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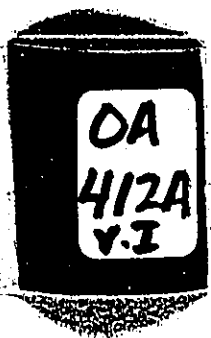
Revised Environmental Impact Statement
for the Proposed
Waikane Golf Course Project

Waikane, Koolaupoko District, Oahu, Hawaii

Volume I

Prepared for
Waikane Development Company

February 1989



GROUP 70 • Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • (808)523-5866

P1989.0067 (vol.1)

Office of Environmental Quality Control
235 S. Beretania #702
Honolulu HI 96813
586-4185

DATE DUE

JUN 19 1998

5-5-99

JOHN WAIHEE
GOVERNOR



MARVIN T. MIURA, Ph.D.
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STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 SOUTH KING STREET, ROOM 104
HONOLULU, HAWAII 96813

Dear Reviewer:

Attached for your review is a revised Environmental Impact Statement (FEIS) that was prepared pursuant to Chapter 343, Hawaii Revised Statutes and Chapter 11-200, Administrative Rules, EIS Rules:

TITLE: WAIKANE GOLF COURSE

LOCATION: TMK: 4-8-4: Por. of 4; 4-8-6: Por. of 8
Koolaupoko, Oahu

CLASSIFICATION Applicant Action



REVISED ENVIRONMENTAL IMPACT STATEMENT
FOR THE PROPOSED
WAIKANE GOLF COURSE PROJECT
Waikane, Koolaupoko District, Oahu, Hawaii

Prepared for:
Waikane Development Company

Prepared by:
Group 70

February 1988

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REFERENCES

LIST OF PREPARERS; RESUMES

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TECHNICAL APPENDICES

- A. "Roads Report for the Proposed Waikane Golf Course"; Waikane, Koolaupoko, Oahu, Hawaii; October, 1988, Engineering Concepts, Inc.
- B. "Wastewater Management Plan for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988, Engineering Concepts, Inc.
- C. "Water Supply Report for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988, Engineering Concepts, Inc.
- D. "Proposed Groundwater Development Lower Waikane Valley, Oahu"; Honolulu, Hawaii; 21 March 1988, Mink, John F.
- E. "Socio-Economic Impact Assessment for Proposed Waikane Golf Course"; October 1988, Community Resources, Inc.
- F. "Drainage Report for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988, Engineering Concepts, Inc.
- G. "Environmental Aspects of Storm Water Runoff Waikane Golf Course"; March 1988, Dugan, Gordon L.
- H. "Soil Erosion Report for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988, Engineering Concepts, Inc.
- I. "Waikane Golf Course Traffic Impact Assessment Report"; February 1988, Pacific Planning & Engineering, Inc.
- J. "Archaeological Reconnaissance Survey and Limited Subsurface Testing for Waikane Golf Course"; Hilo, Hawaii; July 1988, Paul H. Rosendahl, Ph.D., Inc.
- K. "Biological Survey of Waikane Stream, Windward O'ahu"; Waimea, Hawaii; February 1988, Archer, Kelly M.

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TECHNICAL APPENDICES

- L. "Environmental Impact of Fertilizer and Pesticide Use on the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; 5 April 1988, Murdoch, C.L. and Green, R.E.
- M. "Marine Environmental Survey in the Vicinity of the Waikane Golf Course", Oahu, Hawaii; 26 March 1988, Marine Research Consultants
- N. "Botanical Survey Waikane Golf Course, Oahu"; Honolulu, Hawaii; 9 February 1988, Nagata, Kenneth M.
- O. "Terrestrial Vertebrates of the Waiahole/Waikane Area"; Honolulu, Hawaii; December 1987, Berger, Andrew J.
- P. "Air Quality Study for the Proposed Waikane Golf Course"; Honolulu, Hawaii; 26 March 1988, Root and Neal, Inc.
- Q. "Noise Impact Evaluation for the Proposed Waikane Golf Course Draft Report"; Honolulu, Hawaii; 1 April 1988, Darby & Associates
- R. "Feasibility and Need of Waikane Golf Course for Agriculture"; Honolulu, Hawaii; March 1988 (Revised February 1989), Scott, Frank S.
- S. "Feasibility of Agricultural Use of Wetlands in the Waikane Golf Course Project"; Honolulu, Hawaii; November 1988 (Revised February 1989), Scott, Frank S.

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SECTION I
General Information

I. GENERAL INFORMATION

- A. APPLICANT: Waikane Development Company
1001 Bishop Street
Pauahi Tower, Suite 2350
Honolulu, HI 96813
Contact: Terry H. Adaniya
Telephone: 521-6172
- B. RECORDED FEE OWNER: Pan-Pacific Development, Inc.
1001 Bishop Street
Pauahi Tower, Suite 2350
Honolulu, HI 96813
Contact: Terry H. Adaniya
Telephone: 521-6172
- C. AGENT: Group 70
924 Bethel Street
Honolulu, HI 96813
Contact: Ralph Portmore or George Atta
Telephone: 523-5866
- D. TAX MAP KEY: 4-8-4: portion of 4
4-8-6: portion of 8
- E. LOT AREA: 39± acres (portion of property within Special Management Area)
- F. AGENCIES CONSULTED IN PREPARING REVISED EIS
- FEDERAL
U.S. Department of Agriculture
U.S. Department of the Army,
U.S. Army Engineer District, Honolulu
U.S. Department of the Navy
U.S. Fish and Wildlife Service
- STATE
Office of State Planning
State Department of Agriculture
State Department of Land and Natural Resources
State Historic Preservation Office
State Department of Health
State Department of Transportation
State Housing, Finance and Development Corporation
State Public Works Engineer
Environmental Center, University of Hawaii at Manoa

**F. AGENCIES CONSULTED IN
PREPARING DRAFT EIS
(CONTINUED)**

STATE (continued)

Institute of Marine Biology, University of
Hawaii at Manoa
Hawaii Air National Guard
Office of Hawaiian Affairs

CITY

City Building Department
City Department of Housing and Community
Development
City and County Department of Land Utilization
City and County Department of Parks and
Recreation
City and County Department of Public Works
City Department of Transportation Services
Honolulu Board of Water Supply
Honolulu Fire Department
Honolulu Police Department
Kahaluu Neighborhood Board

SECTION II
Description of the Proposed Action

II. DESCRIPTION OF THE PROPOSED ACTION

A. GENERAL DESCRIPTION

1. Description of Proposed Project

The applicant, Waikane Development Company, is proposing the development of a 27-hole golf course on a 505± acre property owned by Pan-Pacific Development, Inc. in Waikane Valley, Koolaupoko District, Oahu. Figure 1 shows the property in relationship to the region.

Figures 1 and 2 show that the property is roughly delineated on the makai side by Kamehameha Highway and residences along Haupoa Road. The northern sector of the property is defined by the Waikane-Hakipuu boundary and the southern sector is defined by the Waiahole-Waikane boundary. Waikane Stream flows along the base of Puu Pueo from the mauka portion of the property to Kamehameha Highway. The property is identified by Tax Map Keys: 4-8-4: 4; 4-8-6: 8; and 4-8-14: 4.

Two existing dirt roads traverse the property. One, known as Waikane Valley Road, provides access to two kuleanas within the greater boundaries of the property and to other properties mauka of the site. Adjacent to one of the kuleanas is a church. Waikane Valley Road continues through the property and divides to provide access to parcels mauka of the property. The other dirt road extends from Haupoa Road, meanders part way parallel to Waikane Stream and then fades out. Both dirt roads are in poor condition due to severe erosion. Other than the church and some tenants, the site is generally vacant and unused.

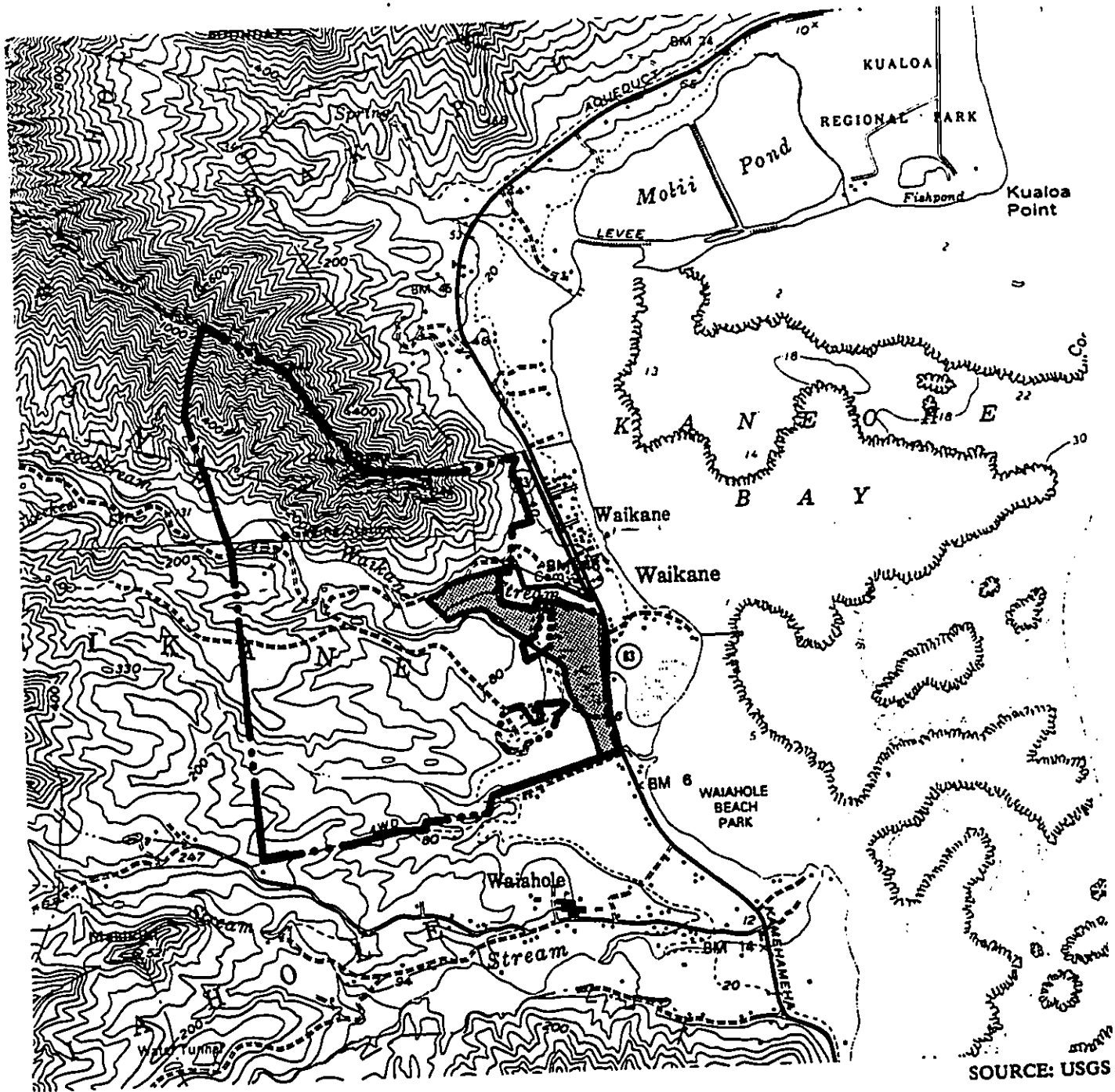
The development of a 27-hole golf course on the property will include a clubhouse (including an outdoor swimming pool and eight tennis courts) driving range, maintenance building, and related infrastructure (Figure 3). The existing church on the property which is on a long-term lease will be maintained.

2. Relationship to Special Management Area

Approximately 39 acres of the property are located within the Special Management Area (SMA) (Figures 2 and 3). The area within the SMA is identified by the following Tax Map Keys: 4-8-04: portion of 4; and 4-8-06: portion of 8.

3. Land Use Approvals

Existing land use designations and the approvals and permits which are expected to be required for the proposed development are described below and in Table 1.



LEGEND
 **SPECIAL MANAGEMENT AREA WITHIN PROJECT**

**LOCATION MAP
 WAIKANE GOLF COURSE**

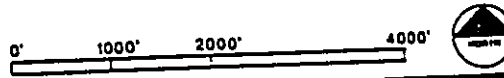
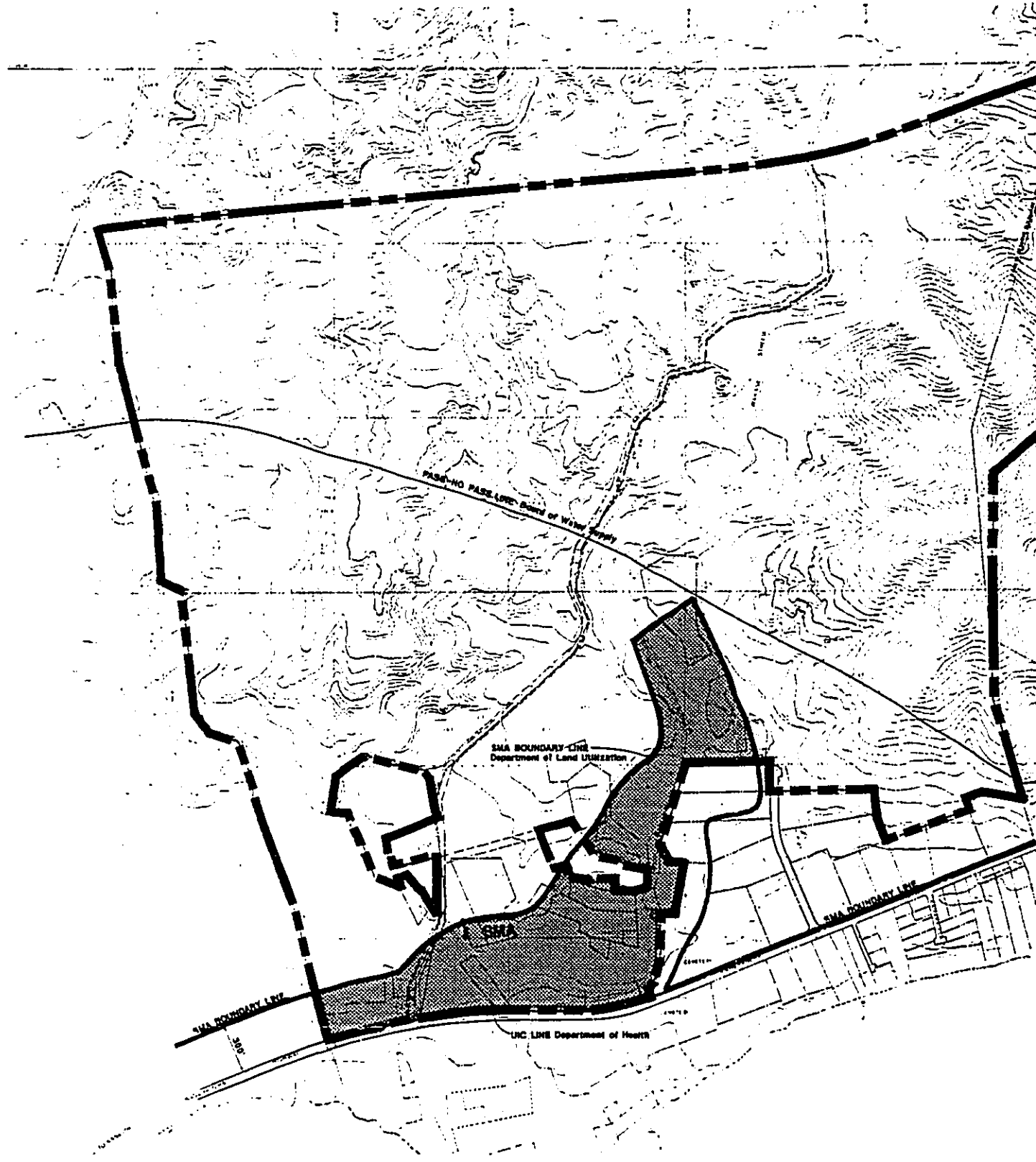


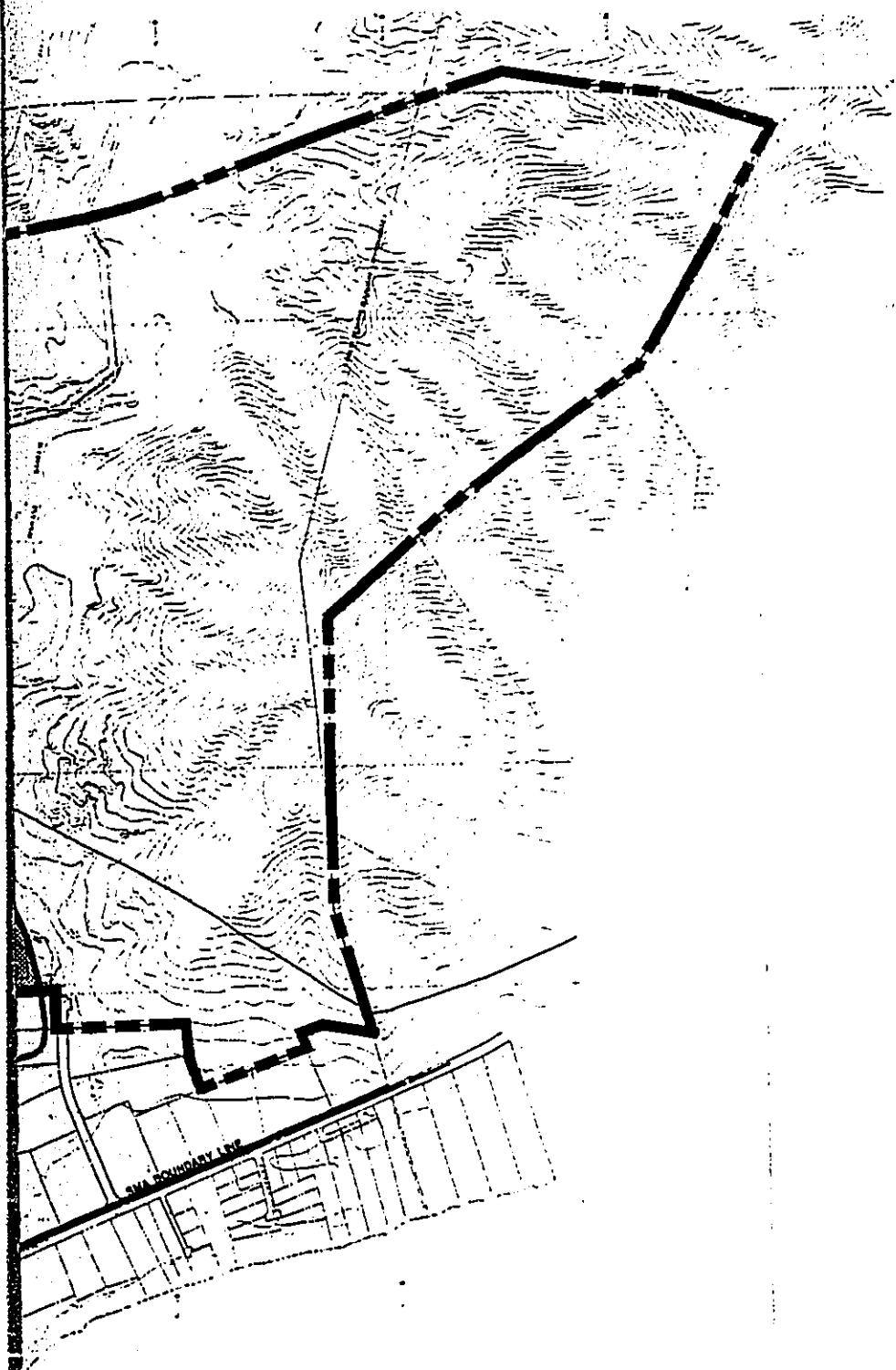
FIGURE 1



LEGEND

 SPECIAL MANAGEMENT AREA
WITHIN PROJECT

**PROJECT BOUNDARY MAP
WAIKANE GOLF COURSE**

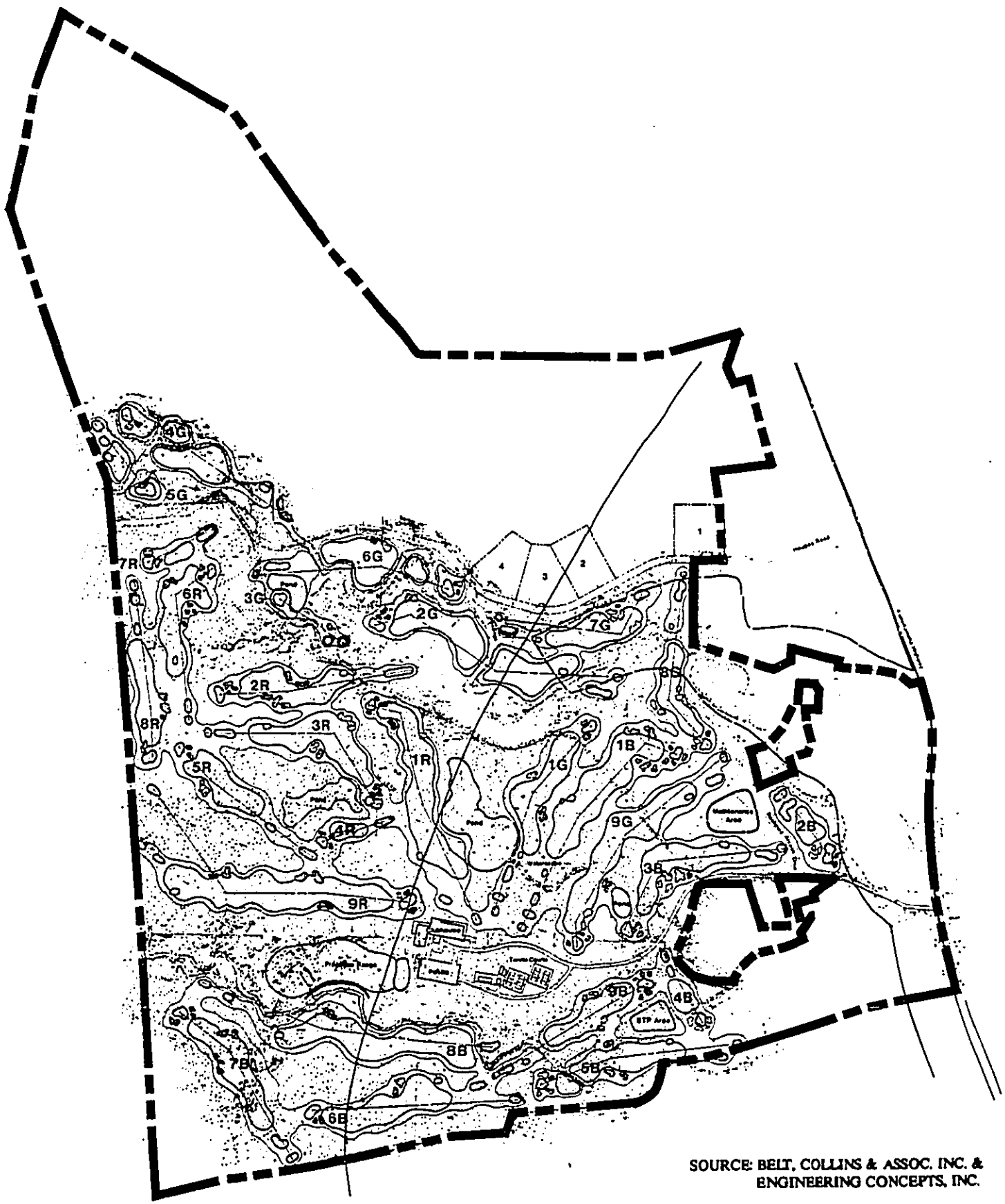


SOURCE: ENGINEERING CONCEPTS, INC.

0' 400' 800' 1600'



FIGURE 2



SOURCE: BELT, COLLINS & ASSOC. INC. &
ENGINEERING CONCEPTS, INC.

**PROPOSED GOLF COURSE MASTER PLAN
WAIKANE GOLF COURSE**

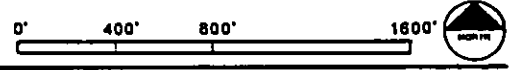


FIGURE 3

TABLE 1
REQUIRED PERMITS AND APPROVALS

WAIKANE GOLF COURSE

<u>Permit</u>	<u>Proposed Use(s)</u>	<u>Approving Agency</u>
Special Management Area Use Permit	Portion of golf course; portion of entry road	Department of Land Utilization
Conditional Use Permit	Golf course; clubhouse	Department of Land Utilization
Conditional Use Permit	Wastewater treatment plant	Department of Land Utilization
Special Use Permit	Wastewater treatment plant	Planning Commission
Stream Alteration Permit	Realignment of portion of unnamed stream	Water Commission
Well Drilling/Pump Installation Permits (for 3 wells)	Golf course irrigation water supply	Water Commission
Subdivision Permit	Four-lot agricultural subdivision	Department of Land Utilization
Grading Permit	Golf Course	Department of Public Works
Construction State Highway Permit	Left-turn Lane	Department of Transportation

- a. State Land Use Designation--Most of the property is located within the State Land Use Agricultural District. Golf courses are a permitted use within Agricultural District lands with soils classified by the Land Study Bureau as "C", "D", and "E". However, the construction of a wastewater treatment facility will require a State Special Use Permit. A portion of the property (72 acres) is located within the State Land Use Conservation District. No activities are proposed within the Conservation District of the property.
- b. State Water Code--Development of the driving range will require some minor alteration of the alignment of the unnamed stream. Although the stream is intermittent and grading will not alter the capacity of the streambed, a stream alteration permit may be necessary. This requirement is being investigated and approvals will be pursued as necessary. The development of the irrigation water system and fire protection for the golf clubhouse will require the drilling of three wells. The wells require permits to drill and permits to withdraw water. Two wells have been drilled and are being tested. The drilling permit for the third well has been obtained. After tests for sustainable yield and impact are done, a water use certificate will be needed from the State DLNR before permanent pumps are installed and water can be drawn from the wells. Golf course design calls for a realignment of a 600-foot section of the unnamed stream. This requires a stream alteration permit from the Water Commission. The lower reaches of the stream as it approaches the wetland area meanders and will be graded for better definition of the stream channels.
- c. General Plan--The property is located within an area of the island designated "Rural" in the Oahu General Plan. The project will not increase the resident population, thus the population distribution guidelines for Koolauoko, as specified in the General Plan, will not be affected.
- d. County Development Plan--Most of the property is designated "Agriculture" in the Koolauoko Development Plan (DP). Golf courses are permissible on lands within the DP Agricultural District which are not classified as "prime", as is the case for this property. A portion of the property (72 acres) is designated Preservation in the DP. No activities are proposed within the latter area. Discussion with Staff of the Department of General Planning indicate that infrastructure planned to service the golf course are considered minor and need not be shown on the DP Public Facilities Map.
- e. County Zoning--Tax Map Keys 4-8-4: 4 and 4-8-6: 8 are zoned AG-2 General Agricultural District. Outdoor recreational facilities and private wastewater treatment facilities are allowed in AG-2 zoned areas, however, a Conditional Use Permit must be obtained. Tax Map Key 4-8-14: 4 is zoned P-1 Restricted Preservation District. No activities are proposed within the P-1 zoned areas.

f. Special Management Area--The portion of the property within the SMA is shown on Figures 1 and 2. This Environmental Impact Statement is submitted as part of the Special Management Area Use Permit application requirements.

B. TECHNICAL CHARACTERISTICS

1. Use Characteristics

Approximately 189 of the 505± acres are steep lands (the slopes of Puu Pueo) unsuitable for golf course use (Figures 1 and 3). This area is concentrated in the northern portion of the property and includes the 72 acres of the property designated "Conservation" by the State, "Preservation" in the DP, and zoned P-1. Another 25.8 acres of the property has been designated wetlands by the U.S. Army Corps of Engineers (Figure 4). No golf course improvements or activities are proposed in the steep area or in the wetlands (within the property's SMA area, 17.1 acres are in the Corps-designated wetland area). The remainder of the property includes approximately 290 acres, of which 136± acres will be used for the tees, fairways, greens and roughs of the 27-hole golf course.

The entire project will preserve open space except for the proposed structures for the clubhouse, maintenance and STP areas.

Approximately 39 acres of the property are located within the SMA. No above-ground structures will be located within the SMA. Other than the beginning portion of the proposed entry road to the golf course and clubhouse site, the only improvements within the SMA area will be 5.7 acres of tees, fairways, greens, roughs and cartpaths of the golf course.

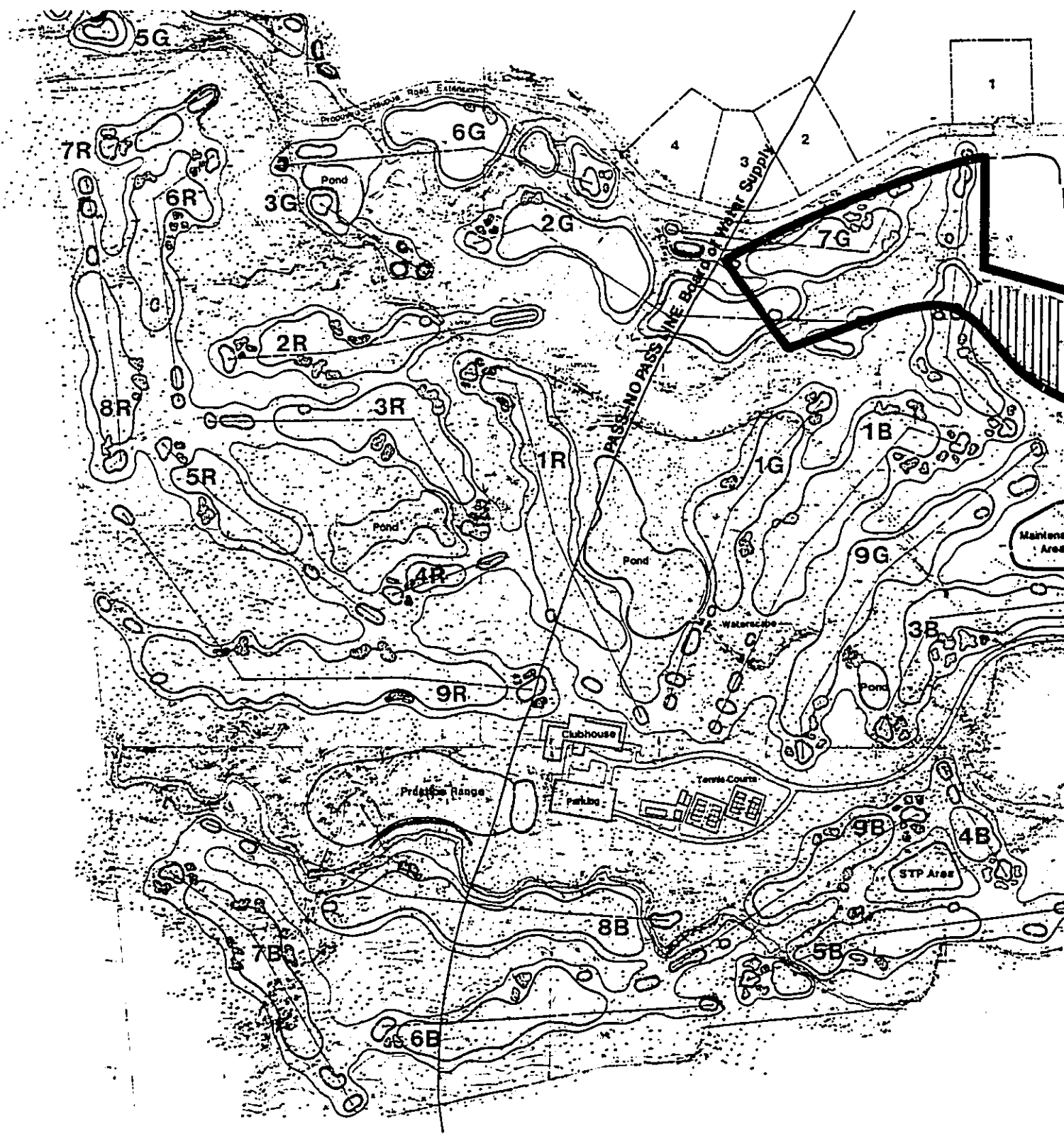
There is a possibility that a part of the designated wetland area on the southeastern portion of the property may be used for a community park. Negotiations with the Waiahole - Waikane Community Association and concerned public agencies will determine the type of park that is created.

2. Physical Characteristics

The tees, fairways, greens and roughs of the 27-hole golf course, will require an estimated 136 acres. The golf course will also include 4 ponds totaling about 7.0 acres. There will also be a driving range (6.5± acres), a clubhouse (on 5.6± acres), a course maintenance yard (1.5± acres), and wastewater treatment facility (1.2± acres). Refer to Figure 3. As stated above, the only improvements within the SMA area will be a portion of the proposed entry road and 5.7 acres of the golf course.

3. Access

Access to the golf course and clubhouse will be via Waikane Valley Road, which is an existing dirt road extending to the site from Kamehameha Highway. Approximately 1,400 feet from Kamehameha Highway, a new road alignment is proposed for the entry road to the clubhouse. The total length of this road will be approximately 3,000 linear feet (475± feet of the roadway is located within the SMA). The proposed entry road will have a paved asphaltic concrete finish approximately

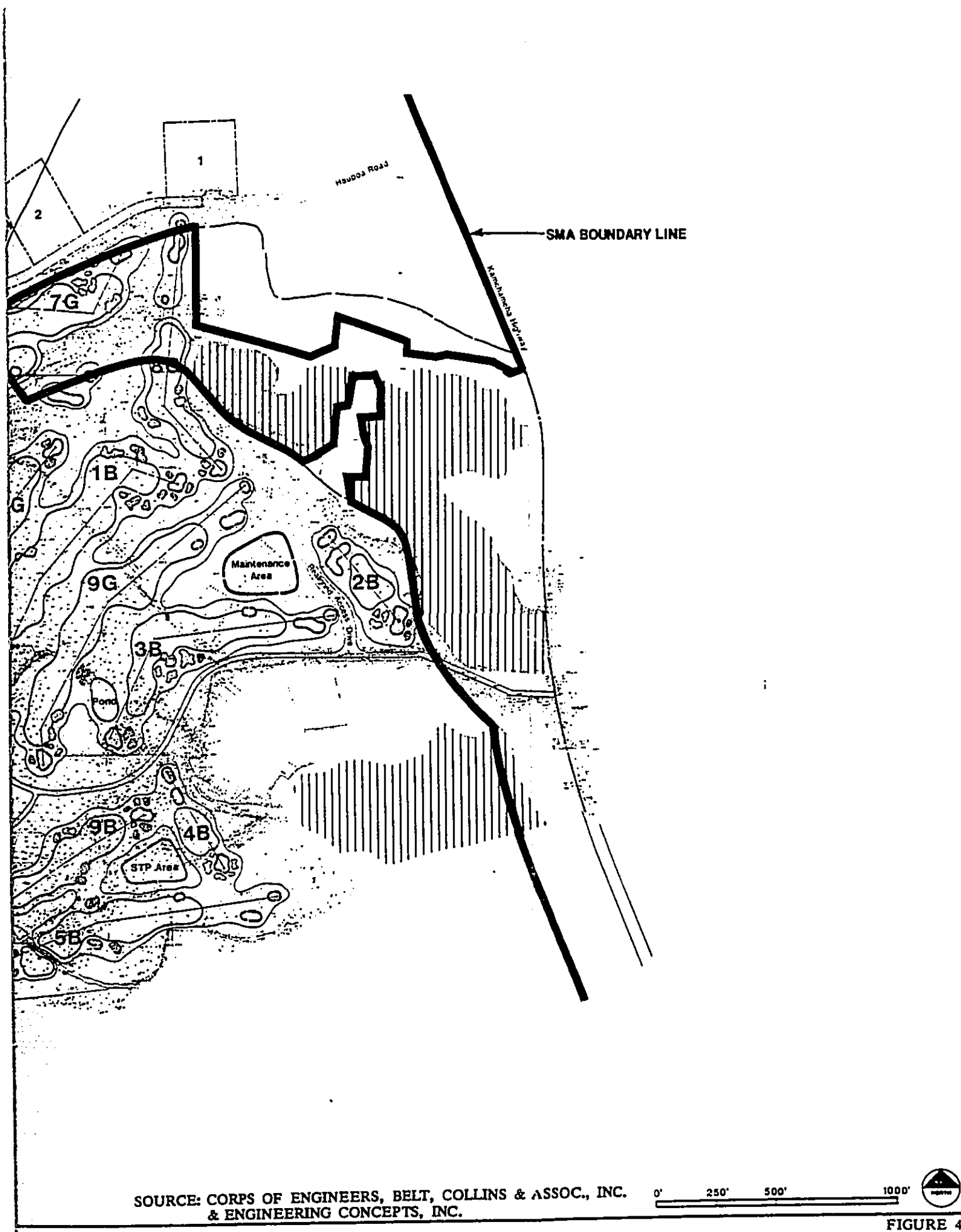


LEGEND

 WETLAND

AREA OF WETLAND WITHIN PROPERTY
 WAIKANE GOLF COURSE

SOURCE: CORPS OF
 & ENGINE



SOURCE: CORPS OF ENGINEERS, BELT, COLLINS & ASSOC., INC.
 & ENGINEERING CONCEPTS, INC.

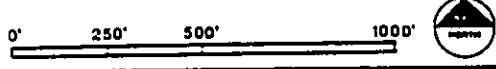


FIGURE 4

24 feet wide with concrete curbs. In addition to providing access to the golf course and clubhouse, this new paved entry road will provide access for the two kuleanas, the church, the maintenance area, and the STP.

A second road will furnish access to properties mauka of the project site. This road will be a 3,800-foot extension of Haupoa Road, an existing public road intersecting Kamehameha Highway near the northern limits of the property. No portion of this road is located within the SMA. The proposed Haupoa Road extension will be designed to conform to City and County of Honolulu standards for public roads. (See Figure 5 for roadway improvements; also Appendix A).

Upon State Department of Transportation approval, an exclusive left turn storage lane for the proposed golf course entry road will be constructed along Kamehameha Highway.

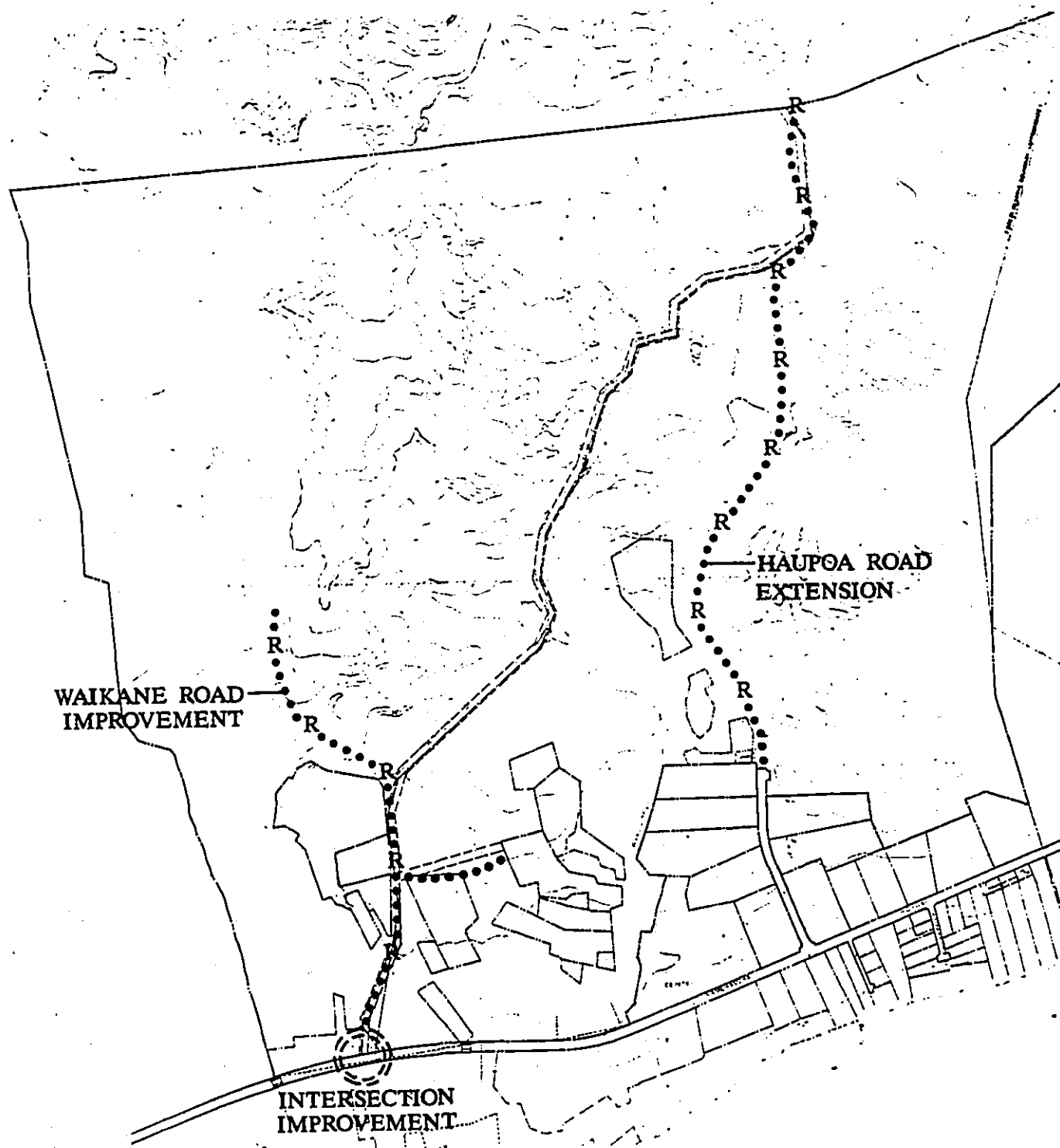
An exclusive right turn lane on Waikane Valley Road will also be created at the intersection with Kamehameha Highway to facilitate turning movements of people leaving the golf course.

4. Liquid Waste Disposal

Wastewater flows are anticipated to be generated primarily from clubhouse activities. These activities include: meal preparation and other related activities; personal hygiene, including toilet and lavatory; showers; and laundry. A small portion of the wastewater flow will be generated from the employee restrooms and service sinks in the maintenance building. Households in the Robert's Kuleana and uses on the church parcel are currently and will remain on a cesspool system. The parcels will not be hooked up to the wastewater treatment system. Engineering Concepts, Inc., the consulting engineer, estimates that the average wastewater design flow will be 20,000 gpd, based on calculations for water use. (See Appendix B.) Wastewater generated from the golf course activities will be of typical domestic composition. The volume of wastewater generated is based on the projected water demand for the system shown in Appendix C minus the church and Robert's Kuleana use.

The proposed wastewater collection system (Figure 6) will be located along the proposed entry road. A gravity sewer will convey wastewater to the wastewater treatment facility site (STP area) from a sewer manhole at the intersection of the proposed entry road and the access road to the STP area. The sewer manhole will receive wastewater flows from a gravity sewer from the clubhouse, and a force main from the maintenance building site. Due to site topography, the maintenance area requires a small pumping station for wastewater transport.

The proposed method of mechanical treatment is by sequencing batch reactor (SBR), a fill-and-draw, non-steady state activated sludge process. Waste activated sludge will be stored in a holding tank prior to transport to a City and County of Honolulu facility for treatment and disposal. A City and Country private sludge disposal



PROPOSED ROADWAY IMPROVEMENTS
WAIKANE GOLF COURSE

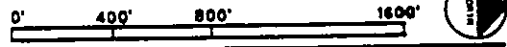
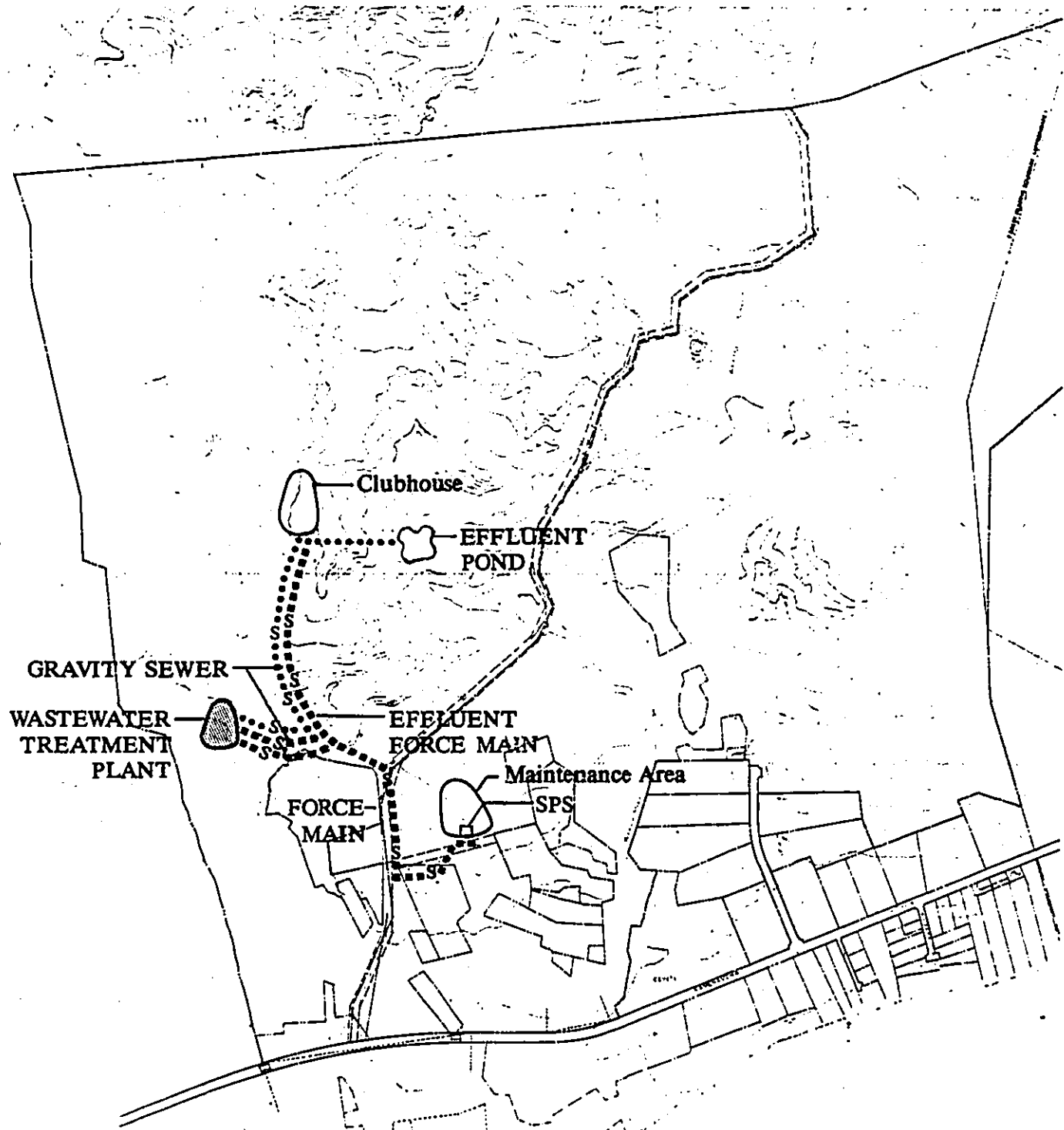


FIGURE 5



**PROPOSED WASTEWATER SYSTEM
WAIKANE GOLF COURSE**



FIGURE 6

permit will be needed prior to operation. The holding tank will be aerated to maintain aerobic conditions, thus reducing odors. Based on typical domestic wastewater conditions, approximately 600 gpd of waste activated sludge is expected. The holding tank will be pumped one to two times each week by a tanker truck and waste activated sludge will be transported for treatment to a City and County of Honolulu facility. The golf course operator will hire a certified treatment plant operator to maintain the system.

Treated effluent will be pumped to a golf course pond located across the proposed entry road and north of the clubhouse, adjacent to the irrigation storage pond. The effluent pond will be physically separated from the irrigation pond and designed to prevent overflow. Effluent in the pond will be diluted with non-potable water from the main irrigation pond and used to irrigate portions of the golf course makai of the Board of Water Supply's no-pass line. Approximately two percent of daily irrigation water requirement can be supplied by wastewater effluent.

In the event of mechanical failure or operational difficulty, the effluent disposal pond will be designed with 14 days of freeboard. The consulting engineer feels this is sufficient time to correct any problems that may arise.

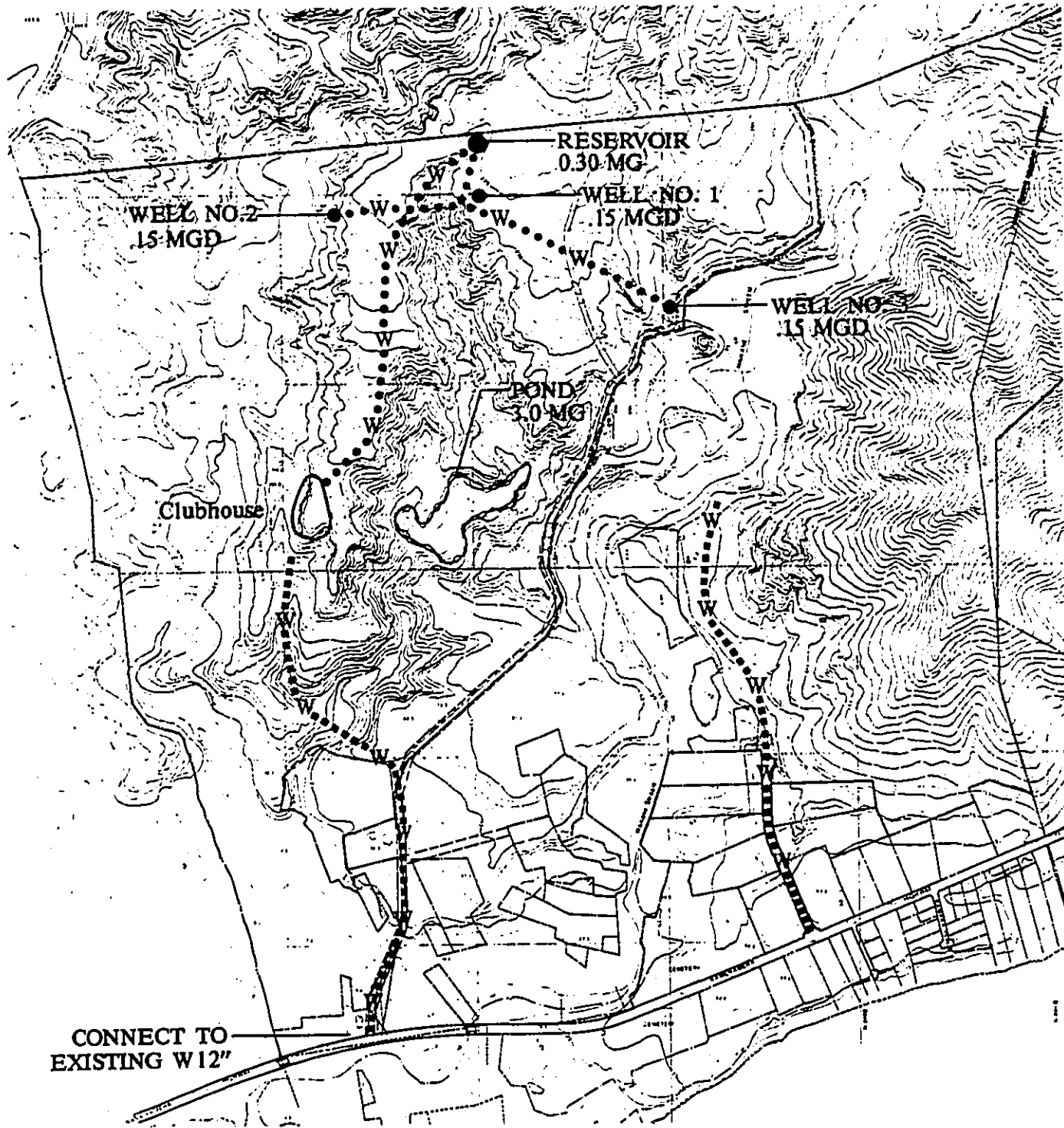
Wastewater infrastructure will exclusively serve the Waikane Golf Course project. No other areas are planned to be serviced by this wastewater treatment facility. None of the on-site wastewater infrastructure will be located within the SMA area.

5. Solid Waste Disposal

Solid waste will be collected by a private collection company and disposed of at the County's windward sanitary landfill.

6. Potable and Non-potable Water

Water supply for the proposed project will be separated into two different systems: the potable water system and the non-potable water system (Figure 7). The potable water system includes domestic supply to the clubhouse, domestic supply and fire protection for the maintenance building, and domestic supply and fire protection for the church and kuleanas along Waikane Valley Road. The non-potable water system includes fire protection for the clubhouse and golf course irrigation.



LEGEND

..... POTABLE WATER SYSTEM

..... IRRIGATION SYSTEM

**PROPOSED POTABLE AND
IRRIGATION WATER SYSTEMS
WAIKANE GOLF COURSE**

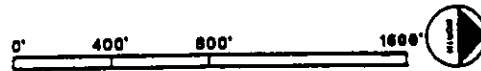


FIGURE 7

Engineering Concepts, Inc. estimates that the operation of the maintenance building and clubhouse will require 25,000 gallons per day (gpd). (See Appendix C.) To meet this demand, the proposed potable water system will tap off the 12-inch (Board of Water Supply) BWS water line along Kamehameha Highway at Waikane Valley Road. A new water line will be installed along Waikane Valley Road which is the proposed entry road to the clubhouse site. Approximately 475 feet of the waterline will be located within the SMA. The waterline will be public from Kamehameha Highway to the church and the maintenance building, and will be private beyond. A fire hydrant, installed off of the public water line, will provide fire protection for the kuleanas and church on Waikane Valley Road. Two parallel water lines will be located within the maintenance area access road. The first line, sized to meet fire protection demands, will connect to a fire hydrant near the maintenance building. A second water line will be sized to meet the domestic needs of the maintenance building.

The non-potable water system will be supplied by three new wells drilled on the property. Each well, located between the 100- and 220-foot elevation, is expected to deliver up to 0.15 millions gallons per day (MGD). (See Appendix D.) Water from the wells will be pumped to a 0.30 million gallon (MG) reservoir at elevation 220± feet. A reservoir of this size is of sufficient capacity to meet the clubhouse fire flow requirement.

Assuming average precipitation it is expected that supplemental irrigation will be required nine months out of the year. Estimated monthly irrigation will range from a high of approximately 4.7 inches in June to less than one inch in the average month. Therefore, the average daily supplemental irrigation will range from a high of 611,600 gallons per day in the dry months to no irrigation in the wet months. Annually this averages to 305,791 gallons/day of irrigation applied during the nine months when irrigation is required.

In addition to the wells, natural drainage from both the land mauka of the golf course and the upper areas of the golf course will drain into the proposed irrigation detention ponds and will serve as a major water source after every rainfall in the area.

Since these irrigation ponds are large, and provide the golf course with a 10+ day supply of irrigation water, and with proper golf course irrigation management, these sources should be sufficient to meet irrigation demands. However, good water conservation practices, especially during times of prolonged drought, will be mandatory in the golf course's management.

Under drought conditions, should additional conservation of irrigation water be required, there are several steps that can be taken. The application rates shown below are for average dry-season peak evapotranspiration with no natural rainfall.

Priorities of irrigation are as follows:

I. Greens: (Approximately 4.0 acres)	= 23,000 GPD Max Avg
II. Greens/Approach: (Approximately 27 acres)	= 153,000 GPD Max Avg
III. Tees: (Approximately 5.0 acres)	= 28,000 GPD Max Avg
IV. Landing Areas: (Approximately 24 acres)	= 136,000 GPD Max Avg
V. Intermediate Areas: (Approximately 30 acres)	= 170,000 GPD Max Avg
VI. Roughs: (Approximately 40 acres)	= 227,000 GPD Max Avg
VII. Driving Range: (Approximately 5.0 acres)	= 28,000 GPD Max Avg
TOTAL: (Approximately 135 acres)	= 765,000 GPD Max Avg

As noted in the above priorities, reductions can take place by reducing or eliminating the applications of Priority VII first, then Priority VI, V, etc., as required. While watering times in Priority II and III can be reduced, they should not be eliminated unless under drastic conditions. Priority I (Greens) should never be reduced during periods of high evapotranspiration except to compensate for natural rainfall, or loss of turf may result.

Since each of the priorities noted above are controlled separately, and with individual control within each priority, drastic water savings can be realized.

Lastly, the irrigation control system which is proposed at Waikane Golf Course will have the state-of-the-art computer system. Linked directly into a private weather station located on the golf course, the control system will monitor the temperature, relative humidity, solar radiation, wind speed/direction and rainfall. This in-turn will calculate the exact evapotranspiration rate and allow the golf course superintendent to apply the exact amount of water required. Additionally, neighboring agricultural users could also benefit through this system by working with the golf course's staff and their technology to maximize the irrigation efficiency of everyone in the Waihole-Waikane area.

Two pump stations will be used for the golf course. Pump System "1" would be located at the Pond No. 1 and would irrigate only the areas below the "No-pass" line. Effluent water from the treatment plant will be mixed with pond water in a special inlet structure, thereby allowing for storage and dissipation of the treated effluent water; separation of effluent from fresh water when in a storage condition; and positive segregation of the use of dissipated effluent only in the areas below the no-pass line where effluent may be applied.

A separate Pump System "2" would be located at Pond No. 2 and would irrigate only the areas above the "No-pass" line using fresh water only.

A gravity line from the reservoir will provide the necessary fire flow and water pressure to the clubhouse. The line will also supply water to an irrigation storage pond located north of the clubhouse. Pond capacity will be about 3 MG, providing a minimum of three days' storage for irrigation.

Electricity and telephone lines to the clubhouse, maintenance and STP areas will be installed underground along the proposed entry road. Approximately 475 feet of the utility lines will be located within the SMA.

7. Construction Characteristics

Construction of the golf course will involve land disturbing activities including removal of existing vegetation (clearing and grubbing), and leveling, removing and replacing soil. Construction of the golf course is estimated to occur over a 16-month period.

C. ECONOMIC AND SOCIAL CHARACTERISTICS

1. Intended Market

The need for golf courses on Oahu has grown tremendously over the last 15 years as a result of increases in both the resident population and the daily visitor count. Yet only one golf course has been built during this period -- the Honolulu International Country Club in Salt Lake. The few recently approved courses will only make a small dent on what is large, virtually untapped market.

Interviews with representatives of Waikiki hotels have indicated that approximately 10% to 30% of the guests request arrangements to be made for them to play golf. It can be expected that this figure is higher at resort destinations offering golf. In addition, many visitors make arrangements in advance with golf tour operators, indicating that the actual demand is even higher.

