL ASSESSMENT PREPARATION

The following comments were received during the Draft EA 30-day comment period. Attached are the responses to comments prepared by BWS.

R. M. TOWILL CORPORATION

420 Waiakamilo Rd #411 Honolulu HI 96817-4941 (808) 842-1133 Fax (808) 842-1937

December 21, 1997

Ms. Marcia Ikuta
Kalihi Palama Public Library
1325 Kalihi Street
Honolulu, Hawaii 96819

Dear Ms. Ikuta:

SUBJECT: Transmittal of Public Review Copy of Draft Environmental Assessment for Kapalama Production Wells, Oahu, Hawaii

Please find attached a copy of the subject Draft Environmental Assessment. This document is forwarded for the Office of Environmental Quality Control (OEQC) public comment period commencing December 23, 1997, and ending January 22, 1998. Comments received during this 30-day review period will be used to prepare the forthcoming Final Environmental Assessment. Availability of both the Draft and Final Environmental Assessments are published in the OEQC Bulletin.

Public comments may be forwarded to:

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

Sincerely,

Brian Takeda
Senior Planner

Attachment
cc Nancy Heinrich, OEQC
Scott Muraoka, Board of Water Supply

RECEIVED
BD OF WATER SUPPLY
Jan 13 2 56 PM '98

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. BOX 621
HONOLULU, HAWAII 96809

JAN 15 1998

MICHAEL D. WILSON
CHAIRPERSON

ROBERT G. GIRALD
DAVID A. NOBRIGA
LAWRENCE H. MIKE
RICHARD H. COX
HERBERT M. RICHARDS, JR.

RAE M. LOUI, P.E.
DEPUTY

January 8, 1998

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

Dear Mr. Sato:

Draft Environmental Assessment for Kapalama Production Wells, Oahu, Hawaii

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas which are important for the maintenance of streams and the replenishment of aquifers.

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

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[X] A Well Construction Permit and a Pump Installation Permit from the CWRM would be required before ground water is developed as a source of supply for the project.

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

[ ] Groundwater withdrawals from this project may affect streamflows. This may require an instream flow standard amendment.

[ ] We recommend that no development take place affecting highly erodible slopes which drain into streams within or adjacent to the project.

[ ] If the proposed project diverts additional water from streams or if new or modified stream diversions are planned, the project may need to obtain a stream diversion works permit and petition to amend the interim instream flow standard for the affected stream(s).

[ ] Based on the information provided, it appears that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR will be required before the project can be implemented.

[ ] Based on the information provided, it does not appear that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR will be required before the project can be implemented.

[ ] An amendment to the instream flow standard from the CWRM would be required before any streamwater is diverted.

[X] OTHER:

Well completion reports for the construction of the exploratory wells were submitted on June 25, 1997. The application for a water use permit is incomplete; additional information regarding the proposed use of the wells has been requested (see attached). Because the proposed source is in a designated water management area, action on the pump installation permit application is being deferred pending a decision on the water use permit application. The Chapter 343 environmental review process must also be completed.

With regard to the reallocation of permitted uses in the aquifer (ie. Jonathon Springs to Kapalama Wells), this may be done administratively pursuant to the attached Declaratory Ruling, DEC-ADM97-A1, upon letter request by Honolulu Board of Water Supply.

If there are any questions, please contact Lenore Nakama at 587-0218.

Sincerely,

RAE M. LOUI
Deputy Director

LN:ss
Attachment

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

MICHAEL D. WILSON
CHAIRPERSON

ROBERT G. GIRALD
DAVID A. NOBRIGA
LAWRENCE H. MIKE
RICHARD H. COX
HERBERT M. RICHARDS, JR.

RAE M. LOUI, P.E.
DEPUTY

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. BOX 621
HONOLULU, HAWAII 96809

JUL 30 1997

Mr. Raymond H. Sato
Manager and Chief Engineer
Honolulu Board of Water Supply
630 S. Beretania Street
Honolulu, HI 96843

Dear Mr. Sato :

Well Completion Reports for Well Nos. 2052-13 & 14 (#2 & #1)

We have received your Well Completion Reports Part I for the Kapalama Wells (#1 & #2) (Well Nos. 2052-13 & 14) and acknowledge that they are complete.

Because this source is located in a designated water management area, approval of pump installation permits is contingent upon the approval of a water use permit. Both approvals require action by the Commission on Water Resource Management (Commission).

Our letter of January 8, 1996 informed you that additional information to justify the proposed water use was needed to complete the water use permit application (ie. complete Table 1 on the back of the application form). This is pursuant to the Commission's action on July 28, 1993, which established "*[t]hat the Commission will not accept future application requests from BWS unless analysis, as demonstrated by staff in Exhibits 1 through 11, of future 4-year potable needs are provided by BWS. Further, that the Commission require such analysis for all currently pending BWS water use permit applications in other water management areas and also for applications whereby wells, pumps, and water use permits for facilities are to be dedicated to the BWS.*" If necessary, we can send you another copy of the July 28, 1993 submittal with Exhibits 1 through 11. Absent an updated Water Use and Development Plan for Oahu, the following justifications for new municipal uses have been deemed acceptable:

- Project information (ie. complete Table 1 on the back of the application form)
- Extrapolation of building permit information

We will look forward to receiving project or building permit information. In addition, please explain how this request for 2.0 mgd relates to your reservation request for 23 mgd for Ewa and Central Oahu and the Primary Urban Center.

Upon receipt of the information requested above, we will continue to process your permit application. If you have any questions, please contact Lenore Nakama of the Commission staff at 587-0218.

Sincerely,

for: RAE M. LOUI
Deputy Director

LN:ss

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

MICHAEL D. WILSON
CHAIRPERSON

ROBERT G. GIRALD
DAVID A. NOBRIGA
LAWRENCE H. MIKE
RICHARD H. COX
HERBERT M. RICHARDS, JR.

RAE M. LOUI, P.E.
DEPUTY

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. BOX 621
HONOLULU, HAWAII 96809

Declaratory Ruling No. DEC-ADM97-A1

Declaratory Order on:
Delegation of Water Use Permit Modification Approval Meeting Certain Criteria to the Chairperson

BACKGROUND:

The Honolulu Board of Water Supply (BWS) requested modifications/adjustments of permitted uses within a water management area to reflect the actual pumpages at existing municipal supply sources which are driven by system demands. Requested increases were small and ranged from 0.012 to 0.390 mgd. To balance these increases, BWS proposed to reduce permitted uses at other sources within the same aquifer system so that no net change occurs. The modification was approved at the Commission meeting on October 22, 1997.

ANALYSIS/ISSUES:

Section 174C-57 HRS states:

> "*A permittee may seek modification of any term of a permit. A permittee who seeks to change the use of water subject to the permit, whether or not such change in use is of a material nature, or to change the place of use of the water or to use a greater quantity of water than allowed under the permit or to make any change in respect to the water which may have a material effect upon any person or upon the water resource, shall make application pursuant to section 174C-51 in respect to such a change.*

BWS submitted a letter request for these proposed modifications, rather than making application(s) pursuant to §174C-51 HRS that would be subject to the full permitting process, which provides for public notice and objections.

However, §174C-57 HRS also provides:

> "*County agencies are exempt from the requirements of this section except where the modification involves a change in the quantity of water to be used or where the new use would adversely affect the quality of the water or quantity of use of another permittee.*

Although BWS' modification request involved increases in the quantity of water used at specific sources, the net change in total permitted municipal uses within the aquifers is zero. The modifications would result in more optimal operation of BWS' interconnected system.

BWS' proposal seeks to optimize pumpage and minimize potential overpumpage violations at these sources. The Commission's records of BWS pumpage supports this proposal. Because the proposed allocation changes result in no net change within the same aquifers, and because the adjustments reflect actual historical pumpages, no adverse impacts to water resources or other existing legal uses are anticipated.

This optimization exercise can and should be extended to non-county agency permittees where the permittees may have multiple wells within the same aquifer system. A declaratory ruling that clarifies the statute and Administrative Rule regarding water use permit modifications and delegates the authority to the Chairperson to approve future such modification requests would be beneficial to the staff.

RECOMMENDATION:

That the Commission adopt the following declaratory order:

DECISION AND ORDER:

The Commission delegates the approval of water use permit modifications to the Chairperson for allocation adjustments that meet the following criteria:

1. The net change in permitted use within an aquifer is zero.

2. The modification would result in more efficient and optimal operation of multiple sources under a single operator.

3. No adverse impacts to water resources or other existing legal uses are anticipated.

4. End use location and type remain unchanged.

Dated: Honolulu, Hawaii January 5, 1998

APPROVED BY THE COMMISSION ON WATER RESOURCE MANAGEMENT AT ITS MEETING ON NOVEMBER 19, 1997

APPROVED AND SO ORDERED:

MICHAEL D. WILSON, Chairperson

0000 0004 0406

COPY

BOARD OF WATER SUPPLY

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

RECD MAY 1998 CWRM

May 1, 1998

Mr. Edwin T. Sakoda, Acting Deputy Director
Commission on Water Resource Management
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Sakoda:

Subject: Your Letter of January 8, 1998 Regarding the Draft Environmental Assessment for the Proposed Kapalama Wells Project, Kapalama, Oahu, Hawaii, THK: 1-6-022: 007

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kapalama Wells project.

We provide the following comments to your concerns:

1. The proposed project is integrated into the county's Water Use and Development Plan.

2. The Pump Installation and Water Use Permit will be obtained before groundwater is developed as a source of water supply.

3. We note that relocation of permitted uses in the aquifer may be done administratively pursuant to the Declaratory Ruling, DEC-ADM97-A1, dated January 5, 1998. A decision on the future of Jonathan Springs will be dependent on the results of an on-going water treatment feasibility study.

We provide the following additional water use information, as requested in your letter of July 30, 1997 regarding the Kapalama Wells WUP application:

Project Information

We have indicated that there are few water master plans within developed urban areas, and thus the information on projected water use is based on current population projections for the development plan areas. We process construction plans and building permits on a regular basis but it is difficult to predict when a landowner will decide to redevelop a parcel and increase its density and associated water requirement. Large and small developments are driven by a fluctuating market and phasing schedules often require revision, especially as the planning horizon extends into the future.

The City Planning Department is currently revising the Primary Urban Center (PUC), development plan which will provide a long term vision for growth. The DP will identify the large areas where redevelopment plans are likely. Until the draft DP's are compiled, we can only provide certain project areas with their THK's and water demands. We do not have information on phasing schedules especially for the Kakaako and Waikiki redevelopments:

Lalea Townhomes Hawaii Kai	-	0.12 mgd	THK: 3-9-8: Portion 13 and 42
Kakaako Redevelopment	-	3.54 mgd	THK: 2-1-26, 27, 29 to 32, 47 to 56, 58 to 60; 2-3-01 to 07
Waikiki Redevelopment	-	2.00 mgd	THK: 2-6-01 to 29
Ala Moana Center Expansion	-	0.50 mgd	THK: 2-3-38: 1
Total request		6.16 mgd	(> 2.0 mgd request)

The Waikiki demand was based on the City's Planning Department's study for the redevelopment of the older areas in Waikiki. Lalea and Ala Moana Center's expansion was based on construction plan and building permit submittals. The Kakaako redevelopment plan was based on the approved water master plan by the State Housing Finance and Development Corporation and also includes Bishop Estate and State lands which will be applying separately for water allocation. The water front redevelopment is the other large area having high growth potential but there is no information on future plans, to date.

Kapalama Wells request relative to 23 mgd reservation request for Ewa, Central Oahu and PUC

The 2.0 mgd for Kapalama Wells is not included in the 23 mgd reservation request for meeting projected demands in Ewa, Central Oahu, and PUC.

The 23 mgd reservation request includes a 4.0 mgd reservation for our proposed Waipahu Wells II Addition and Waipahu Wells IV projects to accommodate small user growth in the Ewa, Central Oahu and PUC areas. The 4.0 mgd reservation for Ewa, Central Oahu, and PUC represents only a portion needed to meet the projected water demand increase of approximately 20 mgd in the PUC, by the year 2020. (See attached tables). The population projections from the City Planning Department indicate a population increase of about 200,000 people, from 908,000 people in 1990 to 1.1 million in 2020.

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

Very truly yours,

BROOKS H. M. YUEN
Acting Manager and Chief Engineer

Attachment

cc: Brian Takeda, R.M. Towill Corporation

972608

PE
cc: Mgr
Dep

JOHN J. CAYETANO
GOVERNOR OF HAWAII

MICHAEL D. WILSON
CHAIRPERSON

ROBERT G. GIRALD
DAVID A. NOBRIGA
LAWRENCE H. MIKE
RICHARD H. COX
HERBERT M. RICHARDS, JR.

RAE M. LOUI, P.E.
DEPUTY

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. BOX 621
HONOLULU, HAWAII 96809

JUL 30 1997

Aug 1 2 23 PM '97

Mr. Raymond H. Sato
Manager and Chief Engineer
Honolulu Board of Water Supply
630 S. Beretania Street
Honolulu, HI 96843

Dear Mr. Sato :

Well Completion Reports for Well Nos. 2052-13 & 14

We have received your Well Completion Reports Part 1 for the **Kapalama Wells #1 & #2** (Well Nos. 2052-13 & 14) and acknowledge that they are complete.

Because this source is located in a designated water management area, approval of pump installation permits is contingent upon the approval of a water use permit. Both approvals require action by the Commission on Water Resource Management (Commission).

Our letter of January 8, 1996 informed you that additional information to justify the proposed water use was needed to complete the water use permit application (ie. complete Table 1 on the back of the application form). This is pursuant to the Commission's action on July 28, 1993, which established *"[t]hat the Commission will not accept future application requests from BWS unless analysis, as demonstrated by staff in Exhibits 1 through 11, of future 4-year potable needs are provided by BWS. Further, that the Commission require such analysis for all currently pending BWS water use permit applications in other water management areas and also for applications whereby wells, pumps, and water use permits for facilities are to be dedicated to the BWS."* If necessary, we can send you another copy of the July 28, 1993 submittal with Exhibits 1 through 11. Absent an updated Water Use and Development Plan for Oahu, the following justifications for new municipal uses have been deemed acceptable:

- Project information (ie. complete Table 1 on the back of the application form)
- Extrapolation of building permit information

We will look forward to receiving project or building permit information. In addition, please explain how this request for 2.0 mgd relates to your reservation request for 23 mgd for Ewa and Central Oahu and the Primary Urban Center.

Upon receipt of the information requested above, we will continue to process your permit application. If you have any questions, please contact Lenore Nakama of the Commission staff at 587-0218.

Sincerely,

for: RAE M. LOUI
Deputy Director

LN:ss

TABLE D-1

OAHU MUNICIPAL WATER DEMAND
1990, BY DP AREA

DP AREA	1990 RESIDENT POPULATION 1/	% RESIDENT POPULATION	RESIDENTS ABSENT 2/	VISITORS PRESENT 3/	DE FACTO POPULATION 4/	PRIVATE SYSTEMS 5/	BWS-SERVED POPULATION 6/	1990 DEMAND MGD 7/	PER CAPITA DEMAND-GPD
PRIMARY URBAN CENTER	432,023	51.80%	8,075	78,429	502,377	36,080	466,297	88.58	190.0
EWA	42,983	5.14%	803	780	42,875	11,854	31,321	10.60	281.1 *
CENTRAL OAHU	130,474	15.60%	2,438	2,415	130,451	24,634	105,817	15.02	141.8
EAST HONOLULU	46,684	5.46%	853	845	46,646	0	45,846	8.68	190.2
KOOLAUPOKO	117,884	14.07%	2,200	2,170	117,873	870	116,803	17.68	151.2
KOOLAULOA	14,283	1.71%	267	1,355	15,352	4,140	11,212	2.85	254.2
NORTH SHORE	15,728	1.88%	294	291	15,729	1,000	14,736	3.19	216.6
WAIANAE	37,411	4.47%	699	1,089	37,801	0	37,801	9.05	239.4
TOTAL	836,231	100.00%	15,631	87,400	808,000	78,278	829,722	155.83	185.4

1/ Dept. of General Planning, from 1990 Census.
2/ Resident Visitor-Defacto; Total apportioned by population percentage.
3/ Hawaii Visitors Bureau, see Visitor Population table.
4/ State Dept. of Business, Economic Development & Tourism.
5/ See Private Systems table.
6/ Delivery minus Private Systems.
7/ Based on Board of Water Supply Current demands, including planned projects and projects
* Less per gallons demand reflects a 3.0 mgd demand adjustment by BWS to account for projected off high industrial water use.

Projected Oahu Water Demand
Year 2020, By DP Area

DP Area	Resident Population	Visitor Census	Private / Military	BWS-Served Population	Per Capita Demand (gpd)	Proj. 2020 Demand (mgd)	*1990 Demand (mgd)	Increase 1990 - 2020 (mgd)
PUC	503,090	107,428	36,080	574,438	190.00	109.14	88.58	20.56
Ewa	124,775	9,458	11,654	122,579	281.10	34.46	10.60	23.86
Central Oahu	186,629	26	24,534	162,121	141.80	22.99	15.02	7.97
East Honolulu	51,640	869	-	52,709	190.20	10.03	8.68	1.35
Koolaupoko	122,083	177	870	121,390	163.96	19.90	19.15	0.75
Koolauloa	15,094	9,467	4,140	20,421	146.18	2.99	1.64	1.35
North Shore	19,560	19	1,000	18,579	196.39	3.65	2.89	0.76
Waianae	48,155	3,127	-	51,282	239.40	12.28	9.05	3.23
Totals	1,071,226	130,571	78,278	1,123,519	191.74	215.43	155.61	59.82

Based on Planning Department's likely population estimates

5/21/97

DP_PROJ.XLS

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RECEIVED
BD OF WATER SUPPLY

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 11TH FLOOR • HONOLULU, HAWAII 96813
PHONE (808) 523-4361 • FAX (808) 527-5697

Jan 9 9 38 AM '98

JEREMY HARRIS
MAYOR

PE

JONATHAN K. SHIMADA, PhD
DIRECTOR AND CHIEF ENGINEER

ROLAND D. LIBBY, JR.
DEPUTY DIRECTOR

ENV 98-005

January 8, 1998

JAN 9 1 56 PM '98

MEMORANDUM:

TO: RAYMOND SATO, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

FROM: JONATHAN K. SHIMADA, PhD
DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENT ASSESSMENT (DEA)
KAPALAMA PRODUCTION WELLS
TMK: 1-6-22: 07

We have reviewed the subject DEA and have the following comments:

1. The DEA should indicate whether hydrotesting is required.

2. An effluent discharge permit for hydrotesting activity will be required from the Department of Public Works for any discharge to the City streets or storm drain system.

If you have any questions, please contact Mr. Alex Ho, Environmental Engineer, at 523-4150.

COPY

BOARD OF WATER SUPPLY

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

JEREMY HARRIS, Mayor

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

RAYMOND H. SATO
Manager and Chief Engineer

January 28, 1998

TO: JONATHAN K. SHIMADA, Ph.D., DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

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

SUBJECT: YOUR MEMORANDUM OF JANUARY 8, 1997 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED KAPALAMA WELLS PROJECT, TMK: 1-6-022: 007

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kapalama Wells project.

We provide the following responses to your concerns:

1. The Final EA will be revised to indicate that hydrotesting activity will be required for the proposed project.

2. We acknowledge that an effluent discharge permit for hydrotesting activity will be required from the Department of Public Works for any discharges into the municipal storm drain system.

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

cc: Brian Takeda, R.M. Towill Corporation

BENJAMIN J CAYETANO
GOVERNOR OF HAWAII

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

LAWRENCE MIKE
DIRECTOR OF HEALTH

RECD JAN 2 1998

In reply, please refer to

January 19, 1998 97-069A/epo

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

Dear Mr. Sato:

Subject: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
Project: Kapalama Production Wells
Location: Kapalama, Honolulu, Oahu, Hawaii
TMK: (1) 1-6-22: 7

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

Safe Drinking Water

1. Federal and state regulations define a public water system as a system that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. All public water system owners and operators are required to comply with Hawaii Administrative Rules (HAR), Title 11, Chapter 20, "Rules Relating to Potable Water Systems."

2. The DEA stated that this project will be developing two wells for potable use. HAR, Chapter 11-20, Section 11-20-29 requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.

3. The engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses, performed by a laboratory certified in the State of Hawaii,

must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional tests may be required by the Director of Health upon his review of the information submitted.

4. There is a typographical error on Page 1, Section 1.2, *Purpose of Environmental Assessment*. In the second line, "... per requirements of Chapter 200..." should be changed to ".... per requirements of Chapter 20..."

If you should have any questions regarding these comments, please contact Ms. Queenie Komori of the Safe Drinking Water Branch, Engineering Section, at 586-4258.

Water Pollution

1. The applicant should contact the Army Corps of Engineers to identify whether a federal permit (including a Department of Army permit) is required for this project. If a federal permit is required, then a Section 401 Water Quality Certification is required from the State Department of Health, Clean Water Branch.

2. A National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State:

   a. Storm water discharges relating to construction activities, such as clearing, grading, and excavation, for projects equal to or greater than five acres;

   b. Storm water discharges from industrial activities;

   c. Construction dewatering activities;

   d. Noncontact cooling water discharges less than one million gallons per day;

   e. Treated groundwater from underground storage tank remedial activities;

   f. Hydrotesting water;

   g. Treated effluent from petroleum bulk stations and terminals; and

   h. Treated effluent from well drilling activities.

Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 30 days prior to commencement of any discharge to waters of the State.

3. After construction of the proposed facility is completed, an NPDES individual permit will be required if the operation of the facility involves any wastewater discharge into State waters.

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

Clean Air Branch

The project location is exposed to the northeast trades and located approximately 1,000 to 2,000 linear feet upwind of Likelike Highway and School Street. The project description notes the use of heavy construction equipment for clearing and grubbing. Proposed actions affecting air quality includes removing vegetation, grading, excavation, and other construction activities.

Control of Fugitive Dust:

There is a significant potential for fugitive dust to be generated during the removal of debris and during the grading, excavating and construction activities that would impact nearby thoroughfares, residences, and business establishments. A dust control management plan should be developed which identifies and addresses activities that have a significant potential to generate fugitive dust.

Construction activities must comply with provisions of HAR, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33 on Fugitive Dust. The contractor should provide adequate means to control dust from the road areas and during the various phases of construction activities. These means include, but are not limited to:

a. Planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing material transfer points and on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. Providing an adequate water source at the site prior to start-up of construction activities;

c. Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. Controlling of dust from shoulders, project entrances, and access roads; and

e. Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities.

If you have any questions regarding fugitive dust, please contact Mr. Calen Miyahara of the Clean Air Branch at 586-4200.

Noise Concerns

The subject DEA references "HAR, Title 11, Chapter 43" and "HAR, Title 11, Chapter 53, Noise," on Page 8, Section 1.6.8, and Page 40, Section 4.11.1, respectively. Chapter 11-43 has been repealed by the adoption of HAR, Chapter 11-46, "Community Noise Control."

Should you have any questions regarding this matter, please contact Mr. Jerry Haruno, Environmental Health Program Manager of the Noise, Radiation, and Indoor Air Quality Branch at 586-4701.

Sincerely,

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

c: R. M. Towill Corporation ✓
SDWB
CWB
CAB
NR&IAQB

COPY

BOARD OF WATER SUPPLY

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

February 25, 1998

RECD MAR 5 1998 HMTC

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

Dear Dr. Anderson:

Subject: Your Letter of January 19, 1998 on the Draft Environmental Assessment for the Proposed Kapalama Wells, TMK: 1-6-22: 07

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kapalama Wells project.

We provide the following comments to your concerns:

1. Safe Drinking Water:

   a. We understand the proposed project is required to comply with Hawaii Administrative Rules (HAR), Section 11-20-29, "Rules Relating to Potable Water Systems." We shall comply with Department of Health requirements, including the submission of an acceptable engineering report prior to placing the wells into service.

   b. The typographical error on Page 1, Section 1.2, will be corrected in the Final EA.

