

**DEPARTMENT OF WATER**

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

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OFFICE OF ENVIRONMENTAL  
QUALITY CONTROL

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GMP ASSOCIATES, INC.  
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April 5, 1995

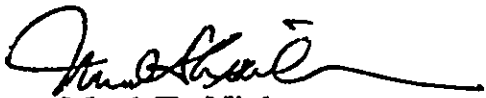
Mr. Gary Gill, Director  
Office of Environmental Quality Control  
220 South King Street, 4th Floor  
Honolulu, HI 96813

RE: Negative Declaration for Koloa Well "F"  
TMK: 2-9-3:1, Koloa, Kauai, Hawaii

The County of Kauai, Department of Water, has reviewed the comments received during the 30-day public comment period which began on January 8, 1995. The Department of Water has determined that this project will not have a significant environmental effect and has issued a negative declaration. Please publish this notice in the April 23, 1995 OEQC Bulletin.

We have enclosed a completed OEQC Bulletin Publication Form and four copies of the Final EA.

Please contact Melvin Matsumura at 245-5410 if you have any questions.



Murl T. Nielsen  
Manager & Chief Engineer

dc  
Enclosures  
cc: GMP Associates, Inc.

1995-04-23-RA-FA-Koloa Well "F" Exploratory Drilling  
and Testing APR 23 1995

FINAL  
ENVIRONMENTAL ASSESSMENT  
AND  
NEGATIVE DECLARATION  
FOR

Exploratory Drilling and Testing  
of the Koloa Well "F"  
TMK: 2-9-3:1


Koloa-Poipu Water System  
Koloa, Kauai, Hawaii  
Job No. 92-4

THIS ENVIRONMENTAL DOCUMENT WAS PREPARED  
PURSUANT TO  
CHAPTER 343, HAWAII REVISED STATUTES


Proposing Agency:

Department of Water  
County of Kauai  
P. O. Box 1706  
Lihue, Hawaii 96766-5706

Responsible Official:

  
Murl T. Nielsen  
Manager and Chief Engineer

Date:



Prepared By:  
GMP Associates, Inc.  
841 Bishop Street, Suite 1501  
Honolulu, Hawaii 96813

April 1995

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## 1.0 INTRODUCTION

### 1.1 Background

The County of Kauai, Department of Water, has identified a need to develop an additional potable water well source for the Koloa-Poipu Water System in Kauai. The scope of this Environmental Assessment is the exploratory drilling and testing of a deep well for Koloa Well "F". If test results prove successful, the second phase of work would include pump installation, access road and utility construction and building a water pipeline to connect with the existing transmission system.

In December 1992, preliminary well site selection surveys were prepared by the State Department of Land and Natural Resources, Division of Water and Land Development. Four geologically favorable sites for Koloa Well "F" were investigated (see Figure 1). The preferred site is situated approximately 1,500 feet east of Koloa Well "C" and 2,500 feet east of Koloa Well "D" (see Figure 2).

The Koloa Well "F" is at an elevation of 130 feet above mean sea level, similar to wells "C" and "D". Koloa Well "F" will have a depth of approximately one hundred and sixty feet (160') for a 12-inch diameter steel casing in an 18-inch diameter hole. An additional 100 to 200 feet of 10-inch diameter open hole will be drilled if required. The well may yield approximately 700 to 800 gallons per minute, or about

1,000,000 gallons per day; but, this is highly variable, depending on pumping rates and well tests. The main advantage of the preferred site is that it would be the least expensive to develop and connect to the existing water system of the four alternates identified by DLNR.

#### 1.2 Applicant and Approving Agencies

This Environmental Assessment is being prepared for the County of Kauai, Department of Water as applicant or proposing agency. As shown in Figure 3, the site of Koloa Well "F" is outside of State Conservation District Land (Limited Use subzone). This situation requires a boundary interpretation by the State Department of Business, Economic Development & Tourism, Land Use Commission. A copy of their boundary interpretation is attached. The use of County of Kauai, Board of Water Supply funds also means that the Kauai County, Department of Water shall also approve the findings of this Environmental Assessment.

Other permit approvals related to the exploratory well drilling are: Department of Land and Natural Resources, Commission on Water Resource Management, exploratory well drilling permit; State Department of Health, Clean Water Branch, National Pollutant Discharge Elimination System (NPDES) permit to discharge and dispose of drilling fluids and

well pump test waters; County of Kauai, Public Works Department, grading and grubbing permits; and a Public Works building permit.

1.3 Agencies Consulted

The following list of public and private entities have been contacted and/or consulted in the preparation of this Environmental Assessment for exploratory water well drilling and testing:

Agency	Input
• Kauai Co., Planning Dept.	Zoning, General Plan
• Kauai Co., Public Works Dept.	Grading and Grubbing Permits
• Grove Farm Company, Inc.	Land Owner, Site Access
• McBryde Sugar Co., Ltd.	Site Access and ROW/Easement
• State Dept. Land and Natural Resources	
- Commission on Water Resource Management	Well Drilling Permit
- Historic Preservation Division	Archaeological Resources
- Water and Land Development Division	Preliminary Well Sites
• State Department of Health	
- Clean Water Branch	NPDES Permit
• Land Use Commission	Conservation District Boundary
• Office of Environmental Quality Control	Public Notice of EA

## 2.0 GENERAL DESCRIPTION OF ACTION

### 2.1 Technical Description

This action will involve drilling an exploratory potable water well approximately 360 feet deep and nominally twelve (12) inches in diameter for the well casing and eighteen (18) inches for the open hole. The well head will be at approximately 130 feet above mean sea level. The bore is planned to avoid alluvium being entirely within Napali Volcanics. If the water quality and yield of the exploratory well tests in the 12-inch well are satisfactory, then a permanent well bore approximately 22 inches in diameter could be reamed out for a 16-inch well casing. The exploratory phase of this project will require clearing a temporary access road approximately 10 feet wide by 1,200 feet in length. The drilling site to be cleared and grubbed is approximately 40 feet by 60 feet. Thus, the total area for access and drilling is approximately one-third of an acre in size (see Figure 4). The temporary access road will connect to an existing plantation road (Mahaulepu Road) and follow the edge of a sugar cane field. The well site is at the base of a ridge on a rock outcrop adjacent to the sugar cane field.

If the well is found suitable and placed into production, the following improvements would be included at the site:

paved access road surface, permanent storm drain appurtenances, power distribution lines and poles, submersible pump and controls, chain link fence and gate, valves and water transmission piping.

The exploratory well drilling should occur around June 1995. The permanent well installation could take place between September and December 1995.

## 2.2 Socio-Economic Impacts

The addition of a potable water well to the Koloa-Poipu water system will have a minimal detrimental socio-economic impact on the island of Kauai. Approximately one-quarter of an acre of agricultural land may be taken out of production for road and utility access to the site. About six-tenths of an acre of limited use conservation district land would be converted to public utility. The County of Kauai, Department of Water would have additional well operating and maintenance expenses to be included in their annual budget.

The additional potable water resource would add to the available supply in the Koloa-Poipu area of Kauai. This would sustain additional consumption in the form of increased demand or future growth of the distribution system. A 750-gpm well could meet the future demand for approximately 5,000 more residents. The actual capacity, size and depth of Well "F" will be based on pump test results.



The Kauai County funding for exploratory well drilling and testing was obligated in Fiscal Year 1992. The work to prepare this Environmental Assessment and contract documents for exploratory well drilling and testing had been delayed two years due to Hurricane Iniki, which struck Kauai in September 1992. The result of delay has not hampered local growth due to the magnitude of devastation in the Koloa-Poipu area of Kauai. This area is currently under going storm-related reconstruction. However, the delay of well development by two years tends to also increase the well drilling and testing costs by approximately 10 percent per year.

### 2.3 Environmental Characteristics

The short-term impacts of the proposed action to drill an exploratory water well will have a minimum impact upon the affected environment. The Koloa Well "F" site is at the eastern base of a 500-foot high ridge (see Figure 5, Site Photographs). It is surrounded to the north, east and south by sugar cane fields. The site is about a mile east of the McBryde sugar mill at Koloa and over two miles from the towns of Koloa and Poipu. Noise and dust generated by clearing the site, drilling and testing the exploratory water well would not directly affect any existing or proposed residence or public facility within a two-mile radius. The conformance with Best Management Practices to control storm water runoff from the site shall satisfy the NPDES permit for construction

from the site shall satisfy the NPDES permit for construction related activities. The site is not in a flood zone or coastal high hazard area. Traffic generated by construction activity would not be significant in the town of Koloa. All track driven heavy equipment would be transported on rubber tired vehicles over the paved, public roads. A maximum of one or two vehicles per day is anticipated to enter and exit the site.

The work will be coordinated between the drilling contractor, Kauai Department of Water, Grove Farm Company, Incorporated, and McBryde Sugar Co., Ltd., to minimize any potential disruptions to the landowner and their lessee. The sugar cane field immediately adjacent to the site has been harvested and currently lies fallow. However, company personnel interviewed on site indicated that planting of a new crop may occur within the next six months, after a drip line irrigation system is installed.

### 3.0 IMPACTS AND MITIGATIVE MEASURES

#### 3.1 Affected Environment

There are no known threatened or endangered species of flora or fauna within the immediate vicinity of the project site. No significant or sensitive habitats would be affected by the proposed action. No historical or archaeological

resources have been previously surveyed or are known to exist within the immediate vicinity of the site.

An irrigation ditch does flow through the cane field adjacent to the site. The proposed access road would cross this ditch. Flow was not observed in this ditch during site visits in June 1994. Another irrigation ditch exists above the well site, but this would not be impacted by the proposed action. Construction of an access road would require installation of a 24-inch diameter reinforced concrete cylinder or high density polyethylene (HDPE) pipe culvert and reinforced concrete cement headwalls. As previously stated, Best Management Practices for controlling storm water runoff during construction would be in place to prevent silt and/or sediment from entering the ditch. It should be noted that this ditch is part of an extensive irrigation system used for watering the sugar cane fields operated by McBryde Sugar Co.

### 3.2 Major Impacts

There is only one long-term major impact which has been identified as resulting from the proposed action. Chloride concentration may increase in the well field over time. This is due to increased pumpage at the makai end of the ridge and a large plantation pump, which exists mauka and up gradient from the Kauai Department of Water well field. This long-term potential increase in chloride concentration of the well field

is not quantifiable for the purpose of this Environmental Assessment.

### 3.3 Proposed Mitigation Measures

There are three alternatives to mitigate the potential negative long-term impact of increased chloride concentration in the well field. The first would be to not construct Koloa Well "F" in its proposed location. The location of this water well at an alternative site would be mauka of the proposed placement. That would raise construction costs putting the well head at a higher elevation and increase the length of access road and pipeline required to connect the relocated well with the existing Koloa-Poipu water system. More grading would result and a deeper well would require higher construction and maintenance costs also.

A second alternative to limit the potential long-term impact of increased chloride concentration in the well field would be to limit the pumpage of the Koloa Plantation Wells. That, however, is subject to legal agreements beyond the scope of this Environmental Assessment.

The "DO NOTHING" alternative would be not to construct this water well. This would eliminate a badly needed additional source to provide water for future growth, peak demands and emergencies. To not proceed with the project will affect the reliability of water service in the Koloa-Poipu area. This alternative is not feasible, because the proposed

well is essential to the planned growth of the Koloa-Poipu area.

Therefore, the long-term monitoring of chloride levels in all local wells should be used to generate data which can be compared to anticipated levels as a means of documenting the effect of Well "F". A well field model may be able to predict, based on pumpage rates, when chloride levels will reach maximum allowable concentration levels. This should provide adequate time to develop appropriate strategies addressing legal, technical and public policy issues.

The drawdown occurring during the testing phase of Well "F" will be monitored by using the closest production well ("C") as an observation well. Existing Well "C" would need to be shut down during Well "F" tests, to insert an airline and 0.2-pound, calibrated recording gage. However, results are uncertain if measurements will be appreciable with the 1,500-foot distance between the testing (Well "F") and the observation (Well "C") wells.

The immediate short-term construction impacts will be mitigated by the appropriate Best Management Practices included in Appendix A.

#### 4.0 NOTICE OF DETERMINATION

##### 4.1 Notice of Negative Declaration

The proposed project will not have any significant, adverse impacts on the natural environment since grubbing, grading and above ground features for the exploratory well drilling will be minimal. A successfully tested, completed well is needed for the planned growth water demand of the Koloa-Poipu area.

This Environmental Assessment indicates that the proposed project will not:

- A. destroy any natural or cultural resources such as historic or archaeological sites,
- B. affect any rare or endangered species of flora or fauna,
- C. result in substantial degradation of environmental quality,
- D. negatively affect the economic or social welfare of the community,
- E. have detrimental effects on the public's health, and
- F. curtail the beneficial uses of the environment.