Existing Oahu golf courses can at most take care of less than 10% of the potential visitor demand. This is demonstrated by the fact that virtually all of them are being used at capacity, with people being turned away. The rapid rise in green fees over the last few years, and the increasing difficulty residents have in making reservations for reasonably good tee times, also show that demand is greatly exceeding supply.

The Waikane Golf Course is intended to serve both the resident and visitor market, in approximately equal shares. The projected distribution of rounds by origin of users is as follows:

Local members	20%
International members	30%
Member guests/tourists	20%
Local non-members	30%
	100%

Provisions will be made at the Waikane Golf Course to ensure the availability of tee times to the general public. Rates for resident public play will be comparable to the kamaaina rates at the Pearl, Hawaii Kai, Makaha East and Navy/Marine golf courses.

Azabu U.S.A. Inc., which is the owner of the Ala Maoana, Hyatt Regency and Waikiki Beachcomber Hotels in Waikiki, will be the operator of this golf course. Thus, most of the visitors who use the golf course will be guests at these hotels. The golf course will provide an important amenity which will help to ensure the continued viability of these hotels.

2. Cost and Phasing of Construction

Construction of the entire project is estimated to cost approximately \$32,000,000.00. Of this total, approximately \$17,000,000 would be expended to construct the 27-hole golf course, and \$8,500,000 for the clubhouse, tennis courts and swimming pool. Infrastructure cost will total about \$6,500,000.00. No public funds will be required for the action, if granted. Construction of the left turn storage lane on Kamehameha Highway will require work within the State owned right-of-way. Upon governmental approval, construction of the project will begin with the proposed entry road and the grading of the golf course. It is estimated that completion of the golf course (including growing time) and related infrastructure will occur 21 months after construction is initiated.

3. Construction-Related Employment

Based on information provided by Waikane Development Company, the construction phase of the project will generate 44 to 68 construction jobs. These jobs would run between 10 to 21 months duration and be equivalent to 57-82 person-years of employment. One person year is equivalent to one full-time job that lasts for one year. According to a report by Community Resources, Inc. (Appendix E), on-site construction employment for this project would be:

<u>Component</u>	<u>No. Employees</u>	<u>Timeframe</u>	<u>Full-Time Equivalent Person-Years</u>	<u>Average</u>
Golf Course	22 - 28	21 Mo.	39 - 49	44
Clubhouse/ Structures	22 - 40	10 Mo.	18 - 33	26
TOTALS			57 - 82	70

On-site construction work also supports other jobs off-site (e.g., support personnel, estimated at 25 percent of the number of on-site workers), plus secondary employment generated by purchase of materials from other businesses and expenditure of workers' wages (equal to 80 percent of the total on- and off-site direct jobs, according to the State of Hawaii's construction model).

Taking the approximate mid-point average estimate of 70 on-site person-years, the total construction-related employment generated throughout the state would be:

$$70 \times 1.25 \times 1.8 = \underline{157.5 \text{ person-years}}$$

4. Operation-Related Employment

Employment related to the operational phase of the development refers to permanent jobs generated by the golf course. It is estimated that 100-120 full-time equivalent jobs will be generated. The majority of jobs will not require much technical training and, in fact, most golf course jobs have on-the-job training. Mr. David Chinen, President of the Waiahole-Waikane Community Association (WWCA), estimates area unemployment at 15 percent. A survey conducted by the WWCA indicated strong interest in working at the golf course.

Total permanent employment generated will include off-site jobs generated as a result of additional products and services supplied for the development. It is estimated that 27 to 34 indirect and induced jobs will be generated, for a total employment impact of 123 to 156 new permanent jobs generated by the golf course development.

5. Government Revenues and Expenditures

A fiscal impact analysis of the project (Appendix E) indicates the State will receive about \$60,000 in income tax from construction-related employment both on and off-site. During the operational phase it is estimated that income and excise tax receipts will be in the neighborhood of \$290,000 per year in 1987 dollars. This is from direct, indirect and induced employment. Finally, it is estimated that the rise in the assessed valuation of the property will result in an increase of \$295,000 per year in real property taxes for the City and County of Honolulu.

a. Public Schools--The schools serving the area are Waiahole Elementary (grades K through 6), King Intermediate (7 through 9) and Castle High School (10 through 12). Since there will be no impact on the resident population, there will be no negative impact on school facilities. There will be some indirect benefits to the school in that the developer will be participating in a continuing program to improve the school by the provision of funds and services. Additionally, a junior golf program will be established for students at Waiahole School.

b. Fire and Police Protection--The Waikane community is served by the Kahaluu and Kaaawa Fire Stations. Both stations are approximately five miles away. Response times will be approximately eight minutes. A 9 May 1978 Fire Department letter states that fire protection is inadequate if the location is more than four miles from the closest station. Conversation with Fire Department staff indicate conditions have not changed. However, given the small number of buildings to be provided, the project is not expected to generate a need for new or expanded fire facilities.

The nearest Police facility is the Kaneohe Substation.

The Police and Fire Departments state in their responses to the Draft EIS that service is adequate for the proposed facility.

Access for police and fire vehicles will be considered in the design development stages of the project. The facility will also be designed to meet life safety code requirements.

- c. Refuse Collection and Disposal--These will be privately handled by the golf course operator. In summary, the proposed project will not require a major increase in any government expenditures.

6. Population and Housing

The Golf Course development has no housing component and, therefore, will have no direct impact on the resident population or housing stock. There may be some population increase in the region as job opportunities from the course attract people to live in the region. There will be an increase in the defacto population of the area. It is estimated that if two-thirds of the golfers and three-fourths of the employees are physically present during peak use periods, there will be about 210 people on the site. This number includes users of the tennis courts and swimming pool, as well as spectators, friends, and family members.

7. Recreational Resources

The Waikane Golf Course will add a new 27 hole golf course to the Island of Oahu. Non-members and the public will be allowed to play. There will be various rates for the golf course usage, including affordable rates for kamaainas. Golf course membership will be mixed with local and international members. Local membership cost will be less than international membership. There will be four tennis courts and a swimming pool built as part of the golf clubhouse complex. Additionally, the developer is willing to provide a portion of the southeastern part of the site for use as a community park. The concept, control and use of the park is under consideration.

D. ENVIRONMENTAL CHARACTERISTICS

1. Climate

The median annual rainfall on the property ranges from nearly 65 inches near Kamehameha Highway to an estimated 79 inches in the mauka portion of the property. Seasonal variation is typically manifested by wet winter months and dry summer months.

The temperature in the valleys near the property is mild and uniform, with the coolest and warmest months averaging approximately 72 and 79 degrees Fahrenheit, respectively. These temperatures are characteristic of Windward Oahu. During the winter months, the relative humidity approaches 80 percent, while during the summer months it is somewhat less humid.

2. Topography

The geologic history of Waikane Valley is essentially that described by Takasaki, Hiroshima, and Lubke (1969) for the Kaneohe Bay drainage basin. Waikane Valley is formed by steep-sided basaltic ridges that project northeastward from the Koolau Range, which developed during the Koolau Volcanic Series in Pliocene times.

The property ranges from about the 10-foot elevation along Kamehameha Highway to the 250-foot elevation in the western portion. The terrain is extremely hilly along the northern boundary, with slopes in excess of 30 percent over most of the area. The portion of the property within the SMA ranges from about the 10-foot elevation to the 50-foot elevation in the mauka portion of the SMA. The southern portion of the property has numerous ridges and relatively small plateaus.

Waikane Stream meanders through the property toward Kaneohe Bay. Grassy low areas, classified as wetlands by the U.S. Army Corps of Engineers, occupy approximately 26 acres of the property along Kamehameha Highway, Waikane Stream and the lower reaches of the unnamed stream. Within the wetlands, the stream channel is poorly defined in numerous branches which converge downstream as the stream extends along the highway and passes under the highway bridge.

3. Soils

Erosion of the basaltic rock over the years has provided an alluvial material which has filled much of the valleys and extends to the coastal areas. Unlike other areas of Windward Oahu, calcareous sedimentary material is sparse at this property. In general, this material consists of an older, moderately-to well-consolidated alluvium, and a younger, more poorly-sorted alluvium, which overlies the older in the coastal regions. These soils are acidic, humic latosols, typified by the Waikane Soil Series and are characteristically well-drained silty clays, with low fertility value for topsoil. Depth of soil material over underlying consolidated materials is almost exclusively greater than 15 ft.

Soil descriptions for the portion of the property within the SMA are based primarily on the Soil Survey of Oahu and other Hawaiian Islands (USDA Soil Conservation Service, 1972). The location of these soils within the SMA area are shown in Figure 8. A brief description of soil group characteristics follows:

Waikane Silty Clay, 8 to 15 Percent Slopes (WpC). Runoff is slow to medium, the erosion hazard is slight to moderate and workability is slightly difficult.

Waikane Silty Clay, 40 to 70 Percent Slopes (WpF). Runoff is rapid to very rapid, the erosion hazard is severe and workability is prohibitive.

Hanalei Silty Clay, 0 to 2 Percent Slope (HnA). Hanalei soils have moderate permeability, very slow runoff and negligible erosion.

Pearl Harbor Clay (Ph). This soil is nearly level and very poorly drained. Permeability is low, runoff is slow and drainage is poor.

Marshlands (MZ). These areas are periodically flooded and water stands on the surface. The water may be fresh or brackish, depending upon the distance from the ocean. In this particular location, the water is indicated to be fresh.

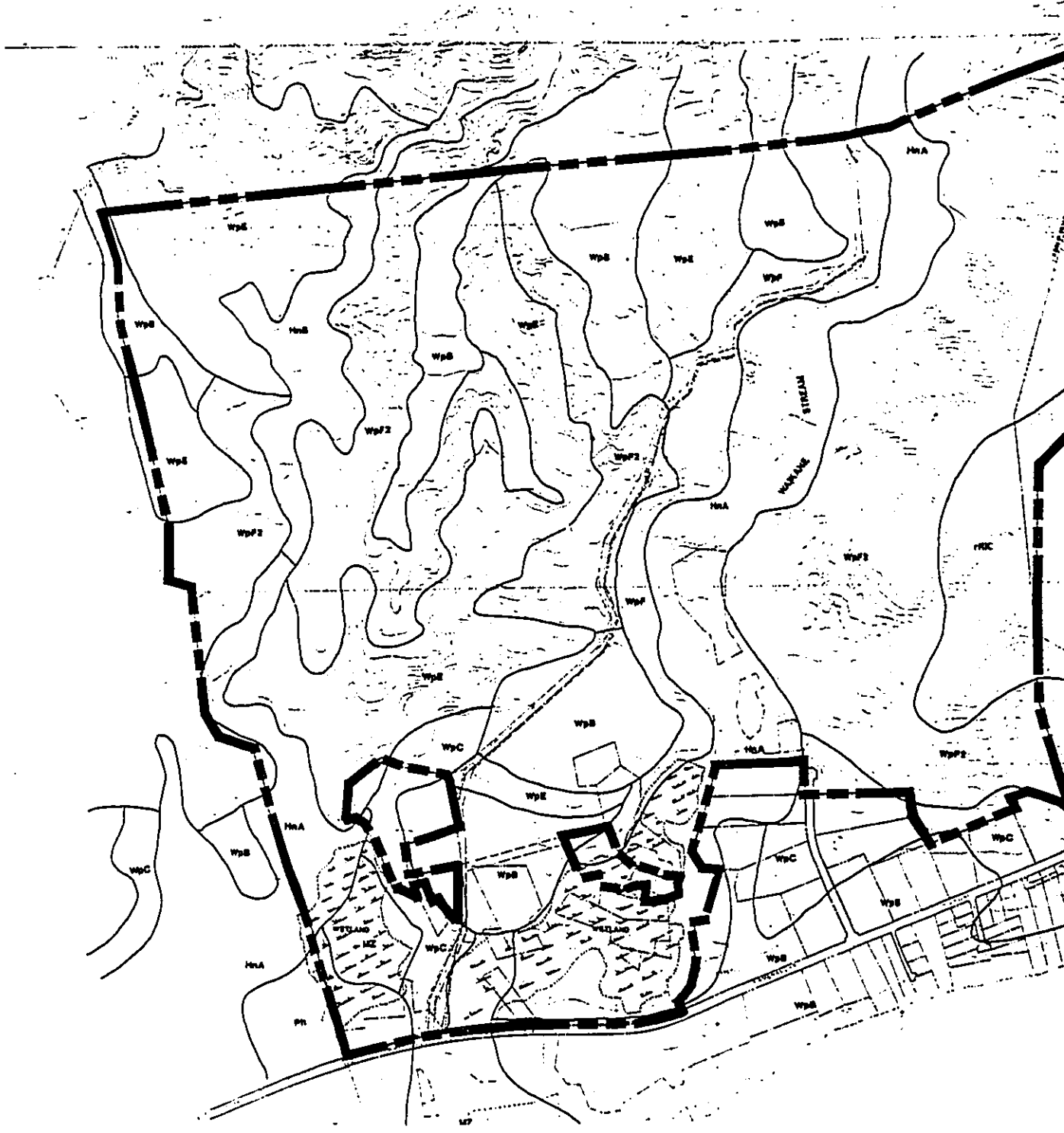
4. Surface Runoff, Drainage and Erosion Hazard

The property is located in Waikane Valley, the northern-most watershed in the Kaneohe Bay drainage basin. The property is approximately divided equally between the main 1,800 acre Waikane Watershed and the adjacent (south) unnamed stream 660 acre drainage area. The unnamed stream and Waikane Watersheds extend from sea level at Kaneohe Bay to a maximum elevation of approximately 1250 feet and 2681 feet, respectively, the latter of which is at the crest of the Koolau Range, a distance of over 3 miles. The Koolau Range on its windward (east) side is characterized by abrupt steep palis that rapidly merge with a rolling plain that gently slopes toward the coast.

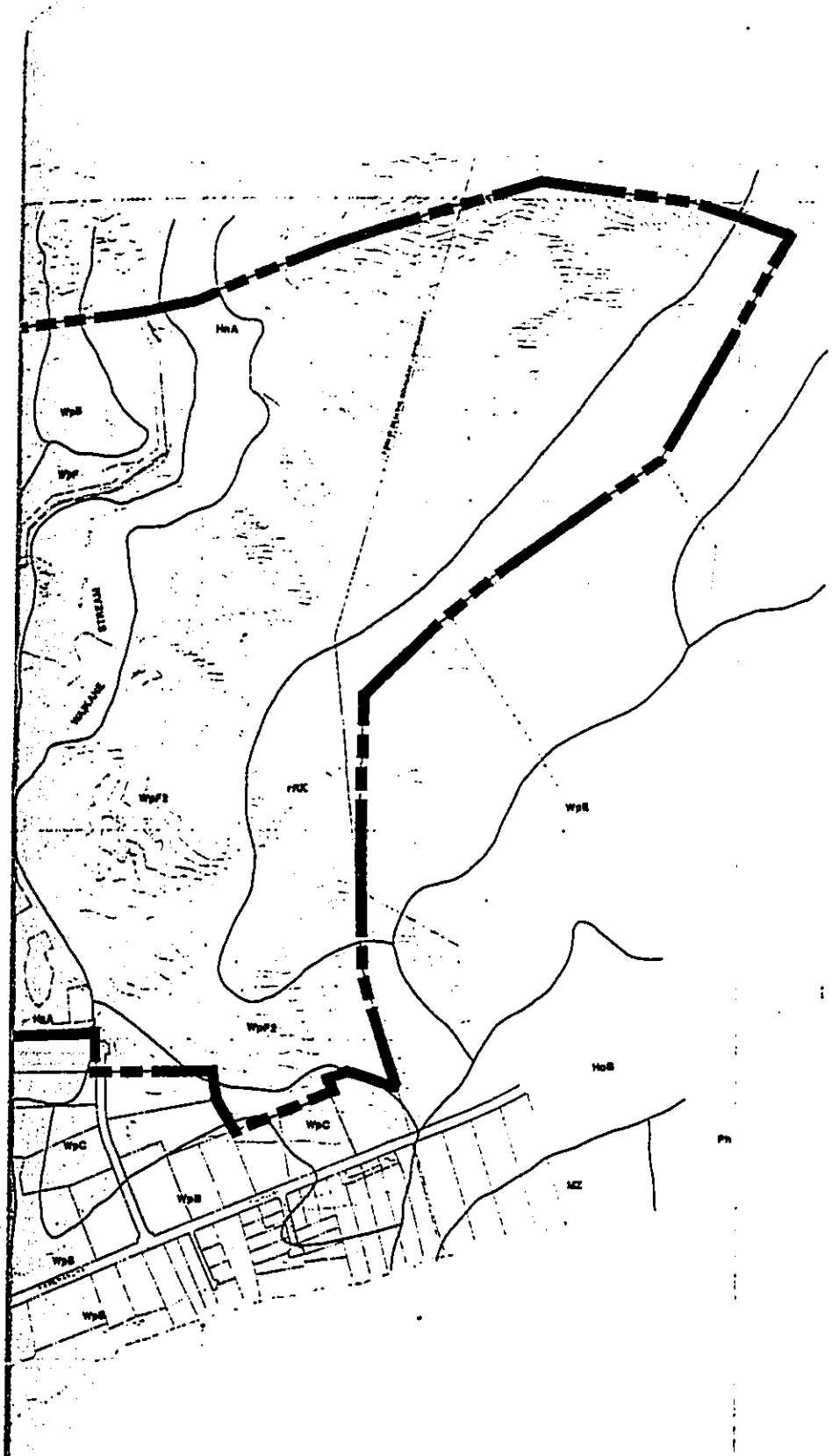
The Waikane Watershed is drained by several tributaries that converge into Waikane Stream, while the unnamed stream only has one water channel. A USGS continuous flow measuring gage (Station 16294900), which has been in operation since December 1959, is located approximately 7,000 feet upstream from Kaneohe Bay at an elevation of 75 feet. The position of the gage enables surface water runoff from 1,420 acres of the 1,800 acre watershed to be continuously recorded. The mean discharge at this station (through 1985) is 8.30 cfs (6,010 acre-ft per year).

The unnamed stream and drainage area, shown in Figure 9, which consists of approximately 660 acres, is situated between the Waikane and Waiahole Watersheds, starting about one-third the distance down from the merger of the two watersheds, at the crest of the Koolau Mountain Range. There is presently no continuous gaging facilities located on this unnamed stream. Much of the streambed within the project area has only intermittent flow.

A drainage study by Engineering Concepts, Inc. (See Appendix F) indicates that development of the proposed golf course improvements may increase the rate of runoff generated on-site. On-site peak runoff has the potential to increase approximately 59 percent for a 10-year storm and 58 percent for a 50-year storm. However, despite this projected increase of on-site peak runoff due to paved roadways, the clubhouse complex and some reduction in forest cover, the runoff rate to downstream properties is expected to be about the same or a little less due to the dampening of the runoff rate by detention basins and ponds. In an independent study Dr. Gordon Dugan reports that,



SCS SOIL CAPABILITY CLASSIFICATIONS
WAIKANE GOLF COURSE



SOURCE: ENGINEERING CONCEPTS, INC.

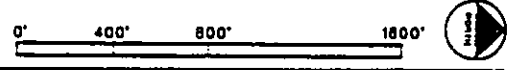


FIGURE 8

As can be observed in Table 3 there is actually a calculated decrease in storm water runoff for the specific storm events being considered. Such a situation is unusual for developments in relatively undeveloped areas. However, in this situation the SCS curve numbers for golf courses are nearly the same as the existing land use vegetative cover, and even though that approximately 8 acres of paved areas are developed there are also about 7 acres of ponds being added within the golf course area. The area of the ponds per se would not result in runoff as long as the banks are high enough to contain the rainfall. Consequently, as a general statement the proposed development would not be expected to significantly alter the quantity of storm water runoff within the project area. (Appendix G).

Additionally, the potential increase in on-site peak runoff represents only about 2% of the total peak runoff from the entire drainage basin for Waikane Stream.

Future drainage patterns are expected to remain similar to existing conditions. Diversion of some on-site runoff to the golf course ponds is proposed. It is intended that the ponds serve as detention basins to dampen the peak runoff generated on-site and limit the quantity of runoff entering Waikane Stream and the unnamed stream to near current seasonal levels.

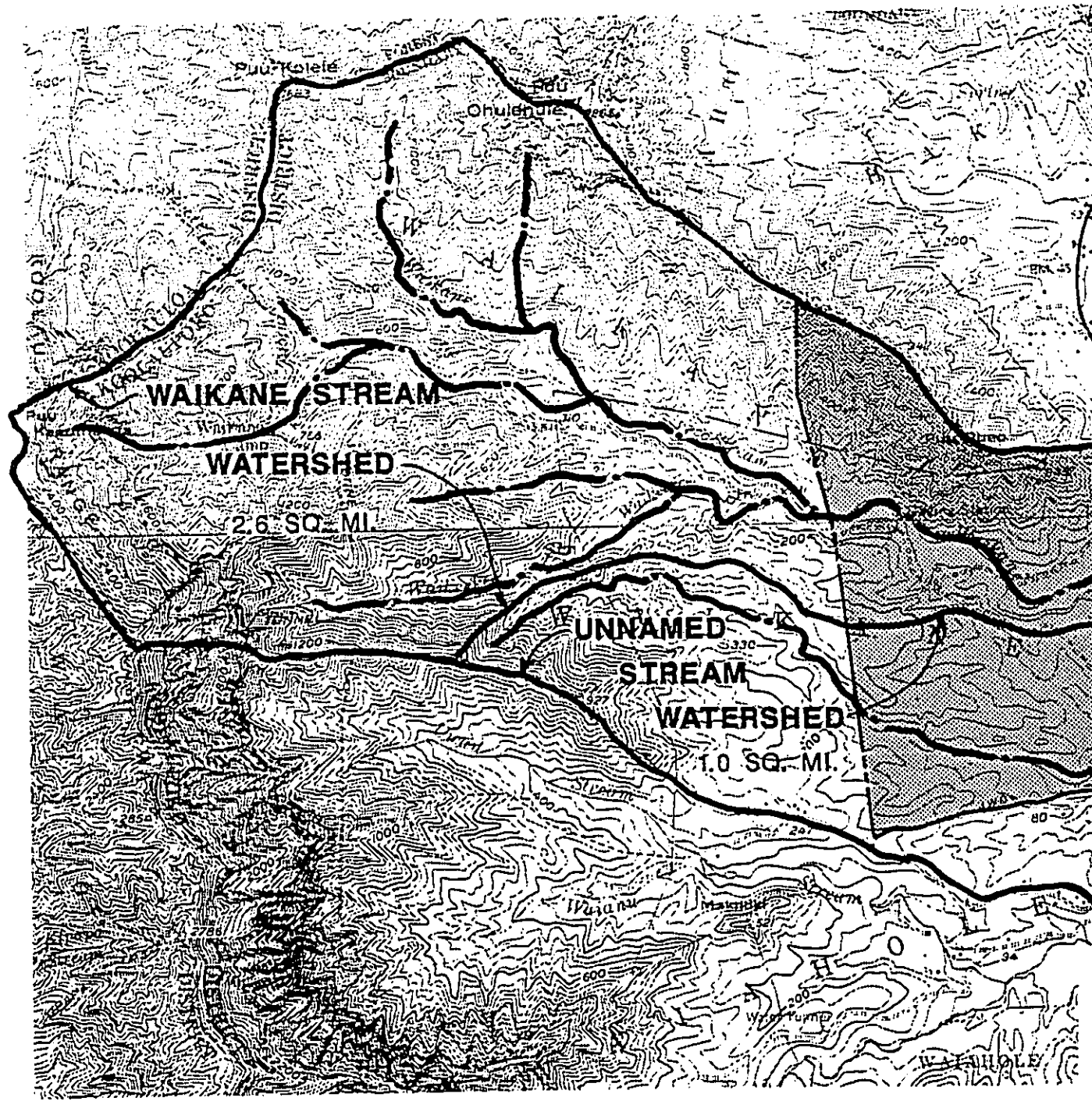
Within the golf course itself, many water retention features will be incorporated. Golf cart paths and low points on fairways will act as diversion and collection areas for excess runoff. Berms and pathways will act as drainage swales and landscaping will slow on-site drainage. Roadways will be designed to channel and retard runoff. Water will not be channeled onto Kamehameha Highway.

It is anticipated that the natural slopes and vegetation would be maintained in most areas unaffected by golf course construction.

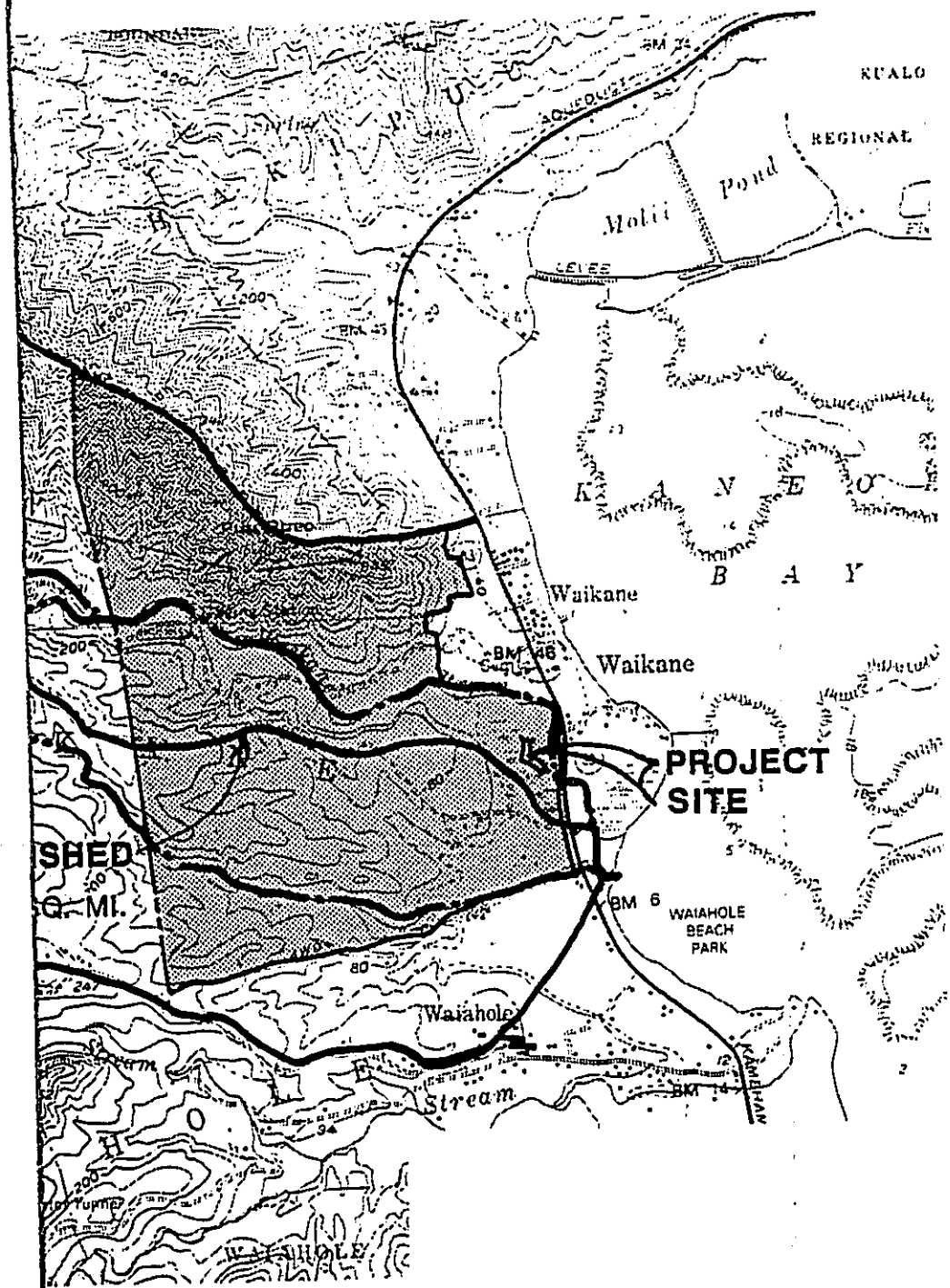
According to Engineering Concepts, Inc., the existing erosion potential for the entire property is approximately 12,000 tons per year. Engineering Concepts, Inc. estimated that the soil erosion potential after development for the entire property will reduce to an estimated 11,000 tons per year. (See Appendix H.)

5. Federal FIRM Zone and LUO Flood Hazard

Portions of the property currently experience flooding. Areas inundated by a 100-year flood are indicated on the Flood Insurance Rate Map (Figure 10). The Flood Insurance Study conducted by the Corps of Engineers for the Federal Emergency Management Agency states that the primary cause of flooding is the inadequate channel capacities and the backwater caused by bridges and culverts at Kamehameha Highway. There are currently no drainage improvements within the property other than the bridges and culverts at Kamehameha Highway.



WAIKANE STREAM DRAINAGE BASIN
WAIKANE GOLF COURSE



SOURCE: ENGINEERING CONCEPTS, INC.

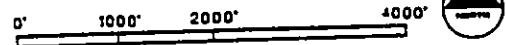









FIGURE 9

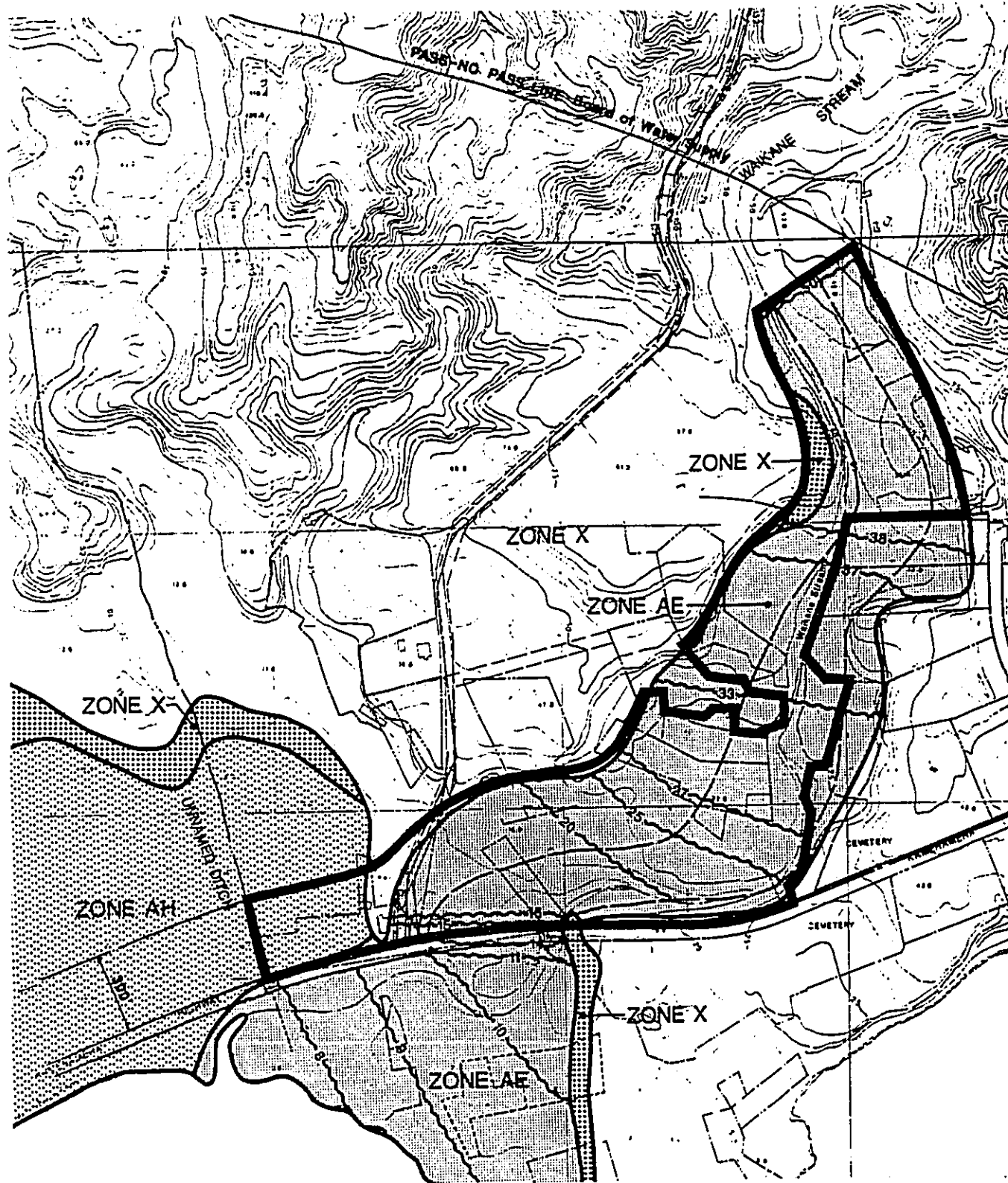
As shown on Figure 10, a small portion of the property is located within the County's Land Use Ordinance (LUO) Flood Hazard District Floodway District. The County's Land Use Ordinance permits outdoor recreational facilities, lawn, garden and play areas which have low flood damage potential within floodways, provided that they do not adversely affect the capacity of the floodway or any tributary or any other drainage facility or system.

No sewer, water, electrical, telephone or gas lines will be located within the Waikane Stream floodway. Portions of the golf course may encroach into the flood fringe, with tees and greens being placed above flood elevations, without adversely obstructing the regulatory flood. According to Engineering Concepts, Inc. construction of the golf course will not affect the 100-year flooding of Waikane Stream.

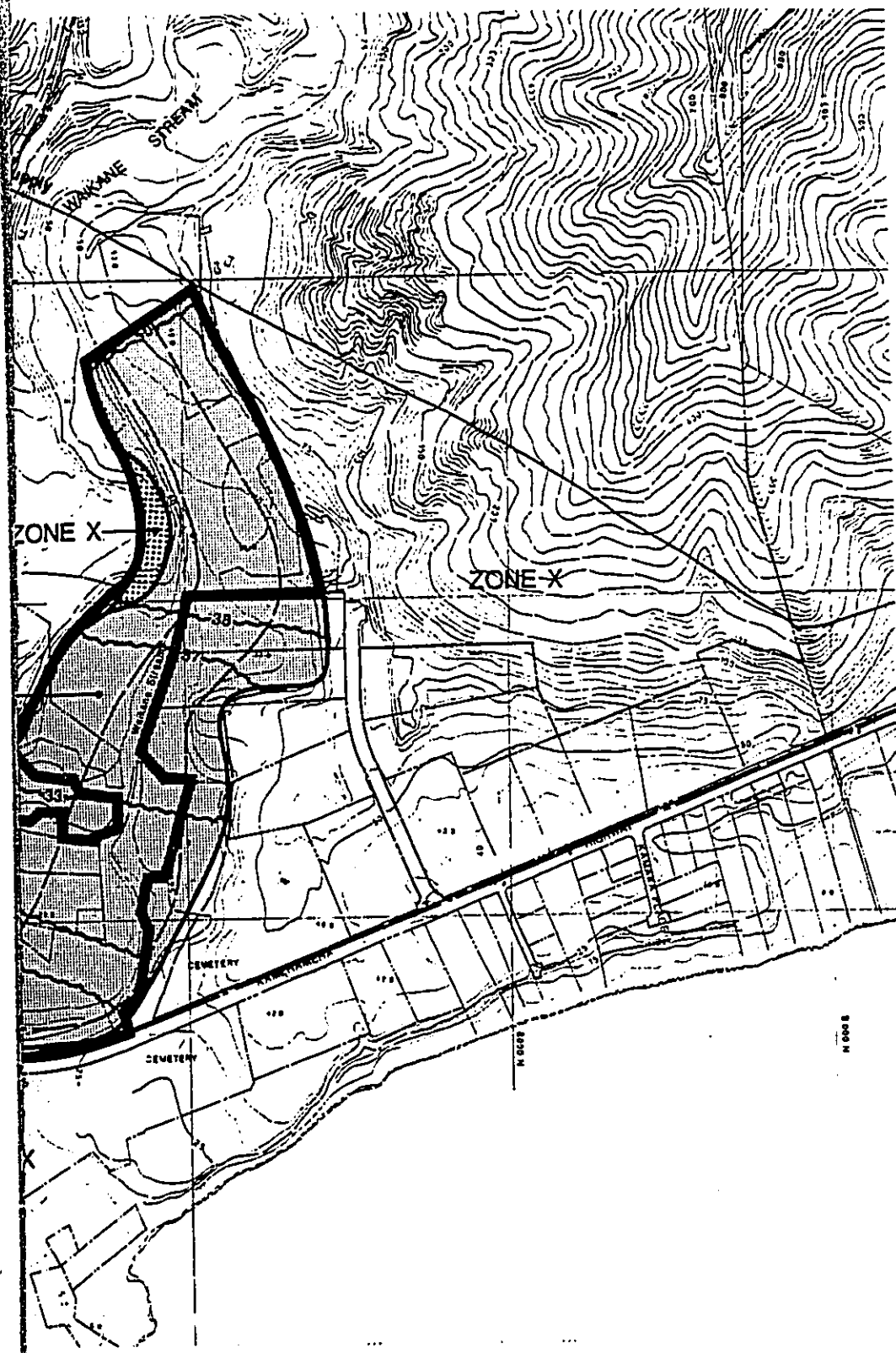
Detailed stream studies, including inundation plans and flood profiles along with a detailed erosion control and grading plan, will be developed at the appropriate stage in golf course design and submitted to the proper agencies.

LEGEND

-  SPECIAL MANAGEMENT AREA WITHIN PROJECT
-  BASE FLOOD ELEVATIONS DETERMINED.
-  FLOOD DEPTHS OF 1 TO 3 FEET (USUALLY AREAS OF PONDING); BASE FLOOD ELEVATIONS DETERMINED.
-  AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN.
-  AREAS OF 500-YEAR FLOOD; AREAS OF 100-YEAR FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 100-YEAR FLOOD.
-  BASE FLOOD ELEVATION LINE; ELEVATION IN FEET*
-  FLOODWAY BOUNDARY



**FLOOD INSURANCE RATE MAP
WAIKANE GOLF COURSE**



SOURCE: ENGINEERING CONCEPTS, INC.

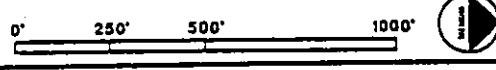


FIGURE 10

SECTION III
Affected Environment

III. AFFECTED ENVIRONMENT

A. RELATIONSHIP TO SURROUNDING AREA

1. Previous Land Uses

Waikane Valley was used historically and very likely prehistorically to grow primarily wetland crops. Much of the valley floor is flat or slopes gently, and fine alluvial soils cover much of the floodplain of Waikane Stream, which courses through the valley. By 1870, taro production had given way to rice production; over 200 acres of rice were cultivated. By the early 20th century, large-scale rice cultivation had declined. Small-scale cultivation continued in certain areas of the valley. The region's history in the last century has been marked by successive attempts to adapt the landscape to one purpose or another (sugar, rice, pineapple, ranching, residential). These attempts have left a complex land use pattern. Residential areas, farms, nurseries and a ranch are all now found near the project site.

Most of the lands in the project area have not been farmed for many years, except for three parcels of lower Waikane Silty Clay Class II plateau lands Kahuku of Waikane Valley Road, which were farmed until recently, and a 50-acre parcel of Hanalei Silty Clay bottomlands near the mauka section of the property along Waikane Stream. The property is presently vacant with the exception of a church and a few tenants.

2. Description of Surrounding Area

The property lies in the historic ahupuaa of Waikane, within the boundaries of the City and County's Kahaluu Neighborhood Board (No. 29). The Neighborhood Board area includes the more populous areas of Kahaluu, Ahuimanu and Heeia Kea to the south, and several areas to the north--Waihee, Kaalaea, Waiahole, Waikane, Hakipuu, and Kualoa--with smaller populations and a more rural appearance.

Kahaluu lies within the Koolaupoko District of Oahu; immediately to the north of the Kahaluu Neighborhood Board area is the Koolauloa District. These districts, stretching from the southeast point to the northern tip of Oahu, include both rural areas and population centers.

The Koolaupoko District is the site of the state's third largest shopping mall, Windward Mall in Kaneohe. The Temple Valley Shopping Center, in the southern sector of the Kahaluu Neighborhood Board area, contains varied retail stores. Kahaluu is home to several nurseries and small scale commercial and industrial operations. Nearer the site of the proposed development are:

- o The State-owned land, in Waiahole, dedicated to agricultural uses. Currently, 35 agricultural lots and 46 residential lots are allocated to tenants who will be eligible for long-term leases when the subdivision process is completed. An additional seven agricultural lots and 33 residential lots will be made available, with priority given to present and previous tenants of Waiahole and Waikane. When all permits are acquired and long-term leases are issued, holders of agricultural leases will be bound to make their living from agriculture. Presently, few tenants devote the bulk of their time and energy to farming.
- o The Coral Kingdom site, in Hakipuu, where a commercial structure with merchandise for tourists attracted many visitors. The owners have cleared the site for new construction.
- o Kualoa Ranch, which has both horses and cattle. In recent years, the ranch has explored ways to provide recreational experiences to residents of Oahu and to visitors. The ranch is now offering dune cycle rides and other attractions to visitors.

While the resident population of Oahu has steadily grown since 1950, the rate of growth has been declining. Particular areas on Oahu have experienced major increases in population at different times. The Koolaupoko District as a whole boomed in the 1950's, with an average annual population growth rate of 11.2 percent. The Kahaluu Census Tract, the most built-up area in the Kahaluu Neighborhood Board area, underwent a major increase in the 1970's.

The growth rates of Windward areas are linked to the spread of suburban and exurban residential areas. Suburban developments in Kailua and then Kaneohe accounted for substantial growth in the 1950's and 1960's, once the Pali and Wilson Tunnels made Honolulu more accessible from the Windward side of the island. More recently, such areas as Kahaluu and Kaaawa have grown due in part to residents who commute to urban areas for work.

Population growth in the Koolaupoko District has slowed during the 1980's. The district population grew at an average annual rate of 1.7 percent during the 1970's, and an estimated average annual rate of 0.9 percent from 1980 to 1985.

Kahaluu's population is far smaller than that of suburban Kaneohe to the south. While it has about the same number of people as the Koolauloa Neighborhood Board area along the coast to the north, the Kahaluu Neighborhood Board area is less than half that of the Koolauloa Board. Hence it is much more densely populated.

The population of the southern part of the Kahaluu Neighborhood Board area has risen in recent years, but little change has occurred in the northern sections of the area. One indication of this can be found in the population figures for Census Tract 103.03, in the north, and Census Tract 103.04, including most of the residential concentration in the Neighborhood Board area:

<u>Census Tract</u>	<u>1970</u>	<u>1980</u>	<u>1985 est.</u>
103.03	3,413	3,593	3,700
103.04	4,776	9,784	10,900

With an economy based on tourism and defense, Oahu has a large proportion of professional, technical and service workers in the civilian population, and relatively few manual workers. Due in part to the high cost of living, a high proportion of Hawaii's adults are in the labor force.

As of 1980, the people of the Neighborhood Board areas of Kaneohe and Kahaluu resembled the entire Oahu civilian population in regard to both labor force involvement and occupation.

Even a majority of the workers living in the relatively rural area near the project site, the Census' Block Group 9 of Tract 103.03, held white-collar jobs in 1980. This area was unlike the more suburban zones to the south, in that farmers comprised about eight percent of the employed civilian labor force. A further consequence of the areas's relatively undeveloped character is that the proportion of workers commuting over 45 minutes to work each day is high, and the mean commuting time of Block Group 9 residents is well above the island average.

The 1974 survey of Waiahole and Waikane showed that 15 percent of the households included a member or members involved in agriculture. Over 60 percent of the households surveyed had a member working in the Windward area. (Still, many residents from other households or from ones with Windward workers, may have commuted to the other side of the island regularly.) Nearly half the Kahaluu area residents who responded to a question about commuting in 1981 (Rural Land & Water, 1981) said that they worked in Honolulu; over a quarter worked in Kahaluu itself.

In a 1975 study (U.S. Army Corps of Engineers, 1975), a sample from the area from Waiahole to Kualoa provided information about involvement in agriculture. In almost all cases, less than a quarter of family income derived from agriculture, a pattern of responses similar to that of more suburban Kahaluu residents, although two-fifths of the sample reported that they grew fruits or vegetables on their land.

In 1986, unemployment was very low in the Kahaluu Neighborhood Board area, especially in the north. At a time when the island average unemployment rate was 4.4 percent, the estimate for Census Tract 103.04 (including Ahuimanu and much of Kahaluu town) was 3.2, while the estimated rate for Tract 103.03 (including Waikane) was 1.8 (unpublished data, provided by Francisco Corpuz, Research Statistician, Research and Statistics Office, Hawaii State Department of Labor and Industrial Relations). In 1980, the U.S. Census reported zero unemployment for the area immediately surrounding the project (Census Tract 103.03, Block Group 9) but a high proportion of adults was not counted as part of the labor force.

3. Recreational Resources

- a. Existing Conditions--Although the country setting and lifestyle of Waikane Valley provides many opportunities for personal recreation, there are few developed recreational facilities in the area. The nearest public golf course to the north is the Kahuku Golf Course, approximately 20 miles away. The private courses at the Kuilima Resort are another two to three miles beyond. In the Kaneohe direction the nearest golf course is the Pali Golf Course, which is about 10 miles away. The nearest beach park is Waiahole Beach Park, which is an unimproved park with mud flats used mainly for launching small boats. The city's Kualoa Regional Park is located about two miles from the site and is a major recreational facility. The planned Kahaluu Regional Park will also be an important facility built around a flood control lagoon. The City is currently in the process of acquiring additional land around the lagoon to create a larger, improved park. Kahaluu Regional Park is about three miles away. The only developed facilities in the Waiahole-Waikane area are the playcourts around Waiahole School.
- b. Anticipated Impacts--The development of the golf course will have positive impacts on the inventory of developed recreational facilities. The creation of a new 27 hole golf course will add a facility to a thirty mile stretch of the island where there are currently no golf courses. The golf course will be open part of the time for public play. The exact percentages of public play are being evaluated. The developer is also committed to assisting Waiahole School in various ways, including improvements to some of their existing recreational facilities and the establishment of a junior golf program. Additionally, discussions are underway for the development of a community park on an unused portion of the project site.

4. Social and Economic Impacts

- a. Existing Conditions--Population growth in the Koolaupoko District has been slow. In the 1970's the growth rate was 1.7 percent per annum. From 1980- 1985 the rate has been 0.9 percent. The Northern part of the Koolaupoko District (census tract 103.03) of which Waikane is a part has shown even slower growth than the southern part. Census tract 103.03 shows a growth from 3,413 in 1970 to 3,700 in 1985. In the Waikane area census data shows a population which is a little older and reside longer in the same area than in other parts of Koolaupoko. Median family income was also low; \$10,500 compared to an island-wide median of \$23,544.00. Further detail on population and labor force characteristics are described in Appendix D. On the project site there are a few tenant farmers and residents.

The Waikane Golf Course project is not a housing project, and its impact on housing is minimal. There are a few older homes that are located on the property clustered around Waikane Valley Road and the end of Haupoa Road. A few miscellaneous people living in abandoned vehicles are squatters on the property, although some indicate that they are there with permission from Raymond Kamaka who claims to have ownership rights to the property. Economically the land is essentially vacant although there are a few tenant farmers on site. Small amounts of truck crops are produced such as unchoi, green beans and leafy vegetables. Rental income is essentially non-existent as tenancy and rents are unwritten.

- b. Anticipated Impacts--Development of the golf course will result in the relocation or removal of existing tenants and squatters. Those tenants with long-term tenancy rights recognized by Waikane Development Company and the WCA will be compensated or relocated to a new agricultural subdivision created by the developer along the proposed Haupoa Road extension. Others will simply be told to vacate the premises. The existing houses will be relocated or torn down. Existing truck farm operations will cease.

5. Access

- a. Existing Conditions--Waikane Valley Road is presently used by a number of different parties. The road provides access for people in the project area. This includes residents on the Robert's kuleana, members of the Church of the True God on the project property, residents on the site, and a 5 acre truck farm on the property. It also serves as a legal easement to the Kamaka and Marks properties on the mauka side of the property. Members of the Robert's family use the valley road to access a kuleana parcel just mauka of the project site. It is also used by Oahu Sugar Company personnel when they come to inspect or service the Waiahole Ditch System. Hunters and hikers also use the valley

road for access to trails and forest reserve areas. The road is privately owned by the developer with other property owners having easement rights through the property.

- b. Anticipated Impact--Waikane Valley Road is a private roadway. It will be surfaced and realigned. Access will be restricted to golf course users, the residents of the two kuleana parcels within the development, and members and guests of the Church of the True God. Haupoa Road will be extended to the mauka boundary at a point roughly similar to the present intersection point of Waikane Valley Road with the mauka edge of the property. Existing access and easement rights to mauka properties will be transferred to Haupoa Road extension.

The planned Haupoa Road extension is also a private roadway owned by the developer. As noted, it will be used as the access for Waikane Valley properties mauka of the project site. Access will remain open for all existing uses, and there will be regulated access for new users. Residents of the new agricultural lots along the Haupoa Road Extension will also have permanent rights of entry on the roads.

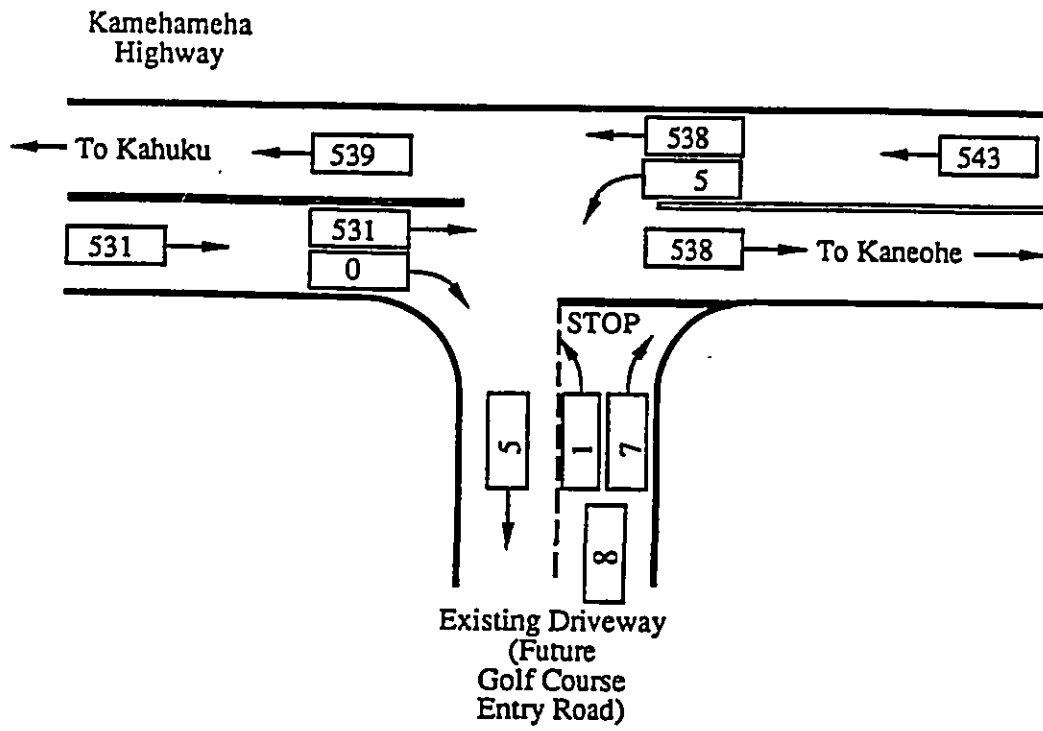
Both roadway improvements will be designed to City and County standards even though they will remain in private ownership.

6. Traffic

- a. Existing Conditions--Kamehameha Highway is a State-maintained highway with a 20-foot wide pavement and 6-foot to 10-foot grassed shoulders. It is the only major road serving the surrounding area. The posted speed of Kamehameha Highway is 35 miles per hour (mph) along this section of the highway.

The Department of Transportation (DOT) 24-hours continuous count station C-29-B along Kamehameha Highway near the old Kualoa Sugar Mill (approximately 3 miles north of the property) has consistently registered the heaviest vehicular traffic on Sundays with the afternoon peak hour occurring between 2:00 and 3:00 P.M. A recent Sunday traffic volume (7 February 1988) obtained from traffic count station C-29-B registered 1092 cars for two directions between the 2:00 and 3:00 p.m. peak hour.

Additional turning movement counts were taken at the intersections of Kamehameha Highway and Waikane Valley Road (the proposed entry road) by Pacific Planning and Engineering, Inc., on Sunday, 14 February 1988, between 2:00 and 3:00 P.M (Figure 11.) Manual counts were taken of passenger cars, trucks, buses, bicycles, motorcycles and pedestrians by turning movements and approaches. The peak hour two-way traffic at the intersection of Kamehameha Highway and Waikane Valley road was 1082 vehicles. Fifty percent of the vehicles approaching the intersection were traveling south-bound towards Kaneohe, with the other 50 percent heading towards



LEGEND

531 → NUMBER OF CARS OBSERVED AND DIRECTION OF TRAVEL DURING THE 2-3 PM PEAK HOUR ON SUNDAY, FEBRUARY 14, 1988

**OBSERVED TURNING MOVEMENTS
WAIKANE GOLF COURSE**

SOURCE: PACIFIC PLANNING & ENGINEERING, INC.



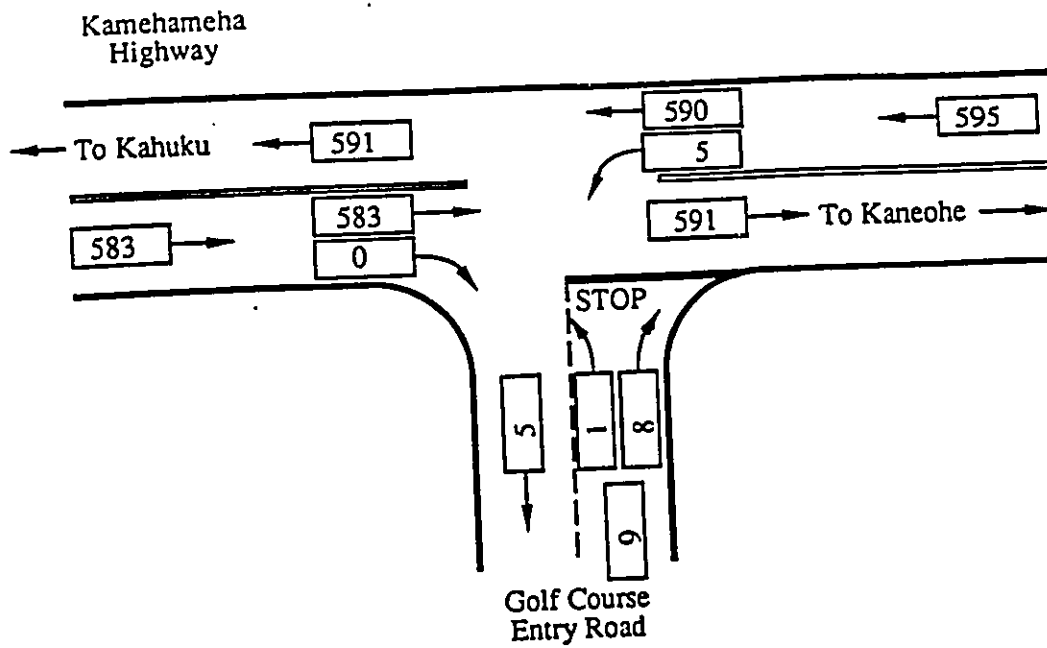
FIGURE 11

Kaaawa. Eight vehicles exited from the existing driveway during the period, and five entered the driveway.

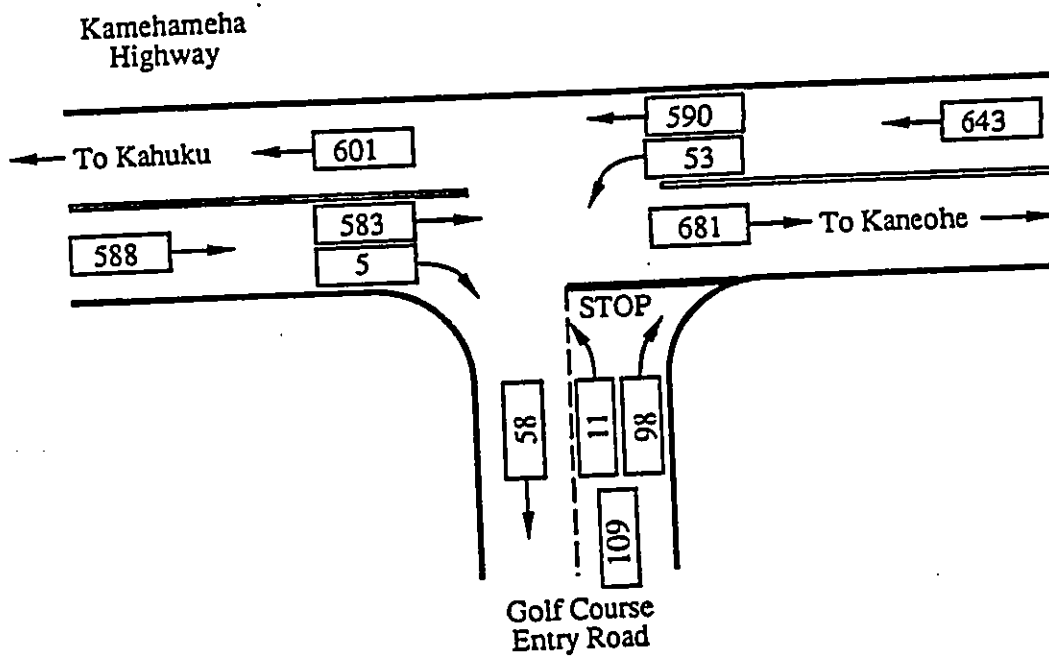
- b. Anticipated Impacts--According to Pacific Planning and Engineering, Inc., the proposed Waikane Golf Course project is not expected to have an adverse impact on traffic flow along Kamehameha Highway. (See Appendix I.) The intersection will continue to operate under capacity during the Sunday 2:00-3:00 p.m. peak hour on Kamehameha Highway. The results of the traffic assignments are shown in Figure 12. Most of the future traffic exiting the golf course is projected to turn right onto Kamehameha Highway heading south towards Kaneohe. This turn will have minimal impact on the intersection traffic movements. Due to heavy traffic on Kamehameha Highway travelling in both directions, traffic turning left from the golf course entry road onto Kamehameha Highway will experience medium to long delays. However, the projected level-of-service for this turning movement is acceptable.

The majority of the vehicles will be making right turns heading towards Kaneohe instead of the more difficult left-turn to cross two lanes of traffic. The low golf course traffic volumes are deemed insignificant in adding to any undue traffic hazard. The recommended storage lane will significantly improve flow and safety. For drivers exiting from the golf course access road, the sight distances in both directions is excellent for the posted speed limit of 35 mph along Kamehameha Highway.