2. Water Pollution:

   a. A federal permit from the Army Corps of Engineers is not required for the proposed project.

   b. A National Pollutant Discharge Elimination System permit for hydrotesting activities will be required for the proposed project. Treated effluent from well drilling activities will be contained on-site and not allowed to reach any receiving waters.

3. Clean Air Branch:

   The contractor will be required to comply with provisions of HAR, Chapter 11-60.1, "Air Pollution Control," and Section 11-60.1-33, "Fugitive Dust." Best management practices will be implemented during construction to control fugitive dust.

4. Noise Concerns:

   We note that Chapter 11-43 has been repealed by the adoption of HAR, Chapter 11-46, "Community Noise Control."

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

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: *Brian Takeda, R.M. Towill Corporation*

KAMEHAMEHA SCHOOLS BERNICE PAUAHI BISHOP ESTATE

January 21, 1998

Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, HI 96813

Gentlemen:

Kapalama Wells (TMK 116-022-007) - Draft Environmental Assessment

The Honolulu Board of Water Supply's Kapalama wells located at the Makuakane Street entrance of the Kamehameha Schools, proposes to develop 2.0 mgd of potable water.

Kamehameha Schools Bishop Estate owns and operates a private drinking water system for the campus and is currently upgrading the entire water system. Two new wells have been drilled in the past year and one is currently in opeartion. The other well is expected to be on-line by the end of the year. The wells are located on campus and taps the same aquifer as the proposed Kapalama wells. Water use permits have been obtained from State Commission on Water Resource Management for both campus wells.

Since the Kapalama wells are expected to draw 2.0 mgd, we recommend a monitoring program be established by the Honolulu Board of Water Supply to insure that no long-term adverse impact will occur to the existing Kamehameha Schools wells on campus. These wells are the only water sources for the campus and every precaution is being taken to protect these sources from contamination and hydrologic impact from surrounding wells.

In addition, we would like to keep the entrance to Kamehameha Schools and the immediate surrounding areas in its natural state. Therefore, we request an opportunity to review any site development plans at the earliset date to comment on the overall development.

Thank you for this opportunity to provide these comments.

Very truly yours,

Manabu Tagomori, P.E.
Water Resources Manager

BOARD OF WATER SUPPLY

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

February 13, 1998

Mr. Manabu Tagomori, P.E.
Water Resources Manager
Kamehameha Schools Bernice
Pauahi Bishop Estate
567 South King Street
Honolulu, Hawaii 96813

Dear Mr. Tagomori:

Subject: Your Letter of January 21, 1998 to the Office of Environmental Quality Control Regarding the Draft Environmental Assessment for the Board of Water Supply's Proposed Kapalama Wells Project, Kapalama, Oahu, Hawaii, TMK: 1-6-022: 007

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kapalama Wells project.

We provide the following comments to your concerns:

1. The Kalihi Aquifer has an existing sustainable yield of 9 million gallons per day (mgd). According to the State's Commission on Water Resource Management, approximately 1.292 mgd SY remain for allocation. As long as the sustainable yield is not surpassed, water quality of all wells within the sub-area should be in good quality. Furthermore, the proposed Kapalama Wells are down gradient of the Kamehameha Schools wells. Water quality of the Board of Water Supply sources are monitored for organic and inorganic constituents on a continuous basis. Pumping operations are adjustable to reflect potential water quality constraints.

2. Construction plans for the Kapalama Wells will be submitted for your comments when completed. As noted in the Draft EA, the proposed project involves limited structures is located downslope of the Kamehameha Schools campus, and will be surrounded by vegetation; therefore, there should be no adverse visual impacts.

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

Very truly yours,

RAYMOND H. SATO
Manager and Chief Engineer

cc: Brian Takeda, R.M. Towill Corporation

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

P-52/98
(98-0243)
GARY GILL
DIRECTOR

January 22, 1998

Jan 28 11 23 AM '98

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

Dear Mr. Sato:

The Office of Environmental Quality Control (OEQC) submits for your response the following comments on a draft environmental assessment (DEA) entitled "Kapalama Wells."

1. **ORIENTATION MAPS:** Please indicate on the maps the points or regions of known contamination, points of potential contamination (landfills, individual wastewater disposal systems (cesspools, septic tanks, aeration units), hazardous waste sites, dry wells and injection wells), known or assumed chloride levels at specified depths in relation to nearest or adjacent wells, and the likely wellhead protection area for the proposed well.

2. **AQUIFER OR HYDROLOGIC UNIT STATUS:** Where not present, please ensure that the following information on aquifer or hydrologic unit status is included in the FEA.

   - Sustainable yields or other measures of water availability;
   - Authorized water use by the Commission on Water Resource Management;
   - Data table presenting the following information as appropriate
     - Current water use totals, including subtotals for individual users
     - Current installed capacity including subtotals for individual wells and/or groups of wells.
     - Pending installed capacity and/or use for the proposed well and subtotals for individual wells and/or groups of wells within the aquifer

3. **CONTAMINATION ANALYSIS**

   Please include a record of contamination problems in the aquifer or hydrologic unit including but not limited to saltwater intrusion, turbidity, heavy metals, inorganic and organic chemicals (such as the termiticides mentionned on page 15), microbiological agents, water quality parameters (such as pH, alkalinity, calcium, conductivity and temperature), and radioactivity. If contamination exists, the sources and duration of the contamination should be listed. Water quality data from nearby wells should be presented as well as any anticipated need for treatment or filtering systems. Discuss past and existing land uses within the likely wellhead protection area and the potential for future contamination from those uses.

Any hazardous materials used and/or produced during drilling and treatment should be described. The method of handling these hazardous materials should also be disclosed.

4. **HYDROLOGICAL IMPACT ANALYSIS**

   Please include in the FEA a description of the associated watershed and recharge area and a discussion of the potential effects the well development may have on affiliated groundwater and surface water (e.g., streams and wetlands). Relevant hydrologic, physical, chemical, and biological data for potentially affected waters should be included. If potential impacts exist, a monitoring program for the surface waters should be included.

   The FEA should include pump test data on water level, extraction rates, and water quality. Similar data from nearby wells should also be included. The precise criteria used to determine if the well should be converted to production should be described. Any provisions for future use and monitoring of wells not placed into production should also be described.

5. **ARCHAEOLOGICAL AND CULTURAL IMPACT ASSESSMENT**

   Please include a description of the archaeological and cultural significance of the region, including an on-site survey as well as consultations with Native Hawaiian groups such as DHHL, OHA and local community associations. Attached is a Cultural Impact Assessment Protocol adopted by the Environmental Council which can be used for this purpose, if applicable.

6. **FINANCIAL AND INSTITUATION ARRANGEMENTS**

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

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

   Any or all of these arrangements and all permits or governmental approvals required to fulfill these commitments should be listed.

   In Chapter 2 of the DEA, please disclose the nature and location of any water/land exchanges with the Estate of Bernice Pauahi Bishop to procure the well site.

7. **WATERSHED AND LAND USE ANALYSIS**

   Please include in the FEA a discussion of how waters from the well will be used, and an analysis of how the proposed well development may affect land and water uses on the island and in the region. The analysis should include a discussion of the following (published materials may be referenced):

- Hawaii State Water Plan and its component parts
- County General, Development, and/or Community Plans
- Plans for future water development within the aquifer
- Any related water, wastewater, drainage or erosion control plans
- Historical water supply and demand figures for the region
- How the well may affect existing water sources
- Any secondary or cumulative impacts caused by promoting land uses that alter the hydrology of the source and/or end-use area
- An assessment of the well's impact on the land owners, water users including farmers and kuleana residents in the region and a declaration if ceded lands are involved.

8. **IMPACTS OF ACCESSORY FACILITIES**

Please include in the FEA a description of impacts associated with the well's permanent production facilities including pumps, distribution pipelines, control devises, storage facilities, access roads and accessory structures.

Please include a copy of this letter and your response for their inclusion in the final environmental assessment and notice of determination on this project.

If there are any questions regarding this letter, please call Leslie Segundo of my staff at 586-4185. Thank you for the opportunity to comment.

Sincerely,

GARY GILL
Director of Environmental Quality Control

Attachment

c: Mr. Barry Usagawa, Board of Water Supply
Mr. Brian Takeda, R. M. Towill Corporation

BOARD OF WATER SUPPLY

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

April 24, 1998

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

Dear Mr. Gill:

Subject: Your Letter of January 22, 1998 Regarding Draft Environmental Assessment for the Board of Water Supply's Proposed Kapalama Wells Project, Honolulu, Oahu, TMK: 1-6-22: 07

Thank you for reviewing the Draft Environmental Assessment (EA) for the proposed Kapalama Wells project.

We provide the following responses to your concerns:

1. Orientation Maps: The Final EA will include a orientation with available information on groundwater flow paths and points of regions of known or potential contamination.

2. Aquifer or Hydrologic Unit Analysis: Appendix D of the Oahu Water Management Plan for the Honolulu region will be incorporated into the Final EA.

3. Contamination Analysis: The Final EA will include a discussion on contamination within the affected aquifer.

4. Hydrological Impact Analysis: The proposed well project is not anticipated to impact any neighboring streams or wetlands. Kalihi Stream is approximately 2,000 feet away and Kapalama Stream is approximately 400 to 500 feet away from the proposed well site. This distance in conjunction with the presence of low permeability alluvium separating stream waters from groundwater will serve to eliminate any potential for streamflow impacts. The Final EA will include test pump data on water level, extraction rates and water quality for the proposed production wells.

5. Archaeological and Cultural Impact Assessment: An archaeological reconnaissance survey by Cultural Surveys Hawaii was completed on July 29, 1994. According to the reconnaissance survey, the project site is devoid of any archaeological potential. Therefore, the proposed project will not impact any archaeological resources.

6. Financial and Institutional Arrangements: There are no formalized financial or institutional arrangements or commitments related to developing the well. The well water is intended for small user growth and for the redevelopment of existing urban areas in Honolulu. The well project is on the Board of Water Supply property and will be financed through our Water System Facilities Charges for resource development.

7. Watershed and Land Use Analysis:

   a. The proposed well project is in conformance with the Hawaii State Water Plan and the County's General and Development Plans.

   b. The proposed project is not anticipated to incur any secondary or cumulative impacts by promoting land uses that alter the hydrology of the source and/or end user.

   c. The proposed project will not impact ceded lands.

   d. The proposed well project is not anticipated to impact streamflow; therefore, farmers and kuleana residents should not be affected.

8. Impacts of Accessory Facilities: The Final EA will include a description of impacts associated with the well's permanent production facilities and accessory structures.

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

Very truly yours,

BROOKS H. M. YUEN
Acting Manager and Chief Engineer

cc: Brian Takeda, R.M. Towill

REFERENCES
(Listed in Chronological Order)

Communication regarding sustainable yield and CWRM allocation for Kalihi Aquifer, conversation with Neil Fujii, Commission on Water Resource Management, Department of Land and Natural Resources, May 13, 1998

Engineering Report, Kapalama Wells, Phase II, Kamehameha Heights, Kapalama, Honolulu, Oahu, Hawaii, City and County of Honolulu, Board of Water Supply, R. M. Towill Corporation, March 1998

Communication, BWS review comments regarding preliminary Draft Environmental Assessment for Kapalama Wells, City and County of Honolulu, Board of Water Supply, November 1997

Draft Oahu Water Management Plan, Initial Revision of the Technical Reference Document, City and County of Honolulu, Planning Department, Board of Water Supply, September 1997 (unpublished)

BWS Memorandum, transmittal notes between BWS Environmental Section and Water Quality Section, August 26, 1997 and August 29, 1997

Current Active Water Use Permits, Island of Oahu, Kalihi Aquifer System, Commission on Water Resource Management, Department of Land and Natural Resources, August 13, 1997

Communication, conversation with Lenore Nakama, Commission on Water Resource Management, Department of Land and Natural Resources, August 1997

Kapalama Exploratory Wells, Final Environmental Assessment, Kapalama, Honolulu, Oahu, Hawaii, City and County of Honolulu, Board of Water Supply, CH2M Hill, June 1995

Draft Oahu Water Plan, Fifth Edition, Board of Water Supply, City and County of Honolulu, March 1995

An Archaeological Inventory Survey of the Kamehameha Homes Project, Kapalama, Oahu, Draft, Borthwick, Masterson, Creed, and Hammatt, Cultural Surveys Hawaii, March 1995

Hourly Precipitation Data, Hawaii and the Pacific, January 1993, Volume 29, Number 1, Department of Commerce, National Oceanographic and Atmospheric Administration, January 1993

Rainfall Atlas of Hawaii, Report R76, State Department of Land and Natural Resources, Division of Water and Land Development, June 1986

Regional Environmental Impact Assessment for Development of Wells, Reservoirs, Transmission Lines and Appurtenances at Honolulu, Hawaii, City and County of Honolulu, Board of Water Supply, 1984

Hawaii Water Resources Plan, Hawaii Water Resources Regional Study, U.S. Water Resources Council and State Board of Land and Natural Resources, State of Hawaii, January 1979

Atlas of Hawaii, Department of Geography, University of Hawaii, University of Hawaii Press, 1973

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

Geology and Groundwater Resources of the Island of Oahu, Hawaii. Stearns, Harold T. and K.N. Vaksvik. Hawaii Division of Geography, Bulletin I, 1935

0000 0004 04 19

APPENDIX 1

Ordinance 97-60, Bill No. 59
To Amend Portion of the Development Plan Public Facilities Map
October 29, 1997

0000 0004 0420

CITY COUNCIL

CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

ORDINANCE 97-60

BILL 59 (1997)

A BILL FOR AN ORDINANCE

TO AMEND PORTION OF THE DEVELOPMENT PLAN PUBLIC FACILITIES MAP FOR THE PRIMARY URBAN CENTER TO ADD A PUBLICLY FUNDED WATER WELL SYMBOL, SITE DETERMINED, WITHIN SIX YEARS, KAPALAMA, OAHU, HAWAII.

BE IT ORDAINED by the People of the City and County of Honolulu:

SECTION I. Portion of the Development Plan Public Facilities Map for the Primary Urban Center is hereby amended by adding a publicly funded water well symbol, site determined, within six years, as shown on the map attached hereto, marked Exhibit A, and by reference made a part hereof.

SECTION II. This public facilities map symbol shall be deleted from the Public Facilities Map by administrative procedure once completion of the facility has been certified in writing by the applicant/agency to the Planning Department and the City Council.

0000 0004 0421

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

ORDINANCE 97-60

BILL 59 (1997)

Section III. This Ordinance shall take effect upon its approval.

INTRODUCED BY:

DATE OF INTRODUCTION:

June 17, 1997
Honolulu, Hawaii

APPROVED AS TO FORM AND LEGALITY:

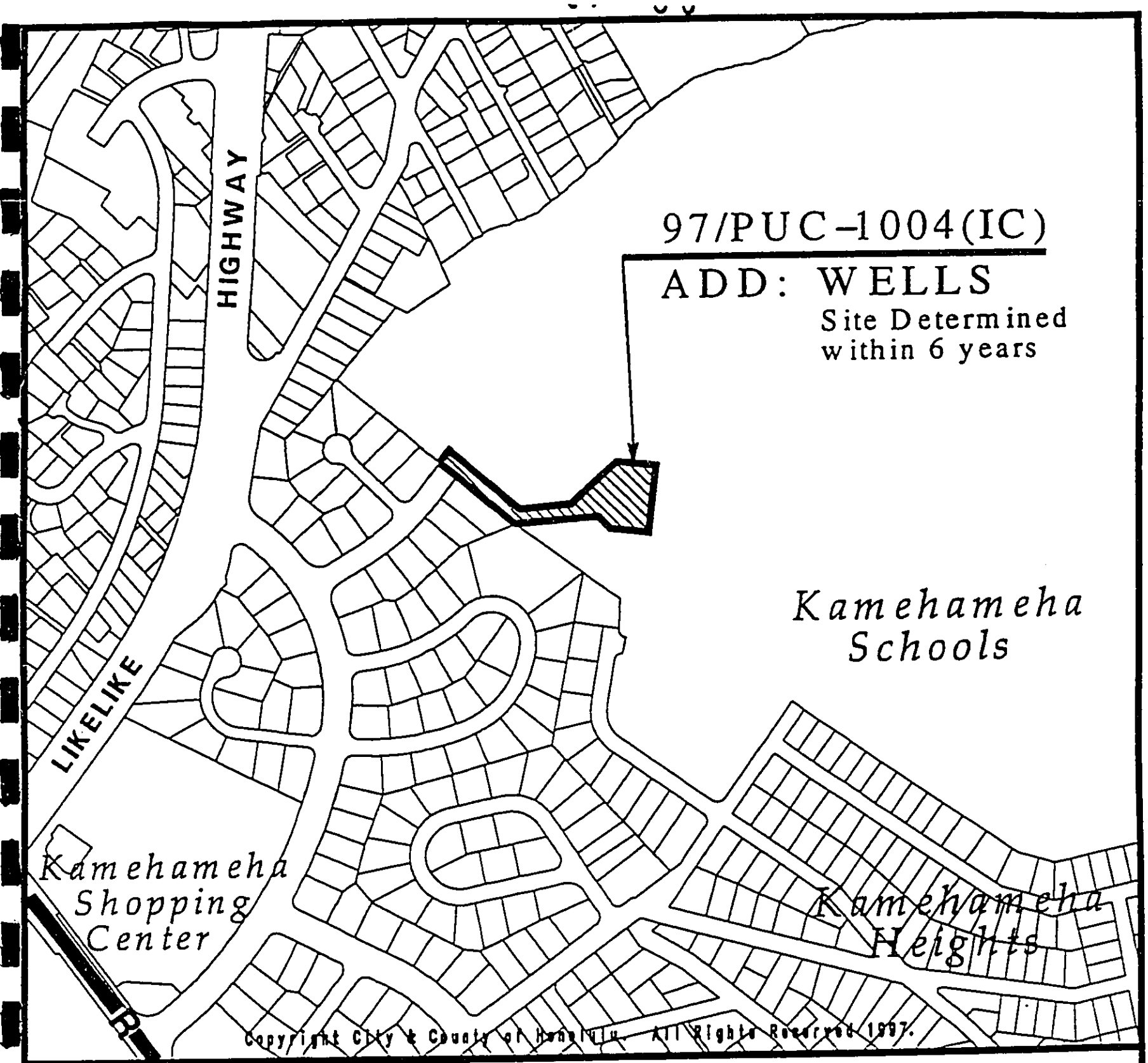
Councilmembers

Deputy Corporation Counsel

Approved this 29th day of October, 1997.

JEREMY HARRIS, MAYOR
City and County of Honolulu

0000 0004 0422



PORTION OF

DEVELOPMENT PLAN PUBLIC FACILITIES MAP
PRIMARY URBAN CENTER

PROJECT NAME:	KAPALAMA WELLS
APPLICANT:	BOARD of WATER SUPPLY
TAX MAP KEY:	1-6-22: 07
FOLDER NO.:	97/PUC-1004(IC)
LAND AREA:	1.02 Acres
PREPARED BY:	DEPARTMENT OF LAND UTILIZATION
PREPARED FOR:	PLANNING DEPARTMENT CITY AND COUNTY OF HONOLULU
PUBLIC HEARING:	PLANNING COMMISSION 5/21/97 CITY COUNCIL 9/24/97

0 400
Scale in Feet

97/PF-12

ORD. NO. 97 - 60

EFF. DATE: 10/29/97

EXHIBIT A

BILL 59, 1997

0000 0004 0423

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII
CERTIFICATE

ORDINANCE 97-60

BILL 59 (1997)

INTRODUCTION DATE: JUNE 17, 1997

INTRODUCED BY: CHAIR DESOTO (BY REQUEST)

1ST READING DATE: 7/9/97
REMARKS: Felix/Holmes - Bill passed 1st reading and referred to Economic Development, Planning and Tourism. - 9.

	AYE	NO	A/E
BAINUM	X		
FELIX	X		
HANNEMANN	X		
HOLMES	X		
KIM	X		
MANSHO	X		
MIRIKITANI	X		
YOSHIMURA	X		
DeSOTO	X		
TOTAL	9	0	0

2ND READING DATE: 9/24/97 PUBLICATION DATE: 10/2/97
DRAFT:
COMMITTEE REPORT: EDPTCR-480
PUBLIC HEARING DATE: 9/24/97 PUBLICATION DATE: 9/13/97
REMARKS: Hannemann/Felix - Bill passed 2nd reading. - 9.

Public hearing held concurrently, closed and referred to Economic Development, Planning and Tourism.

BAINUM	X		
FELIX	X		
HANNEMANN	X		
HOLMES	X		
KIM	X		
MANSHO	X		
MIRIKITANI	X		
YOSHIMURA	X		
DeSOTO	X		
TOTAL	9	0	0

3RD READING DATE: 10/15/97
DRAFT:
COMMITTEE REPORT: EDPTCR-524
REMARKS: Hannemann/Felix - Bill passed 3rd reading and Findings of Fact approved. - 9.

BAINUM	X		
FELIX	X		
HANNEMANN	X		
HOLMES	X		
KIM	X		
MANSHO	X		
MIRIKITANI	X		
YOSHIMURA	X		
DeSOTO	X		
TOTAL	9	0	0

ORDINANCE PUBLICATION DATE:

Referred to: Economic Development, Planning and Tourism
Reference: D-582, 1997

I hereby certify that the above is a true record of action by the Council of the City and County of Honolulu on this BILL.

Genevieve G. Wong

GENEVIEVE G. WONG, CITY CLERK

JOHN DeSOTO, CHAIR AND PRESIDING OFFICER

APPENDIX 2

Well Drilling Logs (Appendix A) and
Water Quality Laboratory Analysis (Appendix B), from the
BWS Engineering Report, Kapalama Wells, Phase II

0000 0004 0425

WELL DRILLING LOGS

0000 0004 0426

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

DATE: 8/7/97
PAGES TRANSMITTED: 5
(Including Cover Sheet)

FACSIMILE COVER SHEET

TO:
NAME: Jim Yamamoto
COMPANY: TOWILL
FAX NO: 842-1937

FROM:
NAME: GLENN OYAMA
DIVISION: P&E (Hydrology - Geology)
FAX NO: 527-6195

SUBJECT: Drilling log for Kapolama wells

REMARKS:

IN CASE OF TRANSMISSION PROBLEMS, PLEASE CONTACT SENDER AT (808) 527-5285. THANK YOU.

0000 0004 0427

BWS

APR 23 10 19 AM '97

State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL COMPLETION REPORT

3/20/96 WCR Form

(Check Appropriate Box) ☒ Well Construction ☐ (Permanent) Pump Installation

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at 587-0225, or 1-800-468-4644 Extension 70225.

1. State Well No.: 2052-14 Well Name: KAPALAMA WELL #1 Island: OAHU
2. Location/Address: KE ALA MANO KAM SCHOOL Tax Map Key: 1-6-22:07

PART I. WELL CONSTRUCTION REPORT

3. Drilling Company: ROSCOE MOSS HAWAII, INC.
4. Name of driller who performed work: CHARLES SHEPHERD
5. Type of rig/construction: AIR ROTARY
6. Date(s) Well Construction and pump tests (if any) completed: 3/6/97 DRILLING 4/7/97 PUMPING
7. GROUND ELEVATION (referenced to mean sea level, msl): 196.37 ft.
   Well Bench Mark (description/location): _____ Elevation(msl): _____ ft.
8. DRILLER'S LOG: *Please attach geologic log (if available or if required by permit)*

Depths (ft.)	Rock Description, Water Level, Dates, etc.
0 to 15	clay
15 to 60	layered basalt
61 to 67	void
67 to 100	layered basalt

(If more space is needed, continue on back.)

