

DEPARTMENT OF WATER

County of Kauai
P. O. Box 1706
Lihue, HI 96766-5706
Phone No. (808) 245-5400 -- FAX No. (808) 245-5813

April 2, 1996

Mr. Gary Gill, Director
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
250 South King Street, 4th Floor
Honolulu, HI 96813

RECEIVED
96 APR -4 P1:17
OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

Dear Mr. Gill:

Subject: Negative Declaration for Exploratory Drilling and
Testing of Hanamaulu Well No. 2, Kauai, Hawaii

The Department of Water, County of Kauai, has reviewed the comments received by OEQC during the 30-day public comment period on the Draft Environmental Assessment (EA), which was available to the public on October 23, 1995. The agency, having addressed these comments, satisfactory to your office, has determined that this project will not have a significant environmental effect and is issuing a negative declaration. Please publish this notice in the April 23, 1996 OEQC Bulletin.

Please find enclosed a completed OEQC Bulletin Publication Form, a 3.5" diskette containing the project summary (WP5.1) and four(4) copies of the Final EA.

Please contact Wayne Hinazumi at 245-5433 should you have any questions.

Sincerely,



Murl T. Nielsen
Manager and Chief Engineer

WH:dc
Enclosures
corr:dgill:dc

1996-04-23-KA-*FEA* - Exploratory Drilling and Testing of
Hanamaulu Well # 2

APR 23 1996

FILE COPY

FINAL ENVIRONMENTAL ASSESSMENT for

**Exploratory Drilling and Testing
of Hanamaulu Well No. 2**

Hanamaulu, Kauai, Hawaii

APRIL 1996

OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

96 APR -4 P1:18

RECEIVED

PREPARED FOR:
DEPARTMENT OF WATER
County of Kauai

PREPARED BY:
R. M. TOWILL CORPORATION
420 Waiakamilo Rd., Suite 411
Honolulu, Hawaii 96817-4941

FINAL ENVIRONMENTAL ASSESSMENT for

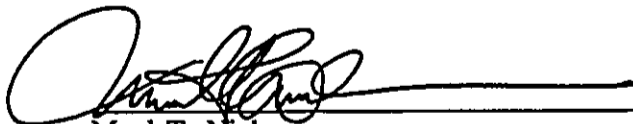
EXPLORATORY DRILLING AND TESTING OF HANAMAULU WELL NO. 2
Hanamaulu, Kauai, Hawaii

TMK: 3-8-02: Por. 2

April 1996

PROPOSING AGENCY:
Department of Water
County of Kauai
P.O. Box 1706
Lihue, Kauai, Hawaii 96766
Telephone: (808) 245-6986

RESPONSIBLE OFFICIAL:



Murl T. Nielsen
Manager and Chief Engineer

3/29/96

Date

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

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PROJECT SUMMARY

PROJECT: Exploratory Drilling and Testing of Hanamaulu Well No. 2

APPLICANT: Department of Water
County of Kauai
P.O. Box 1706
Lihue, Kauai, Hawaii 96766

TAX MAP KEY: 3-8-02: Por. 2

ACREAGE: .5 Acres

LOCATION: Hanamaulu, Kauai, Hawaii

OWNER: Lihue Plantation Co.
2970 Kele Street
Lihue, Kauai, Hawaii 96766

EXISTING LAND USES: Agriculture - Sugarcane Production

**LIHUE DEVELOPMENT PLAN
LAND USE DESIGNATION:** Agriculture

**COUNTY ZONING
DESIGNATION:** Agriculture

SECTION 1 - INTRODUCTION

1.1 Project Description

The proposed activity is to undertake exploratory drilling of a well to assess potential for potable service to commercial, residential and public uses in the Lihue District of Kauai. After drilling and preliminary testing, the well will be further constructed to meet permanent specifications. The permanent specifications of the well will include a 14-inch solid casing for the upper portion, and a 14-inch screen casing for the remaining length to the bottom. The well diameter will be approximately 20-inches. The approximate depth of the solid casing, screen casing, and well will be determined in the field.

Based on preliminary investigation by the Department of Water, County of Kauai, it is expected that this well will provide additional capacity to the Lihue District Water System.

1.2 Project Location

The proposed activity is located in the Lihue District of Kauai (Figure 1). The site is on existing sugar cane fields under cultivation by Lihue Plantation Company (TMK: 3-08-02: por. 2). The site adjoins private cane haul roads to the west and is approximately 4,300-feet southwest from the Hanamaulu Well No. 1 drilling site, near Maalo Road (Figure 2 and Figure 3).