The rerouting of traffic to and from the mauka Valley properties, and the creation of the four-lot agricultural subdivision, will have a minor impact on Haupoa Road and its intersection with Kamehameha Highway. Given the low volume of present through traffic on Waikane Valley Road and the small number of vehicles anticipated from the four-lot subdivision, impact on Haupoa Road will be minor. The intersection and road presently operates well below capacity and can accommodate the 2-3 vehicle per peak hour increase anticipated by the changes without further improvement.



Future (1991) Traffic Volumes Without Project



Future (1991) Traffic Volumes With Project

LEGEND

588 → ESTIMATED NUMBER OF CARS AND DIRECTION OF TRAVEL DURING THE 2-3 PM PEAK HOUR ON SUNDAY

PROJECTED 1991 TRAFFIC WITHOUT AND WITH GOLF COURSE WAIKANE GOLF COURSE

SOURCE: PACIFIC PLANNING & ENGINEERING, INC.



FIGURE 12

B. RELATIONSHIP TO HISTORIC RESOURCES

1. Existing Conditions

During the period January 12-April 20, 1988, Paul Rosendahl, PhD., Inc. (PHRI) conducted an archaeological reconnaissance survey and limited subsurface testing at Waikane Golf Course project area. The results of the survey are reported in Appendix J and are summarized below.

The survey and testing consisted of variable coverage (partial to 100%), variable intensity (30-90 ft. transect intervals) ground surface reconnaissance of approximately 300 acres of the project area to be impacted by development, and limited backhoe trenching in the SMA portion of the project area. Areas excluded from the survey and testing included the wetlands portion of the project area, areas within the immediate vicinity of existing residences, areas under current cultivation, and areas above the 75- to 100-ft elevation contours which will not be affected by development. The objectives of the survey and testing were to:

- a. Identify all sites and site complexes present within the project area;
- b. Evaluate the potential significance of all identified archaeological remains;
- c. Determine the possible impacts of any proposed development upon the identified remains; and
- d. Define the scope of subsequent archaeological work that might be necessary or appropriate.

Twenty-nine archaeological sites (60 component features) were recorded within the project area--one previously identified site and 28 newly identified sites (Figure 13). Formal feature types present in the project area include terraces, mounds, ditches, bolder concentrations, walls, lithic scatters, coral scatters, alignments, burials, pits, a debris scatter, man-made caves, sunken fields, a trail, a midden scatter, a house site, depressions, a possible terrace, and an inclined ramp. Probable functional types include agricultural, boundary, tool manufacture, habitation, transportation, religious (cemetery, burial, shrine, and heiau), and indeterminate. In addition to the recorded archaeological sites, several road cuts were noted and plotted on project maps. Also noted were possible historically/prehistorically used agricultural areas which lacked surface evidence. At one of the lithic sites (T-23), a profile was taken from an eroding cut bank, some soil was collected for a radiocarbon sample, and two adze preforms were collected. Volcanic glass samples were collected from Sites T-9, T-10, T-15, T-18, and T-23.



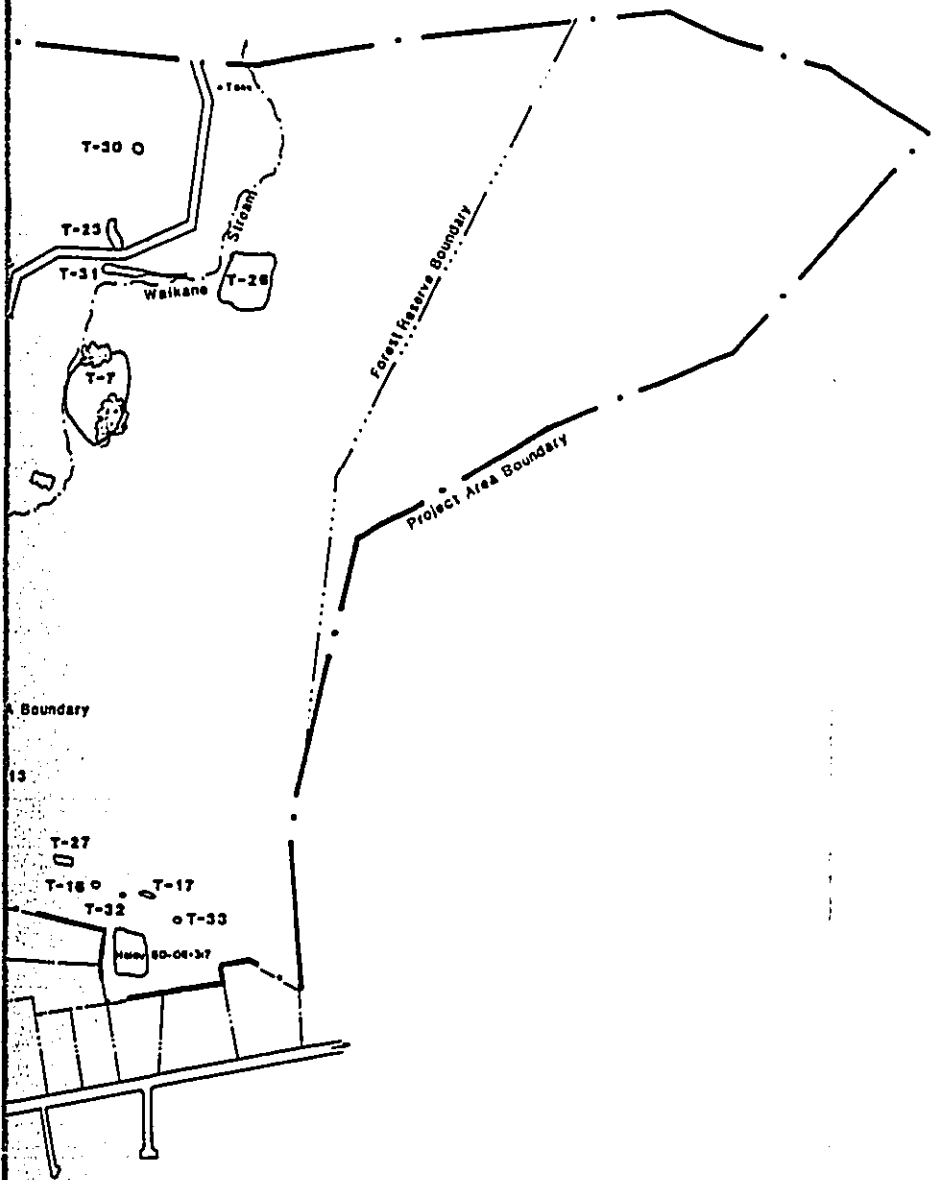
LEGEND

— ROAD CUT

HAU

SITE T-4

**ARCHAEOLOGICAL SITE LOCATIONS
WAIKANE GOLF COURSE**



SOURCE: PAUL H. ROSENDAHL, Ph.D., INC.



FIGURE 13

Of the total 29 sites recorded in the project area, 21 sites, assessed as significant solely for information content (Table 2). For nine of these 21 sites, no further work is recommended. Further data collection is recommended for 12 of the 21 sites. Of the remaining eight sites:

- a. Four (T-10, 16, 19 and 33) are assessed as significant for information content, and are tentatively assessed as culturally significant. Further data collection and a tentative recommendation of preservation "as is" are recommended for these four sites. The recommendation for preservation is contingent on what is uncovered in the data collection phase.
- b. Two (T-2 and 27) are assessed as culturally significant and significant for information content. Further data collection and preservation "as is" are recommended for these two sites.
- c. Two (T-32 and 80-06-317) are assessed as significant for information content, as excellent examples of site types, and as culturally significant. Further data collection and preservation with interpretive development are recommended for these two sites.

Four sites were identified and ten trenches were excavated within the Special Management Area (SMA) (Figure 14). The four sites consist of two irrigation ditches, a stone and earthen embankment, and irrigated fields. All four are historic period sites dating from the late 19th century to recent times; because the sites lack time depth and lack integrity (they are disturbed), they are believed to be only of marginal significance. Sites T-1 through 4 are assessed as being significant solely for information content. For Sites T-1 through 4, no further work is recommended. Site T-4 effectively will be preserved "as is," with no further work, because it is situated within the wetlands part of the project area.

2. Anticipated Impacts

No adverse impacts to the two culturally significant historical period sites T-24 and T-27 are expected since they will be presumed as is. The two most important sites within the property boundaries--Site T-32, a Religious shrine/burial site; and Site 80-06-317, a heiau complex are outside the golf course and will not be disturbed.

It is remotely possible, however, that previously unknown subsurface cultural material might be encountered during the construction of this project. In such a situation, archaeological consultation will be sought immediately.

TABLE 2

SUMMARY OF GENERAL SIGNIFICANCE ASSESSEMENTS
FOR ARCHAEOLOGICAL SITES AND RECOMMENDED GENERAL TREATMENTS
WAIKANE GOLF COURSE PROJECT AREA

Site Number	No. of Sites	Significance Category				Recommended Treatment			
		A	X	B	C	FDC	NEW	PID	PAI
T-5		+	-	-	-	+	-	-	-
T-7		+	-	-	-	+	-	-	-
T-9		+	-	-	-	+	-	-	-
T-15		+	-	-	-	+	-	-	-
T-17		+	-	-	-	+	-	-	-
T-20		+	-	-	-	+	-	-	-
T-21		+	-	-	-	+	-	-	-
T-22		+	-	-	-	+	-	-	-
T-23		+	-	-	-	+	-	-	-
T-26		+	-	-	-	+	-	-	-
T-30		+	-	-	-	+	-	-	-
T-31		+	-	-	-	+	-	-	-
Subtotal:		12	0	0	0	12	0	0	0

General Significance Categories:

- A = Important for information content, further data collection necessary (PHRI=research value);
- X = Important for information content, no further data collection necessary (PHRI=research value, DLNR-HSS-not significant);
- B = Excellent example of site type at local, region, island, State, or National level (PHRI=interpretive value); and
- C = Culturally significant (PHRI=cultural value).

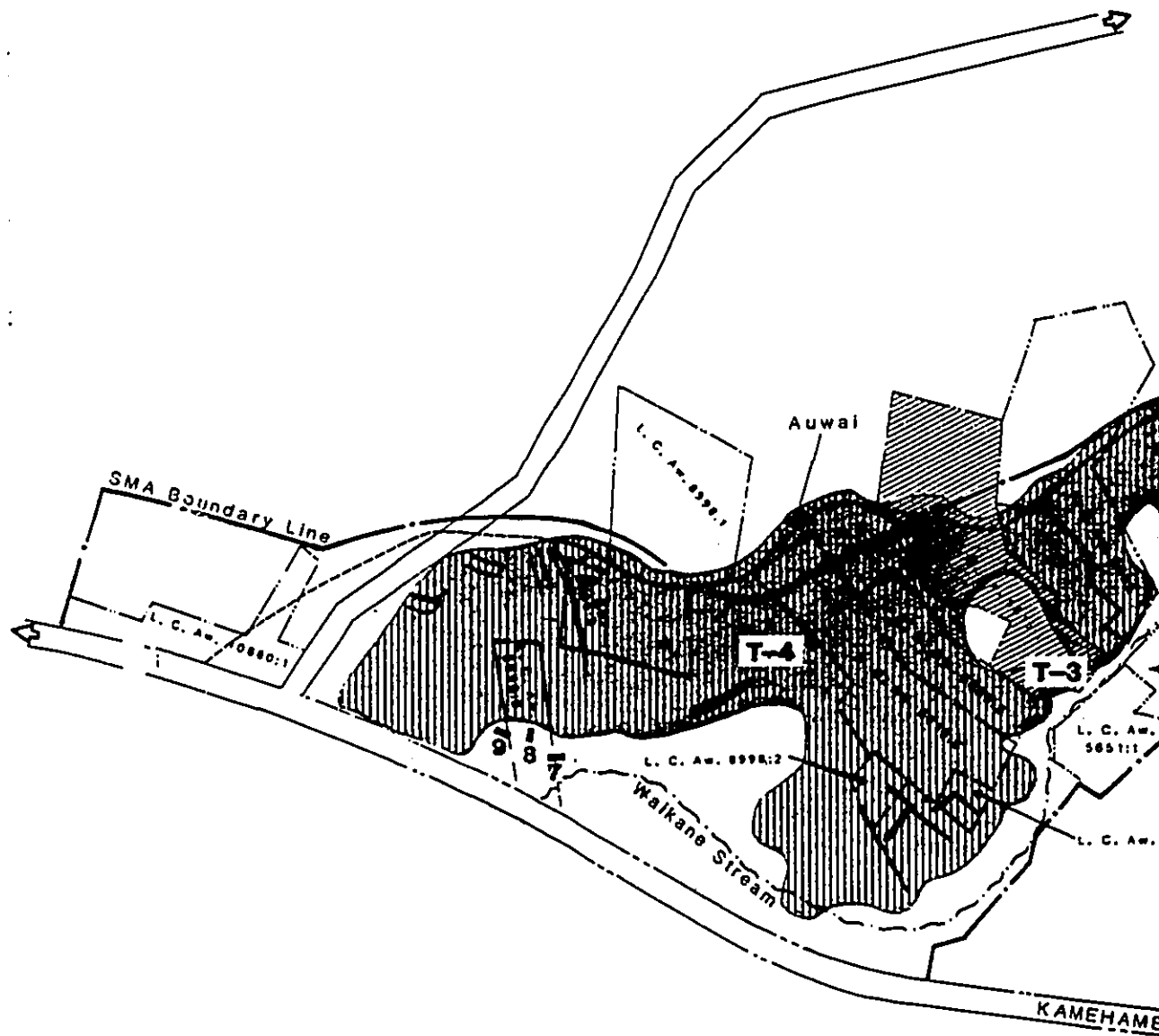
Recommended General Treatments:

- FDC = Further data collection necessary (intensive survey and testing, and possibly subsequent data recovery/mitigation excavations);
- NEW = No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential;
- PID = Preservation with some level of interpretive development recommended for consideration (including appropriate related data recovery work); and
- PAI = Preservation "as is," with no further work (and possible inclusion into landscaping), or further data collection necessary (and possibly subsequent data recovery/mitigation excavations).

Table 2 (Continued)

Site Number	No. of Sites	Significance Category				Recommended Treatment			
		A	X	B	C	FDC	NEW	PID	PAI
T-10		+	-	-	*	+	-	-	*
T-16		+	-	-	*	+	-	-	*
T-19		+	-	-	*	+	-	-	*
T-33		+	-	-	*	+	-	-	*
Subtotal:	4	4	0	0	4	4	0	0	4
T-24		+	-	-	+	+	-	-	+
T-27		+	-	-	+	+	-	-	+
Subtotal:	2	2	0	0	2	2	0	0	2
T-32		+	-	+	+	+	-	+	-
80-06-317		+	-	+	+	+	-	+	-
Subtotal:	2	2	0	2	2	2	0	2	0
T-1		-	+	-	-	-	+	-	-
T-2		-	+	-	-	-	+	-	-
T-3		-	+	-	-	-	+	-	-
T-4		-	+	-	-	-	+	-	-
T-13		-	+	-	-	-	+	-	-
T-14		-	+	-	-	-	+	-	-
T-18		-	+	-	-	-	+	-	-
T-25		-	+	-	-	-	+	-	-
T-29		-	+	-	-	-	+	-	-
Subtotal:	9	0	9	0	0	0	9	0	0
Total:	29	20	9	2	8	20	9	2	6

* Tentative assessment pending further data collection.



LEGEND



TRENCH

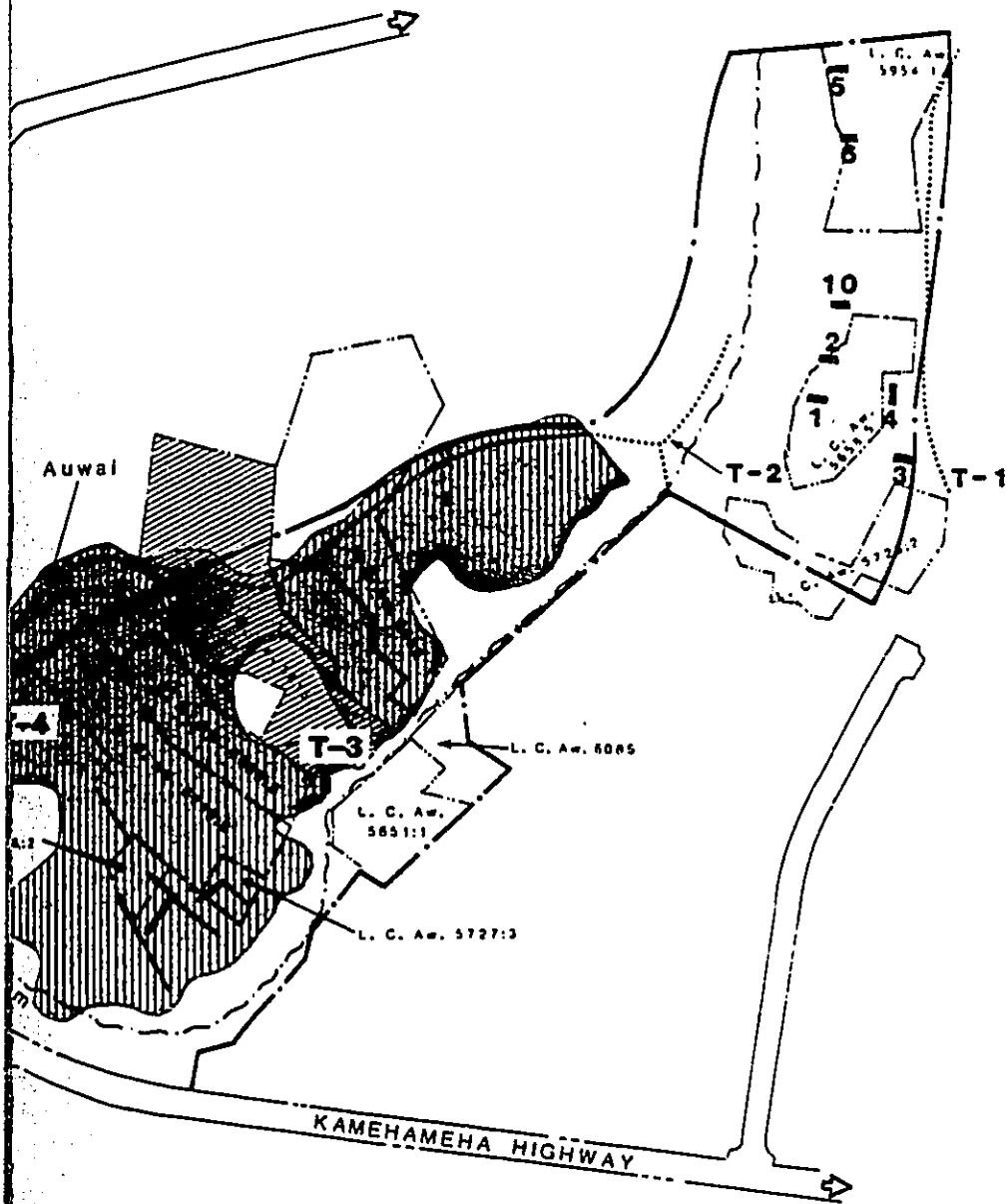


WETLANDS (SITE T-4)



PARCEL NOT PART OF PROJECT

ARCHAEOLOGICAL SITES WITHIN SMA
 WAIKANE GOLF COURSE



SOURCE: PAUL H. ROSENDAHL, Ph.D., INC.

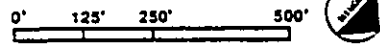


FIGURE 14

C. RELATIONSHIP TO COASTAL/NATURAL RESOURCES

1. Streams

- a. Existing Conditions--When there is no rainfall and stormwater runoff, the flow of streams in the Waikane drainage basin consists of groundwater which drains from saturated dike compartments. Not all of the groundwater is captured by Waikane Stream; a portion moves as underflow toward the coast and surfaces as diffuse discharge at low elevations, creating the wetlands in the lower reach of the valley. Waikane Stream acts as a drain because the dikes trend to the northwest, about perpendicular to the stream channel, and many small aquifer compartments are cut by the stream. In the lower valley, below an elevation of about 40 feet, a cover of poorly permeable alluvium inhibits free drainage of the aquifers and is responsible for artesian conditions.

Virtually all of the groundwater ultimately escapes either to the stream or to the wetlands near the coast. A small quantity may seep into the alluvial cover on the sea bottom just off the coast.

There is an intermittent unnamed stream which drains 660 acres of the overall basin. This stream winds along the Kaneohe side of the project parcel, wanders through forests of mixed Eugenia and hibiscus subtype, and empties into a lowland and wetland area where the stream channels meanders and ultimately connects with Waikane Stream just before it empties into Kaneohe Bay.

- b. Anticipated Impacts--It is proposed that three new wells be drilled on the property. Each well is expected to deliver between hundred gallons and one hundred and fifty per minute.

It is anticipated that the wells will not have a noticeable impact on stream flow due to the density and the northwest alignment of the dike system in the area. Additionally, the bulk of the water source for Waikane Stream is located in the area mauka of the proposed wells, and water drawn from the aquifer below the golf course should have little or no impact on stream flow.

The proposed wells are located to minimize loss of groundwater to Waikane Stream by capturing a portion of groundwater lost to the wetlands. The marshes are sustained both by diffuse groundwater seepage and stream flow. The loss of a portion of the diffuse seepage is not expected to significantly affect the wetlands because runoff is appreciable. Additionally, since the primary use of the water from the wells is for golf course irrigation, much of it will seep back into the ground and the sources that feed the wetland.

Since a reliable record of flow exists for the U.S. Geological Survey gaging station, statistically significant deviation from the long term base flow record will indicate what effect, if any, pumping has on Waikane Stream. During pumping tests, flow behavior at the gage will be closely examined to ascertain whether a short term stream-well connection is detectable.

According to John Mink (Appendix D), the minor streams in the area, such as the unnamed stream which flows through the property are weakly perennial at best. There are no continuous records for them. Nevertheless, before and during the pump tests the unnamed stream will be observed to establish whether it will be affected.

The Waikane Stream will remain as is and there will be no impact on the stream except for some clearing of edge vegetation and replanting or landscaping of bare stream banks. Some improvements are proposed for the intermittent unnamed stream (Figure 15). A 600 foot horseshoe bend is being realigned into a straighter 300 foot channel. In a section by the number 5B golf hole, improvements to the hole will involve grading and lining of the stream channel as it crosses the fairway. The lining will be riprap necessary to meet City and County regulations for streams where peak flows are higher than five cubic feet per second.

A suggestion has been made that a "stream belt" concept be included as part of the golf course development. This would involve setbacks from the streams and trails along the length of the stream through the property. The developer is not specifically opposed to the concept, but concerns about liability, security, safety from errant golf balls and maintenance must be addressed first. An added concern is that this action may contribute to the degradation of the stream environment if proper maintenance practices are not followed and if the intensity of use disrupts the area or results in increased trash and pollution.

2. Waikane Stream Biota

- a. Existing Conditions--Kelly M. Archer surveyed the biota of Waikane Stream in February 1988. His study is presented in Appendix K and is summarized below.

Above the property, Waikane Stream is characterized by strong-flowing riffle reaches with boulder, cobble and gravel substrate. Within the property the mainstream meanders along the valley floodplain toward Kaneohe Bay. The stream is a series of riffle and pool reaches and the substrate changes from cobble, gravel and sand, to sand and gravel in the wetland area. Within the wetlands, the stream branches several times leaving a poorly defined channel until the stream runs adjacent to the highway and passes under the highway bridge.

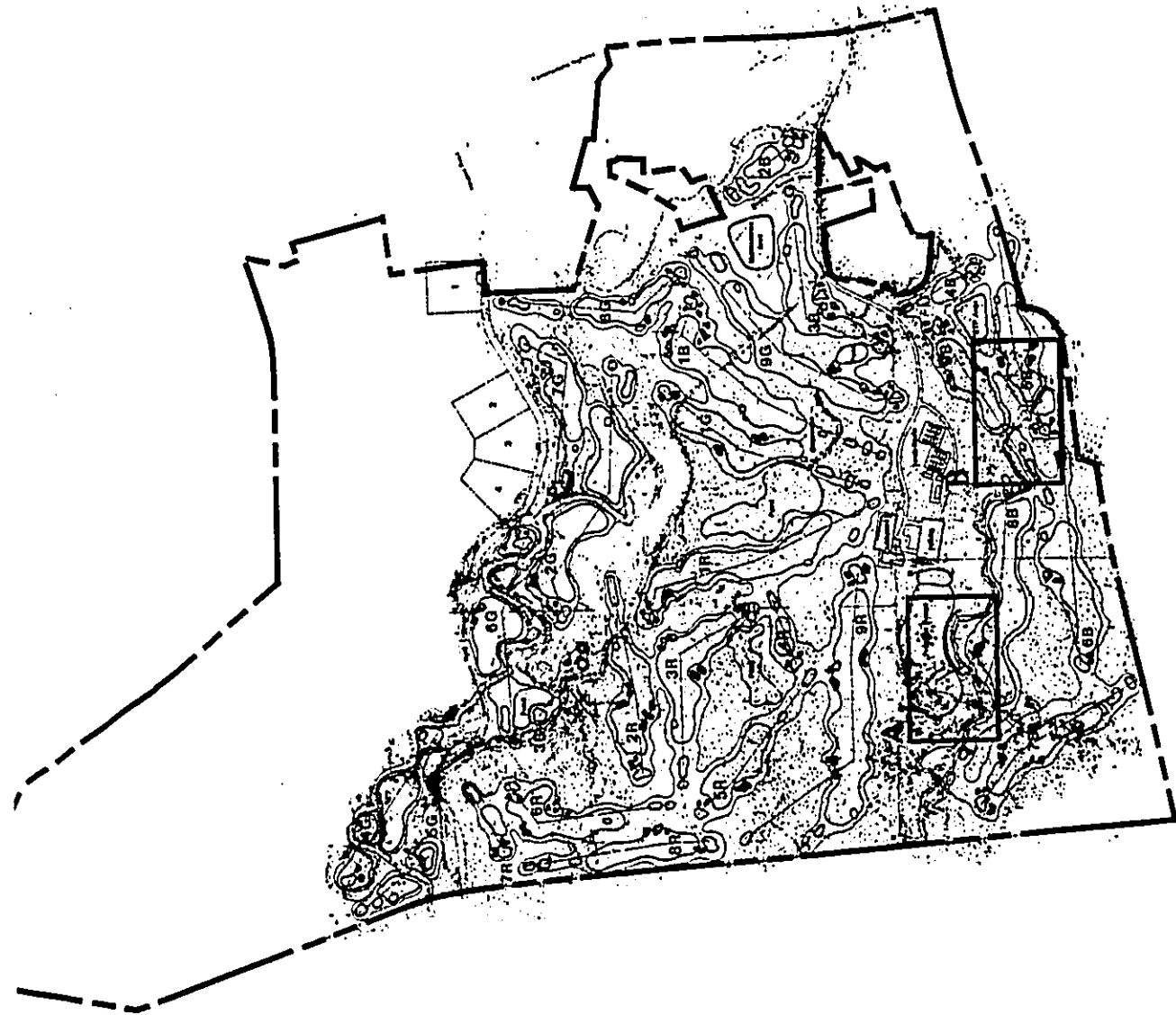
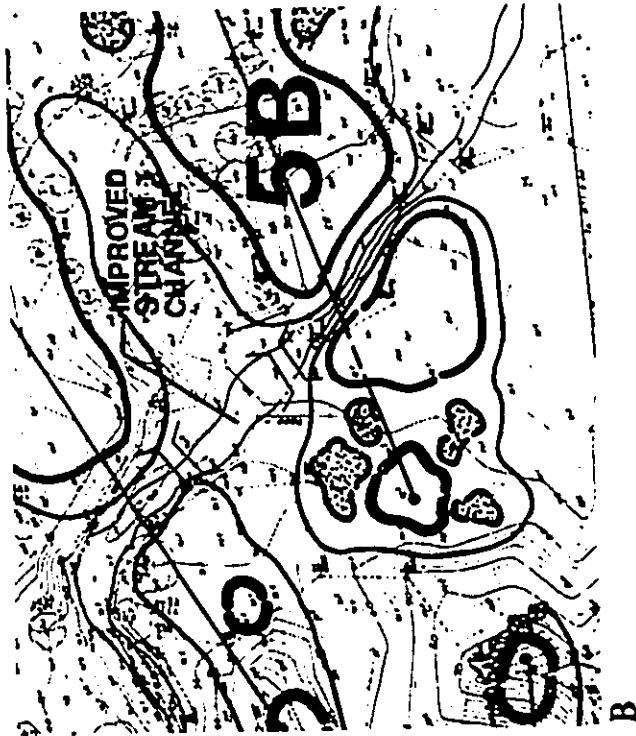
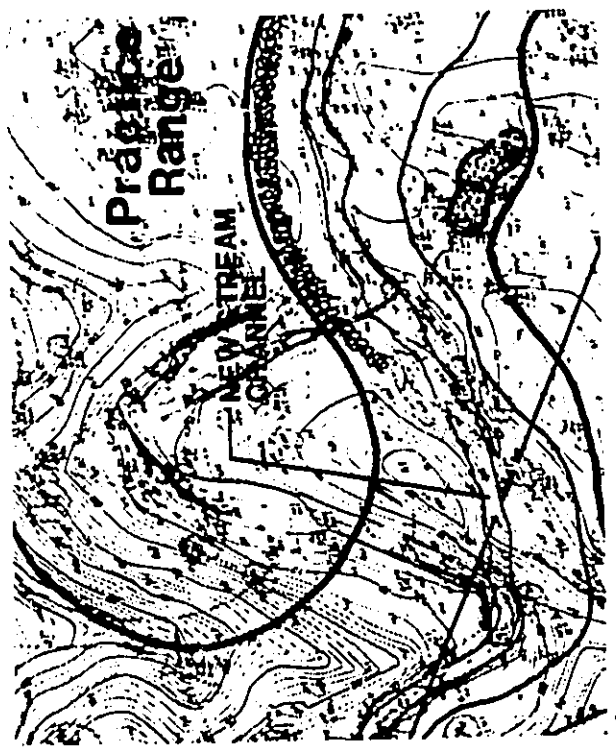


FIGURE 15

UNNAMED STREAM IMPROVEMENTS
WAIKANE GOLF COURSE

Waikane Valley has been highly modified by man's activities for many decades. Farming and small ranching enterprises have used the valley since before the turn of the century. Very few native plant and no native terrestrial vertebrate populations can be found in the area. Waikane Stream is currently being used as a source of irrigation water for farmers and for a family prawn farm immediately mauka of the property. Erosion of the ridges and hills within the valley cause even the lightest rainfall to dramatically increase the sediment load of the stream. Rusting abandoned automobiles and buses upstream from the wetland area contribute to the poor esthetic quality of much of the stream's banks. The riparian vegetation, almost entirely alien in origin, completely covers the stream in a number of areas and is often quite thick and impassable.






Archer divided Waikane Stream into three biographic regions within the property (Figure 16) characterized as "upper", "middle" and "lower" survey regions. Although no clear boundary exists between the regions, there are obvious physical and biological differences. The "lower region" of the stream is within the wetlands of the valley floor. The substrate is predominantly sand and silt and the vegetative canopy is open. Most of the stream within the SMA area is located within the "lower region."

In the "middle region", the stream meanders between the hills within the valley and the valley walls. Deep pools separate slow flowing riffle areas and both the riparian vegetation and the high, steeply-cut stream banks prevent direct light from reaching much of the stream. The substrate in the "middle region" is mainly gravel and cobble. Approximately half of the "middle region" of Waikane Stream is located within the SMA area.

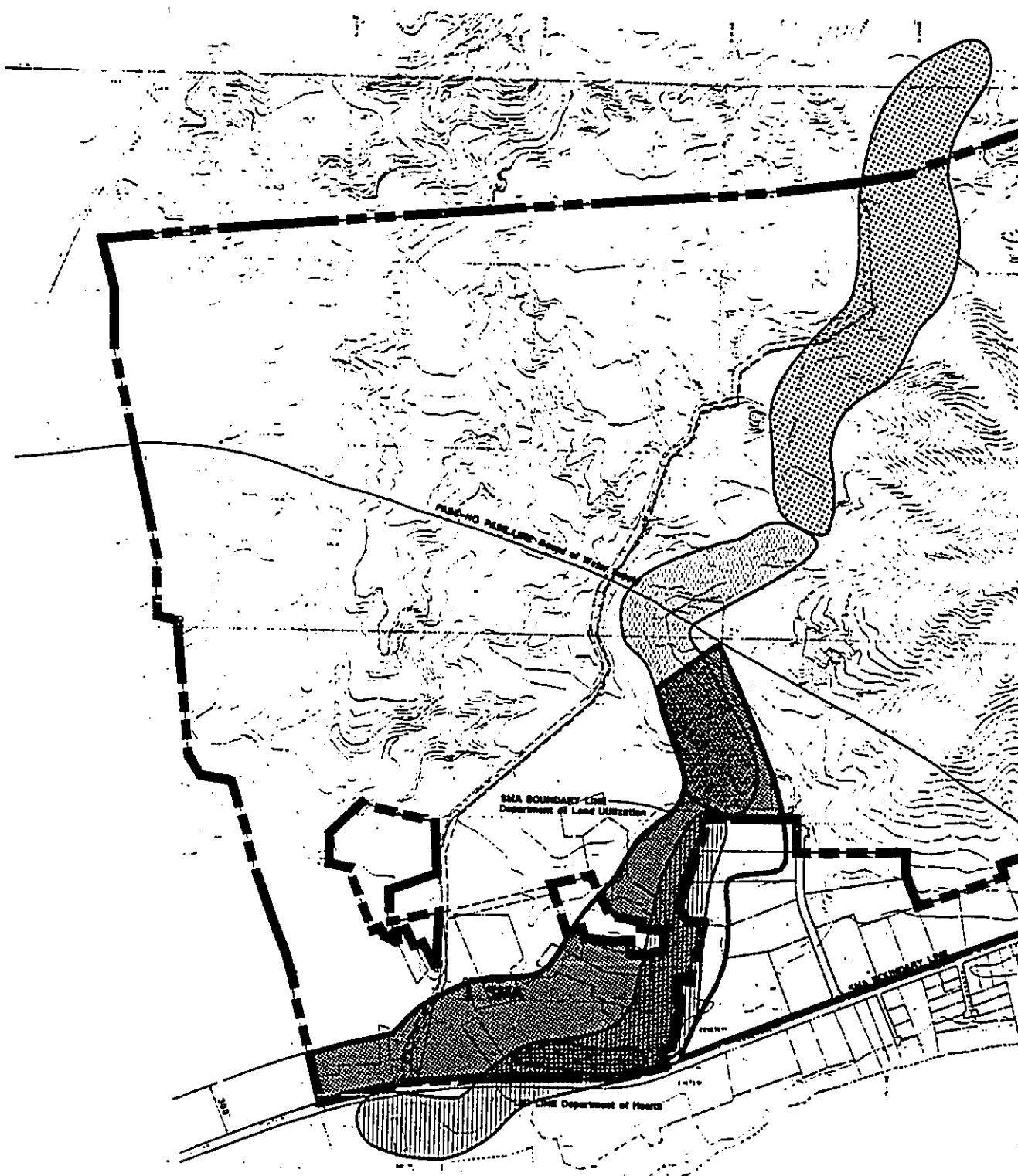
The "upper region" includes the mauka most portion of the property as well as 200 meters of the stream mauka of the property. The vegetative canopy is open and there are few steep banks to prevent light penetration. The substrate is composed of cobble, gravel and boulders. No portion of the "upper region" of Waikane Stream falls within the SMA area.

The lower region of Waikane Stream supports a much richer faunal community than the other stream regions. Two crustacean and six fish species were identified in the lower stream region. Of these species, four are native (Macrobrachium grandimanus, Stenogobius genivittatus, Awaous stamineus and Kuhlia sandvicensis). In the middle region the only native species was the o'opu, (Awaous stamineus). Only a very few o'opu were observed in this stream region while the prawn population (M. lar) was large. The upper region of the stream within the property supported a much larger

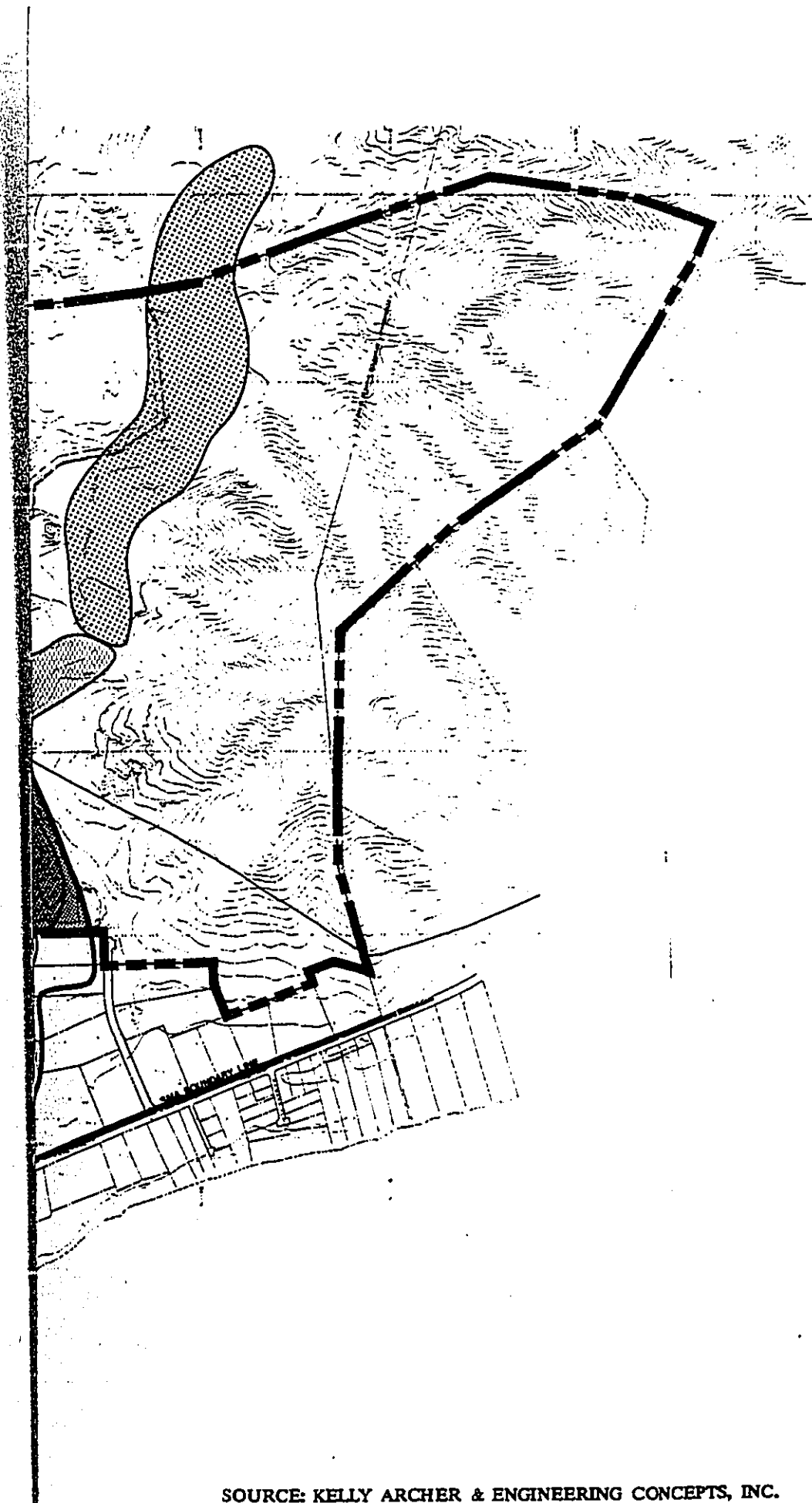
LEGEND

-  UPPER REGION SURVEY AREA
-  MIDDLE REGION SURVEY AREA
-  LOWER REGION SURVEY AREA
-  SITE OF PREVIOUS STREAM SURVEY SAMPLING
-  SPECIAL MANAGEMENT AREA WITHIN PROJECT

**BIOLOGICAL SURVEY OF WAIKANE STREAM
WAIKANE GOLF COURSE**



SOURCE: KE...



SOURCE: KELLY ARCHER & ENGINEERING CONCEPTS, INC.

0' 400' 800' 1600'



FIGURE 16

population of the native o'opu and fewer prawns than downstream. Notably absent from all sampled reaches of the stream was the small native shrimp, Atyoida bisulcata (common in perennial Hawaiian streams), and the native mollusc Neritina granosa, rarely found on the island of Oahu.

The two native stream species of special concern to aquatic biologists in the state; the goby, Lentipes concolor and the mollusc, Neritina granosa, were not found to inhabit Waikane Stream. L. concolor is considered "functionally extinct" on Oahu and the mollusc has been found in only two Oahu streams in recent years (Kaluanui and Koloa Streams).

According to Archer, the biology of Waikane Stream is not unique to streams in the less-developed watersheds of Windward Oahu and show the typical decline in species richness found in Hawaiian streams as distance from the ocean increases. Commonly, opportunistic euryhaline species dominate lower stream reaches. Native species found in the stream are also found in other streams in the district and are not, by any means, considered rare and endangered.

- b. Anticipated Impacts--Murdoch and Green do not anticipate pesticide use on the proposed golf course areas to contribute significant quantities of pesticides or their degradation products to lowland or coastal areas. (See Appendix L). The treated turf areas are small (116-136 acres) in relation to the total watershed (1,800 acres), so that any runoff waters containing pesticide residues from the treated areas would be highly diluted by runoff from untreated areas and from high-level groundwater emerging in stream beds. Additionally, sorption of pesticides on soil organic matter in these soils will retard the movement of most pesticides. Those few pesticides which are not highly sorbed are readily degraded in the soil and thus are not expected to constitute a source of down-stream or groundwater contamination.

With the exception of herbicides, pesticide applications are normally made only to greens on golf courses. According to Murdoch and Green, since greens comprise only approximately 4.5 acres of a typical 27-hole golf course, contribution of fungicide and insecticide contamination of surface waters would be small. The herbicides used on golf fairways are primarily MSMA, metribuzin and 33 plus (or other mixtures of 2, 4-D, mecoprop and dicamba). These herbicides are rapidly degraded and/or are tightly sorbed on soil colloids and organic matter and have little potential for water contamination.

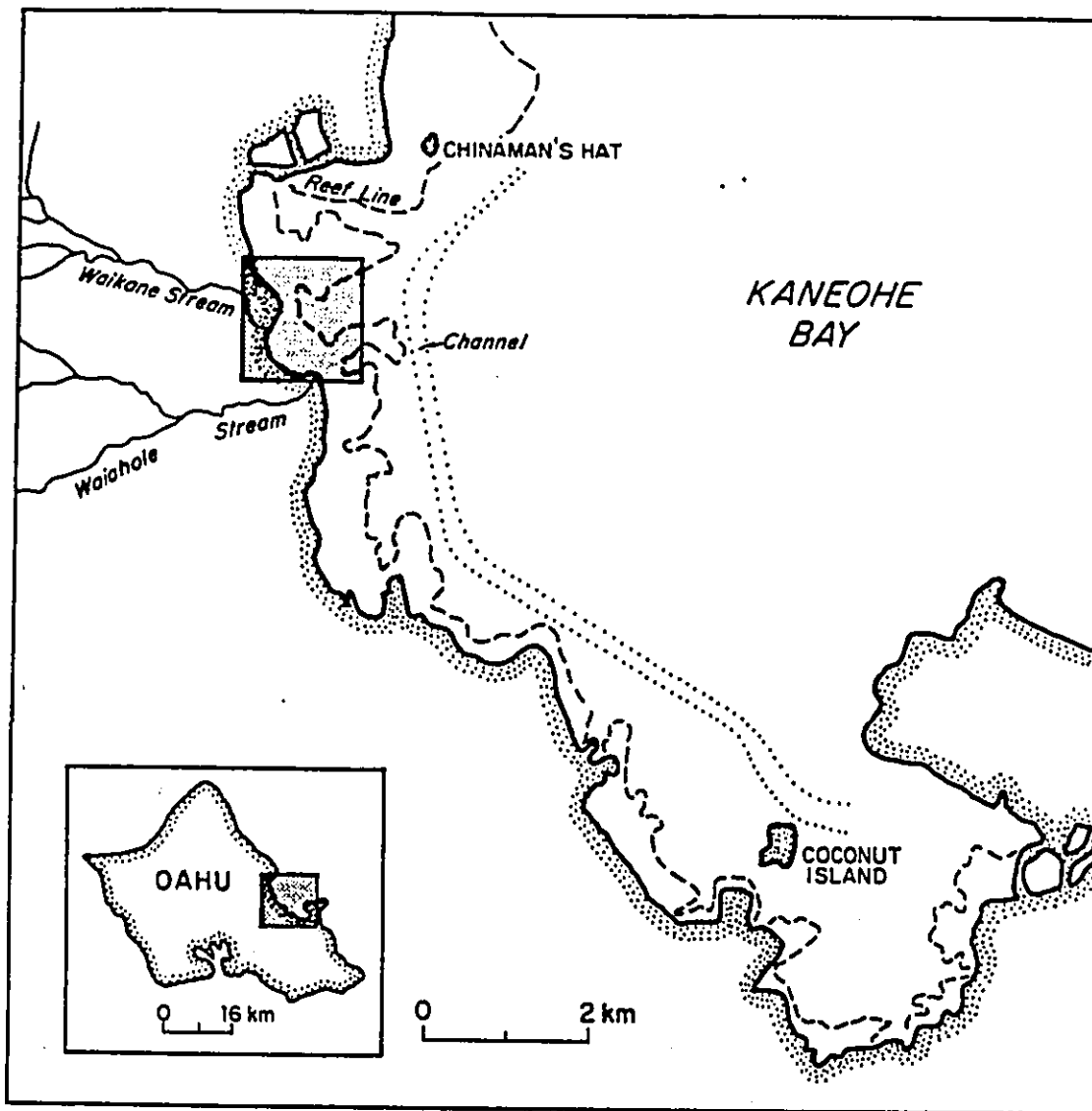
Archer's survey confirms the presence of four native species in Waikane Stream. It is apparent that the physical and biological conditions of the stream at this time are suitable to support these species. It is important to note that none of these species can be considered particularly sensitive to even moderate levels of environmental degradation. The fish species,; A. stamineus, S. genivittatus, K. sandvicensis and the prawn, M. grandimanus can all be found to inhabit streams of considerably lower water quality.

3. Kaneohe Bay

- a. Existing Conditions--A portion of Kaneohe Bay off the mouth of Waikane Stream has been surveyed by Marine Research Consultants. Their report (Appendix M) is summarized below.

Kaneohe Bay is a semi-enclosed embayment located on the northeast coast of Oahu (Figure 17). The landward boundary of the Kaneohe watershed is sharply delineated by a nearly vertical mountain range (Koolaus); the seaward boundary of the bay is a barrier reef that extends across the bay mouth. The bay includes components of both estuaries and coral reefs, two quite different kinds of ecosystems. Coral reefs develop best in environments free of terrestrial influence, while estuaries are characterized by input from rivers and streams. Kaneohe Bay is a weakly developed estuary and thus has moderate land influences in the form of freshwater, sediment and nutrients. In addition, the shape of the bay, as well as submarine topography and relatively weak tidal exchange give the bay a rather poor circulatory pattern. As a result, water quality impacts generated from shoreline activities can be more acute than along areas of open coastline.

Kaneohe Bay is one of the most-studied marine ecosystems in the world, owing to the location of the Hawaii Institute of Marine Biology on Coconut Island. As a result, episodes of intense flooding and sedimentation from run-off are documented. Banner (1974) reviewed the impacts of urbanization associated with dredging of ship channels to provide access to Kaneohe Marine Corps Air Station, and a ten-fold increase in population in the watershed of the Bay in the decades following World War II. Banner reports that dredging activity prior to World War II caused the removal of about 29 percent of the living reef, but that the remaining reefs were not permanently damaged by sediment created by dredging. Removal of upland vegetative cover, exposing soil during the urbanization process, resulted in substantial increases in siltation to the Bay floor. In 1965, torrential rains falling on newly bulldozed lands caused run-off of fine, red silt that caused alteration of normal coral community structure. In addition, lowering of salinity by flood run-off contributed to reef organism mortality. Torrential rains and floods from a recent storm in January of 1988 were similar in magnitude to the 1965 event. The recent floods also resulted in substantial mortality to corals in the south sector of the bay.



LEGEND

 **AREA OF MARINE ENVIRONMENTAL SURVEY**

**LOCATION OF STUDY AREA
OFF WAIKANE STREAM
WAIKANE GOLF COURSE**

SOURCE: MARINE RESEARCH CONSULTANTS, INC.



FIGURE 17

The present study followed a period of severe flooding in Kaneohe Bay. A very intense storm, resulting in approximately 30 cm of rain and reduction in south bay salinity to below 20 o/oo, preceded the present survey by approximately one month, while a minor flood event (approximately 12 cm of rain) occurred one day prior to the survey. The major storm event was equal in magnitude to the episode documented in 1965 by Banner. Resurvey of reef stations established by Banner showed that the 1988 event caused mortality to corals in the southern bay in nearshore areas subjected to freshwater input.

The nearshore area fronting the Waiahole-Waikane area is composed of depositional mud flats, composed of particulate organic materials emanating from stream flow. At the time of this survey, the shoreline was covered with a thick mat of organic material deposited from flood drainage. Moving offshore, sediment particle size decreases, becoming fine, silty mud. Beginning approximately 200 meters from shore, a network of patch reefs is interspersed in the mud flats. The seaward extension of the patch reefs terminates in the main channel. The top surface of the patch reefs is from 1 to 2 meters in depth, and they are composed of limestone, deposited by reef organisms. Sides of the reefs are steep and extend down to mud flats. Such topographic features are typical of the northern sector of Kaneohe Bay, and the area off Waikane does not appear to represent any unique or unusual environment.

Moving offshore salinity steadily increases from a low of 19.8 o/oo near the mouth of Waikane stream to 33.2 o/oo in the main channel which connects to the open ocean. Sampling stations parallel to shore indicate that to the north of Waikane Stream salinity is within 1 o/oo of the values in the channel. Decreased salinity at stations to the south of Waikane Stream in the near shore zone indicate a southerly water flow in the inner reaches of the north bay. It appears that the majority of material that reaches Kaneohe Bay via stream flow is either deposited near the shoreline, or is carried south along the shoreline toward Waiahole Stream. In Figure 18, which shows the circulation pattern in the Bay, it can be seen that material emanating from Waikane Stream will be carried south, and then away from the shoreline back out to the open ocean via the main channel. This circular flow will carry materials entering the nearshore zone out of the north Bay without dispersing these materials over the reef areas off of Waikane stream. Owing to this circulation pattern, dissolved nutrients, suspended solids, and turbidity are elevated in the nearshore region between Waikane and Waiahole streams relative to areas either farther offshore or to the north.



LEGEND

 **AREA OF MARINE ENVIRONMENTAL SURVEY**

**GENERALIZED CIRCULATION PATTERN
IN KANEOHE BAY
WAIKANE GOLF COURSE**

**SOURCE: MARINE RESEARCH
CONSULTANTS, INC.**



FIGURE 18

As described above, the physical structure of the marine environment in the area off Waikane consists of mud flats and patch reefs. Water clarity in the nearshore area (within 200 meters from shore) was so poor that it was not possible to observe any biota, had they been present. This region may be the habitat of burrowing organisms that are adapted to areas of high particulate loading. The offshore mud flats are characterized by burrow openings, predominantly from Alpheid shrimp than inhabit the upper meter of sediment throughout Kaneohe Bay.

Patch reef community structure consists mainly of coral colonies and calcareous algae. Assemblages of coral on patch reefs differs between the "edges" of the reef and the shallow, interior areas. The dominant coral on the edges is Porites compressa, commonly called "finger coral". In Kaneohe Bay, this species occurs predominantly as solid, hemispherically-shaped structures that grow from the reef base at the coral-mud interface. Destructive energy from storm waves is absorbed by these colonies on the edge of the reef, and during episodes of intense storm stress, blocks of P. compressa calve off from the reef and roll to the lagoon floor.

The flat, shallow interior parts of the patch reefs are dominated by a coral with a very different growth form as on the reef edge. Montipora verrucosa accounts for between 24 percent and 64 percent of benthic cover on the interiors of the patch reefs. In Kaneohe Bay, this species occurs predominantly in a ramose growth form characterized by thin pinnacles and flat plates. These colonies are extremely fragile and break into fragments with only slight mechanical stress. However, on the reef tops, wave energy is dissipated to a great extent by the P. compressa edges. With the reduction in wave stress M. verrucosa is competitively superior to other species, and dominates bottom cover. It can be seen that percentage cover of M. verrucosa decreases moving seaward on the patch reefs, probably in response to the degree of wave stress. Several other corals contributed small percentages of coral cover on the patch reefs. Coral species diversity on all transects is low owing to domination by a single species. None of the patch reefs surveyed by Marine Research Consultants in the Waikane area showed any signs of damage from recent floods.

Fishes inhabiting muddy areas adjacent to the shoreline and between patch reefs were not quantitatively assessed because most species are not site attached and avoid divers. Species of interest that are found in such habitats include the mullet (Mugil cephalus), milkfish (Chanos chanos), barracuda (Sphyraena barracuda), flagtail (Kuhlia sandvicensis), various jacks (Caranx spp.), and bonefish (Albula vulpes). During the Marine Research Consultant's survey, a commercial skipjack tuna fishing boat was observed catching anchovy (Stolephorus purpureus) for bait.

In general, the tops of the patch reefs had both low numbers of species and low numbers of total individuals, while the edges and sides harbored a diverse and abundant fish fauna. This is likely due to the abundance of large fissures and crevices on the reef edge and slopes; these features are essentially absent on the top of the reef. The reduced shelter available on the top of the reef makes this habitat less suitable for fishes.

The most common fishes on the reef tops were the saddleback wrasse (Thalassoma duperrey) and aggregations of small parrotfishes (Scarus spp.). Several representative groups of reef fish were predominant on the edge and sides of the reefs. Algal-feeding acanthurids were the most numerous single group of fishes observed. The convict tang (Acanthurus sandvicensis), yellow tang (Zebrasoma flavescens), and the yellow-eye tang (Gtenochaetus strigosus) were particularly abundant. Schools of small juvenile parrotfishes (Scarus spp.) also contributed to the abundance of herbivores. Aggregations of planktivorous sergeant-major damselfish (Abudefduf abdominalis) were also abundant. The reefs further hosted an assemblage of butterflyfish (Chaetodon spp.) and wrasses (fam. Libridae).

Overall, the fish community off Waikane Stream is fairly typical of assemblages found throughout Kaneohe Bay. The number of species, total number of individuals, and overall composition indicate a healthy and diverse fish community in deeper reef sites with suitable habitat, but the upper surfaces on the patch reefs tend to be depauperate, due to a lack of shelter.

Three species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle (Chelonia mydas) occurs commonly along the windward coast of Oahu and is known to feed on selected species of macroalgae. The endangered hawksbill turtle (Eretmochelys imbricata) is found infrequently in waters off Hawaii. One small green sea turtle was observed during the course of the survey swimming near the patch reefs. No nesting sites, however, were encountered near the study site.

Populations of the endangered humpback whale (Megaptera novaeangliae) are known to spend the winter months in the Hawaiian Islands. It is not possible, owing to shallow depth, for whales to occupy areas off Waikane that were surveyed.

The most important result of the survey of the marine environment offshore of the proposed project is that the influence of freshwater from stream flow is not causing detrimental impacts beyond the nearshore region. Counter-clockwise currents carry sediment-laden freshwater parallel to the shoreline makai of the property, followed by flow to the open ocean via the main channel. Thus, materials coming from the stream are not carried directly offshore to the region of patch reefs between the shoreline and main channel. As a result, benthic and fish

community structure are not presently adversely affected by freshwater input at the shoreline, even when such input reaches catastrophic proportions, as happened in early January. While reefs in the southern bay experienced massive coral kills owing to flood run-off, no dead corals were observed in the north bay fronting Waikane.


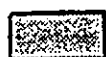









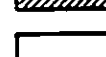

- b. Anticipated Impacts--It appears that the planned Waikane Golf Course does not present the potential to cause negative impacts to any constituents of the marine environment. The nearshore area fronting the development site is presently subjected to input of materials from Waikane stream; this material appears to be carried south along the shoreline and does not, even after intense flooding events, affect the offshore network of patch reefs. The golf course is estimated to cause decreased volumes of freshwater and suspended sediment discharge into north Kaneohe Bay. These two factors have been observed to be responsible for the majority of flood-related damage to reefs. Thus, construction of the golf course may actually serve as a buffer during future intense storms to lessen the impacts of flooding. It appears that dissolved nutrient input to the marine environment will increase as a result of golf course construction. However, the magnitude of these increases is small in relation to flood-related increases. In addition, nutrients per se have not been shown to cause detrimental effects to reef environments. According to Marine Research Consultants, there does not appear to be any potential for marine environmental alteration from biocides that may be used for pest and disease control on the golf course.