Based on the preceding paragraphs, it has been determined that the proposed project will not have any significant, adverse effects on the environment and, accordingly, an Environmental Impact Statement would not be required. Consequently, a Negative Declaration is found to be appropriate for this proposed exploratory well drilling and testing project.

APPENDIX A

BEST MANAGEMENT PRACTICES

The exploratory drilling and testing of Koloa Well "F" will require construction of a temporary access road approximately 1,200 feet long by 10 feet wide. The drilling site to be cleared and grubbed is approximately 40 feet by 60 feet in area. Thus, a total of 14,400 square feet, or about one-third of an acre, is needed to conduct this exploratory work.

The Best Management Practices (BMP's) contained herein shall be the minimum measures implemented by the contractor to reduce the amount of soil erosion caused by storm water runoff during exploratory drilling. In general, the BMP's utilized shall include:

- stabilized construction entrance
- perimeter runoff control
- sediment barriers

The temporary access road shall be rough graded and the roadway shall be constructed with a cross slope of two percent to a parallel drainage ditch. The drilling site shall be cleared and the entire site shall be graded for positive drainage with a ditch around the entire perimeter of the site. Berms will be constructed to trap the runoff water so that it can soak into the ground.

Upon completion of exploratory drilling and with satisfactory pumping rates, the temporary access road and drilling site shall be paved with a permanent surface. If the testing results in unsatisfactory pumping rates, the temporary access road will be reverted back to cane field and the drill site will be grassed with

hydromulch or seeded as acceptable to the Engineer. If storm drain culverts are required, they shall be a minimum of 24 inches in diameter with reinforced concrete or concrete rubble masonry headwalls at each end.



APPENDIX B  
CORRESPONDENCE



ASSOCIATES, INC.

Engineers/Architects

June 16, 1994

Mr. Keith Nitta, Acting Deputy Director  
County of Kauai, Planning Department  
4444 Rice Street, Suite 473  
Lihue, Kauai, Hawaii 96766

Re: Koloa Well "F", TMK 2-9-02:1

Dear Mr. Nitta:

The County of Kauai, Department of Water, has contracted with GMP Associates, Inc., to provide engineering consultant services to prepare an environmental assessment and construction documents for exploratory drilling and testing of Koloa Well "F". This is the first phase of a water well development project. If test results prove successful, the Department of Water will proceed with the second phase of work to install a pump, construct an access road and build a pipeline. Development of this production well is intended to serve the projected water demand of the Koloa-Poipu area. The exploratory well drilling and testing may occur in the last quarter of 1994. Work on developing a production well, if approved, could take place in the middle of 1995.

We have identified the following permit applications as necessary for the exploratory well drilling and testing phase:

<u>Agency</u>	<u>Permit</u>
State, Department of Health	NPDES - Construction Storm Water Discharge
State, DLNR	CDUA - Limited Use Subzone
State, DLNR	Well Construction Permit Application
County, DPW	Grubbing Permit Application
McBryde Sugar Co., Ltd.	Right-of-Entry Permit

We are requesting the Planning Department, County of Kauai, to review the information provided and identify any additional permits which may be required. Are there any specific County zoning permit requirements for this work? Also, does this proposed project conform or conflict with the County general or long-range plans? A site plan is attached for your information.

501052-322



ASSOCIATES, INC.

Engineers/Architects

Mr. Keith Nitta  
June 16, 1994  
Page 2

Please do not hesitate to contact us, if you have any questions regarding this matter.

Sincerely,

GMP ASSOCIATES, INC.

Tommy A. Camarillo, P.E.  
Vice President

TAC:jfh  
Attachment

xc: Melvin Matsumura, Department of Water



JOANN A. YUKIMURA  
MAYOR

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COUNTY OF KAUAI  
PLANNING DEPARTMENT  
4444 RICE STREET, SUITE 473  
BUILDING "A"  
LIHUE, KAUAI, HAWAII 96766

~~XXXXXXXXXX~~  
PLANNING DIRECTOR

DEE M. CROWELL  
~~XXXXXXXXXX~~ PLANNING DIRECTOR

TELEPHONE (808) 241-6677  
FAX (808) 241-6699

July 25, 1994

Mr. Tommy Camarillo, PE  
GMP Associates, Inc.  
841 Bishop St., Suite 1501  
Honolulu, Hawaii 96813

SUBJECT: Koloa Well "F" on TMK: 2-9-02: 1

Please pardon our delay in responding.

Test drilling in general does not require any land use permits from our Department. However, should a test site be converted to a permanent well proper land use permits will be required.

In this case, the site is situated within the Conservation State Land Use District and therefore does not fall within the jurisdiction of the County of Kauai. Please check with the State Department of Land and Natural Resources regarding permitting requirements within the Conservation District.

Also, the site is outside of the County's Special Management Area (SMA) and therefore will not be subject to SMA Regulations. The County's General Plan jurisdiction does not encroach into Conservation District lands. However, we have no objections to a well site in this location.

Should you have any questions, please contact Keith Nitta of my staff at 241-6677.

DEE M. CROWELL  
Planning Director

GROVE FARM PROPERTIES, Inc.  
PO BOX 2069 PUHI RURAL BRANCH  
LIHUE, KAUAI, HI 96766-2069

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August 2, 1994

Mr. Andrew Smith, P.E.  
GMP Associates, Inc.  
841 Bishop Street Suite 1501  
Honolulu, HI 96813

RE: Draft Environmental Assessment - Koloa Well "F"  
Poipu, Koloa, Kauai

Dear Mr. Smith:

Thank you for the opportunity to review your draft EA for the subject project. We were a little surprised that a project was being considered on our property (and had progressed this far) without our knowledge or consent. We also understand your people visited the site without our permission or that of our lessee, McBryde Sugar Co., Ltd. In the future, please secure written permission of both parties before entry. There is a danger to yourselves from on-going cane and factory operations, and we would like to be protected with appropriate waivers.

As to the EA itself, our present comments are the following: -

1. We have no objection to the drilling and testing of the well, provided that any actual development is dependent on Grove Farm reaching agreement with the Department of Water as to the disposition of the water to be derived from the well.

2. Grove Farm Company, Incorporated will sign the required Water Commission permit application for exploratory well drilling.

3. We suggest monitoring of other wells in the area during your testing.

4. Please provide us with copies of all data, plans and reports developed relative to this project.

Please contact me at (808) 245-3678 if you have any questions.

Sincerely,



Greg Kamm  
Vice President

cc: Bill Balfour (McBryde Sugar Co., Ltd.)  
Murl Nielsen (KDOW)

**McBryde**  
SUGAR COMPANY, LIMITED

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August 23, 1994

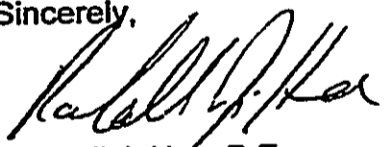
Mr. Tommy A. Camarillo, P.E.  
GMP Associates, Inc.  
841 Bishop Street, Suite 1501  
Honolulu, Hawaii 96813

Dear Mr. Camarillo:

I would appreciate your sending us a copy of the Environmental Assessment for the Koloa Well "F" Project.

Please feel free to contact me at 335-5313 if you have any questions.

Sincerely,



Randall J. Hee, P.E.  
Manager, Engineering

RJH:





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

**APPLICATION FOR PERMIT**  
 Well Construction or  Pump Installation

Instructions: Please print in ink or type and send completed application with attachments to the Commission on Water Resource Management, P.O. Box 621, Honolulu, Hawaii 96809. Application must be accompanied by a non-refundable filing fee of \$25.00 payable to the Dept. of Land and Natural Resources. The Commission may not accept incomplete applications. For assistance, call the Regulation Branch at 587-0225.

1. APPLICANT: (may be a, b, or c, but all must be filled in)

(a) WELL OWNER  
 Firm/Name Department of Water  
 Contact Person Mel Matsumura Ph: 245-6986  
 Address County of Kauai, PO Box 1706  
Lihue, Hawaii 96766-5706

(b) LANDOWNER  
 Firm/Name Grove Farm Company, Incorporated  
 Contact Person Greg Kamm Ph: 248-3678  
 Address PO Box 2069, Puhi Rural Branch  
Lihue, Hawaii 96766-7069

(c) CONTRACTOR (Not Available)  
 Firm/Name \_\_\_\_\_ Ph: \_\_\_\_\_ Contractor's C-57 License No. \_\_\_\_\_  
 Address \_\_\_\_\_

2. WELL LOCATION/NAME: Koloa Well "F" (5426-07) Island Kauai  
 Address Paa, Koloa, Kauai, Hawaii Tax Map Key 2-9-03:1  
 (Attach a USGS map, scale 1" = 2000', and a property tax map showing well location referenced to established property boundaries.)

3. (a) PROPOSED WORK:  Drill New Well  \* Alter Location  
 Modify Existing Well  Redrill  Deepen  \* Abandon/Seal  
 Install New Pump  Replace Pump  Modify Pump  
 \* Be sure to complete and submit well abandonment report upon completion of work.

(b) WELL TYPE:  Dug  Bored  Driven  Drilled  Radial  
 Is this well a part of a battery of wells?  Yes  No  
 (Briefly describe and fill in the diagram on the back of this form.)

4. PROPOSED PUMP INFORMATION: Rated Pump Capacity: N/A gallons per minute

Pump Type:  Deep Well Turbine  Rotary  Propeller  Diesel  
 Submersible  Rotary-Displacement  Reciprocating  Gas  
 Centrifugal  Rotary-Gear  Impulse  Electric, rated horsepower of \_\_\_\_\_

5. PROPOSED USE:  Municipal (including hotels, stores, etc.)  Military  
 Domestic (individual, noncommercial water sys.)  Industrial  
 Irrigation (crop) \_\_\_\_\_  Other (explain) \_\_\_\_\_  
 State Land Use District:  Urban  Agriculture  Rural  Conservation  
 County Zoning (describe) Agricultural  
 (if more space is needed, continue below under remarks, explanations.)

6. (a) PROPOSED AMOUNT OF WITHDRAWAL: N/A gallons per day  
 (b) METHOD OF FLOW MEASUREMENT:  Flow-meter  Open-pipe  Orifice Plate  Weir

7. PENDING ACTIONS:  COUA  SMA  EIS  EA  NONE  Other(explain)

8. REMARKS, EXPLANATIONS: Drill test well to supply existing municipal water system.  
Work to drill and install well, test water quality and water pumping rate.  
Contractor to be selected after advertisement for bids. Test well pump to be  
temporary use only. (if more space is needed, continue on back)

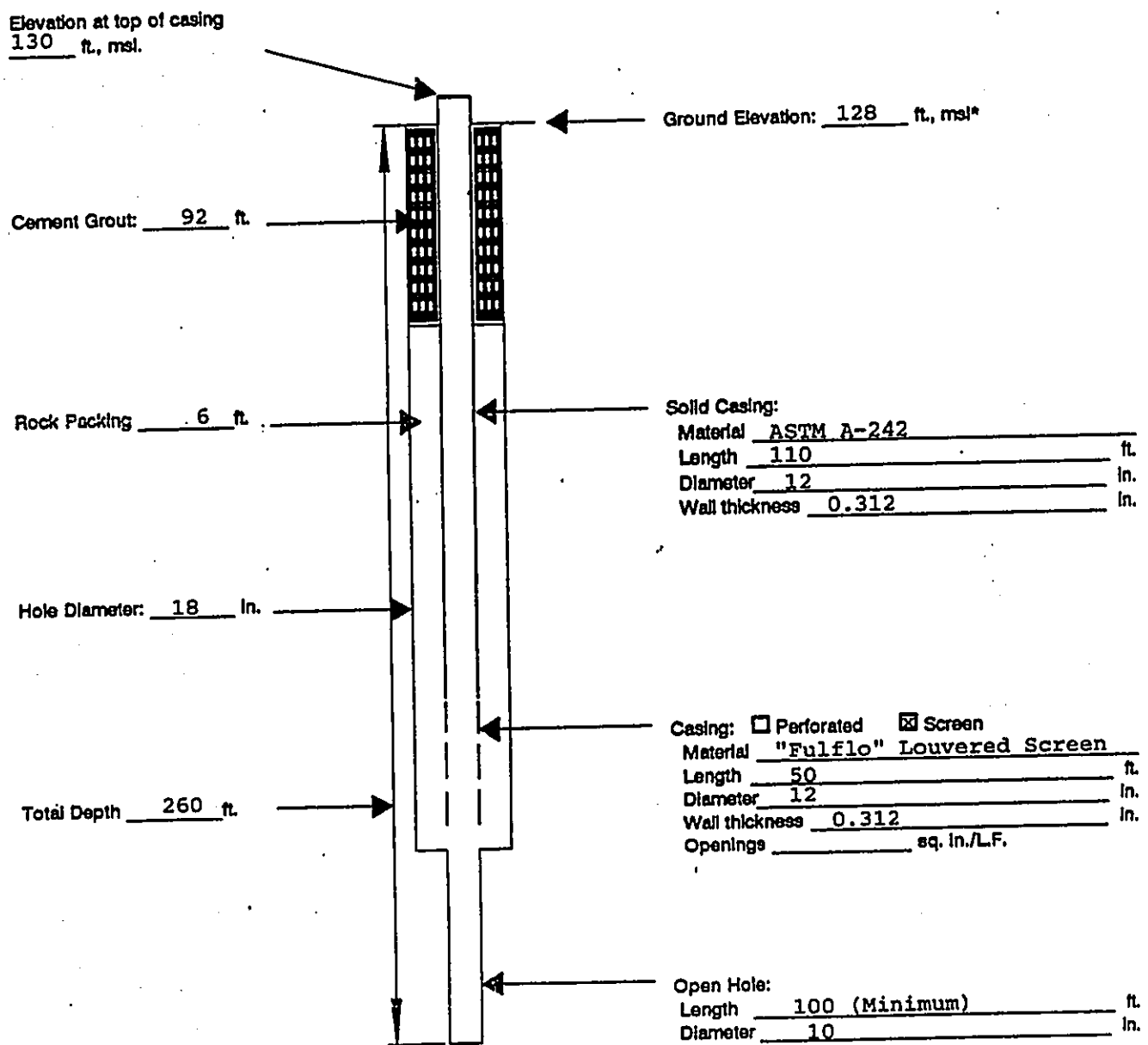
NOTE: Signing below indicates that the applicant understands that, if the permit requested is granted by the Commission on Water Resource Management, the proposed work is to be completed within two (2) years of the approval date. In addition, the contractor shall submit to the Commission a well completion report, well abandonment report, or both, within 30 days after the completion date of the permitted work. The applicant also understands that monthly water use data shall be submitted to the Commission. The applicant further understands that approval of the proposed permit shall not constitute a determination of correlative water rights and shall not guarantee the pump capacity or future use up to the permitted pump capacity.