9. Total depth of well below ground: 346 ft.
10. Hole size: 20 inch dia. from 0 ft. to 246 ft. below ground
    20 1/4 inch dia. from 246 ft. to 346 ft. below ground
    _____ inch dia. from _____ ft. to _____ ft. below ground
11. Casing installed: 13.25 in. I.D. x .375 in. wall solid section to 246 ft. below ground
    _____ in. I.D. x _____ in. wall perforated section to _____ ft. below ground
    Casing Material/Slot Size: _____
12. Annulus: Grouted from 0 ft. below ground to 246 ft. below ground
    Gravel packed from _____ ft. below ground to _____ ft. below ground
13. Initial water level: 175.3 ft. below ground. Date and time of measurement: 3/14/97 914
14. Initial chloride: 83 ppm Date and time of sampling: 3/14/97 926
15. Initial temperature: 70.8° °F Date and time of measurement: 3/14/97 917
16. PUMPING TESTS: Reference Point (R.P.) used: ground, which elevation is 196.37 ft.
    (1) Step-Drawdown Test Date 3/14/97
    Start water level 175.3 ft. below R.P.
    End water level 175.3 ft. below R.P.
    (2) Long-term Aquifer Test Date 4/2/97
    Start water level 174.96 ft. below R.P.
    End water level 174.96 ft. below R.P.
17. Aquifer Pump Test Procedures data & graphs *(1/9/96 LTAT Form)* attached? X Yes __ No
18. As-built drawings attached attached? X Yes ___ No
19. Other remarks/comments: *(On back of this form)*

Well Drilling Contractor (print) ROSCOE MOSS HAWAII, INC. C-57 Lic. No. C-16437
Signature [signature] Date 4/21/97

Surveyor (print) _____ Lic. No. _____
Signature _____ Date _____

Applicant (print) _____
Signature _____ Date _____

0000 0004 0428

WELL # 1 - 2052-14

3/2016 WCR

PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: _____
21. Name of person performing work: _____
22. Date Pump Installation Completed: _____
23. PUMP INSTALLATION:
    Pump Type, Make, Serial No.: _____ Capacity: _____ gpm
    Motor type, H.P., Voltage, rpm: _____
    Depth of Pump Intake Setting _____ ft. below _____, which elevation is _____ ft.
    Depth to bottom of airline _____ ft. below _____, which elevation is _____ ft.
    Pumping Head is _____ ft. Type of flow meter: _____ which measures in _____
24. As-built drawings attached attached? __ Yes __ No
25. Other remarks/comments: *(See below)*

Pump Installation Contractor (print) _____ C-57 Lic. No. _____

Signature _____ Date _____

Applicant (print) _____

Signature _____ Date _____

8.(cont'd) DRILLER'S LOG (cont'd):

Water Level Dates	(ft.)	Depth (ft.)	Rock Description, Remarks,
100	to 116		very hard basalt
116	to 148		layered basalt
148	to 169		very hard basalt
169	to 176		loose basalt rubble
176	to 181		hard basalt
181	to 194		cinders wl 175'
194	to 214		hrd & soft lay'd basalt wl 175'
214	to 220		loose basalt rubble wl 175'

Water Level Dates	(ft.)	Depth (ft.)	Rock Description, Remarks,
220	to 225		very hard basalt wl 175'
225	to 246		layered basalt wl 175'
246	to 255		loose basalt rubble wl 175
255	to 265		layered basalt wl 175'
265	to 276		cinders wl 175'
276	to 318		loose basalt wl 175
318	to 346		layered basalt wl 175'
____	to ____		

19.& 25. Remarks: _____

0000 0004 0429

BWS

APR 23 10 19 AM '97

State of Hawaii
COMMISSION ON WATER RESOURCE MANAGEMENT
Department of Land and Natural Resources

WELL COMPLETION REPORT

3/20/96 WCR Form

(Check Appropriate Box) XX Well Construction ☐ (Permanent) Pump Installation

Instructions: Please print or type and submit completed report within 30 days after well completion to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. An as-built drawing of the well and chemical analysis should also be submitted. For assistance call the Commission Regulation Branch at 587-0225, or 1-800-468-4644 Extension 70225.

1. State Well No.: 2052-13 Well Name: KAPALAMA WELL #2 Island: oahu
2. Location/Address: KE ALA MANO KAM SCHOOL Tax Map Key: 1-6-22:07

PART I. WELL CONSTRUCTION REPORT

3. Drilling Company: ROSCOE MOSS HAWAII, INC.
4. Name of driller who performed work: CHARLES SHEPHERD
5. Type of rig/construction: AIR ROTARY
6. Date(s) Well Construction and pump tests (if any) completed: 11/25/96 DRILLING PUMP 3/3/97
7. GROUND ELEVATION (referenced to mean sea level, msl): 188.72 ft.
   Well Bench Mark (description/location): _____ Elevation(msl): _____ ft.
8. DRILLER'S LOG: *Please attach geologic log (if available or if required by permit)*

Depths (ft.)	Rock Description, Water Level, Dates, etc.	Depths (ft.)	Rock Description, Water Level, Dates, etc.
0 to 2	clay soft	5 to 11	grey w/little green hrd
2 to 5	large boulder	11 to 13	red brn med soft

(If more space is needed, continue on back.)

9. Total depth of well below ground: 338 ft.
10. Hole size: 20 inch dia. from 0 ft. to 238 ft. below ground
    12 1/4 inch dia. from 238 ft. to 338 ft. below ground
    _____ inch dia. from _____ ft. to _____ ft. below ground
11. Casing installed: 13.25 in. I.D. x .375 in. wall solid section to 238.72 ft. below ground
    _____ in. I.D. x _____ in. wall perforated section to _____ ft. below ground
    Casing Material/Slot Size: _____
12. Annulus: Grouted from 0 ft. below ground to 238.72 ft. below ground
    Gravel packed from _____ ft. below ground to _____ ft. below ground
13. Initial water level: 168.42 ft. below ground. Date and time of measurement: 1/24/97 1021
14. Initial chloride: 95 ppm Date and time of sampling: 1/24/97 1038
15. Initial temperature: 70.8 °F Date and time of measurement: 1/24/97 1050
16. PUMPING TESTS: Reference Point (R.P.) used: ground, which elevation is 188.72 ft.
    (1) Step-Drawdown Test Date 1/24/97
    Start water level 168.28 ft. below R.P.
    End water level 168.16 ft. below R.P.
    (2) Long-term Aquifer Test Date 1/27/97
    Start water level 168.04 ft. below R.P.
    End water level 168.04 ft. below R.P.
17. Aquifer Pump Test Procedures data & graphs *(1/9/96 LTAT Form)* attached? X Yes __ No
18. As-built drawings attached attached? X Yes __ No
19. Other remarks/comments: *(On back of this form)*

Well Drilling Contractor (print) ROSCOE MOSS HAWAII, INC. C-57 Lic. No. C-16437

Signature Tracy Russell Date 4/21/97

Surveyor (print) _____ Lic. No. _____

Signature _____ Date _____

Applicant (print) _____

Signature _____ Date _____

0000 0004 0430

WELL#2 2052-13

3/2005 WCR Form

PART II. (PERMANENT) PUMP INSTALLATION REPORT

20. Pump Installation Company: _____
21. Name of person performing work: _____
22. Date Pump Installation Completed: _____
23. PUMP INSTALLATION:
    Pump Type, Make, Serial No.: _____ Capacity: _____ gpm
    Motor type, H.P., Voltage, rpm: _____
    Depth of Pump Intake Setting _____ ft. below _____, which elevation is _____ ft.
    Depth to bottom of airline _____ ft. below _____, which elevation is _____ ft.
    Pumping Head is _____ ft. Type of flow meter: _____ which measures in _____
24. As-built drawings attached attached? __ Yes __ No
25. Other remarks/comments: *(See below)*

Pump Installation Contractor (print) _____ C-57 Lic. No. _____

Signature _____ Date _____

Applicant (print) _____

Signature _____ Date _____

8.(cont'd) DRILLER'S LOG (cont'd):

Water Level Dates		(ft.)	Depth (ft.) Rock Description, Remarks,
13	to	25	grey rock w/olivine
25	to	33	loose rocks & clay
33	to	48	grey rock very hard
48	to	55	cinders brn red
55	to	72	grey rock hard
72	to	80	hard rock
80	to	108	weathered rock
108	to	162	layered basalt

Water Level Dates		(ft.)	Depth (ft.) Rock Description, Remarks,
162	to	171	loose cinders
171	to	175'	hard rock
175	to	186	loose rocks
186	to	195	layered basalt
195	to	209	med hard & loose rock
209	to	219	very hard basalt wl 168.1
219	to	222	loose cinders wl 166.1
222	to	240	layered basalt wl 166.5

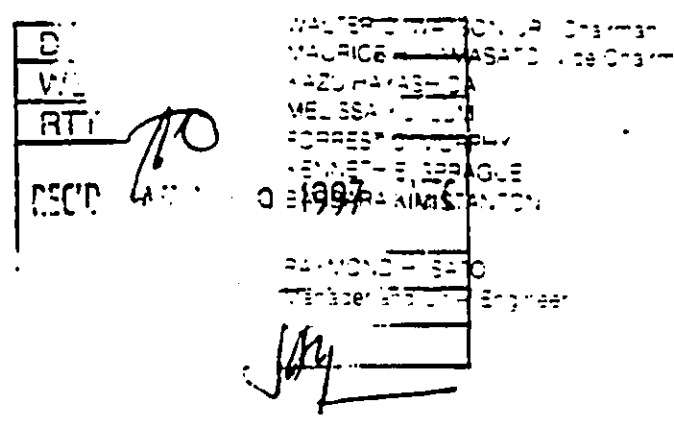
19.& 25. Remarks:

240	277	layered basalt wl 166.75
277	287	porous basalt wl 166.75
287	304	layered basalt wl 166.75
304	316	loose basalt wl 166.75
316	338	layered basalt wl 166.75

0000 0004 0431

BOARD OF WATER SUPPLY

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



TO: R. M. Towill Corp.
420 WaiaKamilo Rd. #411
Honolulu, HI 96817

ATTENTION: Mr. James Yamamoto

FROM: R. MATSUI, HEAD, ENGINEERING BRANCH
PLANNING AND ENGINEERING DIVISION

DATE: April 25, 1997

SUBJECT: Kapalama Wells, Phase I

WE ARE SENDING YOU ✓ Attached ___ Under separate cover
___ Shop drawings ___ Tracings ___ Plans/Prints ___ Specifications
___ Copy of letter ___ Change order ___ Samples ✓ Other

ITEM	COPIES	DESCRIPTION
1.	1	Test Pumping Results from Planning Br.

___ For signature
___ For approval
✓ For your use
___ As requested

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___ Approved as noted
___ Returned for corrections
___ Not approved

___ Resubmit ___ copies for approval
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___ Return ___ corrected prints
___ Return our marked-up material with your tracings
___ Other

___ For review & comments

___ For reapproval due to lapse in time

REMARKS:

If you have any questions, please contact Larry Hazama at 527-5202.

SIGNED:
R. MATSUI

Enclosure

Init. LH Log No:

0000 0004 0432

Honolulu Board of Water Supp

to RICHARD MATSUI

from BERT KUIOKA

subject For TEST PUMPING RESULTS AT KAPALAMA WELLS #1 (2052-14) AND #2 (2052-13)

date APR. 17, 1997

We recommend the proposed installed capacity of 1,400 gpm for both wells. The expected drawdown for well #2 is one foot. The expected drawdown for well #1 is two feet.

Attached are the as-build drawing and data from the step-drawdown and sustained pumping tests. We previously submitted the plumbness and alignment data.

Well #2 (state no. 2052-13):

Step-drawdown pumping rates were 804, 1,128, 1,319 and 1,500 gpm with drawdowns of 0.58 ft., 0.81 ft., 1.04 ft. and 1.27 feet, respectively. Chloride concentrations remained constant during the test at 95 ppm. The specific capacity at the proposed rate of 1,400 gpm is 1,210 ppm/ft.

The sustained pumping test was conducted over a period of four days at an average rate of 1,450 gpm (8,323,000 gallons total). Chloride concentrations varied from 93 ppm to 94 ppm. Drawdown stabilized at approximately 1.0 feet within 20 minutes. After 96 hours the drawdown was still 1.0 feet.

Well #1 (state no. 2052-14):

Step-drawdown pumping rates were 824, 1,079, 1,300 and 1,488 gpm with drawdowns of 0.92 ft., 1.27 ft., 1.73 ft. and 2.19 feet, respectively. Chloride concentrations increased with pumpage rate from 83 to 86 ppm. The specific capacity at the proposed rate of 1,400 gpm is 720 gpm/ft.

The sustained pumping test was conducted over a period of five days at an average rate of 1,232 gpm (8,867,000 gallons total). Chloride concentrations varied from 86 to 89 ppm. Drawdown stabilized at approximately 1.4 feet within three minutes. During the 120 hour test, the average drawdown was 1.5 feet.

Attachments

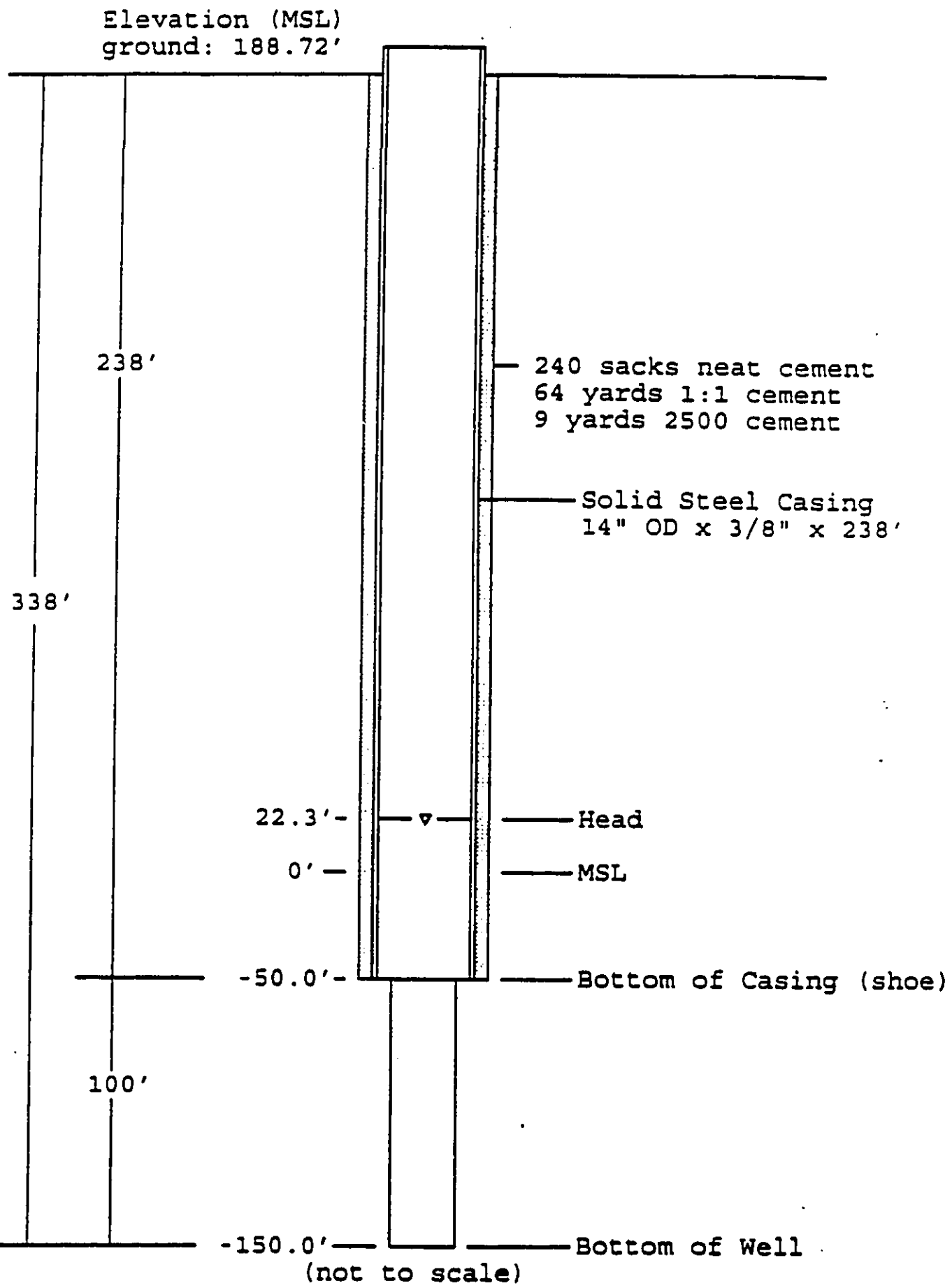
KLG:js

cc: Plant Operations
H. Minakami
G. Kuo
J. Kaakua
C. Lao

0000 0004 0433

Kapalama Well #2 No. 2052-13
Kapalama, Oahu, Hawaii
T.M.K.: 1-6-22:07

As-Built Section
Drilling Completed: November 25, 1996
Drilling Contractor: Roscoe Moss Hawaii, Inc.



KLG
March 1997

0000 0004 0434

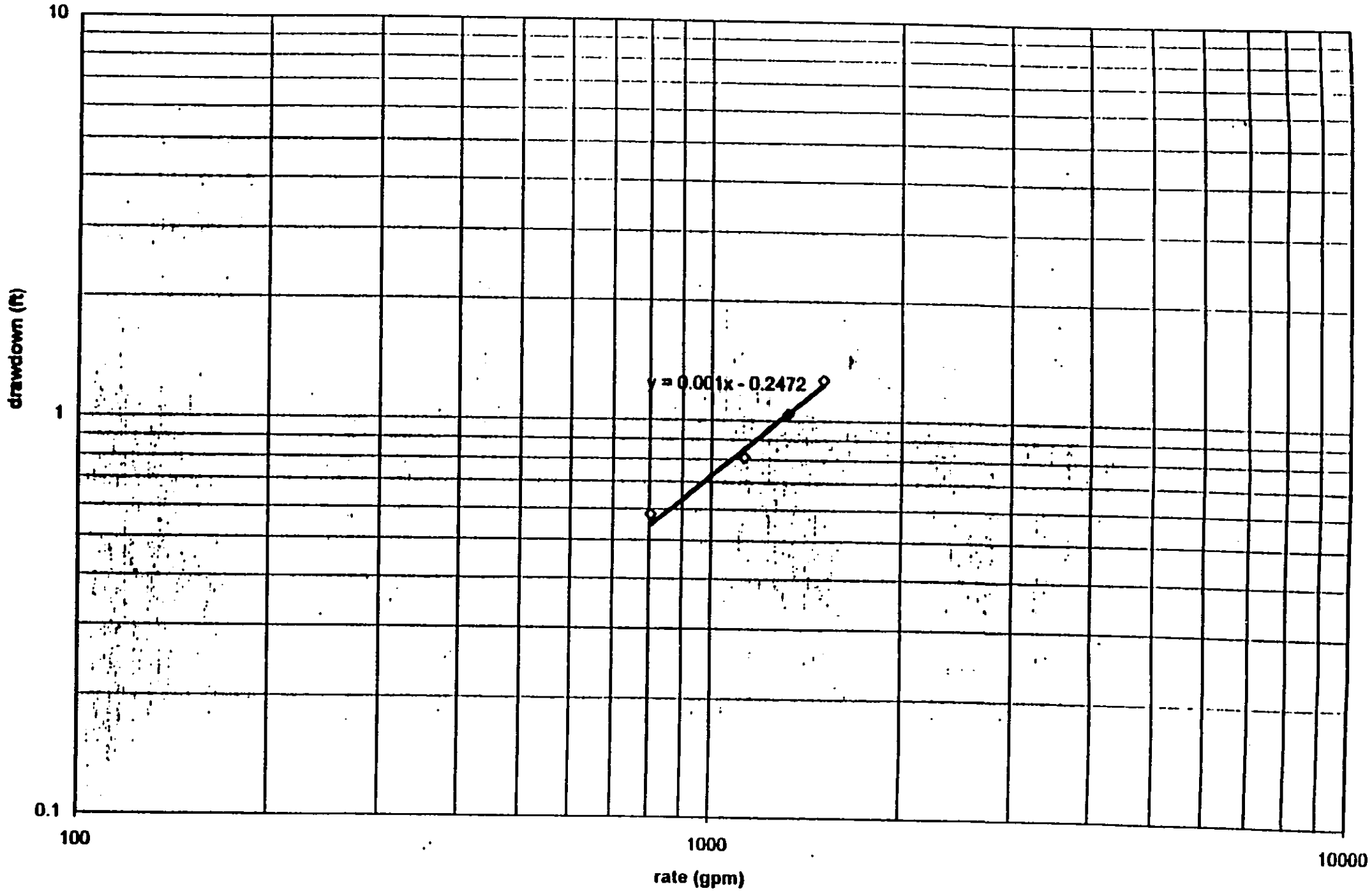
Yield Drawdown Test

County: Honolulu — Well no.: 2052-13

Well: Kapalama Wells #2 — drawdown in pumping well

Date	time	elapsed time min	Depth to water	psi	draw-down (feet)	Discharge (gpm)	Chloride (ppm)	Temp deg F	Remarks
1/24/97	1021		168.28	13.95					
	1030	0							start test
	1033	3	168.74	13.75	0.46			70.9	
	1038	8	168.85	13.7	0.58		95		
	1041	11	168.85	13.7	0.58	909			adjust rate down
	1050	20	168.85	13.7	0.58	778		70.8	
	1100	30	168.85	13.7	0.58	800			
	1111	41	168.85	13.7	0.58	767	95		
	1116	46							change rate, av. rate 804 gpm
	1118	48	169.20	13.55	0.92				
	1124	54	169.20	13.55	0.92			70.7	
	1126	56							adjust rate down
	1132	62	169.20	13.55	0.92	1083			
	1139	69	169.08	13.6	0.81	1115		70.8	
	1150	80	169.08	13.6	0.81	1104			
	1159	89	169.08	13.6	0.81	1167	95	70.8	
	1203	93							change rate, av rate 1128 gpm
	1208	98	169.32	13.5	1.04	1200			
	1211	101							adjust rate up
	1215	105	169.43	13.45	1.16	1444		70.8	
	1224	114	169.32	13.5	1.04	1333			
	1230.0	120	169.32	13.5	1.04	1333		70.8	
	1240	130	169.32	13.5	1.04	1300			
	1246	136	169.32	13.5	1.04	1326	95		
	1250	140							change rate, av rate 1319 gpm
	1253	143	170.01	13.2	1.73	1667			
	1257	147							adjust rate down
	1301	151	169.55	13.4	1.27	1500		70.8	
	1307	157	169.55	13.4	1.27	1500			
	1317	167	169.55	13.4	1.27	1467		70.8	
	1327	177	169.55	13.4				70.8	
	1333	183	169.55	13.4	1.27	1500	95		
	1335	185							end test average rate 1500 gpm
	1338	188	168.16	14	-0.12				recovery instantaneous
	1342	192	168.16	14	-0.12				
	1357	207	168.16	14	-0.12				
	1404	214	168.16	14	-0.12				total pumpage: 219,500 gal