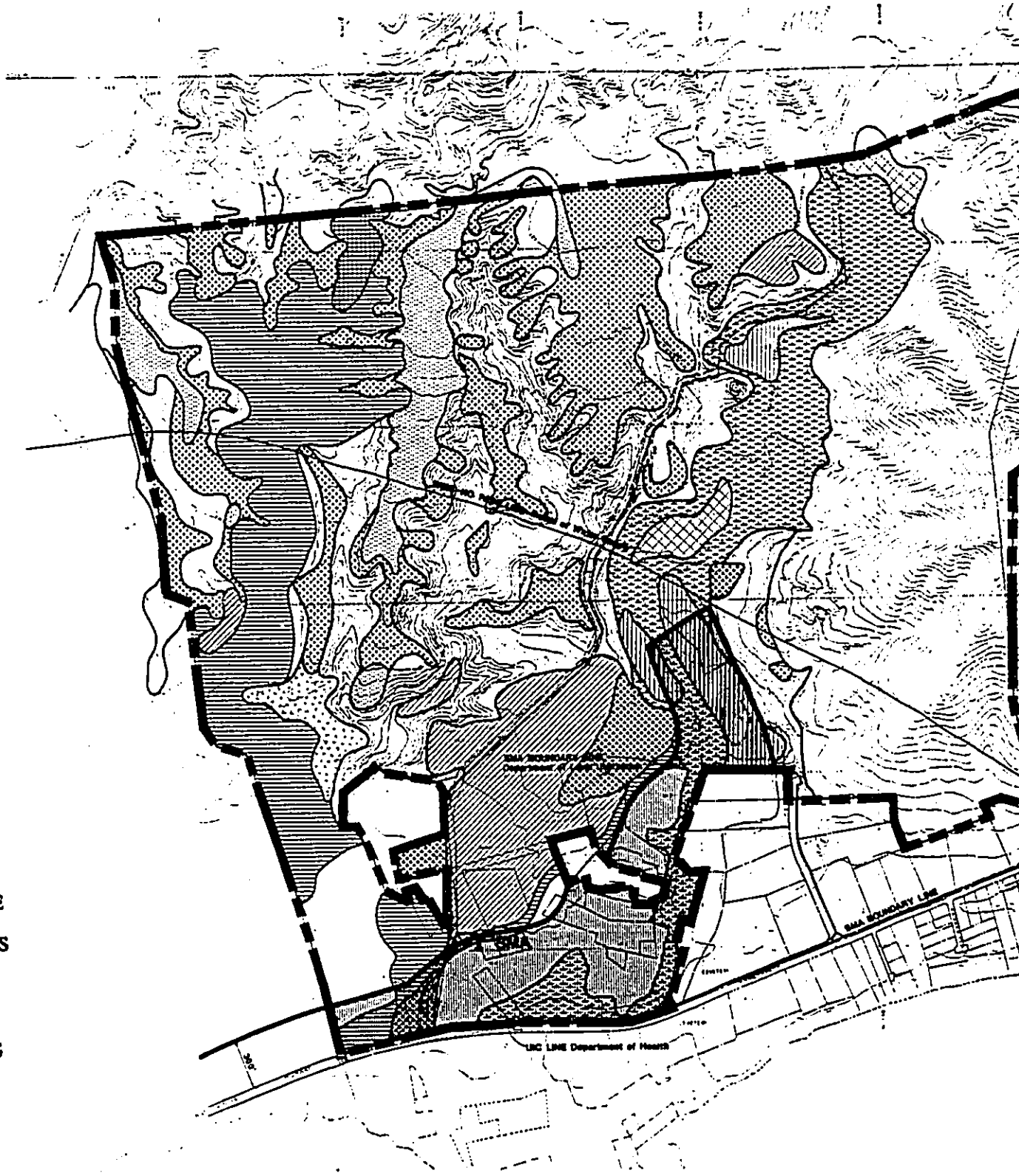
4. Flora

- a. Existing Conditions--According to a survey of the existing vegetation by Kenneth M. Nagata (Appendix N), the portion of the property within the SMA area can be divided into four major cover types. The distribution of the major cover types is indicated on Figure 19 and a description of these cover types is provided below.

Mixed Eugenia Forest - The dominant species throughout the site is Java plum. It occurs in abundance in all topographic situations except on the narrow ridge crests but reaches its fullest potential in the moist ravines and along Waikane Stream where the trees attain heights of more than 50 feet. On the slopes and on poorer soils the trees are dwarfed and widely scattered. Often they are festooned with yellow granadilla (Passiflora laurifolia) which may be the second most abundant species in the property. Although Java plum occasionally forms small pure stands, it is more commonly found in association with other species. Three forest subtypes can be distinguished.

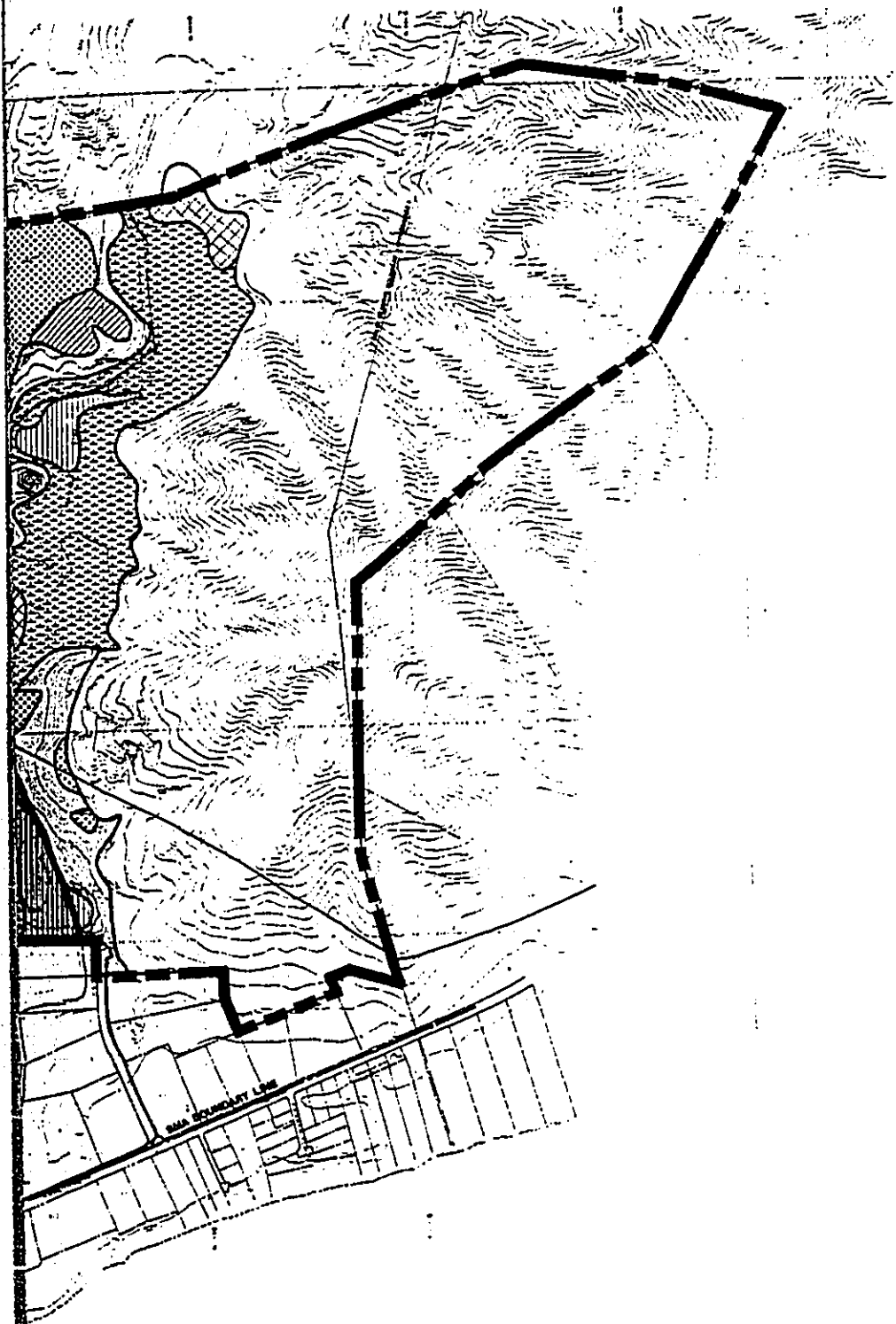
LEGEND

-  CULTIVATED LANDS
-  MIXED EUGENIA FORESTS,
BRASSIA SUBTYPE
-  MIXED EUGENIA FORESTS,
HIBISCUS SUBTYPE
-  MIXED EUGENIA FORESTS,
EUGENIA JAMBOS SUBTYPE
-  MIXED RIPARIAN,
MIXED FOREST SUBTYPE
-  MIXED RIPARIAN,
GRASSLAND SUBTYPE
-  MIXED RIPARIAN,
CULTIVATED AREA SUBTYPE
-  ANDROPOGON GRASSLANDS
-  AXONOPUS GRASSLANDS
-  MICROLAENA GRASSLANDS
-  BRACHLARIA GRASSLANDS
-  UNSURVEYED
-  SPECIAL MANAGEMENT AREA
WITHIN PROJECT



**VEGETATION MAP
WAIKANE GOLF COURSE**

SOURCE: KENNE



SOURCE: KENNETH NAGATA & ENGINEERING CONCEPTS, INC.

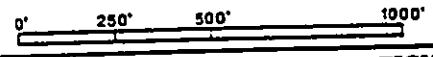


FIGURE 19

-- Brassaia Subtype - This is the single most prevalent vegetation unit in the property. Octopus tree is a co-dominant element in this subtype which is best developed in gullies and ravines where moisture is more readily available. In these situations the Java plum and octopus trees reach heights of 35 feet or more. Mango and albizia (Albizia falcataria) which grow to more than 100 feet tall, are common in these situations. On exposed slopes and on the tablelands the trees are shorter and more widely spaced and the herb and shrub layers generally consist of Boston fern (Nephrolepis exaltata), broomsedge and 'akia (Wikstroemia oahuensis). On more protected slopes the trees are very closely spaced, forming dense growth. On the slopes in the Kahuku side of the property, octopus tree is often dominant over Java plum. Yellow grana-dilla, Boston fern and strawberry guava (Psidium cattleianum) are common species in this subtype. On drier slopes, Christmas berry is an important element.

-- Hibiscus Subtype - Typically, this subtype consists of dense tangles of hau in association with stands of closed-canopied Java plum more than 30 feet tall. Because of the deep shade, the understory is poorly developed. In the upper portions of the small gullies the forest is open-canopied and the trees much shorter. Here, Boston fern, Koster's curse (Clidemia hirta) and lantana are common in the understory and octopus tree, strawberry guava and Christmas berry become increasingly important. This forest extends down to Kamehameha Highway where the land is marshy and false kamani (Terminalia catappa) is a conspicuous element.

This subtype is also found on the mauka edge of the wetlands along Waikane Stream. The forest here is open-canopied with the trees festooned with maile pilau (Paederia foetida) and moon flower (Ipomoea alba). The resulting shrub and herb layers are well developed and consist mostly of Guinea grass, basketgrass (Oplismenus hirtellus), paragrass (Brachiaria mutica) and burbush (Triumfetta semitriloba).

Mixed Riparian Association - Broadly defined, the Mixed Riparian Association includes the vegetation along the flood plain of Waikane Stream. Three completely different subtypes are recognized; according to Nagata, none are considered botanically important from the stand point of native ecosystems.

-- Mixed Forest Subtype - The forest along Waikane Stream is itself a mosaic of several species each forming nearly pure stands in certain areas and mixed stands in others. Typically the forest is closed-canopied but the understory varies from sparse to exceedingly dense. Along Kamehameha Highway the forest is closed-canopied and consists of tall mango, Java plum and false kamani (Java plum often forms pure stands here), but the land is generally one of mud and gravel outwash

and gravel bars. The resulting understory is sparse and consists largely of tree seedlings, 'ape (Alocasia macrorrhiza) and blue 'ape (Xanthosoma violaceum).

Conspicuous trees include Java plum which grow to 50 feet or more in height, mango, octopus tree, hau which forms impenetrable thickets, albizia which grow to heights of 100 feet or more, and false kamani. The most common understory species are Boston fern and basketgrass. Maile pilau, yellow granadilla and moon flower occasionally grow into the trees and may become locally abundant. Several banana (Musa x paradisiaca) groves are found in these forests but in small numbers. A small stand of an undetermined species of Rubiaceae was discovered on the banks of Waikane Stream. Although it is definitely not a native species, proper identification cannot be made until flowers or fruits are seen.

-- Grassland Subtype - Several Brachiaria Grasslands are found along Waikane Stream and are here considered part of the riparian vegetation. These are situated on flat sections adjacent to the stream and are believed to be former taro paddies. Honohono, Job's tears (Coix lachryma-jobi), primrose willow (Ludwigia octivalvis) and canna (Canna indica) are generally associated with these sites.

Cultivated Lands (C)--Lands designated as Cultivated Lands include tenants' residences and farms (except those along Waikane Stream which are included as a subunit of Mixed Riparian Association), but not pastures which are included as Grasslands. An enormous number of ornamental and weedy species are associated with these areas. Mango, Java plum, monkeypod (Samanea saman), coconut (Cocos nucifera) and avocado (Persea americana) are the typical trees while the lawns are generally a mixture of Hilo grass, Bermuda grass, kyllinga (Cyperus kyllinga), Henry's crabgrass (Digitaria adscendens) and Hemigraphis reptans. Among the numerous ornamentals are poinsettia (Euphorbia pulcherrima), impatiens (Impatiens sultani), yellow ginger (Hevechium flavescens), red ginger (Alpinia pupurata) and monstera (Monstera deliciosa). Several cultivated species have escaped from the numerous trash piles scattered along the road beyond the residential area and are now found as wayside species. The most conspicuous of these is wedelia (Wedelia trilobata). Coconuts, papaya, monstera, Calliandra sp. and Philodendron radiatum have also become established in certain areas. Common weeds in the Cultivated Lands include burbush, honohono, phyllanthus weed, Spanish clover, goosegrass, sensitive plant, Asiatic pennywort, ageratum (Ageratum conyzoides) and sour grass (Tricachne insularis).

Unsurveyed Areas (Wetlands)--Once rice and taro paddies, the areas designated as wetlands today consist of nearly pure stands of paragrass with emergent hau and Java plum. Hilo grass and honohono are co-dominant in certain areas. Primrose willow, pluchea (Pluchea odorata), candlebush (Cassia alata), pua-nana-honua (Solanum auriculatum), Jamaica vervain, sensitive plant and koa-

haole are among the very few additional species associated with the wetlands. Conspicuous in their absence are rushes and sedges such as the great bulrush (Scirpus californicus) which are characteristic of marshes and other wetlands.

Very few native plant species occur in the property. The most abundant are the indigenous hau which is a co-dominant component in one of the vegetation subtypes, the endemic 'akia which is common on many of the slopes and the indigenous ferns, pala'a (Sphenomeris chusana) and uluhe (Dicranopteris linearis), are present in smaller numbers. All are common species in Hawaii. Of the major native forest trees, only two 'ohi'a-lehua and two koa trees were encountered. Additionally, the native hala occurs in small to moderate numbers along Waikane Stream.

The vegetation in the property is almost totally secondary in nature. According to Nagata, no native communities are present in the site and the few native species present are all common in Hawaii.

- b. Anticipated Impacts--According to Nagata, native vegetation and endangered plant species can be eliminated as concerns in any development in the property. However, temporary soil erosion, alteration of stream discharge and load, and ocean siltation are potential problems that may result when vegetation is removed from 136 acres during construction to develop the tees, fairways, greens and roughs of the golf course. Excessive erosion and runoff during construction may result in excessive silting of the wetlands along Kamehameha Highway. This may alter the ecosystem in favor of arborescent species.

Removal of riparian vegetation could have an impact on the biota of Waikane Stream. The vegetation provides shelter and an organic input to the stream which is critical to many aquatic species. A minor degree of removal will be done in connection with alignment and placement of the greens, tees and fairways of the golf holes on land adjacent to the stream. However, as there will be no alteration of the stream itself, much of the mature existing vegetation will be retained. The removal and replanting of any edge vegetation will be managed with the understanding that stream environments are to be protected and erosion of the banks prevented. New edge planting will also be provided along some parts of the stream.

The removal and replanting of any edge vegetation will be managed with the understanding that stream environments are to be protected and erosion of the banks prevented. The net effect of the changes will be some decrease in the amount of shade and some increase in the amount of direct sun on instream environments. The degree of removal and replanting will be done in consultation

with a stream biologist to insure that the health of the stream environment is preserved.

5. Terrestrial Vertebrates

- a. Existing Conditions--Andrew J. Berger surveyed the property on 9 December 1987. According to his report (Appendix O), the following birds have been reported to occur in the Waiahole and Waikane region:

Cattle Egret (Bulbucus ibis)
Feral Pigeon or Rock Dove (Columba livia)
Spotted or Chinese Dove (Streptopelia chinensis)
Barred Dove (Geopelia striata)
Barn Owls (Tyto alba pratincola)
Melodious Laughing-thrush (Garrulax canorus)
Red-vented Bulbul (Pycnonotus cafer)
White-rumped Sharma (Copysychus malabaricus)
Japanese Bush Warbler (Horeites cantans)
Common Indian Myna (Acridotheres t. tristis)
Japanese White-eye (Zosterops i. japonicus)
House Finch (Carpodacus mexicanus frontalis)
Ricebird or Nutmeg Mannikin (Lonchura punctulata)
House Sparrow (Passer domesticus)
Cardinal (Cardinalis cardinalis)
Red-crested Cardinal (Paroaria coronata)
Lesser Golden Plover (Pluvialis dominica fulva)
Black-crowned Night Heron (Nycticorax n. hoactli)

According to Berger, no endemic forest birds occur within the boundaries of the property or in the immediate area.

There are no native amphibians, reptiles, or mammals in Waikane Valley. All amphibians, reptiles, or mammals have been introduced by man, and most of them are pests; for example, roof rat or black rat (Rattus rattus), Polynesian rat (Rattus exulans), house mouse (Mus musculus), and small Indian mongoose (Herpestes auropunctatus). These mammals prey on both ground-nesting and tree-nesting birds, and the rats and mouse cause damage to agriculture.

- b. Anticipated Impacts--During the construction period, there will be a temporary disturbance to introduced terrestrial vertebrates as vegetation is removed in phases (a total of approximately 158 acres will be developed). However, the remainder of the property (347 acres) will not be developed and will provide alternative nesting and feeding areas. The completed golf course may provide additional habitat for birds that were displaced during construction.

The proposed development will not have a detrimental effect on any endemic animal or on any endemic or native ecosystem. The fertilizers, herbicides, and fungicides used in golf course maintenance pose little or no hazard to birds frequenting the grassed areas or ponds associated with golf courses. Fertilizers are relatively non-toxic unless ingested in large amounts. All herbicides and fungicides used in golf course maintenance in Hawaii are of low to moderate toxicity. The only chemicals used in golf course maintenance in Hawaii which are highly toxic to birds are the organic phosphate insecticides, especially chlorpyrifos.

Although both diazinon and chlorpyrifos are highly toxic to birds, they are strongly absorbed on the thatch layer of turf and move little from the site of application. One reason for their weakness in controlling soil infesting insects is the inability to get the insecticides through the thatch layer to the depth needed to contact these insect. Recent studies (Sears and Chapman, 1980; Tashiro, 1980) have shown that diazinon and chlorpyrifos applied to turfgrasses do not penetrate more than 2 to 3 centimeters in the soil. In addition to resistance to movement in the soil, it has been shown that they are rapidly degraded in the soil, both by hydrolysis and microbial action.

Because of the absorption of organic phosphate insecticides on organic layers in turf and their rapid break down, there is little chance of their movement from grassed areas into the ponds or waterways associated with the proposed golf course. Label instruction for application of these pesticides, which turfgrass managers are required by law to follow, specifically prohibit their direct application to streams and ponds.

6. Wetlands

a. Existing Conditions

Land areas designated as Wetlands in the Waikane Golf Course Master Plan encompass 25.8 acres in the makai section of the project, mauka of Kamehameha Highway (Figure 4). The Wetlands are composed of two separate parcels of different soil types. The parcel in the Kaneohe-makai section consists of 10.8 acres, of which 3.7 acres are Pearl Harbor Clay (Ph), 1.7 acres are Hanalei Silty Clay (HnA) and 5.4 acres in the central part of the parcel are Marsh (MZ). A larger parcel of 15.0 acres, located in the Kahuku-makai section, consists of 3.7 acres of MZ bordered by Kam Highway and the proposed golf course entry, and 11.3 acres of HnA bordering Waikane Stream.

The land areas designated as Wetlands in the Waikane Golf Course Project are under the jurisdiction of the U.S. Army Corps of Engineers. The Corps specifies that production of hydrophytic plants is permitted in wetlands. Hydrophytic crops consist of plants that grow in water or in soil too waterlogged for most plants to survive. Insofar as Hawaii agricultural production is concerned, taro and watercress are examples of crops that fall into this category. The Corps further specifies that producers of hydrophytic plants in wetlands must assure that there will be no detrimental effects on health and safety through alteration of the topography or storage capacity of wetland areas, particularly with respect to adding fill.

Discussions with officials in the Army Corps of Engineers indicated that non-hydrophytic crops can be grown in wetland areas, provided there is no alteration of the topography. Plowing and drainage of areas subject to occasional flooding, such as Hanalei Silty Clay soils, are permitted if the topography is not altered. A general or generic permit for agricultural use which specifies specific conditions is required.

There are no permanent areas of open water in these wetlands and, as such, the habitat does not attract wetland birds (native or introduced). A biological survey of the area concluded that the entire Waiahole/Waikane Valley system, including the wetlands, is a "wasteland" as far as endemic or native vegetation and animal life is concerned because the area has been disturbed for over 100 years.

b. Anticipated impacts

The golf course developer is proposing no development in the designated wetlands. Golf course design will also minimize runoff into the marsh area as various detention and retention features are built into the course. Although some concern has been expressed regarding the development of the three wells, the impact of the wells are anticipated to be minor. (See section on water quality anticipated impacts).

Some agencies and community representatives have indicated the desire or possibility of alternative uses of the wetlands. If any of these alternatives are pursued, it would be based on interests outside of the golf course development. Some suggested uses are: wetland agriculture, community park and wetland enhanced wildlife refuge. Each alternative will require a separate analysis and evaluation of feasibility, impacts and potential. The question of the feasibility of wetland agriculture was investigated and the report is included in Volume II of the EIS.

Essentially, the development of the golf course itself will have little or no impact on the wetlands.

D. COASTAL VIEWS

1. Existing Conditions

According to the City and County of Honolulu's Coastal View Study, the property lies within Section A, Kahaluu, of the Kaneohe Bay Viewshed. Figures 20 through 23 were prepared as a visual analysis of the Kaneohe Bay Viewshed. Figure 20 shows the location from which the various photographs were taken, with the numbers corresponding to those shown in the caption under each of the photographs.

The primary physical characteristics of this viewshed are characterized by the steep cliffs and ridges extending from the Koolau Mountains, an undulating coastline, and an abundance of natural vegetation along the roadway (refer to Figure 21, view #1). While the coastline, Kaneohe Bay and Mokoli'i island are significant visual resources, the abundant natural vegetation along the makai side of Kamehameha Highway does not permit views of these features (refer to Figure 22, view #4). The property is located mauka of Kamehameha Highway and does not interfere with or detract from the line of sight toward the sea from Kamehameha Highway (the nearest inland public roadway). Generally, the vegetation along the mauka side of the highway does not allow views toward the steep cliffs and ridges of the Koolau Mountains except near Waikane Valley Road (Figure 23, view #6), where the existing "wetland" abuts Kamehameha Highway (Figure 23, view #5). Outside of the property, Haupoa Road provides a mauka view corridor, allowing views of Puu Pueo (Figure 21, view #2) and of the Koolau Mountains (Figure 22, view #3).

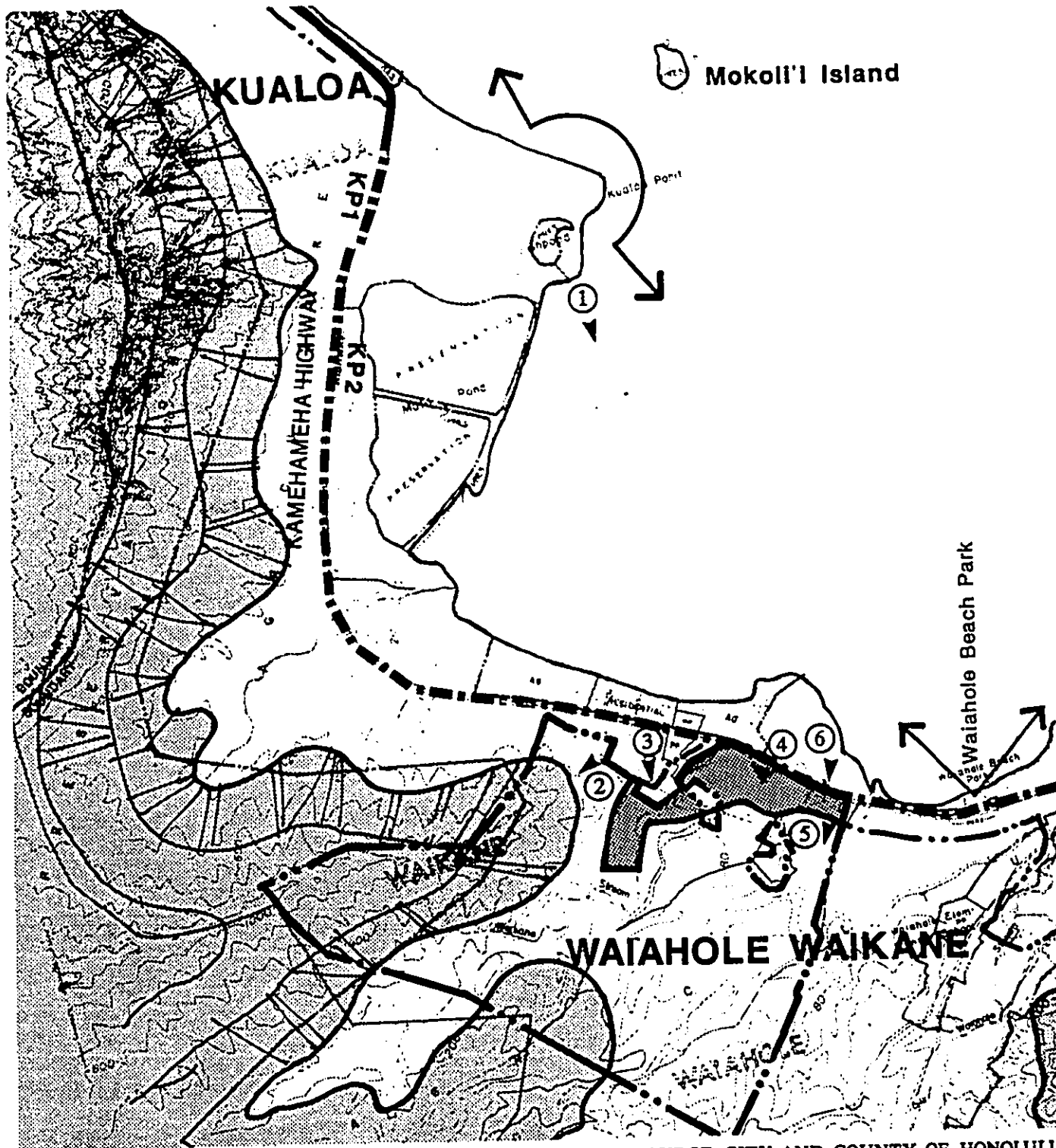
2. Anticipated Impacts

No adverse effects to coastal views from the nearest inland public roadway are expected. Due to the distance, views of the property from Kualoa Regional Park will not be affected by the proposed golf course development. Views mauka from Kamehameha Highway through the "wetland" area will not be affected by the project, since no development is proposed within the "wetland" area.

E. WATER QUALITY

1. Existing Conditions

Waikane Valley lies entirely within the dike complex of the Koolau rift zone. In the dike complex, intrusive rocks comprise more than 10 percent of the total rock mass. Intrusives are virtually impermeable compared to normal lavas, and therefore the hydrologic environment of the dike complex is unfavorable for the accumulation and movement of groundwater. The aquifer compartments between dikes are small and poorly connected. In fact, subsurface conditions are so poor as to have discouraged attempts at groundwater development for municipal purposes requiring producing units of several hundred gallons per minute or more.



SOURCE: CITY AND COUNTY OF HONOLULU

LEGEND

 SPECIAL MANAGEMENT AREA
WITHIN PROJECT

**VIEW STUDIES - KEY MAP
WAIKANE GOLF COURSE**

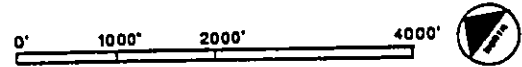
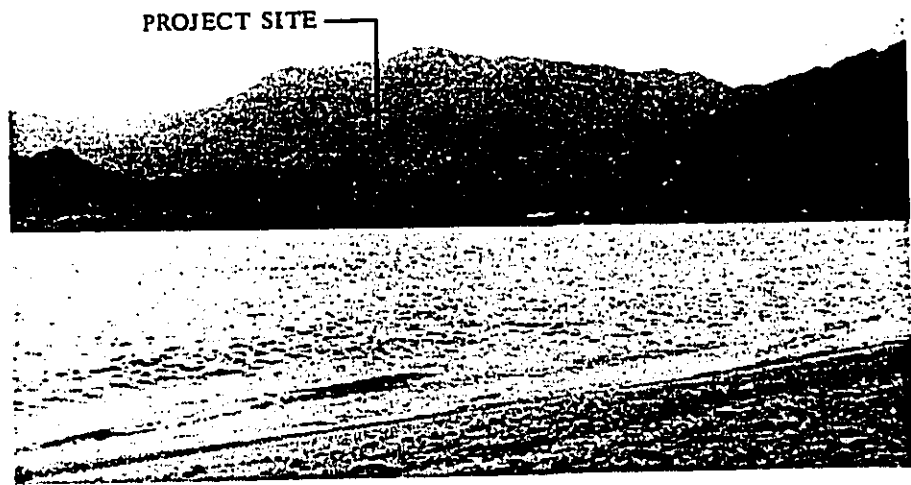
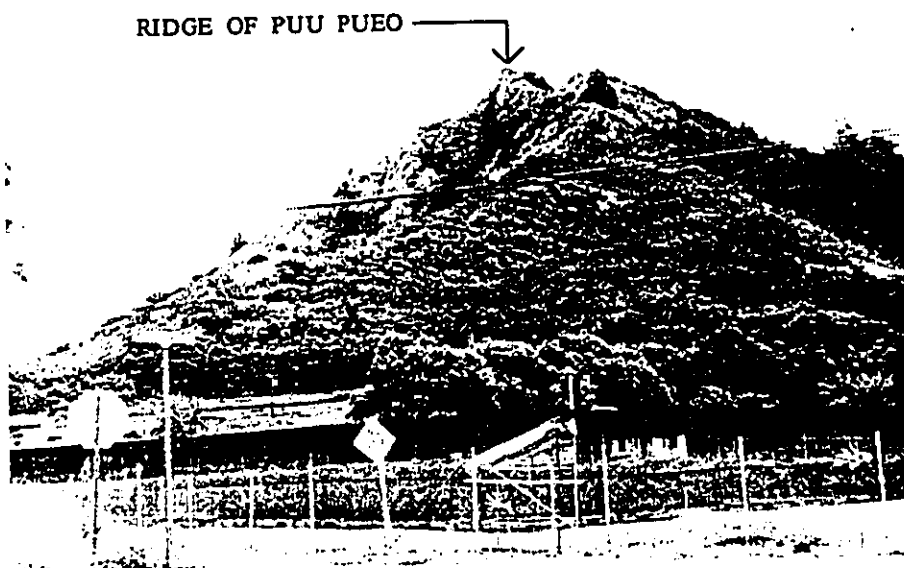


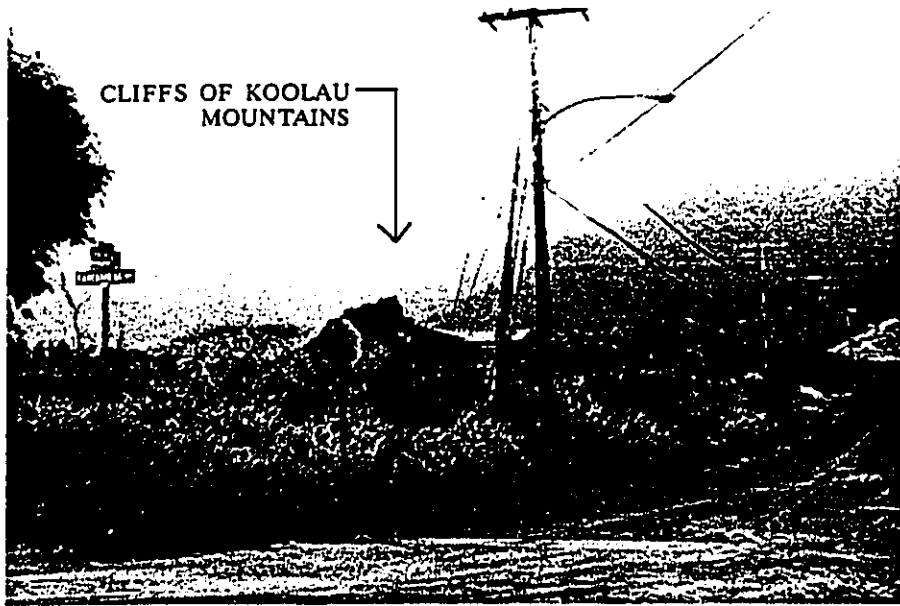
FIGURE 20



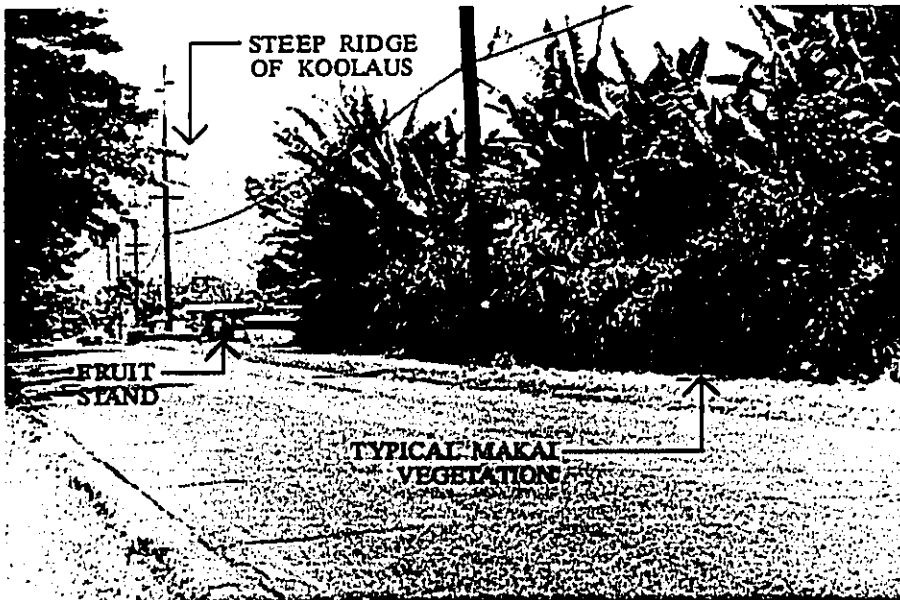
① VIEW OF WAIKANE AREA FROM KUALOA REGIONAL PARK



② VIEW OF PUU PUEO FROM KAMEHAMEHA HIGHWAY AT HAUPOA ROAD



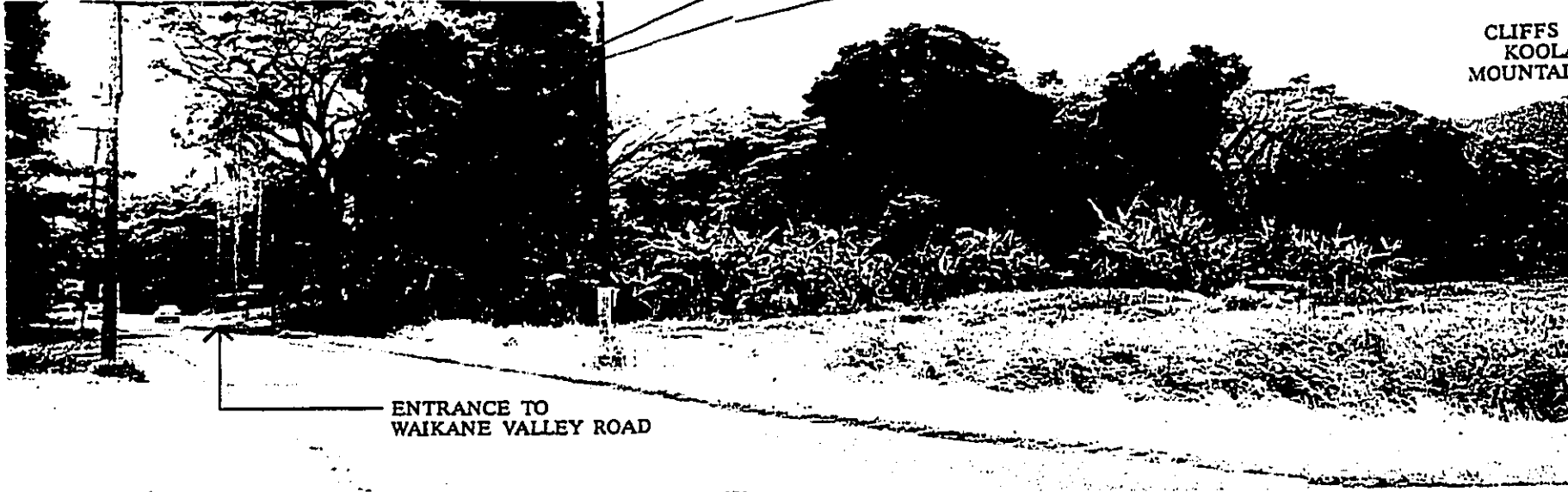
③ VIEW OF KOOLAU MOUNTAINS FROM KAMEHAMEHA HIGHWAY AT HAUPOA ROAD



④ TYPICAL VIEW FROM KAMEHAMEHA HIGHWAY

VIEW STUDIES
WAIKANE GOLF COURSE

FIGURE 22



CLIFFS
KOOLA
MOUNTAIN

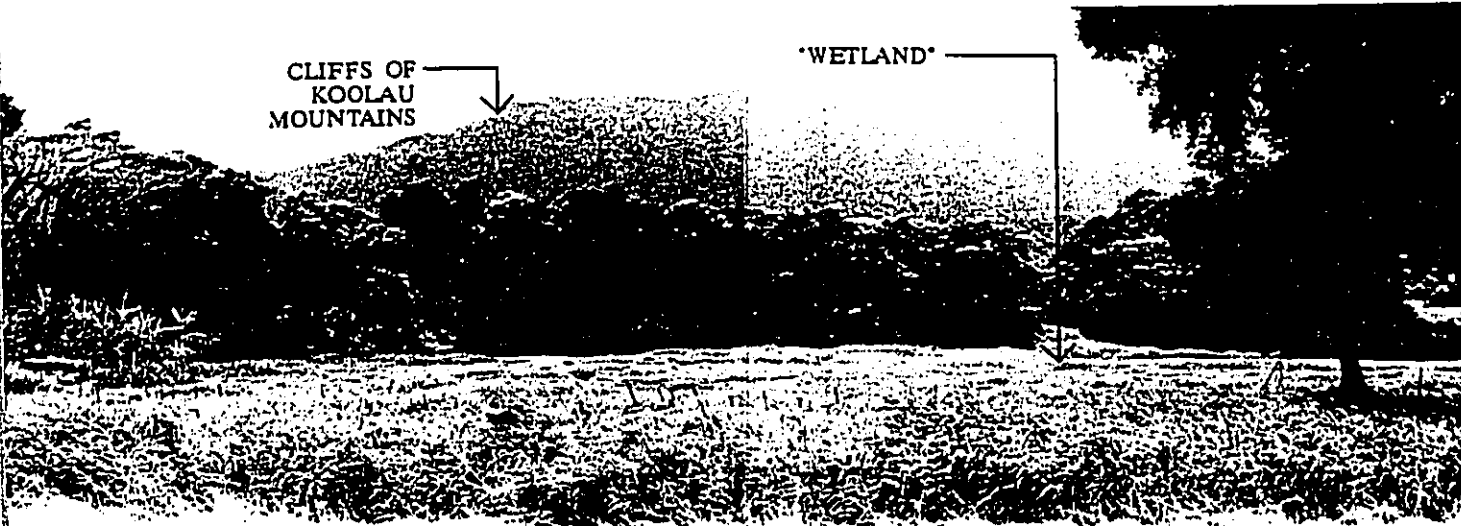
ENTRANCE TO
WAIKANE VALLEY ROAD

⑤ VIEW OF PROPERTY FROM KAMEHAMEHA HIGHWAY



⑥ ENTRANCE TO WAIKANE VALLEY ROAD FROM KAMEHAMEHA HIGHWAY

VIEW STUDIES
WAIKANE GOLF COURSE



FROM KAMEHAMEHA HIGHWAY



ROAD FROM KAMEHAMEHA HIGHWAY

FIGURE 23

Waikane Stream courses through the heart of the Koolau dike complex. Its low flows are sustained by seepage of groundwater from overflowing dike compartments, but it also frequently discharges direct surface runoff due to appreciable rain showers, especially from the high rainfall area in its headwaters, and general storms. The most voluminous springs in the drainage basin emerge above an elevation of 800 feet, but since 1916 these discharges, which average 5.5 mgd, have been diverted by the Waiahole Tunnel System and never reach the lower valley. All of the groundwater that now accumulates in the stream originates below an elevation of 800 feet.

The U.S. Geological Survey has had a continuous stream flow recorder at elevation 75 feet on Waikane Stream since 1959, providing nearly 30 years of record. The gage is located 1.2 miles inland of the coast. The stream drains an area of 2.22 square miles, but the most productive portion of the drainage area is intercepted by the Waiahole Tunnel system. Normal base flow of Waikane Stream is about 1.5 mgd.

Groundwater seepage is most productive in the vicinity and for several thousand feet upstream of the gaging station. At higher elevations in the portion of the valley still within the drainage area of the gage, the groundwater level is not high enough to yield substantial overflow from dike aquifers, while downstream of the gage, outflow is impeded by a blanket of alluvium. Groundwater discharge, instead of draining to the stream channel, is diffused over an area of alluvial lowland. The marshy conditions at the mouth of the valley result from this conjugation of diffuse seepage and alluvium. Before the diversions at the head of the valley started three fourths of a century ago, base flow of the stream in the lower valley was five times what it is today. The lost groundwater now drains to Waikane 1 and Waikane 2 collection tunnels of the Waiahole Tunnel System.

2. Anticipated Impacts

The three wells proposed for the area are planned to produce 450-550,000 gpd for irrigation and fireflow purposes. Some concern has been raised about the impact of well pumpage on Waikane Stream flow, groundwater resources in the area and the wetland areas on the makai areas along the unnamed stream and Waikane Stream. Due to the alignment of the dike system in the area and the location of the three wells, little or no impact on Waikane Stream flow is expected. Additionally, prior studies of Waikane Stream indicate that the major water sources for lower Waikane Stream are found above the 75 ft. USGS Gaging Station. This places the majority of sources for stream flow above the aquifers supplying the wells.

With regard to the marsh areas below the golf course, John Mink writes "The marshes are sustained by diffuse groundwater seepage and runoff from streams. The loss of a portion of the diffuse is not expected to significantly affect the wetlands because runoff is appreciable." Additionally, since the water pumped from the wells will be used for irrigation of lands above the marshes and streams, except for what is lost through evapotranspiration, the remainder will seep back into the ground or run off into the streams and marshes.

There are concerns that the application of pesticides and fertilizers during the normal maintenance of a golf course may affect water quality. The results of Murdock and Green's assessment of possible impacts (Appendix L) are summarized below.

There are a number of weed, insect and disease pests of turfgrasses in Hawaii which sometimes require application of chemical pesticides. However, pesticides are normally applied only in response to outbreaks of pests. There are few instances in which pesticides are applied in a regularly scheduled, preventative program.

The soils of the area consist of the Waikane series on upland areas and the Hanalei series on the stream bottoms and flood plains. Both the Waikane and Hanalei soil series are characterized by relatively high organic matter contents throughout the soil profile.

Considering the relatively high organic matter content of the soils, which will retard movement of pesticides through the soil profile, and the limited persistence of those pesticides which are not highly sorbed (e.g., 2, 4-D), it is not likely that significant quantities of pesticides will move below the soil profile (approximately 1 meter). Moreover, there is evidence that groundwater in this area moves on a hydraulic gradient toward the ocean and actually emerges at the surface where stream beds intersect the groundwater table. Thus, it is questionable whether even insignificant quantities of pesticides in leachate will move beyond the soil profile.

Fertilizers are applied to golf courses to supply those essential nutrients which are used in large amounts and which are deficient in most soils. In typical soils, the elements which are normally applied in a turfgrass fertilization program are nitrogen (N), phosphorus (P), and potassium (K). Fertilizers are normally applied to only the greens, tees, fairways, and part of the roughs of a golf course.

According to Murdoch and Green, the primary fertilizer elements of concern for contamination of ground and surface waters are nitrogen and phosphorus. Phosphorus is attached very tightly to iron and aluminum hydroxides which are plentiful in the soil of this location and moves little if any from the site of application. Phosphorus, therefore, is not expected to cause contamination of drainage water. Ammonium nitrogen (NH₄) likewise moves little in soils. Nitrogen applied in the ammonium form, however, is rapidly converted to the nitrate form (NO₃) which is not bound to the soil and moves readily

with water. Because of high N uptake by turfgrasses, however, nitrogen will be used rapidly after application. Only under conditions where rainfall occurs soon after application of a soluble nitrogen source would there be excessive loss by surface runoff or by leaching below the root zone. This nitrogen movement could be avoided by applying a slow-release nitrogen fertilizer.

Because rainfall is not uniformly distributed throughout the year, all golf courses are irrigated to supplement rainfall. Irrigation practices may have a large influence on the movement of soluble nitrogen fertilizers in soils. If excessive irrigation water is applied soon after application of soluble nitrogen sources, the chance for runoff or leaching of nitrogen below the root zone is increased. Because of the high cost of irrigation water, there is little incentive to over-water golf courses.

Since it appears that groundwater in this area emerges at the surface and moves toward the ocean in stream beds which intersect the groundwater table, movement of nitrate would be in runoff waters. However, because of the small amount applied at any one application, and the large dilution from water off-site in the surface drainage way, nitrate content of drainage water would likely be of minor significance.

Increased turbidity due to sediment load is another water quality factor that was investigated by Engineering Concepts (Appendix F) and Gordon Dugan (Appendix G). Although the potential rate of runoff within the project site was calculated to increase by 59 percent, the erosion potential is expected to be reduced from 12,040 tons/year to 11,044 tons/year. This is an 8 percent reduction in erosion potential. The apparent incongruity between increased runoff and decreased erosion potential is due to differences in the rainfall absorptive potential of the existing vegetation and eroded hillsides versus the golf course and the new drainage control plan. The drainage system will be designed to detain stormwaters on site in detention basins and ponds, and the golf course will add landscaping to eroded hillsides.

Construction of the golf course will involve land disturbing activities which could result in soil erosion and subsequent increase in the sediment load of the stream during this period. County grading requirements will be followed and additional mitigation measures will be instituted to minimize short-term soil erosion impact.

F. AIR QUALITY

1. Existing Conditions

Root and Neal prepared an air quality study of the project. Their report (Appendix P) is summarized below.

Present air quality in the Waikane area is likely to be affected by air pollutants from four different types of sources: natural, industrial, agricultural, and vehicular. Natural air pollutant producers which could affect Waikane include the ocean (sea spray), plants (aero-allergens), dust (from the wind blowing over areas with no vegetative cover), or perhaps distant volcanic emissions from the Island of Hawaii.

Industrial and agricultural sources of air pollutants are located on the leeward and central portions of Oahu. The 3000-foot Koolau Mountain Range separates the property from these source areas. Upwind in the normal trade wind direction there are no industrial or agricultural air pollution sources for thousands of miles. The nearest representative long term State of Hawaii monitoring station on the windward side of Oahu is located at Waimanalo, about 15 miles to the southeast of Waikane. This monitoring site was selected to measure background levels of particulates and recent reported levels have been running in the range of 25 to 30 micrograms per cubic meter, far below allowable State of Hawaii and Federal Ambient Air Quality Standards (AAQS).

Unfortunately there are no nearby long term measurements of carbon monoxide, ozone, or lead on the windward side of Oahu, so current levels of vehicular pollutants are difficult to estimate using anything other than a modeling approach. Measurements of lead from sites in urban Honolulu indicate that most recent levels are barely above the threshold of detection for current measuring techniques. Airborne lead is thus not considered to be a problem anywhere on Oahu. On the other hand, carbon monoxide and ozone readings from urban Honolulu indicate that allowable State of Hawaii standards for these vehicle-related pollutants are being violated at a rate of up to three times a year. Ozone is an indicator of the formation of photochemical smog, a condition which tends to develop over Oahu if the air mass is fairly stable with light southerly winds prevailing for a period of two or more days.

2. Anticipated Impacts

- a. Construction-Related Impacts--There will be two types of short term direct air quality impact from project construction: fugitive dust and on-site emissions from construction equipment. There will also be short term indirect impacts from slow-moving construction equipment travelling to and from the property and a temporary increase in local traffic caused by commuting construction workers.

Fugitive dust emissions will arise from grading and dirt-moving activities within the property and from any off-site dirt hauling as well. State of Hawaii Air Pollution Control Regulations require that visible emissions of fugitive dust from construction activity be essentially nil.

Adequate fugitive dust control can usually be accomplished by establishment of a frequent watering program to keep bare-dirt surfaces in work areas from becoming significant dust generators. Control regulations also require that open-bodied trucks be covered at all times when in motion if they are transporting materials likely to give rise to airborne dust. Paving of parking areas and establishment of landscaping as early in the construction process as possible can also lower the potential for fugitive dust emissions.

On-site mobile and stationary construction equipment will also emit some air pollutants in the form of engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen dioxide emissions from diesel engines can be quite high, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short term construction equipment emissions. Furthermore, carbon monoxide emissions from diesel engines are very low and should be essentially insignificant compared to normal vehicular emissions on nearby Kamehameha Highway (Root, 1988).

Indirectly, slow-moving construction vehicles on the two-lane Kamehameha Highway can obstruct the normal flow of traffic to such an extent that overall vehicular emissions of carbon monoxide are increased, but this impact can be mitigated by moving heavy construction equipment during periods of low traffic volume. Likewise the schedules of commuting construction workers can be adjusted to avoid peak hours in the project vicinity. Thus most potential short term air quality impacts from project construction should be relatively easy to mitigate.

- b. Golf Course Maintenance-Related Impacts--To maintain the golf course it will be necessary to regularly apply various pesticides.

According to Murdoch and Green, the pesticides that are applied on golf courses are of relatively low mammalian toxicity. Because these pesticides are not highly volatile and are applied in dilute sprays (50 to 100 gallons of spray solution per acre) to open areas, there is little likelihood of toxic levels in the atmosphere because of volatility once the pesticides are applied. The greatest danger of significant airborne concentrations of pesticides is from aerial application (from airplanes), in contrast, golf course pesticides are applied with ground spray equipment. Boom height of spray equipment is less than one meter. Low spray pressures (20 to 40 psi) and coarse spray droplets further reduce the hazard of airborne fine droplets. Droplets larger than 100 micrometers diameter are not highly subject to drift. Most of the spray volume from typical flat-fan nozzles used in agricultural spray equipment is from droplets larger than 100 micrometers.

At the low concentrations used in pesticide application, this would not result in significant quantities of pesticides being carried downwind. High wind speed would increase the likelihood of drift of fine spray droplets, however, because high wind speed distorts spray patterns and results in poor pesticide coverage, spraying in periods of high wind is not common practice.

To facilitate spray operations and to comply with label instructions of some pesticides, spray applications are only made in late afternoon or early morning hours when golfers are not on the golf course. This reduces the risk of exposure to airborne pesticide particles to hours when golfers are not on the golf course. Sufficient buffer space with tall vegetation between facilities (such as the clubhouse) used by people and areas where pesticides are applied, will further reduce the chance of exposure to airborne pesticide particles.

The greatest human health risk from airborne pesticides is to the applicators of pesticides themselves. Mixing of wettable powder formulations and being in close proximity to airborne spray particles, particularly when operating spray equipment in a downwind position, places spray operators in particularly vulnerable positions.

- c. Future Traffic-Related Impacts—Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide. They also emit some nitrogen dioxide and those burning leaded gasoline can contribute some lead to the atmosphere as well. The use of leaded gasoline in new automobiles is prohibited. As older vehicles continue to disappear from the numbers of those currently operating on Oahu roadways, lead emissions are approaching zero.

Federal control regulations also call for increased efficiency in removing carbon monoxide and nitrogen dioxide from vehicle exhausts. By the year 1995 carbon monoxide emissions are expected to be about one fourth less than the amounts now emitted. At present, however, no further reductions in vehicular emissions have been mandated and increases in traffic levels after 1995 will result in directly proportional increases in vehicle-related pollutant emissions.

Long term indirect air quality impact is expected to be minimal since detailed carbon monoxide modeling (Root, 1988) has indicated that worst case projected levels of carbon monoxide at the intersection of Kamehameha Highway and the proposed entry road will be very low compared to allowable State of Hawaii and Federal Ambient Air Quality Standards.

G. NOISE

1. Existing Conditions

Darby & Associates evaluated the potential noise impacts from the project (Appendix Q). Their findings are summarized as follows.

The ambient noise levels at the structures along Waikane Valley Road and Haupoa Road are low in consideration of the low traffic volumes and the few civilian aircraft operations over the area. At residences away from Kamehameha Highway, the background noise would be dominated by neighborhood self-generated sounds, e.g., occasionally local vehicle movements, lawn mowers, weed wackers, televisions, radios, and sounds from children and animals. Wind blowing in the foliage may often be the dominant sound, along with occasional muffled vehicle noise events from traffic on Kamehameha Highway.

Residents of the area adjacent to the property periodically hear the sounds from jet aircraft flights and engine testing as well as helicopters associated with Kaneohe Marine Corps Air Station.

Averaged noise level measurements made on 18 February 1988 in the mid-day at 119 feet from the center of Kamehameha Highway with the microphone about 10 feet above the ground ranged from 60 dB(A) to 61 dB(A) over short time periods.

2. Anticipated Impacts

a. Noise Impact from Construction--Development of the project site will involve grubbing, grading, and the construction of infrastructure and buildings. The various construction phases of a development project may generate significant amounts of noise; the actual amounts are dependent upon the methods employed during each state of the process. Typical construction equipment noise ranges in dB(A) are shown on Figure 24. Earthmoving equipment such as bulldozers and diesel powered trucks will probably be the loudest equipment used during construction.

b. Potential Noise Impact from Clubhouse Activities--Noise sources from clubhouse operations could include kitchen equipment, fans, air-conditioning equipment, refrigeration equipment, pool pumps, as well as sound systems for announcements and music. The sounds from these sources should not usually be audible to the closest residents (1,200 feet distant) in consideration of the sound level that would be acceptable at the clubhouse, and because of the large sound transmission losses from topography and foliage.

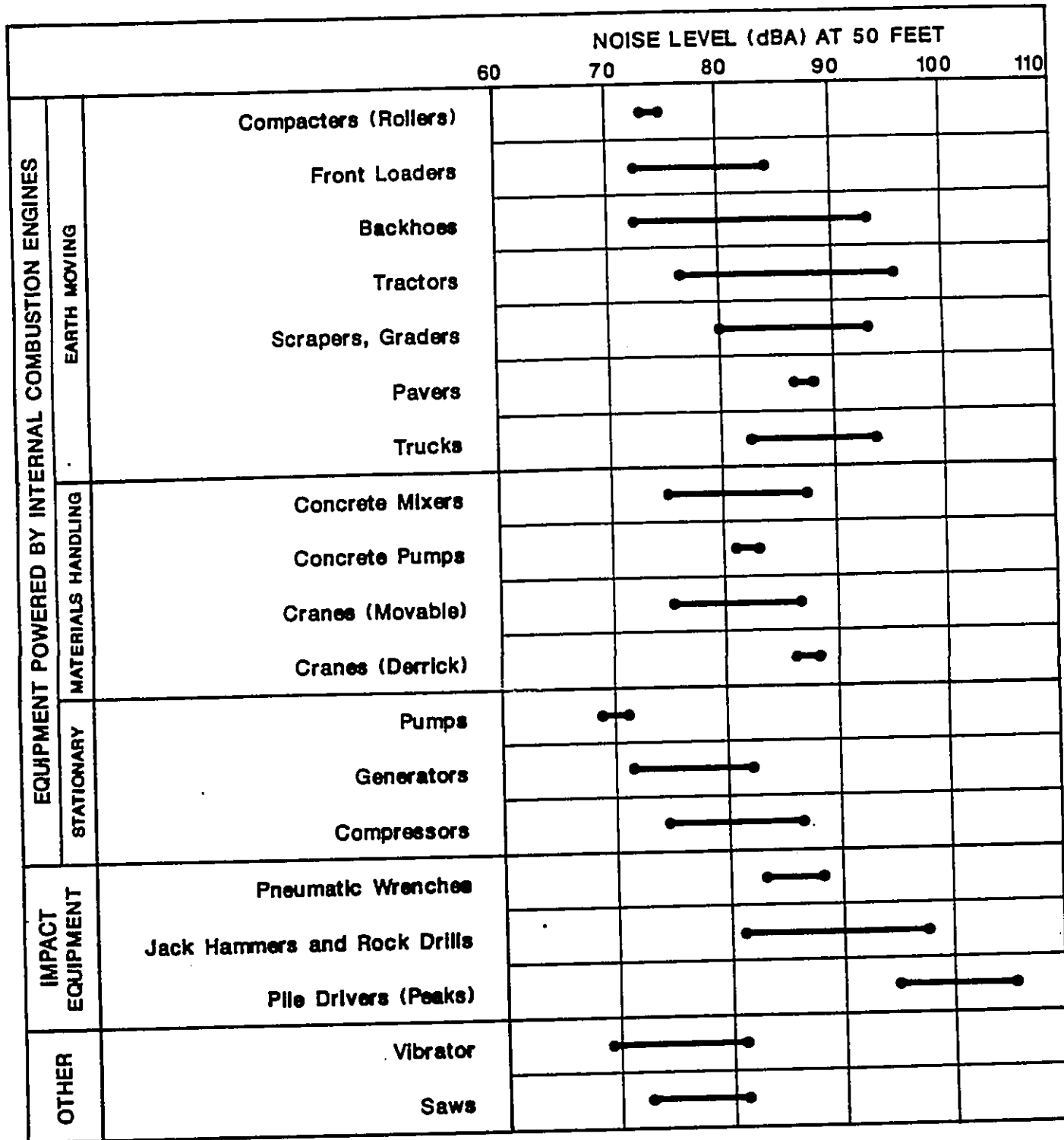
- c. Ground Maintenance Noise--Noise from equipment associated with ground maintenance activities, including lawn mowers and leaf blowers, could have an adverse impact on surrounding residential neighborhood, particularly when the equipment is near the housing. However, noisy equipment is also incompatible and disruptive with golf play.

All ground maintenance equipment powered by internal combustion engines will have exhaust mufflers. Schedules will be developed so noisier maintenance operations do not occur near residences before 7 a.m. According to Darby (1988), the noise from ground maintenance operations will not cause "unreasonable" or "excessive" noise.

Calculations show that typical housing setback about 120 feet from the center of Kamehameha Highway will have traffic noise levels during the noisiest hour of the week for the worst case in 2001 with the project to be just below 65 dB(A). The increase in traffic noise level along Kamehameha Highway is less than one dB(A) and thus it is not considered a significant noise impact. Noise level increases of less than 3 dB(A) are considered to be imperceptible to the human ear.

At present, occupants in the housing on the entry road experience very little traffic noise. It is expected that traffic noise level increases of about 10 dB(A) will occur along Waikane Valley Road when the project is in operation. However, the total traffic noise level at the structures on the entry road will still be low compared to levels occurring on nearby public roadways.