Well Owner County of Kauai Landowner Grove Farm Company, Contractor \_\_\_\_\_  
Dept. of water Incorporated  
 Signature [Signature] Signature [Signature] Signature \_\_\_\_\_  
 Date 9/8/94 Date Sept 9 1994 Date \_\_\_\_\_

For Official Use Only:  
 Date Received \_\_\_\_\_  
 Date Accepted \_\_\_\_\_  
 Field Checked By \_\_\_\_\_  
 Date \_\_\_\_\_  
 Longitude \_\_\_\_\_  
 Latitude \_\_\_\_\_  
 Aquifer System Name \_\_\_\_\_  
 State Well No. \_\_\_\_\_

Remarks, Explanations (cont'd): CDUA and Environmental Assessment to be prepared as part of this  
Scope of Work for exploratory test well drilling and testing.

### 9. PROPOSED WELL SECTION



\*Approximate elevation at time of filing application. Ground elevation above mean sea level (msl) by a surveyor licensed by the State must be submitted at start of construction. Final elevations of well components shall be submitted in the well completion/well abandonment reports.



ASSOCIATES, INC.

Engineers/Architects

September 14, 1994

Ms. Esther Veda, Executive Officer  
State Land Use Commission, DBEDT  
Old Federal Building, Room 104  
335 Merchant Street  
Honolulu, Hawaii 96813

Re: Deep Water Well, Koloa, Kauai

Dear Ms. Veda:

The Kauai County, Department of Water, has contracted with our firm to prepare plans, specifications, estimates and environmental documents for the drilling and testing of a deep water well in Koloa, Kauai. The location of this well site is on agricultural land near the boundary of a State conservation district, limited use subzone. The well site is on property owned by Grove Farm Company, Incorporated; TMK 2-9-03:1. This land is currently leased to a plantation operator, McBryde Sugar Company, Ltd.

The approximate property line has been plotted on the attached site plan and is based upon research of record documents. We have examined the available commission maps and received a verbal interpretation from your staff. The boundary between conservation district and agricultural lands appears to lie beyond the property line at this location.

Therefore, we are requesting a written boundary determination for this project in lieu of submitting a CDUA, that the proposal site for Koloa Well 'F' is outside of State Conservation District lands. Attached please find a set of project plans, a reproducible vellum copy of the site plan, and a copy of the Draft Environmental Assessment. Note, however, that the Draft EA was written prior to realizing that the well site is outside of State conservation district land. The Final EA will be corrected accordingly.

232000.012-293



ASSOCIATES, INC.

Engineers/Architects

Ms. Esther Veda, Executive Officer  
State Land Use Commission, DBEDT  
September 14, 1994  
Page 2

Please contact Mr. Andrew W. Smith at our office if you require any further information on this matter.

Sincerely,

GMP ASSOCIATES, INC.

Tommy A. Camarillo, P.E.  
Vice President

TAC:jd

cc: Mr. Murl T. Nielsen  
Manager and Chief Engineer  
Kauai County, Department of Water

JOHN WAIHEE  
GOVERNOR



ESTHER UEDA  
EXECUTIVE OFFICER

STATE OF HAWAII  
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM  
LAND USE COMMISSION  
Room 104, Old Federal Building  
335 Merchant Street  
Honolulu, Hawaii 96813  
Telephone: 587-3822

October 26, 1994

Mr. Tommy A. Camarillo, V.P.  
GMP Associates, Inc.  
841 Bishop Street, Suite 1501  
Honolulu, Hawaii 96813

Dear Mr. Camarillo:

Subject: State Land Use District Boundary Interpretation  
Request No.: 94-36  
Location: Mahaulepu, Kolca, Kauai  
Tax Map Key No. : 2-9-03: 01  
Date of Request : September 14, 1994

As a follow-up to the telephone conversation between Fred Talon of my staff and Andrew W. Smith of your staff on October 12, 1994, we understand that your office will provide the following item:

- 1) A map of the subject parcel with the current U.S.G.S. Topographic Quadrangle as a base. The scale of the revised map should be 1"= 1,000 ft. ±.

The map should also represent the location of the proposed well site lot and access road, and have the proper border lines, north arrow, and location coordinates of the well.

Please provide the above item or an indication of when the item will be provided to our office by November 8, 1994. Until we receive the above item, your request for the boundary interpretation will be held in pending.

If you have any questions, please call Fred Talon or Bert Saruwatari of my staff at 587-3822.

Sincerely,

A handwritten signature in cursive script, appearing to read "Esther Ueda".

ESTHER UEDA  
Executive Officer

EU:fl

JOHN WAIHEE  
GOVERNOR



ESTHER UEDA  
EXECUTIVE OFFICER

STATE OF HAWAII  
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM  
LAND USE COMMISSION  
Room 104, Old Federal Building  
335 Merchant Street  
Honolulu, Hawaii 96813  
Telephone: 587-3822

November 30, 1994

Mr. Tommy A. Camarillo, Vice President  
GMP Associates, Inc.  
841 Bishop Street, Suite 1501  
Honolulu, Hawaii 96813

RECEIVED  
GMP ASSOCIATES, INC.  
'94 DEC 2 AM 8

Dear Mr. Camarillo:

Subject: BOUNDARY INTERPRETATION No. 94-36 for Tax Map Key  
No.: 2-9-03: por. 1, Mahaulepu, Koloa, Kauai

Pursuant to your September 14, 1994 letter requesting a boundary interpretation for the subject parcel, please be advised that we have determined an approximate location of the State Land Use Agricultural / Conservation District boundary relative to the proposed well site.

The location of the district boundary is based on the Commission's records and official maps currently on file at our office and the representation of the well site as shown on the USGS Topographic Quadrangle that you provided.

A blue-line print of your map with the approximate State Land Use Agricultural / Conservation District boundary delineated is enclosed for your reference.

If you have any questions, please call Fred Talon or Bert Saruwatari of my staff at 587-3822.

Sincerely,

A handwritten signature in cursive script, appearing to read "Esther Ueda".

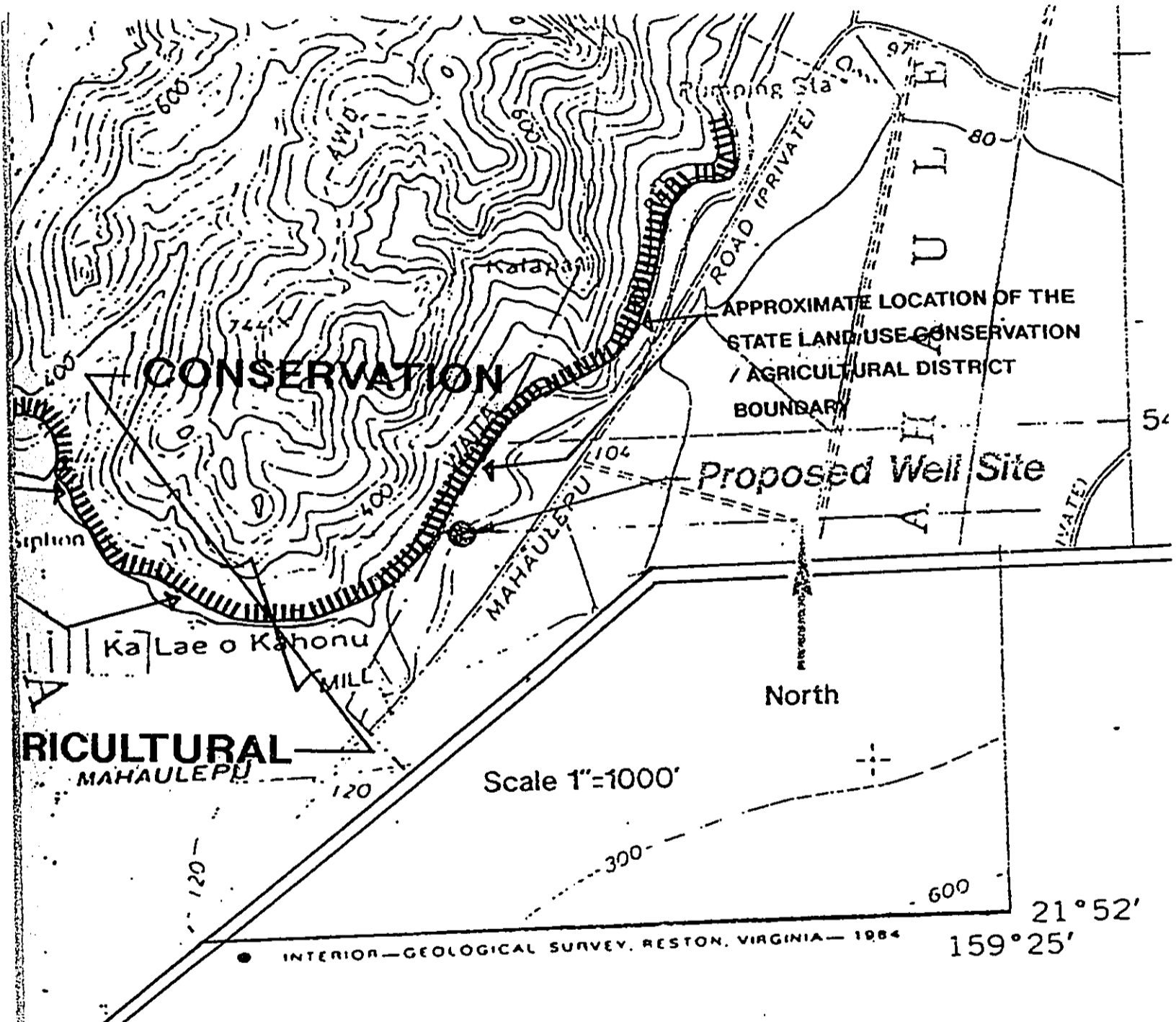
ESTHER UEDA  
Executive Officer

EU:fl

encl: Boundary Interpretation Map dated November 30, 1994

cc: Keith Ahue, BLNR Chairperson (w/encl.)  
Attn: OCEA  
Dee Crowell, Director, Kauai County Planning Dept. (w/encl.)  
Glenn Y. Sato, Tax Maps & Records Supervisor (w/encl.)  
C&C of Honolulu, Department of Finance





The boundary as located, named and delineated is hereby certified as the actual Land Use District Boundary adopted by the State Land Use Commission, Honolulu, Hawaii.