Step Drawdown Test 2052-13



0000 0004 0436

Sustained Yield Test - Kapalama Well #2

Well no.: 2052-13

County: Honolulu

Well: Kapalama Wells #2 — drawdown in pumped well

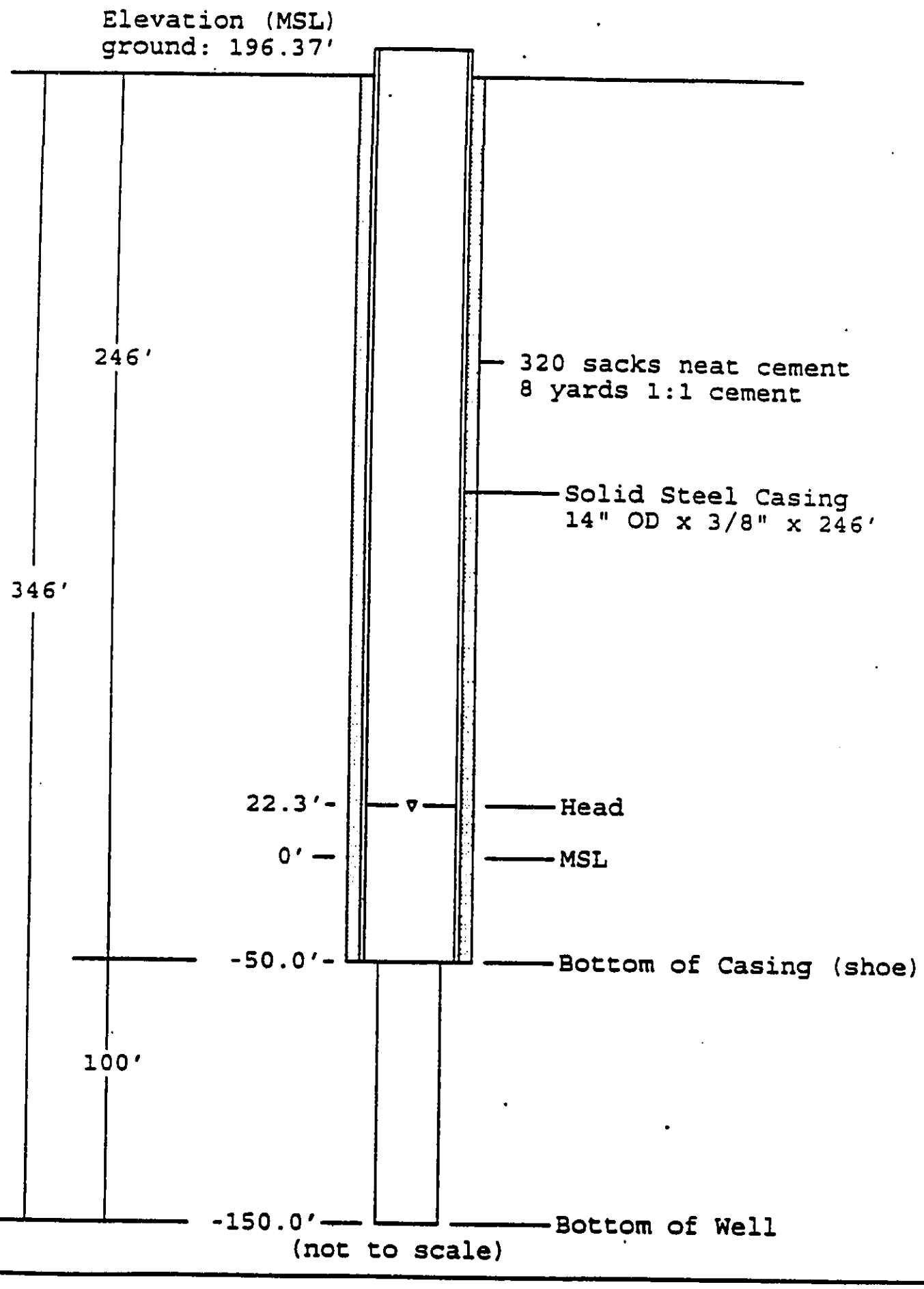
ground elev. : 188.72 ft — water level measurements by airline

Date	time	elapsed time min	Depth to water	psi	drawdown (feet)	Discharge (gpm)	Chloride (ppm)	Temp deg F	Remarks
2/27/97	0951			14.05					
	1000	0							start test
	1001	1	171.16	12.70	3.12				
	1002	2	170.47	13.00	2.43				
	1003	3	170.24	13.10	2.19				
	1004	4	169.78	13.30	1.73				
	1006	6	169.20	13.55	1.16				
	1009	9	169.08	13.60	1.04	1375		70.9	
	1013	13	169.20	13.55	1.16	1417	94		
	1019	19	169.08	13.60	1.04				
	1030	30	169.08	13.60	1.04	1448		70.9	
	1052	52	169.08	13.60	1.04				
	1101	61	169.08	13.60	1.04			70.9	
	1119	79	169.08	13.60	1.04	1474			
	1300	180	169.08	13.60	1.04				
	1500	300	169.08	13.60	1.04				
	1700	420	169.08	13.60	1.04				
	2100	660	169.08	13.60	1.04				
2/28/97	0100	900	169.08	13.60	1.04				
	0700	1260	169.08	13.60	1.04				
	1003	1443	169.08	13.60	1.04			71.0	average day 1 rate: 1493 gpm
	1007	1447	169.08	13.60	1.04	1500	94		
	1300	1620	169.08	13.60	1.04				
	1700	1860	169.08	13.60	1.04				
	2300	2220	169.08	13.60	1.04				
3/1/97	0500	2580	169.08	13.60	1.04				
	1009	2889	169.08	13.60	1.04			71.0	average day 2 rate: 1460 gpm
	1015	2895	169.08	13.60	1.04	1500	94		
	1500	3180	169.08	13.60	1.04				
	2100	3540	169.08	13.60	1.04				
3/2/97	0300	3900	169.08	13.60	1.04				
	0752	4192	169.08	13.60	1.04			70.9	average day 3 rate: 1460 gpm
	0800	4200	169.08	13.60	1.04	1474	94		
	1300	4500	169.08	13.60	1.04				
	1900	4860	169.08	13.60	1.04				driller closed the discharge pipe valve
	2300	5100	168.85	13.70	0.81				a little by mistake
3/3/97	0300	5340	168.85	13.70	0.81				
	0700	5580	168.85	13.70	0.81				re-opened valve
	0835	5675	169.08	13.60	1.04			71.0	average day 4 rate: 1390 gpm
	0840	5680	169.08	13.60	1.04		93		
	0854	5694	169.08	13.60	1.04	1473		71.0	
	0917	5717	169.08	13.60	1.04	1476			
	0940	5740	169.08	13.60	1.04				
	0941	5741							stopped pumping
									water level recovered before pump
	0942	1	168.04	14.05	0.00				backspin was completed in <1 minute
	0943	2	168.04	14.05	0.00				Total pumpage: 8,323,000 gallons
	0944	3	168.04	14.05	0.00				average rate 1450 gpm
	0959	18	168.04	14.05	0.00				

0000 0004 0437

Kapalama Well #1 No. 2052-14
Kapalama, Oahu, Hawaii
T.M.K.: 1-6-22:07

As-Built Section
Drilling Completed: January 6, 1997
Drilling Contractor: Roscoe Moss Hawaii, Inc.



KLG
March 1997

0000 0004 0438

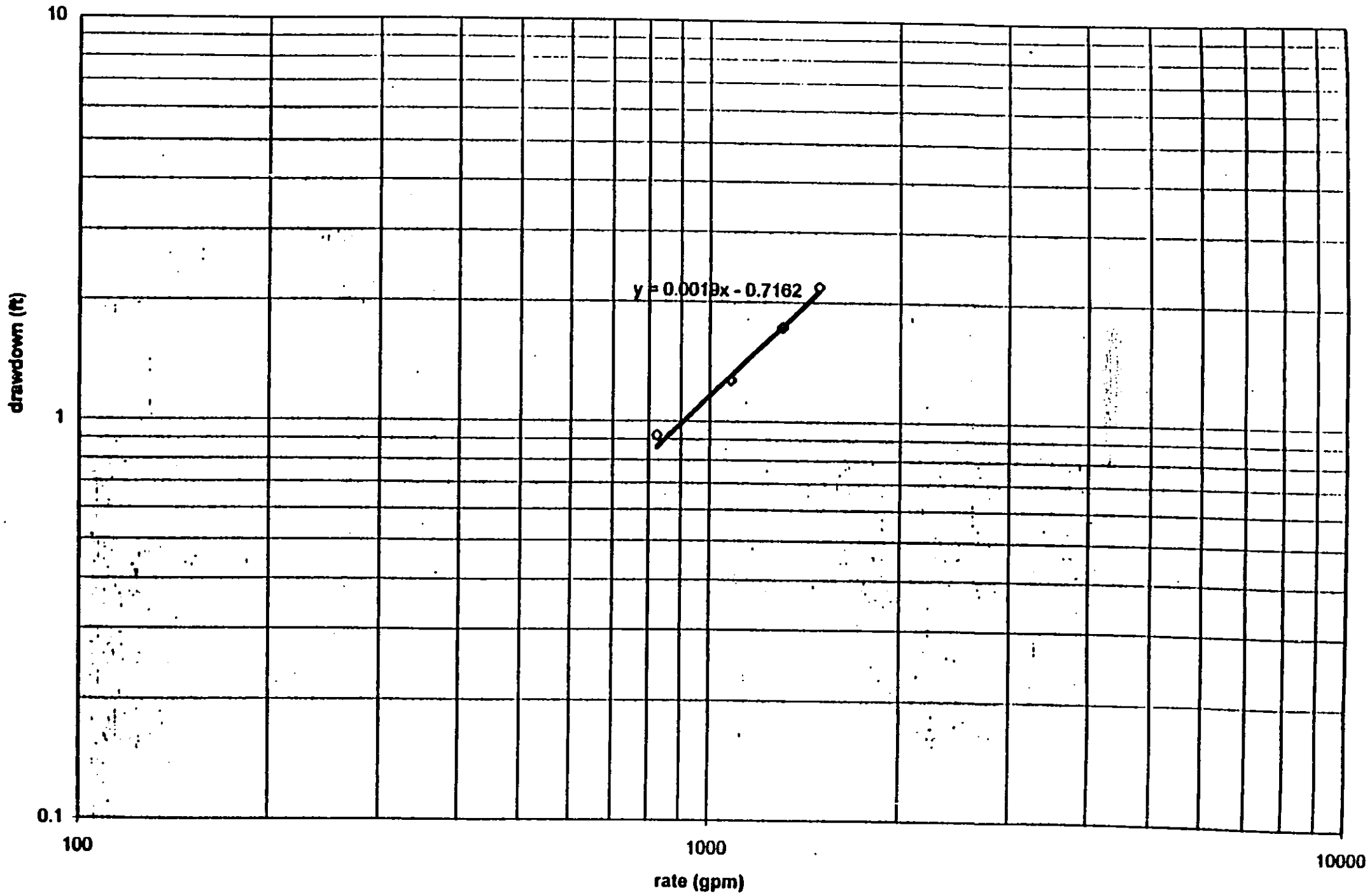
Yield Drawdown Test

County: Honolulu — Well no.: 2052-14

Well: Kapalama Wells #1 — drawdown in pumping well

Date	time	elapsed time min	Depth to water (ft)	gage psi	draw down (feet)	draw-down (feet)	Discharge (gpm)	Chloride (ppm)	Temp deg F	Remarks
3/14/97	0908		175.3	2.25						
	0914	0								start test
	0915.5	1.5								
	0917	3							70.8	pipe not full, rate unknown
	0921	7								adjust rate up
	923	9	176.2	1.85	0.92	0.92				
	926	12.0	176.2	1.85	0.92	0.92		83	70.8	sample #1
	0928	14.0	176.2	1.85	0.92	0.92				
	0931	17.0	176.2	1.85	0.92	0.92	750			
	0938	24.0	176.2	1.85	0.92	0.92	800		70.8	
	0948	34.0	176.2	1.85	0.92	0.92	840			
	0954	40.0	176.2	1.85	0.92	0.92	838	85		sample #2
	0957	43.0								change rate, av. rate 824 gpm
	0959	45.0	176.6	1.70	1.27	1.27				
	1001	47.0	176.6	1.70	1.27	1.27				
	1004	50.0	176.6	1.70	1.27	1.27	1000		70.7	
	1016	62.0	176.6	1.70	1.27	1.27	1059		70.7	
	1025	71.0	176.6	1.70	1.27	1.27	1058		70.7	
	1031	77.0	176.6	1.70	1.27	1.27	1033	86		sample #3
	1035	81.0								change rate, av rate 1079 gpm
	1036	82.0	177.0	1.50	1.73	1.73				
	1037	83.0	177.0	1.50	1.73	1.73				
	1040	86.0	177.0	1.50	1.73	1.73			70.7	
	1046	92.0	177.0	1.50	1.73	1.73	1300			
	1056	102.0	177.0	1.50	1.73	1.73	1313			
	1107	113.0	177.0	1.50	1.73	1.73			70.8	
	1113	119.0	177.0	1.50	1.73	1.73	1303	86		sample #4
	1115	121.0					1308			change rate, av rate 1300 gpm
	1116	122.0	177.5	1.30	2.19	2.19				
	1117	123.0	177.5	1.30	2.19	2.19			70.7	
	1121	127.0	177.5	1.30	2.19	2.19	1500			
	1126	132.0	177.5	1.30	2.19	2.19	1500			
	1135	141.0	177.5	1.30	2.19	2.19	1500		70.7	
	1145	151.0	177.5	1.30			1500			
	1155	161.0	177.5	1.30	2.19	2.19	1500	86	70.7	sample #5
	1157	163.0								end test; av. rate 1488 gpm
	1157.5	163.5	175.4	2.20	0.12	0.12				recovery instantaneous
	1158	164.0	175.3	2.25	0.00	0.00				
	1159	165.0	175.3	2.25	0.00	0.00				
	1204	170.0	175.3	2.25	0.00	0.00				total pumpage: 190,500 gal
	1215	181.0	175.3	2.25	0.00	0.00				

Step Drawdown Test 2052-14



0000 0004 0440

Sustained Yield Test - Kapalama Well #1

Well no.: 2052-14

County: Honolulu

Well: Kapalama Wells #1 — drawdown in pumped well

ground elev. : 196.37 ft — water level measurements by airline

Date	time	elapsed time min	Depth to water	psi	draw-down (feet)	Discharge (gpm)	Chloride (ppm)	Temp deg F	Remarks
4/2/97	0859		174.96	2.40					
	0910	0							start test
	0912	2	176.34	1.80	1.39				
	0914	4	176.34	1.80	1.39				
	0920	10	176.34	1.80	1.39				
	0926	16	176.34	1.80	1.39	1250			
	0944	34	176.34	1.80	1.39	1233	86		
	0952	42	176.34	1.80	1.39			70.8	
	1031	81	176.34	1.80	1.39	1230		70.7	
	1057	107	176.34	1.80	1.39	1243		70.8	
	1100	110	176.34	1.80	1.39				shutdown to fix a short: 1224-1234
	1300	230	176.46	1.75	1.50				
	1500	350	176.46	1.75	1.50				
	1700	470	176.46	1.75	1.50				
	1900	590	176.46	1.75	1.50				
	2100	710	176.46	1.75	1.50				shutdown to tape wires: 2240-2305
	2300	830	176.46	1.75	1.50				
4/3/97	0100	950	176.46	1.75	1.50				
	0300	1070	176.46	1.75	1.50				
	0500	1190	176.46	1.75	1.50				
	0700	1310	176.46	1.75	1.50				
	0900	1430	176.46	1.75	1.50				
	0938	1468	176.46	1.75	1.50			70.8	overnight average: 1206 gpm
	0956	1486	176.46	1.75	1.50	1222	88		
	1014	1504	176.46	1.75	1.50	1222			
	1100	1550	176.46	1.75	1.50				
	1500	1790	176.46	1.75	1.50				
	1900	2030	176.46	1.75	1.50				
	2300	2270	176.46	1.75	1.50				
4/4/97	0300	2510	176.46	1.75	1.50				
	0700	2750	176.46	1.75	1.50				
	0937	2907	176.46	1.75	1.50				overnight average 1239 gpm
	0952	2922	176.46	1.75	1.50			70.8	
	1000	2930	176.46	1.75	1.50	1261	89	70.8	
	1300	3110	176.46	1.75	1.50				
	1700	3350	176.46	1.75	1.50				
	2100	3590	176.46	1.75	1.50				
4/5/97	0100	3830	176.46	1.75	1.50				
	0500	4070	176.46	1.75	1.50				
	0839	4289	176.46	1.75	1.50			70.8	overnight average 1239 gpm
	0858	4308	176.46	1.75	1.50	1211	88	70.8	
	1100	4430	176.46	1.75	1.50				
	1500	4670	176.46	1.75	1.50				
	1900	4910	176.46	1.75	1.50				
	2300	5150	176.46	1.75	1.50				
4/6/97	0100	5270	176.46	1.75	1.50				

000,0 0004 0441

Date	time	elapsed time min	Depth to water	psi	draw-down (feet)	Discharge (gpm)	Chloride (ppm)	Temp deg F	Remarks
	0500	5510	176.46	1.75	1.50				
	0856	5746	176.46	1.75	1.50			70.8	overnight average 1239 gpm
	0958	5806	176.46	1.75	1.50	1233	88	70.8	
	1100	5870	176.46	1.75	1.50				
	1500	6110	176.46	1.75	1.50				
	1900	6350	176.46	1.75	1.50				
	2300	6590	176.46	1.75	1.50				
4/7/97	0300	6830	176.46	1.75	1.50				
	0700	7070	176.46	1.75	1.50				
	0816	7146	176.34	1.80	1.39			70.8	overnight average 1239 gpm
	0821	7151	176.34	1.80	1.39	1239			closed valve a little
	0839	7169							valve back to normal
	0842	7172	176.34	1.80	1.39		88	70.8	
	0906	7196	176.34	1.80	1.39				
	0908	7198							shutdown test
	0909	7199	175.65	2.10	0.69				test average 1232 gpm
	0910	7200	175.19	2.30	0.23				total: 8,867,000 gallons
	0911	7201	174.96	2.40	0.00				
	0912	7202	174.96	2.40	0.00				
	0915	7205	174.96	2.40	0.00				
	0921	7211	174.96	2.40	0.00				
	0933	7223	174.96	2.40	0.00				
	0946	7236	174.96	2.40	0.00				
	1000	7250	174.96	2.40	0.00				
	1011	7261	174.96	2.40	0.00				

WATER QUALITY LABORATORY ANALYSIS

0000 0004 0443

MONTGOMERY WATSON LABORATORIES

555 East Walnut Street
Pasadena, California 91101
818 568 6400; Fax: 818 568 6324;
1 800 566 LABS (1 800 566 5227)

Laboratory Report

for

Honolulu, City of
Board of Water Supply Lab

630 S Beretania St

Honolulu , HI 96843

Attention: Ron Fenstemacher
Fax: 808 527-6195

Kapalama Well 1

Report#: 33525
PHASEV

0000 0004 0444

eport Summary of positive results, PR33525

			Result	MDL	UNITS
nalyzed	970408042	KAPALAMA-WELL 1 (2052-14)			
4/19/97	Data Entry		04/24/97		--
4/15/97	Chromium, Total, ICAP/MS		5.5	5.000	UGL
04/09/97	Data Entry		04/10/97		--
4/17/97	Di-n-Butylphthalate		0.5	.500	UGL
4/17/97	Isophorone		3.4	.500	UGL
04/09/97	Nitrate as NO3 by IC		2.6	.440	MGL
4/09/97	Nitrate-N by IC		0.6	.100	MGL
4/25/97	Data Entry		04/30/97		--
4/23/97	Data Entry		04/30/97		--
04/17/97	Calcium, Total, ICAP		15	1.000	MGL

0000 0004 0445

DOCUMENT CAPTURED AS RECEIVED

MONTGOMERY WATSON LABORATORIES
555 East Walnut Street
Pasadena, California 91101
818 568 6400; Fax: 818 568 6324;
1 800 566 LABS (1 800 566 5227)

Laboratory
Report
#33525

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

Samples Received
08-apr-1997 13:05:05

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilut
APALAMA-WELL 1 (2052-14) (970408042) Sampled on 04/07/97								
04/17/97	04/17/97	61690	(EPA/ML 200.7)	Calcium, Total, ICAP	15	mg/l	1.0	1
	04/17/97	61627	(ML/S4500CN-F)	Cyanide	ND	mg/l	0.025	1
04/09/97	04/14/97	61661	(ML/EPA 548.1)	Endothall	ND	ug/l	5.0	1
	04/15/97	61602	(SM 4500F)	Fluoride	ND	mg/l	0.10	1
	04/21/97	61736	(ML/EPA 547)	Glyphosate	ND	ug/l	6.0	1
04/11/97	04/11/97	61427	(EPA/ML 245.1)	Mercury	ND	ug/l	0.50	1
	04/09/97	61444	(ML/EPA 300.0)	Nitrite, Nitrogen by IC	ND	mg/l	0.10	1
04/15/97	04/19/97		(EPA 1613)	2,3,7,8 - TCDD	ND	PGL	0.54	1
525 Semivolatiles by GC/MS								
04/14/97	04/17/97	61733	(ML/EPA 525.2)	2,4-Dinitrotoluene	ND	ug/l	0.10	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	alpha-Chlordane	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Acenaphthylene	ND	ug/l	0.10	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Alachlor	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Aldrin	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Anthracene	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Atrazine	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Benz(a)Anthracene	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Benzo(a)pyrene	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Benzo(b)Fluoranthene	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Benzo(g,h,i)Perylene	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Benzo(k)Fluoranthene	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Di(2-Ethylhexyl)phthalate	ND	ug/l	0.60	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Butylbenzylphthalate	ND	ug/l	0.50	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Bromacil	ND	ug/l	2.0	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Butachlor	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Caffeine	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Chrysene	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Dibenz(a,h)Anthracene	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Di-(2-Ethylhexyl)adipate	ND	ug/l	0.60	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Diethylphthalate	ND	ug/l	0.50	1

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Honolulu, City of (continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilut
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Dieldrin	ND	ug/l	0.20	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Dimethylphthalate	ND	ug/l	0.50	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Dimethoate	ND	ug/l	10	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Di-n-Butylphthalate	0.5	ug/l	0.50	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Endrin	ND	ug/l	0.10	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Fluorene	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	gamma-Chlordane	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Hexachlorobenzene	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Hexachlorocyclopentadiene	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Heptachlor	ND	ug/l	0.040	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Heptachlor Epoxide	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Indeno(1,2,3,c,d)Pyrene	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Isophorone	3.4	ug/l	0.50	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Lindane	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Methoxychlor	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Metribuzin	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Molinate	ND	ug/l	0.20	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Metolachlor	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	trans-Nonachlor	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Pentachlorophenol	ND	ug/l	1.0	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Phenanthrene	ND	ug/l	0.020	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Prometryn	ND	ug/l	0.50	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Propachlor	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Pyrene	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Simazine	ND	ug/l	0.050	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Thiobencarb	ND	ug/l	0.20	1
04/14/97	04/17/97	61733	(ML/EPA 525.2)	Trifluralin	ND	ug/l	0.10	1
			(Surrogate)	Perylene-d12	88	% Rec		

Aldicarbs

04/17/97	61724	(ML/EPA 531.1)	3-Hydroxycarbofuran	ND	ug/l	2.0	1
04/17/97	61724	(ML/EPA 531.1)	Aldicarb (Temik)	ND	ug/l	0.50	1
04/17/97	61724	(ML/EPA 531.1)	Aldicarb sulfone	ND	ug/l	0.80	1
04/17/97	61724	(ML/EPA 531.1)	Aldicarb sulfoxide	ND	ug/l	0.50	1
04/17/97	61724	(ML/EPA 531.1)	Baygon	ND	ug/l	2.0	1
04/17/97	61724	(ML/EPA 531.1)	Carbofuran (Furadan)	ND	ug/l	0.90	1