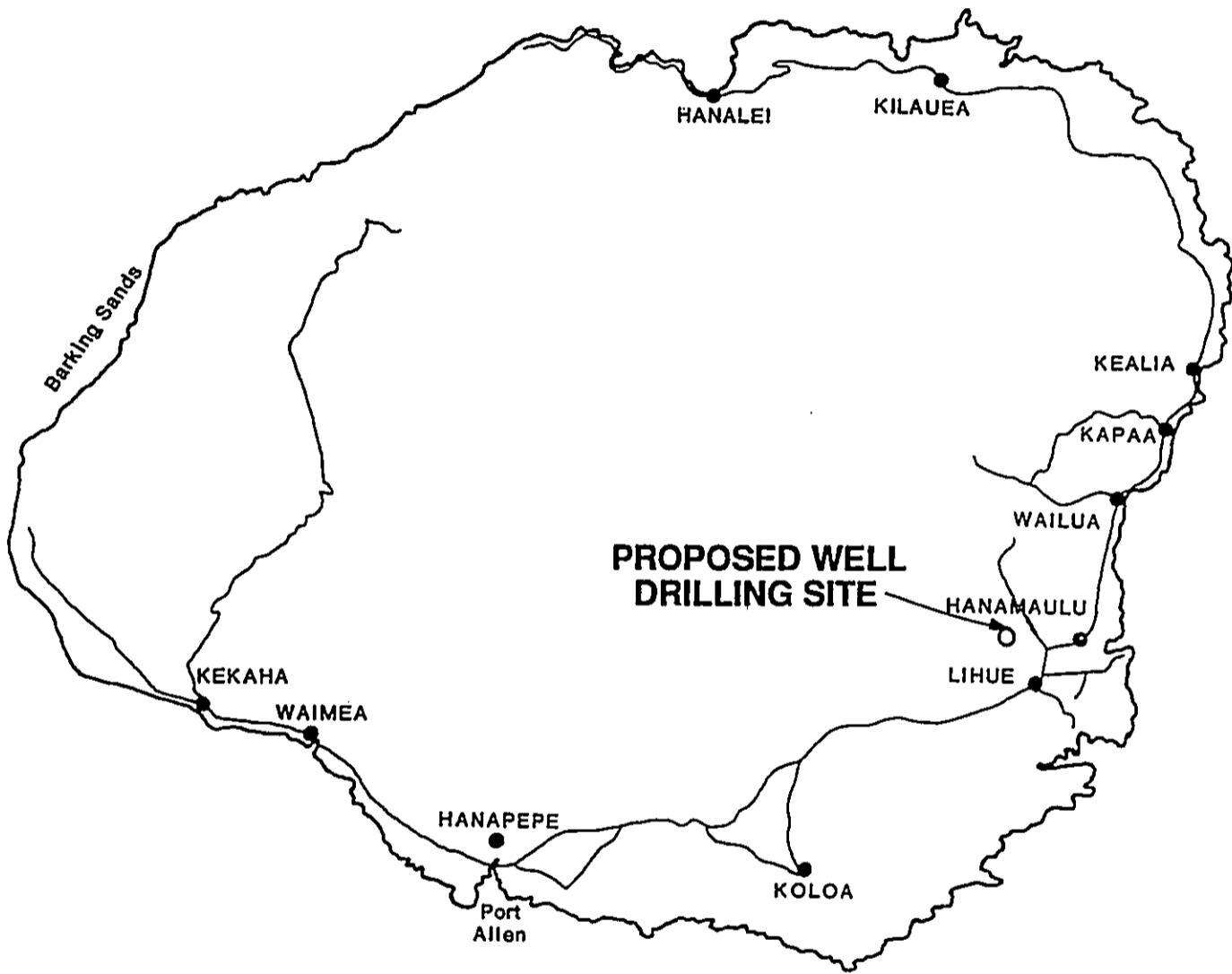
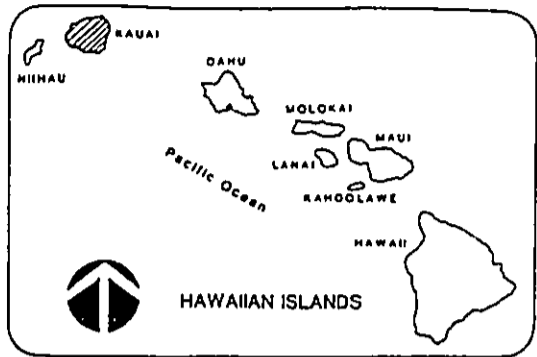