NOV 30 1994 by *[Signature]*  
 Date Executive Officer

Boundary Interpretation No. 94 361

NOV 30 1994



**DEPARTMENT OF WATER**

COUNTY OF KAUAI

P.O. BOX 1706

LIHUE, HAWAII 96766-5706

PHONE NO: (808) 245-6986 FAX NO. 245-5813

RECEIVED  
EMP ASSOCIATES, INC

'94 DEC 15 AM 8 17

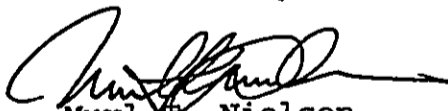
December 9, 1994

Mr. Leslie Segundo, Acting Director  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
220 South King Street, 4th Floor  
Honolulu, HI 96813

Re: Draft Environmental Assessment (EA) for Exploratory Drilling  
and Testing of Koloa Well "F", TMK: 2-9-3:1, Koloa, Kauai

The Kauai Department of Water has reviewed the draft environmental assessment for the subject project and anticipates a negative declaration determination. Please publish notice of availability for this project in the January 8, 1995 OEQC Bulletin.

We have enclosed a completed OEQC Bulletin Publication Form and four(4) copies of the draft EA. Please contact Mel Matsumura at 245-5410 if you have any questions.



Murl P. Nielsen  
Manager and Chief Engineer

IM  
Enclosures

**OEQC BULLETIN PUBLICATION FORM**

TITLE OF PROJECT: Koloa Well 'F', Exploratory Drilling and Testing

LOCATION: ISLAND Kauai DISTRICT Mahaulepu

TAX MAP KEY : 2-9-3:1

PLEASE CHECK THE FOLLOWING CATEGORIES:

Type of Action: AGENCY \_\_\_\_\_ APPLICANT X

Applicable State or Federal Statute:

X Chapter 343, HRS \_\_\_\_\_ Chapter 205A, HRS \_\_\_\_\_ NEPA (Federal Actions Only)

Type of Document:

<u>X</u> Draft Environmental Assessment (Negative Declaration anticipated)	_____ Draft EIS	_____ NEPA NOP
_____ Final Environmental Assessment (Negative Declaration)	_____ Final EIS	_____ NEPA Draft EIS
_____ Final Environmental Assessment (EIS Preparation Notice)	_____ NEPA FONSI	_____ NEPA Final EIS

Type of Revision (if applicable):

\_\_\_\_\_ Revised \_\_\_\_\_ Supplemental \_\_\_\_\_ Addendum \_\_\_\_\_ Other (please explain)

Prior to general distribution, please submit to OEQC: 4 copies of the Draft EA, Final EA (Negative Declaration or EIS Preparation Notice), 4 copies of the Draft EIS or Final EIS (For Draft and Final EISs an additional copy is mailed to OEQC.)

PROPOSING AGENCY OR APPLICANT SHOULD SUBMIT COPIES OF THE DOCUMENTS TO THE APPROVING AGENCY OR ACCEPTING AUTHORITY PRIOR TO SUBMITTING COPIES TO OEQC.

APPROVING AGENCY OR

ACCEPTING  
AUTHORITY:

Department of Water

ADDRESS:

County of Kauai

P.O. Box 1706

Lihue, Kauai, Hawaii 96766

CONTACT:

Murl T. Nielsen

PHONE: 245-6986

PROPOSING AGENCY OR

APPLICANT:

Department of Water

ADDRESS:

County of Kauai

Lihue, Kauai, Hawaii 96766

CONTACT:

Melvin E. Matsumura

PHONE: 245-6986

CONSULTANT:

GMP Associates, Inc.

ADDRESS:

841 Bishop Street, Suite 1501

Honolulu, Hawaii 96813

CONTACT:

Tommy A. Camarillo, P.E.

PHONE: 521-4711

COMMENT PERIOD END DATE:

February 7, 1995

CONDITIONS WHICH TRIGGERED THE EIS LAW: PLEASE CHECK ALL THAT APPLY TO THE PROPOSED ACTION.

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Use of State or County lands or funds<br>HRS 343-5(a)(1) | <input type="checkbox"/> Use of lands in the Waikiki Special District<br>HRS 343-5(a)(5)          |
| <input type="checkbox"/> Use of Conservation District Lands<br>HRS 343-5(a)(2)               | <input type="checkbox"/> Amendment to a County General Plan<br>HRS 343-5(a)(6)                    |
| <input type="checkbox"/> Use of Shoreline Setback Area<br>HRS 343-5(a)(3)                    | <input type="checkbox"/> Reclassification of Conservation Lands<br>HRS 343-5(a)(7)                |
| <input type="checkbox"/> Use of Historic Site or District<br>HRS 343-5(a)(4)                 | <input type="checkbox"/> Construction or modification of helicopter facilities<br>HRS 343-5(a)(8) |

OTHER CONDITIONS:

- Use of Special Management Area (City & County of Honolulu)
- Other\* \_\_\_\_\_

\* If the project does not trigger HRS 343, please explain why document is being submitted to OEQC.

**SUMMARY** of the proposed action or project to be published in the OEQC Bulletin. Please submit it as a summary ready for publication. The description should be brief (300 words or less), yet provide sufficient detail to convey the full impact of the proposed action.

Action involves drilling and testing an exploratory potable water well approximately 360 feet deep and nominally twelve (12) inches in diameter for the well casing and eighteen (18) inches for the open hole. An additional 100 to 200 feet of ten inch diameter open hole will be drilled if required. The well site is adjacent to a sugar cane field approximately 2.25 miles east of Koloa, Kauai. The exploratory phase of this project will require clearing a ten foot wide access road for approximately 1,200 feet from an existing plantation road (Mahaulepua Road). The drilling site to be cleared and grubbed is approximately 40 feet by 60 feet, resulting in a total area of one-third acre to be cleared for access and drilling.

If the water quality and yield tests are satisfactory, then a permanent bore 22 inches in diameter would be reamed out for a 16-inch well casing. A minimum yield is 700 to 800 gallons per minute, or about 1,000,000 gallons per day. Permanent improvements to be constructed if the well is placed into production include: paved access road, power distribution lines and poles, submersible pump and controls, chain link fence and gate, valves and water transmission piping to connect to the existing county water system.

Exploratory well drilling should occur around April 1995. The permanent well installation could take place between September and December 1995.

**NOTE:** Since the deadline for EIS submittal is so close to the publication date for the OEQC Bulletin, please assist us by bringing the Document for Publication Form and a computer disk with the project description (size 3 1/2" or 5 1/4" disk are acceptable; preferably WordPerfect 5.1 or ASCII text format) to the Office of Environmental Quality Control as early as possible. Thank you.

# OEQC Bulletin



BENJAMIN J. CAYETANO  
Governor

GARY GILL  
Director

VOLUME XII

JANUARY 23, 1995

NO. 02

## REGISTER OF DOCUMENTS PREPARED UNDER CHAPTER 343, HAWAII REVISED STATUTES

The *OEQC Bulletin* is a semi-monthly publication. The publication dates of the *OEQC Bulletin* are the eighth and twenty-third of each month. Environmental Assessments should be submitted to the appropriate agency directly. For environmental assessments (EA) for which a Negative Declaration is anticipated, agencies should submit four copies of the Draft EA with a letter stating that a Negative Declaration is anticipated and that notice of the Draft EA should be published in the *OEQC Bulletin*. (When an agency initially determines that an EIS will be required for a project, an EIS Preparation Notice determination is made. No Draft EA is required since those projects undergo two comment periods throughout the EIS process.) After the Draft EA comment period ends, the agency will submit to OEQC, four copies of the document and a determination of a Negative Declaration or an EIS Preparation Notice for publication in the *OEQC Bulletin*. Applicants should deliver an appropriate number of Draft and Final Environmental Impact Statements (EIS) to the accepting authority before submitting copies to OEQC for publication. All documents submitted for publication in the *OEQC Bulletin* should be delivered to the Office of Environmental Quality Control, 220 South King Street, 4th Floor, Honolulu, Hawaii 96813. The deadline for all submittals is eight working days prior to the publication date. To ensure proper processing of documents, please attach the *OEQC Bulletin Publication Form* (Revised July, 1992) with all submittals. This form can be obtained by calling OEQC at 586-4185.

Please contact the approving or proposing agency to request copies of any Draft EAs, Negative Declarations, EISPNs or EISs. Any questions related to the content of these documents should be directed to the listed agency contact person.

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OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
220 South King Street, Central Pacific Plaza, Suite 400, Honolulu, HI 96813

Telephone: (808) 586-4185  
Fax: (808) 586-2452

OEGC BULLETIN  
January 23, 1995

**MOUNTAIN VIEW ELEMENTARY SCHOOL 12-CLASSROOM  
BUILDING H**

District: Puna  
TMK: 1-8-01:07  
Agency:  
Department of Accounting and General Services  
1151 Punchbowl Street, Room 430  
Honolulu, Hawaii 96813  
Attention: Brian Isa (586-0484)  
Deadline: February 22, 1995

This project is to construct a twelve-classroom building of approximately 13,600 square feet.

This project also includes any site improvements, connections to public utilities and easements that may be required as a result of this project. The total estimated cost of this project is approximately \$3,657,000.

**WAIAKEA HIGH SCHOOL NEW ADMINISTRATION BUILDING**

District: South Hilo  
TMK: 2-4-01:05, 15 and 114  
Agency:  
Department of Accounting and General Services  
1151 Punchbowl Street, Room 430  
Honolulu, Hawaii 96813  
Attention: Brian Isa (586-0484)  
Deadline: February 22, 1995

This project is to construct a new administration building of approximately 6,526 square feet. Also included in this project is the renovation of the existing administration spaces into other uses. This project also includes any site improvements, connections to public utilities and easements that may be required as a result of this project. The total estimated cost of this project is approximately \$3,385,000.

**KAUAI**

**KAPAA HOMESTEADS GENERAL PLAN AMENDMENT PETITION**

District: Kawaihau  
TMK: 4-6-12:65, 48, 79 and 80 (por.)  
Agency:  
County of Kauai, Planning Department  
4444 Rice Street, Suite 473  
Lihue, Hawaii 96766  
Attention: Barbara Pendragon  
Applicant:  
Damien Victorino and Elizabeth, et al  
1772A Bettencourt Lane  
Kapaa, Hawaii 96746  
Consultant:  
Portugal and Associates, Inc.  
1840 Leleiona Street  
Lihue, Hawaii 96766  
Attention: Cesar Portugal (245-6749)  
Deadline: February 7, 1995

The applicant proposes to amend the State Land Use District Boundary from Agriculture to Urban District; the County of Kauai General Plan from Agriculture to Urban Residential; and the County of Kauai Zoning from Agriculture to Residential District (R-4).

The amendments are sought to subdivide a portion of the subject parcels into eight (8) lots, with each lot having a minimum size of 10,000 square feet. Road access and utilities for the subdivision would be extended from an abutting residential subdivision.

**KOLOA WELL 'F' EXPLORATORY DRILLING AND TESTING**

District: Koloa  
TMK: 2-9-3:1  
Agency:  
County of Kauai, Department of Water  
P. O. Box 1706  
Lihue, Hawaii 96766  
Attention: Melvin Matsumura (245-6986)  
Consultant:  
GMP Associates, Inc.  
841 Bishop Street, Suite 1501  
Honolulu, Hawaii 96813  
Attention: Tommy Camarillo (621-4711)  
Deadline: February 7, 1995

Action involves drilling and testing an exploratory potable water well approximately 360 feet deep and nominally twelve (12) inches in diameter for the well casing and eighteen (18) inches for the open hole. An additional 100 to 200 feet of ten inch diameter open hole will be drilled if required. The well site is adjacent to a sugar cane field approximately 2.25 miles east of Koloa, Kauai. The exploratory phase of this project will require clearing a ten foot wide access road for approximately 1,200 feet from an existing plantation road (Mahaulepu Road). The drilling site to be cleared and grubbed is approximately 40 feet by 60 feet, resulting in a total area of one-third acre to be cleared for access and drilling.

If the water quality and yield tests are satisfactory, then a permanent bore 22 inches in diameter would be reamed out for a 16-inch well casing. A minimum yield is 700 to 800 gallons per minute, or about 1,000,000 gallons per day. Permanent improvements to be constructed if the well is placed into production include: paved access road, power distribution lines and poles, submersible pump and controls, chainlink fence and gate, valves and water transmission piping to connect to the existing county water system.

Exploratory well drilling should occur around April 1995. The permanent well installation could take place between September and December 1995.