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Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
	04/17/97	61724	(ML/EPA 531.1)	Carbaryl	ND	ug/l	2.0	1
	04/17/97	61724	(ML/EPA 531.1)	Methiocarb	ND	ug/l	2.0	1
	04/17/97	61724	(ML/EPA 531.1)	Methomyl	ND	ug/l	1.0	1
	04/17/97	61724	(ML/EPA 531.1)	Oxamyl (Vydate)	ND	ug/l	2.0	1
			(Surrogate)	BDMC	102	% Rec		
			Diquat and Paraquat					
/09/97	04/18/97	61741	(ML/EPA 549.1)	Diquat	ND	ug/l	0.40	1
/09/97	04/18/97	61741	(EPA 549.1)	Paraquat	ND	ug/l	2.0	1
			EPA Method 504.1					
/18/97	04/19/97	61776	(ML/EPA 504)	1,2-Dibromo-3-chloropropane	ND	ug/l	0.010	1
/18/97	04/19/97	61776	(ML/EPA 504)	1,2-Dibromoethane	ND	ug/l	0.010	1
04/18/97	04/19/97	61776	(ML/EPA 504)	1,2,3-Trichloropropane	ND	ug/l	0.10	1
			(Surrogate)	1,2-dibromopropane	103	% Rec		
			Herbicides by 515.1					
/21/97	04/25/97	61891	(ML/EPA 515.1)	2,4,5-T	ND	ug/l	0.20	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	2,4,5-TP (Silvex)	ND	ug/l	0.20	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	2,4-D	ND	ug/l	0.10	1
04/21/97	04/25/97	61891	(ML/EPA 515.1)	2,4-DB	ND	ug/l	2.0	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	Dichlorprop	ND	ug/l	0.50	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	Acifluorfen (qualitative)	ND	ug/l	0.20	1
04/21/97	04/25/97	61891	(ML/EPA 515.1)	Bentazon	ND	ug/l	0.50	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	Dalapon (qualitative)	ND	ug/l	1.0	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	3,5-Dichlorobenzoic acid	ND	ug/l	0.60	1
04/21/97	04/25/97	61891	(ML/EPA 515.1)	DCPA	ND	ug/l	0.20	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	Dicamba	ND	ug/l	0.080	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	Dinoseb	ND	ug/l	0.20	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	Pentachlorophenol	ND	ug/l	0.040	1
04/21/97	04/25/97	61891	(ML/EPA 515.1)	Picloram	ND	ug/l	0.10	1
/21/97	04/25/97	61891	(ML/EPA 515.1)	4-Nitrophenol (qualitative)	ND	ug/l	5.0	1
			(Surrogate)	2,4-Dichlorophenylacetic acid	104	% Rec		

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				Nitrate by IC as NO3 & N				
	04/09/97	61448	(ML/EPA 300.0)	Nitrate-N by IC	0.6	mg/l	0.10	1
	04/09/97	61448	(ML/EPA 300.0)	Nitrate as NO3 by IC	2.6	mg/l	0.44	1
				SDWA Pesticides				
04/14/97	04/23/97	61913	(ML/EPA 508)	PCB 1016 Aroclor	ND	ug/l	0.10	1
04/14/97	04/23/97	61913	(ML/EPA 508)	PCB 1221 Aroclor	ND	ug/l	0.10	1
04/14/97	04/23/97	61913	(ML/EPA 508)	PCB 1232 Aroclor	ND	ug/l	0.10	1
04/14/97	04/23/97	61913	(ML/EPA 508)	PCB 1242 Aroclor	ND	ug/l	0.10	1
04/14/97	04/23/97	61913	(ML/EPA 508)	PCB 1248 Aroclor	ND	ug/l	0.10	1
04/14/97	04/23/97	61913	(ML/EPA 508)	PCB 1254 Aroclor	ND	ug/l	0.10	1
04/14/97	04/23/97	61913	(ML/EPA 508)	PCB 1260 Aroclor	ND	ug/l	0.10	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Alpha-BHC	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Alachlor (Alanex)	ND	ug/l	0.050	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Aldrin	NA	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Beta-BHC	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Chlordane	ND	ug/l	0.10	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Chlorthalonil (Draconil,Bravo)	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Delta-BHC	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	p,p' DDD	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	p,p' DDE	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	p,p' DDT	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Dieldrin	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Endrin Aldehyde	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Endrin	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Endosulfan I (alpha)	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Endosulfan II (beta)	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Endosulfan sulfate	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Heptachlor	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Heptachlor Epoxide	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Lindane (gamma-BHC)	ND	ug/l	0.010	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Methoxychlor	ND	ug/l	0.050	1
04/14/97	04/23/97	61913	(ML/EPA 508)	Toxaphene	ND	ug/l	0.50	1
			(Surrogate)	Dibutyl Chlorendate	120	% Rec		

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Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilutio
			(Surrogate)	Tetrachlorometaxylene	80	% Rec		
				T-22 Inorg+Gen Min ICPMS Mets				
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Silver, Total, ICAP/MS	ND	ug/l	10	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Aluminum, Total, ICAP/MS	ND	ug/l	50	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Arsenic, Total, ICAP/MS	ND	ug/l	5.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Barium, Total, ICAP/MS	ND	ug/l	10	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Beryllium, Total, ICAP/MS	ND	ug/l	1.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Cadmium, Total, ICAP/MS	ND	ug/l	0.50	1
04/15/97	04/15/97	61584	(EPA/MS 200.8)	Chromium, Total, ICAP/MS	5.5	ug/l	5.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Copper, Total, ICAP/MS	ND	ug/l	50	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Manganese, Total, ICAP/MS	ND	ug/l	2.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Nickel, Total, ICAP/MS	ND	ug/l	5.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Lead, Total, ICAP/MS	ND	ug/l	5.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Antimony, Total, ICAP/MS	ND	ug/l	2.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Selenium, Total, ICAP/MS	ND	ug/l	5.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Thallium, Total, ICAP/MS	ND	ug/l	1.0	1
04/15/97	04/15/97	61584	(EPA/ML 200.8)	Zinc, Total, ICAP/MS	ND	ug/l	20	1
				Volatile Organic Compounds				
	04/09/97	61396	(ML/EPA 502.2)	1,1,1,2-Tetrachloroethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,1,1-Trichloroethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,1,2,2-Tetrachloroethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,1,2-Trichloroethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,1-Dichloroethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,1-Dichloroethene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,1-Dichloropropene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2,3-Trichloropropane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2,3-Trichlorobenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2,4-Trichlorobenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2,4-Trimethylbenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2-Dichloroethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2-Dichlorobenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2-Dichloropropane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,3,5-Trimethylbenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,3-Dichlorobenzene	ND	ug/l	0.50	1

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	04/09/97	61396	(ML/EPA 502.2)	1,3-Dichloropropane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,4-Dichlorobenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	2,2-Dichloropropane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	2-Chlorotoluene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	4-Chlorotoluene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Bromodichloromethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Benzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Bromobenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Bromochloromethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Bromomethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	cis-1,2-Dichloroethene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Chlorobenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Carbon tetrachloride	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	cis-1,3-Dichloropropene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Bromoform	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Chloroform	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Chloroethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Chloromethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Dibromochloromethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2-Dibromo-3-chloropropane	ND	ug/l	1.0	1
	04/09/97	61396	(ML/EPA 502.2)	Dibromomethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Dichlorodifluoromethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	1,2-Dibromoethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Ethylbenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Hexachlorobutadiene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Isopropylbenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Methylene chloride	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	m+p-Xylenes	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Methyl tert-butyl ether	ND	ug/l	5.0	1
	04/09/97	61396	(ML/EPA 502.2)	Naphthalene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	n-Butylbenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	n-Propylbenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	o-Xylene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Tetrachloroethylene (PCE)	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	p-Isopropyltoluene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	sec-Butylbenzene	ND	ug/l	0.50	1

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Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilu
	04/09/97	61396	(ML/EPA 502.2)	Styrene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	trans-1,2-Dichloroethene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	tert-Butylbenzene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Trichloroethylene (TCE)	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Trichlorotrifluoroethane(Freon	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	trans-1,3-Dichloropropene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Toluene	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Trichlorofluoromethane	ND	ug/l	0.50	1
	04/09/97	61396	(ML/EPA 502.2)	Vinyl chloride	ND	ug/l	0.30	1
			(Surrogate)	Bromofluorobenzene-ELCD	91	% Rec		
			(Surrogate)	Bromofluorobenzene-PID	93	% Rec		
			(Surrogate)	Chlorofluorobenzene-ELCD	94	% Rec		
			(Surrogate)	Chlorofluorobenzene-PID	93	% Rec		

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Group Comments

Result for TCDD analysis submitted by Quanterra Environmental Services.
(508) Sample result reported as NA for aldrin due to QC failure on LCS recovery. Use 525.2 data for this target analyte. Reference QIR-GC-97-078.

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QC Batch #61396 — Volatile Organic Compounds

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	1,1,1,2-Tetrachloroethane	ND				
LCS1	1,1,1-Trichloroethane	4.00	4.13	103.2	(80.00 - 120.00)	
LCS2	1,1,1-Trichloroethane	4.00	4.06	101.5	(80.00 - 120.00)	1.7
MBLK	1,1,1-Trichloroethane	ND				
MBLK	1,1,2,2-Tetrachloroethane	ND				
MBLK	1,1,2-Trichloroethane	ND				
MBLK	1,1-Dichloroethane	ND				
MBLK	1,1-Dichloroethene	ND				
MBLK	1,1-Dichloropropene	ND				
LCS1	1,2,3-Trichlorobenzene	4.00	4.00	100.0	(80.00 - 120.00)	
LCS2	1,2,3-Trichlorobenzene	4.00	3.53	88.2	(80.00 - 120.00)	12
MBLK	1,2,3-Trichlorobenzene	ND				
MBLK	1,2,3-Trichloropropane	ND				
MBLK	1,2,4-Trichlorobenzene	ND				
MBLK	1,2,4-Trimethylbenzene	ND				
MBLK	1,2-Dichlorobenzene	ND				
MBLK	1,2-Dichloroethane	ND				
MBLK	1,2-Dichloropropane	ND				
MBLK	1,3,5-Trimethylbenzene	ND				
MBLK	1,3-Dichlorobenzene	ND				
MBLK	1,3-Dichloropropane	ND				
MBLK	1,4-Dichlorobenzene	ND				
MBLK	2,2-Dichloropropane	ND				
MBLK	2-Chlorotoluene	ND				
MBLK	4-Chlorotoluene	ND				
LCS1	Benzene	4.00	3.96	99.0	(80.00 - 120.00)	
LCS2	Benzene	4.00	3.90	97.5	(80.00 - 120.00)	1.5
MBLK	Benzene	ND				
MBLK	Bromobenzene	ND				
MBLK	Bromochloromethane	ND				
LCS1	Bromodichloromethane	4.00	4.24	106.0	(80.00 - 120.00)	
LCS2	Bromodichloromethane	4.00	4.24	106.0	(80.00 - 120.00)	0.00
MBLK	Bromodichloromethane	ND				
LCS1	Bromoform	4.00	4.08	102.0	(80.00 - 120.00)	
LCS2	Bromoform	4.00	4.19	104.8	(80.00 - 120.00)	2.7
MBLK	Bromoform	ND				

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

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MBLK	Bromomethane	ND				
LCS1	Carbon tetrachloride	4.00	4.11	102.8	(80.00 - 120.00)	
LCS2	Carbon tetrachloride	4.00	4.04	101.0	(80.00 - 120.00)	1.7
MBLK	Carbon tetrachloride	ND				
MBLK	Chlorobenzene	ND				
MBLK	Chloroethane	ND				
LCS1	Chloroform	4.00	4.25	106.2	(80.00 - 120.00)	
LCS2	Chloroform	4.00	4.17	104.2	(80.00 - 120.00)	1.9
MBLK	Chloroform	ND				
MBLK	Chloromethane	ND				
LCS1	Dibromochloromethane	4.00	4.12	103.0	(80.00 - 120.00)	
LCS2	Dibromochloromethane	4.00	4.17	104.2	(80.00 - 120.00)	1.2
MBLK	Dibromochloromethane	ND				
MBLK	Dibromomethane	ND				
MBLK	Dichlorodifluoromethane	ND				
MBLK	Ethylbenzene	ND				
MBLK	Hexachlorobutadiene	ND				
LCS1	Isopropylbenzene	4.00	4.02	100.5	(80.00 - 120.00)	
LCS2	Isopropylbenzene	4.00	3.93	98.2	(80.00 - 120.00)	2.3
MBLK	Isopropylbenzene	ND				
MBLK	Methylene chloride	ND				
MBLK	Naphthalene	ND				
MBLK	Styrene	ND				
LCS1	Tetrachloroethylene (PCE)	4.00	4.39	109.7	(80.00 - 120.00)	
LCS2	Tetrachloroethylene (PCE)	4.00	4.39	109.7	(80.00 - 120.00)	0.00
MBLK	Tetrachloroethylene (PCE)	ND				
MBLK	Toluene	ND				
LCS1	Trichloroethylene (TCE)	4.00	4.24	106.0	(80.00 - 120.00)	
LCS2	Trichloroethylene (TCE)	4.00	4.25	106.2	(80.00 - 120.00)	0.24
MBLK	Trichloroethylene (TCE)	ND				
MBLK	Trichlorofluoromethane	ND				
MBLK	Trichlorotrifluoroethane(Freon	ND				
MBLK	Vinyl chloride	ND				
MBLK	cis-1,2-Dichloroethene	ND				
MBLK	cis-1,3-Dichloropropene	ND				
MBLK	m+p-Xylenes	ND				
MBLK	n-Butylbenzene	ND				
MBLK	n-Propylbenzene	ND				

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

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MBLK	o-Xylene	ND				
MBLK	p-Isopropyltoluene	ND				
LCS1	sec-Butylbenzene	4.00	4.45	111.2	(80.00 - 120.00)	
LCS2	sec-Butylbenzene	4.00	3.83	95.8	(80.00 - 120.00)	15
MBLK	sec-Butylbenzene	ND				
MBLK	tert-Butylbenzene	ND				
LCS1	trans-1,2-Dichloroethene	4.00	4.23	105.8	(80.00 - 120.00)	
LCS2	trans-1,2-Dichloroethene	4.00	4.32	108.0	(80.00 - 120.00)	2.1
MBLK	trans-1,2-Dichloroethene	ND				
MBLK	trans-1,3-Dichloropropene	ND				

QC Batch #61427

QC	Analyte
LCS1	Mercury
LCS2	Mercury
MBLK	Mercury
MS	Mercury
MSD	Mercury

Mercury

Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
1.50	1.45	96.7	(85.00 - 115.00)	
1.50	1.28	85.3	(85.00 - 115.00)	12
ND				
1.50	1.45	96.7	(80.00 - 120.00)	
1.50	1.42	94.7	(80.00 - 120.00)	2.1

QC Batch #61444

QC	Analyte
LCS1	Nitrite, Nitrogen by IC
LCS2	Nitrite, Nitrogen by IC
MBLK	Nitrite, Nitrogen by IC
MS	Nitrite, Nitrogen by IC
MSD	Nitrite, Nitrogen by IC

Nitrite, Nitrogen by IC

Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
1.0	0.92	92.0	(90.00 - 110.00)	
1.0	0.91	91.0	(90.00 - 110.00)	1.1
ND				
1.0	0.88	88.0	(80.00 - 120.00)	
1.0	0.93	93.0	(80.00 - 120.00)	5.5

QC Batch #61448

QC	Analyte
MBLK	Nitrate as NO3 by IC
LCS1	Nitrate-N
LCS2	Nitrate-N

Nitrate by IC as NO3 & N

Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
ND				
2.5	2.45	98.0	(90.00 - 110.00)	
2.5	2.41	96.4	(90.00 - 110.00)	1.6

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

CORRECTION

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MBLK	o-Xylene	ND				
MBLK	p-Isopropyltoluene	ND				
LCS1	sec-Butylbenzene	4.00	4.45	111.2	(80.00 - 120.00)	
LCS2	sec-Butylbenzene	4.00	3.83	95.8	(80.00 - 120.00)	15
MBLK	sec-Butylbenzene	ND				
MBLK	tert-Butylbenzene	ND				
LCS1	trans-1,2-Dichloroethene	4.00	4.23	105.8	(80.00 - 120.00)	
LCS2	trans-1,2-Dichloroethene	4.00	4.32	108.0	(80.00 - 120.00)	2.1
MBLK	trans-1,2-Dichloroethene	ND				
MBLK	trans-1,3-Dichloropropene	ND				

QC Batch #61427 Mercury

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Mercury	1.50	1.45	96.7	(85.00 - 115.00)	
LCS2	Mercury	1.50	1.28	85.3	(85.00 - 115.00)	12
MBLK	Mercury	ND				
MS	Mercury	1.50	1.45	96.7	(80.00 - 120.00)	
MSD	Mercury	1.50	1.42	94.7	(80.00 - 120.00)	2.1

QC Batch #61444 Nitrite, Nitrogen by IC

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Nitrite, Nitrogen by IC	1.0	0.92	92.0	(90.00 - 110.00)	
LCS2	Nitrite, Nitrogen by IC	1.0	0.91	91.0	(90.00 - 110.00)	1.1
MBLK	Nitrite, Nitrogen by IC	ND				
MS	Nitrite, Nitrogen by IC	1.0	0.88	88.0	(80.00 - 120.00)	
MSD	Nitrite, Nitrogen by IC	1.0	0.93	93.0	(80.00 - 120.00)	5.5

QC Batch #61448 Nitrate by IC as NO3 & N

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	Nitrate as NO3 by IC	ND				
LCS1	Nitrate-N	2.5	2.45	98.0	(90.00 - 110.00)	
LCS2	Nitrate-N	2.5	2.41	96.4	(90.00 - 110.00)	1.6

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

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MS	Nitrate-N	2.5	2.49	99.6	(75.00 - 125.00)	
MSD	Nitrate-N	2.5	2.50	100.0	(75.00 - 125.00)	0.40

QC Batch #61504 T-22 Inorg+Gen Min ICPMS Mets

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Aluminum, Total, ICAP/MS	200	199	99.5	(85.00 - 115.00)	
LCS2	Aluminum, Total, ICAP/MS	200	207	103.5	(85.00 - 115.00)	3.9
MBLK	Aluminum, Total, ICAP/MS	ND				
MS	Aluminum, Total, ICAP/MS	200	197	98.5	(70.00 - 130.00)	
MSD	Aluminum, Total, ICAP/MS	200	198	99.0	(70.00 - 130.00)	0.51
LCS1	Antimony, Total, ICAP/MS	50	48.9	97.8	(85.00 - 115.00)	
LCS2	Antimony, Total, ICAP/MS	50	47.1	94.2	(85.00 - 115.00)	3.7
MBLK	Antimony, Total, ICAP/MS	ND				
MS	Antimony, Total, ICAP/MS	50	44.6	89.2	(70.00 - 130.00)	
MSD	Antimony, Total, ICAP/MS	50	47.6	95.2	(70.00 - 130.00)	6.5
LCS1	Arsenic, Total, ICAP/MS	20	20.2	101.0	(85.00 - 115.00)	
LCS2	Arsenic, Total, ICAP/MS	20	19.3	96.5	(85.00 - 115.00)	4.6
MBLK	Arsenic, Total, ICAP/MS	ND				
MS	Arsenic, Total, ICAP/MS	20	20.7	103.5	(70.00 - 130.00)	
MSD	Arsenic, Total, ICAP/MS	20	20.4	102.0	(70.00 - 130.00)	1.5
LCS1	Barium, Total, ICAP/MS	100	98.8	98.8	(85.00 - 115.00)	
LCS2	Barium, Total, ICAP/MS	100	98.1	98.1	(85.00 - 115.00)	0.71
MBLK	Barium, Total, ICAP/MS	ND				
MS	Barium, Total, ICAP/MS	100	94.5	94.5	(70.00 - 130.00)	
MSD	Barium, Total, ICAP/MS	100	98.8	98.8	(70.00 - 130.00)	4.4
LCS1	Beryllium, Total, ICAP/MS	5	5.06	101.2	(85.00 - 115.00)	
LCS2	Beryllium, Total, ICAP/MS	5	5.1	102.0	(85.00 - 115.00)	0.79
MS	Beryllium, Total, ICAP/MS	5	5.22	104.4	(70.00 - 130.00)	
MSD	Beryllium, Total, ICAP/MS	5	5.36	107.2	(70.00 - 130.00)	2.6
LCS1	Cadmium, Total, ICAP/MS	20	19.4	97.0	(85.00 - 115.00)	
LCS2	Cadmium, Total, ICAP/MS	20	19.2	96.0	(85.00 - 115.00)	1.0
MBLK	Cadmium, Total, ICAP/MS	ND				
MS	Cadmium, Total, ICAP/MS	20	19	95.0	(70.00 - 130.00)	
MSD	Cadmium, Total, ICAP/MS	20	19.1	95.5	(70.00 - 130.00)	0.52
LCS1	Chromium, Total, ICAP/MS	100	102	102.0	(85.00 - 115.00)	
LCS2	Chromium, Total, ICAP/MS	100	99.5	99.5	(85.00 - 115.00)	2.5

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

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MBLK	Chromium, Total, ICAP/MS	ND				
MS	Chromium, Total, ICAP/MS	100	100	100.0	(70.00 - 130.00)	
MSD	Chromium, Total, ICAP/MS	100	99.2	99.2	(70.00 - 130.00)	0.80
LCS1	Copper, Total, ICAP/MS	100	99.6	99.6	(85.00 - 115.00)	
LCS2	Copper, Total, ICAP/MS	100	97.3	97.3	(85.00 - 115.00)	2.3
MBLK	Copper, Total, ICAP/MS	ND				
MS	Copper, Total, ICAP/MS	100	92.5	92.5	(70.00 - 130.00)	
MSD	Copper, Total, ICAP/MS	100	91.9	91.9	(70.00 - 130.00)	0.65
LCS1	Iron, Total, ICAP/MS	500	521	104.2	(85.00 - 115.00)	
LCS2	Iron, Total, ICAP/MS	500	530	106.0	(85.00 - 115.00)	1.7
MBLK	Iron, Total, ICAP/MS	ND				
MS	Iron, Total, ICAP/MS	500	492	98.4	(70.00 - 130.00)	
MSD	Iron, Total, ICAP/MS	500	483	96.6	(70.00 - 130.00)	1.8
LCS1	Lead, Total, ICAP/MS	20	20	100.0	(85.00 - 115.00)	
LCS2	Lead, Total, ICAP/MS	20	19.8	99.0	(85.00 - 115.00)	1.0
MBLK	Lead, Total, ICAP/MS	ND				
MS	Lead, Total, ICAP/MS	20	19	95.0	(70.00 - 130.00)	
MSD	Lead, Total, ICAP/MS	20	18.9	94.5	(70.00 - 130.00)	0.53
LCS1	Manganese, Total, ICAP/MS	50	49.2	98.4	(85.00 - 115.00)	
LCS2	Manganese, Total, ICAP/MS	50	47.9	95.8	(85.00 - 115.00)	2.7
MBLK	Manganese, Total, ICAP/MS	ND				
MS	Manganese, Total, ICAP/MS	50	46.5	93.0	(85.00 - 115.00)	
MSD	Manganese, Total, ICAP/MS	50	46.8	93.6	(85.00 - 115.00)	0.64
LCS1	Selenium, Total, ICAP/MS	20	20.6	103.0	(85.00 - 115.00)	
LCS2	Selenium, Total, ICAP/MS	20	19.5	97.5	(85.00 - 115.00)	5.5
MBLK	Selenium, Total, ICAP/MS	ND				
MS	Selenium, Total, ICAP/MS	20	20.3	101.5	(70.00 - 130.00)	
MSD	Selenium, Total, ICAP/MS	20	20.1	100.5	(70.00 - 130.00)	0.99
LCS1	Silver, Total, ICAP/MS	50	49.9	99.8	(85.00 - 115.00)	
LCS2	Silver, Total, ICAP/MS	50	50.4	100.8	(85.00 - 115.00)	1.00
MBLK	Silver, Total, ICAP/MS	ND				
MS	Silver, Total, ICAP/MS	50	37	74.0	(70.00 - 130.00)	
MSD	Silver, Total, ICAP/MS	50	37.8	75.6	(70.00 - 130.00)	2.1
LCS1	Thallium, Total, ICAP/MS	20	19.9	99.5	(85.00 - 115.00)	
LCS2	Thallium, Total, ICAP/MS	20	19.5	97.5	(85.00 - 115.00)	2.0
MBLK	Thallium, Total, ICAP/MS	ND				
MS	Thallium, Total, ICAP/MS	20	19.1	95.5	(70.00 - 130.00)	
MSD	Thallium, Total, ICAP/MS	20	19.1	95.5	(70.00 - 130.00)	0.00