Figure 1
LOCATION MAP
 Hanamaulu Well No. 2



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OCTOBER 1995

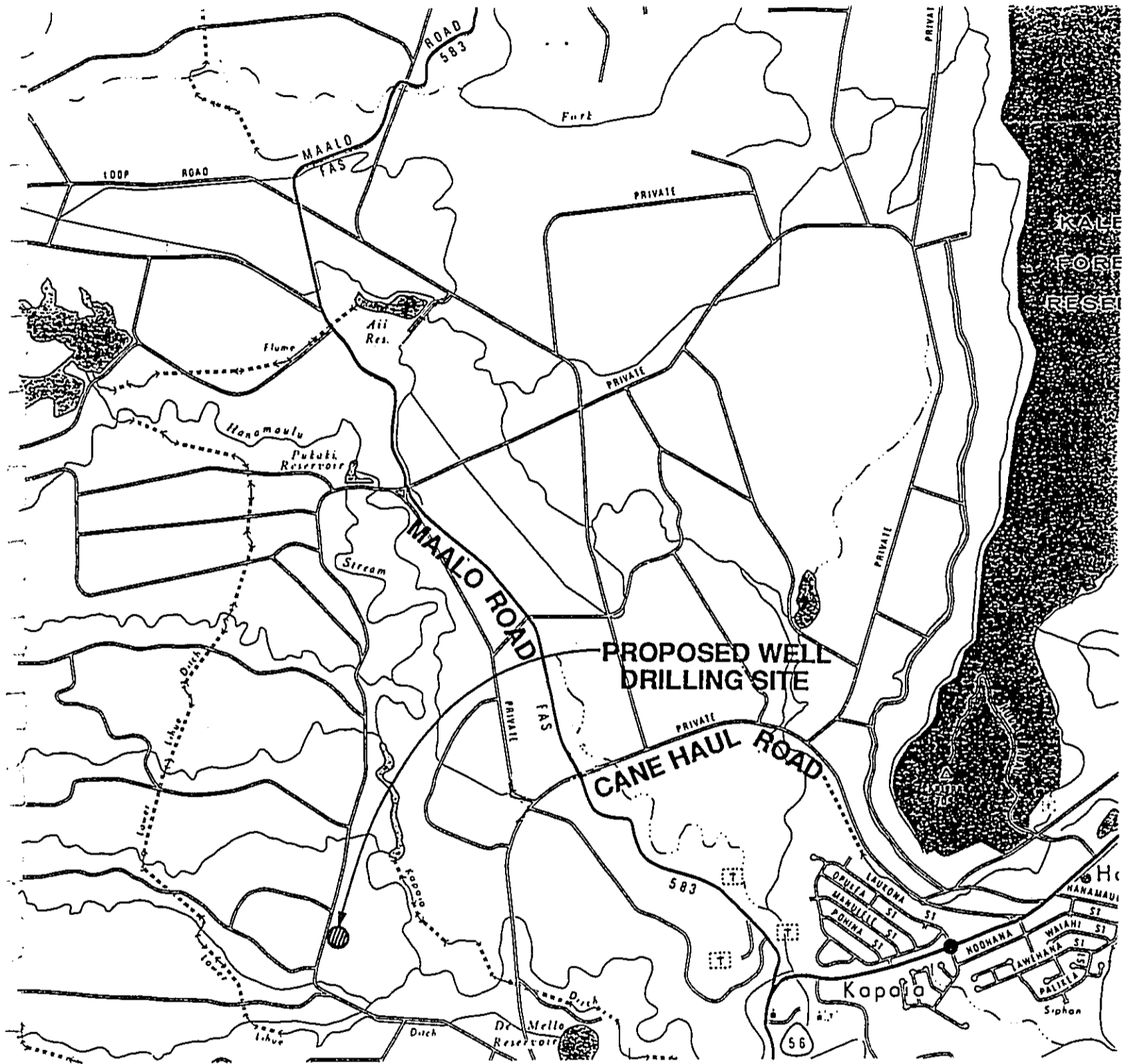


Figure 2
SITE MAP
Hanamoulu Well No. 2



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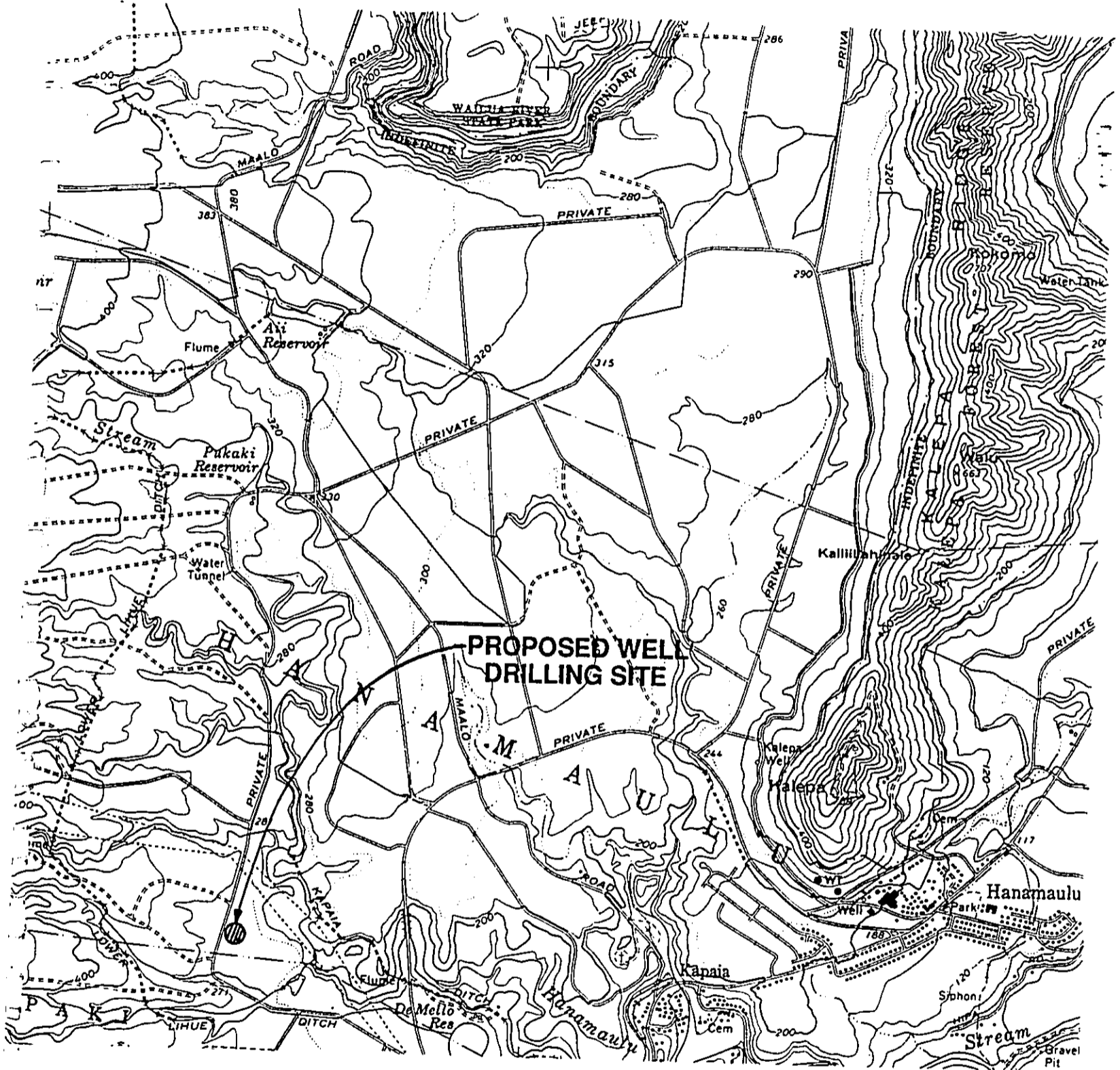
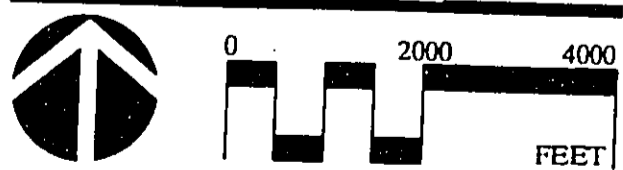