**MAUI**

**HONOAPIILANI LOWER ROAD PHASE II PROJECT**

District: Lahaina  
TMK: 4-4-01 and 4-3-06

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

MAR 14 1995

**WELL CONSTRUCTION PERMIT**

for

Koloa Well F  
(Well No. 5425-15)  
Mahaulepu, Koloa, Kauai

MICHAEL D. WILSON  
CHAIRPERSON

ROBERT S. NAKATA  
ROBERT G. GIRALD  
DAVID A. NOBRIGA  
LAWRENCE H. MIKE

RAE M. LOUI, P.E.  
DEPUTY

TO: Kauai Department of Water  
P.O. Box 1706  
Lihue, HI 96766

In accordance with the Department of Land and Natural Resources Administrative Rules, Section 13-168, entitled "Water Use, Wells, and Stream Diversion Works", your application to construct and test Koloa Well F (Well No. 5425-15), is approved subject to the following conditions:


**STANDARD WELL CONSTRUCTION PERMIT CONDITIONS**

1. The Commission on Water Resource Management (Commission), P.O. Box 621, Honolulu, HI 96809, shall be notified, in writing, before any work covered by this permit commences.
2. The well construction permit shall be for construction and testing of the well only. The applicant shall coordinate with the Commission and conduct a pumping test in accordance with the attached protocol. A one-inch diameter (minimum) galvanized pipe shall be permanently installed, in a manner acceptable to the Commission, to accurately record water levels. No permanent pump may be installed and no water used from the well without first obtaining a pump installation permit from the Commission.
3. The proposed well construction shall not adversely affect existing or future legal uses of water in the area, including any surface water or established instream flow standards. This permit or the authorization to construct the well shall not constitute a determination of correlative water rights.
4. The following shall be submitted to the Commission within thirty (30) days after completion of work:
  - a. Well completion report.
  - b. Elevation (referenced to mean sea level, msl) survey by a Hawaii-licensed surveyor.
  - c. As-built sectional drawing of the well.
  - d. Plot plan and map showing the exact location of the well.
  - e. Complete pumping test records, including time, pumping rate, drawdown, chloride content, and other water quality data.

**WELL CONSTRUCTION PERMIT**  
Well No. 5425-15

Page 2

5. The applicant shall comply with all applicable laws, rules, and ordinances.
6. The well construction permit application and staff submittal approved by the Commission at its March 1, 1995 meeting are incorporated into the permit by reference.
7. The permit may be revoked if work is not started within six (6) months after the date of issuance or if work is suspended or abandoned for six (6) months, unless otherwise specified. The work proposed in the well construction permit application shall be completed within two (2) years from the date of permit approval, unless otherwise specified. The permit may be extended by the Commission upon a showing of good cause and good-faith performance. A request to extend the permit shall be submitted to the Commission no later than three (3) months prior to the date the permit expires. If the commencement or completion date is not met, the Commission may revoke the permit after giving the permittee notice of the proposed action and an opportunity to be heard.

  
\_\_\_\_\_  
MICHAEL D. WILSON, Chairperson  
Commission on Water Resource ManagementMAR 14 1995  
Date of Issuance

I have read the conditions and terms of this permit and understand them. I accept and agree to meet these conditions as a prerequisite and underlying condition of my ability to proceed.

Applicant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Firm or Title: \_\_\_\_\_

Please sign and return one copy of this permit to the Commission and retain a copy for your record.

cc: USGS  
Department of Health  
Safe Drinking Water Branch  
Ground Water Protection Program  
Wastewater Branch

'95-03-02 10:23

005 P02

**GROVE FARM PROPERTIES, Inc.**  
**PO BOX 2069 PUHI RURAL BRANCH**  
**LIHUE, KAUAI, HI 96766-706995** MAR 1 1995 **PI: 13**

February 27, 1995

Mr. Murl Nielsen, Manager & Chief Engineer  
Kauai Board of Water Supply  
4398 Pua Loke St.  
Lihue, HI 96766

*A. J. J. J.*  
2/27/95  
COUNTY OF KAUAI

*Maaboa*  
pk director of water

**RE: Koloa Well "F" - Comments on Environmental Assessment**

Dear Murl:

As requested in your letter of 2/10/95, we are providing such other information and/or response is appropriate, relative to your proposed Well "F" on our property.

We previously indicated that "any actual development is dependent on Grove Farm reaching agreement with the Department of Water as to the disposition of the water to be derived from the well." The EA reviewer suggested that "the form of these agreements should be discussed in the Draft EA." We do not agree. Since the DOW is proposing an exploratory action only, nobody knows if there will be any water, let alone the quantity or quality thereof. To expend resources on an agreement at this point in time would be wasteful. Should water be discovered and further, should the DOW decide to proceed with well development, Grove Farm will, at that time, work with the DOW on a simple agreement which deals with water sharing. This agreement will reflect the conditions that exist at that time and cannot be further defined presently.

With respect to the reviewers comment about existing, planned and proposed uses, Grove Farm does not, at this time have definitive plans for the area, but anticipates the need for substantial domestic water over the next 20 years.



'95-03-02 10:24

005 P03

I assume these comments are sufficient. Please contact me if you have any further questions.

Sincerely,

A handwritten signature in black ink, appearing to be 'GK' followed by a horizontal line.

Greg Kamm  
Vice President

BWS



RECEIVED

**University of Hawai'i at Mānoa**

'95 FEB 9 AM 9 29  
Environmental Center

A Unit of Water Resources Research Center  
Crawford 317 • 2550 Campus Road • Honolulu, Hawai'i 96822  
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

February 7, 1995  
EA:0103

Mr. Melvin Matsumura  
County of Kauai  
Department of Water  
P.O. Box 1706  
Lihue, Hawaii 96766

Dear Mr. Matsumura:

**Draft Environmental Assessment (EA)  
Koloa Well "F" Exploratory Drilling And Testing  
Koloa, Kauai**

The County proposes to drill and test an exploratory potable water well at an approximate depth of 160 feet deep. The open hole will be 18 inches and the well casing 12 inches in diameter. An additional 100 to 200 feet with an open hole 10 inches in diameter may be drilled if required. Anticipated yield will be 1 million gallons per day (MGD) of water at the preferred 'F' site. The purpose of the project is to obtain potable water to accommodate future growth in the Koloa-Poipu area of Kauai.

We have reviewed this document with the assistance of David Penn, Geography, and Malia Akutagawa of the Environmental Center.

**Commitment For Larger Actions**

Under Section 11-200-12(b) "every phase of a proposed action, the expected consequences, both primary and secondary and the cumulative as well as the short and long-term effects of the action" must be considered in making a determination of whether the action may have a significant effect on the environment. Subsection (b)(8) is pertinent to this project because the action is "individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions."

In Section 3.3 on "Proposed Mitigation Measures", the Draft EA states that a "DO NOTHING" alternative is not feasible because water is needed for "future growth,

Mr. Melvin Matsumura  
February 7, 1995  
Page 3

Arguments against the "DO NOTHING" alternative should be better documented with quantification of the need for additional water and documentation of its effects upon the reliability of water service in the area. (6)

There is also a lack of discussion of non-source development means of increasing water supply, such as demand-side management via conservation and reuse of existing potable, non-potable, and wastewater supplies. (7)

The Draft EA suggests long-term monitoring of chloride levels in all local wells and development and use of a well field model as a means of overcoming the immediate lack of strategies addressing legal, technical, and public policy issues, but makes no commitment to initiating or otherwise contributing to this effort. While Grove Farm suggested "monitoring of other wells in the area during your testing," the proposed mitigative measure is to monitor only one other well in the area during testing. With regard to this testing, the meaning of the statement, "However, results are uncertain if measurements will be appreciable with the 1,500-foot distance between the testing well (Well "F") and the observation (Well "C") wells," is unclear (p. 10).

Note that Grove Farm wrote to the consultant stating that "any actual development [of the well] is dependent on Grove Farm reaching agreement with the Department of Water as to the disposition of the water to be derived from the well." The form that these agreements might take should be discussed in the Draft EA. (5)

Also missing from the document is an assessment of the proposed well's impact upon the sources it developed from. The Draft EA should map the boundaries of the pertinent hydrologic unit (aquifer system), showing the location and magnitude of all existing, planned, and proposed groundwater uses and the sustainable yield of the aquifer. Statistics on existing, planned, and proposed uses should be tabulated by user so that the relative impact of parties involved (Kauai Department of Water Supply and Grove Farm) can be assessed. Some of these data can be obtained from the Hawaii Water Plan. The Draft EA should also evaluate the consistency of the proposed action with that plan. (8)

The Kauai Water Use and Development Plan is part of the Hawaii Water Plan. If not included in this Plan and referenced accordingly, the Draft EA should quantify on its own the estimated change in Koloa-Poipu water demand and assess it against potential accommodation of this change by various alternative water sources. (9)

Note that the County of Kauai Planning Department did not respond to the following question by the consultant, "Does the proposed project conform or conflict with the County general or long-range plans," because it erroneously believed the

Mr. Melvin Matsumura  
February 7, 1995  
Page 4

proposed project site to be within the State Conservation Land Use District. Thus a new response should be obtained from the County Planning Department.

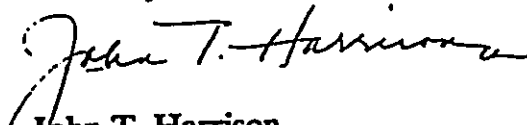
(10)

A brief chronology of the proposed project's planning and fiscal history should also be provided for informational purposes.

(11)

Thank you for the opportunity to review this Draft EA.

Sincerely,

  
John T. Harrison  
Environmental Coordinator

cc: OEQC  
✓ GMP Associates, Inc.  
Roger Fujioka  
David Penn  
Malia Akutagawa

Mr. Melvin Matsumura  
February 7, 1995  
Page 2

peak demands and emergencies" (p. 9). If the water must be utilized to sustain future growth, this future growth should be identified and quantified. What are the specific development plans for the Koloa-Poipu area? How much water is "needed"? This project does not involve just drilling and testing, but a potential "commitment for larger actions," meaning, an accommodation of future development. The Draft EA should at least state explicitly that an Environmental Impact Statement (EIS) will be prepared if, after drilling and testing the exploratory well, a production well is to be made operational. (1) (2)

Furthermore, the statement that the "DO NOTHING" alternative is not feasible assumes that everything must be sacrificed in the name of "growth". Future, unrestricted growth is impossible in the presence of finite resources.

#### Archaeological, Historical, Cultural Significance

The possibility that "no historical or archaeological resources have been previously surveyed or are known to exist within the immediate vicinity of the site" inadequately examines the question of the proposed project's potential impacts upon cultural resources that may not be historic, archaeological, or structural/material (p. 7 and 8). Assessment of cultural significance of the proposed project vicinity and activity should be included in the Draft EA. (3)

#### Possible Chloride Contamination

Although the long-term potential increase in chloride concentration of the well field may not be quantifiable for the purpose of this Draft EA, the discussion of proposed mitigation measures could be better quantified and otherwise improved in order to develop a risk assessment for the identified alternatives. (4)

For instance, quantification of increased construction, operation, and maintenance costs for a higher, deeper well could be assessed against the estimated cost of various levels of chloride contamination.

#### Deficiencies In Proposed Mitigation Measures and Alternatives Considered

Legal agreements affecting proposed limits to Koloa Plantation Wells extractions should not be "beyond the scope of this draft environmental assessment" (p. 9). Any identified alternative should be fully explored until concrete arguments for or against its implementation can be developed. Merely claiming legal matters to be beyond the scope of the assessment is an unacceptable argument. (5)

March 29, 1995  
KOLOA WELL "F"  
DRAFT EA COMMENTS AND RESPONSES

ITEM 1:

Comment: "If the water must be utilized to sustain future growth, this future growth should be identified and quantified. What were the specific development plans for the Koloa-Poipu area? How much water is needed?"

Response: The Kauai Water Use and Development Plan states that the future municipal water demand for the Koloa-Poipu system is 3.56 MGD in the year 2010. This is 1.83 MGD increase from the 1988 consumption rate. This estimated growth is based upon DBED Series M-K projections available at the time of that report (1990). See Table 8, attached.

ITEM 2:

Comment: "The Draft EA should at least state explicitly that an Environmental Impact Statement (EIS) will be prepared if, after drilling and testing the exploratory well, a production well is to be made operational."

Response: The Kauai County, Department of Water will conform with all applicable State DOH and DLNR regulations for well development.

ITEM 3:

Comment: "Assessment of cultural significance of the proposed project vicinity and activity should be included in the Draft EA."

Response: The project will not have any negative potential impact upon cultural resources. The Koloa area has been cultivated for sugar cane for well over the past 100 years. Contact with the DLNR/SHPD staff indicates that no known culturally significant sites are associated with the proposed project vicinity or activity.

ITEM 4:

Comment: "... the discussion of proposed mitigation measures could be better quantified and otherwise improved in order to develop a risk assessment for the identified alternatives."

Response: The well pumps would be turned off if chloride levels increased above State DOH potable water criteria.

**ITEM 5:**

**Comment:** "Legal agreements affecting proposed limits to Koloa Plantation Wells extractions should not be beyond the scope of this draft environmental assessment. Any identified alternative should be fully explored until concrete arguments for or against its implementation can be developed." Also, "... The form that these agreements might take should be discussed in the Draft EA."