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LCS1	Zinc, Total, ICAP/MS	100	100	100.0	(85.00 - 115.00)	
LCS2	Zinc, Total, ICAP/MS	100	96.1	96.1	(85.00 - 115.00)	4.0
MBLK	Zinc, Total, ICAP/MS	ND				
MS	Zinc, Total, ICAP/MS	100	94.8	94.8	(70.00 - 130.00)	
MSD	Zinc, Total, ICAP/MS	100	95.4	95.4	(70.00 - 130.00)	0.63

QC Batch #61602 Fluoride

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Fluoride	0.87	0.88	101.1	(90.00 - 110.00)	
LCS2	Fluoride	0.87	0.88	101.1	(90.00 - 110.00)	0.00
MBLK	Fluoride	ND				
MS	Fluoride	0.909	1.03	113.3	(80.00 - 120.00)	
MSD	Fluoride	0.909	1.02	112.2	(80.00 - 120.00)	0.98

QC Batch #61627 Cyanide

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Cyanide	0.10	0.10	100.0	(90.00 - 110.00)	
MBLK	Cyanide	ND				
MS	Cyanide	0.10	0.094	94.0	(80.00 - 120.00)	
MSD	Cyanide	0.10	0.096	96.0	(80.00 - 120.00)	2.1

QC Batch #61661 Endothall

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Endothall	25	23.0	92.0	(58.00 - 137.00)	
MBLK	Endothall	ND				
MS	Endothall	25	25.8	103.2	(63.00 - 126.00)	

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

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QC Batch #61690 Calcium, Total, ICAP

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Calcium, Total, ICAP	50	50.2	100.4	(90.00 - 110.00)	
LCS2	Calcium, Total, ICAP	50	50.2	100.4	(90.00 - 110.00)	0.00
MBLK	Calcium, Total, ICAP	ND				
MS	Calcium, Total, ICAP	50	51	102.0	(80.00 - 120.00)	
MSD	Calcium, Total, ICAP	50	51.5	103.0	(80.00 - 120.00)	0.98

QC Batch #61724 Aldicarbs

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	3-Hydroxycarbofuran	20.0	20.3	101.5	(85.00 - 120.00)	
MBLK	3-Hydroxycarbofuran	ND				
MS	3-Hydroxycarbofuran	20.0	20.1	100.5	(70.00 - 130.00)	
LCS1	Aldicarb (Temik)	20.0	19.2	96.0	(83.00 - 115.00)	
MBLK	Aldicarb (Temik)	ND				
MS	Aldicarb (Temik)	20.0	20.3	101.5	(70.00 - 130.00)	
LCS1	Aldicarb sulfone	20.0	19.0	95.0	(84.00 - 128.00)	
MBLK	Aldicarb sulfone	ND				
MS	Aldicarb sulfone	20.0	20.0	100.0	(60.00 - 130.00)	
LCS1	Aldicarb sulfoxide	20.0	19.2	96.0	(85.00 - 138.00)	
MBLK	Aldicarb sulfoxide	ND				
MS	Aldicarb sulfoxide	20.0	19.6	98.0	(70.00 - 130.00)	
LCS1	Baygon	20.0	20.3	101.5	(85.00 - 115.00)	
MBLK	Baygon	ND				
MS	Baygon	20.0	20.5	102.5	(70.00 - 130.00)	
LCS1	Carbaryl	20.0	20.3	101.5	(85.00 - 119.00)	
MBLK	Carbaryl	ND				
MS	Carbaryl	20.0	20.6	103.0	(70.00 - 130.00)	
LCS1	Carbofuran (Furadan)	20.0	20.1	100.5	(85.00 - 115.00)	
MBLK	Carbofuran (Furadan)	ND				
MS	Carbofuran (Furadan)	20.0	20.5	102.5	(70.00 - 130.00)	
LCS1	Methiocarb	20.0	21.4	107.0	(70.00 - 136.00)	
MBLK	Methiocarb	ND				

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

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MS	Methiocarb	20.0	20.7	103.5	(70.00 - 130.00)
LCS1	Methomyl	20.0	19.3	96.5	(85.00 - 115.00)
MBLK	Methomyl	ND			
MS	Methomyl	20.0	19.7	98.5	(70.00 - 130.00)
LCS1	Oxamyl (Vydate)	20.0	19.6	98.0	(85.00 - 115.00)
MBLK	Oxamyl (Vydate)	ND			
MS	Oxamyl (Vydate)	20.0	19.9	99.5	(70.00 - 130.00)

QC Batch #61733 525 Semivolatiles by GC/MS

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Acenaphthylene	2	2.16	108.0	(70.00 - 130.00)	
MBLK	Acenaphthylene	ND				
MS	Acenaphthylene	2	2.13	106.5	(70.00 - 130.00)	
LCS1	Alachlor	2	2.41	120.5	(70.00 - 130.00)	
MBLK	Alachlor	ND				
MS	Alachlor	2	2.46	123.0	(70.00 - 130.00)	
LCS1	Aldrin	2	1.93	96.5	(70.00 - 130.00)	
MBLK	Aldrin	ND				
MS	Aldrin	2	1.77	88.5	(70.00 - 130.00)	
LCS1	Anthracene	2	2.18	109.0	(70.00 - 130.00)	
MBLK	Anthracene	ND				
MS	Anthracene	2	2.02	101.0	(70.00 - 130.00)	
LCS1	Atrazine	2	2.25	112.5	(70.00 - 130.00)	
MBLK	Atrazine	ND				
MS	Atrazine	2	2.20	110.0	(70.00 - 130.00)	
LCS1	Benz(a)Anthracene	2	2.14	107.0	(70.00 - 130.00)	
MBLK	Benz(a)Anthracene	ND				
MS	Benz(a)Anthracene	2	2.06	103.0	(70.00 - 130.00)	
LCS1	Benzo(a)pyrene	2	2.09	104.5	(70.00 - 130.00)	
MBLK	Benzo(a)pyrene	ND				
MS	Benzo(a)pyrene	2	1.74	87.0	(70.00 - 130.00)	
LCS1	Benzo(b)Fluoranthene	2	2.07	103.5	(70.00 - 130.00)	
MBLK	Benzo(b)Fluoranthene	ND				
MS	Benzo(b)Fluoranthene	2	1.72	86.0	(70.00 - 130.00)	
LCS1	Benzo(g,h,i)Perylene	2	1.92	96.0	(70.00 - 130.00)	
MBLK	Benzo(g,h,i)Perylene	ND				

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

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MS	Benzo(g,h,i)Perylene	2	1.57	78.5	(70.00 - 130.00)
LCS1	Benzo(k)Fluoranthene	2	2.14	107.0	(70.00 - 130.00)
MBLK	Benzo(k)Fluoranthene	ND			
MS	Benzo(k)Fluoranthene	2	1.86	93.0	(70.00 - 130.00)
MBLK	Bromacil	ND			
MBLK	Butachlor	ND			
LCS1	Butylbenzylphthalate	2	2.45	122.5	(70.00 - 130.00)
MBLK	Butylbenzylphthalate	ND			
MS	Butylbenzylphthalate	2	3.77	188.5	(70.00 - 130.00)
LCS1	Caffeine	2	2.10	105.0	(70.00 - 130.00)
MBLK	Caffeine	ND			
MS	Caffeine	2	2.28	114.0	(70.00 - 130.00)
LCS1	Chrysene	2	2.33	116.5	(70.00 - 130.00)
MBLK	Chrysene	ND			
MS	Chrysene	2	2.04	102.0	(70.00 - 130.00)
LCS1	Di(2-Ethylhexyl)phthalate	2	2.39	119.5	(70.00 - 130.00)
MBLK	Di(2-Ethylhexyl)phthalate	ND			
MS	Di(2-Ethylhexyl)phthalate	2	2.90	145.0	(70.00 - 130.00)
LCS1	Di-(2-Ethylhexyl)adipate	2	2.27	113.5	(70.00 - 130.00)
MBLK	Di-(2-Ethylhexyl)adipate	ND			
MS	Di-(2-Ethylhexyl)adipate	2	2.23	111.5	(70.00 - 130.00)
LCS1	Di-n-Butylphthalate	2	2.23	111.5	(70.00 - 130.00)
MBLK	Di-n-Butylphthalate	ND			
MS	Di-n-Butylphthalate	2	2.48	124.0	(70.00 - 130.00)
MBLK	Diazinon	ND			
LCS1	Dibenz(a,h)Anthracene	2	1.98	99.0	(70.00 - 130.00)
MBLK	Dibenz(a,h)Anthracene	ND			
MS	Dibenz(a,h)Anthracene	2	1.50	75.0	(70.00 - 130.00)
MBLK	Dieldrin	ND			
LCS1	Diethylphthalate	2	2.46	123.0	(70.00 - 130.00)
MBLK	Diethylphthalate	ND			
MS	Diethylphthalate	2	2.56	128.0	(70.00 - 130.00)
MBLK	Dimethoate	ND			
LCS1	Dimethylphthalate	2	2.29	114.5	(70.00 - 130.00)
MBLK	Dimethylphthalate	ND			
MS	Dimethylphthalate	2	2.29	114.5	(70.00 - 130.00)
LCS1	Endrin	2	2.31	115.5	(70.00 - 130.00)
MBLK	Endrin	ND			

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

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MS	Endrin	2	3.44	172.0	(70.00 - 130.00)
LCS1	Fluorene	2	2.23	111.5	(70.00 - 130.00)
MBLK	Fluorene	ND			
MS	Fluorene	2	2.20	110.0	(70.00 - 130.00)
LCS1	Heptachlor	2	2.00	100.0	(70.00 - 130.00)
MBLK	Heptachlor	ND			
MS	Heptachlor	2	1.72	86.0	(70.00 - 130.00)
LCS1	Heptachlor Epoxide	2	2.14	107.0	(70.00 - 130.00)
MBLK	Heptachlor Epoxide	ND			
MS	Heptachlor Epoxide	2	2.29	114.5	(70.00 - 130.00)
LCS1	Hexachlorobenzene	2	1.90	95.0	(70.00 - 130.00)
MBLK	Hexachlorobenzene	ND			
MS	Hexachlorobenzene	2	1.61	80.5	(70.00 - 130.00)
LCS1	Hexachlorocyclopentadiene	2	1.96	98.0	(40.00 - 130.00)
MBLK	Hexachlorocyclopentadiene	ND			
MS	Hexachlorocyclopentadiene	2	1.68	84.0	(40.00 - 130.00)
LCS1	Indeno(1,2,3,c,d)Pyrene	2	1.86	93.0	(70.00 - 130.00)
MBLK	Indeno(1,2,3,c,d)Pyrene	ND			
MS	Indeno(1,2,3,c,d)Pyrene	2	1.50	75.0	(70.00 - 130.00)
MBLK	Isophorone	ND			
LCS1	Lindane	2	2.24	112.0	(70.00 - 130.00)
MBLK	Lindane	ND			
MS	Lindane	2	2.31	115.5	(70.00 - 130.00)
LCS1	Methoxychlor	2	2.29	114.5	(70.00 - 130.00)
MBLK	Methoxychlor	ND			
MS	Methoxychlor	2	2.39	119.5	(70.00 - 130.00)
MBLK	Metolachlor	ND			
MBLK	Metribuzin	ND			
LCS1	Molinate	2	2.44	122.0	(70.00 - 130.00)
MBLK	Molinate	ND			
MS	Molinate	2	2.46	123.0	(70.00 - 130.00)
LCS1	Pentachlorophenol	8	8.19	102.4	(70.00 - 130.00)
MBLK	Pentachlorophenol	ND			
MS	Pentachlorophenol	8	9.60	120.0	(70.00 - 130.00)
LCS1	Phenanthrene	2	2.10	105.0	(70.00 - 130.00)
MBLK	Phenanthrene	ND			
MS	Phenanthrene	2	2.02	101.0	(70.00 - 130.00)
MBLK	Prometryn	ND			

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MBLK	Propachlor	ND			
LCS1	Pyrene	2	2.20	110.0	(70.00 - 130.00)
MBLK	Pyrene	ND			
MS	Pyrene	2	2.10	105.0	(70.00 - 130.00)
LCS1	Simazine	2	2.31	115.5	(70.00 - 130.00)
MBLK	Simazine	ND			
MS	Simazine	2	2.34	117.0	(70.00 - 130.00)
LCS1	Thiobencarb	2	2.37	118.5	(70.00 - 130.00)
MBLK	Thiobencarb	ND			
MS	Thiobencarb	2	2.31	115.5	(70.00 - 130.00)
MBLK	Trifluralin	ND			
LCS1	alpha-Chlordane	2	2.15	107.5	(70.00 - 130.00)
MBLK	alpha-Chlordane	ND			
MS	alpha-Chlordane	2	1.87	93.5	(70.00 - 130.00)
LCS1	gamma-Chlordane	2	2.18	109.0	(70.00 - 130.00)
MBLK	gamma-Chlordane	ND			
MS	gamma-Chlordane	2	1.73	86.5	(70.00 - 130.00)
LCS1	trans-Nonachlor	2	2.05	102.5	(70.00 - 130.00)
MBLK	trans-Nonachlor	ND			
MS	trans-Nonachlor	2	1.71	85.5	(70.00 - 130.00)

QC Batch #61736 Glyphosate

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Glyphosate	50	46.0	92.0	(70.00 - 130.00)	
MBLK	Glyphosate	ND				
MS	Glyphosate	50	42.1	84.2	(70.00 - 130.00)	

QC Batch #61741 Diquat and Paraquat

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Diquat	10.0	9.3	93.0	(70.00 - 130.00)	
MBLK	Diquat	ND				
MS	Diquat	10.0	9.4	94.0	(70.00 - 130.00)	
LCS1	Paraquat	10.0	9.1	91.0	(70.00 - 130.00)	
MBLK	Paraquat	ND				

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MS	Paraquat	10.0	8.3	83.0	(70.00 - 130.00)

QC Batch #61776 EPA Method 504.1

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
DUP	1,2,3-Trichloropropane	ND	ND		(0.00 - 20.00)	
LCS1	1,2,3-Trichloropropane	1.00	0.96	96.0	(60.00 - 140.00)	
LCS2	1,2,3-Trichloropropane	1.00	0.93	93.0	(60.00 - 140.00)	3.2
MBLK	1,2,3-Trichloropropane	ND				
MS	1,2,3-Trichloropropane	1.00	0.96	96.0	(60.00 - 140.00)	
LCS1	1,2-Dibromo-3-chloropropane	0.10	0.09	90.0	(60.00 - 140.00)	
LCS2	1,2-Dibromo-3-chloropropane	0.10	0.10	100.0	(60.00 - 140.00)	11
MBLK	1,2-Dibromo-3-chloropropane	ND				
MS	1,2-Dibromo-3-chloropropane	0.10	0.09	90.0	(60.00 - 140.00)	
LCS1	1,2-Dibromoethane	0.10	0.10	100.0	(60.00 - 140.00)	
LCS2	1,2-Dibromoethane	0.10	0.10	100.0	(60.00 - 140.00)	0.00
MBLK	1,2-Dibromoethane	ND				
MS	1,2-Dibromoethane	0.10	0.11	110.0	(60.00 - 140.00)	
DUP	Dibromochloropropane (DBCP)	ND	ND		(0.00 - 20.00)	
DUP	Ethylene Dibromide (EDB)	ND	ND		(0.00 - 20.00)	

QC Batch #61891 Herbicides by 515.1

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	2,4,5-T	ND				
LCS1	2,4,5-TP (Silvex)	0.50	0.50	100.0	(67.00 - 120.00)	
MBLK	2,4,5-TP (Silvex)	ND				
MS	2,4,5-TP (Silvex)	0.50	0.50	100.0	(42.00 - 226.00)	
LCS1	2,4-D	1.00	0.95	95.0	(72.00 - 127.00)	
MBLK	2,4-D	ND				
MS	2,4-D	1.00	0.95	95.0	(49.00 - 214.00)	
MBLK	2,4-DB	ND				
MBLK	3,5-Dichlorobenzoic acid	ND				
MBLK	4-Nitrophenol (qualitative)	ND				
MBLK	Acifluorfen (qualitative)	ND				
LCS1	Bentazon	1.00	1.25	125.0	(75.00 - 134.00)	

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

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MBLK	Bentazon	ND			
MS	Bentazon	1.00	1.21	121.0	(70.00 - 170.00)
MBLK	DCPA	ND			
LCS1	Dalapon (qualitative)	6.50	6.46	99.4	(40.00 - 160.00)
MBLK	Dalapon (qualitative)	ND			
MS	Dalapon (qualitative)	6.50	6.43	98.9	(40.00 - 160.00)
LCS1	Dicamba	0.50	0.49	98.0	(38.00 - 232.00)
MBLK	Dicamba	ND			
MS	Dicamba	0.50	0.46	92.0	(38.00 - 232.00)
MBLK	Dichlorprop	ND			
LCS1	Dinoseb	1.00	0.46	46.0	(0.00 - 85.00)
MBLK	Dinoseb	ND			
MS	Dinoseb	1.00	0.79	79.0	(0.00 - 85.00)
LCS1	Pentachlorophenol	0.50	0.48	96.0	(36.00 - 224.00)
MBLK	Pentachlorophenol	ND			
MS	Pentachlorophenol	0.50	0.48	96.0	(36.00 - 224.00)
LCS1	Picloram	0.50	0.44	88.0	(45.00 - 138.00)
MBLK	Picloram	ND			
MS	Picloram	0.50	0.41	82.0	(45.00 - 138.00)

QC Batch #61913 SDWA Pesticides

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	Alachlor (Alanex)	ND				
LCS1	Aldrin	0.050	0.027	54.0	(59.64 - 145.56)	
MBLK	Aldrin	ND				
MS	Aldrin	0.050	0.031	62.0	(75.56 - 142.71)	
MBLK	Alpha-BHC	ND				
MBLK	Beta-BHC	ND				
MBLK	Chlordane	ND				
MBLK	Chlorthalonil (Draconil,Bravo)	ND				
MBLK	Delta-BHC	ND				
LCS1	Dieldrin	0.100	0.090	90.0	(65.75 - 149.79)	
MBLK	Dieldrin	ND				
MS	Dieldrin	0.100	0.091	91.0	(77.36 - 141.97)	
MBLK	Endosulfan I (alpha)	ND				
MBLK	Endosulfan II (beta)	ND				

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

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MBLK	Endosulfan sulfate	ND			
LCS1	Endrin	0.100	0.091	91.0	(70.07 - 149.66)
MBLK	Endrin	ND			
MS	Endrin	0.100	0.091	91.0	(86.46 - 138.80)
MBLK	Endrin Aldehyde	ND			
LCS1	Gamma-BHC (Lindane)	0.050	0.045	90.0	(81.57 - 148.43)
MBLK	Gamma-BHC (Lindane)	ND			
MS	Gamma-BHC (Lindane)	0.050	0.041	82.0	(88.58 - 141.42)
LCS1	Heptachlor	0.050	0.035	70.0	(60.95 - 145.71)
MBLK	Heptachlor	ND			
MS	Heptachlor	0.050	0.037	74.0	(78.23 - 146.04)
MBLK	Heptachlor Epoxide	ND			
MBLK	Methoxychlor	ND			
MBLK	PCB 1016 Aroclor	ND			
MBLK	PCB 1221 Aroclor	ND			
MBLK	PCB 1232 Aroclor	ND			
LCS1	PCB 1242 Aroclor	0.500	0.513	102.6	(70.00 - 130.00)
MBLK	PCB 1242 Aroclor	ND			
MBLK	PCB 1248 Aroclor	ND			
MBLK	PCB 1254 Aroclor	ND			
MBLK	PCB 1260 Aroclor	ND			
MBLK	Toxaphene	ND			
MBLK	p,p' DDD	ND			
MBLK	p,p' DDE	ND			
LCS1	p,p' DDT	0.100	0.088	88.0	(37.03 - 169.44)
MBLK	p,p' DDT	ND			
MS	p,p' DDT	0.100	0.087	87.0	(57.41 - 158.86)

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

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Laboratory Report

for

Honolulu, City of
Board of Water Supply Lab

630 S Beretania St

Honolulu , HI 96843

Attention: Ron Fenstemacher
Fax: 808 527-6195

Kapalama Well 2

MONTGOMERY WATSON LABS.
SUBMITTED ON
~~APR~~ MAR
~~MAR~~ 23 1997
HDS Hillary Strayer

Report#: 32657
PHASEV

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Report
Comments
#32657

Group Comments

Result for TCDD analysis submitted by Quanterra Environmental Services.