Figure 3
PROJECT LOCATION
 Hanamaulu Well No. 2



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SECTION 2 - DESCRIPTION OF THE PROPOSAL

2.1 Background

The Lihue Water System serves Lihue and Hanamaulu, and is one of the two largest public water systems on the island. The system service area is relatively large and includes: the port and commercial complexes at Nawiliwili; the adjoining Niumalu residences; Kauai Community College; Kauai High School; numerous resort hotels in the Lihue District; the residential subdivisions of Kupolo, Pua Loke, Ulu Mahi, and Ulu Ko; the central commercial district and its surrounding public, residential and industrial areas; the Lihue Airport; and the towns of Kapaia and Hanamaulu. Some of these areas were formerly served by the Lihue Plantation Company water system, which the County acquired in 1964, and incorporated into the Lihue System (A General Plan for Domestic Water, 1972).

The subject of this Environmental Assessment is to drill and test a water well on Lihue Plantation Company land, in the Lihue District, to ensure adequate supply of domestic water to existing storage facilities. According to the 1972, County of Kauai, General Plan for Domestic Water, these facilities include a 500,000 gallon concrete tank at Kalepa Ridge, the 250,000 gallon Kauai Inn Tank on Rice Street below central Lihue, and the two 100,000 gallon Grove Farm tanks near Puhi. Since the 1972 Water Plan was developed, additional storage facilities have been built to ensure sufficient capacity for future needs. These include:

- 150,000 gallon concrete tank at Puhi Tunnel;
- 500,000 gallon concrete tank at Puhi;
- 2-1,000,000 gallon steel tanks Kilohana; and
- 1,000,000 gallon storage tank at Kalepa.

2.2 Development Activity

The exploratory well will be drilled on existing Lihue Plantation Company sugar land. The land area required will be approximately one-half acre on existing grade. Ground elevation at the project site is approximately 277 feet (MSL). Well depth requirements will be assessed based on results of exploratory drilling and testing. If the results of the drilling and testing are

successful, the well will be cased with a 14-inch solid and screen casing for future development of a production well with a pump, controls, pump house, connecting pipes, and appurtenances. The 14-inch casing will be secured to the 20-inch diameter opening with cement grout. Details of this proposed well are identified in Figure 4.

It is anticipated that construction activity will be minimal since all equipment and mobilization can be accomplished using Maalo Road and the private Cane Haul Roads. The well drilling site is in sugarcane production which will greatly minimize impacts to the surrounding environment.

During well drilling valuable geological and hydrological samples will be gathered and tests will be conducted to determine yield, drawdown, recovery, and water quality at various rates of pumping. Once the tests are completed detailed data will be analyzed by the County Department of Water.

Based on prior research, it is expected that the well will be suitable for domestic water production with an estimated yield of .25 to .50 million gallons per day (mgd). However, should tests indicate the well is infeasible for production, the wellhead will be capped, backfilled, and abandoned, and all equipment mobilized to the site will be removed. These activities will not impede the future agricultural use of the area.

2.3 Cost Estimate

Preliminary costs estimates for the Hanamaulu Well No. 2 drilling are approximately \$300,000. This activity will be funded by the State funds.