**Response:** Draft EA comments from Grove Farm Properties, Inc. regarding potential future agreements with Kauai Department of Water. State that "To expend resources on an agreement at this point in time would be wasteful." Any agreement on water sharing will reflect future conditions which are presently unknown.

**ITEM 6:**

**Comment:** "Arguments against the 'DO NOTHING' alternative should be better documented with quantification of the need for additional water and documentation of its effects upon the reliability of water service in the area."

**Response:** The Kauai Water Use Development Plan does quantify the need for additional water. The EA will not try to repeat the information contained therein. See attached pages 4-1 to 4-4.

**ITEM 7:**

**Comment:** "There is also a lack of discussion of non-source development means of increasing water supply, such as demand site management via conservation and reuse of existing potable, non-potable, and wastewater supplies."

**Response:** The Kauai Water Use Development Plan identifies alternative strategies for meeting future demand (Section 5.2). Also, the Water Resources Protection Plan identifies typical long-term water conservation measures (Table 2). See attached for both.

**ITEM 8:**

**Comment:** "The Draft EA should map the boundaries of the pertinent hydrologic unit (aquifer system), showing the location and magnitude of all existing, planned, and proposed ground water uses and the sustainable yield of the aquifer. Statistics on existing, planned, and proposed uses should be tabulated by user so that the relative impact of parties involved (Kauai Department of Water Supply and Grove Farm) can be assessed. Some of these data can be obtained from the Hawaii Water Plan. The Draft EA should also evaluate the consistency of the proposed action with that plan."

**Response:** This information is contained in the Hawaii Water Plan, Water Resources Protection Plan and the Kauai Water Use and Development Plan. The Draft EA is

consistent with these plans. See pages B-2 to B-4, and Figure 6, respectively, attached.

**ITEM 9:**

**Comment:** "The Draft EA should quantify on its own the estimated change in Koloa-Poipu water demand and assess it against potential accommodation of this change by various alternative water sources."

**Response:** A need for additional water has already been established in the Kauai Water Use and Development Plan. Two-800 gpm wells and one-1200 gpm well are proposed for the Koloa-Poipu water system. See Table 17, attached.

**ITEM 10:**

**Comment:** "A new response should be obtained from the (Kauai) County Planning Department."

**Response:** The (Kauai) County Planning Department was afforded the opportunity to comment on the Draft EA with the OEQC public notice.

**ITEM 11:**

**Comment:** "A brief chronology of the proposed project's planning and fiscal history should also be provided for informational purposes."

**Response:** A brief chronology follows for Drill and Test Koloa Well "F" project:

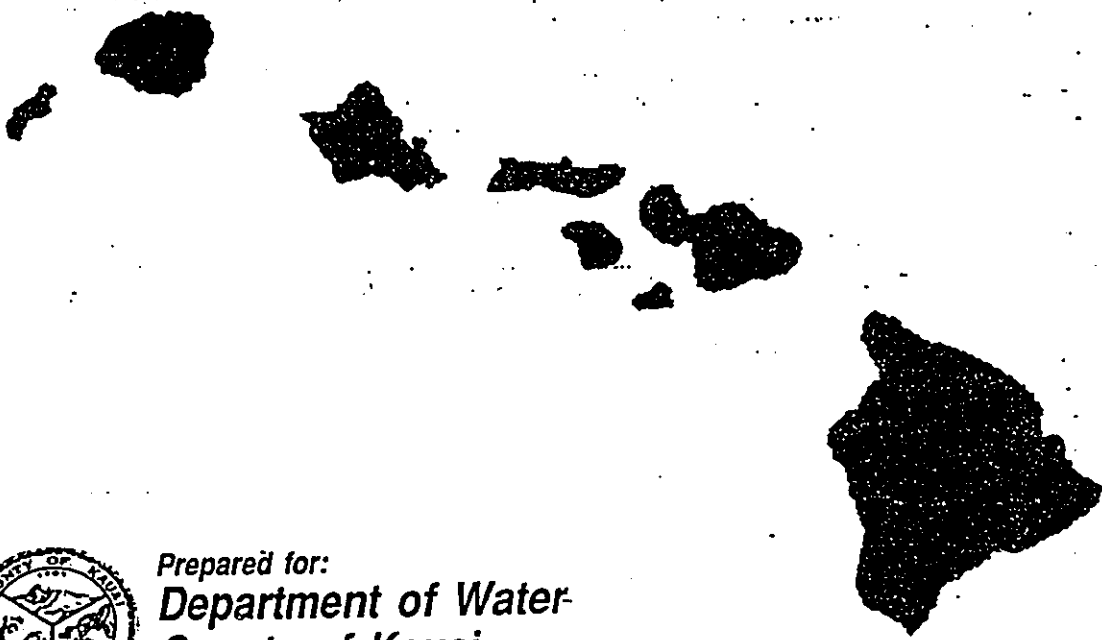
- |                       |  |
|-----------------------|--|
| <b>December 1992:</b> | DLNR prepares a preliminary well site selection survey in Koloa area.  |
| <b>June 1994:</b>     | Field site visits with Kauai Department of Water, DLNR and GMP Associates to set Koloa test Well "F" drilling location and establish a temporary bench mark. |
| <b>December 1994:</b> | Draft Environmental Assessment completed.  |
| <b>January 1995:</b>  | Final Plans, Specifications and Estimate completed   |
| <b>March 1995:</b>    | Well drilling permit approved by CWRM.   |
| <b>April 1995:</b>    | Final Environmental Assessment completed.  |



D9003090

HAWAII WATER PLAN

# KAUAI WATER USE AND DEVELOPMENT PLAN



Prepared for:  
**Department of Water  
County of Kauai**

By:  
**R.M. Towill Corporation**



**Commission on Water Resource Management  
Department of Land and Natural Resources  
State of Hawaii**

February 1990

## SECTION 4

### FUTURE WATER NEEDS

#### 4.1 MUNICIPAL WATER DEMAND

Municipal water demand consists of water supply provided for Kauai customers of the Department of Water. These include the vast majority of residential, commercial, governmental and industrial users, as well as smaller agricultural farmers. A portion of the military water demand is also serviced by the Department of Water.

Future municipal water demand on Kauai is projected by major system areas and hydrologic unit up to the year 2010. The projects are based on the widely accepted population projections developed by the State Department of Business and Economic Development. The most recent Series M-K projections as modified by the Kauai County Department of Economic Development indicate a residential population for Kauai of 86,900 in the year 2010. This population total was distribution among the water system and hydrologic unit areas using the existing and future 2010 population distributions based on zoning.

Existing water consumption data were provided by the Department of Water for the water service areas established for its billing purposes. Differences between the DOW districts and the hydrologic units necessitated deriving some estimates in the distribution of population and water consumption.

The existing per capita consumption by hydrologic unit was used in projecting water demand for the planning period. A no increase or decrease in per capita consumption has been assumed through the planning period. Per capita consumption was provided by the DOW. The gallons per capita per day (gpcd) figures are; 187 gpcd for Waimea, 155 gpcd for Koloa, 202 gpcd for Lihue, 124 gpcd for Kapaa and 155 gpcd for Hanalei. Due to the large component of future demand of the Princeville development, the Princeville water demand is included in the projections for the Hanalei area.

Table 8 shows the actual and projected municipal water demand from 1990 to 2010 based on the above methodology.

Municipal and private potable water demand for Kauai is anticipated to increase from the current level of 10.51 million gallons per day (mgd) to 20.08 mgd by the year 2010. This represents a 91 percent increase over the planning period. Residential population during the period is expected to increase 72 percent, and de facto population by over 100 percent.

#### 4.2 AGRICULTURAL WATER DEMAND

The future water demand for agricultural pursuits is dependent on the type of crops cultivated and the number of acres under cultivation. Principal among these on Kauai

are sugar and diversified agriculture.

#### 4.2.1 Sugar

By far, the largest users of water are the sugar plantations. The plantations collectively use 355 mgd or 84 percent of the total water use on Kauai. Sugarcane requires large quantities of water, using 6,000 to 10,000 gallons per day per acre depending upon the irrigation system used. The conversion of much of the sugar irrigated acreage from furrow to drip irrigation has saved substantial amounts of water and increased yields through the efficient application of fertilizer.

Sugar is expected to experience a gradual decline in acreage under cultivation due to the increasing cost of production and sugar prices. U.S. sugar support prices are expected to remain unchanged but the costs of labor, materials, equipments, and new facilities are expected to increase with inflation. Sugar companies are actively exploring replacement crops, including macadamia nuts, coffee, tea, cocoa, and citrus. Of these replacement crops, the only land-extensive crop of proven profitability is macadamia nut orchards.

The State Department of Business and Economic Development (DBED) anticipates a decrease in export value statewide for raw sugar from \$325 million in 1987 to \$230 million by 2010. This amounts to a decline of approximately 30 percent or an average annual decline of 1.5 percent through 2010. Whether sugar will be replaced by other agricultural crops or urbanization will in large part depend upon future sugar prices, the disposition of lease arrangements, and State and County land use policies. The decrease in sugar cultivation may result in a reduced demand for water, given the high consumption rate of sugarcane cultivation.

#### 4.2.2 Diversified Agriculture

Diversified agriculture in the State has done well over the past decade. Kauai has also experienced consistent increases over the past few years. The guava industry has done particularly well, but the papaya has had major setbacks during the same period.

Projections of future water demand for diversified agriculture are difficult to determine except in the aggregate. At this time all increases in diversified agriculture will be assumed to be due to a change in crop from sugar. Therefore, no projections can be made at this time.

#### 4.3 MILITARY WATER DEMAND

The military in Hawaii is expected to continue to maintain a strong presence in the foreseeable future. Water demand for the military is affected principally by the number of active duty personnel and their dependents stationed on Kauai. There are currently about 129 military personnel on Kauai.

The State's expectation per the M-K projections is that the total military population will remain relatively constant in terms of military personnel and civilian employment. No increases in military demand is projected.

#### 4.4 PRIVATE SYSTEMS DEMAND

Private systems water demand is expected to remain relatively constant over the planning period. No major expansions or increases are anticipated, except for the Princeville System. Most of the zoned land is located within the Princeville development area and this is where the expected population growth in the Hanalei area will occur. For this reason the Princeville projections are added into the Hanalei projections.

#### 4.5 SUMMARY OF FUTURE KAUAI WATER DEMAND

Future water demand on Kauai is primarily dependent on the projections of municipal water demand which would be supplied by the Department of Water and private water demand at Princeville. Although presently constituting only about 2 percent of water use on the island, the municipal demand is expected to steadily increase in both the near and long term, to 20.08 mgd by the year 2010. Sugar production have experienced a gradual decline in crop production over the years, and this trend is likely to continue. Although diversified agriculture is expected to increase, the overall acreage in agriculture on Kauai is not expected to increase from present levels.

For the purpose of projecting future water demand it is assumed that the M-K projected decline in sugar exports will result in corresponding changes over to the crops. Therefore, water demand for irrigation is not projected to rise or fall but remain constant, except for 4.8 mgd of water demand for two State agricultural parks.

The military presence on Kauai is expected to remain relatively stable in terms of the number of active military personnel and dependents stationed on the island. Private systems and industrial use are expected to remain stable in usage through the planning period.

Municipal water demand is driven primarily by population increases and associated land use allowances for increased residential and other urban activities. The overall impact on water resources, however, may not be significant depending upon the amount of the source available.

#### 4.6 AREAL IMBALANCES IN FUTURE DEMAND/SUPPLY

The basic directions for growth on Kauai are established by the County's General Plan and implemented by zoning. Table 8 shows future water needs by planning areas, the 20-year or 2010 projections and the maximum demand based on zoning. Tables 9 and 10 present the projected 20-year ground and surface water use, respectively, within a hydrologic unit and Tables 11 and 12 show the projected 20-year ground and surface

water withdrawn, respectively, from a hydrologic unit. Figure 6 shows the projected 20-year demand by municipal system and Figure 8 shows the projected long range demand by municipal system based on zoning. Figure 7 shows the projected 20-year water demand by hydrologic unit and Figure 9 shows the long range demand hydrologic systems. Tables 13 and 14 present the projected long range ground and surface water use, respectively, within a hydrologic unit and Tables 15 and 16 show the projected long-range ground and surface water withdrawn, respectively, from a hydrologic unit. The long range water use is determined by calculating the total water demand at full development of all the General Plan lands on Kauai. This is expected to occur after the year 2030 at present growth rates.