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Laboratory
Report
#32657

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

Samples Received
04-mar-1997 11:27:28

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilutio
APALAMA-WELL 2 (970304002)				**Sampled on 03/03/97**				
03/07/97	03/07/97	60305	(EPA/ML 200.7)	Calcium, Total, ICAP	15	mg/l	1.0	1
	03/04/97	60312	(ML/S4500CN-F)	Cyanide	ND	mg/l	0.025	1
03/10/97	03/19/97	60700	(ML/EPA 548.1)	Endothall	ND	ug/l	5.0	1
	03/06/97	60313	(SM 4500F)	Fluoride	0.51	mg/l	0.10	1
	03/18/97	60868	(ML/EPA 547)	Glyphosate	ND	ug/l	6.0	1
03/11/97	03/11/97	60477	(EPA/ML 245.1)	Mercury	ND	ug/l	0.50	1
	03/05/97	60280	(ML/EPA 300.0)	Nitrite, Nitrogen by IC	ND	mg/l	0.10	1
03/06/97	03/12/97		(EPA 1613)	2,3,7,8 - TCDD	ND	PGL	2.6	1
				525 Semivolatiles by GC/MS				
03/10/97	03/14/97	60497	(ML/EPA 525.2)	2,4-Dinitrotoluene	ND	ug/l	0.10	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	alpha-Chlordane	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Acenaphthylene	ND	ug/l	0.10	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Alachlor	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Aldrin	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Anthracene	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Atrazine	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Benz(a)Anthracene	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Benzo(a)pyrene	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Benzo(b)Fluoranthene	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Benzo(g,h,i)Perylene	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Benzo(k)Fluoranthene	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Di(2-Ethylhexyl)phthalate	ND	ug/l	0.60	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Butylbenzylphthalate	ND	ug/l	0.50	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Bromacil	ND	ug/l	2.0	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Butachlor	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Caffeine	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Chrysene	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Dibenz(a,h)Anthracene	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Di-(2-Ethylhexyl)adipate	ND	ug/l	0.60	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Diethylphthalate	ND	ug/l	0.50	1

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Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilution
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Dieldrin	ND	ug/l	0.20	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Dimethylphthalate	ND	ug/l	0.50	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Dimethoate	ND	ug/l	10	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Di-n-Butylphthalate	ND	ug/l	0.50	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Endrin	ND	ug/l	0.10	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Fluorene	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	gamma-Chlordane	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Hexachlorobenzene	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Hexachlorocyclopentadiene	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Heptachlor	ND	ug/l	0.040	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Heptachlor Epoxide	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Indeno(1,2,3,c,d)Pyrene	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Isophorone	3.7	ug/l	0.50	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Lindane	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Methoxychlor	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Metribuzin	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Molinate	ND	ug/l	0.20	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Metolachlor	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	trans-Nonachlor	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Pentachlorophenol	ND	ug/l	1.0	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Phenanthrene	ND	ug/l	0.020	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Prometryn	ND	ug/l	0.50	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Propachlor	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Pyrene	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Simazine	ND	ug/l	0.050	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Thiobencarb	ND	ug/l	0.20	1
03/10/97	03/14/97	60497	(ML/EPA 525.2)	Trifluralin	ND	ug/l	0.10	1
			(Surrogate)	Perylene-d12	106	% Rec		
Aldicarbs								
	03/13/97	60698	(ML/EPA 531.1)	3-Hydroxycarbofuran	ND	ug/l	2.0	1
	03/13/97	60698	(ML/EPA 531.1)	Aldicarb (Temik)	ND	ug/l	0.50	1
	03/13/97	60698	(ML/EPA 531.1)	Aldicarb sulfone	ND	ug/l	0.80	1
	03/13/97	60698	(ML/EPA 531.1)	Aldicarb sulfoxide	ND	ug/l	0.50	1
	03/13/97	60698	(ML/EPA 531.1)	Baygon	ND	ug/l	2.0	1
	03/13/97	60698	(ML/EPA 531.1)	Carbofuran (Furadan)	ND	ug/l	0.90	1

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	03/13/97	60698	(ML/EPA 531.1)	Carbaryl	ND	ug/l	2.0	1
	03/13/97	60698	(ML/EPA 531.1)	Methiocarb	ND	ug/l	2.0	1
	03/13/97	60698	(ML/EPA 531.1)	Methomyl	ND	ug/l	1.0	1
	03/13/97	60698	(ML/EPA 531.1)	Oxamyl (Vydate)	ND	ug/l	2.0	1
			(Surrogate)	BDMC	94	% Rec		
			Diquat and Paraquat					
3/10/97	03/26/97	61020	(ML/EPA 549.1)	Diquat	ND	ug/l	0.40	1
3/10/97	03/26/97	61020	(EPA 549.1)	Paraquat	ND	ug/l	2.0	1
			EPA Method 504.1					
3/10/97	03/11/97	60542	(ML/EPA 504)	1,2-Dibromo-3-chloropropane	ND	ug/l	0.010	1
3/10/97	03/11/97	60542	(ML/EPA 504)	1,2-Dibromoethane	ND	ug/l	0.010	1
03/10/97	03/11/97	60542	(ML/EPA 504)	1,2,3-Trichloropropane	ND	ug/l	0.10	1
			(Surrogate)	1,2-dibromopropane	102	% Rec		
			Herbicides by 515.1					
3/10/97	03/18/97	60857	(ML/EPA 515.1)	2,4,5-T	ND	ug/l	0.20	1
/10/97	03/18/97	60857	(ML/EPA 515.1)	2,4,5-TP (Silvex)	ND	ug/l	0.20	1
3/10/97	03/18/97	60857	(ML/EPA 515.1)	2,4-D	ND	ug/l	0.10	1
03/10/97	03/18/97	60857	(ML/EPA 515.1)	2,4-DB	ND	ug/l	2.0	1
/10/97	03/18/97	60857	(ML/EPA 515.1)	Dichlorprop	ND	ug/l	0.50	1
/10/97	03/18/97	60857	(ML/EPA 515.1)	Acifluorfen (qualitative)	ND	ug/l	0.20	1
03/10/97	03/18/97	60857	(ML/EPA 515.1)	Bentazon	ND	ug/l	0.50	1
/10/97	03/18/97	60857	(ML/EPA 515.1)	Dalapon (qualitative)	ND	ug/l	1.0	1
/10/97	03/18/97	60857	(ML/EPA 515.1)	3,5-Dichlorobenzoic acid	ND	ug/l	0.60	1
03/10/97	03/18/97	60857	(ML/EPA 515.1)	DCPA	ND	ug/l	0.20	1
03/10/97	03/18/97	60857	(ML/EPA 515.1)	Dicamba	ND	ug/l	0.080	1
/10/97	03/18/97	60857	(ML/EPA 515.1)	Dinoseb	ND	ug/l	0.20	1
3/10/97	03/18/97	60857	(ML/EPA 515.1)	Pentachlorophenol	ND	ug/l	0.040	1
03/10/97	03/18/97	60857	(ML/EPA 515.1)	Picloram	ND	ug/l	0.10	1
/10/97	03/18/97	60857	(ML/EPA 515.1)	4-Nitrophenol (qualitative)	ND	ug/l	5.0	1
			(Surrogate)	2,4-Dichlorophenylacetic acid	92	% Rec		

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				Nitrate by IC as NO3 & N				
	03/05/97	60284	(ML/EPA 300.0)	Nitrate-N by IC	0.6	mg/l	0.10	1
	03/05/97	60284	(ML/EPA 300.0)	Nitrate as NO3 by IC	2.6	mg/l	0.44	1
				SDWA Pesticides				
03/05/97	03/10/97	60393	(ML/EPA 508)	PCB 1016 Aroclor	ND	ug/l	0.10	1
03/05/97	03/10/97	60393	(ML/EPA 508)	PCB 1221 Aroclor	ND	ug/l	0.10	1
03/05/97	03/10/97	60393	(ML/EPA 508)	PCB 1232 Aroclor	ND	ug/l	0.10	1
03/05/97	03/10/97	60393	(ML/EPA 508)	PCB 1242 Aroclor	ND	ug/l	0.10	1
03/05/97	03/10/97	60393	(ML/EPA 508)	PCB 1248 Aroclor	ND	ug/l	0.10	1
03/05/97	03/10/97	60393	(ML/EPA 508)	PCB 1254 Aroclor	ND	ug/l	0.10	1
03/05/97	03/10/97	60393	(ML/EPA 508)	PCB 1260 Aroclor	ND	ug/l	0.10	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Alpha-BHC	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Alachlor (Alanex)	ND	ug/l	0.050	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Aldrin	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Beta-BHC	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Chlordane	ND	ug/l	0.10	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Chlorthalonil (Draconil,Bravo)	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Delta-BHC	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	p,p' DDD	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	p,p' DDE	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	p,p' DDT	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Dieldrin	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Endrin Aldehyde	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Endrin	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Endosulfan I (alpha)	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Endosulfan II (beta)	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Endosulfan sulfate	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Heptachlor	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Heptachlor Epoxide	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Lindane (gamma-BHC)	ND	ug/l	0.010	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Methoxychlor	ND	ug/l	0.050	1
03/05/97	03/10/97	60393	(ML/EPA 508)	Toxaphene	ND	ug/l	0.50	1
			(Surrogate)	Dibutyl Chlorendate	100	% Rec		

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			(Surrogate)	Tetrachlorometaxylene	100	% Rec		
				T-22 Inorg+Gen Min ICPMS Mets				
	03/14/97	60656	(EPA/ML 200.8)	Silver, Total, ICAP/MS	ND	ug/l	10	1
	03/14/97	60656	(EPA/ML 200.8)	Aluminum, Total, ICAP/MS	ND	ug/l	50	1
	03/14/97	60656	(EPA/ML 200.8)	Arsenic, Total, ICAP/MS	ND	ug/l	5.0	1
	03/14/97	60656	(EPA/ML 200.8)	Barium, Total, ICAP/MS	ND	ug/l	10	1
	03/14/97	60656	(EPA/ML 200.8)	Beryllium, Total, ICAP/MS	ND	ug/l	1.0	1
	03/14/97	60656	(EPA/ML 200.8)	Cadmium, Total, ICAP/MS	ND	ug/l	0.50	1
	03/14/97	60656	(EPA/MS 200.8)	Chromium, Total, ICAP/MS	ND	ug/l	5.0	1
	03/14/97	60656	(EPA/ML 200.8)	Copper, Total, ICAP/MS	100	ug/l	50	1
	03/14/97	60656	(EPA/ML 200.8)	Iron, Total, ICAP/MS	ND	ug/l	100	1
	03/14/97	60656	(EPA/ML 200.8)	Manganese, Total, ICAP/MS	ND	ug/l	2.0	1
	03/14/97	60656	(EPA/ML 200.8)	Nickel, Total, ICAP/MS	ND	ug/l	5.0	1
	03/14/97	60656	(EPA/ML 200.8)	Lead, Total, ICAP/MS	ND	ug/l	5.0	1
	03/14/97	60656	(EPA/ML 200.8)	Antimony, Total, ICAP/MS	ND	ug/l	2.0	1
	03/14/97	60656	(EPA/ML 200.8)	Selenium, Total, ICAP/MS	ND	ug/l	5.0	1
	03/14/97	60656	(EPA/ML 200.8)	Thallium, Total, ICAP/MS	ND	ug/l	1.0	1
	03/14/97	60656	(EPA/ML 200.8)	Zinc, Total, ICAP/MS	46	ug/l	20	1
				Volatile Organic Compounds				
	03/17/97	60654	(ML/EPA 502.2)	1,1,1,2-Tetrachloroethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,1,1-Trichloroethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,1,2,2-Tetrachloroethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,1,2-Trichloroethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,1-Dichloroethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,1-Dichloroethene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,1-Dichloropropene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2,3-Trichloropropane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2,3-Trichlorobenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2,4-Trichlorobenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2,4-Trimethylbenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2-Dichloroethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2-Dichlorobenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2-Dichloropropane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,3,5-Trimethylbenzene	ND	ug/l	0.50	1

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	03/17/97	60654	(ML/EPA 502.2)	1,3-Dichlorobenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,3-Dichloropropane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,4-Dichlorobenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	2,2-Dichloropropane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	2-Chlorotoluene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	4-Chlorotoluene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Bromodichloromethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Benzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Bromobenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Bromochloromethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Bromomethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	cis-1,2-Dichloroethene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Chlorobenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Carbon tetrachloride	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	cis-1,3-Dichloropropene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Bromoform	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Chloroform	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Chloroethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Chloromethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Dibromochloromethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2-Dibromo-3-chloropropane	ND	ug/l	1.0	1
	03/17/97	60654	(ML/EPA 502.2)	Dibromomethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Dichlorodifluoromethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	1,2-Dibromoethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Ethylbenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Hexachlorobutadiene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Isopropylbenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Methylene chloride	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	m+p-Xylenes	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Methyl tert-butyl ether	ND	ug/l	5.0	1
	03/17/97	60654	(ML/EPA 502.2)	Naphthalene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	n-Butylbenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	n-Propylbenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	o-Xylene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Tetrachloroethene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	p-Isopropyltoluene	ND	ug/l	0.50	1

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Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MDL	Dilutio
	03/17/97	60654	(ML/EPA 502.2)	sec-Butylbenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Styrene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	trans-1,2-Dichloroethene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	tert-Butylbenzene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Trichloroethene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Trichlorotrifluoroethane(Freon	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	trans-1,3-Dichloropropene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Toluene	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Trichlorofluoromethane	ND	ug/l	0.50	1
	03/17/97	60654	(ML/EPA 502.2)	Vinyl chloride	ND	ug/l	0.30	1
			(Surrogate)	Bromofluorobenzene-ELCD	89	% Rec		
			(Surrogate)	Bromofluorobenzene-PID	96	% Rec		
			(Surrogate)	Chlorofluorobenzene-ELCD	90	% Rec		
			(Surrogate)	Chlorofluorobenzene-PID	96	% Rec		

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QC Batch #60280 — Nitrite, Nitrogen by IC

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Nitrite, Nitrogen by IC	1.00	0.98	98.0	(90.00 - 110.00)	
LCS2	Nitrite, Nitrogen by IC	1.00	0.96	96.0	(90.00 - 110.00)	2.1
MBLK	Nitrite, Nitrogen by IC	ND				
MS	Nitrite, Nitrogen by IC	1.00	1.00	100.0	(80.00 - 120.00)	
MSD	Nitrite, Nitrogen by IC	1.00	1.03	103.0	(80.00 - 120.00)	3.0

QC Batch #60284 — Nitrate by IC as NO3 & N

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	Nitrate as NO3 by IC	ND				
LCS1	Nitrate-N	2.5	2.56	102.4	(90.00 - 110.00)	
LCS2	Nitrate-N	2.5	2.51	100.4	(90.00 - 110.00)	2.0
MS	Nitrate-N	2.5	2.63	105.2	(75.00 - 125.00)	
MSD	Nitrate-N	2.5	2.63	105.2	(75.00 - 125.00)	0.00

QC Batch #60305 — Calcium, Total, ICAP

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Calcium, Total, ICAP	50	50.9	101.8	(90.00 - 110.00)	
LCS2	Calcium, Total, ICAP	50	49.8	99.6	(90.00 - 110.00)	2.2
MBLK	Calcium, Total, ICAP	ND				
MS	Calcium, Total, ICAP	50	47.8	95.6	(80.00 - 120.00)	
MSD	Calcium, Total, ICAP	50	47.4	94.8	(80.00 - 120.00)	0.84

QC Batch #60312 — Cyanide

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Cyanide	0.10	0.097	97.0	(90.00 - 110.00)	
MBLK	Cyanide	ND				
MS	Cyanide	0.10	0.099	99.0	(80.00 - 120.00)	
MSD	Cyanide	0.10	0.098	98.0	(80.00 - 120.00)	1.0

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QC Batch #60313 Fluoride

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Fluoride	0.87	0.87	100.0	(90.00 - 110.00)	
LCS2	Fluoride	0.87	0.86	98.9	(90.00 - 110.00)	1.2
MBLK	Fluoride	ND				
MS	Fluoride	0.909	0.87	95.7	(80.00 - 120.00)	
MSD	Fluoride	0.909	0.87	95.7	(80.00 - 120.00)	0.00

QC Batch #60393 SDWA Pesticides

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	Alachlor (Alanex)	ND				
LCS1	Aldrin	0.050	0.041	82.0	(59.64 - 145.56)	
MBLK	Aldrin	ND				
MS	Aldrin	0.050	0.036	72.0	(75.56 - 142.71)	
MBLK	Alpha-BHC	ND				
MBLK	Beta-BHC	ND				
MBLK	Chlordane	ND				
MBLK	Chlorthalonil (Draconil,Bravo)	ND				
MBLK	Delta-BHC	ND				
LCS1	Dieldrin	0.100	0.106	106.0	(65.75 - 149.79)	
MBLK	Dieldrin	ND				
MS	Dieldrin	0.100	0.088	88.0	(77.36 - 141.97)	
MBLK	Endosulfan I (alpha)	ND				
MBLK	Endosulfan II (beta)	ND				
MBLK	Endosulfan sulfate	ND				
LCS1	Endrin	0.100	0.110	110.0	(70.07 - 149.66)	
MBLK	Endrin	ND				
MS	Endrin	0.100	0.098	98.0	(86.46 - 138.80)	
MBLK	Endrin Aldehyde	ND				
LCS1	Gamma-BHC (Lindane)	0.050	0.055	110.0	(81.57 - 148.43)	
MBLK	Gamma-BHC (Lindane)	ND				
MS	Gamma-BHC (Lindane)	0.050	0.049	98.0	(88.58 - 141.42)	
LCS1	Heptachlor	0.050	0.040	80.0	(60.95 - 145.71)	

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MBLK	Heptachlor	ND			
MS	Heptachlor	0.050	0.035	70.0	(78.23 - 146.04)
MBLK	Heptachlor Epoxide	ND			
MBLK	Methoxychlor	ND			
MBLK	PCB 1016 Aroclor	ND			
MBLK	PCB 1221 Aroclor	ND			
MBLK	PCB 1232 Aroclor	ND			
LCS1	PCB 1242 Aroclor	0.500	0.476	95.2	(70.00 - 130.00)
MBLK	PCB 1242 Aroclor	ND			
MBLK	PCB 1248 Aroclor	ND			
MBLK	PCB 1254 Aroclor	ND			
MBLK	PCB 1260 Aroclor	ND			
MBLK	Toxaphene	ND			
MBLK	p,p' DDD	ND			
MBLK	p,p' DDE	ND			
LCS1	p,p' DDT	0.100	0.102	102.0	(37.03 - 169.44)
MBLK	p,p' DDT	ND			
MS	p,p' DDT	0.100	0.091	91.0	(57.41 - 158.86)

QC Batch #60477 Mercury

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Mercury	1.50	1.45	96.7	(85.00 - 115.00)	
LCS2	Mercury	1.50	1.37	91.3	(85.00 - 115.00)	5.7
MBLK	Mercury	ND				
MS	Mercury	1.50	1.41	94.0	(80.00 - 120.00)	
MSD	Mercury	1.50	1.48	98.7	(80.00 - 120.00)	4.8

QC Batch #60497 525 Semivolatiles by GC/MS

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Acenaphthylene	2	1.75	87.5	(70.00 - 130.00)	
MBLK	Acenaphthylene	ND				
MS	Acenaphthylene	2	2.10	105.0	(70.00 - 130.00)	
LCS1	Alachlor	2	2.01	100.5	(70.00 - 130.00)	
MBLK	Alachlor	ND				

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MS	Alachlor	2	2.20	110.0	(70.00 - 130.00)
LCS1	Aldrin	2	1.75	87.5	(70.00 - 130.00)
MBLK	Aldrin	ND			
MS	Aldrin	2	1.90	95.0	(70.00 - 130.00)
LCS1	Anthracene	2	1.77	88.5	(70.00 - 130.00)
MBLK	Anthracene	ND			
MS	Anthracene	2	1.97	98.5	(70.00 - 130.00)
LCS1	Atrazine	2	1.84	92.0	(70.00 - 130.00)
MBLK	Atrazine	ND			
MS	Atrazine	2	1.99	99.5	(70.00 - 130.00)
LCS1	Benz(a)Anthracene	2	1.75	87.5	(70.00 - 130.00)
MBLK	Benz(a)Anthracene	ND			
MS	Benz(a)Anthracene	2	1.99	99.5	(70.00 - 130.00)
LCS1	Benzo(a)pyrene	2	1.96	98.0	(70.00 - 130.00)
MBLK	Benzo(a)pyrene	ND			
MS	Benzo(a)pyrene	2	2.43	121.5	(70.00 - 130.00)
LCS1	Benzo(b)Fluoranthene	2	1.89	94.5	(70.00 - 130.00)
MBLK	Benzo(b)Fluoranthene	ND			
MS	Benzo(b)Fluoranthene	2	2.32	116.0	(70.00 - 130.00)
LCS1	Benzo(g,h,i)Perylene	2	1.97	98.5	(70.00 - 130.00)
MBLK	Benzo(g,h,i)Perylene	ND			
MS	Benzo(g,h,i)Perylene	2	2.60	130.0	(70.00 - 130.00)
LCS1	Benzo(k)Fluoranthene	2	1.96	98.0	(70.00 - 130.00)
MBLK	Benzo(k)Fluoranthene	ND			
MS	Benzo(k)Fluoranthene	2	2.33	116.5	(70.00 - 130.00)
MBLK	Bromacil	ND			
MBLK	Butachlor	ND			
LCS1	Butylbenzylphthalate	2	2.15	107.5	(70.00 - 130.00)
MBLK	Butylbenzylphthalate	ND			
MS	Butylbenzylphthalate	2	2.33	116.5	(70.00 - 130.00)
LCS1	Caffeine	2	1.75	87.5	(70.00 - 130.00)
MBLK	Caffeine	ND			
MS	Caffeine	2	1.88	94.0	(70.00 - 130.00)
LCS1	Chrysene	2	1.85	92.5	(70.00 - 130.00)
MBLK	Chrysene	ND			
MS	Chrysene	2	2.05	102.5	(70.00 - 130.00)
LCS1	Di(2-Ethylhexyl)phthalate	2	2.13	106.5	(70.00 - 130.00)
MBLK	Di(2-Ethylhexyl)phthalate	ND			

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MS	Di(2-Ethylhexyl)phthalate	2	2.73	136.5	(70.00 - 130.00)
LCS1	Di-(2-Ethylhexyl)adipate	2	1.97	98.5	(70.00 - 130.00)
MBLK	Di-(2-Ethylhexyl)adipate	ND			
MS	Di-(2-Ethylhexyl)adipate	2	2.25	112.5	(70.00 - 130.00)
LCS1	Di-n-Butylphthalate	2	1.69	84.5	(70.00 - 130.00)
MBLK	Di-n-Butylphthalate	ND			
MS	Di-n-Butylphthalate	2	1.87	93.5	(70.00 - 130.00)
MBLK	Diazinon	ND			
LCS1	Dibenz(a,h)Anthracene	2	1.91	95.5	(70.00 - 130.00)
MBLK	Dibenz(a,h)Anthracene	ND			
MS	Dibenz(a,h)Anthracene	2	2.23	111.5	(70.00 - 130.00)
MBLK	Dieldrin	ND			
LCS1	Diethylphthalate	2	1.88	94.0	(70.00 - 130.00)
MBLK	Diethylphthalate	ND			
MS	Diethylphthalate	2	2.20	110.0	(70.00 - 130.00)
MBLK	Dimethoate	ND			
LCS1	Dimethylphthalate	2	1.89	94.5	(70.00 - 130.00)
MBLK	Dimethylphthalate	ND			
MS	Dimethylphthalate	2	2.25	112.5	(70.00 - 130.00)
LCS1	Endrin	2	1.77	88.5	(70.00 - 130.00)
MBLK	Endrin	ND			
MS	Endrin	2	2.10	105.0	(70.00 - 130.00)
LCS1	Fluorene	2	1.76	88.0	(70.00 - 130.00)
MBLK	Fluorene	ND			
MS	Fluorene	2	2.03	101.5	(70.00 - 130.00)
LCS1	Heptachlor	2	1.90	95.0	(70.00 - 130.00)
MBLK	Heptachlor	ND			
MS	Heptachlor	2	2.29	114.5	(70.00 - 130.00)
LCS1	Heptachlor Epoxide	2	1.82	91.0	(70.00 - 130.00)
MBLK	Heptachlor Epoxide	ND			
MS	Heptachlor Epoxide	2	2.00	100.0	(70.00 - 130.00)
LCS1	Hexachlorobenzene	2	1.64	82.0	(70.00 - 130.00)
MBLK	Hexachlorobenzene	ND			
MS	Hexachlorobenzene	2	2.04	102.0	(70.00 - 130.00)
LCS1	Hexachlorocyclopentadiene	2	1.64	82.0	(40.00 - 130.00)
MBLK	Hexachlorocyclopentadiene	ND			
MS	Hexachlorocyclopentadiene	2	1.65	82.5	(40.00 - 130.00)
LCS1	Indeno(1,2,3,c,d)Pyrene	2	1.90	95.0	(70.00 - 130.00)

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

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MBLK	Indeno(1,2,3,c,d)Pyrene	ND			
MS	Indeno(1,2,3,c,d)Pyrene	2	2.49	124.5	(70.00 - 130.00)
MBLK	Isophorone	ND			
LCS1	Lindane	2	1.86	93.0	(70.00 - 130.00)
MBLK	Lindane	ND			
MS	Lindane	2	2.00	100.0	(70.00 - 130.00)
LCS1	Methoxychlor	2	2.00	100.0	(70.00 - 130.00)
MBLK	Methoxychlor	ND			
MS	Methoxychlor	2	2.25	112.5	(70.00 - 130.00)
MBLK	Metolachlor	ND			
MBLK	Metribuzin	ND			
LCS1	Molinate	2	1.92	96.0	(70.00 - 130.00)
MBLK	Molinate	ND			
MS	Molinate	2	2.23	111.5	(70.00 - 130.00)
LCS1	Pentachlorophenol	8	8.52	106.5	(70.00 - 130.00)
MBLK	Pentachlorophenol	ND			
MS	Pentachlorophenol	8	8.83	110.4	(70.00 - 130.00)
LCS1	Phenanthrene	2	1.78	89.0	(70.00 - 130.00)
MBLK	Phenanthrene	ND			
MS	Phenanthrene	2	2.00	100.0	(70.00 - 130.00)
MBLK	Prometryn	ND			
MBLK	Propachlor	ND			
LCS1	Pyrene	2	1.83	91.5	(70.00 - 130.00)
MBLK	Pyrene	ND			
MS	Pyrene	2	2.00	100.0	(70.00 - 130.00)
LCS1	Simazine	2	1.88	94.0	(70.00 - 130.00)
MBLK	Simazine	ND			
MS	Simazine	2	1.92	96.0	(70.00 - 130.00)
LCS1	Thiobencarb	2	1.83	91.5	(70.00 - 130.00)
MBLK	Thiobencarb	ND			
MS	Thiobencarb	2	1.94	97.0	(70.00 - 130.00)
MBLK	Trifluralin	ND			
LCS1	alpha-Chlordane	2	1.78	89.0	(70.00 - 130.00)
MBLK	alpha-Chlordane	ND			
MS	alpha-Chlordane	2	1.96	98.0	(70.00 - 130.00)
LCS1	gamma-Chlordane	2	1.69	84.5	(70.00 - 130.00)
MBLK	gamma-Chlordane	ND			
MS	gamma-Chlordane	2	1.94	97.0	(70.00 - 130.00)