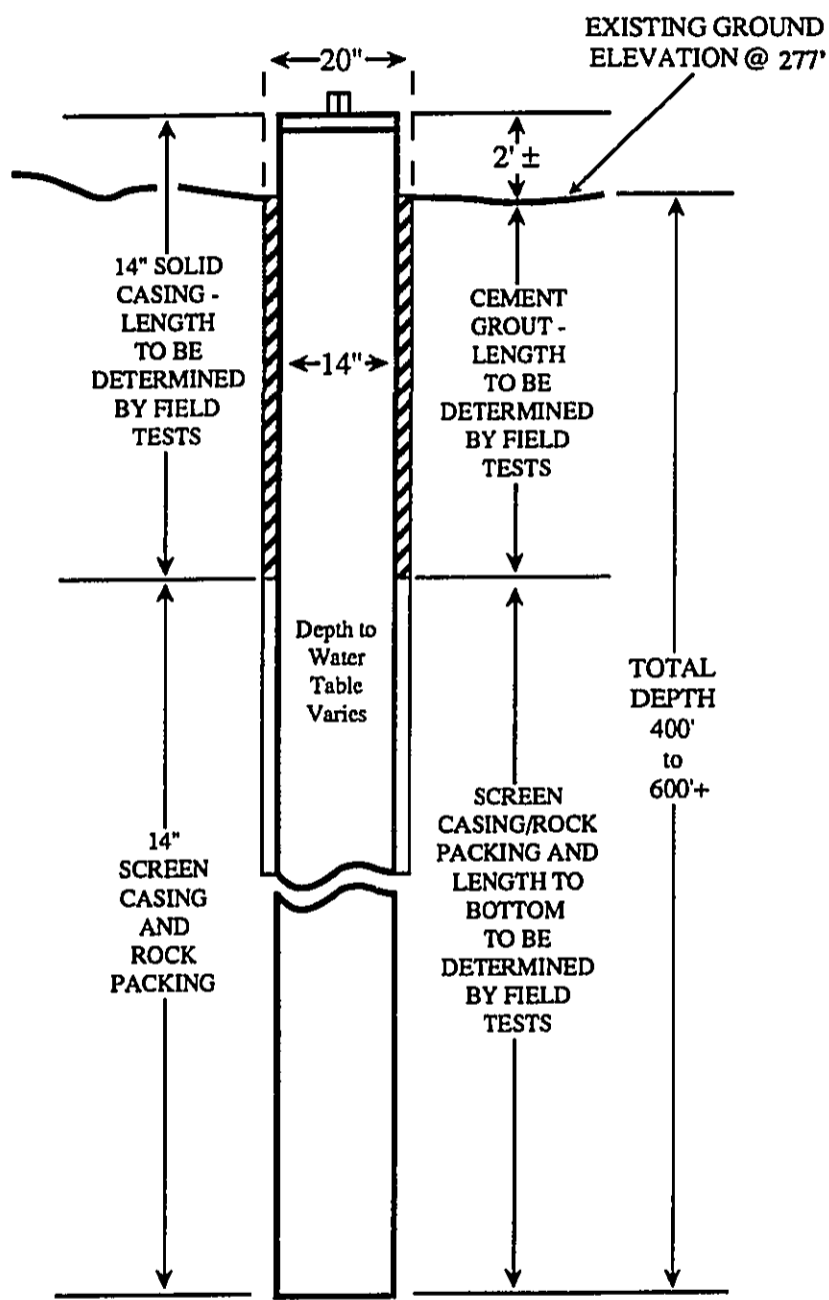


Figure 4
CROSS-SECTION (Not to Scale)
 Hanamaulu Well No. 2

Department of Water
 County of Kauai

R. M. TOWILL CORPORATION
 OCTOBER 1995

SECTION 3 - DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Physical Environment

TOPOGRAPHY

The project location is approximately 3 miles west of Hanamaulu Bay, located on the east coast of Kauai. Grade at this site is approximately 2 to 8 percent, gently sloping from west to east. Figure 3, provides additional topographical information.

GEOLOGY

Information on soil types were obtained from the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii," as prepared by the U.S. Department of Agriculture, 1972.

According to the Soil Conservation Service, the soil classification at the subject location is the Puhi Series. The Puhi series consists of well-drained soils on uplands on the island of Kauai. These soils developed in material derived from basic igneous rock. They are nearly level to steep. Elevation range from 175 to 500 feet. The annual rainfall amounts to 60 to 80 inches. The mean annual soil temperature is 73°F. Puhi soils are geographically associated with Lihue and Kapaa soils.

The specific soil type at the proposed drilling site is Puhi silty clay loam (PnB), which is found on 2 to 8 percent grade slopes. On this soil runoff is slow and the erosion hazard is slight.

CLIMATE

Kauai lies just south of the Tropic of Cancer and has a mild semitropical climate, dominated by the northeast tradewinds which blow approximately 80 percent of the time. The tradewinds are sometimes interrupted by cyclonic disturbances, usually during the winter months, commonly referred to as Kona Storms.

At elevations below 300 feet, such as the proposed drilling location, the mean monthly temperatures range from 69°F in February and March to about 77°F during August through October (Kukuiula Planned Community EIS, April 1989).