The areas requiring the greatest amounts of water by the year 2010 are Kawaihau, Lihue and Koloa-Poipu. Kawaihau will need 1.16 mgd additional water supply to meet the projected population. Lihue, ~~Koloa-Poipu~~ and Kalaheo-Lawai will have additional needs of 3.47 mgd, 1.83 mgd, and 0.69, respectively. All other areas will need additionally about 0.5 mgd or less by the year 2010. The Hanalei-Kalihiwai area which includes Princeville will require another 1.53 mgd.

The sustainable yield figures show that groundwater is available in the hydrologic units to meet the water demand beyond the year 2010, except for Kekaha. While the hydrologic units have the available sustainable yields to meet the projected demands, the DOW must develop the wells to extract the water from the ground for use. Potential sources have been identified by the present Water Master plan and additional sources have been identified since then. Additional well testing and exploration will be required to meet the projected 2010 and long range demands. Alternative sources, including the expansion of surface water treatment facilities, will also have to be studied for the long range plan.

The Kekaha area is already importing some its potable water from the Waimea hydrologic unit to the Kekaha unit. The Lihue area or Hanamaulu Hydrologic unit can now import water from the Wailua-Kapaa or the Wailua hydrologic unit and portions of the Anahola hydrologic unit. This will be required to meet projected peak flow demands but there is adequate capacity to meet the average daily demands within the hydrologic unit. The koloa-Poipu water system should be connected to the Lawai-Kalaheo system to increase the reliability of both systems.

The areal imbalances created by the importation of surface water for irrigation from one hydrologic unit to another is expected to persist as it exists today. The sugar companies can divert water from streams in other hydrologic units to this fields by extensive systems of ditches and tunnels. The Kekaha Sugar Company and Lihue Plantation Company move large amounts of surface water from one hydrologic unit to another. Plans to convert some cane fields to residential or other urban activities will reduce irrigation requirements, reducing some of the areal imbalances. The conversion will also reduce groundwater requirements for irrigation as in the Koloa-Poipu and Kalaheo-Lawai areas.

projects. The total water demand for these projects is 8.9 mgd. The 4.8 mgd water demand for the agricultural parks is included above. The remaining projected water demand is included in the municipal water system projections.

## 5.2 ALTERNATIVE STRATEGIES FOR MEETING FUTURE DEMAND

### 5.2.1 Greater Use of Non-Potable Sources

The use of non-potable water for agricultural and industrial purposes indirectly enhances potable water supplies for municipal use. This will not be required for Kauai as long as over pumping does not occur in Kekaha and Koloa.

### 5.2.2 Reuse of Wastewater Effluent

Results of the recent test project at the Honouliuli Wastewater Treatment Plant (WWTP) in Ewa support the potential benefits of wastewater effluent reuse as a source for replenishing non-potable water and maintaining low salinity caprock water. The project, conducted by the University of Hawaii Water Resources Center (WRRC) in conjunction with DLNR, flooded six half-acre plots adjacent to the WWTP with primary-treated effluent once a day. The process produced 68,000 gpd of recharge water per acre, or 14.6 acres per 1 mgd. On sugarcane, recharge was greater but was accompanied by a loss in crop quality due to a failure in the drip-irrigation system which alternately watered the crop. This system will become effective as the flows to Kauai's WWTP increases.

### 5.2.3 Desalinization

The high salinity water can also be transformed by desalting plants to create potable supplies. By the mid-1990's a \$5.7 million desalting plant built near Campbell Industrial Park is expected to produce 1 mgd for household use, with a potential production capacity of 10 mgd. This high technology facility will rely on either reverse osmosis or electrodialysis, the two most commercially proven methods. Both methods can produce purified water with only 25 percent of the saline content of tap water.

With respect to cost, the proposed plant in Ewa should be competitive with the current Oahu BWS rates. With Oahu BWS rates expected to increase, purified water done at \$1.50 to \$3.00 per 1,000 gallons is not unreasonable. It should be noted that the plant will not be designed to desalinate seawater.

### 5.2.4 Conservation Measures

The Department of Water can implement extensive water conservation programs similar to the programs on Oahu. These programs fall into two major categories: Water System Conservation and Consumer Conservation.

Water system conservation involves efforts by the DOW to account for all the water in their transmission and distribution systems. Even water used for firefighting and street and sewer flushing must be measured through various means. This careful monitoring will enable the DOW to pinpoint discrepancies within the system and to institute conservation measures where required.

Furthermore, a leak detection program will minimize losses that inevitably occur in such a large system. Under certain circumstances, leaks in piping may go undetected for a long time and cause large losses. The leak detection program can be a preventive program too, sometimes revealing a need for pipe replacements.

While the DOW has the ability to regulate its own systems, regulating consumer consumption is more difficult. Because a reduction in per capita consumption can partially offset population increases, long-range public information and awareness campaigns will help to educate the public.

TABLE 8

Kauai Water Use and Development Plan  
 WATER DEMAND SUMMARY (per Municipal System)

Municipal System	Well Cap. (MGD)	Water Demand (MGD)		
		1988	2010	Ultimate
Kekaha-Waimea	3.07	1.18	1.19	2.89
Hanapepe-Eleele	2.25	0.52	1.02	2.48
Koloa-Poipu	5.99	1.73	3.56	6.94
Kalaheo-Lawai	3.99	0.77	1.46	2.85
Lihue	6.94	2.45	5.92	8.59
Wailua-Kapaa	8.35	2.49	3.65	5.62
Anahola	0.72	0.13	0.18	0.28
Kilauea	2.02	0.28	0.45	0.82
Hanalei-Princeville	0.36	0.88	2.41	4.36
Wainiha-Haena	0.52	0.09	0.24	0.43
<b>TOTALS:</b>	<b>34.21</b>	<b>10.52</b>	<b>20.08</b>	<b>35.26</b>

Note: The above figures include Princeville.





TABLE 17

Kauai Water Use and Development Plan  
 PROPOSED WATER DEVELOPMENTS FOR KAUAI  
 DOW DEVELOPMENTS

	System	Type of Improvement	Capacity	Cost
Kekaha-Waimea	301	1 Wells	600 gpm	\$2,242,080
		2 Reservoir	1 mg	\$3,376,000
	302	3 Exploratory Wells	n.a.	\$360,000
Hanapepe-Eleele	304	1 Well	700 gpm	\$2,615,760
		2 Reservoir	1 mg	\$3,376,000
		13000 Lineal Feet of Pipe	12 in	\$975,000
Kalaheo-Lawai	101	1 Well 3 Reservoir	700 gpm 1 mg	\$2,615,760 \$5,064,000
Koloa-Poipu	101	2 Well	800 gpm	\$5,978,880
		1 Well	1200 gpm	\$4,484,160
		7 Reservoir	1 mg	\$11,816,000
		12600 Lineal Feet of Pipe	12 in	\$945,000
Lihue	102	3 Wells	200 gpm	\$2,242,080
		2 Well	700 gpm	\$5,231,520
		5 Reservoir	1 mg	\$8,440,000
		18500 Lineal Feet of Pipe	12 in	\$1,387,500
Wailua-Kapaa	104	1 Well	1000 gpm	\$3,736,800
		3 Well	700 gpm	\$7,847,280
		2 Well	600 gpm	\$4,484,160
		7 Reservoir	1 mg	\$11,816,000
		12000 Lineal Feet of Pipe	12 in	\$900,000
Kilauea	105	1 Well	700 gpm	\$2,615,760
		1 Reservoir	0.5 mg	\$844,000
Hanalei	202	1 Well	250 gpm	\$934,200
Princeville	201	1 Well	1500 gpm	n.a.
		1 Reservoir	1.5 mg	n.a.
TOTAL				\$94,327,940

Unit prices developed from Oahu BWS C.I.P.

D9003045

**HAWAII WATER PLAN**

# **WATER RESOURCES PROTECTION PLAN**

Volumes I & II



*Prepared by:*  
**George A.L. Yuen and Associates, Inc.**



**Commission on Water Resource Management  
Department of Land and Natural Resources  
State of Hawaii**

June 1990

**TABLE 2 - Typical Long-Term Water Conservation Measures**

Area of Application	Conservation Measure
General	Public information In-school education Metering Pressure reduction Pricing Uniform commodity rates Inclining commodity rates Seasonal rates Leak detection and repair System rehabilitation
Interior residential use	Low-flow shower heads Shower-flow restrictors Toilet-tank displacement bottles/dams Pipe insulation Faucet aerators Water-efficient appliances
Devices for new construction	Low-flush toilets and ultra-low-flush toilets Low-flow shower heads Pipe insulation Faucet aerators Water-efficient appliances
Power generation	Recirculation of cooling water Reuse of treated wastewater In-system treatment
Industrial use	Recirculation of cooling water Reuse of cooling and process water Reuse of treated wastewater Efficient landscape irrigation Low-water-using fixtures Process modification
Agricultural irrigation	Off-farm conveyance systems Canal lining, canal realignment, canal consolidation Phreatophyte control On-farm distribution and irrigation systems Ditch lining or piping Water-control structures Land leveling or contouring Sprinkler irrigation Drip irrigation Subsurface irrigation Tailwater recovery Irrigation scheduling Improved tillage practices Surface mulches Pressure regulator
Irrigation system evaluations	Return-flow systems Field drainage Main drainage
Landscape irrigation	Efficient landscape design Low-water-use plant material Scheduled irrigation Efficient irrigation systems Tensiometers

Source: Water Conservation, William O. Maddaus, American Water Works Association, Denver, Colorado, 1987.

SUSTAINABLE YIELD  
Explanation of Column Headings

Sector: In the Aquifer Classification, the Sector is the largest subdivision within an island. It encompasses a region having hydrogeological similarities, but its aquifers are not necessarily hydraulically continuous.

System: Aquifer Systems are subsets of Sectors. Normally aquifers within a System are hydraulically connected. Water balances are computed for each System.

Code: The Aquifer Code is an identifier in which the first number refers to the island, the following two numbers to the Aquifer Sector and the last two numbers to the Aquifer System.

A(sq.mi): The Aquifer System area in square miles.

P(in/yr): Weighted average annual rainfall in the System in inches per year. Rainfall is taken from the DLNR isohyetal maps, which generally are representative, but where the rainfall gradient is steep or distorted the weighted averages may diverge appreciably from actual conditions. This phenomenon is evident particularly where stream runoff exceeds basin rainfall. part of the discrepancy results from groundwater contributions to a stream from outside the topographic boundaries of the drainage basin, but much is attributable to generalizing the isohyets.

RO(in/yr): Average total stream flow in inches per year for an Aquifer System. The average is derived from correlation between recorded average stream flows and average rainfall within the System, or other Systems with similar environments, then extrapolated to the entire System at its weighted average rainfall. Correlations between average rainfall and average runoff are not very good but nevertheless are the only reasonable estimators for working water balances on a System scale. The correlations assume a power (log-log) relationship between average runoff and average rainfall. The empirical equation has the form:

$$RO = aP^n$$

in which a and n are constants.

ET(in/yr): Actual loss of water to the atmosphere by evapotranspiration from a natural, vegetated surface is difficult to establish accurately, but good estimates have been made for Hawaiian conditions. In high rainfall areas, which usually are in the mountains, potential evapotranspiration is suppressed by cloud cover and temperature, while in the sunny lowlands it is limited by lack of available soil moisture. In environments having 55 inches or more rain per year the average evapotranspiration is estimated as 40 inches per year. This value is based on work of Ekern in the Koolau Range of Oahu and Giambelluca in the high rainfall region of southern Oahu. For averages less than 55 inches per year, evapotranspiration is taken as 73 percent of rainfall, an estimate based on Giambelluca's water budget for the Pearl Harbor region. No matter how small the annual average rainfall, not

all is lost to evapotranspiration. A portion goes to surface runoff and some infiltrates to the saturated zone.

I(in/yr): The difference between average rainfall and the combination of average runoff and evapotranspiration is infiltration to groundwater. For all Aquifer Systems this column is calculated employing data in the previous columns. The following column, I(mgd), is not always calculated from I(in/yr).

I(mgd): Infiltration reported as mgd. In some cases an estimate other than the one that would follow from the previous column is given. These few cases are restricted to Oahu and Maui where more detailed water budgets have been calculated.

SY(mgd): Sustainable yield is derived for the steady state relationship among head, infiltration and net draft, which is equivalent to sustainable yield. The infiltration value is given in the I(mgd) column. The calculated sustainable yield assumes that all groundwater is pumped from basal aquifers seaward of the high level zone except where high level water approaches the coast. The relationship is:

$$D/I = 1 - \{h(e)/h(0)\}^2$$

in which D is allowable draft (sustainable yield), I is infiltration, h(0) is initial head and h(e) is the equilibrium head.