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Note: Based on Limited Available Data Samples

CONSTRUCTION EQUIPMENT NOISE RANGES
 WAIKANE GOLF COURSE

SOURCE: U.S. ENVIRONMENTAL
 PROTECTION AGENCY, 1972

FIGURE 24

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SECTION IV
Mitigation Measures

IV. MITIGATION MEASURES

Mitigation measures proposed to minimize the potential impacts generated by the construction and operation of the Waikane Golf Course are described below:

A. SOCIAL AND ECONOMIC

The proposed golf course will result in the relocation of some tenant farmers and residents on the property. Those tenants with long-term tenancies will be given compensation or relocated to a new four-lot agricultural subdivision created along the edge of the golf course along Haupoa Road. These people have signed a relocation agreement with the developer.

The development of the golf course will not add any direct resident population to the area, but it will increase the defacto population by the number of workers living outside the area and the number of guests using the facilities. All on-site facilities needed to support this defacto population are being provided by the developer. Off-site public facilities such as roadways, potable water and sludge disposal facilities are adequate to treat the potential increase resulting from the project. Additionally, since golf course activities are low-density uses compatible to agricultural areas, the impact on existing adjacent uses is not expected to be significant.

B. TRAFFIC AND ACCESS

Upon approval by the State Department of Transportation (DOT), an exclusive left-turn storage lane will be constructed along Kamehameha Highway at Waikane Valley Road. This change will prevent stacking up and long delays for northbound through traffic on Kamehameha Highway, and should prevent rear-end accidents involving vehicles slowing down or stopping to turn left into Waikane Valley Road. According to Pacific Planning and Engineering, Inc., with the creation of the left-turn storage lane, the proposed project is not expected to have an adverse impact on traffic flow along Kamehameha Highway. Also, the exclusive right-turn lane will manage traffic flow leaving the golf course so that unwanted delays are prevented.

The DOT Highways Division has recently resurfaced the highway and incorporated safety improvements such as guardrail modifications at bridge approaches and delineators along the edge of shoulders. These will improve driving conditions and reduce traffic accidents between Waiahole Bridge and Kualoa Old Sugar Mill.

C. HISTORIC RESOURCES

Paul H. Rosendahl conducted an archaeological survey of the entire property in March, 1988. Of the sites identified in the study, twenty sites were identified as requiring some form of treatment or mitigation as identified in Table 2. However, most of these sites will not be affected by the golf course development. Where the sites are impacted, the recommendations in the Rosendahl report will be followed. The sites were

surveyed and placed on a topographic map by a licensed surveyor. Of the 12 sites recommended for further data collection, 5 sites (T-5, T-17, T-21, T-23 and T-26) will not be affected by the golf course development. No mitigation will be needed for these sites. Of the remaining seven sites, four (T-7, T-9, T-15 and T-31) will probably be impacted by development. For these a data collection plan will be adopted and followed. Sites T-20, T-22, T-30 might be affected depending on the final alignments of the golf course. Similar procedures for data collection will be followed if these sites are affected in the final golf courses designation.

Four sites were recommended for tentative assessments of preservation as is pending further data collection of these. T-16 and T-33 will not be affected as they are outside the area of development. T-19 may be impacted by the clubhouse development and T-10a and 10b will be affected by the development. They will be included in the data recovery plan. The archaeologist has indicated that the "preserve as is" recommendation is tentative and conditioned only on further data collection.

Two sites are recommended for preservation as is and further data collection. Site T-24 is a trail and will not be affected by golf course development. It will be preserved as is. Site T-27 is a historic grave site and will also be preserved as is. Although it is outside of the golf course development area, it is tentatively within the four lot agricultural subdivision which is being created to accommodate people displaced by the golf course development. Final resolution is pending but regardless of which solution is arrived at, the end result is that this cemetery site will be preserved as recommended.

Sites T-32 and 80-06-317 are the most significant sites within the property boundaries. Both sites are outside the golf course development and the agricultural subdivision area. Both will be preserved as is. The Office of Hawaiian Affairs has indicated that they wish to have public access to the heiau site. The developer is willing to discuss this possibility, but granting of access would be conditioned on the resolution of many issues such as liability, easement alignment impact on neighbors and maintenance of the site.

Mitigation involves data collection as the area is developed. If bones or significant artifacts are discovered, the State Historic Preservation Officer will be contacted and appropriate action will be taken.

D. SOIL EROSION

The impact of construction activities can be minimized by adhering to strict erosion control measures, as outlined in the City and County of Honolulu ordinance relating to grading, grubbing, and stockpiling.

Specific erosion control measures which will be taken include:

- Limiting grading to not more than 15 consecutive acres at a time.
- Installation of a sedimentation basin at least 12,000 square feet in size at the onset of grading.

- Minimizing the time of construction.
- Retaining existing ground cover until latest date before construction.
- Early construction of drainage control features.
- Using temporary area sprinklers in nonactive construction areas when ground cover is removed.
- Stationing water truck on site during construction period to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).
- Using temporary berms and cut-off ditches, where needed, for control of erosion.
- Thorough watering of graded areas after construction activity has ceased for the day and on weekends.
- Sodding or planting all cut and fill slopes immediately after grading work has been completed.

A positive impact of the proposed development is the probable reduction of erosion and sediment transport to Kaneohe Bay. Exposed areas of the property would be planted as part of the golf course development, with the property as a whole having greater vegetative cover than currently exists.

E. STREAM FLOW

Stream flow is being monitored during the well drilling and testing period to determine if there is any impact on the stream. This monitoring will continue for several years after the well is in operation. Minimum in-stream standards will be respected.

In the event that monitoring of Waikane Stream and the unnamed stream indicates significant reduced flow due to pumping from the golf course wells, pumping at the proposed wells will be reduced or halted as needed.

The improvements proposed for the unnamed stream will be integrated into the natural setting. Riprap will be set in a natural manner and water retention features in the golf course will reduce the rate of runoff into the stream. The net effect will be essentially no impact on stream flows.

F. WAIKANE STREAM BIOTA

According to Archer (Appendix K), certain stream reaches would actually benefit from controlled clearing of the existing riparian species and replanting. Native vegetation would particularly enhance the esthetic value of much of the stream channel within the project area.

On-site runoff will be diverted, where possible, to the ponds incorporated in the golf course layout. It is intended that the ponds also serve as detention basins to dampen the runoff generated on-site such that the quantity of runoff entering Waikane Stream and the unnamed stream remains near or below the levels experienced for existing conditions.

G. KANEHOHE BAY

The potential increase in on-site runoff will be mitigated by the creation of detention and retention basins as part of the golf course design and drainage. The landscaping of bare hillsides will also reduce the level of runoff. The net effect of the changes is that the amount of stormwater runoff will at most remain at present levels, and will most likely be slightly less. The estimated potential increase in nitrogen and phosphorous is small. A study by Marina Research Consultants indicates that no mitigation is needed for these impacts. Further, the use of slow-release fertilizers will provide additional measures to reduce the nutrient impact on Kaneohe Bay. Finally, although the use of pesticides has the potential to impact the bay, the measures described for water quality mitigation will safeguard the bay from any degradation due to pesticides.

H. TERRESTRIAL VERTEBRATES

The likelihood of bird injury by pesticides used in maintenance of the proposed golf course can be reduced by proper application of pesticides with reduced toxicity to birds. Carbaryl and trichlorfon are less toxic to birds than diazinon or chlorpyrifos. In most cases these insecticides may be substituted for diazinon or chlorpyrifos with little loss of effectiveness.

I. WATER QUALITY

If excessive irrigation water is applied, the likelihood of nitrate movement in surface waters is increased. For this reason, it is recommended (Murdoch and Green, Appendix L) that golf course management practices be followed, including:

1. A U.S. Weather Bureau Class A Evaporation Pan be used to measure evaporation and schedule irrigation application in the management of the proposed golf course.
2. Fertilizer application schedules should be timed so that heavy applications of soluble fertilizers are not made during the rainy months for this area (October through April).
3. During the rainy season, slow-release fertilizers can be applied which will release nitrogen at a rate comparable to the rate at which it is used by turf.
4. A "buffer zone" of vegetation along the Waikane Stream banks should be maintained where spraying would not occur.
5. A well-qualified Golf Course Superintendent (preferably a Certified Golf Course Superintendent) be given the responsibility of managing the golf course.

The effluent storage pond will be designed to provide for sufficient free-board to handle periods of high rainfall, including 100-year storms. The effluent will meet DOH standards and the storage pond will provide additional ultraviolet treatment from the sun. The pond will be lined and groundwater quality will not be affected by this service.

On-site runoff will be diverted, where possible, to the ponds incorporated in the golf course layout. It is intended that the ponds also serve as detention basins to dampen the runoff generated on-site such that the quantity of runoff entering Waikane Stream and the unnamed stream remains at or below the levels experienced under existing conditions.

J. AIR QUALITY

Most pesticides presently in use carry warning or caution labels on their containers. The primary purpose of these labels is to provide occupational safety and health guidance regarding proper handling and application.

The primary risk of using these chemicals is to the applicator rather than to individuals at possible receptor sites downwind, since these individuals should encounter airborne concentrations of these chemical substances only in greatly diluted form. There are, however, certain precautions that must be followed by pesticide applicators in order to prevent significant downwind drift from spraying. Primary among these is use of a coarse rather than fine spray and application under wind conditions that will not contribute to drift towards the clubhouse area or to nearby residences.

Provided that proper safety precautions are followed, the potential for serious air quality degradation from chemical spraying for golf course maintenance is expected to be minimal. EPA and OSHA have strict standards which specify that spray operators wear appropriate protective clothing and breathing apparatuses.

K. NOISE

Since it is anticipated that noise generated during construction will exceed allowable limits a permit will be obtained from the State Department of Health (DOH). DOH may grant permits to operate vehicles, construction equipment and power tools which emit noise levels in excess of the allowable limits. Required permit conditions for construction activities are listed below:

"No permit shall allow construction activities creating excessive noise...before 7:00 a.m. and after 6:00 pm. of the same day."

"No permit shall allow construction activities which emit noise in excess of ninety-five dB(A)...except between 9:00 a.m. and 5:30 p.m. of the same day."

"No permit shall allow construction activities which exceed the allowable noise levels on Sundays or on...(certain) holidays. Activities exceeding ninety-five dB(A) shall (also) be prohibited on Saturdays."

In addition, construction equipment and on-site vehicles or devices requiring an exhaust of gas or air must be equipped with mufflers. Also, construction vehicles using traffic ways will satisfy the noise level requirements.

It is to be noted that if the sound source is located in an enclosed, air-conditioned building, an additional 25 to 35 dB(A) lessening of the noise levels can be achieved with standard construction.

The air-conditioning equipment, fans, pool pumps, and any other stationary equipment on the project site will not exceed the allowable noise levels in local noise regulations. Public address sound systems and entertainment sounds will not cause "unreasonable" or "excessive" noise. The clubhouse will not be in operation late into the night.

SECTION V
Relationship to Existing Policies and Plans for the Area

V. RELATIONSHIP TO EXISTING POLICIES AND PLANS FOR THE AREA

This section includes a discussion of the relationship of the project to the objectives, policies and guidelines of the Hawaii State Plan, the General Plan for the City and County of Honolulu, the Koolaupoko Development Plan, the Hawaii Coastal Zone Management Program, and the City and County Special Management Area Program.

A. HAWAII STATE PLAN

Many goals, objectives and policies of the Hawaii State Plan, Chapter 226 HRS, and adopted functional plans relate to the Waikane Golf Course development. Those which are relevant are discussed below.

State Plan Objectives and Policies

Section 6(a): Objectives for the economy - in general:

"(2) A steadily growing and diversified economic base that is not overly dependent on a few industries."

Section 6(b): Applicable policies:

"(8) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility."

"(10) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems."

"(14) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy."

Discussion: The proposed development will not only diversify the State's economic base, but also offer a variety of job opportunities to the area. An estimated 123 to 156 full-time jobs will be provided by the operation of the proposed golf course. During the construction phase approximately 70 jobs will be created.

Hawaii's distinct geography, tropical climate and central Pacific location make it an attractive market for real estate investment. The amenities put in by the developer are environmentally and socially sound, and will benefit Hawaii's people. In addition, the aloha spirit indigenous to the area, and the property's scenic beauty, can be seen both as a resource and an asset of the property, to be protected and promoted by the developer.

Section 8(a): Objective for the economy - visitor industry:

"(1) ...a visitor industry that constitutes a major competent of steady growth for Hawaii's economy."

Section 8(b): Applicable policies:

- "(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people."
- "(4) Encourage cooperation between the public and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities

Discussion: The environmental review process and the close working relationship that has been established in the community by the developer, will ensure that the golf course and visitor use of the facilities will be sensitive to the neighboring community.

Section 11(a): Objectives for the physical environment—land-based, shoreline, and marine resources:

- "(2) Effective protection of Hawaii's unique and fragile environmental resources."

Section 11(B): Applicable policies:

- "(1) Exercise an overall conservation ethic in the use of Hawaii's natural resources."
- "(3) Take into account the physical attributes of areas when planning and designing activities."
- "(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage."
- "(8) Pursue compatible relationships among activities, facilities, and natural resources."
- "(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes."

Discussion: Approximately 189 of the 505-acre site are steep lands of Puu Pueo. Concentrated in the northern portion of the property, it includes 72 acres of designated Conservation lands. Another 25.8 acres of wetlands has been designated by the U.S. Army Corps of Engineers. No improvements or activities are planned for the steep areas or the wetlands. The natural course of Waikane Stream will also be maintained. The golf course itself is a recreational facility which will have a significant number of tee times available for public play. A portion of the property will be made available to the community for use as a park. Haupoa Road will be extended and improved and this will provide improved access for hikers and hunters.

Section 12(a): Objectives for the physical environment—scenic, natural beauty, and historic resources:

- "(1) Enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources."

Section 12(b): Applicable policies:

- "(1) Promote the preservation and restoration of significant natural and historic resources."
- "(2) Provide the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural feature."
- "(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage."
- "(5) Encourage the design of developments and activities that complement the natural beauty of the islands."

Discussion: The enhancement of the subject area's natural beauty and the preservation of the natural resources are important to the design of the development. It will complement the natural beauty of the open area and provide the users the pleasure of the ocean and mountain vistas. The development will avoid and protect important historic and cultural resources found during the archaeological reconnaissance survey. There will be no interference in the views and vistas from points outside the project boundaries.

Section 13(a): Objectives for the physical environment—land, air, water quality:

- "(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources."
- "(2) Greater public awareness and appreciation of Hawaii's environmental resources."

Section 13(b): Applicable Policies:

- "(2) Promote the proper management of Hawaii's land and water resources."
- "(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters."
- "(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters."

"(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities."

"(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures and visitors."

Discussion: The land and water resources of the property will be properly managed. Stormwater runoff will be controlled through the use of detention basins to protect the stream and marine environments. Soil erosion will be reduced after development due to the increased ground cover and improved maintenance practices. Waikane Stream will be monitored to ensure that pumpage from on-site wells for irrigation water will not adversely affect steam flow.

The proposed project will provide the opportunity for visitors and the public to explore and appreciate the natural resources of the area.

Priority Guidelines

The purpose of the State Plan priority guidelines is to address areas of statewide concern which warrant priority action. The following discussion provides an assessment of how the proposed project conforms to applicable priority guidelines.

Economic priority guidelines:

"(a)(8): Provide public incentives and encourage private initiative to develop and attract industries which promise long-term growth potentials and which have the following characteristics:

"(A) An industry that can take advantage of Hawaii's unique location and available physical and human resources.

"(B) A clean industry that would have minimal adverse effects on Hawaii's environment.

"(C) An industry that is willing to hire and train Hawaii's people to meet the industry's labor needs.

"(D) An industry that would provide reasonable income and steady employment."

"(a)(10): Enhance the quality of Hawaii's labor force and develop and maintain career opportunities for Hawaii's people through the following actions:

"(D) Promote career opportunities in all industries for Hawaii's people by encouraging firms doing business in the State to hire residents.

"(E) Promote greater public and private sector cooperation in determining industrial training needs and in developing relevant curricula and on-the-job training opportunities."

Discussion: The golf course will be a clean industry having no significant adverse impacts on Hawaii's unique environment. A job training program will be implemented to prepare local residents to fill the labor needs of the development and ancillary jobs. The proposed project will provide new and steady work for area residents. The developer is working closely with community organizations and the school to improve opportunities for local residents.

"(b)(5): Develop and maintain career opportunities in the visitor industry for Hawaii's people, with emphasis on managerial positions."

Discussion: The proposed development will enhance the natural scenic, and cultural resources of Hawaii and by preserving much of the project site as open space, and by the proper management of Waikane Stream, historic and cultural sites, use of the underlying water aquifer, and other natural resources. Job training programs will be provided to ensure that local residents have every opportunity to obtain the jobs which will be available.

State Functional Plans

The State Functional Plans translate the broad goals and objectives of the Hawaii State Plan into detailed courses of action. The relationship of the proposed actions within the project site to the relevant Functional Plan objectives is described below.

State Agricultural Functional Plan--Land:

"B(5). POLICY: Provide greater protection to agricultural lands in accordance with the Hawaii State Constitution."

"B(5)(a). IMPLEMENTING ACTION: Until standards and criteria to conserve and protect important agricultural lands are enacted by the Legislature, important agricultural lands should be classified in the State Agricultural District and zoned for agricultural use, except where, by preponderance of the evidence presented, injustice or inequity will result, or overriding public interest exists to provide such lands for other objectives of the Hawaii State Plan"

Discussion: There is a preponderance of evidence that the lands on the subject property are of minimal agricultural importance (see Chapter VI and Appendix R). Soil classification systems (SCS, ALISH, LSB), rate the overall quality of most of the soils on the property as poor for agricultural purposes. A study by Frank S. Scott, Jr., Ph.D.,

Agricultural Economist, of the project site concluded that commercial agricultural operations would be economically infeasible. In any event, the project site will continue to be classified in the State Agricultural District and zones for agricultural use.

State Recreational Functional Plan:

The purpose of the project is to provide recreational facilities--a 27-hole golf course, driving range, tennis courts, and a swimming pool--for both the public and visitors. The project is consistent with several of the objectives and policies in this functional plan, but is not directly relevant to any of its specific implementing actions.

State Health Functional Plan:

The State Health Functional Plan focuses on public health programs under the jurisdiction of the State Health Department. Several of the implementing actions relate to Department of Health permit programs which relate to the proposed project. These include reviewing private wastewater treatment systems, discharges to the air or groundwater, new sources of drinking water, and air conditioning/mechanical ventilation systems for buildings that are used by the public. The proposed project will comply with all necessary permit requirements of the Department of Health.

State Historic Preservation Functional Plan:

Most of the policies and implementing actions in the State Historic Preservation Functional plan are directed at State agencies, especially the Department of Land and Natural Resources (DLNR). An archaeological survey of the project site has been conducted and the findings of the survey have been forwarded to DLNR for their review.

State Conservation Lands Functional Plan:

The State Conservation Lands Functional Plan focuses on the management and protection of Hawaii's natural resources. Designated conservation lands at Puu Pueo will be preserved. The wetlands in the area will be not be disturbed so as to maintain the integrity of their natural ecosystem.

Remaining Functional Plans:

The State Functional Plans for Water Resources Development, Housing, Tourism, Transportation, Energy, Education, and Higher Education are not directly relevant to the proposed project.

B. GENERAL PLAN FOR THE CITY AND COUNTY OF HONOLULU

The General Plan for the City and County of Honolulu sets forth long-range objectives for the general welfare and prosperity of the people of Oahu, and broad policies to attain those objectives. The following discussion

provides an assessment of how the proposed project conforms to and implements the General Plan.

Economic Activity:

Objective A: "To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living."

Policy 1: "Encourage the growth and diversification of Oahu's economic base."

Discussion: The proposed development will contribute to economic diversification by supplying jobs with skill levels varying from management to laborer. The employment will be steady, stable and sufficient to provide an adequate standard of living for people living in the area.

Objective E: "To prevent the occurrence of large scale unemployment."

Policy 1: "Encourage the training and employment of present residents for currently available and future jobs."

Discussion: The proposed project will provide direct employment to area residents and indirect and induced employment elsewhere within the State. The developer will undertake a job training program to prepare community residents to fill the jobs at the development.

Natural Environment:

Objective A: "To protect and preserve the natural environment."

Policy 1: "Protect Oahu's natural environment, especially the shoreline, valleys, and ridges, from incompatible development."

Policy 4: "Require development projects to give due consideration to natural features such as slope, flood, and erosion hazards, water-recharge areas, distinctive land forms, and existing vegetation."

Policy 6: "Design surface drainage and flood-control systems in a manner which will help preserve their natural settings."

Discussion: The proposed development will preserve and enhance the natural environment by maintaining open space and working within the natural confines of the site. Environmental factors such as slopes, flood hazards, vegetation, wetlands and drainage were given careful consideration in the site design. The conservation areas will be left as is, and the designated wetlands will also remain untouched by golf course development. On steeper slopes, much of the existing vegetation will be retained.

Physical Development and Urban Design:

Objective A: "To coordinate changes in the physical environment of Oahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located."

Policy 2: "Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation, and public safety facilities."

Policy 4: "Require new developments to provide or pay the cost of all essential community services, including roads, utilities, schools, parks, and emergency facilities that are intended to directly serve the development."

Discussion: The proposed development will supply its own irrigation water source, build its own sewage treatment plant, construct detention basins for drainage control purposes, and build a left-turn storage lane to handle turning movements into the project without causing delays to the through traffic. Connections to the public potable water system will be done at the developer's expense.

Culture and Recreation:

Objective D: "To provide a wide range of recreational facilities and services that are readily available to all residents of Oahu."

Policy 1: "Develop and maintain community-based parks to meet the needs of the different communities on Oahu."

Discussion: The golf course development will add a 27-hole golf course in a 30-mile area where there is none. The course will be open to the general public for part of the time. Additionally, tennis courts and a swimming pool will be developed in conjunction with the clubhouse. A park for the Waiahole-Waikane community is being planned near the project's entry road. The park in conjunction with the recreational facilities at the proposed development will add to recreational features on Oahu.

C. CITY AND COUNTY OF HONOLULU DEVELOPMENT PLAN FOR KOOLAUPOKO

The following discussion provides an assessment of how the proposed development will conform to and implement the Development Plan (DP) for Koolauoko.

Development Plan Common Provisions

Section 32-1.4. General Urban Design Principles and Controls:

Physical Development and Urban Design:

Objective A: "To coordinate changes in the physical environment of Oahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located."

Policy 2: "Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation, and public safety facilities."

Policy 4: "Require new developments to provide or pay the cost of all essential community services, including roads, utilities, schools, parks, and emergency facilities that are intended to directly serve the development."

Discussion: The proposed development will supply its own irrigation water source, build its own sewage treatment plant, construct detention basins for drainage control purposes, and build a left-turn storage lane to handle turning movements into the project without causing delays to the through traffic. Connections to the public potable water system will be done at the developer's expense.

Culture and Recreation:

Objective D: "To provide a wide range of recreational facilities and services that are readily available to all residents of Oahu."

Policy 1: "Develop and maintain community-based parks to meet the needs of the different communities on Oahu."

Discussion: The golf course development will add a 27-hole golf course in a 30-mile area where there is none. The course will be open to the general public for part of the time. Additionally, tennis courts and a swimming pool will be developed in conjunction with the clubhouse. A park for the Waiahole-Waikane community is being planned near the project's entry road. The park in conjunction with the recreational facilities at the proposed development will add to recreational features on Oahu.

C. CITY AND COUNTY OF HONOLULU DEVELOPMENT PLAN FOR KOOLAUPOKO

The following discussion provides an assessment of how the proposed development will conform to and implement the Development Plan (DP) for Koolauoko.

Development Plan Common Provisions

Section 32-1.4. General Urban Design Principles and Controls:

(1) Public Views: "The design and siting of all structures shall reflect the need to maintain and enhance available views of significant landmarks. No development shall be permitted that will block important public views."

Discussion: The only structures of significant size to be provided on the 505-acre project site are the clubhouse, the adjoining parking garage, a swimming pool, a maintenance building, and a wastewater treatment plant. All of these structures will be below 25 feet in height and will be located so as not to block important views. All except the clubhouse and possibly the top deck of the parking garage will not be visible except to those in the immediate vicinity. The clubhouse will offer spectacular views of Kaneohe Bay from Mokolii Island (Chinaman's Hat) to Mokapu Peninsula.

(2) Open Space: "The City's mountains, hills, shoreline and stream shall be considered as major scenic, open space and recreational resources. Adequate public access to these resources shall be incorporated as part of developments adjacent to them.

"Existing natural stream beds and drainage ways shall be retained wherever possible. Where further channelization must occur, materials that are harmonious with the setting, such as stone, shall be used whenever feasible."

Discussion: More than 200 acres of the 505-acre project site, including Puu Ohulehule-Puu Pueo Ridge, will remain as undisturbed open space. The natural stream bed of Waikane Stream will be retained. All designated wetland areas will also be excluded from golf course development. Proposals from community groups to use the area are all for open-space type uses, such as a community park, wetlands agriculture, or bird sanctuary.

(3) Vehicular and Pedestrian Routes: "Landscaping shall be provided along major vehicular arterials and collector streets as a means to increase the general attractiveness of the community and the enjoyment of vehicular travel for visitors and residents."

Discussion: The entry road connecting the clubhouse with Kamehameha Highway will be attractively landscaped. Haupoa Road extension will be built in accordance with City and County rural roadway standards.

(8) Rural Areas: "Rural areas are characterized by a preponderance of open and agricultural lands with limited development clustered in small, low-density residential areas which have a strong sense of community and country-like environment....The location and character of new development shall be consistent with the above-described characteristics of such areas and be guided by the following principles and controls:

- "a. The visual attractiveness that distinguishes rural from urban and country from city shall be maintained.
- "b. Preservation of good agricultural land uses, and the natural resources.
- "g. Design standards for streets and other infrastructure improvements shall reflect the reduced demands of lower density developments and be compatible with the desired country-like environment of rural communities."

Discussion: The proposed development has been designed with the natural environment as a guiding principle. Agriculture is not a feasible option, whereas a golf course will be visually attractive and complementary to the area's rural character. The golf course will not create an immigration of people and, therefore, will not materially add to the population or demand for housing in the area. Infrastructure design will reflect the area's rural character.

Section 32-1.5. General Principles and Controls for Parks Recreation and Preservation Areas:

(1) Parks and Recreation Areas: "Parks and recreation areas as defined in Section 3.10 shall be located and designed so as to be suitable for different and varied neighborhoods and available to all residents of Oahu."

(1) (B) Community-Based Parks and Recreation Sites: "Each community shall have reasonable accessibility to all types of public parks and facilities according to population size and/or community preferences."

Discussion: The open-space character of the proposed golf course will complement the area's rural environment. Times will be provided at the golf course for public play. In addition, discussions are underway with the Waiohole-Waikane Community Association which are expected to result in the setting aside of a portion of the project site for a community park.

(2) Preservation Areas: "Preservation areas...encompass elements of Oahu's natural environment that give the island its essential character while also performing invaluable functions for its residents at no cost."

Discussion: A portion of the property is zoned Preservation. No activities are planned in the Preservation area.

Section 32-1.8 Identification of Public Buildings, Public or Private Facilities for Utilities, Terminals and Drainage:

(4) Drainage: "Whenever practical, drainage improvements shall emphasize natural means and retention of water with minimum reliance on structural means and rapid transport."

Discussion: Waikane Stream's natural streambed and the designated wetlands will remain in their natural state, undisturbed by project improvements. Stormwater will be retained and detained on site so that peak runoff rates will be at or below existing conditions.

Development Plan Special Provisions

Section 32-6.2. Urban Design Principles and Controls for Koolaupko:

(a)(1) Open Space. "The visibility, preservation, enhancement and accessibility of open-space areas...shall be given high priority in the design of adjacent and nearby developments in Koolaupko."

Discussion: To accommodate the rural atmosphere of the Koolaupoko area, the proposed development will maintain in its natural state more than 200 acres of the 505-acre parcel. The design of the golf course will also preserve and enhance the open space character of the area. At present, the property is unimproved private property accessible only to people with easement rights over the property. The development of a golf course open to public play will improve accessibility. The Haupua Road extension to the mauka boundary will improve access to hiking trails and hunting areas mauka of the project site.

(a)(2) Public Views: "In order to promote pleasing and attractive living environments and panoramic mauka and makai views from public places, views of major landmarks from public places shall be protected whenever possible."

Discussion: The proposed structures will generally be below 25 feet in height and will have minimal impact on the viewplanes from the coastal highway. The Department of Land Utilization Coastal View Study indicated that because of the dense vegetation in the area there are no significant coastal views. Additionally, there are no significant public views or viewing areas near the project site that will be impacted by the development. However, the verdent vegetation, rolling hills and wetland areas preserve the rural character of the community.

All structural features will be screened or set back from adjacent areas so that there will be little or no visual impact. The wastewater treatment plant will be separated from the Robert's kuleana by a small ridge line, a golf course fairway and landscaping. The maintenance area will be landscaped to be un-obtrusive from neighboring areas. The clubhouse area is over 2000 feet from the highway and will not affect coastal views.

D. COASTAL ZONE MANAGEMENT PROGRAM OBJECTIVES AND POLICIES

The objectives of the Hawaii Coastal Zone Management Program, Section 205A-2, HRS, are to protect valuable and vulnerable coastal resources such as coastal ecosystems, special scenic and cultural values and recreational opportunities. The objectives of the program are also to reduce coastal hazards and to improve the review process for activities proposed within the coastal zone.

Only a small part (approximately 39 acres) of the 505± acre project site is included in the City and County of Honolulu Special Management Area. Proposed improvements within this area are limited to about 400 feet of the entry road and portions of three golf holes.

The following are the objectives of the Hawaii Coastal Zone Management Program and an assessment of how the proposed project relates to them:

Recreational Resources Objective: "Provide coastal recreational opportunities accessible to the public."

Discussion: The property is separated from the coastline by Kamehameha Highway and therefore will not hinder public access to the shoreline.

Historic Resources Objective: "Protect, preserve, and where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture."

Discussion: Paul H. Rosendahl, Ph.D., Inc. conducted a surface archaeological reconnaissance survey (100 percent ground coverage) and limited subsurface testing in the non-wetlands parts of the SMA portion of the property. The survey and testing was part of the scheduled survey and testing of the entire property. All of the four sites identified in the SMA area were considered to be of marginal significance and no further work is recommended.

Scenic and Open Space Resources Objective: "Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources."

Discussion: The master plan for the proposed Waikane Golf Course Project calls for structures on only 9.0± acres of the 505± acres site (an existing church on 0.7± acre, a clubhouse on 5.6± acres, a course maintenance yard on 1.5± acres, and a wastewater treatment facility on 1.2± acres). The remainder, 496± acres, will be in open space (189± acres of the slopes of Puu Pueo; 25.8± acres of wetlands; 136± acres of golf course, including tees, fairways, greens and roughs; 7.0± acres of ponds; a 6.5± acre driving range; and 131.6± acres of open space around the golf course). There are several old houses which will be torn down when the tenants are relocated to the new agricultural subdivision. This will improve the open space and scenic quality of the views along Kamehameha Highway and Waikane Valley Road.

Coastal Ecosystems Objective: "Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems."

Discussion: The following studies were completed to assess the impact of the proposed golf course project on the biota of Waikane Stream and Kaneohe Bay:

"Biological Survey of Waikane Stream, Windward Oahu", prepared by Kelly M. Archer for Group 70, Honolulu, Hawaii, February 1988 (Appendix K): As part of his studies, Archer conducted a biological survey of the aquatic fauna of Waikane Stream. According to Archer, the biology of Waikane

Stream is not unique to streams in the less-developed watersheds of Windward Oahu. Native species found in the stream are also found in other streams in the district and are not, by any means, considered rare or endangered. Apparently, all of the native species in Waikane Stream tolerate a wide range of environmental degradation as indicated by their presence in many of the altered streams in the state.

"Marine Environmental Survey in the Vicinity of the Waikane Golf Course, Oahu, Hawaii", Prepared by Marine Research Consultants for Group 70, Honolulu, Hawaii, 26 March 1988 (Appendix M): Marine Research Consultants was contracted to evaluate the potential for alteration to water chemistry and marine biota in Kaneohe Bay as a result of changes in stream discharge associated with golf course construction and operation. In summary, it appears that the planned Waikane Golf Course does not present the potential to cause negative impacts to the marine environment. The nearshore area fronting the development site is presently subjected to input of materials from Waikane Stream, and this material appears to be carried south along the shoreline and does not, even after intense flooding events, affect the offshore network of patch reefs.

"Environmental Impact of Fertilizer and Pesticide Use on the Proposed Waikane Golf Course", prepared by Charles L. Murdoch and Richard E. Green for Engineering Concepts, Inc., Honolulu, Hawaii, 5 April 1988 (Appendix L): The purpose of this study was to assess the anticipated environmental impact of chemicals applied to a golf course on this property based on an analysis of site factors and recommended management practices. Murdoch and Green determined that it is unlikely that development of the proposed golf course will pose environmental risks associated with the use of chemical fertilizers and pesticides. Nitrate would be the only fertilizer element of concern since phosphorus is bound tightly to soil colloids and does not move appreciably from the site of application. Since groundwater in this area emerges at the surface and moves toward the ocean in stream beds which intersect the groundwater table, movement of nitrate would be in runoff waters. However, because of the small amount applied at any one application, and the large dilution from water off-site in the surface drainage way, nitrate content of drainage water would likely be insignificant.

Economic Uses Objective: "Provide public or private facilities and improvements important to the State's economy in suitable locations."

Discussion: The proposed golf course will provide an economic activity on a property mostly vacant and unused, which will be compatible (maintaining open space) with the rural character of the region.

Coastal Hazards Objective: "Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence."

Discussion: Preliminary drainage and soil erosion studies for the project site have been completed, and will be submitted to the City and County of Honolulu Department of Public Works for review. The drainage study recommends suggested improvements to the drainage system which will reduce hazard to life and property from storm runoff. Additionally, the soil erosion report provides measures to mitigate soil erosion.

In addition to the drainage study, the U.S. Department of Housing and Urban Development Flood Insurance Rate Map has been obtained and studied to determine the effects of flooding on the property. The applicant will mitigate the impact of flooding on the proposed golf course within the regulatory floodplain areas by observing both County flood hazard ordinances and requirements of the National Flood Insurance Program. On-site runoff will be diverted, where possible, to the ponds incorporated in the golf course layout. It is intended that the ponds also serve as detention basins to dampen the runoff generated on-site such that the quantity of runoff entering Waikane Stream and the unnamed stream remains near the levels experienced for existing conditions.

The property is not subject to tsunami or storm waves.

Managing Development Objective: "Improve the development review process, communication, and public participation in the management of coastal resources and hazards."

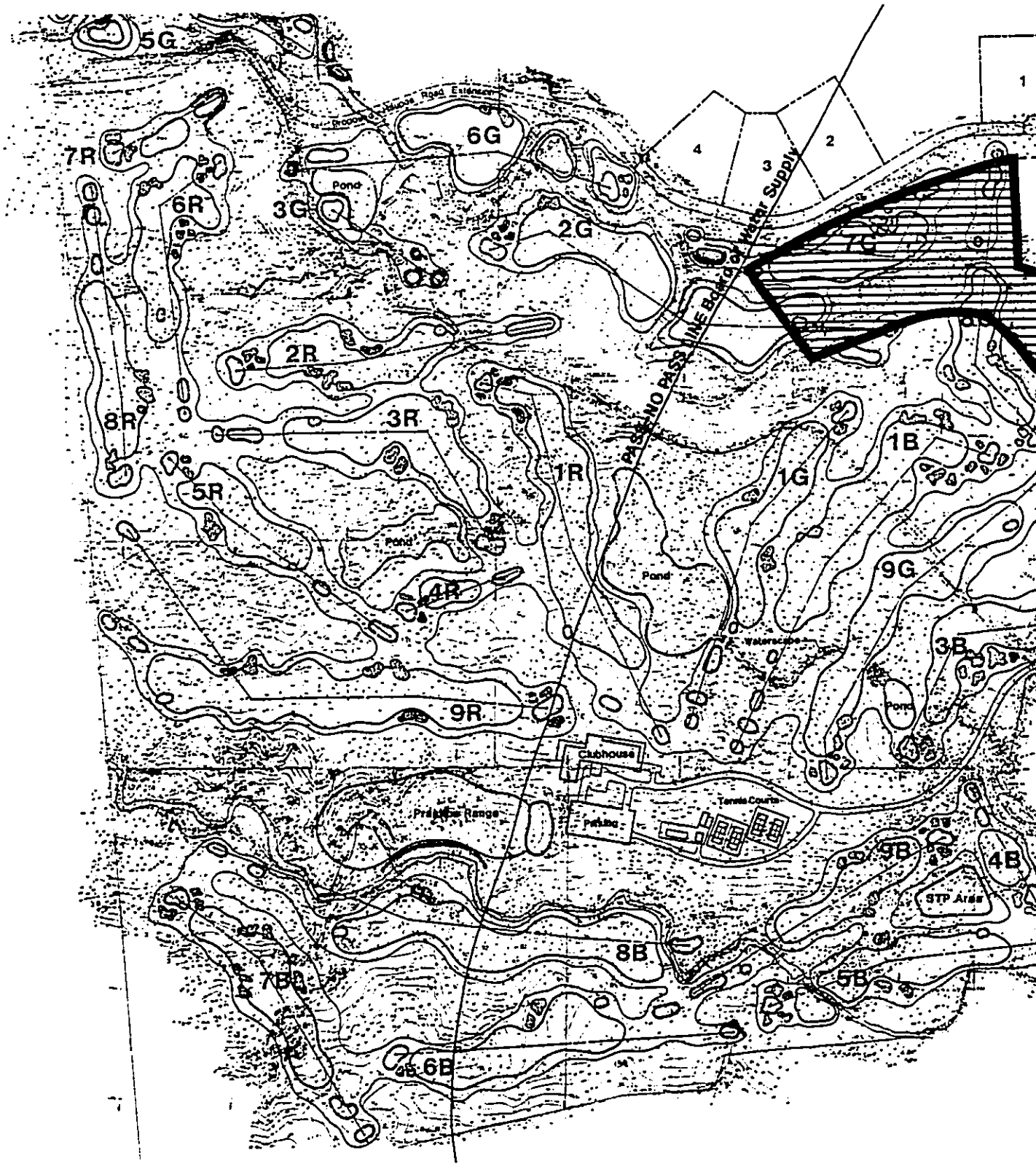
Discussion: In order to implement the proposed Waikane Golf Course project, a number of governmental approvals are required, including a Special Management Area Use Permit (SMP) and a Conditional Use Permit. During processing of the SMP application, public hearings will be held. The potential environmental impacts of developing the property will be reviewed through this Environmental Impact Statement, and this document will be made available through the County for public review by all interested parties.

To the extent possible, the applicant and their consultants, have tried to identify all necessary governmental approvals and to plan the processing of these approvals concurrently. Every attempt is being made to avoid unnecessary duplication of governmental review.

E. SPECIAL MANAGEMENT AREA GUIDELINES

The review guidelines of Section 33-3.2 are used by the City Council and the Department of Land Utilization for the review of developments proposed in the SMA (Figure 25). These guidelines are derived from Section 205A-2, HRS, and the consistency of the proposed project with the latter guidelines are discussed below.

"(1) All development in the special management area shall be subject to reasonable terms and conditions set by the council in order to ensure:

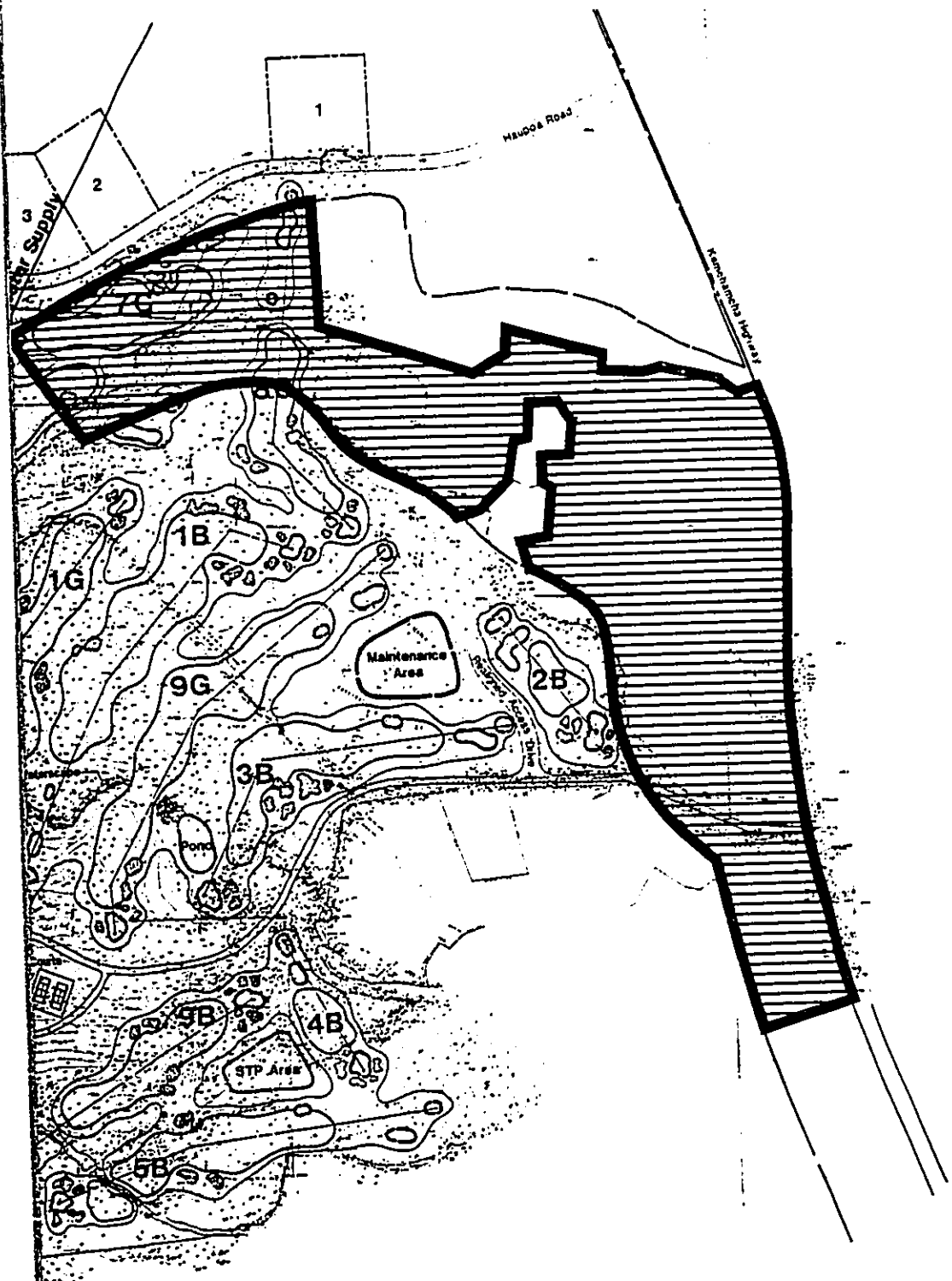


LEGEND

 **SPECIAL MANAGEMENT
AREA WITHIN PROPERTY**

**SPECIAL MANAGEMENT AREA WITHIN PROPERTY
WAIKANE GOLF COURSE**

SOURCE



SOURCE: CORPS OF ENGINEERS, BELT, COLLINS & ASSOC. INC.,
 & ENGINEERING CONCEPTS, INC.

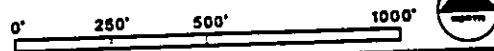


FIGURE 25

- "(A) Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas, and natural reserves is provided to the extent consistent with sound conservation principles;
- "(B) Adequate and properly located public recreation areas and wildlife preserves are reserved;
- "(C) Provisions are made for solid and liquid waste treatment, disposition, and management which will minimize adverse effects upon special management area resources; and
- "(D) Alterations to existing land forms and vegetation, except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of earthquake."

Discussion: There are presently no beaches, wildlife preserves or public recreation areas within the property. However, Waikane Valley Road is used by hikers and hunters to reach trails and hunting areas mauka of the property. When the golf course is completed the new Haupoa Road extension will become the access road to the mauka areas.

The applicant has prepared a preliminary wastewater report for the proposed project which will be circulated to the State Department of Health, the Honolulu Board of Water Supply, and City and County of Honolulu Department of Public Works Division of Wastewater Management for review.

Solid waste will be collected by private collection companies and disposed of at public or private sanitary landfills. Public Health Regulations Chapter 58 of Title 11 provides guidelines on solid waste management at both public and private sanitary landfills.

The proposed development of 5.7 acres of golf course within the 39 acre SMA area is expected to have minimal effect on water resources. Barring unusual conditions, no other hazards such as landslides, erosion, siltation or failure in the event of earthquake are expected during the life of the project.

"(2) No development shall be approved unless the council has first found that:

- "(A) The development will not have any substantial, adverse environmental or ecological effect except as such adverse effect is minimized to the extent practicable and clearly outweighed by public health and safety, or compelling public interests. Such adverse effect shall include, but not be limited to, the potential cumulative impact of individual developments, each one of which taken in itself might not have a substantial adverse effect, and the elimination of planning options;

"(B) The development is consistent with the objectives and policies set forth in section 33-3.1 and area guidelines contained in section 205A-26, Hawaii Revised Statutes; and

"(C) The development is consistent with the County General Plan, development plans, zoning and subdivision codes and other applicable ordinances."

Discussion: Adverse or unavoidable environmental effects include: dust generation during site clearing activities, construction noise, potable water consumption, additional traffic, solid waste disposal and occasional demand on County protective services. Some of these environmental impacts will be limited to the construction phase of the project (dust generation, soil erosion, construction noise). Other adverse effects will be minimized to the extent practicable (potable water consumption will be constantly monitored; upon State Department of Transportation approval, an exclusive left turn storage lane will be constructed along Kamehameha Highway at the proposed entry road). The use of County solid waste disposal and protective services will be paid for by the projected tax revenues that will be generated by the project.

The objectives and policies set forth in section 33-3.1 are those contained in Section 205A-2, HRS, Hawaii Coastal Zone Management Program.

The property is located within area of the island designated "Rural" in the General Plan. The proposed golf course, which will maintain the open space character of the property, is consistent with "Rural" designation. The applicant will observe the applicable regulations of the Land Use Ordinance, subdivision codes and other applicable ordinances.

"(3) The council shall seek to minimize, where reasonable:

"(A) Dredging, filling or otherwise altering any bay, estuary, salt marsh, river mouth, slough, or lagoon;

"(B) Any development which would reduce the size of any beach or other area usable for public recreation;

"(C) Any development which would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management area and the mean high tide line where there is no beach;

"(D) Any development which would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast; and

"(E) Any development which would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land."

Discussion: No dredging, filling or otherwise altering of Waikane Stream, the wetlands within the property or Kaneohe Bay is proposed. No beaches are located within the property, and none of the actions proposed would reduce the size of any beach or other area usable for public recreation or impose restrictions upon public access. The only use proposed for the property is a 27-hole golf course and ancillary uses. This proposed land use will create public recreational opportunities for the site, resulting in approximately 136 acres of the 505± acre site set aside for active recreational use. Sites for the clubhouse, maintenance yard, and wastewater treatment plant will occupy an additional nine acres. The remainder will be open space.

Since the property is located mauka of the nearest inland public roadway, Kamehameha Highway, no activities on the property will substantially interfere with or detract from the line of sight toward the sea from Kamehameha Highway.

It is anticipated that the proposed golf course will not adversely affect water quality, existing and potential fisheries and fishing grounds, and wildlife habitats. While the proposed use of the property for a golf course could be interpreted as a loss of existing and potential agricultural uses, most of the lands in the project area have not been farmed for many years. The areas recently farmed are three parcels of lower Waikane Silty Clay Class II plateau lands Kahuku of Waikane Valley Road, which were farmed until recently, and a 50-acre parcel of Hanalei Silty Clay bottomlands near the mauka section of the property along Waikane Stream.

Frank S. Scott studied the agricultural potential of the property (Appendix R) and found that a maximum of 134 acres of the 505± acres in the property are ecologically-adaptable to agricultural production with irrigation. The ecologically adaptable acreage consists of a large number of isolated parcels of plateaus and bottomlands scattered throughout the project. The crops considered best adapted to the better lands in the project are bananas, selected truck crops and, to a lesser extent, papayas. All of these crops would require supplemental irrigation water, since rainfall in the area is seasonal and extremely variable for individual months from year to year.

The cost of water development for 82 of the 134 acres is indicated to be prohibitive (Scott, 1988). The poor configuration of arable land, consisting of many small parcels scattered throughout the project and the fact that they are surrounded by deep gulches or steep, eroded hillsides would further add to the cost of crop production.

Projected increases in acreage needed to supply market requirements for crops ecologically adaptable to the project area exceed the 134 acres of usable acreage, but crops which would be grown in the project area would have a comparative disadvantage in competing for sales potentials because of higher costs of production than alternative areas. Oahu production of

these crops has leveled off or is declining because of the inability to compete with imports or because of shifts in production to the Neighbor Islands where labor and irrigation costs are lower, or irrigation is not required. Also, better production areas than those located in Waikane are available elsewhere on Oahu.

Considering the limited land areas ecologically adaptable to crop production, the infeasibility of irrigation development for the majority of usable land, projected high costs of production, the inability to compete in the market place and the availability of better lands and better production conditions elsewhere in the State, it is concluded that intensive commercial agriculture is not a viable use for the property (Scott, 1988).

The project is unsuitable for commercial agricultural production as one unit because of the limited acreage of usable land and the poor configuration of the small parcels that are adaptable to agricultural production. An estimated one-third of the project could be utilized for an agricultural subdivision of small lots which would serve as homesites and provide the opportunity for small scale or subsistence farming. Without such a subdivision, it is highly unlikely that the subject area would be used for agriculture. A prior proposal for such a subdivision was rejected by the City and County of Honolulu.

Golf courses would provide a higher economic use value than agriculture and at the same time would provide open space and erosion control. Lands conserved through use for golf courses could readily be converted to agriculture in the future if conditions warranted. The need for erosion control is crucial not only for maintaining the soils, but for preservation of water- sheds and flood control.

Although the developer is not proposing any use of the wetland areas, community groups have expressed interest in various uses, ranging from a community park to wetland agriculture and bird sanctuaries. The developer is not opposed to these uses, but specific impacts will need to be evaluated and discussions held with the various community groups and pertinent regulatory agencies before any decisions are made.

F. GOLF COURSE MORATORIUM

On December 27, 1988 a bill proposed by Mayor Frank F. Fasi was introduced on the City Council floor by Council Chair Arnold Morgado. Bill No. 207 is entitled "A Bill For An Ordinance Relating To The Control For An Interim Period The Construction Of Golf Courses in the AG-2 General Agricultural District." The bill expressed concerns about the cumulative effect of the proliferation of golf courses on the island. The long term effect on agricultural land prices, the feasibility of agriculture as a viable economic alternative, the adverse impacts on rural communities and small agricultural enterprises, and the unresolved issues of public play at affordable rates are cited as reasons for the moratorium. The initial bill was dated to be in effect from the date of adoption until April 1, 1990.

The bill was subsequently amended to exempt golf course projects going throughout the SMA process.

According to the list of golf course projects listed in the attachment to the bill, 14 projects would have been affected by the moratorium. Processing of all conditional use permits, subdivision, grading and building permits and site plan reviews would be stopped.

The concerns behind the bill need to be addressed individually to get a better perspective on the issues. First, the assumption of a cumulative impact assumes all golf courses on AG-2 lands are similar and have a similarity of impact which have a cumulative effect. The specific cumulative impacts are cited, but these are also based on assumptions and have not been fully examined. One purpose of the moratorium is to examine the assumptions.

1. Long Term Impact On Agricultural Land - Golf course demand for AG-2 land is part of the overall demand for such land. It cannot be realistically separated from other development pressures. For instance, the demand for housing also competes for agricultural lands; note the pressures in Central Oahu for prime agricultural land for housing purposes. Many of these residential developments also have golf courses as part of their overall plans. Resort developments have also competed for agricultural land in the past.

Any type of large scale development will tend to affect the demand pressure for the conversion of agricultural land. The real question on long term impact is whether the conversion of these lands will reduce the supply of agricultural land available at economical prices to the point that agricultural activities begin to fail or anticipated future needs are shortchanged. Studies done by Frank Scott indicate that Oahu currently has an oversupply of agricultural land and has more than enough to meet future needs. Scott calculates that there is in excess of 12,000 acres of good agricultural land outside of the urban area that is not in cultivation at the present time. This figure increases even more when marginal lands are included.

Therefore, total supply is not really a question. The question is whether the land is available at affordable prices and whether golf course development significantly raises the overall price of agricultural land. Studies conducted by Community Resources Inc. and Dr. Michael Sklarz of Locations Inc. show little or no change on the price of adjacent agricultural lands with the development of golf courses. It is uncertain whether historic examples and their impacts can be extrapolated to conclude that future golf courses will also have little impact. However, the historic analysis combined with the current oversupply and the trend for agricultural operations to move to the outer islands indicate the impact of golf course development on the available supply and cost of agricultural land will probably be minor. Other, larger and wider market factors are at work.

Having said the above, it is useful to note that the rise in agricultural land values is reflective of the overall rise in land values in the State and Oahu in general. This reflects a rise in demand and the fact that the Hawaii real estate market is now a part of the international marketplace.

2. The Viability of Agriculture - Incidents such as the intended displacement of the Higas in Lualualei and the Souzas at Ohikilolo due to golf course development have raised the issue of the adverse impact of golf course development on the viability of agriculture in the State. This, coupled with the fact that most golf course developments currently in progress are planned on agricultural land, give credence to this worry.

The concern is understandable but misplaced and overly specific. Anyone who remembers the land struggles of the seventies recalls that the displacement of small farmers is an impact of any development pressure whether it is for resort, housing developments or golf courses. The viability of agriculture is determined by the marketplace and not by a specific type of competing use. The only connection with golf courses is that, in the current marketplace, there is a perceived demand for more golf courses and less competitive demand for agricultural uses. To use economic terms, the demand for agricultural use is more elastic than the demand for golf courses. Golf courses are more competitive in today's marketplace.

The problems of agriculture and its competitive position are more varied. Issues of reliable markets, reliable supply, lack of economies of scale, losses in the competitive value of labor, changes in technology, interaction with domestic and international markets and changes in the farming population all affect the viability of agriculture. The pressure for the competitive use of land is only a small part of the viability issue. Even without any golf course development, these other factors would remain.

3. Adverse Impacts on Rural Areas and Small Agricultural Enterprises--This concern seems mainly based on speculation and a generic concern over change. The prior examples of the Higas and Souzas, along with the struggle of the Maunawili farmers, have focussed the blame on golf courses. Potentially any non-agricultural use proposed on agricultural land could have the same impact or worse. There is nothing intrinsic to golf courses that makes them incompatible with rural communities or small agricultural enterprises. In fact, there are many reasons why golf courses are compatible with the rural lifestyle. The major problem seems to be the integration of golf courses with the community in a social sense. The Waikane Golf Course developer and the Waiahole-Waikane Community Association both see the golf course as a community project and are working to make the project an integrated and positive part of the Waiahole-Waikane community. A close and continuing relationship between the golf course developer/operator and the community can address the concerns covered by this subject.

4. Public Play at Affordable Rates--This concern is also raised as a rationale for the moratorium. Although many golf courses are privately owned and operated and some have an elitist and exclusive image, the Waikane Golf Course will be open to public play at rates affordable to the public. The specific periods of play and the rates applicable to the local community and Hawaii residents are being negotiated. Specific conditions will be incorporated as requirements of the conditional use permit.

Finally, the statement about cumulative impact indicates a sense that golf course developments are similar and the incremental impacts add up to a larger total impact. A cursory review of proposed golf courses shows that not all golf courses are alike, nor are their impacts alike. Also, because so many of the projects are unique in their impacts, the surface similarities should be balanced by a deeper analysis of both the positive and negative aspects of the development. Criteria for evaluation of impacts and development of appropriate responses would be helpful to this process.

Unless the concerns and issues related to the moratorium are more specifically identified and evaluated, it is unclear what the moratorium will accomplish. There will be a temporary delay in the construction of golf courses and a signal will be sent that the City and County of Honolulu is unfriendly to golf course development. The moratorium is a blunt instrument aimed at scattered concerns. It makes no distinction between golf courses, the communities affected, or the extent of benefits accrued.

SECTION VI
Alternatives

VI. ALTERNATIVES

Alternatives for the property have been considered which utilize the land for several different purposes. A No-Action Alternative was considered which would leave the property as is. An Agricultural Alternative was evaluated which would initiate more intensive agriculture for commercialization. Development of the property as an Agricultural Subdivision was also considered as a potential option. Additionally a housing alternative was evaluated. A sub-alternative or activity which could be accommodated along with the proposed golf course, is agricultural use of the wetland areas. This has also been considered.

A. NO-ACTION ALTERNATIVE

The no-action alternative would involve no changes to the property. This option would result on the loss of potential benefits to the community. New and different job prospects would be lost. There will be no new recreational opportunities for the residents of the area and the general public. Property taxes would continue at existing levels. The no-action alternative would result in the owner continuing to pay property taxes without gaining an offsetting income from the property.

The present erosion of dirt roadways and unvegetated hillsides will continue as well as siltation of Kaneohe Bay and soil loss on the property.

Benefits discussed between the Waiahole-Waikane Community Association and the developer will not be realized. The status of the property will remain unclear as it is not certain that agricultural operations will replace the golf course plan. Subdivision or other more intensive uses are more likely to be proposed.