HYDROLOGY

The well is located within the State designated Hanamaulu Aquifer System, which has an estimated sustainable yield of 40 mgd. The well will be drilled into Koloa volcanic rock erupted from Kilohana Crater. The Koloa Volcanic rock are post erosional and much younger than the main shield-building lavas of the Waimea Canyon series and Napili Volcanic Series (Macdonald, Davis, and Cox, 1960).

The well will tap ground water from perched aquifers within the Koloa Volcanics. Because the Koloa Volcanics consist of interbedded lava flows and pyroclastic deposits, the possibility of encountering many different aquifers during drilling is possible. Therefore, water levels may also change during drilling.

At the present time return irrigation water has been seen in streams near the well site. However, at depth the water level will drop to a lower elevation and will necessitate careful monitoring of water levels during drilling (Glenn Bauer, Commission on Water Resource Management, DLNR, March 5, 1993).

BIOLOGY

The Lihue Plantation Company has utilized the proposed site for sugar cultivation over the last several decades. Native vegetation at this site has long since been replaced by sugarcane. Existing vegetation surrounding the location consist primarily of introduced species such as guava, javaplum, eucalyptus, pangolagrass, and california grass.

No threatened or endangered fauna have been known to inhabit the site. Introduced species such as the Common Indian Mynah (Acridotheres tristis), House Sparrow (Passer domesticus), Spotted or Lace-necked Dove (Streptopelia chinensis), Barred or Zebra Dove (Geopelia striata), and Cardinal (Cardinalis cardinalis) have been observed at the project location. Mammals such as stray cats and rodents including the Roof Rat (Rattus rattus) and Norway Rat (Rattus norvegicus) are known to inhabit the surrounding area.

AIR QUALITY

No information was obtained on air quality. It is assumed the subject activity will have little or no impact on air quality since the project will not require use of industrial facilities and is proposed to be of limited duration.

NOISE

No information was obtained on ambient noise levels. The proposed activity will be adjacent to a sugarcane field. The nearest residential area is Kapaia, located to the east, approximately 6,000 to 6,500 feet away.

ARCHAEOLOGY

The proposed well drilling site is within a sugarcane field which has been under continuous use for several years. If any potential remains existed at this site such remains or deposits would have been recovered or destroyed during the cultivation of the field. According to DLNR, State Historic Preservation Division, "It is highly unlikely that significant historic sites are present in the proposed project location. We concur with your comments on this project" However, should any unidentified deposits be uncovered during well drilling activities, work will cease in the immediate area and the State Historic Preservation Officer will be contacted.

FLOOD HAZARD

Flood hazard data was not obtained for the project site. The subject location is on high ground (approximately 277 feet elevation) and therefore, flooding is not anticipated to be a problem.

3.2 Socio-Economic Environment

POPULATION

In 1990, the population of Kauai was 51,177 persons, a 29.9 percent increase since 1980. The Lihue District, location of the subject proposal, contains 10,663 persons, representing approximately 21 percent of Kauai's population.

PROJECTED GROWTH

According to the Department of Business, Economic Development and Tourism (DBEDT), population growth on Hawaii's neighbor island counties is expected to nearly double between 1985 and 2010. Projections for Kauai County indicate an estimated increase from approximately 45,400 persons in 1985, to nearly 84,000 persons by 2010, representing a growth rate of approximately 85 percent (Population and Economic Projections for the State of Hawaii to 2010, November 1988).

LABOR AND ECONOMY

The economy of Kauai continues to rely heavily on tourism, with related services and trades as its major industries. Personal income earned in 1989 by Kauai residents totalled \$790 million. Average per capita income was \$15,585. In inflation adjusted dollars, the 1989 per capita income was 4.9 percent higher than in 1988. The job count in 1990 by industry showed the service and trade categories with 7,600 and 7,050 positions respectively. The agriculture sector showed 1,150 jobs, 950 of which were in the sugar industry.

SECTION 4 - PROBABLE IMPACTS OF THE PROPOSED PROJECT AND MITIGATION MEASURES

4.1 Short Term Impact

Short term impacts resulting from the subject proposal are expected to be minimal. Construction work will be limited to daily traffic through Maalo Road and a privately owned cane haul road; noise of the drilling rig; and related mobilization activities.

The drilling rig will be powered by an internal combustion engine and will be muffled in accordance with standard equipment operating practices. The work will be limited to daylight hours, and the noise generated should have no impact on the surrounding sugarcane operations. The nearest residential community, Kapaia, is located approximately 6,000 feet distant, and therefore is not expected to be affected by construction noise. Engine exhausts cannot be avoided but will be governed in accordance with applicable state and county regulations.

Erosion and dust disturbances are expected to be slight and insignificant to the surrounding sugarcane operations. All work will be in accordance with applicable County ordinances. Water will be discharged from the site during testing procedures, and will be directed to the nearest existing drainageway.

4.2 Long Term Impact

No long term adverse impacts are expected for the subject activity. The land required for the well is approximately one-half of one acre, and will require that land necessary to the well be removed from sugar cultivation. This is not anticipated to have a major effect on the broader scale of sugar operations at Lihue Plantation.

Should the water well prove infeasible all on-site drilling equipment will be removed, the well head will be capped, and the land will be returned to existing preconstruction conditions. Upon completion of demobilization, the land can be returned to existing agricultural uses.

The successful development of the well will provide an additional potable resource which will be a factor in facilitating the future economic development of the Lihue District.