Assigning a value for I, the controlling variable in the equation is h(e). This head is selected to preserve the quality of water produced at the steady state. Where the initial head was low, the ratio h(e)/h(0) must be high and the ratio D/I small. The head ratio used to obtain sustainable yield is based on experience with known aquifers, such as those of Honolulu and southern Oahu. The sustainable yields are calculated from the following:

<u>h(0) Range(ft)</u>	<u>h(e)/h(0)</u>	<u>D/I</u>
4 - 10	.75	.44
11 - 15	.70	.51
16 - 20	.65	.58
21 - 25	.60	.64
>26 and HL	.50	.75

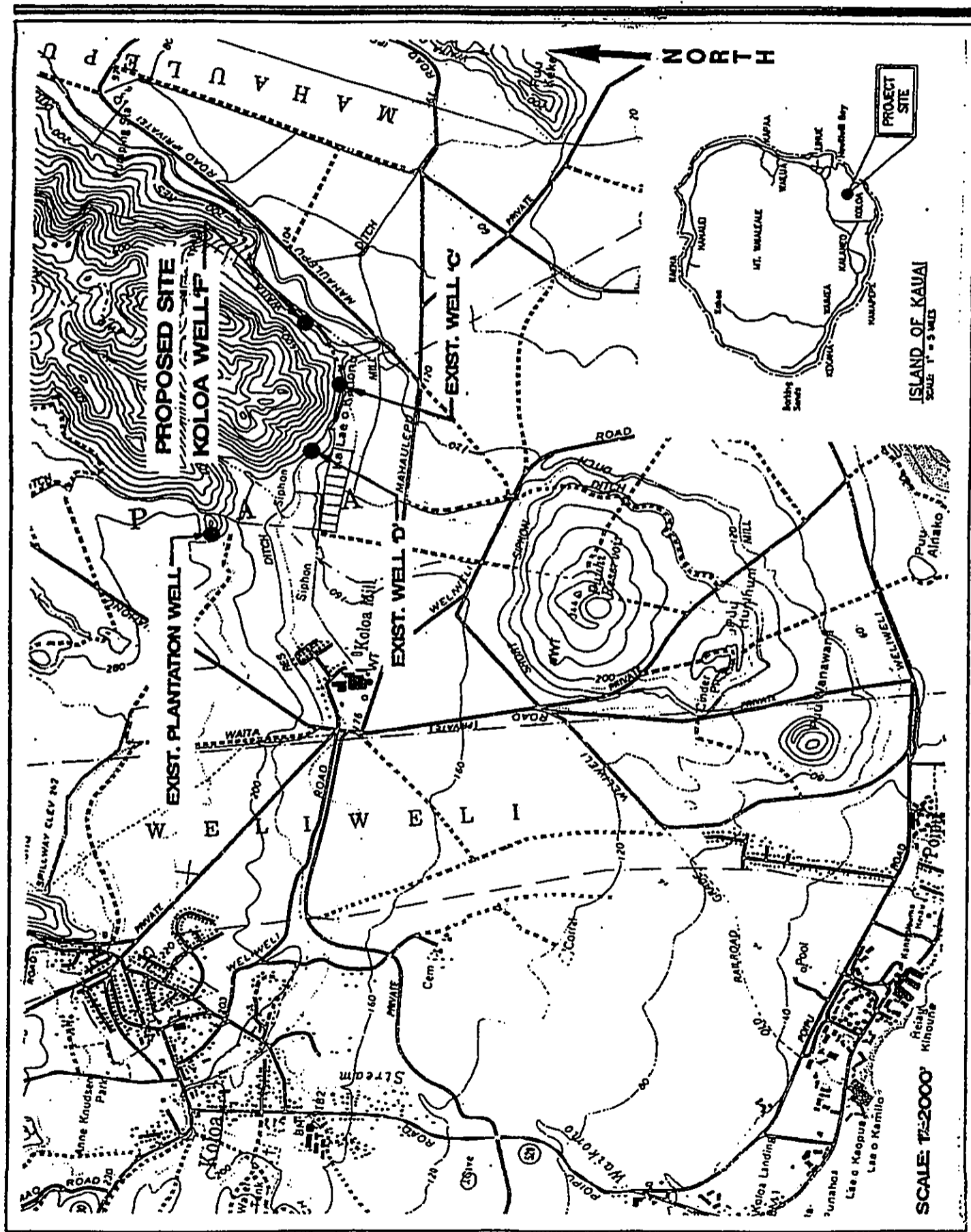
h(0): Initial head before the start of groundwater development. The head refers to a specific location, and h(e) is specified for that location. Many initial heads are estimated because of absence of information.

KAUAI  
Estimated Sustainable Yields by Aquifer Systems

<u>Sector</u>	<u>System</u>	<u>Code</u>	<u>A(sq.mi)</u>	<u>P(in/yr)</u>	<u>RO(in/yr)</u>	<u>ET(in/yr)</u>	<u>I(in/yr)</u>	<u>I(mgd)</u>	<u>SY(mgd)</u>	<u>h(0)</u>
Lihue	Koloa	20101	50.72	73	9	40	24	59	30	15
Lihue	Hanamaulu	20102	55.22	83	13	40	30	79	40	15
Lihue	Waialua	20103	52.46	146	59	40	47	117	60	15
Lihue	Anahola	20104	49.89	83	13	40	30	71	36	15
Lihue	Kilauea	20105	18.63	96	19	40	37	33	17	15
Total:			226.92					359	183	
Hanalei	Kalihiwai	20201	17.69	121	36	40	45	38	16	20
Hanalei	Hanalei	20202	32.81	176	97	40	39	61	35	20
Hanalei	Wainiha	20203	38.69	200	137	40	23	42	24	20
Hanalei	Napali	20204	33.75	70	8	40	22	35	20	20
Total:			122.94					176	95	
Waimea	Kekaha	20301	59.22	33	1	24	8	23	12	10
Waimea	Waimea	20302	48.40	95	19	40	36	83	42	10
Waimea	Makaweli	20303	67.76	65	7	40	18	58	30	10
Waimea	Hanapepe	20304	22.35	127	41	40	46	50	26	10
Total:			197.73					214	110	
Total:			547.59					749	388	

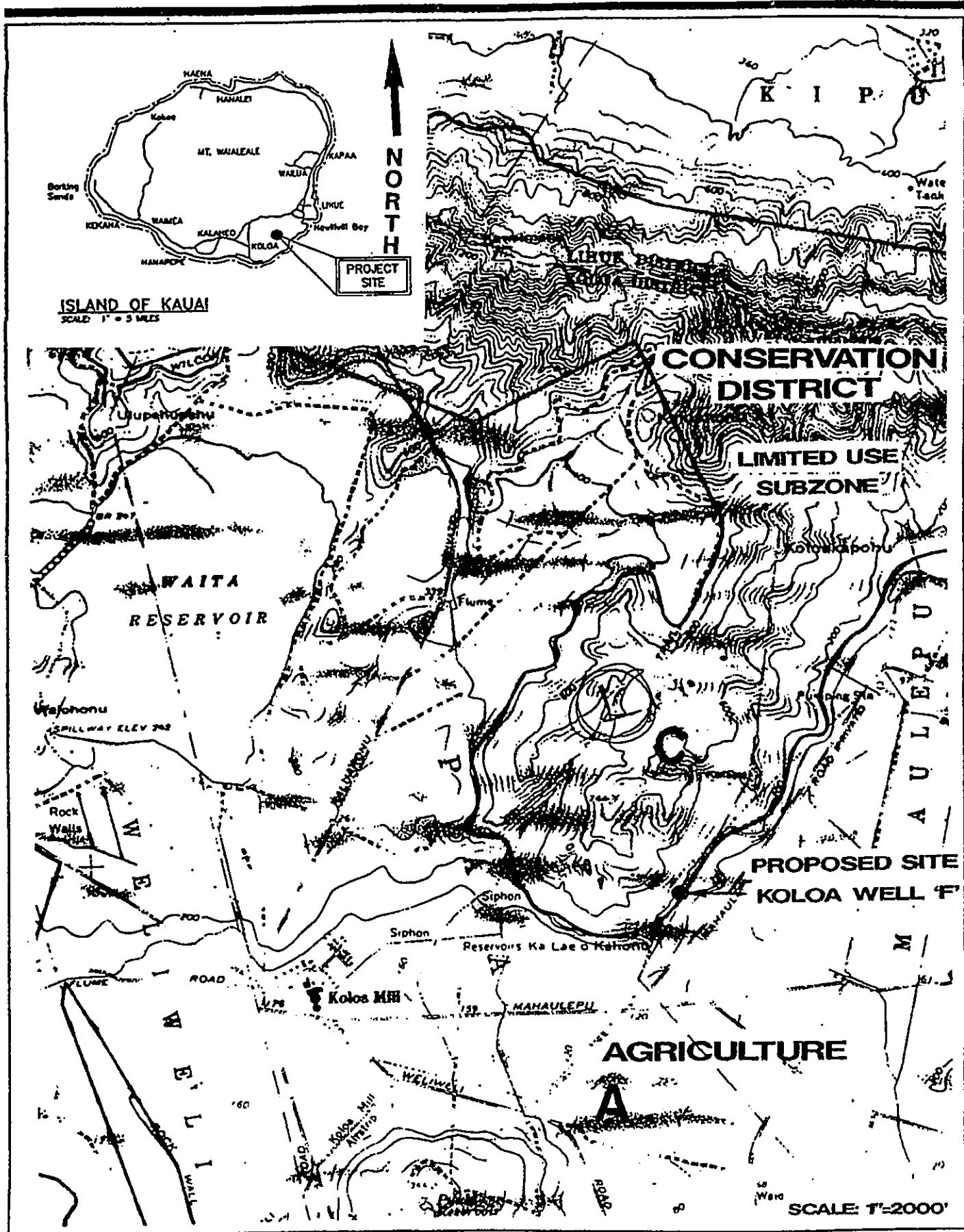






Proposed Koloa Well 'F' Site

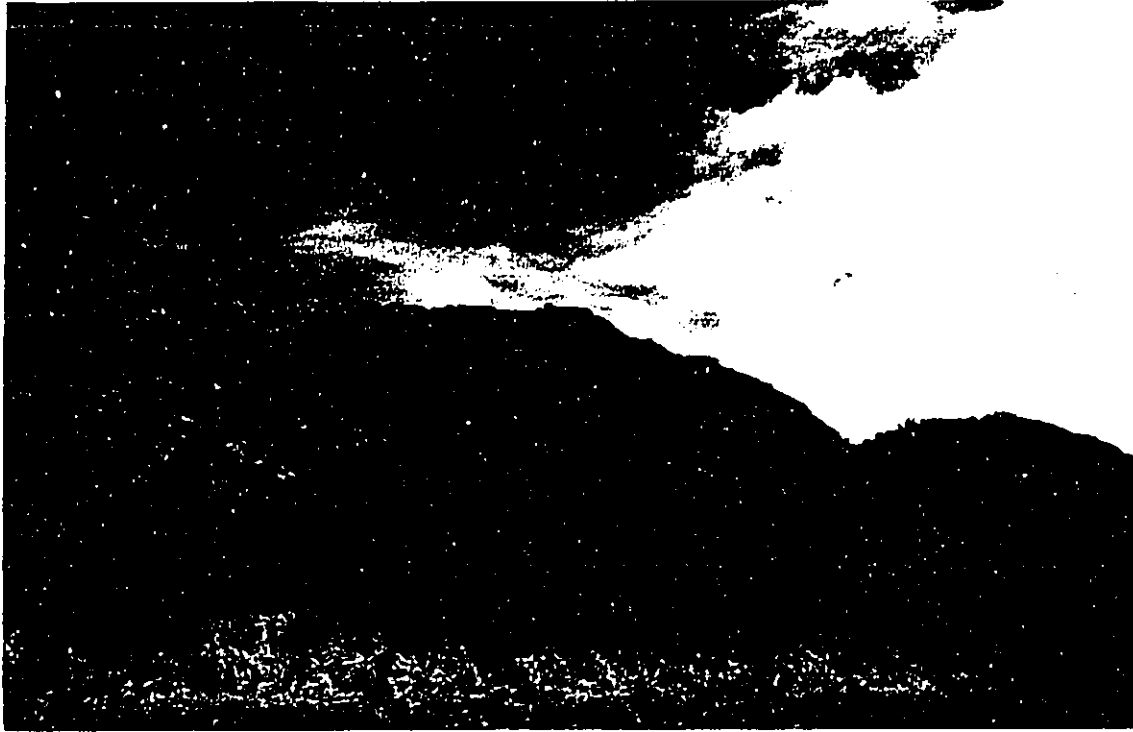
FIGURE 2



Land Use Zones

FIGURE 3





PROPOSED SITE KOLOA WELL 'F' IN LOWER CENTER OF PHOTO  
APPROXIMATELY 20 FEET INTO TREE LINE



TYPICAL VEGETATION AT PROPOSED WELL SITE

DOCUMENT CAPTURED AS RECEIVED

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