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

CORRECTION

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MBLK	Indeno(1,2,3,c,d) Pyrene	ND			
MS	Indeno(1,2,3,c,d) Pyrene	2	2.49	124.5	(70.00 - 130.00)
MBLK	Isophorone	ND			
LCS1	Lindane	2	1.86	93.0	(70.00 - 130.00)
MBLK	Lindane	ND			
MS	Lindane	2	2.00	100.0	(70.00 - 130.00)
LCS1	Methoxychlor	2	2.00	100.0	(70.00 - 130.00)
MBLK	Methoxychlor	ND			
MS	Methoxychlor	2	2.25	112.5	(70.00 - 130.00)
MBLK	Metolachlor	ND			
MBLK	Metribuzin	ND			
LCS1	Molinate	2	1.92	96.0	(70.00 - 130.00)
MBLK	Molinate	ND			
MS	Molinate	2	2.23	111.5	(70.00 - 130.00)
LCS1	Pentachlorophenol	8	8.52	106.5	(70.00 - 130.00)
MBLK	Pentachlorophenol	ND			
MS	Pentachlorophenol	8	8.83	110.4	(70.00 - 130.00)
LCS1	Phenanthrene	2	1.78	89.0	(70.00 - 130.00)
MBLK	Phenanthrene	ND			
MS	Phenanthrene	2	2.00	100.0	(70.00 - 130.00)
MBLK	Prometryn	ND			
MBLK	Propachlor	ND			
LCS1	Pyrene	2	1.83	91.5	(70.00 - 130.00)
MBLK	Pyrene	ND			
MS	Pyrene	2	2.00	100.0	(70.00 - 130.00)
LCS1	Simazine	2	1.88	94.0	(70.00 - 130.00)
MBLK	Simazine	ND			
MS	Simazine	2	1.92	96.0	(70.00 - 130.00)
LCS1	Thiobencarb	2	1.83	91.5	(70.00 - 130.00)
MBLK	Thiobencarb	ND			
MS	Thiobencarb	2	1.94	97.0	(70.00 - 130.00)
MBLK	Trifluralin	ND			
LCS1	alpha-Chlordane	2	1.78	89.0	(70.00 - 130.00)
MBLK	alpha-Chlordane	ND			
MS	alpha-Chlordane	2	1.96	98.0	(70.00 - 130.00)
LCS1	gamma-Chlordane	2	1.69	84.5	(70.00 - 130.00)
MBLK	gamma-Chlordane	ND			
MS	gamma-Chlordane	2	1.94	97.0	(70.00 - 130.00)

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LCS1	trans-Nonachlor	2	1.70	85.0	(70.00 - 130.00)
MBLK	trans-Nonachlor	ND			
MS	trans-Nonachlor	2	1.78	89.0	(70.00 - 130.00)

QC Batch #60542 EPA Method 504.1

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
DUP	1,2,3-Trichloropropane	ND	ND		(0.00 - 20.00)	
LCS1	1,2,3-Trichloropropane	1.00	0.98	98.0	(60.00 - 140.00)	
LCS2	1,2,3-Trichloropropane	1.00	1.01	101.0	(60.00 - 140.00)	3.0
MBLK	1,2,3-Trichloropropane	ND				
LCS1	1,2-Dibromo-3-chloropropane	0.10	0.10	100.0	(60.00 - 140.00)	
LCS2	1,2-Dibromo-3-chloropropane	0.10	0.10	100.0	(60.00 - 140.00)	0.00
MBLK	1,2-Dibromo-3-chloropropane	ND				
LCS1	1,2-Dibromoethane	0.10	0.10	100.0	(60.00 - 140.00)	
LCS2	1,2-Dibromoethane	0.10	0.10	100.0	(60.00 - 140.00)	0.00
MBLK	1,2-Dibromoethane	ND				
DUP	Dibromochloropropane (DBCP)	ND	ND		(0.00 - 20.00)	
DUP	Ethylene Dibromide (EDB)	ND	ND		(0.00 - 20.00)	

QC Batch #60654 Volatile Organic Compounds

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	1,1,1,2-Tetrachloroethane	ND				
LCS1	1,1,1-Trichloroethane	4.00	4.49	112.2	(80.00 - 120.00)	
LCS2	1,1,1-Trichloroethane	4.00	4.26	107.0	(80.00 - 120.00)	5.3
MBLK	1,1,1-Trichloroethane	ND				
MBLK	1,1,2,2-Tetrachloroethane	ND				
MBLK	1,1,2-Trichloroethane	ND				
MBLK	1,1-Dichloroethane	ND				
MBLK	1,1-Dichloroethane	ND				
MBLK	1,1-Dichloropropene	ND				
LCS1	1,2,3-Trichlorobenzene	4.00	3.86	96.5	(80.00 - 120.00)	
LCS2	1,2,3-Trichlorobenzene	4.00	4.00	100.0	(80.00 - 120.00)	3.6
MBLK	1,2,3-Trichlorobenzene	ND				
MBLK	1,2,3-Trichloropropane	ND				

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(continued)

MBLK	1,2,4-Trichlorobenzene	ND				
MBLK	1,2,4-Trimethylbenzene	ND				
MBLK	1,2-Dichlorobenzene	ND				
MBLK	1,2-Dichloroethane	ND				
MBLK	1,2-Dichloropropane	ND				
MBLK	1,3,5-Trimethylbenzene	ND				
MBLK	1,3-Dichlorobenzene	ND				
MBLK	1,3-Dichloropropane	ND				
MBLK	1,4-Dichlorobenzene	ND				
MBLK	2,2-Dichloropropane	ND				
MBLK	2-Chlorotoluene	ND				
MBLK	4-Chlorotoluene	ND				
LCS1	Benzene	4.00	4.31	107.7	(80.00 - 120.00)	
LCS2	Benzene	4.00	4.16	104.0	(80.00 - 120.00)	3.5
MBLK	Benzene	ND				
MBLK	Bromobenzene	ND				
MBLK	Bromochloromethane	ND				
LCS1	Bromodichloromethane	4.00	4.20	105.0	(80.00 - 120.00)	
LCS2	Bromodichloromethane	4.00	4.28	107.0	(80.00 - 120.00)	1.9
MBLK	Bromodichloromethane	ND				
LCS1	Bromoform	4.00	4.12	103.0	(80.00 - 120.00)	
LCS2	Bromoform	4.00	4.24	106.0	(80.00 - 120.00)	2.9
MBLK	Bromoform	ND				
MBLK	Bromomethane	ND				
LCS1	Carbon tetrachloride	4.00	4.63	115.8	(80.00 - 120.00)	
LCS2	Carbon tetrachloride	4.00	4.22	106.0	(80.00 - 120.00)	9.3
MBLK	Carbon tetrachloride	ND				
MBLK	Chlorobenzene	ND				
MBLK	Chloroethane	ND				
LCS1	Chloroform	4.00	4.46	111.5	(80.00 - 120.00)	
LCS2	Chloroform	4.00	4.38	110.0	(80.00 - 120.00)	1.8
MBLK	Chloroform	ND				
MBLK	Chloromethane	ND				
LCS1	Dibromochloromethane	4.00	4.20	105.0	(80.00 - 120.00)	
LCS2	Dibromochloromethane	4.00	4.18	105.0	(80.00 - 120.00)	0.48
MBLK	Dibromochloromethane	ND				
MBLK	Dibromomethane	ND				
MBLK	Dichlorodifluoromethane	ND				

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

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MBLK	Ethylbenzene	ND				
MBLK	Hexachlorobutadiene	ND				
LCS1	Isopropylbenzene	4.00	4.20	105.0	(80.00 - 120.00)	
LCS2	Isopropylbenzene	4.00	4.01	100.0	(80.00 - 120.00)	4.6
MBLK	Isopropylbenzene	ND				
MBLK	Methylene chloride	ND				
MBLK	Naphthalene	ND				
MBLK	Styrene	ND				
LCS1	Tetrachloroethene	4.00	4.52	113.0	(80.00 - 120.00)	
LCS2	Tetrachloroethene	4.00	4.43	111.0	(80.00 - 120.00)	2.0
MBLK	Tetrachloroethene	ND				
MBLK	Toluene	ND				
LCS1	Trichloroethene	4.00	4.41	110.2	(80.00 - 120.00)	
LCS2	Trichloroethene	4.00	4.24	106.0	(80.00 - 120.00)	3.9
MBLK	Trichloroethene	ND				
MBLK	Trichlorofluoromethane	ND				
MBLK	Trichlorotrifluoroethane(Freon	ND				
MBLK	Vinyl chloride	ND				
MBLK	cis-1,2-Dichloroethene	ND				
MBLK	cis-1,3-Dichloropropene	ND				
MBLK	m+p-Xylenes	ND				
MBLK	n-Butylbenzene	ND				
MBLK	n-Propylbenzene	ND				
MBLK	o-Xylene	ND				
MBLK	p-Isopropyltoluene	ND				
LCS1	sec-Butylbenzene	4.00	4.08	102.0	(80.00 - 120.00)	
LCS2	sec-Butylbenzene	4.00	3.87	97.0	(80.00 - 120.00)	5.3
MBLK	sec-Butylbenzene	ND				
MBLK	tert-Butylbenzene	ND				
LCS1	trans-1,2-Dichloroethene	4.00	4.45	111.2	(80.00 - 120.00)	
LCS2	trans-1,2-Dichloroethene	4.00	4.29	107.0	(80.00 - 120.00)	3.7
MBLK	trans-1,2-Dichloroethene	ND				
MBLK	trans-1,3-Dichloropropene	ND				

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QC Batch #60656 T-22 Inorg+Gen Min ICPMS Mets

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Aluminum, Total, ICAP/MS	200	213	106.5	(85.00 - 115.00)	
LCS2	Aluminum, Total, ICAP/MS	200	214	107.0	(85.00 - 115.00)	0.47
MBLK	Aluminum, Total, ICAP/MS	ND		0.0		
MS	Aluminum, Total, ICAP/MS	200	205.	102.5	(70.00 - 130.00)	
MSD	Aluminum, Total, ICAP/MS	200	205.	102.5	(70.00 - 130.00)	0.00
LCS1	Antimony, Total, ICAP/MS	50	50.5	101.0	(85.00 - 115.00)	
LCS2	Antimony, Total, ICAP/MS	50	51.7	103.4	(85.00 - 115.00)	2.3
MBLK	Antimony, Total, ICAP/MS	ND		0.0		
MS	Antimony, Total, ICAP/MS	50	53	106.0	(70.00 - 130.00)	
MSD	Antimony, Total, ICAP/MS	50	53.9	107.8	(70.00 - 130.00)	1.7
LCS1	Arsenic, Total, ICAP/MS	20	18.7	93.5	(85.00 - 115.00)	
LCS2	Arsenic, Total, ICAP/MS	20	19.2	96.0	(85.00 - 115.00)	2.6
MBLK	Arsenic, Total, ICAP/MS	ND		0.0		
MS	Arsenic, Total, ICAP/MS	20	20	100.0	(70.00 - 130.00)	
MSD	Arsenic, Total, ICAP/MS	20	19.1	95.5	(70.00 - 130.00)	4.6
LCS1	Barium, Total, ICAP/MS	100	98.9	98.9	(85.00 - 115.00)	
LCS2	Barium, Total, ICAP/MS	100	101	101.0	(85.00 - 115.00)	2.1
MBLK	Barium, Total, ICAP/MS	ND		0.0		
MS	Barium, Total, ICAP/MS	100	103.	103.0	(70.00 - 130.00)	
MSD	Barium, Total, ICAP/MS	100	104.	104.0	(70.00 - 130.00)	0.97
LCS1	Beryllium, Total, ICAP/MS	5	5.06	101.2	(85.00 - 115.00)	
LCS2	Beryllium, Total, ICAP/MS	5	4.99	99.8	(85.00 - 115.00)	1.4
MS	Beryllium, Total, ICAP/MS	5	5.22	104.4	(70.00 - 130.00)	
MSD	Beryllium, Total, ICAP/MS	5	5.16	103.2	(70.00 - 130.00)	1.2
LCS1	Cadmium, Total, ICAP/MS	20	19.3	96.5	(85.00 - 115.00)	
LCS2	Cadmium, Total, ICAP/MS	20	19.7	98.5	(85.00 - 115.00)	2.1
MBLK	Cadmium, Total, ICAP/MS	ND		0.0		
MS	Cadmium, Total, ICAP/MS	20	20	100.0	(70.00 - 130.00)	
MSD	Cadmium, Total, ICAP/MS	20	20.3	101.5	(70.00 - 130.00)	1.5
LCS1	Chromium, Total, ICAP/MS	100	104	104.0	(85.00 - 115.00)	
LCS2	Chromium, Total, ICAP/MS	100	106	106.0	(85.00 - 115.00)	1.9
MBLK	Chromium, Total, ICAP/MS	ND		0.0		
MS	Chromium, Total, ICAP/MS	100	107.	107.0	(70.00 - 130.00)	

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

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MSD	Chromium, Total, ICAP/MS	100	107.	107.0	(70.00 - 130.00)	0.00
LCS1	Copper, Total, ICAP/MS	100	97.4	97.4	(85.00 - 115.00)	
LCS2	Copper, Total, ICAP/MS	100	98.6	98.6	(85.00 - 115.00)	1.2
MBLK	Copper, Total, ICAP/MS	ND		0.0		
MS	Copper, Total, ICAP/MS	100	102.	102.0	(70.00 - 130.00)	
MSD	Copper, Total, ICAP/MS	100	104.	104.0	(70.00 - 130.00)	1.9
LCS1	Iron, Total, ICAP/MS	500	519	103.8	(85.00 - 115.00)	
LCS2	Iron, Total, ICAP/MS	500	529	105.8	(85.00 - 115.00)	1.9
MBLK	Iron, Total, ICAP/MS	ND		0.0		
MS	Iron, Total, ICAP/MS	500	502.	100.4	(70.00 - 130.00)	
MSD	Iron, Total, ICAP/MS	500	501.	100.2	(70.00 - 130.00)	0.20
LCS1	Lead, Total, ICAP/MS	20	20.1	100.5	(85.00 - 115.00)	
LCS2	Lead, Total, ICAP/MS	20	20.5	102.5	(85.00 - 115.00)	2.0
MBLK	Lead, Total, ICAP/MS	ND		0.0		
MS	Lead, Total, ICAP/MS	20	20.8	104.0	(70.00 - 130.00)	
MSD	Lead, Total, ICAP/MS	20	20.6	103.0	(70.00 - 130.00)	0.97
LCS1	Manganese, Total, ICAP/MS	50	49.4	98.8	(85.00 - 115.00)	
LCS2	Manganese, Total, ICAP/MS	50	50.4	100.8	(85.00 - 115.00)	2.0
MBLK	Manganese, Total, ICAP/MS	ND		0.0		
MS	Manganese, Total, ICAP/MS	50	50.5	101.0	(85.00 - 115.00)	
MSD	Manganese, Total, ICAP/MS	50	50.7	101.4	(85.00 - 115.00)	0.40
LCS1	Selenium, Total, ICAP/MS	20	20.5	102.5	(85.00 - 115.00)	
LCS2	Selenium, Total, ICAP/MS	20	20.4	102.0	(85.00 - 115.00)	0.49
MBLK	Selenium, Total, ICAP/MS	ND		0.0		
MS	Selenium, Total, ICAP/MS	20	21.2	106.0	(70.00 - 130.00)	
MSD	Selenium, Total, ICAP/MS	20	21.7	108.5	(70.00 - 130.00)	2.3
LCS1	Silver, Total, ICAP/MS	50	50.2	100.4	(85.00 - 115.00)	
LCS2	Silver, Total, ICAP/MS	50	51.0	102.0	(85.00 - 115.00)	1.6
MBLK	Silver, Total, ICAP/MS	ND		0.0		
MS	Silver, Total, ICAP/MS	50	48.1	96.2	(70.00 - 130.00)	
MSD	Silver, Total, ICAP/MS	50	50.1	100.2	(70.00 - 130.00)	4.1
LCS1	Thallium, Total, ICAP/MS	20	20.0	100.0	(85.00 - 115.00)	
LCS2	Thallium, Total, ICAP/MS	20	20.4	102.0	(85.00 - 115.00)	2.0
MBLK	Thallium, Total, ICAP/MS	ND		0.0		
MS	Thallium, Total, ICAP/MS	20	20.6	103.0	(70.00 - 130.00)	
MSD	Thallium, Total, ICAP/MS	20	20.5	102.5	(70.00 - 130.00)	0.49
LCS1	Zinc, Total, ICAP/MS	100	97.4	97.4	(85.00 - 115.00)	
LCS2	Zinc, Total, ICAP/MS	100	98.0	98.0	(85.00 - 115.00)	0.61

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MBLK	Zinc, Total, ICAP/MS	ND		0.0		
MS	Zinc, Total, ICAP/MS	100	102.	102.0	(70.00 - 130.00)	
MSD	Zinc, Total, ICAP/MS	100	102.	102.0	(70.00 - 130.00)	0.00

QC Batch #60698 Aldicarbs

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	3-Hydroxycarbofuran	20.0	18.6	93.0	(85.00 - 120.00)	
MBLK	3-Hydroxycarbofuran	ND				
MS	3-Hydroxycarbofuran	20.0	20.4	102.0	(70.00 - 130.00)	
LCS1	Aldicarb (Temik)	20.0	17.3	86.5	(83.00 - 115.00)	
MBLK	Aldicarb (Temik)	ND				
MS	Aldicarb (Temik)	20.0	20.5	102.5	(70.00 - 130.00)	
LCS1	Aldicarb sulfone	20.0	17.4	87.0	(84.00 - 128.00)	
MBLK	Aldicarb sulfone	ND				
MS	Aldicarb sulfone	20.0	20.5	102.5	(60.00 - 130.00)	
LCS1	Aldicarb sulfoxide	20.0	17.0	85.0	(85.00 - 138.00)	
MBLK	Aldicarb sulfoxide	ND				
MS	Aldicarb sulfoxide	20.0	19.7	98.5	(70.00 - 130.00)	
LCS1	Baygon	20.0	19.6	98.0	(85.00 - 115.00)	
MBLK	Baygon	ND				
MS	Baygon	20.0	20.6	103.0	(70.00 - 130.00)	
LCS1	Carbaryl	20.0	19.0	95.0	(85.00 - 119.00)	
MBLK	Carbaryl	ND				
MS	Carbaryl	20.0	20.7	103.5	(70.00 - 130.00)	
LCS1	Carbofuran (Furadan)	20.0	18.6	93.0	(85.00 - 115.00)	
MBLK	Carbofuran (Furadan)	ND				
MS	Carbofuran (Furadan)	20.0	19.6	98.0	(70.00 - 130.00)	
LCS1	Methiocarb	20.0	19.6	98.0	(70.00 - 136.00)	
MBLK	Methiocarb	ND				
MS	Methiocarb	20.0	21.1	105.5	(70.00 - 130.00)	
LCS1	Methomyl	20.0	18.7	93.5	(85.00 - 115.00)	
MBLK	Methomyl	ND				
MS	Methomyl	20.0	19.0	95.0	(70.00 - 130.00)	
LCS1	Oxamyl (Vydate)	20.0	18.9	94.5	(85.00 - 115.00)	
MBLK	Oxamyl (Vydate)	ND				
MS	Oxamyl (Vydate)	20.0	19.7	98.5	(70.00 - 130.00)	

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QC Batch #60700 Endothall

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Endothall	25	24.9	99.6	(58.00 - 137.00)	
MBLK	Endothall	ND				
MS	Endothall	25	30.9	123.6	(63.00 - 126.00)	

QC Batch #60857 Herbicides by 515.1

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MBLK	2,4,5-T	ND				
LCS1	2,4,5-TP (Silvex)	0.50	0.47	94.0	(67.00 - 120.00)	
MBLK	2,4,5-TP (Silvex)	ND				
MS	2,4,5-TP (Silvex)	0.50	0.47	94.0	(42.00 - 226.00)	
LCS1	2,4-D	1.00	0.92	92.0	(72.00 - 127.00)	
MBLK	2,4-D	ND				
MS	2,4-D	1.00	0.89	89.0	(49.00 - 214.00)	
MBLK	2,4-DB	ND				
MBLK	3,5-Dichlorobenzoic acid	ND				
MBLK	4-Nitrophenol (qualitative)	ND				
MBLK	Acifluorfen (qualitative)	ND				
LCS1	Bentazon	1.00	0.90	90.0	(75.00 - 134.00)	
MBLK	Bentazon	ND				
MS	Bentazon	1.00	0.75	75.0	(70.00 - 170.00)	
MBLK	DCPA	ND				
LCS1	Dalapon (qualitative)	6.50	6.59	101.4	(40.00 - 160.00)	
MBLK	Dalapon (qualitative)	ND				
MS	Dalapon (qualitative)	6.50	6.89	106.0	(40.00 - 160.00)	
LCS1	Dicamba	0.50	0.45	90.0	(38.00 - 232.00)	
MBLK	Dicamba	ND				
MS	Dicamba	0.50	0.44	88.0	(38.00 - 232.00)	
MBLK	Dichlorprop	ND				
LCS1	Dinoseb	1.00	0.65	65.0	(0.00 - 85.00)	
MBLK	Dinoseb	ND				
MS	Dinoseb	1.00	0.68	68.0	(0.00 - 85.00)	

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LCS1	Pentachlorophenol	0.50	0.48	96.0	(36.00 - 224.00)
MBLK	Pentachlorophenol	ND			
MS	Pentachlorophenol	0.50	0.47	94.0	(36.00 - 224.00)
LCS1	Picloram	0.50	0.39	78.0	(45.00 - 138.00)
MBLK	Picloram	ND			
MS	Picloram	0.50	0.37	74.0	(45.00 - 138.00)

QC Batch #60868 Glyphosate

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Glyphosate	50	46.5	93.0	(70.00 - 130.00)	
MBLK	Glyphosate	ND				
MS	Glyphosate	50	46.7	93.4	(70.00 - 130.00)	

QC Batch #61020 Diquat and Paraquat

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
LCS1	Diquat	10.0	10.5	105.0	(70.00 - 130.00)	
MBLK	Diquat	ND				
MS	Diquat	10.0	10.0	100.0	(70.00 - 130.00)	
LCS1	Paraquat	10.0	10.6	106.0	(70.00 - 130.00)	
MBLK	Paraquat	ND				
MS	Paraquat	10.0	10.1	101.0	(70.00 - 130.00)	

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eport Summary of positive results, PR32657

Analyzed	970304002 KAPALAMA-WELL 2	Result	MDL	UNITS
3/11/97	Data Entry	03/13/97		--
03/14/97	Copper, Total, ICAP/MS	100	50.000	UGL
03/14/97	Zinc, Total, ICAP/MS	46	20.000	UGL
3/17/97	Data Entry	03/18/97		--
3/14/97	Isophorone	3.7	.500	UGL
03/05/97	Nitrate as NO3 by IC	2.6	.440	MGL
3/05/97	Nitrate-N by IC	0.6	.100	MGL
3/18/97	Data Entry	03/21/97		--
03/10/97	Data Entry	03/11/97		--
3/07/97	Calcium, Total, ICAP	15	1.000	MGL
3/06/97	Fluoride	0.51	.100	MGL