SECTION 5 - RELATIONSHIP TO STATE AND COUNTY LAND USE PLANS AND POLICIES

5.1 Existing Land Use

The site is utilized by the *Lihue Plantation Company* for cultivation of sugarcane. The site has been in continuous sugar production for several decades. Maalo Road (FAS 583) is approximately 4500-feet from the project site to the north-east. Directly to the north and to the east are private cane haul roads used by Lihue Plantation to access sugar fields in the area. Drainage ditches surround the project site.

5.2 State Land Use District

The State Land Use District classification system designates the project site in the Agricultural District. According to State Land Use District Regulation, Part III, Section 3-3, the water well is a permitted use:

"Public, private, and quasi-public utility lines, and roadways, transformer stations, solid waste transfer station, etc., and appurtenant small buildings such as booster pumping stations, but not including offices or yards for equipment, material, vehicle storage, repair or maintenance, treatment plants and major storage tanks not ancillary to agricultural practices, or corporation yards or other like structures."

5.3 County of Kauai - General Plan and Zoning

The proposed activity is consistent with the County of Kauai General Plan, which states as its goals,

"To promote and protect the health, safety and welfare of all residents and visitors;
and,

To promote the improvement and expansion of the island's economy, by recognizing and carefully utilizing land and water resources" (County of Kauai

General Plan, Section 7-2.1, June 21, 1984).

The proposed activity is being developed to ensure the continued health, safety and welfare of Kauai's people through the continued provision of a basic public need - potable water. Provision of sufficient water resources in turn, facilitates improvement and expansion of Kauai's economy through ensuring sufficient conditions necessary for economic development.

5.4 County of Kauai - Lihue Development Plan

The proposed activity is consistent with the goals of the *Lihue Development Plan*, which identifies need for conditions suitable for long-term economic growth:

"(2) GOAL: Develop Lihue as a More Active and Competitive Commercial, Business and Financial Center; and

(5) GOAL: Improve Health and Safety - (B): Encourage development of more water sources, to support present and planned activities" (County of Kauai, Lihue Development Plan, Section 10-5.1, June 21, 1984).

5.5 County of Kauai - Zoning

Zoning for the subject location is Agriculture. According to County of Kauai Zoning Ordinance No. 164, public utilities and facilities are a permitted use in all zoning districts.

5.6 Hawaii Water Plan, Kauai Water Use and Development Plan

According to the Hawaii Water Plan, Kauai Water Use and Development Plan, February 1990, well capacity for the Lihue water system is approximately 6.9 mgd. Water demand for Lihue in 1988 was 2.5 mgd. In 2010, water use is anticipated to rise to 5.9 mgd, with an ultimate demand of 8.6 mgd. The General Plan for Domestic Water Update, Kauai, December 1992, indicates current Lihue system demand at approximately 3.3 mgd. The proposed Hanamaulu Well No. 2 is an exploratory well, which if developable, will assist in meeting Lihue's future demand for water resources.

SECTION 6 - ALTERNATIVES TO THE PROPOSED ACTION

The selection of the proposed test well is based on previous research by the State Department of Land and Natural Resources and the County of Kauai Department of Water. Favorable hydrogeological conditions prompted the selection of the test site over other locations after comparing road access, available power requirements, geology and slope conditions.

The no action alternative is unacceptable because water demand within the Lihue District will continue to increase. If existing source capacity cannot be upgraded future demand for water service will be delayed pending future water source development. This will affect future economic development and will hinder the County of Kauai's ability to ensure basic potable water service.

**SECTION 7 - RELATIONSHIP BETWEEN LOCAL SHORT TERM USES AND
MAINTENANCE AND ENHANCEMENT OF LONG TERM PRODUCTIVITY**

The short-term and long-term intent of the project is to ensure provision of potable water for public use. Project activities related to well drilling will not affect on-going agricultural land practices since the project site will not adversely affect continuing cultivation of sugarcane.

The effort to provide potable water will be consistent with the need to provide for the long term growth of the Lihue District.

**SECTION 8 - IRREVERSIBLE AND IRRETRIEVABLE
COMMITMENT OF RESOURCES**

Development of the proposed project will involve the irretrievable loss of certain material and fiscal resources. These will include construction materials, personnel, energy resources and mobilization costs. However, costs associated with use of these resources should be evaluated in light of major benefits to the residents of the Lihue District and the County of Kauai.

It is expected that construction associated with the project will commit the necessary construction materials and human resources (in the form of engineering, labor, management and other functions). Reuse for much of these materials and resources is not practicable. Labor will be compensated during various stages of work.

SECTION 9 - NECESSARY PERMITS AND APPROVALS

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

In order to develop the well site, a well drilling permit will need to be obtained from the Department of Land and Natural Resources, Commission on Water Resource Management (HRS, Chapter 174C). Relevant information including composition of materials, pump capacity, casing, rock packing and other details will need to be provided.

DEPARTMENT OF HEALTH

Upon successful testing of the proposed water well, approval for source development will be required from the State Department of Health, for connection to a public water system (Public Health Regulations, Chapter 20, Title II, Potable Water Systems).