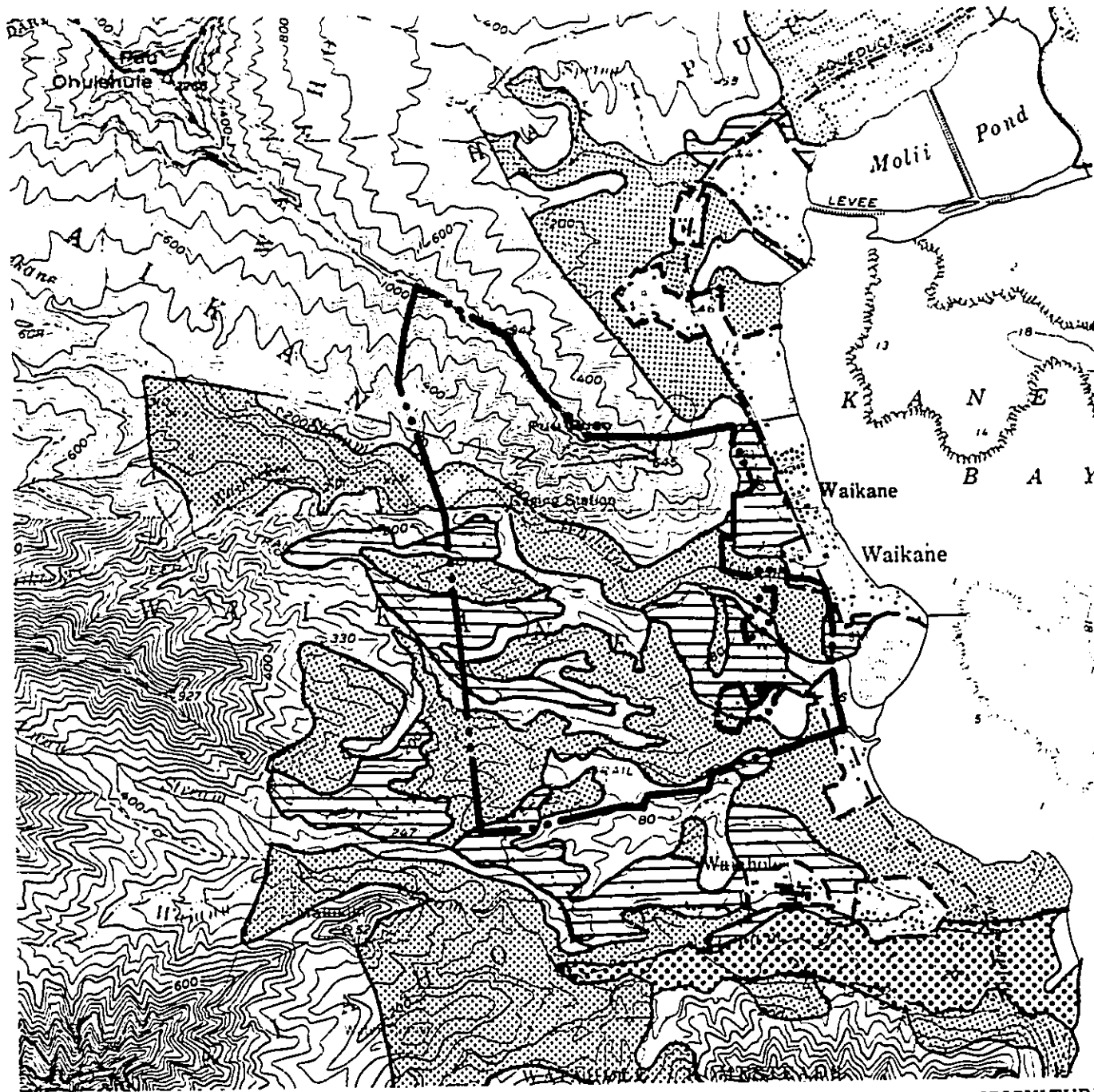
B. INTENSIVE AGRICULTURAL USE ALTERNATIVE

Another alternative is the possibility of establishing a large agricultural venture on the site. An agricultural feasibility study was prepared for the property by Frank S. Scott, Jr., Ph.D. in March 1988, and the analysis in this section is based on information from the report. The entire report is included as Appendix R.

Determination of agricultural feasibility is based on the following criteria: ecological adaptation, sales potentials, economic viability, and the availability and cost of irrigation water.

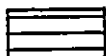


Without Irrigation

The "Agricultural Lands of Importance to the State of Hawaii" (ALISH) rating system classifies approximately 70.1 acres (14%) of the project site land as Prime Agricultural and 191.9 acres (38%) and as Other Agricultural land (Figure 26). Two hundred forty-three acres are unclassified. This classification system indicates that a large percentage of the soils at the project site are generally deficient for agricultural purposes.



SOURCE: STATE DEPARTMENT OF AGRICULTURE

LEGEND

-  PRIME AGRICULTURAL LAND
-  OTHER IMPORTANT AGRICULTURAL LAND
-  UNCLASSIFIED

AGRICULTURAL LANDS OF
IMPORTANCE TO THE STATE OF HAWAII
WAIKANE GOLF COURSE

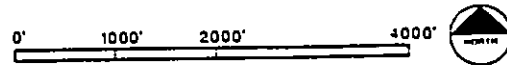


FIGURE 26

The USDA Soil Conservation Service (SCS) classifications were also considered (Figure 8). Classes I and II are considered suitable for agriculture while the remaining classifications indicate increasing degrees of difficulty in using the land for crop production. There are no lands placed in Class I and 147.2 acres (29%) are in Class II. Class III, which is marginal for production, includes only 11.4 acres (2%) of the land area. The remaining 346.4 acres (69%) of the land falls into Classes IV to VIII, which are ecologically infeasible for crop production. These ratings also show most of the area as ecologically infeasible for most types of crop production.

The University of Hawaii Land Study Bureau (LSB) classifications are more restrictive than SCS classifications in the project area (Figure 27). LSB classifications range from A to E, with A being the best. Without irrigation, none of the project area is classified as A or B, (comparable to SCS I and II), and 146.6 acres are classified as C or marginal (comparable to SCS III). At 340 acres, the area classified as D and E (infeasible for agriculture) is almost identical to that of SCS classifications VI and VIII.

Thus all three soils analyses are consistent in concluding that the project area is poor for agricultural purposes.

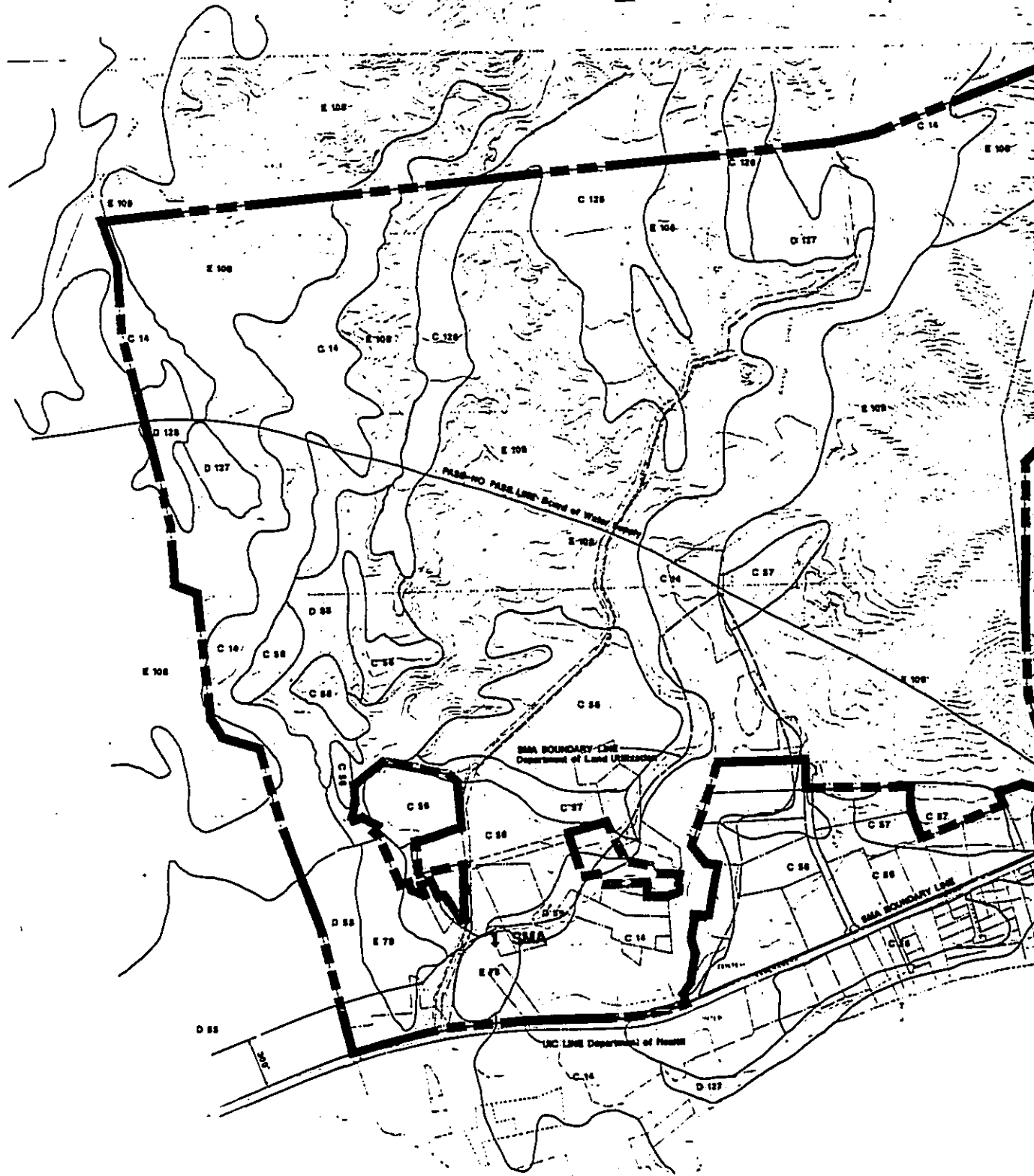
A major deterrent to commercial agriculture is that the good and marginal soil types (SCS II and III; LSB B and C) are scattered throughout the project as small isolated plateaus divided by deep, rocky hillsides. The separation would prevent economies of scale. The inability to increase efficiency through economies of scale and the higher cost of transporting produce and equipment in the field would also impose limitations on the economics of banana, papaya, truck crop and tree fruit production.

With Irrigation

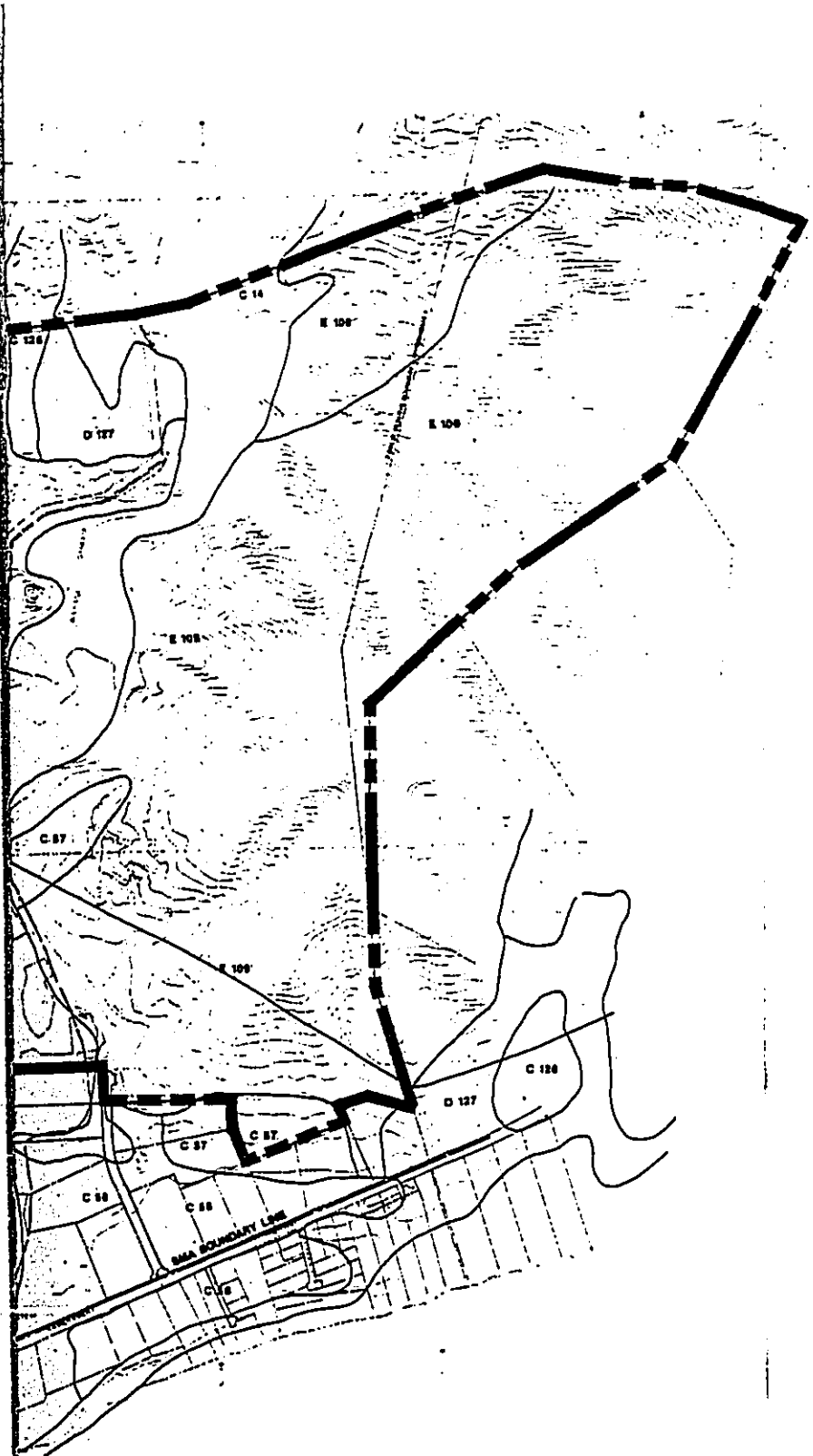
The project currently has no developed water source or infrastructure for an irrigation system. The maximum area with sufficiently good soil types to justify irrigation is 134 acres. Of the 134 acres considered for possible crop production, 52 acres are located in bottomlands along Waikane Stream, and the remaining 82 acres are primarily on high plateaus in the mauka section of the project.

Assuming a permit could be obtained to pump water from Waikane Stream for the 52 acres of bottomlands, the water cost for this area would be affordable at \$170 per acre. However, obtaining such a permit is highly questionable given current instream flow standards established by the State Water Commission.

Providing irrigation water for the 82 acres located on the high plateaus or on bottomlands not accessible to Waikane Stream would be much more difficult. One possible source would be from the municipal water transmission line at Kamehameha Highway, estimated to cost \$760 per acre. Another possible source would be a private system from wells with an estimated cost of \$710 per acre.



**LSB SOIL CAPABILITY CLASSIFICATIONS
WAIKANE GOLF COURSE**



SOURCE: ENGINEERING CONCEPTS, INC.

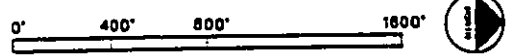


FIGURE 27

Crop Selection Based on Ecology

The poor configuration of suitable soils within the project site poses a major obstacle to commercial use for crop production. Most of the areas ecologically adaptable to crop production are scattered throughout the project and are surrounded by either deep gulches or steep, badly eroded hillsides. This configuration would require costly road and irrigation delivery systems and presents a major obstacle to establishing economies of scale.

Sales Potential

Sales potential refers only to those crops which are ecologically adaptable to the project site. An estimated 134 acres of the 505 acres in the project area could be utilized for cultivated crop production, considering ecological constraints and assuming that good quality irrigation water could be made available at affordable cost (which actually is not the case).

The market potential for Hawaii-produced truck crops, bananas and tree fruits is essentially the acreage required to displace imports. Sales potentials of Waikane for the above crops, plus papayas, depend on the ability to compete in the marketplace against the mainland and other Hawaii producing areas (Table 3). The total of 592 acres required to displace imports, plus an estimated 20 acres of papayas, considerably exceeds the 134 acres in the project. Therefore, assuming there was little or no other suitable land available for these crops in Hawaii, it might be important to preserve the potential for using the 134 acres for crop production at some time in the future.

Land Requirements in Relation To Availability Of Agricultural Land on Oahu

The acreage in cultivated crops on Oahu has steadily declined during the past ten years, from 50,780 acres in 1977 to 40,700 acres in 1986. The State Land Use Commission classified 141,849 acres of land on Oahu as Agricultural in 1986, or three and one-half times the area actually in agricultural use. The decline of agricultural activity on Oahu, despite the ample supply of suitable land, is largely because good agricultural land on the neighbor islands is available at lower cost and irrigation costs are less. Thus, the supply of unused prime agricultural land on Oahu continues to increase, even with the urbanization of some areas, as the agricultural need for it decreases.

Summary of Agricultural Potential and Need

Evaluation of the ALISH, SCS, and LSB soil classifications indicates that the majority of the soils in the project site are unsuited for any type of crop production. The acres that are suited are in small non-contiguous parcels making economies of scale difficult. In addition, establishing an irrigation system for agricultural use of the area would not be cost-effective.

TABLE 3

**Hawaii Market Supply and Acreage Required to
Displace Imports of Selected Fruits and Vegetables**

Crop	Market Supply		Yield Per Acre (pounds)	Acreage Required To Displace Imports (acres)
	Hawaii (1,000 pounds)	Imports		
Beans, Snap	980	330	12,000	28
Cucumbers	3,720	2,024	20,000	101
Eggplant	1,300	196	30,000	7
Peppers, Green	2,050	1,392	20,000	70
Sweet Potatoes	2,000	676	30,000	23
Bananas	9,700	10,887	30,000	363
TOTAL				592

In any event, commercial agriculture on Oahu is on the decline as diversified crop activities find it more viable to locate on the outer islands. This and the consequent increase in the amount of unused prime agricultural lands on Oahu, demonstrates the absence of any real need to keep the project site open for possible future agricultural use.

Other Impacts of Agricultural Use

Agricultural operations will have environmental effects that need to be considered. According to the stormwater and drainage study done for previous agricultural plans for the site, estimates indicated that runoff, nitrogen, phosphorus and sediment-loads would increase by as much as 33% over existing conditions. Additionally, the likelihood of wind drift of pesticides is increased under agricultural cultivation as compared to golf course operations. Runoff increases because of the need to till the soil. There also would be an increase in traffic from commercial agricultural operations.

C. AGRICULTURAL USE OF WETLANDS AREA ALTERNATIVE

In evaluating the proposed development, some people have suggested the use of the designated wetlands for agricultural purposes. In a sense, this is not really an alternative use for the site, since the proposed golf course development avoids any use of the designated wetlands. Dr. Frank S. Scott, Jr. evaluated the feasibility of agricultural use of the wetlands to determine the viability of this proposal (See Appendix S).

There are 25.8 acres of designated wetlands in the Waikane Golf Course project area. Dr. Scott concludes as follows:

"The study indicates that 16.7 acres of the 25.8 acres designated as Wetlands in the Waikane Golf Course project, including 13.0 acres of Hanalei Silty Clay and 3.7 acres of Pearl Harbor Clay, are ecologically adaptable to cultivated crop production. The 9.1 acres of Marshland in the unit are adaptable only to marsh type vegetation and cannot be used for cultivated crop production in their present state. Alteration by filling would not likely be permitted by the controlling Army Corps of Engineers.

Certain vine type vegetables, bananas and taro are identified as fairly well adaptable to Hanalei Silty Clay soils and marginally adaptable to Pearl Harbor Clay soils in the wetlands area. Whereas crop production is feasible ecologically, commercial economic feasibility under an outleasing program is questionable because of indicated lower yields, high water costs and additional costs of other activities, such as drainage, in relation to competing areas. In addition, the cost of establishing a horizontal property regime (condominium), estimated at \$300 to

\$600 per acre and the cost of administering outleasing would further erode the competitive position of leasees in the marketplace.

Outleasing of the better wetlands for crop production under good management and in compliance with Army Corps of Engineers regulations would appear to be compatible with the golf course project, particularly since farming activities would, for the most part, border Kam Highway. The more critical considerations are costs of administering an outleasing program for only 16.7 acres and reservations concerning the economic viability of potential crop production in the wetlands."

Besides the agricultural and economic consideration discussed by Scott, several environmental and policy questions remain. Cultivation of the wetland areas will increase runoff and sediment loads into Waikane Stream. This will increase siltation in Kaneohe Bay. Although this impact will be small due to the relatively small acreage under consideration (0.7 percent of the total basin) it is an impact that needs to be noted. Another concern was the possible increase in the flood hazard potential of the area. The existing stream channel and flood plain is already inadequate in heavy rains. Any alteration of the stormwater retention function of the wetlands must be done with full knowledge of the hydrodynamics involved. A related concern is the potential damages that might result from use of the wetland. During flood conditions it is probable that retaining walls, irrigation ditches, agricultural equipment and crop damages will occur. This brings forth the next concern; that of property and personal injury liability on the property or on adjoining and downstream areas. While these concerns do not preclude more intensive use of the wetlands, they do indicate the delicate balances that exist in the wetland environment and the dynamic nature of the processes involved.

From a regulatory standpoint, according to the U.S. Army Corps of Engineers, crops allowed in the wetland area would be limited to hydrophytic plants. This limits the number of plant species that would be acceptable for the dredge and fill activity necessary to make wetland agriculture feasible. Dredge and fill activity must also consider the potential impact of such action on the flooding within the flood plain.

Finally, the wetland areas are those that are closest to the lower reaches of Waikane Stream. Of the three major stream segments studied by Archer, this section contains the most diverse and abundant stream biota. Pesticide and fertilizer impacts would have the most direct impacts here. Although proper management and use of the chemicals can minimize these impacts, because of the direct contact with water and proximity to the richest biological section of Waikane Stream, potential impacts need to be carefully considered.

All indications point to this alternative as one that has marginal possibilities and potential conflicts with competing public policies. Although it is possible to develop agricultural uses for the wetlands, many issues need to be resolved before this alternative can be considered viable.

D. AGRICULTURAL SUBDIVISION ALTERNATIVE

The agricultural subdivision alternative is permitted under the existing AG-2 General Agricultural Zoning District. It would involve the creation of between 100-150 two-acre minimum lots with the remaining acreage being used for open space, roads, and drainage basins. The lots would presumably be sold in fee with individual purchasers responsible for the construction of their home. The subdivision process would require the developer to meet subdivision requirements for infrastructure.

Infrastructure construction would include paved access and internal roadways, siltation and retention basins. To provide potable water to residents below the 115-foot elevation a connection to the Board of Water Supply's main at Kamehameha Highway would be needed. For residents above this elevation a reservoir would have to be provided. Overhead electricity and telephone lines would be provided along the internal roadways. Cesspools or septic tanks would be used to handle disposal, with the individual lot purchasers preparing their own plans and obtaining the necessary approvals.

The impacts of this alternative were reviewed in the EIS for Waikane Acres. In particular, impacts from storms of different durations were calculated factoring in the development of siltation basins as shown in Table 4. Erosion would increase under this alternative because there would be more vegetation clearing and exposed soils due to uneducated farming techniques that would more than likely be used. Thus, nitrogen, phosphorus, and suspended solids concentrations will all rise and impact Waikane Stream and Kaneohe Bay.

The agricultural lots will generate traffic volumes of the same order of magnitude as a large lot residential area. Each household may be expected to own two automobiles and generate numerous trips per day, adding substantially to existing traffic on Kamehameha Highway.

The past agricultural uses of the Waikane acreage have been limited in general to pasture and cultivation of bananas, papayas and sweet potatoes due to soils, topography, and the lack of irrigation. Historically taro and rice have been grown in the wetland areas. The strong acidity and low fertility of the soils in the area require the incorporation of large amounts of lime and the liberal use of fertilizers. The increased runoff expected due to the impervious surfaces of the subdivision and agricultural tilling will further add to the degradation of Waikane Stream and Kaneohe Bay.

TABLE 4

**Estimated Storm Water Runoff and Constituent Changes
with 23 AC-Ft of Siltation Basins for the Proposed
Waikane Acres Unit I Development, Windward Oahu, Hawaii**

Storm Duration, hours	1	1	1	24	24	24
Recurrence Interval, years	1	25	100	1	25	100
Total Precipitation, inches	<u>2.4</u>	<u>4.5</u>	<u>5.5</u>	<u>6.0</u>	<u>15.5</u>	<u>19.5</u>
RUNOFF						
Existing, ac-ft	5	39	59	70	321	446
Developed, ac-ft	16	57	81	93	358	484
Increase, ac-ft	11	18	22	23	37	38
Increase, %	220	46	37	33	12	9
NITROGEN						
Existing, lbs.	6	48	72	87	393	546
Developed, lbs.	-	45	77	93	446	728
Increase, lbs.	-	(3)	5	6	53	182
PHOSPHOROUS						
Existing, lbs.	1	9	13	15	70	97
Developed, lbs.	-	18	32	38	182	251
Increase, lbs.	-	9	19	23	112	154
SUSPENDED SOLIDS						
Existing, tons	1.8	14.3	21.7	25.7	117.8	163.7
Developed, tons	-	12.3	20.9	25.2	120.7	166.1
Increase, tons	-	(2.0)	(0.8)	(0.5)	2.9	2.4

NOTES:

- Storm data taken from U.S. Weather Bureau's "Rainfall Frequency Atlas of the Hawaii Islands, 1962"
- Nitrogen values taken from Lau et al (1976) for undeveloped conditions, 0.45 mg/l, and from Lau et al (1976) and Fujiwara (1973) for developed conditions, 0.49 mg/l.
- Phosphorous values taken from Lau et al (1976) for undeveloped conditions, 0.08 mg/l, and from Lau et al (1976) and Fujiwara (1973) for developed conditions, 0.20 mg/l.
- Suspended solids values taken from Lau et al (1976) for undeveloped conditions, 270 mg/l, and from Lau et al (1976) and Fujiwara (1973) for developed conditions, 265 mg/l.
- Assume siltation basin empty before storm runoff event, and that no percolation or evaporation occurs during the storm event.
- Combined volume of siltation basins = 23 ac-ft.
- The loads for the developed conditions takes into account the removal of the various constituents by the siltation basin, i.e., that load associated with the 23 ac-ft of runoff retained by the siltation basins.
- Values in () indicate negative values.

SOURCE: "Stormwater Runoff Considerations for Waikane Acres, Unit I, Windward Oahu, Hawaii" by Michael J. Chun and Gordon L. Dugan, May 1978.

Cost-Benefit

The net operating returns per acre are expected to be low compared to what the same crops could earn on better lands and with cheaper water for irrigation. Farming in Waikane would at best be a risky enterprise. It is considered highly unlikely that all the land physically available for cultivation would be so utilized even if it was made available for lease or sale. Therefore, the low productivity of the lands and lack of inexpensive irrigation water makes much of the lands in Waikane unattractive for small as well as large scale agricultural operators.

There would exist a tax incentive for the parcel purchasers to keep the land in an agricultural use, if possible. The land is classified by the State Land Use Commission as agricultural, and would be assessed based on its agricultural use value rather than the fair market value.

E. RESIDENTIAL ALTERNATIVE

Another land use alternative would be to build a residential housing development. Under the existing Development Plan Agricultural designation, Country District zoning is allowed. This would permit one-acre lots. Approximately 300± houses could be built on the site.

Infrastructure demands would be high, including one or two paved access roads, along with a more complex internal roadway system. These additional impervious surfaces in conjunction with the many house roofs will increase runoff. Increased runoff will transport residuals of unknown amounts into receiving waters.

Wastewater treatment and disposal will be a major impact no matter what form it takes. Septic tanks and cesspools have limited efficiency and questionable environmental impacts. A sewage treatment plant raises the question of effluent and disposal. With average residential loads at 100 gallons per day per capita, there will be an estimated wastewater treatment requirement of up to 100,000 gallons per day. This kind of impact will probably require a private sewage treatment plant as the State Department of Health is discouraging the use of cesspools. Additionally, no cesspools will be allowed above the no-pass line.

Government services would be stressed with the increase in population. The schools, health facilities, fire and police protection would all be taxed. With up to 300 units and a household size of three to four persons per household, a population increase of between 900 and 1,200 people is likely. Traffic on Kamehameha Highway would increase significantly and reduce the level of service. This alternative would also increase the pressure to urbanize other vacant agricultural land in the area.

It is the City's policy to keep the area rural in nature, feeling and atmosphere. Country zoning is meant to be used in transitional areas generally at the edge of urban development and in existing rural areas where residences are concentrated. Neither scenario fits the Waikane property, even if the economics and market forces may support such a project. Environmental and social impacts would be too severe.

The residential alternative is one that has been proposed by past owners of the property. Previously, Windward Partners had planned the area for residential use during the heights of the Waiahole-Waikane "struggle". Community opposition prevented this alternative from becoming a reality. Subsequent to this Phoenix Realty proposed an agricultural subdivision of two acre lots. Although it was described as an agricultural subdivision, it was clear that the primary purpose was residential. A portion of this plan received tentative subdivision approval. However, community opposition and objections from adjacent neighbors prevented approval of the remaining phases of the proposed project, and final subdivision approval was never granted even for the phase one portion which received tentative approval.

It is clear from the history of the area that public policy and community opposition has effectively prevented the development of a residential alternative for the area.

F. JOINT USE OF THE SITE

Some community representatives have suggested joint use of the site to accommodate both the golf course developers wishes and the desire to preserve agricultural uses. Concepts range from employee housing mixed into open pockets in the golf course area to using remnant parcels for agriculture within the golf course layout. Additionally, agricultural or wildlife refuge uses for the wetland have been suggested in conjunction with the golf course.

Although the applicant has no basic difficulties with alternative uses of the wetlands, there are major difficulties with the concept of mixed uses or coexisting uses within the golf course layout itself. First, the availability of useable agricultural land not in golf course use would be minimal. What would be available is scattered in odd inefficient configurations. Second, the uses would conflict with each other when placed side by side, without proper buffers or setbacks for safety and esthetic purposes. For instance, a farmer might want to spray his crops when golfers are playing on the golf course and create conditions hazardous to unprotected players downwind.

Thirdly, the conflicts arising from access, hour of operation, security and liability are too onerous. Fourthly, the construction and maintenance of infrastructure for two different uses is both a legal and maintenance difficulty. Finally, the end product would be a poor golf course and a poor agricultural development. Joint use in the above manner will likely be a recipe for the failure of both operations.

SECTION VII
Summary of the Unresolved Issues

VII. SUMMARY OF UNRESOLVED ISSUES

During the review of the Environmental Assessment and the comment period for the EIS Preparation Notice, several issues were raised which have not yet been resolved.

The first issue is possible alternative uses of the wetlands. Some community members expressed the hope that the designated wetland areas could be used for wetland agriculture or a wildlife sanctuary. The Waiahole-Waikane Community Association suggested park use for one area. Questions of economic feasibility, impact on flooding, governmental regulations and tort liability were raised.

These issues are still being studied. The applicant, Waikane Development Company, has in essence proposed a no-action alternative for the wetland areas. The issue of the feasibility of agricultural use of the wetlands is addressed in a special study by Dr. Frank Scott (Appendix S). The question of the other uses of the wetlands will be resolved after further discussions with the various community groups.

A second issue raised is the question of impact on property values, levels of taxation, and development pressures. If property values rise due to golf course development, there is nothing that the developer can do to affect this increase in value.

The fiscal impacts of golf courses were examined by Community Resources Inc. Although no definite conclusions were possible due to the lack of comparables, some tentative indications were suggested. The report suggests land values may increase in the immediate Waikane Valley area where there are residentially zoned lands or potential subdivision possibilities for existing properties. However, the degree of impact is impossible to predict or quantify without appropriate historical comparisons. Dr. Michael Sklarz is also doing an evaluation of prices around golf courses to further evaluate possible impacts on land values. Additionally, current public policy opposes such changes in use, and it is unclear what the degree of impact will be. These potential effects are described more fully in Appendix E.

Another factor controlling the impact of development pressures on the region is the vigilance of the community. Rising land values, the wishes of some landowners, and the market shortage of easily developable land for residential purposes have together led to many proposals for residential or other urban uses of lands in the Kahaluu Neighborhood Board area. Time and again community organizations have successfully opposed urbanization of lands in the area. This has been a major factor in the continued preservation of the rural character of the area and has helped blunt some of the pressures for urbanization in the area.

The economic viability of the golf course, and the effect of failure or sale of the property on negotiated benefits to the community, are still in the discussion stage. Although the success or failure of the project is uncertain, the potential impact of such an event can be evaluated and resolved. Questions have been raised about the impact on benefits and agreements should the property be sold or the operations cease. These questions are expected to be resolved in the near future.

SECTION VIII
Environmental Impacts Which Cannot Be Avoided

VIII. ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Some of the short-term and long-term impacts of the project cannot be avoided but can be mitigated as described in Chapter IV.

Construction activities will generate noise, fugitive dust and emission from equipment operations. Grading will result in some soil erosion and air-borne dust. Increased movement of trucks and other vehicles will result in noise and exhaust emissions. While the mitigating measures described in Chapter IV will minimize these impacts, and all governmental regulations will be complied with, there will still be some negative impacts that remain.

The development of the golf course is not anticipated to have any significant long-term adverse environmental impacts. The increase in defacto population may result in, at most, a slight decrease in air quality due to increased vehicular and equipment use on the site. The wastewater generated on site and the effluent used for irrigation is not expected to alter the quality of water resources in the area since the effluent will be used in areas makai of the Board of Water Supply no-pass line and will meet the requirements established by the Department of Health. Improvements of the drainage system will keep the rates of storm water runoff from the site at or below existing levels, and will reduce the sediment load on Waikane Stream and Kaneohe Bay. The use of pesticides and fertilizer will be monitored and controlled to avoid impact on the flora or fauna. While there may be some increase in nitrogen and phosphorus loads on the ecosystem, the amounts are not expected to be significant or to have any adverse impacts. Occasional night time use of the facility will add night lighting to an area that currently has none. This impact is also expected to be minor as lighting will be designed to be unobtrusive and the frequency of evening events is not expected to be high.

Realignment of 600 feet of the unnamed stream is necessary due to the topography of the area and the functional needs of the golf course operation. It will result in a permanent change in channel length from 600 feet to 300 feet.

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SECTION IX
Irreversible and Irrecoverable Commitment of Resources

IX. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Approximately 290 acres of the property will be used for the golf course and related uses. Developed areas will include about 136 acres for the golf course fairways, greens and tees, and about nine acres for the clubhouse, swimming pool, tennis courts, parking, the maintenance yard and wastewater treatment plant. The remaining golf course area will be open space. These lands will not be available for agricultural use as long as the golf course exists. However, golf courses are landscaped open spaces compatible with agricultural and rural uses. It is also much more possible to restore agricultural use if the golf course closes down, than it would be if residential or similar urban uses were established. However, this is not a probable future as it is not expected that there will ever be reason to close the golf course.

Grading for the golf course will create changes in topography. Additionally, a short U-turn in the unnamed stream on the Waiahole side of the property will be realigned. These changes are not expected to have an adverse environmental impact, but they will be permanent changes resulting from the development of the project.

There will be a permanent commitment of private funds and resources to plan, design, construct and operate the golf course and related facilities. This will result in a permanent increase in jobs and other employment-related benefits and resources. It is expected that increased tax revenues will be generated along with the increase in economic activity and appreciated property value of the golf course. Beyond the on-site improvements constructed and operated by the developer, there will be an increased usage of public facilities such as the BWS Kamehameha Highway waterline for potable water use, Kamehameha Highway itself for traffic, and greater load on the City and County facilities for waste disposal to handle the sludge from the golf course wastewater treatment plant.

SECTION X
Consulted Parties, Comments and Responses

X. CONSULTED PARTIES, COMMENTS AND RESPONSES

Listed below are the agencies and organizations consulted in the preparation of the Revised EIS. This is followed by the written comments received and responses. An asterisk (*) indicates those who either did not submit or had no written comments.

A. FEDERAL AGENCIES

1. U.S. Department of Agriculture, Soil Conservation Service
2. U.S. Department of the Army, U.S. Army Engineer District, Honolulu
3. U.S. Department of Interior, Fish and Wildlife Service
- *4. U.S. Department of the Navy

B. STATE AGENCIES

- *1. Office of State Planning
- *2. Land Use Commission
3. Department of Agriculture
4. Department of Land and Natural Resources
5. Department of Health
6. Department of Transportation
7. State Housing, Finance and Development Corporation
- *8. State Public Works Engineer
9. University of Hawaii Environmental Center
- *10. University of Hawaii Institute of Marine Biology
- *11. Hawaii Air National Guard
- *12. Office of Hawaiian Affairs

C. CITY AND COUNTY AGENCIES

- *1. Building Department
- *2. Department of Housing and Community Development
3. Department of Land Utilization
- *4. Department of Parks and Recreation
5. Department of Public Works
6. Department of Transportation Services
7. Board of Water Supply
8. Honolulu Fire Department
9. Honolulu Police Department
10. Kahaluu Neighborhood Board No. 29

D. COMMUNITY ORGANIZATIONS

- *1. Life Of The Land
2. Hui Malama Aina o Koolau
- *3. Waiahole-Waikane Community Association

E. MISCELLANEOUS

- *1. Hawaiian Electric Company

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P. O. BOX 50004
HONOLULU, HAWAII
96850

January 4, 1989

RECEIVED

JAN 10 1989

GROUP 70

Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Gentlemen:

Subject: Draft Environmental Impact Statement (DEIS) -
Waikane Golf Course Project, Waikane, Oahu

The above-mentioned documents have been reviewed as requested. One comment that we would offer concerns the need to carefully examine potential effects of any treatment adjacent to/or in the two streams in the project area, especially Waikane Stream since it is a major waterway and outlets directly into Kaneohe Bay.

Appendix F of the draft EIS mentions some planned stream channel modification to the unnamed stream that borders the project area, but does not mention any other down stream improvements to be made to this stream. At the present time, this stream is not maintained and cannot adequately handle current flow levels.

Please note for future reference that draft EIS documents and preparation notices from the various departments of the City and County of Honolulu requiring review should be sent to Mr. Lawrence T. Yamamoto, District Conservationist, Soil Conservation Service, P. O. Box 50006, Honolulu, HI, 96850. This will ensure a more detailed reviewing process and an immediate response.

Sincerely,



WARREN M. LEE
State Conservationist

cc:
Mr. Ralph Portmore, Group 70, 924 Bethel Street, Honolulu, HI 96813



23 January 1989

United States Department of Agriculture
Soils Conservation Service
P. O. Box 50004
Honolulu, HI 96850

Francis S Oda AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc

Attn: Mr. Warren M. Lee, State Conservationist

Roy H Nihei AIA
Linda M Aniya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

Gentlemen:

Subject: Waikane Golf Course Draft EIS

Thank you for your 4 January 1989 letter to the City and County Director of Land Utilization concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

There will be no treatment or work in Waikane Stream. The stream channel will remain in its natural condition. There will be some clearing and replanting of stream edge vegetation in areas where the stream is contiguous to or intersects golf course fairways. Any work on stream edges will be done with the awareness of potential erosion as well as impact on stream environments. A stream biologist will be consulted as necessary. We feel that the golf course development will result in better maintenance of stream edges and will probably result in less erosion of stream banks since the operator will insure the proper maintenance of landscaping to preserve golf course features.

With regard to the unnamed stream, the proposed improvements call for realignment of a 600 feet mauka section of the channel into a straighter 300 feet segment, and greater channel definition along a portion of the lower reaches of the stream. Along the lower reaches, the channel meanders along the valley bottom in an indeterminate fashion. The primary channel will be identified and graded to provide greater capacity and definition.

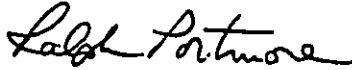
At both locations, the channel will be lined but in a naturalistic way. The effect of both actions is not anticipated to increase runoff. The golf course will have drainage retention and detention features such as ponds, cart paths running perpendicular to the slope, vegetation barriers and low areas on fairways which will slow the rate of runoff into the stream.

MR. WARREN M. LEE
WAIKANE GOLF COURSE DRAFT EIS
23 JANUARY 1989
PAGE 2

It should be noted that the flooding that occurs periodically on the lower reaches of the stream near Kamehameha Highway is primarily due to channel capacities along and below the bridge. It is not a function of channel capacities on the section of the stream that lies within the project site.

Thank you again for your review and comments.

Sincerely,



Ralph Portmore, AICP
Associate

05561/sy



DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858-5440

December 8, 1988

REPLY TO
ATTENTION OF:
Planning Branch

RECEIVED
DEC 15 1988


GROUP 70

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Thank you for the opportunity to review the Draft Environmental Impact Statement for the Proposed Waikane Golf Course Project, Waikane, Koolaupoko District, Oahu, Hawaii. Our previous comments (letter dated August 4, 1988) have been incorporated into the DEIS. We have no additional comments.

Sincerely,


Risuk Cheung
Chief, Engineering Division

Copy furnished:

✓ Mr. Ralph Portmore ;
Group 70
924 Bethel Street
Honolulu, Hawaii 96813



United States Department of the Interior

FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE

P.O. BOX 50167
HONOLULU, HAWAII 96850

RECEIVED

JAN 5 1989

GROUP 70

ES

Room 6307

JAN 4 1989

Mr. John P. Whalen, Director
Department of Land Utilization
650 South King Street
Honolulu, Hawaii 96813

Re: Draft Environmental Impact Statement for Waikane Golf Course
Project, Waikane, Koolaupoko District, Oahu

Dear Mr. Whalen:

We have reviewed the subject report dated November 1988 and believe that it adequately addresses fish and wildlife resources within our jurisdiction. We encourage the enhancement of the wetlands within the affected parcel as habitat for endangered Hawaiian waterbirds.

We appreciate this opportunity to comment.

Sincerely yours,

for.

Ernest Kosaka
Field Office Supervisor
Environmental Services

✓ cc: Group 70

JAN 11 1989



DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

IN REPLY REFER TO

RECEIVED

NOV 30 1988

GROUP 70

5090 (81B)
Ser 032/3026
28 Nov 1988

Department of Land Utilization
650 S. King St.
Honolulu, Hawaii 96813

Gentlemen:

The Draft Supplemental Environmental Impact Statement for the Proposed Waikane Golf Course Project has been reviewed and we have no comments to offer. Since we have no further use for the EIS, it is being returned to the Office of Environmental Quality Control.

Thank you for the opportunity to review the draft.

Sincerely,

W. K. LIU
Assistant Base Civil Engineer
By direction of
the Commander

Copy to:
Ralph Portmore ←
Group 70
924 Bethel Street
Honolulu, HI 96813

Office of Environmental Quality Control (w/encl)

UNCLASSIFIED AT GOVERNMENT EXPENSE

JOHN WAIHEE
GOVERNOR



YUKIO KITAGAWA
CHAIRPERSON, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

November 7, 1988

Mr. Ralph Portmore
Group 70
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Portmore:

Subject: Environmental Assessment
for the Proposed Waikane Golf Course
Waikane Development Company
TMK: 4-8-4: Por. of 4
4-8-6: Por. of 8
Waikane, Koolaupoko District, Oahu
Area: Approximately 505 acres

The Department of Agriculture has reviewed the subject document and offers the following comments.

According to the document, the developer is proposing to develop a 27-hole golf course (including a clubhouse, driving range, maintenance building, and related infrastructure) on a 505-acre site in Waikane Valley, Koolaupoko District, Oahu.

The subject area is partially classified as "Prime" (approximately 10 percent) and "Other" (approximately 50 percent) with the remaindering portion (approximately 40 percent) not classified according to the Agricultural Lands of Importance to the State of Hawaii (ALISH) system.

The Soil Conservation Service Soil Survey identifies the soils of the project area as follows:

1. Waikane silty clay (WpB), 3 to 8 percent slopes, which is used for truck crops, pasture, and homesites. The soil capability classification is IIE (soils subject to moderate erosion if they are cultivated and not protected).



Mr. Ralph Portmore
November 7, 1988
Page -2-

2. Waikane silty clay (WpC), 8 to 15 percent slopes, which is used for truck crops, pasture and homesites. The soil capability classification is IIIe (soils subject to severe erosion if they are cultivated and not protected).

3. Waikane silty clay (WpF), 40 to 70 percent slopes, which is used for pasture and woodland. The capability is VIIe (soils very severely limited by risk of erosion).

4. Waikane silty clay (WpF2), 40 to 70 percent slopes, which is used for pasture and woodland. The soil capability classification is VIIe (soils very severely limited by risk of erosion).

5. Hanalei silty clay (HnA), 0 to 2 percent slopes, which is used for taro, pasture, and sugarcane. The soil capability classification is IIw (soils having moderate limitations because of excess water).

6. Hanalei silty clay (HnB), 2 to 6 percent slopes, which is used for pasture and woodland. The soil capability classification is IIw (soils having moderate limitations because of excess water).

7. Marsh (MZ) having a soil capability classification of VIIIw (soils severely limited by excess water but may be used for wildlife habitat, watershed protection, or recreation).

8. Rockland (rRK) is made up of areas where exposed rock covers 25 to 90 percent of the surface. Rockland is used for pasture, wildlife habitat and water supply. The soil capability classification is VIIs (soils having severe soil limitation because of unfavorable texture, or because they are extremely rocky or stony).

The Land Study Bureau Overall Productivity Ratings of the subject site are E78, E108, E109, C14, C56, and C57. By this method of classification, the site has poor to fair productivity potential for most agricultural uses.

In addition, we would like to see further discussion in the following areas:

1. The broader economic and resource impact to the State from the irrevocable loss of agricultural land; and

Mr. Ralph Portmore
November 7, 1988
Page -3-

2. Conformity of the project to the State Agriculture
Functional Plan and its objectives and policies, particularly,
Implementing Action B(5)(c).

Thank you for the opportunity to comment.

Sincerely,

Yukio Kitagawa
YUKIO KITAGAWA
Chairperson, Board of Agriculture

cc: OEQC

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17 November 1988

Department of Agriculture
P.O. Box 22159
Honolulu, HI 96822-0159

Attn: Mr. Yukio Kitagawa, Chairperson, Board of Agriculture

Gentlemen:

Subject: Environmental Assessment for the Proposed Waikane Golf Course/87762.14

Thank you for your comments on the Environmental Assessment for the Proposed Waikane Golf Course. The following responses are to your specific issues of concern.

The proposed project site has been analyzed according to the ALISH, SCS, and LSB classifications. Our overall evaluation of the soils is that they are not of good quality for large scale agricultural production. Although the ALISH classification identifies approximately 60% of the lands as Prime or Other, and 40% as unclassified, other considerations of the soils and site are unfavorable. Of the SCS categories I through III, defined as marginal to good, there are 167.5 acres of good agricultural lands (assuming irrigation). The remaining 337.5 acres are inadequate for crop production. The LSB classifications identify even more restrictive categories. Classes A through C represent good to marginal soils. The subject property has no A or B lands, but does have 146.6 acres of Class C lands.

Soil quality is only one factor in considering the agricultural viability of an area. Frank S. Scott Jr., Ph. D., prepared an agricultural feasibility study for the proposed project area. (His entire report will be included in Volume II of the Draft EIS.) In his analysis he considered criteria such as sales potential, ecological adaptation, economic viability, and the availability and cost of irrigation water.

He found 134 acres to be potentially available for crop production. However, considering all factors he concluded that:

1. Providing irrigation water for portions of the 134 acres would be exorbitantly expensive.

MR. YUKIO KITAGAWA
WAIKANE GOLF COURSE/87762.14
17 NOVEMBER 1988
PAGE 2

2. The suitable acres are small and scattered throughout the subject property requiring costly road and irrigation delivery systems, and rendering economies of scale nearly impossible.
3. Sales potential of selected crops that could be grown in Waikane depend on their ability to compete in the marketplace, that is to displace mainland imports as well as other locally grown market producers. This market is limited and farmers in the Waikane lands would be at a disadvantage in this competition.

The issue of the irrevocable loss of agricultural land is complex. Although it is not likely that a golf course would fail and then revert back to agriculture (open space or park use are probably more likely), it is one of the best alternative uses of agricultural land, and it does maintain open space in the area. There would not be an "irrevocable" loss of agricultural land by building a golf course. The land would keep its agricultural zoning, and could be put to agricultural use without, for example, requiring the removal of major improvements. On the contrary, it might be possible to adapt the golf course irrigation system for crop irrigation at little expense.

The fact that agricultural lands have been declining on Oahu during the past ten years, and that current supply of designated agricultural lands exceeds the demand on Oahu, raise further questions about the need for and viability of agriculture on the Waikane lands.

With respect to conformance of the project with the State Agriculture Functional Plan Implementing Action B (5)(c), the above study results show that the Waikane lands are not truly "important" in meeting the State's agricultural needs. Soils are mostly of marginal quality, the costs of establishing substantial agricultural operations are too high to be feasible, and there is more than ample supply of agricultural lands elsewhere to meet the anticipated demand. The preponderance of evidence indicates that the area need not be retained in the State Agricultural District. Nevertheless, it will be retained; construction of the golf course does not require a reclassification of this property.

Sincerely,

GROUP 70



Ralph Portmore, AICP
Associate

03941/ng

JOHN WAIHEE
GOVERNOR



YUKIO KITAGAWA
CHAIRPERSON, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

December 9, 1988

RECEIVED
DEC 15 1988

Mr. Ralph Portmore
Group 70
924 Bethel Street
Honolulu, Hawaii 96813

GROUP 70

Dear Mr. Portmore:

Subject: Draft Environmental Impact Statement (DEIS)
for Waikane Golf Course
Waikane Development Company
TMK: 4-8-04: por. 4
4-8-06: por. 8
Waikane, Koolaupoko District, Oahu
Area: approximately 505 acres

The Department of Agriculture has reviewed the three documents sent to us and offers the following comments.

The concerns expressed in our letter to you (dated November 7, 1988) on the subject project have been adequately addressed. We note that the Socio-Economic Impact Assessment indicates that the landowner will compensate a farmer for the termination of his agricultural activities.

Thank you for the opportunity to comment.

Sincerely,

Yukio Kitagawa
YUKIO KITAGAWA
Chairperson, Board of Agriculture

cc: OEQC



JOHN WAIHEE
GOVERNOR OF HAWAII



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

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

DEPUTIES

LIBERT K. LANDGRAF
MANABU TAGOMORI
RUSSELL N. FUKUMOTO

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

RECEIVED
DEC 19 1988

DEC 16 1988

GROUP 70

DOC. NO.: 4797E
FILE NO.: 89-283

The Honorable John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

SUBJECT: Draft Environmental Impact Statement for the Proposed
Waikane Golf Course Project
Waikane, Koolaupoko District, Oahu, Hawaii
TMKs: 4-8-4: 4, 5; 4-8-06: 8; 4-8-14: 4

Thank you for giving our Department the opportunity to
comment on this matter. We have reviewed the materials you
submitted and have the following comments.

Our Department's Historic Sites Section indicates that in
Section III, "Affected Environment," of the DEIS, the results of
the archaeological inventory survey are presented. A total of 29
sites were located. Of these, 9 have been recorded and are
considered "no longer significant". Of the remaining 20 sites, 12
were evaluated as significant under criterion 'd' for information
only and recommended for archaeological data recovery. Eight
sites were evaluated as significant under two or more criteria;
four of these were tentatively recommended for preservation and
the remaining four were definitely recommended for preservation.

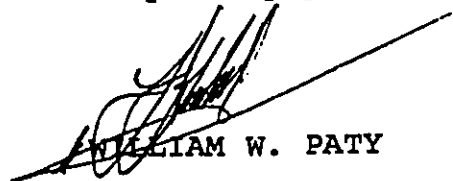
In Section IV, "Mitigation Measures," only two sites are
discussed. This section must reflect disposition plans for all 20
sites which are still significant under one or more National
Register criteria. For the 12 sites which are significant only
for information content, a data recovery plan must be prepared and
submitted to our Historic Sites office for review and approval.
For the 8 sites which are significant under two or more criteria,
a detailed preservation plan must be prepared and submitted to our
Historic Sites office for review and approval. Further, if the
recovery of human skeletal material is a distinct possibility, a
burial treatment agreement between our Historic Sites office, the
Office of Hawaiian Affairs and the developer should be negotiated
and signed.

Our Aquatic Resources Division remains concerned about two issues raised in response to an earlier EA prepared for this project: 1) the possible impacts of pumping on the flow rate of Waikane Stream, which contains significant numbers of o'opu nakea, o'opu naniha, aholehole and o'pae o'eha'a; and 2) erosion problems associated with the clearing of riparian vegetation.

Also, to address the dewatering concern, we suggest that a provision be included in the approval for immediate cessation of pumping should there be any reduction in stream flow below the instream flow standard. This should include well pumping for any reservoir, pond, or irrigation system of the project. To minimize erosion, all mitigative measures mentioned in Volume I, Section IV, Part D (page 72) of the EIS document should be implemented. Consideration should also be given to scheduling land clearing operations during the dryer periods of the year.

Please feel free to call me or Roy Schaefer of our Office of Conservation and Environmental Affairs, at 548-7837, if you have any questions.

Very truly yours,



WILLIAM W. PATY

cc: Ralph Portmore



9 January 1989

Francis S Oda AIA, Inc
Robert K.L. Wong AIA, Inc
Norman G Y Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc

Roy H Nihei AIA
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Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

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

Attn: Mr. William W. Paty, Chairperson

Gentlemen:

Subject: Waikane Golf Course EIS/87762-14

Thank you for your 16 December 1988 letter to the City and County Director of Land Utilization concerning the Environmental Impact Statement. The following responses are to your specific comments.

A. Historic Sites Mitigation

The mitigation measures recommended in the report "Archaeological Reconnaissance Survey and Limited Subsurface Testing for Waikane Golf Course" by Paul H. Rosendahl, Ph.D., Inc. will be followed.

The disposition plans for the 21 sites listed as significant will be included in the Revised EIS. Of the 12 sites designated as significant for information contents a data recovery plan is being prepared for those sites which will be affected by the golf course development.

With regard to the possibility of recovering human skeletal remains, a burial treatment agreement will be prepared and accepted before grading commences.

B. Impacts on Waikane Stream

Due to the density and alignment of the dike system in the area, we do not expect any impact on Waikane Stream flows from well pumpage. However, the developer has instituted a monitoring program on both Waikane and Waiahole Streams to determine if there will be any impacts due to pumpage from the project wells. If minimum instream flow standards are affected by the wells, pumpage will be reduced or terminated as determined by the Water Commission.

Department of Land and Natural Resources
9 January 1989
Page 2

The stream flow and environment will be preserved to the maximum extent possible. The cleaning of riparian vegetation and the removal or replanting of edge vegetation along the stream will be managed with the consultation of a stream biologist, as indicated in page 55 of the EIS.

C. Erosion

With regard to erosion, while there may be some temporary impacts during the grading and construction period after the golf course is developed, it is anticipated that long-term erosion impact on Waikane Stream will be reduced. It is also anticipated that better grounds management and landscaping, with proper planting and maintenance of stream edge vegetation will reduce offsite runoff and erosion.

With regard to the suggestion of scheduling land clearing operations during the drier periods of the year, this will be done where possible. However, due to the long construction time period (16-20 months) and the high cost of delay, other erosion control measures will also be used as indicated in page 72 of the EIS.

Thank you again for your suggestions and comments. Please feel free to call either me or George Atta (523-5866) if you have any further questions or concerns.

Sincerely,

GROUP 70 LIMITED

Ralph Portmore

Ralph Portmore, AICP
Associate

05161/ksk

JOHN WAIHEE
GOVERNOR OF HAWAII

RECEIVED
FEB 8 1989
GROUP 70



JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

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

January 31, 1989

In reply, please refer to:
EPHSD

MEMORANDUM

To: Mr. John P. Whalen, Director
Department of Land Utilization, City & County of Honolulu

From: Deputy Director for Environmental Health

Subject: Draft Environmental Impact Statement (DEIS) for Waikane Golf Course Project

Thank you for allowing us to review and comment on the DEIS. We provide the following comments:

Wastewater Disposal

1. We are unable to verify the estimated average wastewater flow of approximately 20,000 gpd. Appendix B as indicated in the report as the base of calculation was not included in the report;
2. Wastewater treatment works must conform with the requirements of Hawaii Administrative Rules, Title 11, Department of Health, Chapter 62, Wastewater Systems, effective December 10, 1988; and
3. All technical details of the wastewater treatment works must be submitted to DOH for approval prior to construction.

Underground Injection Control (UIC)

1. The entire project site is located above the UIC line. Approximately half of the golf course is situated above the Board of Water Supply pass/no pass line.
2. A holding/mixing pond is proposed in the central portion of the golf course to receive treated sewage effluent and nonpotable water from three onsite wells. Treated sewage effluent mixed with nonpotable water is proposed to be used for irrigation below the pass/no pass line.
3. There is no mention of the characteristics of the holding/mixing pond. The design of the pond should not allow infiltration of the irrigation water into the subsurface. The pond lining must be made impervious. Periodic monitoring of the pond shall be conducted to insure that no leakage is occurring.
4. Several ponds are proposed in the golf course. Diversion of some surface runoff to the ponds is proposed. It is intended that the ponds will serve as detention basins to

Mr. John P. Whalen
January 31, 1989
Page 2

dampen peak runoff and limit the runoff quantity entering Waikane Stream and an unnamed stream to the south.

This point of reducing runoff into the streams is emphasized. Additional ponds throughout the golf course to provide more detention basins is recommended. The reduction of surface runoff to the streams means the reduction of possible fertilizer contamination of the streams.

Also emphasized is the grading and landscaping of the terrain to dramatically retard surface runoff to the streams; beyond what the natural land surface conditions already provide.

5. Monitoring wells shall be installed throughout the golf course, especially in areas downgradient from effluent irrigation and areas following drainage ways. The monitoring wells should be periodically sampled and tested for compounds associated with effluent irrigation, fertilizers and biocides. If any detrimental compounds are found, the owners must be made responsible to immediately correct the situation or face the possibility of shut-down.

Drinking Water Program

1. The State's potable water systems regulations, Chapter 20, Title 11, Administrative Rules, are not applicable to the proposed wells because the wells will be used for irrigation only. Chapter 20 will apply if the use of the wells changes to potable.
2. Land areas above the UIC line are considered to contain underground sources of drinking water. Activities associated with golf courses should not be allowed to contaminate groundwater. Activities of concern include:
 - a. Storage of fuel for golf carts
 - b. Maintenance facilities
 - c. Sewage disposal facilities
3. The water supply for the proposed project will be separated into two separate water systems: the potable water system and the nonpotable water system. These lines should be clearly identified in order to prevent unintentional consumption of nonpotable water and appropriate steps taken to prevent any cross-connection of the two systems.

Please contact the Drinking Water Program at 548-2235 for questions on the above comments.

Vector Control

1. Ponds holding a mixture of half sewage effluent and clean water are ideal breeding sites for midges. Every golf course in Hawaii using effluent water for irrigation have been subjected to complaints of intolerable midge nuisance from the public.

Mr. John P. Whalen
January 31, 1989
Page 3

2. Our studies have shown that insecticides are not an effective or desirable means of control of midges in these ponds. I recommend that the ponds be stocked with guppies (Poecilia reticulata) and tilapia. Guppies are predators of the immature stages of midges while tilapia eat the algae upon which the midges feed. It is important that only these two fish are stocked. Other fish, such as mosquito fish, Gambusia affinis, do not feed on midges and will eliminate the guppy through predation.

In addition to the above comments, attached are 11 standard conditions applicable to all new golf course developers. The developer should also address and meet these conditions.



BRUCE S. ANDERSON, Ph.D.

Attachment

cc: Ralph Portmore, Group 70 ✓
Board of Water Supply
Dept of Land & Natural Resources

JOHN WAIHEE
GOVERNOR OF HAWAII



JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EPHSD

January 31, 1989

ELEVEN (11) CONDITIONS APPLICABLE TO NEW GOLF COURSE DEVELOPMENTS

Conditions:

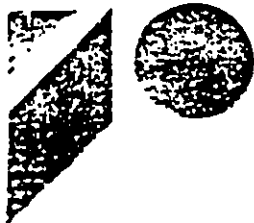
1. Owner/developer shall obtain a written statement from the Board of Water Supply regarding their intentions to utilize or not utilize groundwaters beneath and downgradient of the project site for potable drinking water, now and in the future.
2. Owner/developer shall obtain a written statement from the State Department of Land and Natural Resources that they will not issue any private water well permits beneath and downgradient of the project sites whose uses are intended for potable drinking water, now and in the future.
3. In the event that the Board of Water Supply and/or the Department of Land and Natural Resources considers the groundwaters below or downgradient of the project site to be, now or in the future, a source of potable drinking water, the owner/developer and all subsequent owners shall establish a groundwater monitoring plan and system which shall be presented to the State Department of Health for its approval. The groundwater monitoring plan and system shall minimally describe the following components:
 - a. A system of monitoring wells constructed throughout the site. These monitoring wells shall extend approximately ten (10) feet below the water table.
 - b. A routine groundwater monitoring schedule of at least once every six (6) months and more frequently, as required by the State Department of Health, in the event that the monitoring data indicates a need for more frequent monitoring.
 - c. A list of compounds which shall be tested for as agreed to by the State Department of Health. This list may include, but not be limited to the following: total dissolved solids; chlorides; PH; nitrogen; phosphorus; or any other compounds associated with fertilizers, biocides or effluent irrigation.
4. If Condition #3 is in effect, baseline groundwater data shall be established as described in this paragraph. Once the test well sites and list of compounds to be monitored for have been determined and approved by the State Department of Health, the owner/developer shall contract with an independent third-party professional (approved by the State Department of Health) to have the groundwater sampled and its data reported to the State Department of Health. Testing of the groundwater shall be done by a certified laboratory.

5. If Condition #3 is in effect and the data from the monitoring wells indicate the presence of the measured compound and/or the increased level of such compound, the State Department of Health can require the owner/developer or subsequent owner to take immediate mitigating action to stop the cause of the contamination. Subsequently, the developer/owner or subsequent owner shall mitigate any adverse effects caused by the contamination.
6. Owner/developer shall provide sewage disposal by means of connection to the public sewer system; or by means of a wastewater treatment works providing treatment to a secondary level with chlorination. Effluent from this wastewater treatment works may be used for golf course irrigation, subject to Condition #5. The entire system shall be approved by the State Department of Health.
7. If a wastewater treatment works with effluent reuse becomes the choice of wastewater disposal, then the owner/developer and all subsequent owners shall develop and adhere to a Wastewater Reuse Plan which shall address as a minimum, the following items:
 - a. Management Responsibility. The managers of the irrigation system using reclaiming wastewater shall be aware of the possible hazards and shall evaluate their system for public health, safety, and efficiency. They must recognize that contact with the reclaimed wastewater from treated domestic sewage poses potential exposure to pathogenic organisms which commonly cause infectious diseases (bacteria, viruses, protozoa, and helminths or worms).
 - b. General Recommendations
 - 1) Irrigated areas should be no closer than 500 feet from potable water wells and reservoirs.
 - 2) Irrigated areas should be no closer than 100 feet from any private residence.
 - 3) Application rates should be controlled to minimize ponding. Excess irrigation tailwater in the reclaimed wastewater irrigation area shall be contained and properly disposed. An assessment should be made of the acceptable time and rate of application based on factors such as type of vegetation, soil, topography, climate and seasonal variations.
 - 4) Effluent holding/mixing ponds shall be designed to prevent the infiltration of the wastewater into the subsurface. The holding/mixing ponds shall be made impervious.
 - 5) Irrigation shall be scheduled such that the public is not in the vicinity and the soil is sufficiently dry to accept the irrigation water.
 - 6) Permanent fencing or barriers shall be erected around polishing or holding ponds to prevent public entry or stray feral and tame animals from gaining access to the ponds.

- 7) Adequate irrigation records shall be maintained. Records should include dates when the fields are irrigated, rate of application, total application and climatic conditions. Records should also include any operational problems, diversions to emergency storage or safe disposal and corrective or preventive action taken.
 - 8) The holding/mixing ponds shall be periodically monitored for the purpose of detecting leakage into the subsurface. If leakage is detected, corrective action shall be immediately taken.
- c. Adequate Notice. Appropriate means of notification shall be provided to inform the employees and public that reclaimed wastewater is being used for irrigation on the site.
- 1) Posting of conspicuous signs with sufficient letter size for clear visibility with proper wording should be distributed around the use areas.
 - 2) Signs shall be securely fastened. Periodic surveillance shall be conducted to assure permanent posting at all times. Immediate replacements shall be made when necessitated by deterioration, vandalism or misuse.
- d. Adequate Employee Education. Employees or users should be cautioned and warned of the potential health hazards associated with the ingestion of reclaimed wastewater being used at the site.
- 1) Employees should be warned that the ingestion of reclaimed wastewater is unsafe.
 - 2) Employees should be protected from direct contact of the reclaimed wastewater. If necessary, protective clothing should be provided.
 - 3) Employees should be informed of the following:
 - o The irrigation water is unsafe for drinking or washing.
 - o Avoid contact of the water or soil with any open cuts or wounds.
 - o Avoid touching the mouth, nose, ear or eyes with soiled hands, clothes or any other contaminated objects.
 - o Be aware that inanimate objects such as clothes or tools can transport pathogenic organisms.
 - o Always wear shoes or boots to protect feet from the pathogenic organisms in the soil or irrigation water.
8. Use of electrical golf carts is recommended. It is recognized that underground storage tank(s) to store gasoline for gas driven golf carts will impose potential risks to the groundwater. If gasoline-driven golf carts are to be utilized, the developer/owner must meet all federal requirements in the installation of any underground storage tank.

9. On- and off-site wells will be utilized for irrigation purposes only. Potable water will be accommodated by the Board of Water Supply transmission lines.
10. Buildings designated to house the fertilizer and biocides shall be bermed to a height sufficient to contain a catastrophic leak of all fluid containers. It is also recommended that the floor of this room be made waterproof so that all leaks can be contained within the structure for cleanup.
11. A golf course maintenance plan and program will be established based on "Best Management Practices (BMP)" in regards to utilization of fertilizers and biocides as well as the irrigation schedule. BMP's will be revised as an ongoing measure. The golf course maintenance plan will be reviewed by the State Department of Health prior to implementation.

If there are any questions regarding the eleven (11) conditions mentioned here, please contact Mr. James K. Ikeda at 548-6455. We ask your cooperation in the protection of Hawaii's valuable groundwater resource.



15 February 1989

Francis S Oda AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc

Roy H Nihei AIA
Linda M Aniya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Attn: Mr. Bruce Anderson, Ph.D.
Deputy Director for Environmental Health

Gentlemen:

Subject: Draft Environmental Impact Statement for Waikane
Golf Course Project/87762-14

Thank you for your January 31, 1989 letter to the City and County Director of Land Utilization concerning the draft environmental impact statement. The following responses are to your specific comments.

Wastewater Disposal:

1. The wastewater generation number of 20,000 gpd was based on the estimated water demand for the facility. The water demand calculations are shown in Appendix C, page 6, "Water Supply Report" which shows a total demand of 24,950 gpd. Of this 6,000 gpd is projected for the residences on the Roberts kuleana and the church. These users will be hooked up to the same water system but will not be hooked into the wastewater treatment facility. Therefore, the wastewater treatment plant is being designed for 20,000 gpd instead of the 25,000 gpd projected for the total water system demand.
2. The plant design and operation will conform to the new departmental rules for treatment works which are effective December 10, 1988.
3. The technical details of the wastewater facilities will be submitted to the DOH prior to construction.

MR. BRUCE ANDERSON, Ph.D
WAIKANE GOLF COURSE EIS/87762-14
15 FEBRUARY 1989
PAGE 2

Underground Injection Control (UIC):

1. All applicable regulations regarding the Board of Water Supply (BWS) no pass line and the State's UIC line will be complied with.
2. The effluent storage pond and the irrigation pond will be adjacent to each other but will be separated. The effluent storage pond will be lined with impervious material to prevent percolation and seepage into the ground. The mixed irrigation water will be used on areas below the no pass line. The effluent is expected to account for approximately 2 percent of the total golf course irrigation water supply. Because of the treatment and the dilution of effluent with the well water, it is expected that no contamination will occur.
3. As mentioned above, the effluent storage pond will be lined by an impervious layer. The pond will be monitored to prevent leakage into the groundwater.
4. The point of detention ponds and the retardation of surface runoff is a concept and goal the project has already set. Various retention and detention features will be added to the golf course as we enter the design development stage. Cart paths will be used as swales to retain water. Vegetation and landscaping will be used extensively to prevent erosion, minimize runoff and retard surface flow. Additional depressions and low lying areas will be designed into the course to minimize impact during storm conditions.
5. Consultant studies have been completed to evaluate the potential impact of fertilizers and pesticides on groundwater and down gradient environmental features and resources. The siting and placement of these wells will be done after further evaluation of the need and appropriate locations have been established.

Drinking Water Program:

1. At this time there are no plans to convert these wells for potable water use.
2. The caution regarding this design and siting of the fuel storage for carts, the maintenance facilities and the sewage disposal facilities is understood. The architects and engineers involved in the design and construction of these facilities have been informed of the department's concerns and will incorporate safeguards to prevent groundwater contamination.
3. The concern about cross connections and mixing of potable and non-potable water system is acknowledged. Proper labeling and system separation will be designed into the system.

MR. BRUCE ANDERSON, Ph.D
WAIKANE GOLF COURSE EIS/87762-14
15 FEBRUARY 1989
PAGE 3

Vector Control:

1. The concern about midge nuisance is also acknowledged. Your suggestions of pond stocking with guppies and tilapia will be investigated. Other types of fish such as koi and goldfish will be reviewed as potential candidates. In any case appropriate measures will be taken to eliminate any potential problems with midges.

Eleven Standard Conditions:

The standard conditions attached to your letter have been noted. The golf course will be developed and operated in compliance with all applicable conditions and standards.

Thank you for your comments and concerns.

Sincerely,

GROUP 70 LIMITED

Ralph Portmore

Ralph E. Portmore, AICP
Vice President for Planning

cc: Norman Quon

RECEIVED

JAN 13 1966

GROUP 70

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HWY-PS
2.4518

Mr. John P. Whalen
Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Draft EIS for the Proposed Waikane Golf Course

We have the following comments on the subject Draft EIS:

1. The developer should implement the recommendation in the EIS that a left turn storage lane be provided on Kamehameha Highway. Also, intersection improvements should include a separate right turn lane onto Kamehameha Highway. A 20-foot setback from the existing R/W line should be provided to allow for this intersection improvement and for future widening of Kamehameha Highway.
2. The EIS should also discuss the impact of the project at the Kaupoa Road/Kamehameha Highway intersection.
3. On page 27 of the Drainage Report, the report should refer to the new City and County Drainage Standards. Surface water runoff from the new access roads should be addressed during final design. Concentration of water runoff onto Kamehameha Highway will not be allowed.

Mr. John P. Whalen
Page 2

HWY-PS -2.4518

6. Construction Plans for all work done within our highway rights-of-way must be submitted to us for our review and approval. All cost incurred for the above work shall be borne by the developer.
7. Developer shall implement required highway improvements before or at the same time as the development.

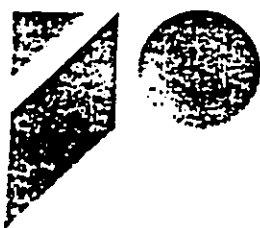
Very truly yours,



Edward Y. Hirata
Director of Transportation

FC:gf

cc: HWY-DD, -T, -C, -PS
Ralph Portmore (Group 70)



2 February 1989

Francis S Oda AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc

Roy H Nihei AIA
Linda M Aniya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, HI 96813

Attn: Mr. Edward Y. Hirata, Director

Gentlemen:

Subject: Waikane Golf Course Draft EIS

Thank you for your 17 January 1989 letter to the Director of Land Utilization concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

The left turn storage lane described in the Draft EIS will be constructed, as well as the separate right turn lane onto Kamehameha Highway. The detailed design and approvals will be completed after discussions and agreements have been reached with your department. The easement for the future widening of Kamehameha Highway will be respected.

The Revised EIS will describe the impact of the project on the Haupoa Road intersection.

Regarding drainage, the project system will be designed to retain storm water on site as much as possible by incorporating retention ponds and detention features into the golf course design. The net effect will be lower peak run off volumes than currently exists under storm conditions. Runoff will not be channelled onto Kamehameha Highway. More detailed descriptions of the drainage system and the appropriate City and County drainage standards will be referenced in the Revised EIS.

With regard to the highway improvements, as stated above, we will apply for the necessary approvals as we enter design development.

MR. EDWARD Y. HIRATA, DIRECTOR
WAIKANE GOLF COURSE/87762.14
2 FEBRUARY 1989
PAGE 2

All costs for the improvements will be borne by the developer.
Additionally, these improvements will be implemented before the
opening of the Waikane Golf Course.

Thank you for your comments.

Sincerely,

GROUP 70 LIMITED

Ralph Portmore
Ralph Portmore, AICP
Associate

06451/sy

cc: Norman Y. Quon, AIA

JOHN WAIHEE
GOVERNOR



RECEIVED
JAN 12 1989
GROUP 70

JOSEPH K. CONANT
EXECUTIVE DIRECTOR

STATE OF HAWAII
DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT
HOUSING FINANCE AND DEVELOPMENT CORPORATION
P. O. BOX 29360
HONOLULU, HAWAII 96820-1760

IN REPLY REFER

TO:

89:PLNG/74B JT

January 9, 1989

MEMORANDUM


TO: The Honorable John P. Whalen, Director
Department of Land Utilization

FROM: Joseph K. Conant, Executive Director

SUBJECT: Draft Environmental Impact Statement (EIS) for the
Proposed Waikane Golf Course Project

We have reviewed the subject draft EIS and have no comments to offer.

Thank you for the opportunity to comment.



JOSEPH K. CONANT
Executive Director

cc: Mr. Ralph Portmore, Group 70.

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2 1988

. GROUP. 70

(P)2050.8

NOV 30 1988

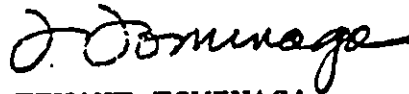
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: Draft Environmental Impact
Statement for the Proposed
Waikane Golf Course Project

We have reviewed the subject document and have no
comments to offer.

Very truly yours,



TEUANE TOMINAGA
State Public Works Engineer

LO:jk
cc: Mr. Ralph Portmore



University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

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JAN 10 1989

GROUP 70

January 9, 1989
RE: 0516

Department of Land Utilization
650 South King Street
Honolulu, Hawaii 96813

Gentlemen:

Draft Environmental Impact Statement
Waikane Golf Course Project
Waikane, Koolaupoko District, Oahu

The proposed project involves the development of a 27-hole golf course with the attendant facilities, a clubhouse (including an outdoor swimming pool and four tennis courts), driving range, maintenance building, and related infrastructure. Approximately 39 acres of the property are located within the Special Management Area (SMA).

The Environmental Center has reviewed the above referenced document with the assistance of P. Bion Griffin, Anthropology; Marion Kelly, Ethnic Studies; Paul Jokiel, Hawaii Institute for Marine Biology; and Nancy Kanyuk, Environmental Center.

We would like to commend the preparers of the Draft EIS on the comprehensiveness of this document. The appendices provided thorough documentation of most of the issues identified. However, two areas of major concern have been noted by our reviewers.

Socio-economic impacts

Our reviewers have expressed concern that the construction of a golf course in a relatively undeveloped, rural area will promote use of agricultural lands for residential and/or resort development. This sentiment has been vigorously echoed by members of the community, who have actively lobbied for the preservation of Waiahole-Waikane as a primarily agricultural area (Appendix E, p. 9). It is feared that development of a golf course will trigger residential development, thereby decreasing agricultural land in production, and increasing tax assessments on surrounding agricultural lands.

AN EQUAL OPPORTUNITY EMPLOYER

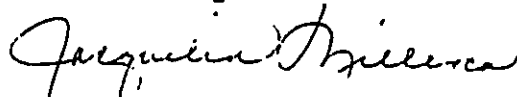
January 9, 1989

Non-potable Water

Community concern has also been expressed as to the fate of the wetlands immediately adjacent to the proposed development, considering the importance of such areas as wildlife habitats. The Draft EIS proposes the drilling of three non-potable source wells for irrigation and fire protection. The document suggests that "the proposed wells were located to minimize loss of groundwater to Waikane Stream by capturing a portion of groundwater lost to the wetlands." Unfortunately since, as the document states, "the marshes are sustained both by diffuse groundwater seepage and runoff from streams" (Appendix D, p. 5) the result will be that water pumped from the proposed non-potable wells will either reduce stream flow or groundwater flowing to the marsh areas. According to the hydrologist's groundwater report (Appendix D) "whether or not Waikane Stream will be affected by well pumpage will not be quickly or easily determinable" (p. 6). Hence, the potential impacts of the development, in particular the three wells, on either the wetlands or Waikane stream are uncertain. Because Waikane Stream has considerable ecological value, it is essential that adequate monitoring procedures be established to assure that the impacts are minimized.

Thank you for the opportunity to comment on this Draft EIS. We hope our comments will be helpful in preparing the final document.

Yours truly



Jacquelin Miller
Associate Environmental Coordinator

cc: OEQC
L. Stephen Lau
Ralph Portmore
Bion Griffin
Marion Kelly
Paul Jokiel
Nancy Kanyuk



2 February 1989

Francis S Oda AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hirosi Hida AIA, Inc

Roy H Nihei AIA
Linda M Aniya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

University of Hawaii
Crawford 317, 2550 Campus Road
Honolulu, HI 96822

Attn: Ms. Jacquelin Miller

Gentlemen:

Subject: Waikane Golf Course Draft EIS

Thank you for your 9 January 1989 letter to the City and County Director of Land Utilization concerning the Environmental Impact Statement. The following responses are to your specific comments.

Socio-Economic Impact

The basic concern about golf course development increasing development pressure on agricultural lands needs to be reviewed on several levels: First, the connection between golf course development and the rise in agricultural land values; second, the fear that any kind of development will increase the pressure on agricultural land; and finally, the perception of many people that all agricultural land is essentially the same and the experience on one area is applicable to others.

The first step should be a recognition that this is a premise and a perception which should be evaluated. Due to the lack of truly comparable data for analysis, the development engaged consultants to look into the question. Dr. Michael Sklarz of Locations, Inc. conducted a search of historic sales and evaluation of the impact of golf course development on property values. His analysis showed no significant correlation between golf course development and the rise in land values. Community Resources, Inc. surveyed realtors and sales data of properties near existing golf courses similar to the one planned for Waikane. There was no consensus or agreement among professionals as to the real impact of golf course development on surrounding land prices. Representatives of the City and County's Department of Finance, which assesses real property for tax purposes, indicated that the department does not add a premium if there is a golf course adjacent to agricultural land.

MS. JACQUELIN MILLER
WAIKANE GOLF COURSE/87762.14
2 FEBRUARY 1989
PAGE 2

The second issue of the general fear of development is more complex. It is true that development in general has created both the demand and the competition which have helped to raise property values in general. However, if this fear is to be addressed, all development, not just golf courses, should be controlled. Public policies need to balance the competing public interests that are encompassed by this fear and not single out golf course development.

The third source of concern is based on a misconception. Not all agricultural lands are alike. Not all AG-2 lands are alike in physical characteristics, susceptibility to urban pressures, or the political context or regulations which protect them. Due to the public policy for the area and the community in which it is located, it is very likely that the remaining agricultural lands in the Waiahole-Waikane area will be preserved in agricultural use. The Waiahole-Waikane Community Association supports the project and sees the golf course as a community project which would take pressure off the area for more intense residential development, as has been proposed in the past. These issues are discussed more fully in Appendices E and R of Volume II of the Draft EIS. The Revised EIS will also discuss these issues more fully.

Non-potable Water

The concerns about the wetlands and Waikane Stream are recognized. A botanical survey (K. Nagata) and terrestrial vertebrate study (A. Berger) were conducted for the project (Appendices N and O). Vegetation in the area is neither endangered nor unique. The area has been disturbed by man for well over a hundred years and there is little that is unique that requires special attention. The vertebrate survey found no evidence of the wetlands being used by native waterbirds. There is no permanent open water area in the designated wetlands which would attract such birds.

As you and the Draft EIS noted, the impact of well pumpage on the wetlands is uncertain and difficult to assess at the present time. It should also be noted that with the water being used for irrigation and fireflow purposes, much of it will percolate back into the ground, where it will join the seepage that feeds the stream and the wetlands. Additionally, stream monitoring data indicate the bulk of Waikane Stream water is drawn from watersheds mauka of the existing stream gage at the 75 foot level. This places the source above the dike system from which the proposed wells will draw their water. Therefore, impact on stream flow should be minimal.

MS. JACQUELIN MILLER
WAIKANE GOLF COURSE/87762.14
2 FEBRUARY 1989
PAGE 3

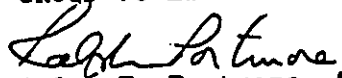
However, recognizing the critical importance of the stream for aquatic biota and the downstream agricultural users, a stream monitoring program is being developed and will be implemented. If it is found that there is a significant impact on the stream due to the wells, pumpage will be reduced or stopped as necessary. It should be recognized that, except for what is lost through evapotranspiration, essentially all remaining water will percolate back into the ground where it will replenish the aquifer, the marsh or stream.

As a final note, the conditions of the well permits require monitoring of the streams. Also, instream standards adopted by the Board of Land and Natural Resources will require the maintenance of instream flow at 100% of median historic flows.

Thank you for your comments and concerns.

Sincerely,

GROUP 70 LIMITED


Ralph E. Portmore, AICP
Associate

06481/sy

cc: Norman Y. Quon, AIA

STATE OF HAWAII
DEPARTMENT OF LAND UTILIZATION
OFFICE OF THE DIRECTOR
3041 DIAMOND DRIVE, HONOLULU, HAWAII 96813-4495

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NOV 29 1988

GROUP 70

NOV 23 1988

Engineering Office

Department of Land Utilization
650 S. King Street
Honolulu, HI 96813

Dear Gentlemen:

Waikane Golf Course Project
Waikane, Koolaupoko District, OA
Applicant action

Thank you for providing us the opportunity to review the subject project.

We have no comments to offer at this time regarding this project.

Sincerely,

signed

Jerry H. Matsuda
Major, Hawaii Air
National Guard
Contr & Engr Officer

cc: Ralph Portmore



STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
1600 KAPIOLANI BLVD., SUITE 1500
HONOLULU, HAWAII 96814
(808) 548-8960
(808) 946-2642

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GROUP 70

December 9, 1988

C-88-0013

Mr. John Whalen, Director
Dept. of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Subject: Draft EIS: Waikane Golf Course Project, Waikane, O'ahu
TMK: 4-8-04: por. 4 and 4-8-06: por. 8

Dear Mr. Whalen:

Thank you for the opportunity to review the proposed undertaking. We appreciate the effort that has gone into producing this Draft EIS and find it to be well written and comprehensive.

The proposed undertaking will reduce the amount of agricultural lands potentially available for small farms and diversified agriculture, and further limit the options of Hawaiians who seek to maintain or pursue rural occupations or lifestyles. This is always a concern of the Office of Hawaiian Affairs whenever rural lands are converted to golf courses, which are an urban commercial and recreational use.

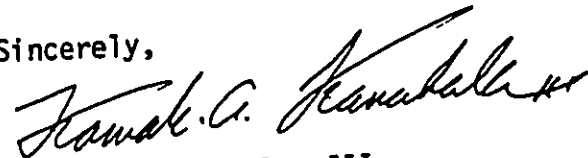
In recent years the National Register program has shown an interest in preserving rural landscapes as an important historical and cultural resource. There are few eligible areas left on the island of O'ahu, but the ahupua'a of Waikane is one of them. The valley's potential eligibility as an important rural landscape should be recognized, and the loss to our historic preservation program acknowledged.

A recurring matter of concern to Hawaiians is access to the ruins of heiau sites. It would be appropriate for this Draft EIS to present a proposal for developing access to the heiau ruins on the subject property, and a plan for maintaining those sites for community use and enjoyment. This would be considered a mitigating measure.

Mr. John Whalen, Director
December 9, 1988
Page 2

If any further archaeological work is conducted on this project, please
send our office a copy of the report.

Sincerely,



Kamaki A. Kanahale, III
Administrator

KAK:EN:klr

cc: Ralph Portmore, Group 70



9 January 1989

Francis S Oda AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc

Roy H Nihei AIA
Linda M Aniya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

Office of Hawaiian Affairs
1600 Kapiolani Boulevard, Suite 1500
Honolulu, Hawaii 96814

Gentlemen:

Subject: Waikane Golf Course EIS/87762-14

Thank you for your 9 December 1988 letter to the City and County Director of Land Utilization concerning the Environmental Impact Statement for the proposed Waikane Golf Course. The following responses are to your specific concerns.

We appreciate your concern about the loss of agricultural land potentially available for small farms and diversified agriculture. However, feasibility studies and practical considerations have shown the subject lands to be uneconomical for agricultural production. An agricultural subdivision which might have been marginally feasible has been rejected by the City in the past. The topography and market conditions create major constraints to other types of farming on the site. Considering all factors, we feel that a golf course is compatible with the agricultural uses and general ambiance of the area. Besides landbanking, it is one of the better alternate methods for retaining open space with potential for future agricultural use.

Regarding your concern for the preservation of rural landscapes, we feel golf course use is compatible. The open space, extensive landscaping and low intensity of use are characteristics of rural landscapes shared by golf courses. Additionally, the clubhouse building is being designed by Vladimir Ossipoff, the foremost practitioner of the modern Kamaaina architectural style. The building will be integrated into the local setting, and its design will be compatible with local architecture and the area's rural character. The golf course development will be set back a significant distance from Kamehameha Highway. Wetland areas border the project along Kamehameha Highway and provide a visual barrier from public roadways. Alternative uses for these wetland areas proposed by community groups include a community park and wetland agriculture. The developer is open to either suggestion or retaining them in their present state. Due to setback distances, topography and landscaping, the golf course and clubhouse will have very low visibility and will mesh elegantly with the rural landscape.

Office of Hawaiian Affairs
9 January 1989
Page 2

On the final suggestion of access to the heiau site, the developer is willing to work with you and the community in determining the most appropriate course of action. Although the heiau is on the project parcel, it is in an area that will not be developed. As such, issues such as provision of parking and access easements, impact on neighbors, maintenance of the site, problems with vandalism, liability, and other related questions need to be resolved. We will also continue to keep your office informed of any reports regarding archaeological work on the project site.

Thank you again for your suggestions and comments.

Sincerely,

GROUP 70 LIMITED

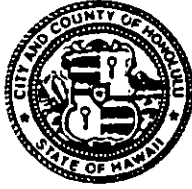
Ralph Portmore
Ralph Portmore, AICP
Associate

05171/ksk

BUILDING DEPARTMENT
CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR



HERBERT K. MURAOKA
DIRECTOR AND BUILDING SUPERINTENDENT

PB 88-1043

November 25, 1988

MEMO TO: MR. JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: HERBERT K. MURAOKA
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: WAIKANE GOLF COURSE PROJECT
TAX MAP KEYS: 4-8-4:4; 4-8-6:8; AND 4-8-14:4

88 NOV 29 AM 7 58
DEPT OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

We have reviewed the draft EIS for the Waikane Golf Course project and have no comments.

Thank you for the opportunity to review the document.


HERBERT K. MURAOKA
Director and Building Superintendent

cc: J. Harada

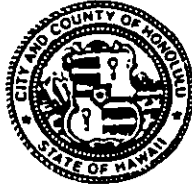
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4161

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GROUP 70

FRANK F. FASI
MAYOR



MIKE MOON
DIRECTOR
Michael N. Scarfone
DEPUTY DIRECTOR

December 2, 1988

MEMORANDUM

TO: John P. Whalen, Director
Department of Land Utilization

FROM: Mike Moon

SUBJECT: Draft Environmental Impact Statement
Waikane Golf Course Project

We have reviewed the subject Draft Environmental Impact Statement and have no comments.

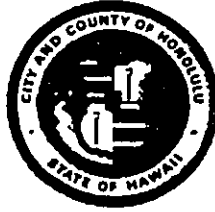
for 
MIKE MOON
Director

✓ cc: Mr. Ralph Portmore
Group 70
942 Bethel Street
Honolulu, Hawaii 96813

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

FRANK F. FASI
MAYOR



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JAN 09 1989

GROUP 70.

JOHN P. WHALEN
DIRECTOR

BENJAMIN B. LEE
DEPUTY DIRECTOR

88/EIS-5(BM)
88/SMA-67

January 6, 1989

Mr. Ralph Portmore
Group 70
924 Bethel Street
Honolulu, Hawaii 96813

Dear Mr. Portmore:

Draft Environmental Impact Statement (DEIS) for the Proposed
Waikane Golf Course
Waikane, Koolaupoko, Oahu
Tax Map Keys 4-8-4: Por. 4; 4-8-06: Por. 8

The Department of Land Utilization (DLU) has reviewed the DEIS for the proposed Waikane Golf Course and has the following comments:

1. Relationship to Existing Policies and Plans for the Area.

The DLU has recently recommended that the City Council institute an interim development control for the construction of golf courses in the AG-2 General Agricultural District.

This proposal was made in response to concerns that the cumulative effects of the proliferation of golf courses may adversely affect the local farming community, increase housing development costs, and escalate the price for undeveloped land. A discussion of this proposed moratorium, and the concerns raised in the proposed moratorium should be included in the EIS.

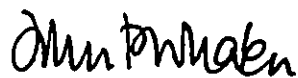
2. Relationship to Coastal/Natural Resources.

A discussion of the wetland areas, and whether wetland or non-wetland bird species utilize these wetland areas should be included in the EIS.

Mr. Ralph Portmore
Page 2
January 6, 1989

Thank you for the opportunity to comment. If you have any questions regarding these comments, you may contact Bennett Mark of our staff at 527-5038.

Sincerely yours,

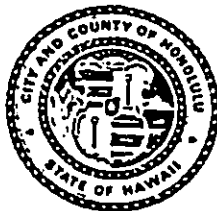


JOHN P. WHALEN
Director of Land Utilization

JPW:nt
0235N

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

FRANK F. FASI
MAYOR



JOHN P. WHALEN
DIRECTOR

December 19, 1988

Honorable Arnold Morgado, Jr., Chair
and Members of the City Council
City and County of Honolulu
Honolulu, Hawaii

Dear Chair Morgado and Councilmembers:

Subject: A BILL TO REGULATE FOR AN INTERIM PERIOD THE CONSTRUCTION OF
GOLF COURSES IN THE AG-2 GENERAL AGRICULTURAL DISTRICT

Attached for your consideration is a proposed bill to regulate for an interim period the construction of golf courses in the AG-2 General Agricultural District.

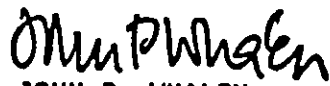
In the last twenty-four (24) months, there has been an unprecedented number of proposals for the development of golf courses on Oahu. Presently, there are applications or inquiries for 30 golf courses covering a total of more than 5,000 acres (see attached summary). Since most of the proposed sites are in the AG-2 General Agricultural District, they require only a conditional use permit, involving no public hearing or comprehensive review of land use policy issues. Yet, the cumulative effect of these proposals has the potential of significantly altering the price of agricultural land. This will not only hurt the local farming community, but could also increase housing development costs, as the price for undeveloped land escalates.

It is difficult to evaluate the cumulative effect of these golf courses, because permit applications are submitted on a case-by-case basis. For this reason, it is imperative that the City institute an interim development control to allow for a more detailed analysis of this phenomenon and the consideration of permanent land use controls which address the specific problems that these projects create.

Honorable Arnold Morgado, Jr., Chair
and Members of the City Council
Page 2

We offer the full cooperation of the administration in reaching a solution to
this problem that is workable, legal and fair.

Very truly yours,



JOHN P. WHALEN
Director of Land Utilization

JPW:ey
0903L
Attachments

Jeremy Harris

JEREMY HARRIS
Managing Director

FRANK F. FASI

FRANK F. FASI
Mayor

SUMMARY

GOLF COURSES -- OAHU 1988

EXISTING

Number of Public Golf Courses	4	(Mahuku Golf Course proposed for expansion from 9 to 18 holes)
Number of Private Golf Courses (Allows public play)	9	(Hawaii Kai and Makaha each have two 18 hole courses)
Number of Private Golf Courses (Members only)	4	(Maialae Country Club, Oahu Country Club, Mid-Pacific Country Club, Honolulu International Country Club)
Number of Military Golf Courses	<u>7</u>	
Total	24	

PROPOSED

Number of Public Golf Courses Proposals	2
Number of Private Golf Course Proposals (36 holes), were submitted as one application, but counted as two.	<u>17</u>
SUBTOTAL	19
Number of Private Inquiries	<u>4</u>
TOTAL	23

Breakdown of Private Proposals:

No. of 18 Hole Courses	13
No. of 27 Hole Courses	2
No. of 36 Hole Courses	3
No. of 54 Hole Courses	<u>1</u>
	19

Includes the following:

4 Private Proposals Approved

- Royal Hawaiian Country Club(CUP)
- Puuloa Golf Course (CUP)
- Ewa Golf Course(CUP)
- Minami Golf Course(CDUA)

2 public proposals (under construction)

- West Loch
- Kapolei

ACREAGE INVOLVED (APPROXIMATE) (Does not include 4 preliminary inquiries involving 746 acres in AG-1/AG-2 zoning)

AG-1/AG-2 Lands	-	4,262 Acres
P-1 Lands	-	240 Acres
P-2 Lands	-	507 Acres

PROPOSED GOLF COURSES - OAHU 1988

<u>PROJECT</u>	<u>TAX MAP KEY</u>	<u>ACRES</u>	<u>LANDOWNER</u>	<u>DEVELOPER</u>	<u>ZONING</u>	<u>STATUS</u>
Ewa Gentry Golf Course (18 holes)	9-1-12: 29	170	Campbell Estate	Gentry Pacific Corp.	AG-1	Pending SIUC boundary adjustment.
Puuloa Golf Course (18 holes, 9 holes approved)	9-1-1: 6, 27	133.5 (77 acres approved under CUP)	H. Horita Realty Puuloa Homes Inc.	H. Horita Realty Puuloa Homes Inc.	AG-2/R-5	CUP for 77 acres approved 9/26/88. Rezoning for 56.6 acres being processed.
Ewa Golf Course (27 holes)	9-1-10: 6, Por. 7	270	Campbell Estate	Myers Corp.	AG-2	CUP approved 10/7/88.
Makakilo Golf Course (18 holes)	9-2-3: Por. 18	232.5	Campbell Estate	Finance Realty	AG-2	CUP application rejected; water issue.
Kapolei Golf Course (18 holes)	9-1-16: 23, 25	200	Campbell Estate	Hawaii Housing Authority	AG-1	Exempted under Act 15.
Ko'Oliina Golf Course #1 (18 holes)	9-1-14: Por. 2 9-1-15: 3, 6, 7, 10, Por. 4 9-2-3: 2, 3, 7	171	West Beach Estates	West Beach Estates	P-2	Zoning approved 3/11/86.
Ko'Oliina Golf Course #2 (18 holes)	9-1-14: Por. 2 9-1-15: 3, 6, 7, 10, Por. 4 9-2-3: 2, 3, 7	160	West Beach Estates	West Beach Estates	Undetermined	Preliminary Inquiry: DP and zoning required.
West Loch Golf Course (18 holes)	9-1-17: Por. 6 9-1-20: 19, Por. 4 9-1-21: 15, 21, Por. 16, 17, 25 9-1-22: 6-11, Por. 2, 4, 5, 13	197	Campbell Estate	City and County of Honolulu	AG-1	SUP approved; public u

Maianae

<u>PROJECT</u>	<u>TAX MAP KEY</u>	<u>ACRES</u>	<u>LANDOWNER</u>	<u>DEVELOPER</u>	<u>ZONING</u>	<u>STATUS</u>
Maii Kai Golf Course (18 holes)	8-7-10: 2, 14	160	Kaiser Cement Co.	Kaiser Cement Co.	AG-2	CUP application rejected; Ag and water issue.
Maianae Kai Golf Course (18 holes)	8-5-3: 9, 10, 29 31, 32, 43	250	H. Horita Invest. Shinwa Golf Co.	H. Horita Invest. Shinwa Golf Co.	AG-2	CUP application rejected; water issue.
Lualualei Golf Course (18 holes)	8-7-9: 2	236	Sanjiro Nakode	Sanjiro Nakode	AG-2	Preliminary inquiry; Res. 88-115 denial; needs CUP.
Okukilolo Golf Course (18 holes)	8-3-1: Por. 13	190	Alpha Kai Corp.	Alpha Kai Corp.	AG-1	Preliminary inquiry; received opposition at H.B. meeting. Needs rezoning to AG-2 and Cur.

Central Oahu

<u>PROJECT</u>	<u>TAX MAP KEY</u>	<u>ACRES</u>	<u>LANDOWNER</u>	<u>DEVELOPER</u>	<u>ZONING</u>	<u>STATUS</u>
Maikela Golf Course (18 holes)	9-4-2: 3, 10, 11	142.2	Amfac Properties	Amfac Properties	P-2	Zoning approved 12/1/86.
Royal Kuni Golf Course (18 holes)	9-4-2: Por. 1, 17, 30	174	Halekua Develop.Co.	Halekua Develop.Co.	AG-1	DP amendment pending; needs rezoning to P-2.

North Shore

<u>PROJECT</u>	<u>TAX MAP KEY</u>	<u>ACRES</u>	<u>LANDOWNER</u>	<u>DEVELOPER</u>	<u>ZONING</u>	<u>STATUS</u>
Mokuleia Golf Course (18 holes)	6-8-3: 31, 34, Por. 5, 6, 11, 15, 40 6-8-2: Por. 6	160 (415)	Mokuleia Land Co.	Mokuleia Land Co.	AG-2	CUP application rejected; archaeological survey required.
Maialua Golf Course (18 holes)	6-4-1: 6 6-5-1: 2	214	Oceanic Prop. Inc.	Oceanic Prop. Inc.	AG-2	DP amendment pending; needs rezoning to P-2.

Koolaupoko

<u>PROJECT</u>	<u>TAX MAP KEY</u>	<u>ACRES</u>	<u>LANDOWNER</u>	<u>DEVELOPER</u>	<u>ZONING</u>	<u>STATUS</u>
Royal Hawaiian Country Club (36 holes)	4-2-8: Por. 1 4-2-9: Por. 1	300	Y.Y. Valley Corp.	Y.Y. Valley Corp.	AG-2	CUP approved 6/13/86.
Hinami Golf Course (18 holes)	4-5-42	240	Hinami Corp	Hinami Corp.	P-1	COUA approved 3/13/87.
Waikane Golf Course #1 (27 holes)	4-8-4: Por. 4 4-8-6: Por. 8	505	Waikane Develop.Co.	Waikane Develop.Co.	AG-2	DP amendment pending; needs rezoning to P-2.
Waikane Golf Course #2 (27 holes)	4-8-6: Por. 1,8	300	Undetermined	Undetermined	AG-1/AG-2	Preliminary inquiry.

Koolauloa

<u>PROJECT</u>	<u>TAX MAP KEY</u>	<u>ACRES</u>	<u>LANDOWNER</u>	<u>DEVELOPER</u>	<u>ZONING</u>	<u>STATUS</u>
Turtle Bay Expansion Golf Course (18 holes)	5-6-3: Por.40,42 5-7-1: 1, Por.13, 16,17 5-7-3: 1-25, Por. 26,28, 29,66,72, 73-75 5-7-6: 1-17,19,21	194	Kuilima Develop.Co.	Kuilima Develop.Co.	P-2	Zoning approved 8/14/86.
Lihl Lani Resort (Pupukea) Development (36 holes)	5-9-5: 38,82, Por. 38 5-9-6: 1,8,18, 24,3,7,6	430	Ohbayashi Hawaii Corporation State of Hawaii	Ohbayashi Hawaii Corp. State of Hawaii	AG-2	Pending SLUC application; needs rezoning to P-2 or CUP.
Pumamano Golf Course (54 holes)	5-6-05: 2,5,6, Por. 1,7 5-7-1: Por. 21	560	Campbell Estate	Campbell Estate	AG-1/AG-2	DP amendment pending; needs rezoning to P-2.
Maiaekahana Golf Course (36 holes)	5-6-6: 2, Por. 6 5-6-7: Por. 1	400	Campbell Estate	Campbell Estate	AG-2	DP amendment pending; needs rezoning to P-2.

0009N

ORDINANCE NO. _____

BILL NO. _____ (1988)

A BILL FOR AN ORDINANCE RELATING TO THE CONTROL FOR AN INTERIM PERIOD THE CONSTRUCTION OF GOLF COURSES IN THE AG-2 GENERAL AGRICULTURAL DISTRICT.

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

SECTION I. Purpose and Intent.

WHEREAS, the last twenty-four (24) months have witnessed unprecedented activity in the applications for private golf courses.

WHEREAS, there have been inquiries and preliminary plans presented to the Department of Land Utilization for more than 30 new golf courses on the island of Oahu, covering more than 5,000 acres, mostly in the AG-2 General Agricultural District.

WHEREAS, this large number of requests, and potential requests and the extent of the land area involved, raise significant questions of land use policy.

WHEREAS, it is difficult to evaluate the cumulative effect of these golf courses on agricultural uses because permit applications are submitted case-by-case and there is no way of being certain how many additional requests may be submitted in the future.

WHEREAS, the intensive, sudden surge of golf course development may have long-term effects on agricultural land prices and the feasibility of the agricultural sector of the economy that must be studied and carefully evaluated.

WHEREAS, the City Council may wish to establish special policies for private golf courses, including their availability for public play at affordable rates, or certain locational restrictions to avoid adverse effects on rural communities or small agricultural enterprises.

SECTION II. Scope of Controls.

- A. From the effective date of this ordinance until April 1, 1990, no building permits, grading permits, Special Management Area Permits, subdivision approvals or conditional use permits shall be approved or issued for any golf course in the AG-2 General Agricultural District, except as provided below.

B. Nothing contained in this ordinance shall be deemed to affect:

1. The processing, approval and granting of building permit applications which have been properly filed with the City's Building Department prior to the effective date of this ordinance.
2. Any building permit which was lawfully issued and is in effect on the effective date of this ordinance.
3. The granting of necessary permits to make a building or structure conform or comply with applicable laws or rules and regulations.
4. The granting of permits for maintenance, repairs and minor alterations.

SECTION III. Penalties.

Any person, firm, entity, or corporation constructing, erecting, enlarging, or altering structurally, any building or structure, or altering any landform in violation of the provisions of this ordinance shall be subject to the penalties and enforcement procedures set forth in the Revised Ordinances of Honolulu 1978, Chapter 21A (Land Use Ordinance).

SECTION IV. Validity.

The invalidity of any word, section, clause, paragraph, sentence, part or portion of this ordinance shall not affect the validity of any other part of this ordinance which can be given effect without such invalid part or parts.

SECTION V. This ordinance shall take effect upon its approval.

DATE OF INTRODUCTION:

Honolulu, Hawaii

APPROVED AS TO FORM AND LEGALITY:

Deputy Corporation Counsel

APPROVED this _____ day of _____, 1988.

FRANK F. FASI, Mayor
City and County of Honolulu

(DLU.0162L.12.14.88.)

11 10 9 8 7 6 5 4 3 2 1

2 February 1989

Francis S Oda AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc
Roy H Nihei AIA
Linda M Aniya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Attn: Mr. John P. Whalen, Director

Gentlemen:

Subject: Waikane Golf Course Draft EIS

Thank you for your 6 January 1989 letter concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

The concern about the adverse impact of a proliferation of golf courses on the island is recognized. The proposed moratorium is understood to be an interim solution while more permanent answers are sought. A discussion of the moratorium and the concerns and premises on which it is based will be included in the Revised EIS.

Descriptions and references to the wetlands are scattered through various parts of the report. A discussion of the avifauna population is found in the sections on terrestrial vertebrates. Both subjects are described in greater detail in the appendices on terrestrial vertebrates and agricultural use of the wetlands (Appendices "O" and "S"). A separate section on the wetland areas will be incorporated in the Revised EIS.

Thank you for your comments and concerns.

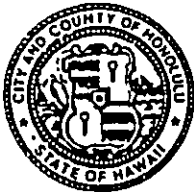
Sincerely,

Ralph Portmore
Ralph Portmore, AICP
Associate

06421/sy

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

450 SOUTH KING STREET
HONOLULU, HAWAII 96813



FRANK F. FASI
MAYOR

ALFRED J. THIEDE
DIRECTOR AND CHIEF ENGINEER
In reply refer to:
PRO 88-331(448)

December 8, 1988

MEMORANDUM

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: ALFRED J. THIEDE, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)
WAIKANE GOLF COURSE PROJECT
(TMK: 4-8-04: POR. OF 4 AND 4-8-06: POR. OF 8)

RECEIVED
DEC 13 1988

GROUP 70

We have reviewed the subject draft EIS and have the following comments:

1. Application for a private sewage treatment plant sludge disposal system permit should be submitted before sludge can be accepted by a City facility.
2. A certified operator is required to operate the proposed wastewater treatment facility (Chapter 340B HRS).
3. If the effluent is not acceptable for irrigation, what will be done to the effluent?
4. Drainage report is too general. A detailed stream study which includes inundation plans and flood profiles (before and after the floods) should be provided.
5. A detailed erosion control plan will be required at the time grading plans are reviewed.

Sam Callejo
For ALFRED J. THIEDE
Director and Chief Engineer

cc: /Mr. Ralph Portmore
Group 70



9 January 1989

Francis S Oda AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc

Roy H Nihei AIA
Linda M Anya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attn: Mr. Sam Callejo, Director

Gentlemen:

Subject: Waikane Golf Course EIS/87762-14

We have received your 8 December 1988 letter to the City and County Director of Land Utilization concerning the Draft Environmental Impact Statement for the Waikane Golf Course Project. The following responses are to your specific comments.

1. A private sewage treatment plant sludge disposal system permit will be applied for.
2. The golf course operator will hire a certified operator for the wastewater treatment facility.
3. The treatment plant is designed to clearly meet Department of Health Standards for irrigation water below the no-pass line. If the effluent is not acceptable it will be due to improper operation which is a correctable situation. The containment pond is designed with enough free board to store 14 deep of effluent. The engineering consultant feels that this is sufficient to correct any operational problems that may arise.
4. A detailed stream study, including inundation plans and flood profiles, will be provided when the project reaches the appropriate design phase. The golf course development is currently at the schematic and preliminary regulatory approval stage. Detailed plans will be completed at the design development stage and will be submitted at that time.

Department of Public Works
9 January 1989
Page 2

5. A detailed erosion control plan will be submitted with the grading plans.

Thank you for your comments and suggestions.

Sincerely,

GROUP 70 LIMITED

Ralph Portmore

Ralph Portmore, AICP
Associate

05141/ksk

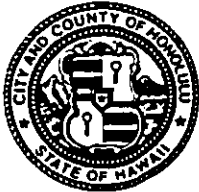
DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

'88 DEC 30 AM 10 08

FRANK F. FASI
MAYOR

DEPT OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU



JOSEPH M. MAGALDI, JR.

Acting Director
TE-7673
PL1.1367

December 29, 1988

MEMORANDUM

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: JOSEPH M. MAGALDI, JR., ACTING DIRECTOR

SUBJECT: WAIKANE GOLF COURSE PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TMK: 4-8-04: 4, 4-8-06: 8, & 4-8-14: 4

This is in response to a request for our comments on the above subject from the Office of Environmental Quality Control.

We have the following traffic concerns:

1. Access for existing residents should be kept open at all times.
2. All roadways and driveways entering Kamehameha Highway should have sufficient sight distances in both directions.
3. The proposed ownership of the interior roadways should be specified.

Should you have further questions, please contact Wayne Nakamoto of my staff at 523-4190.


JOSEPH M. MAGALDI, JR.



2 February 1989

Francis S Oda AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc

Roy H Nihei AIA
Linda M Aniya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

Department of Transportation Services
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

Attn: Mr. Joseph M. Magaldi, Jr., Acting Director

Gentlemen:

Subject: Waikane Golf Course Draft EIS

Thank you for your 29 December 1988 letter to the City and County Director of Land Utilization regarding the Draft Environmental Impact Statement. The following responses are to your specific comments and concerns.

Access for existing residents will be preserved. Access through Waikane Valley Road will remain open to residents of the Robert's kuleana, their guests, and for the church within the golf course property. Additionally, access will be provided for the vacant kuleana parcel adjacent to the wetlands. Access rights to lands mauka of the project site will be rerouted to the Haupoa Road extension. Haupoa Road will also serve as the access to the four lot agricultural subdivision being created to relocate existing tenants. The description of access rights will be expanded in the Revised EIS.

The improvements planned for the Waikane Valley Road intersection will improve sight distances in both directions. A more detailed description of the intersection changes will be included in the Revised EIS.

Both Waikane Valley Road and the Haupoa Road Extension will remain in private ownership. However, the improvements will be designed to city standards.

Thank you for your comments.

Sincerely,

GROUP 70 LIMITED
Ralph E. Portmore
Ralph E. Portmore, AICP
Associate

06471/sy

cc: Norman Y. Quon, AIA

GROUP 70 • Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 521-1111



COPY

December 22, 1988

RECEIVED
DEC 28 1988

GROUP 70

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: OFFICE OF ENVIRONMENTAL QUALITY CONTROL LETTER
REGARDING DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR
THE PROPOSED WAIKANE GOLF COURSE PROJECT

We have the following comments on the proposed project:

1. If non-potable water is used to irrigate portions of the golf course located in the "No-Pass Zone", the chloride content of the water should not exceed the chloride content of the water within the aquifer over which the irrigation water is applied.
2. Section III-E "Water Quality, Existing Conditions" (page 58) should note that although Waikane Valley lies within a marginal dike zone, the Board of Water Supply (BWS) may plan to develop sources there.
3. The availability of domestic water for the golf course will be determined when the building permit and/or water meter application is submitted for our approval. If water is made available, the applicant will be assessed our Water System Facilities Charges for source-transmission and storage.
4. The on-site fire protection should be coordinated with the Fire Protection Bureau of the Honolulu Fire Department.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Mr. Ralph Portmore



9 January 1989

Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Attn: Mr. Kazu Hayashida, Manager and Chief Engineer

Gentlemen:

Subject: Waikane Golf Course EIS/87762-14

Thank you for your 22 December 1988 letter to the City and County Director of Land Utilization concerning the Environmental Impact Statement for the proposed Waikane Golf Course. The following responses related to your specific comments.

1. The non-potable water to be used for irrigation will come from wells within the project site. Chloride content will be monitored to insure the brackish water is not drawn up and used over the fresh water aquifer below. Preliminary tests indicate the water from the test wells are of low salinity.
2. We recognize the critical importance of water development on the island and will note the Board of Water Supply's comments on this matter in the Revised EIS.
3. We understand the preliminary nature of any comment on the availability of domestic water for the golf course development at this time. The application for a service connection will be made at the appropriate stage in golf course development.
4. Fire protection facilities and plans will be submitted for review to the Fire Protection Bureau of the Honolulu Fire Department.

Thank you again for your suggestions and comments.

Sincerely,

GROUP 70 LIMITED

Ralph Portmore

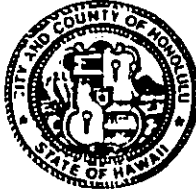
Ralph Portmore, AICP
Associate

05151/ksk

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1455 S. BERETANIA STREET, ROOM 305
HONOLULU, HAWAII 96814

FRANK F. FASI
MAYOR



FRANK K. KAHOOHANOANO
FIRE CHIEF

LIONEL E. CAMARA
DEPUTY FIRE CHIEF

RECEIVED

NOV 30 1988

November 30, 1988

GROUP 70

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: FRANK K. KAHOOHANOANO, FIRE CHIEF

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT - WAIKANE GOLF COURSE PROJECT

We have reviewed the subject material provided and foresee no adverse impact in Fire Department facilities or services, planned or now provided. Existing fire protection is considered adequate.

Access for emergency vehicles and new construction shall conform to fire and building codes and standards.

We are returning the EIS draft to the Office of Environmental Quality Control.

Should you have any questions, please contact Battalion Chief Kenneth Word of our Administrative Services Bureau at 943-3838.


FRANK K. KAHOOHANOANO
Fire Chief

HA:ny

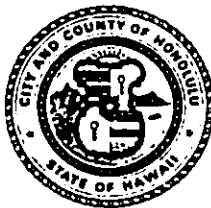
Copy to: Ralph Portmore
Group 70
924 Bethel Street
Honolulu, Hawaii 96813

COPY

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 - AREA CODE (808) 943-3111

FRANK F. FASI
MAYOR



DOUGLAS G. GIBB
CHIEF

WARREN FERREIRA
DEPUTY CHIEF

OUR REFERENCE SS-LC

December 27, 1988

88 DEC 27 PM 3 14
DEPT of Land Utilization,
CITY & COUNTY OF HONOLULU

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT


SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR
THE WAIKANE, KOOLAUPOKO DISTRICT, OAHU, HAWAII

We have completed our review of the EIS relating to the above project and provide the following comments:

1. The project should have minimal impact on the need for police services. We do not foresee a substantive increase in calls for service as a result of this development.
2. We agree that the intersection of Waikane Valley Road and Kamehameha Highway must be improved, and that a left-turn storage lane must be created to prevent traffic from staggering on Kamehameha Highway during peak hours. We firmly believe that these improvements are necessary and that the traffic flow on Kamehameha Highway would be adversely affected without them.
3. We recommend that the clubhouse and other facilities be designed and constructed with public safety and security in mind, and that parking areas be well lit at night and accessible to police patrols.

Thank you for allowing us to comment on this matter.

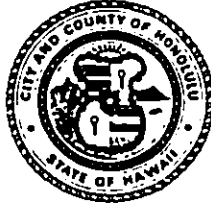
DOUGLAS GIBB
Chief of Police

By 
RONALD SOUZA
Assistant Chief of Police
Support Services Bureau

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 . AREA CODE (808) 943-3111

FRANK F. FASI
MAYOR



DOUGLAS G. GIBB
CHIEF

WARREN FERREIRA
DEPUTY CHIEF

OUR REFERENCE SS-LC

December 27, 1988

DEPT. OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU
88 DEC 27 PM 3 14

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT


SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR
THE WAIKANE, KOOLAUPOKO DISTRICT, OAHU, HAWAII

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2. We agree that the intersection of Waikane Valley Road and Kamehameha Highway must be improved, and that a left-turn storage lane must be created to prevent traffic from staggering on Kamehameha Highway during peak hours. We firmly believe that these improvements are necessary and that the traffic flow on Kamehameha Highway would be adversely affected without them.
3. We recommend that the clubhouse and other facilities be designed and constructed with public safety and security in mind, and that parking areas be well lit at night and accessible to police patrols.

Thank you for allowing us to comment on this matter.

DOUGLAS GIBB
Chief of Police

By 
RONALD SOUZA
Assistant Chief of Police
Support Services Bureau

2 February 1989

Francis S Oria AIA, Inc
Robert KL Wong AIA, Inc
Norman GY Hong AIA, Inc
Sheryl B Seaman AIA, Inc
Hitoshi Hida AIA, Inc

Roy H Nihei AIA
Linda M Aniya
Vincent R Shigekuni
Derrick T Seiki
Ralph E Portmore AICP
Edward T Green
Paul P Chorney AIA
Stephen H Yuen AIA
Susano P Pabo

Police Department
City and County of Honolulu
1455 South Beretania Street
Honolulu, HI 96814

Attn: Mr. Douglas G. Gibb, Chief of Police

Gentlemen:

Subject: Waikane Golf Course Draft EIS

Thank you for your 27 December 1988 letter to the Director of Land Utilization concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

The intersection of Waikane Valley Road and Kamehameha Highway will be improved. The alignment of Waikane Valley Road will be straightened to make it more perpendicular with Kamehameha Highway. Also, the left turn storage lane on the highway will be constructed after approval is granted by the State Department of Transportation. A more detailed description of these improvements will be provided in the Revised EIS.

We appreciate your comments about public safety and security and accessibility to police patrols. The facilities will be designed with public safety in mind. These issues will be discussed more fully in the Revised EIS.

Thank you for your comments and concerns.

Sincerely,

GROUP 70 LIMITED


Ralph Portmore, AICP
Associate

06461/sy

cc: Norman Y. Quon, AIA

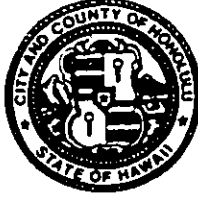
RECEIVED

JAN 13 1989

GROUP 70

KAHALU'U NEIGHBORHOOD BOARD NO. 29

c/o KAHALU'U COMMUNITY CENTER
47-232 WAIHE'E ROAD
KANE'OHE P.O., HAWAII 96744
(He'eia Kea/Ahuimanu, Kahalu'u, Waihe'e, Ka'alaea, Waiholo, Waikane, Makipu'u, Kusioa)



"Let us not ever have
an unhappy minority
rather, let us build
a community consensus"

January 5, 1988

Group 70
924 Bethel Street
Honolulu, Hawaii
96813

attn: Mr. Ralph Portmore/George Atta

SUBJECT: Draft EIS for Proposed Waikane Golf Course

Dear Sirs:

As of the date of this letter, the Kahaluu Neighborhood Board #29 has not received a copy of the Draft EIS, despite the fact that it has been available since November of '88. We appreciate the appearance of your group at past meetings to update us on the planning of this proposal. However, as the affected Neighborhood Board, we cannot be expected to respond without the benefit of a detailed analysis of the document and the time to do so. Several phone calls requesting the Draft EIS have been made over the past few weeks - both to the Waikane Development Co. and the OEQC. Somehow we have yet to receive copies although arrangements are being made.

We therefore request an extension of the comment period to the week after our February '89 meeting in order to allow adequate time for review and time to prepare our response. We are asking for no more time than what was allowed other consultant parties.

As was stated in our response to the initial "Environmental Assessment": "...detailed information will make for a more informed reaction..." from the affected community.

Mahalo, John Lewis Reppun

John Lewis Reppun
Land Use and Planning Committee, Chr.

cc: Waikane Development Co.
Office of Environmental Quality Control

16 January 1989

Kahaluu Neighborhood Board No. 29
Kahaluu Community Center
47-232 Waihee Road
Kaneohe, HI 96744

Attn: John L. Reppun

Gentlemen:

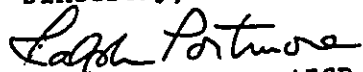
Subject: Draft Waikane EIS

With reference to your 5 January 1989 letter regarding an extension of the comment period, we are pleased to inform you that the applicant has agreed to an extension for the Neighborhood Board. An extension until February 15, 1989 has been accepted.

We wish to make clear that this extension is only for the Kahaluu Neighborhood Board and the two other organizations (Hui Malama Aina O Koolau and Life of the Land) which did not receive copies of the Draft EIS when it was initially distributed.