SECTION 10 - CONSULTED AGENCIES AND ORGANIZATIONS

Department of Planning
County of Kauai
4280 A Rice Street
Lihue, Kauai, Hawaii 96766

Department of Health
Kinau Hale
1250 Punchbowl Street
Honolulu, Hawaii 96813

State Historic Preservation Division
Department of Land and Natural Resources
33 South King Street
Honolulu, Hawaii 96813

Commission on Water Resource Management
Department of Land and Natural Resources
1151 Punchbowl Street, Room 227
Honolulu, Hawaii 96813

Lihue Plantation Company, Ltd.
2970 Kele Street
Lihue, Kauai 96766

SECTION 11 - DETERMINATION

The action being proposed is intended to benefit both residents and visitors to the Lihue District of Kauai. The foregoing discussion indicates there will no adverse environmental or socioeconomic impacts according to statutes of Chapter 343, Hawaii Revised Statutes (HRS), and Section 11-200-12, State of Hawaii, Administrative Rules.

It is therefore recommended that an Environmental Impact Statement not be required, and that a negative declaration be issued for this project.

SECTION 12 -
COMMENTS AND RESPONSES TO THE DRAFT
ENVIRONMENTAL ASSESSMENT

BENJAMIN J. CAYETANO

GOVERNOR



GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4186
FACSIMILE (808) 586-2452

November 21, 1995

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DKF	

Mr. Murl T. Nielsen, Manager
Department of Water
County of Kauai
P.O. Box 1706
Lihue, HI 96766

Dear Mr. Nielsen:


Subject: Draft Environmental Assessment for the Exploratory Drilling
and Testing of Hanamaulu Well No. 2

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

1. The proposed well is located within the State designated Hanamaulu Aquifer System, which has an estimated yield of 40 mgd. How much of this water has been allocated to various parties? How much of this water is presently being used?
2. Would the proposed withdrawal affect any adjacent streams? If so, what are the impacts and mitigation measures?
3. This project assumes a population growth rate of 85% from 1985 to 2010. The growth assumption is based on a study conducted in 1988. Is this projection still valid today? Is there a more recent projection? If so, would there still be a need for this project with the newer projection?
4. This environmental assessment examines issues relating to exploratory drilling and testing. If and when the well is considered for production, a new environmental assessment must be prepared to discuss issues relating to well production.

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

Sincerely,


Gary Gill
Director

c: James Yamamoto, R.M. Towill Corporation

FILE COPY

R. M. TOWILL CORPORATION

420 W Alakamilo Rd. #411 Honolulu, HI 96817-4041 (808) 842-1133 Fax (808) 842-1937

December 20, 1995

Mr. Gary Gill
Director
Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Gentlemen:

Attention: Mr. Jeyan Thirugnanam

Subject: Draft Environmental Assessment for the Exploratory Drilling and Testing of Hanamaulu Well No. 2

We have received your letter dated November 21, 1995. The following has been prepared in response to your comments..

Item 1. The aquifer is not designated by the Commission on Water Resource Management. The 1992 draft Kauai Water Use and Development Plan (WUDP) states that 3.28 million gallons per day (mgd) is withdrawn from the Hanamaulu Aquifer. The Department of Water has well capacity up to approximately 5.85 mgd and usually pumps for no more than 16 hours a day. This equates to an actual maximum pumpage capability of 3.9 mgd.

The Commission on Water Resource Management has a tabulation of water registrations which is different from water allocations. This data is available from the Commission. The water registrations can differ from actual water use and indicate the potential existing maximum water use for an aquifer. Wells with capacities totalling 11.44 mgd are registered with the Commission in the Hanamaulu aquifer but actual water use is much less due to actual field conditions.

Item 2. The proposed well will not affect nearby streams significantly. The nearby streams in the vicinity of the well have significant watersheds that supply them with water mauka of the proposed well. The proposed well is intended to pump no more than 350 gallons per minute.

Engineers • Planners • Photogrammetrists • Surveyors

Construction Managers • Environmental Services

Item 3. The Office of State Planning in their State Land Use District Boundary Review published in 1992 uses the projected a de facto population increase of 71 percent from 70,100 to 120,300. It is still based on the Department of Business and Economic Development, Population and Economic Projections for the State of Hawaii to 2010, Dated November 1988. This is the population projection that the County Planning Department intends to use for their long range planning.

Item 4. Your comment has been noted.

Very truly yours,


James H. Yamamoto, PE
Project Manager

JY/jy

REFERENCES
(Arranged In Chronological Order)

- Hawaii Division of Hydrography, 1960. Bulletin 13, Geology and Ground-Water Resources of the Island of Kauai, Hawaii. Gordon A. Macdonald, Dan A. Davis, and Doak C. Cox. Geological Survey, U.S. Department of the Interior.
- Division of Land and Water Development, February 1972. A General Plan for Domestic Water/Island of Kauai. Prepared for Department of Water, County of Kauai, Report R40. Department of Land and Natural Resources, Honolulu, Hawaii.
- Soil Conservation Service and University of Hawaii, 1972. 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 Agriculture Experiment Station, Washington, D.C.
- Kauai County Code, 1987. Title IV. County Planning and Land Development, Chapter 7. The General Plan for the County of Kauai. General Ordinances of the County of Kauai, State of Hawaii.
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