We await your review and comments and look forward to continued cooperation in the future.

Sincerely,


Ralph Portmore, AICP
Associate

05681/sy

cc: Dept. of Land Utilization
Norman Y. Quon

KAHALU'U NEIGHBORHOOD BOARD NO. 29
c/o KAHALU'U COMMUNITY CENTER
47-232 WAIHE'E ROAD
KANE'OHE P.O., HAWAII 96744
(He'ala Kaa/Ahulmanu, Kahalu'u, Waihe'e, Ka'alaee, Waihole, Waikane, Hakipu'u, Kulae)



*"Let us not ever have
an unhappy minority
rather, let us build
a community consensus"*

February 15, 1989

John Whalen, Director
Dept. of Land Utilization
City and County of Honolulu

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT/PROPOSED WAIKANE GOLF COURSE

Dear Mr. Whalen:

The following represents the "comments and concerns" of the Kahaluu Neighborhood Board to date. As we only received copies of the EIS in question in early January of this year, we requested an extension of time to allow for review and comment. A compromise date of Feb. 15th was agreed upon and stated in writing by the developers and Group 70, their representative.

May we note that, at the time of this writing, hearings are being held at the City Council level on an Administration-initiated Bill calling for an interim control period of the construction of all golf courses in the Ag-2 General Agricultural District. Our Board is on record, as of our Feb. 8, 1989 meeting, as being in support of this "moratorium" action; the action was deemed necessary as a means of controlling unwanted and unknown or unanticipated impacts including the cumulative impacts of such developments. Our Board has always touted the principle of public disclosure of impact and planning first! Waikane Golf Course is but one of several golf courses proposed or in the planning stage in the Kaneohe Bay area. Cumulative impact is of great concern to us and the public is deserving of far more information than any one proposal/EIS seems willing to provide.

It is also important to note, in advance of our comments, that this proposal for use of Agriculturally-zoned land, even as it argues for being the "highest and best use" of such land, is being undercut by an argument/proposal to change the underlying zoning to "Park" (see DP proposed amendment/EA). The merits of such a proposal are, as the Developers admit, an effort to skirt around the potential effect of the afore-mentioned "interim controls". The proponents' ambivalence about zoning has the potential of causing confusion. The general public must be able to rely first on zoning as a basis for evaluation of a project's merits. They deserve to know if the question is one that is basically agricultural, recreational (broad-based planning concerns) or only one concerning the merits of a private golf course and how these relate to a set zone. This proposal for a DP

amendment, at this time, undercuts the intent of interim assessment of an island wide concern. With a specific, private project already in the till under one zoning, full consideration of the merits of a zone change to Park may be precluded.

One final general comment: In the supporting data attached to Bill 207 (Interim Controls) there is mention of an inquiry made for yet another Waikane golf course. This may connect to newspaper advertisements for a 1400+ acre property in Waikane "suitable for golf course". Thus, our Neighborhood Board may be considering one proposal whereas the impact of two should be really be anticipated. This only furthers our interest in an island-wide assessment prior to consideration of individual proposals, no matter what the merits of the latter may be.

AGRICULTURAL FEASIBILITY

o Need for agricultural land in the project area:
The Ag Feasibility report indicates a substantial excess of prime ag land on Oahu. Although this may be accurate there is little discussion of the "need" for ag land as expressed by people already living in the greater Koolaupoko/Koolauloa area or the need expressed by people wanting to farm on the windward side. There is a need for surveys or citing of surveys and sources (Dept. of Ag, HHA, community surveys etc.) that would indicate demand for windward ag lots. This Board is aware of the existence of a "waiting list" for lots in the Waiahole Ag Park, adjacent to this property.

Where in this report is there discussion of the number of individuals who graduate from the University or other educational institutions that have Agriculture programs? What demand is expressed by this populace? What preference do they have with regard to jobs in agriculture or in ag-related fields? Statistics, for those interested in farming, should indicate information related to size of parcels desired, location, and what crops they are interested in etc.

Have any surveys been done to indicate what interest families now residing in Waiahole Ag park may have in acquiring additional ag lots? What interest is expressed by younger family members in the Waiahole and adjacent farm communities with regard to setting up their own farms nearby?

The discussion on pp. 32-35 of this report (Ag Feas.) does not specify where better or more available ag lands exist. Nor does it compare costs of developing irrigation systems, suitability for development of small, rural-family style farming communities or economic viability of establishing operations in those areas as opposed to the subject property. This discussion is important when related to statistics on the demand for land and location for that demand. The advantages. (or disadvantages)

of expansion of the Waiahole Ag Park concept need to be more fully addressed. Such discussion should include an assessment of the potential for additional farm lots as well as housing potential related to Ag use. The Socio-economic value of such a scenario for the community needs to be assessed.

Were this property to be considered for Ag-Park use, how many parcels and related houses could be created? Who would be likely to take advantage of such potential. How would the impact of this latter scenario compare with the impact of a golf course?

At a recent Board meeting, the possibility of "co-existence" of true agriculture alongside golf course was discussed with favorable potential. Discussion focused on the need to require "lease-rents" comparable to those of the adjacent Waiahole Ag Park. Where is this scenario presented in this EIS? Potential parcels should be identified. This would speak to maximizing the public benefit of such a project. This discussion should also consider the impact/benefit of potential ag-related housing.

o Agricultural Feasibility Criteria (pp.3-32)

This section of Dr. Scott's report describes a number of criteria important to the discussion of feasibility. A number of parcels, some of sizable acreage, appear to have conditions that are very encouraging to crop production, notably parcels in the C14 (p.12), C56, C57, C126 (pp. 14,15) categories. One category, D58 (p15), describes potential for grazing lands. This report, and the EIS, should include this information in the development of scenarios called for in the preceding section of our comments, namely Ag and/or a GC/Ag coexistence scenario. This should be accompanied by parcel-specific maps that relate to these soil and land categories.

This Ag Feasibility report makes only passing mention, on page 26, of "flowers and nursery crops" as part of its discussion of crop selection. Aside from obvious cautions and conditions relating to construction of shade houses, drainage, placement of facilities etc., the prospect of this kind of crop production appears to be positive. What are the prospects? Only one paragraph here and one sentence (2nd paragraph, p.28) under discussion of "Sales Potentials", seems grossly inadequate for an industry that has grown by leaps and bounds both Statewide and in Koolaupoko alone! Should there not be a Table 6 to this effect on page 30?

In a similar vein, as aquaculture is also an allowable and increasingly evident use of Ag land (examples: Hanohano Farms, MRTC - Hakipuu, Kahuku operations, etc.) there needs to be a thorough analysis of this potential for the subject property. This should include both edible and ornamental aquaculture products, and appropriate analysis of market potential, demand for space to conduct operations etc.

Potential for mixing and coexistence of the above mentioned options should be discussed. A variety of scenarios like this would potentially describe viable ag options and a variety of job/career potentials that this community deserves to consider. Training opportunities and potential for advancement in these fields should be described along with the potential for education in these industries. Are these not also supported by planning policies in this state?

USE OF WETLANDS

o Originally, this Board requested that the developer explore potential "compatible uses of the wetland area". Since a number of large parcels and areas in our windward community are comprised of wetlands, the opportunity to explore beneficial and ecologically sound uses of such areas contributes to the planning options available to us. Historically, much of the wetland, floodplain areas were valuable as a combination of flood control and productive space. This request was interpreted in the narrowest possible way to be one of exploring only the agricultural potential. Were the US Army Corps and the Dept. of Fish and Wildlife consulted as to the potential for mixed uses that would include development (enhancement) of Wildlife refuges for endangered species alongside of crop production. Projects of this kind have been undertaken in other areas of this state (Hanalei Wildlife Refuge - Kauai County as an example). Were these projects considered in this analysis? US Fish and Wildlife has a program and staff persons concerned with this area. Was the educational and environmental value of such a concept considered?

It seems that only the "economic viability" of taro production is considered in the feasibility report for wetland use. Discussion of other socio-economic values is lacking. The windward side of Oahu was once known for its wetland cultivation of this crop, staple in the diet of ancient times. Taro growing in wetland paddy form is unique to Hawaii in the Polynesian Triangle and its cultural/educational value should be a part of any study. No mention is made of the demand for poi and potential for production of poi in the area. No mention is made of State goals and planning policies that relate to continued taro production where possible.

On page 14 of the Feasibility for Wetlands report it is stated that "the extent to which farmers are interested in producing taro under these conditions has not been determined.". Will this be determined in the final draft? The existence of other taro operations on the windward side of Oahu is not discussed. It is stated that "recent history of crop production in windward valleys does not demonstrate major interest in subsistence taro production, although there is considerable discussion of land not being available for that purpose."(p.16). However, the discussion of obstacles to taro production ends here. Has the history of water diversion from WW Oahu or the

problem of land ownership as it relates to taro lands been researched? Perhaps Waikane wetlands represents a unique opportunity for returning some former "taro lands" to production?

The data re: use of water for taro production is misleading. Water that is used in taro patches may be considered a part of the stream system in that it is diverted only briefly, saturates the area of production and returns to the stream both directly and indirectly as seepage. Does it really pose "the most serious problem with respect to water use", as stated on page 16? Or does it expand the stream system in an ecologically sound and beneficial way?

SOCIO-ECONOMIC IMPACT

o Re: use of Ag land from a socio-economic point of view. It is significant to note reference on p. 21 (Socio-Eco Impact Study) to the NB survey of 1986 wherein residents of the Board area, from Kualoa to Heeia, were asked about "possible uses for agricultural land, if changes were necessary". Nearly half of those responding "supported conversion of agricultural land for parks". Given such interest in public recreational space, were any surveys conducted by the developers of this EIS to determine the desirability of golf courses as a form of public recreation? What windward demand is there for such use? Shouldn't a comparative analysis between recreational (both public and private) options for use of this land be included in this study? This is particularly relevant in light of the recent proposal, by the developer, to rezone the subject parcel from Ag to Park.

On page 58 mention is made of public (non-member) use of the course. What percentage of the general (island-wide) public actively golfs or will benefit from this intent?

o Section 4.6.1, p.45 - Comparable Past Hawaii GC Outcomes:

It is stated here that there are no other golf course situations that are truly comparable, meeting the criteria as related in the paragraph. Does this heighten or lessen the importance of the component impact studies? Does this fact create more or less concern for studying the impacts, both specific and cumulative on surrounding resources, land uses and the community? Could the proposed Bill 207 (C&C of Honolulu) and a period of government assessment of impact serve to better describe the impacts of this specific golf course proposal, particularly with regard to land values?

On p. 47 the EIS states that "future residential leases in the Waiahole Agricultural Park will be unaffected by any rise in residential values in Waikane.". Does this statement extend to the Waiahole Ag leases? Was the Hawaii Housing Authority consulted in this determination?

Concern has been expressed by residents in the Kamaka Rd. area of Waikane over potential rising land values and property

taxes. Although mitigation or relief measures are mentioned on page 60, in the form of proposed Bills and Ordinances, what direct mitigation has the Waikane Dev. Corp. considered in the interim period?

A history of plans and proposed Dev. Plan changes for properties in the Waiahole, Waikane area should be put in table form, including critical properties like the Waiahole/Waikane makai and mauka areas. Pressure for development of these properties is mentioned only briefly.

o Employment/Housing/Lifestyle/Values:

Has consideration been given to providing housing for employees? For those persons in the community of Waiahole/Waikane, especially, that are potential employees of this operation, reasonably priced rental housing should be discussed. Discussion of pay scales and employment benefits of this project for the immediate community should center around median income considerations and ability to afford housing especially. Living conditions that take into consideration the desirable rural "advantages" mentioned at the bottom of p.19 should be looked at. For example, can employee housing with space for "backyard agriculture" be considered with the proposal?

o Community Parks: Has consideration been given to an educational park in the wetland area (see comments on Wetlands above). Are there no other areas in which to locate a community park that are not in the wetland area?

STREAM IMPACT

o US Fish and Wildlife Service, in their comments pointed to a discrepancy in Mr. Kelly Archer's report (see letter, Sect. X; Vol. I EIS) on the quality of Waikane Stream. The criteria for assessment of stream quality must be discussed in the final EIS. The 1984 Archer report, cited in the letter should be included in the technical data of Vol. II. Discussion should also include criteria and considerations related to the recently enacted State Water Code. Stream protection is a high priority of this State and of our Board. The DLNR has undertaken a "rivers assessment" program - this should be considered. The Water Commission has only set interim stream flow standards at this time. These and the permanent standards considerations should be discussed.

Consideration of the potential for restoration of stream quality is desirable and a goal of the Water Code. This same principle stands for wetlands, wildlife refuges and estuarine habitats related to or affected by the stream ecosystem. The potential for restoration of water, now diverted by mauka projects, to Waikane stream should be discussed along with a history of that diversion-impact. (Ditch Tunnel system)

This Neighborhood Board has, as was mentioned to the developer in our 2-8-89 meeting, a standing policy calling for the establishment of "stream belts". This concept, a part of our KUALOA-HEEIA COMMUNITY PARKS PLAN (Jan.27,1982-approved), calls

for all major streams to "be protected along their full length in such a way as to encourage public access and usage to the greatest extent possible." (p.10) The plan also stipulates that "a system of trails shall be developed along the streams to interconnect mountain trails with shoreline access. The resulting trail and access system shall be properly linked with pedestrian ways and bikeways along the major highways.". This parcel, proposed for development, represents an outstanding example of the reason for such policies. A detailed plan accomodating this community interest should be included in the final EIS. This would still need to include a substantial "buffer" of undisturbed vegetation along the stream. Accomodation of this interest would set the proper precedent for future developments in our area and statewide.

Monitoring of impacts on stream flow and stream-related habitats and their quality should be extend beyond just the duration of construction. Such a program should be maintained throughout operation of the golf course. The design and means for implementing such a program should be laid out in the final EIS. (Long-term monitoring programs should extend into the receiving estuary, Kaneohe Bay).

The effects of well development and withdrawal of ground water from areas within the parcel should be related to proposed plans of other government agencies (BWS etc.) and adjacent land owners. This should include effects on streams and groundwater availability, including Waiahole stream.

WATER SUPPLY

o Exploration as to alternative sources of water should include consideration of all possible means of using water catchments, including roof catchment systems, cistern storage, and uses that may take advantage of these sources. Studies are available for such systems. These should be utilized and referenced.

KANEOHE BAY/ESTUARINE IMPACT

o The cumulative effects of fertilizer, pesticide, herbicide and chemical application on golf courses and agricultural lands, on the whole, on Kaneohe Bay estuary should be included in the final EIS. This will help to provide a context within which to assess the impact of this "component". Resources and studies should be cited. The Dollar report (Marine Survey, Appendum M - Vol.II) does not take into account other developments that are potential or pending in the Kaneohe Bay area.

Re: reef fish community structure - p.13, Marine Survey: The report states that "fishes inhabiting muddy areas adjacent to the shoreline were not quantitatively assessed

because most species are not site attached...". These species constitute some of the more popular fishing game and the mudflats of Kaneohe Bay are known to be an important habitat for them. When will they be quantitatively assessed and those assessments compared to other areas of the Bay or other estuarine areas both island and state-wide? A long term study is in order for these species especially as they are semi-migratory and are "on the move". Are there seasons or cycles, kapu or fishing bans related to these fish?

The site studies conducted by Mr. Dollar do not seem to account for tidal influences. What tidal conditions were in effect during observation time and what significance may be attached to them? The effects of "incoming" and "outgoing" tides on distribution and currents is essential data.

His study primarily concerns itself with "episodic" events and their impact (storm runoff etc) and does not provide enough information about chronic impacts of nutrient loads and their long term effects. Ideally, a program of application of chemicals etc. on the course will be done properly with a sensitivity to the environment. Realistically, rainfall and storm runoff in this windward area is unexpected, difficult to anticipate and may not be well controlled. What potential is there for not using such chemicals? Research in this area should be mentioned. Inquiries into development of "safe" course treatment, by way of research, should probably be funded by those most likely to use detrimental chemicals. Has this problem been dealt with by the golf course "industry" elsewhere?

Has a comparative study been done with regard to the amount of fertilizers, chemicals taken up by ag crops as opposed to turf? Does the amount of organic matter in the soil (tilled in or naturally existing) make a difference to this "take up"? More data on the comparative effects of nutrient load from ag vs. golf courses should be a part of any marine study. Has the nutrient load and chemical input to K-Bay been assessed with regard to other land areas both inside and outside of Kaneohe Bay?

The claim that "endangered or protected species" will not be adversely affected is undercut by the failure to note the abundance of green turtles in the bay and the whereabouts of their "resting" (as opposed to "nesting") sites in the North end of the bay. The importance of these turtles returning and spending time in waters of lower salinity is not explained.

Dr. Ernest Reece of HIMB, a marine biologist at Coconut Island strongly disagrees with statements made by Mr. Dollar (p.3) as to the ability of corals to withstand "the nutrient subsidies from sewage without alteration in community structure". This suggests that the analysis of the effects of nutrient loads, especially phosphorous and nitrogen, in Waikane may be questionable. Dr. Reece, in commenting on this report - at the request of our Board, predicts that the species of algae most responsible for smothering of corals during the period of worst sewage impact on K-Bay "will flourish with nutrient loading from (the) Golf Course." (from notes to the NB on Dollar report).

NB #29 comments cont'd; page 9

Perhaps, as with assessing the impacts of this project on taxes and land values, several "opinions" should be solicited from a wide range of members in the scientific community. Certainly a sampling of opinions from several experts is warranted in this area of much controversy.

This concludes our report of comments and concerns at this time. This Board intends to pursue gathering of opinions as to the merits and reservations about this project and will continue to comment as we receive information. Thankyou for the opportunity to comment.

for: Kahaluu Neighborhood Board #29
John Lewis Reppun
John Lewis Reppun Chairman
Land Use & Planning Committee

cc: Mr. Ralph Portmore, Group 70
Representative Reb Bellinger
Sen. Mike McCartney
Councilman David Kahanu



21 February 1989

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Kahaluu Neighborhood Board No. 29
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Attn: Mr. John L. Reppun

Gentlemen:

Subject: Draft Waikane EIS/87762-14

Thank you for your 15 February 1989 letter to the City and County Director of Land Utilization concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

On the general comments regarding the moratorium, we have included a section in the Revised EIS discussion our views on the issue. As to the issue of highest and best use, we feel that it is a public policy issue best handled through the legislative process. Finally, with regard to another Waikane golf course, we have no information about it and no basis to comment on it. If a concrete proposal does materialize, it would be appropriate for the proposer of the second golf course to assess cumulative impacts.

Agricultural Feasibility:

The scope of the EIS is to determine the impact on agriculture if the subject parcel is taken out of agricultural use, not to investigate all possible scenarios or conditions that affect the viability of agriculture on the island or even the Windward coast. While people's expressions of desires and preferences are certainly noteworthy, the nature of the public response to them is more the responsibility of government. It is not the responsibility of the private landowner to subsidize the hopes and dreams of other individuals.

Regarding the questions about the Waiahole Agricultural Park and its expansion possibilities, it is not our responsibility to determine either the need or location of expanding that development. Our purpose is primarily to disclose the facts as we understand them. As for better, more available, agricultural lands, Dr. Scott's reports indicate their existence on the island as a whole. Whether that land is available in Windward Oahu or elsewhere is not the issue under discussion. The present site has been generally vacant and unused for many years except, for a few tenants on 5-10 acres of the site. Availability has not spurred use because of other difficulties in developing viable agricultural operations on the site.

Also, the State Department of Agriculture is responsible for keeping track of the supply of agricultural land. Our studies and focus has been on the impact of the conversion of the subject parcel to golf course use. If there is a great demand for the expansion of the Waiahole Agricultural Park, that is a separate issue which should be investigated by the State. Also, the question as to where additional agricultural parks, should be created is a public policy question that is not within the jurisdiction or responsibility of the private developer.

To address additional points, the Revised EIS provides an expanded discussion of nurseries and aquaculture through revised versions of Dr. Scott's reports. Additional discussion of mixed use options for golf course and agriculture is included in the Revised EIS. However, it is not practical or realistic to address every possible scenario or combination of alternatives. We feel we have evaluated the range of reasonable options that are available.

Use of Wetlands:

As pointed out in the Draft EIS, the developer is not planning to develop the designated wetland areas. Nor does he have any specific objections to alternative uses of the wetlands. The only caveats are that whatever uses are proposed be compatible with existing uses, not place any unreasonable liability and safety issue on the land owner, and not become an unreasonable financial and psychological burden on the operator of the golf course or adjacent property owners. Beyond this, the owner does not have any specific position or objections about agriculture or other use of the wetlands.

It is not the property owners's responsibility to search for and evaluate every possible option available for the wetlands because some other party wishes to use the wetlands. The developer is willing to look at reasonable proposals, but it is the responsibility of those proposing the use to evaluate the impacts of that use. This is especially true when many resident of the immediate area have expressed reservations about any use of the wetlands because of compatibility issues and concern about increased flood hazards.

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WAIKANE GOLF COURSE EIS/87762-14
21 FEBRUARY 1989
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The other issue you mention, the land ownership patterns and their effect on specific crop feasibility, are not relevant to the project impacts. Land ownership patterns are an existing fact, not a question up for debate. If there is a public desire to change them, then that is a public policy question involving significant financial considerations.

Socio-Economic Impact:

The question of the recreational value of the parcel is pertinent as an alternative use for the land. Although the survey referenced in your letter indicates a strong demand for park use as an alternative use for agricultural land, without seeing the report we have no way of knowing the validity or reliability of the survey. Also, the City and County of Honolulu has a policy of not accepting undeveloped vacant land for park purposes due to the development and maintenance cost of such land. City studies and policy have established a priority for beach parks and active parks closer to residential areas. The value of this land as a public park is highly questionable, especially when the existing Waiahole Beach Park remains undeveloped. As far as the question of the recreational value of a golf course in the area is concerned, the islandwide demand has been demonstrated by the City's own studies on golf course demand and the clientele and use experienced by the courses at Kahuku and Kuilima, where players arrive from Honolulu.

A discussion of the intended market for the proposed golf course is included in the Revised EIS. As to the location of the community park in the wetland area, the specific location of the park has not been finalized. Parts of it may be on dry land.

Your comment about the lack of comparables to the Waikane Golf Course situation is taken out of context. The Revised EIS has a fuller discussion on the issue. The report from Community Resources, Inc. really points out the uniqueness of the situation with the understanding that the case must be reviewed individually. Also, it does not follow that, if there are no comparables then a group analysis will enlighten anyone. If anything, a general analysis will be insensitive to the finer benefits and detriments and result in a loss of opportunities for the community. It will not result in a better or clearer understanding of issues or impacts.

The issues raised about assessed values is not a concern of the State regarding their leases to the Waiahole Agricultural Park. Discussions with the administrator for the park verified the observation that lease rents were established independent of the surrounding property values. Also, our technical report specifically points out that assessment practices by the City do not view golf courses as amenities that raise the value of agricultural land. An evaluation of land prices and sales around golf courses also shows that there is essentially no impact on the value of agricultural land from golf course development.

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PAGE 4

The history of development pressure on the area has been acknowledged. We feel there is no need to revise the information into a tabular format. All this ties into the issue of lifestyles, housing and jobs. However, the affordability question that ties many of these issued together is a separate question. The level of pay is related to the marketplace. Also, since no existing jobs are being taken away, the project has a net positive influence on the job choices available to the community. Housing affordability is a general issue unrelated to golf course development. It relates to the supply and demand for housing which is a separate issue from golf course development. The non-development of the golf course does not mean housing will be built or that it is a desirable alternative in the area. Previous proposals to develop housing on the site have been opposed by area residents. Community opposition has prevented both straight residential use or agricultural subdivisions. For these reasons, plus the fact that golf course employee housing is not a permitted use on agriculture-designated land, the provisions of employee housing is not a viable option.

Stream Impact:

This project has nothing to do with the long-established water diversion by Waiahole Ditch. It will not affect the water diversion itself or alter its impacts on Waikane Valley. Discussion of this is irrelevant to the purposes of this EIS. The discrepancy noted in the U.S. Fish and Wildlife Service letter was discussed in the Draft EIS. The question of stream protection and enhancement is noted. Conditions for monitoring and mitigation are included in the well drilling permits and will be included in the unilateral agreement which will be filed with the conditional use permit. Waikane Stream will be left as is and there will be no work in the stream channel itself.

The idea of a stream belt is a laudable concept. However, many practical issues need to be resolved. Questions of liability, security, control, hazards from golf balls and maintenance are involved. The developer is not specifically opposed to the idea if the practical issues can be resolved. One observations to consider is that in the enhancement of natural resources, there is a threshold above which increased access provided by any easement will be to the detriment of the stream. A stream belt may possibly contribute to the degradation of the stream water quality, plant and animal life. Control and maintenance become critical issues in these circumstances.

Water Supply:

Alternative sources of water have been investigated. The use of effluent for irrigation and the channeling of runoff into detention ponds are the major alternative sources. The concept of catchment

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systems has been considered but is not considered feasible given the type of facility, the size of the source, and economics involved.

Kaneohe Bay:

It is not within the purpose or scope of the EIS process to consider past, present and conceivable future actions in the region. The impacts that need evaluation are those related to the project itself, unless there is a sense that this is the proverbial straw that may break the camel's back. There is no indication that this is so. The general consensus is that the Bay is on the the road to recovery. Also, with the reduction of runoff from the site, it is anticipated that the golf course development will actually assist in the improvement of the Bay.

With regard to tidal influences, tidal action in Hawaii is not significant to the impacts that are being studied.

Regarding the incremental impact question there is no reason to study something when there is no impact generated since fresh water inflow and sediment loads will decrease from the golf course development. There is no negative impact being contributed in these regards.

As to nutrient loads, although there may be some increase during storm conditions, it is not expected to alter growth conditions in the Bay. During normal conditions no impact is expected due to proper application of these chemicals. With reference to the growth of algae and their impact on corals, Dr. Dollar is the resident specialist on this particular subject at the Coconut Island facility, and he feels his conclusion is accurate.

Regarding the resting of green sea turtles in the Bay, the comment about lower salinity is inconsistent since the golf course development will reduce the fresh water impact by reducing surface runoff from the site. Kaneohe Bay is a recognized resource for the State of Hawaii and it is anticipated that golf course development will not be detrimental to, but will more likely assist in the continued recovery of the Bay from previous detrimental impacts caused by human activities.

Thank you for your comments and concerns.

Sincerely,

GROUP 70 LIMITED



Ralph E. Portmore, AICP
Vice President for Planning

cc: Norman Y. Quon, AIA

13 February 1989

'89 FEB 16 PM 1 17

John Whalen, Director
Dept. of Land Utilization

DEPT OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

Subject: Draft EIS, Waikane Golf Course

Dear Mr. Whalen,

Here are my comments on the EIS.

1. In my comments on the assessment I asked that the link between estuaries and ocean life be looked at. The effects of pesticides on estuary life has not been addressed. The effects of "decreased volumes of fresh water" discharged into the estuary have not been addressed, because no mention is ever made of the importance of estuaries.
2. My request for a serious analysis of "small scale subsistence farming" has not been answered. Alternatives are put in terms of value to the land owner. An assessment of the demand for a Waiahole type agricultural subdivision should be included in the EIS. How many requests from the public are there for Waiahole lots? How many house holds in the Kualoa-Heeia area contain more than one family?

In the related area of jobs, I question many of the assumptions and conclusions used to assess compliance of this project with State and County plans and policies.

p. 76 How will golf course jobs offer "opportunities for upward mobility"?

p. 79 In what sense will these jobs "provide reasonable income"?

80 In what way are these jobs "career opportunities"?

p. 82 There should be documentation to prove that employment will "provide an adequate standard of living for people living in the area."

I ask these questions because the socio-economic study in volume 11 shows that 90% of these jobs will earn less than \$16,800/yr. and 40% will earn less than \$12000. These are described as "entry level" jobs. Many questions about availability of housing for people at these income levels need to be answered before the following statement can be made: "Golf courses would provide a higher use value than agriculture." p. 94 Higher use value for whom? (It is also inaccurate to assess agricultural value by whether or not it is currently being used.)

3. p. 94 "Lands conserved through use for golf courses could readily be converted to agriculture in the future if conditions warranted." While that might be true physically, economically it will not, since the developer will want to recover a \$40 million investment.

4. While "tentative indications were suggested" concerning the "fiscal impacts of golf courses" on surrounding properties, not enough research has been done on this absolutely crucial issue. Surrounding land owners and tenants need to see some numbers even if they are tentative.
It is certainly not a

Charles Reppun

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Hui Malama Aina O

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Attn: Mr. Charles Reppun

Gentlemen:

Subject: Waikane Golf Course EIS/87762-14

Thank you for your letter of 13 February 1989 to the Director of Land Utilization regarding the Waikane Golf Course EIS. The following responses are to your specific comments:

1. The fact that Kaneohe Bay is a large estuary and that the link between the ocean and the estuary is vital is without question. As the study by Murdoch and Green indicates, we anticipate no pesticide impact on Kaneohe Bay. Therefore, the issue was not described any further. Additionally, the decrease in fresh water due to the retention of surface runoff from storm conditions is seen as a positive impact since large volumes of stormwater runoff have been shown to be detrimental to marine life in Kaneohe Bay.
2. As mentioned in the Draft EIS, small scale agriculture is a marginal proposition on the subject Waikane lands. The three major problems are competition in the marketplace from better lands with greater efficiency; the cost of providing infrastructure, particularly roads and water; and finally the inability to receive subdivision approval from the City and County of Honolulu. The question about the demand for Waiahole lots is not material to this EIS and is not an appropriate comparison. Those lots and leases are subsidized by the State with public funds.


MR. CHARLES REPPUN
WAIKANE GOLF COURSE EIS/87762-14
17 FEBRUARY 1989
PAGE 2

3. The question about number of families in households is not relevant to the issue of impacts from golf course development. The housing problem exists regardless of whether or not the golf course is built.
4. Concerns about the quality, level and pay of golf course jobs relate to the marketplace for such jobs and the demand that exists relative to supply. The pay scale is good relative to the existing income levels in the Waiahole - Waikane area. Median family income in the area was \$10,500 in 1980; well below the island-wide median of \$23,554. The entry level individual jobs will generally be near the median family income for the area. The low wages in the area are generally due to the level of agricultural income in the State. It should also be understood that the golf course development will not replace any existing jobs and that it will create a diversity of job options where none exist today. There is a net positive impact on income levels and job choices.
5. The question of use value is somewhat subjective. This issue is discussed more in the Revised EIS. The primary measurable increase is in the economic value. However, we feel the golf course has high value in other ways such as aesthetic, social opportunity, community pride and environmental enhancement through the control of stormwater runoff.
6. The statement of the unlikelihood of the conversion of the golf course to agriculture use is understood. The point about the possibility of such a conversion relates to the practicality or ease of doing so should the golf course ever cease to operate. It is one of very few non-agricultural uses where this would be physically possible with little expense required to remove existing improvements.
7. The fiscal impact of golf courses continues to be studied. The results of our latest study are included in Appendix E on socio-economic impacts.

Thank you for your comments and concerns.

Sincerely,

GROUP 70 LIMITED


Ralph E. Portmore, AICP
Vice President for Planning

cc: Norman Quon

07201/ksk



ENV 2-1
JA/G

RECEIVED
DEC 14 1988

December 13, 1988

GROUP 70

Department of Land Utilization
650 South King Street
Honolulu, HI 96813

Dear Sir:

Subject: Environmental Impact Statement for the Proposed Waikane
Golf Course Project

We have reviewed the subject document and have no comments.

Sincerely,

William A. Bonnet
Manager, Environmental Department

cc: Mr. Ralph Portmore
Group 70

REFERENCES

REFERENCES

- Archer, Kelly M.; "Biological Survey of Waikane Stream, Windward O'ahu"; Waimea, Hawaii; February 1988.
- Berger, Andrew J.; "Terrestrial Vertebrates of the Waiahole/Waikane Area"; Honolulu, Hawaii; December 1987.
- Chu, M.S. and Jones, R.B.; "Coastal View Study"; Honolulu, Hawaii; 1987.
- Community Resources, Inc.; "Socio-Economic Impact Assessment for Proposed Waikane Golf Course"; October 1988.
- Darby & Associates; "Noise Impact Evaluation for the Proposed Waikane Golf Course Draft Report"; Honolulu, Hawaii; 1 April 1988.
- DHM, Inc.; "Environmental Impact Statement for Golf Course on Iolani School Property"; Honolulu, Hawaii; November 1986.
- Dugan, Gordon L.; "Environmental Aspects of Storm Water Runoff Waikane Golf Course"; March 1988.
- Engineering Concepts, Inc.; "Drainage Report for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988.
- Engineering Concepts, Inc.; "Roads Report for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988.
- Engineering Concepts, Inc.; "Soil Erosion Report for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988.
- Engineering Concepts, Inc.; "Wastewater Management Plan for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988.
- Engineering Concepts, Inc.; "Water Supply Report for the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; October 1988.
- Environmental Communications, Inc.; "Revised Environmental Impact Statement for the Proposed Waikane Agricultural Subdivision, Waikane, Koolaupoko District, Oahu, Hawaii (undated)".
- Tyrone T. Kusao, Inc.; "Waialua Golf Course Draft Environmental Impact Statement"; Honolulu, Hawaii; January 1988.
- Marine Research Consultants; "Marine Environmental Survey in the Vicinity of the Waikane Golf Course", Oahu, Hawaii; 26 March 1988.
- Mink, John F.; "Proposed Groundwater Development Lower Waikane Valley, Oahu; Honolulu, Hawaii"; 21 March 1988.
- Murdoch, C.L. and Green, R.E.; "Environmental Impact of Fertilizer and Pesticide Use on the Proposed Waikane Golf Course Project"; Honolulu, Hawaii; 5 April 1988.

Nagata, Kenneth M.; "Botanical Survey Waikane Golf Course, Oahu"; Honolulu, Hawaii; 9 February 1988.

Pacific Planning & Engineering, Inc.; "Waikane Golf Course Traffic Impact Assessment Report"; February 1988.

Root and Neal, Inc.; "Air Quality Study for the Proposed Waikane Golf Course"; Honolulu, Hawaii; 26 March 1988.

Paul H. Rosendahl, Ph.D., Inc.; "Archaeological Reconnaissance Survey and Limited Subsurface Testing for Waikane Golf Course within Special Management Area (SMA)"; Hilo, Hawaii; October 1988.

Scott, Frank S.; "Feasibility and Need of Waikane Golf Course for Agriculture"; Honolulu, Hawaii; March 1988. (Revised Feb. 1989)

Scott, Frank S.; "Feasibility of Agricultural Use of Wetlands in the Waikane Golf Course Project"; Honolulu, Hawaii; November 1988. (Revised Feb. 1989)

William E. Wanket, Inc.; "Draft Environmental Impact Statement Nihonkai Lease Company, Ltd., Proposed Golf Course, Kunia, Oahu"; Honolulu, Hawaii; January 1988.

PREPARERS' RESUMES

LIST OF PREPARERS

This Draft Environmental Impact has been prepared by the planners and environmental analysts at GROUP 70 Architects/Planners/Interior Designers, 924 Bethel Street, Honolulu, Hawaii 96813, Telephone (808) 523-5866. The GROUP 70 staff involved in the preparation of this document included:

Francis S. Oda, AIA, AICP	Chairman of Group 70
Ralph Portmore, AICP	Project Manager
George Atta	Senior Planner
Edith Masaki	Graphics
Kathy Hida	Graphics

Several technical consultants to GROUP 70 were employed to provide specific assessments of environmental factors for this project. These consultants, their company affiliation (if any), and their specialty are listed below:

Kelly M. Archer	Consultant	Stream Biology
Gordon L. Dugan, Ph.D.	Consultant	Storm Water Runoff
Charles L. Murdoch, Ph.D.		
Richard E. Green, Ph.D.	Murdoch & Green	Fertilizer/Pesticides
John F. Mink, Ph.D.	Consultant	Ground Water
Steven Dollar, Ph.D.	Marine Research Consultants	Marine Resources
Andrew Berger, Ph.D.	Consultant	Terrestrial Vertebrates
Paul H. Rosendahl, Ph.D.	Paul H. Rosendahl, Ph.D., Inc.	Archaeology
Alan Haun, Ph.D.		
Kenneth Nagata	Consultant	Botany
Ronald Darby, P.E.	Darby & Associates	Noise
Barry D. Neal	Root & Neal	Air Quality
Barry D. Root	Root & Neal	
Johnathan K. Shimada	Pacific Planning & Engineering	Traffic
Frank S. Scott, Jr., Ph.D.	Consultant	Agriculture
John Knox, Ph.D.	Community Resources, Inc.	Social/Economic
John Kirkpatrick, Ph.D.	Community Resources, Inc.	Social/Economic
Kay Muranaka, P.E.		
Kenneth Ishizaki, P.E.	Engineering Concepts, Inc.	Engineering/Infrastructure

FRANCIS S. ODA, AIA, AICP - GROUP 70

EDUCATION:

Bachelor of Architecture - 1964, Cornell University, Ithaca, New York
Graduate Work - University of Hawaii, Pacific Urban Regional Planning Program

REGISTRATIONS:

Architect, State of Hawaii
Architect, State of California
American Institute of Certified Planners

PROFESSIONAL ASSOCIATIONS:

Hawaii Society/American Institute of Architects, Past President 1982
American Institute of Certified Planners
Hawaii Chapter, American Planning Association

PROFESSIONAL EXPERIENCE:

Chairman, Francis S. Oda, AIA, Inc. - A General Partner of Group 70, 1980 - Present
Principal 1973 - 1980, Group 70 - Architects and Planners, Honolulu, Hawaii
University Architect 1971-1973, University of Hawaii, Honolulu, Hawaii
Partner 1970 - 1974, Carson/Oda, El Paso, Texas
Partner 1970 - 1972, Quinn and Oda, Berkeley, California

SELECTED PROJECTS:

Manele Hotel, Lanai, Hawaii
Koele Lodge, Lanai, Hawaii
Mililani Town Center, Mililani, Oahu
Maui Marriott Hotel, Kaanapali, Maui
Iwasaki/Capricorn Resort Hotel, Yeppoon, Australia
Master Plan for the Turtle Bay Resort, Kahuku, Oahu
Kaanapali Resort Master Plan, Kaanapali, Maui
Kona Village Resort Master Plan, North Kona, Hawaii
Farms of Kapua Master Plan, South Kona, Hawaii
Astronomy Facilities for Hale Pohaku, Mauna Kea, Hawaii
Kagoshima Chamber of Commerce Building, Japan
Long-Range Development Plan, University of Hawaii Manoa, Oahu
Maui Lu Resort Condominiums, Kihei, Maui
Chapel and Religious Education Facilities for Pearl Harbor, Oahu

FRANCIS S. ODA, AIA, AICP
RESUME
PAGE 2

AWARDS:

Recent Awards - First Honor Award 1980, National AIA and U.S. Navy Chapel and Religious Education Complex, Pearl Harbor
Design Awards - 1975, 1978 (2), 1980, Hawaii Society, AIA
Award - 1973, Hawaii Chapter American Institute of Architects, Office Design Competition, Honolulu, Hawaii
Honor Award National - 1971, American Institute of Architects, Our Divine Savior Church and Community Center, Chico, California
Bartlett Award - 1971, AIA and President's Committee on the Handicapped
Honorable Mention - 1970, Liturgical Conference of Church Architecture and Community Center, Oakland, California
Hale Pohaku Design - D.A.G.S.

RALPH PORTMORE, AICP - GROUP 70

EDUCATION:

M.S. in Urban Planning - 1968, Columbia University, New York
B.S. in Civil Engineering - 1963, Rutgers University, New Jersey

PROFESSIONAL AND COMMUNITY ASSOCIATIONS:

American Institute of Certified Planners
Hawaii Chapter, American Planning Association: Public Issues Committee
Chair 1985-87, Vice President/President Elect 1987-88, President
1988-89
Decisions 87/Action 88: Co-chair 1987-88
Health and Community Services Council of Hawaii: First Vice-President and
Program Committee Chair 1985-86, Long Range Plan Committee Chair 1988

PROFESSIONAL EXPERIENCE:

Vice President for Planning, 1989-Present, Group 70 Limited, Architects
and Planning Consultants, Honolulu, Hawaii,
Senior Planner/Associate, 1985-1988, Group 70 Honolulu, Hawaii
Deputy Chief Planning Officer 1981-1985, City and County of Honolulu,
Hawaii
Legislative Analyst 1976-1981, City Council, City and County of Honolulu,
Hawaii
Senior Planner/Branch Chief 1973-1976, Department of General Planning,
City and County of Honolulu, Hawaii
Associate 1968-1973, Frederick P. Clark Associates, Planning Consultants,
Rye, New York

SELECTED PROJECTS:

Kapolei City Center, Ewa, Oahu:
Urban Design Master Plan
Strategic Phasing Plans
Design Guidelines
Lihi-lani Recreational Community, Pupukea, Oahu:
Community Master Plan
Environmental Assessment
State Land Use Boundary Amendment
Hawaiian Electric Company, Honolulu, Oahu:
Ward Avenue Complex Master Plan
Kuilima Resort, Kahuku, Oahu:
Special Management Area Use Permit/Shoreline Setback Variance
Conditional Use and State Special Use Permits
Hawea Point Residence, Kapalua, Maui:
Environmental Assessment
Special Management Use Permit Application
Conservation District Use Permit Application
Signal Puako Property, South Kohala, Hawaii:
New Community Master Plan
Laie, Oahu:
Community Master Plan
Waikane Golf Course, Waikane Valley, Oahu:
Environmental Impact Statement
Development Plan Land Use Map Amendment
Special Management Area Use Permit
Conditional and State Special Use Permits

GEORGE I. ATTA - GROUP 70

EDUCATION:

Masters in City & Regional Planning - 1981, Harvard University
Professional Diploma - 1973, University of Hawaii
B.A. in Liberal Arts - 1972, University of Hawaii

PROFESSIONAL ASSOCIATIONS:

American Planning Association

PROFESSIONAL EXPERIENCE:

Senior Planner, 1988-Present, Group 70, Architects/Planners/Interior
Designers, Honolulu, HI
Legislative Analyst, 1984-1988, Office of Council Services, City &
County of Honolulu
Adjunct Professor, 1986-1987, Wayland Baptist University
Planner, 1982-1984, Dept. of General Planning, City & County of Honolulu
Planner, 1981-1982, Research Corporation, University of Hawaii
Planner, 1979-1980, H. Mogi Planning & Research Inc.

SELECTED PROJECTS:

Aloha Tower Development Corporation
Kapiolani Community College Replacement Facilities
City & County of Honolulu Streamlining Program
Department of General Planning Sequencing Guidelines
Housing Opportunity Measure and Evaluation
Waialae Agricultural Experiment Station
Massachusetts Waste Oil Re-refining
Renovation of the Honolulu Old Federal Building
Kuilima Resort Urban Design Plan
Lanai City Urban Design Plan

12/3/87

Kelly M. Archer
Box 428, c/o HPA
Kamuela, HI 96743
(808)-885-6828 (hm)
(808)-885-4474 (bs)

Born 3/27/55
Married, 3 children

RESUME

Education:

Graduated Cum Laude with a B.S. in biology, minor in chemistry from Whitworth College, Spokane, WA, May 1978. Cumulative G.P.A. 3.54.

Master of Science degree in zoology from University of HI, Aug., 1983. Cumulative G.P.A. 3.70.

Work Experience:

September 1978 - ongoing. Secondary instructor in mathematics and natural sciences. Now teaching at Hawaii Preparatory Academy, Kamuela, HI.

October 1978 to October 1979. Research Assistant with the Hawaii Cooperative Fishery Research Unit. Duties included research, field work and reporting on the ecology of Hawaiian streams. Electroshocking devices, nets, traps and small boats used to sample estuarine and stream macrofauna. Familiarity with endemic and exotic aquatic organisms was gained. Year culminated in report for Dept. of Land and Natural Resources, State of Hawaii outlining the ecology of Kahana Stream, O'ahu, proposing actions to insure preservation of this watershed purchased by the Department.

October 1979 - ongoing. Freshwater Environmental Consulting.

1. Assisted Dr. Amadeo Timbol in field work on Kaluanui, Kaneohe and Kahana Streams, Island of O'ahu, and various Big Island streams. (VTN Pacific; Grey, Rhee and Assoc.; DLNR; Army Corp..)

2. May 1980. Biological assessment of Lumahai River, Island of Kauai. Presence and relative abundance of aquatic animals was determined. Report included in an EIS by Wilson Okamoto and Associates for Graterford Aqua-Investments, Inc..
3. August 1983 to April 1984. Determination of the ecological quality of 26 streams in Windward O'ahu, HI. Report submitted to VTN Pacific, Inc. for an EIS for the Honolulu Board of Water Supply.
4. December 1983. Biological survey of Maunawili, Ainoni, Makawao Streams, Oahu, HI. Report prepared for Fukunaga and Associates, Inc. for inclusion in Maunawili Ditch Improvements EIS for DOWALD, DLNR, HI.
5. October 1984. Biological survey of East and West Wailuaiki Streams, Maui, HI. Report prepared for W. A. Hirai and Assoc., Inc., in association with proposed hydroelectric power plant.
6. June 1985. Biological survey of Kamananui Stream and Ukoa Marsh near Haleiwa O'ahu, HI. Report prepared for Wilson Okamoto and Assoc. as part of a regional EIS for the Honolulu Board of Water Supply.
7. June 1985. Biological survey of Waikakalaua Stream, O'ahu, HI. Report prepared for Gray, Hong and Assoc. as part of EIS for housing development within Waikakalaua Gulch.
8. October-November 1985. Second biological survey of East and West Wailuaiki Streams, Maui, HI. Report prepared for Associated Engineers, Inc., for a proposed hydroelectric power plant.
9. April-June 1986. A biological survey of Wailua River and Hookelekele Stream near Hilo, HI. Report submitted to Associated Engineers, Inc., for a proposed hydroelectric power plant.

CURRICULUM VITAE OF GORDON L. DUGAN

October 1986

Date and Place of Birth:

June 25, 1933, Moline, Illinois

Mailing Address:

704 Ainapo Street
Honolulu, Hawaii 96825

Marital Status:

Married, four children;
ages 20 to 28

Phone: (H) (808) 395-5474
(O) (808) 948-8969
148-7550

Education

February 1959, B.S., Civil Engineering, Washington State University

August 1963, M.S., Sanitary Engineering, Washington State University

June 1970, Ph.D., Environmental Health Sciences, School of Public
Health, University of California at Berkeley

Dissertation title: Nutrient and Energy Relationships of an
Integrated Aerobic-Anaerobic Bio-system

Professional License:

Registered Civil Engineer (1965), State of California , Number C15518

Professional and Honorary Societies:

American Society of Civil Engineers; national and local

Water Pollution Control Federation; Hawaii Water Pollution Control
Association

Air Pollution Control Association

Sigma Xi

Chi Epsilon

Honors and Awards:

Award for Outstanding Service, ASCE, 1981

Hobbies:

Long distance running
Bicycle riding

Experience:

September 1971 to present:

Professor (since July 1975); Associate Professor (September 1971 to July 1975), Department of Civil Engineering, University of Hawaii, Honolulu; Department Chairman of 16-member faculty, July 1983 to July 1986. Primary major endeavors, excluding administrative duties while Department Chairman, have been the instruction of civil engineering, including design and laboratory courses (primarily Environmental Engineering related courses during the Fall and Spring semesters), at both the undergraduate and graduate levels; research on several projects; public service; and outside consulting.

From September 1973 to May 1975; 25 percent of my time was assigned to the Hawaii Environmental Simulation Laboratory, an innovative organization that attempted to estimate, mainly by quantitative modeling means, the probable end results from proposed development changes or alternations.

September 1969 to September 1971:

Resident Project Engineer-Biologist for two research demonstration projects designed to study eutrophication of surface waters in general and Lake Tahoe in particular and study the reservoir that received the tertiary treated South Tahoe (California) wastewater effluent.

June 1967 to September 1969:

Project Engineer responsible for the design of the components and methods of operation of a research project entitled, "Photosynthetic Reclamation of Agricultural Solid and Liquid Wastes" at the University of California-Berkeley, Sanitary Engineering Research Laboratory, Richmond, California.

August 1963 to August 1966:

Employed by the State of California, Department of Water Resources, Fresno, California. Varied duties involved responsibility for subsurface water conditions, development of minimum well standards, water quality investigation, advisory services for Water Pollution Control Board, and supervisor of Sanitary Engineering of the Quality Studies Unit, Planning Section, San Joaquin Valley Branch, California.

February 1959 to September 1962:

Estimator-Engineer for R.E. McKee, General Contractor, Inc., El Paso, Texas, doing diverse construction work throughout the United States.

Consulting (continued)

<u>Year</u>	<u>Firm</u>	<u>Project</u>	<u>Consulting Area</u>
1981	Environmental Communications Inc., Honolulu	Kahaluu Commercial and Residential Development, Kahaluu, Windward Oahu, Hawaii	Surface water runoff quantity and quality
1981	Park Engineering Associates, Inc., Honolulu	Kahuku Wastewater Treatment Plant	Assisted in the writing and editing of the wastewater treatment manual
1981	Gray, Hong and Associates, Inc., Honolulu	Kahaluu Industrial and Residential Development, Kahaluu, Windward Oahu, Hawaii	Surface water runoff quantity and quality
1981 to 1982	Aquaculture Associates, Inc., Honolulu	Energy from Marine Biogas Program	Evaluating the bioconversion (producing methane) portion of the project
1983	The Universities Council on Water Resources, Inc., Lincoln, Nebraska	U.S. Bureau of Reclamation Project Proposals	Evaluating Water Resources Proposals
1984	Environmental Communciations	Olomana/Maunawili Sewer Project - Phase I, Windward Oahu, Hawaii	Surface water runoff quantity and quality
1984	Brubaker & Associates	Surface water filtration plant, Hawaiian Home Lands, Molokai, Hawaii	Ascertain the operational efficiency of existing sand filtration units
1984	Environmental Communications Inc., Honolulu	West Beach Development Project, Southern Oahu	Determine the constituent loads from storm water runoff that enters lagoons and fronting ocean
1984 to 1985	Park Engineering Associates, Inc., Honolulu	Honokaa Wastewater Facility Plan, Honokaa, Hawaii	Recommend and conceptually design the wastewater treatment and disposal facilities for the Honokaa area

Consulting (continued)

<u>Year</u>	<u>Firm</u>	<u>Project</u>	<u>Consulting Area</u>
1985	Environmental Communications Inc., Honolulu	Hawaii Kai Marina Zoning Project, Oahu	Surface water runoff quality and quantity
1985	Environmental Communications Inc., Honolulu	Maunawili Golf Course Project, Windward Oahu	Surface water runoff quality and quantity
1985	Environmental Communications Inc., Honolulu	Maunawili District Trunk Sewer-Section 2, Windward Oahu	Environmental impact regarding surface runoff from three alternative sewer alignments
1985	Environmental Communications Inc., Honolulu	Waiawa Development Project, Southern Oahu	Surface water runoff quality and quantity
1986	Environmental Communications Inc., Honolulu	Hawaii Kai Golf Course 2/1A Residential Project, Oahu	Surface water runoff quality and quantity
1986	Environmental Communications Inc., Honolulu	Waiola Estates Residential Project, Central Oahu	Surface water runoff quality and quantity, and potential pesticide ground contamination
1986	William J.N. Garcia, Attorney at Law, Mililani, Hawaii	Law suit - subsurface flooding of Waikiki hotel	Expert witness - flooding caused by Hurricane Iwa
1986	McKenzie, Trecker & Fritz, Attorneys at Law, Honolulu	Law suit - potential water-borne disease transmission	Expert witness - potential water pollution in Hawaii Kai Marina

Major Academic and Professional Offices

University of Hawaii

- 1973-1974 Secretary of the College of Engineering Faculty Senate
- 1974-1975 President of the College of Engineering Faculty Senate
- 1975-1978 Member, representing the College of Engineering, on the University Graduate Council
- 1975-1976 Member of the Programs Committee of the University Graduate Council
- 1976-1977 Member of the Curriculum Committee of the University Graduate Council
- 1976-1977 Member, representing the College of Engineering, on the Manoa Faculty Personnel Committee
- 1976-1978 Member of the Coordinating Advisory Committee for Lyon Arboretum
- 1977-1979 Member of the Biomass Advisory Board, Hawaii Natural Energy Institute
- 1977-1978 Member of the Administrative-Advisory Admissions Committee of the University Graduate Council
- 1977-1979 One of two faculty members on the University Athletic Scholarship Committee
- 1977-1979 Member of the (University level) Tenure and Promotion Review Committee
- 1978-1984 Member of the University Athletic Advisory Board
- 1980-1983 Chairman, Department of Civil Engineering Personnel Committee (five members elected)
- 1983-1986 Chairman, Department of Civil Engineering
- 1983-1985 Member of the University Faculty Senate
- 1983-1984 Member of the (University level) Tenure and Promotion Review Committee
- 1984-1985 Chairman, Committee on Administration, University Faculty Senate
- 1984-1985 Member (University level) of the Tenure and Promotion Review Committee
- 1986-1987 Member, Department of Civil Engineering Personnel Committee (five members elected)

Participating Faculty Member

1. "Quality of Coastal Waters." National Oceanic and Atmospheric Administration

July 1971 to June 1972: \$160,000
July 1972 to June 1973: \$161,279
July 1973 to June 1974: \$129,695

Publications, Papers, and Technical Reports

- Cheng, E.D.H., and Dugan, G.L., "Low Energy Mixing in Algal Culture Raceways". Paper prepared and submitted to for inclusion in conference proceedings and scheduled to be presented at the American Society of Civil Engineers Energy Division Specialty Conference "Energy 87", Atlantic City, New Jersey, April 27-30, 1987.
- Dugan, G.L., and Takiguchi, D.K., "Rotating Biological Contactor Pilot Study: Fort Kamehameha Wastewater Treatment Plant, Pearl Harbor, Hawaii". Special Report 9:19:86 (Draft), Water Resources Research Center, University of Hawaii at Manoa, Honolulu, September 1986.
- Dugan, G.L., and Bartolini, G., "Water Quality Aspects, Development of Kakaako Waterfront Park, Southeastern Oahu". Final project report to Sea Grant Extension, University of Hawaii at Manoa, Honolulu, August 1986.
- Dugan, G.L.*, Gee, H.K., Oshiro, K.M., and Lau, L.S., "Low-Level Organic Pesticide Removal". Paper presented at the HAZTECH International Conference, Denver, Colorado, August 11-15, 1986. Conference Proceedings pp. 231-245. *Presented paper.
- Cheng, E.D.H., and Dugan, G.L., "Algae Production in Relationship to Induced Mixing in Low Velocity Shallow Water Flow-Phase I". Project Report to Hawaii Natural Energy Institute, University of Hawaii at Manoa, Honolulu, June 1986.
- Lau, L.S., et al., "Subsurface Water Quality Organic Chemical Contamination of Oahu Groundwater, First Progress Report". Special Report 7:0:85, Water Resources Research Center, University of Hawaii at Manoa, Honolulu, December 1985, (one of 15 contributing authors).
- Dugan, G.L.*, Gee, H.K., Oshiro, K.M., and Lau, L.S., "Activated Carbon Adsorption of Low Concentration Organic Pesticides in Water". Paper presented at the Fifth National Symposium on Aquifer Restoration and Ground Water Monitoring, Columbus, Ohio, May 21-24, 1985. Conference Proceeding, pp. 449-461. *Presented paper.
- Dugan, G.L., "Should All Civil Engineering Faculty Have Ph.D.'s?". Paper presented to the American Society of Civil Engineers Conference, Challenges to Civil Engineering Educators and Practitioners, Columbus, Ohio, April 11-13, 1985. Paper in Conference Proceedings.

Publications, Papers, and Technical Reports (continued)

Cheng, E.D.H., Dugan, G.L., Shikada, E.K., and Oshita, A.H., "Mixing Characteristics Created by Various Shaped and Positioned Plates in Low Velocity Shallow Water Flow". Project completion report to the Hawaii Natural Energy Institute, University of Hawaii at Manoa, Honolulu, March 1985.

Dugan, G.L., and Takahashi, P.K., "Energy, Food, and Waste Treatment Systems for Hawaii and the Pacific Basin". Cooperative Report No. 7, Water Resources Resource Center, and Hawaii Natural Energy Institute, University of Hawaii at Manoa, February 1985.

Dugan, G.L.*, and Takahashi, P.K., "Integrated Energy and Food Production and Waste Treatment in Hawaii". Paper presented at the Energy from Biomass and Wastes IX Symposium". Lake Buena Vista, Florida, January 28-February 1, 1985. Conference Proceedings, pp. 127-182. *Presented paper.

Dugan, G.L., Gee, H.K., Oshiro, K.M., "Activated Carbon Adsorption of Low Adsorption of Low Concentration Organic Pesticide in Water", Technical Report No. 166, Water Resources Research Center, University of Hawaii, December 1984.

Dugan, G.L., "Airport Runoff as a Source of Water Supply". Paper presented at the Honolulu Post of the Society of American Military Engineers monthly meeting, Hickam Air Force Base, Oahu, Hawaii, November 6, 1984.

Dugan, G.L., Christakos-Comack, E., and Lau, L.S., "Water Supply Supplemented by Airport Storm Runoff". Paper presented at the 1984 ASCE Hydraulic Division Specialty Conference, Coeur d'Alene, Idaho, August 14, 1984.

Dugan, G.L.*, Tomomitsu, M.S., and Lau, L.S., "Chemical Constituents of Rainfall at Different Locations in Hawaii". Paper presented at the 2nd International Conference on Rainwater Cistern Systems. St. Thomas, Virgin Islands, June 25-27, 1984. *Presented paper.

Dugan, G.L.*, Christakos-Comack, E., and Lau, L.S., "Storm Quality Runoff at Honolulu International Airport". Paper presented at the 2nd International Conference on Rainwater Cistern Systems, St. Thomas, Virgin Islands, June 25-27, 1984. *Presented paper.

Dugan, G.L. and Ekern, P.C., "Chemical Constituents of Rainfall at Different Locations on Oahu, Hawaii, Technical Report No. 160, Water Resources Research Center, University of Hawaii, Honolulu, Hawaii, May 1984.

Dugan, G.L., Gee, H.K., and Lau, L.S. "Decontamination of Chromium-Contaminated Soil in Hawaii", Technical Report No. 159, Water Resources Research Center, University of Hawaii, Honolulu, Hawaii, March 1984.

Publications, Papers, and Technical Reports (continued)

- Dugan, G.L., "Rotating Biological Contactor for Brackish Wastewater Effluent Treatment". Special Report 3:12:84, Water Resources Research Center, University of Hawaii at Manoa, Honolulu, March 1984.
- Dugan, G.L.*, Gee, H.K., Lau, L.S., and Yamamoto, V.K., "Decontamination of Chromium-Contaminated Soil in Hawaii". Paper presented at the Water Pollution Control Federation 56th Annual Conference, Atlanta, Georgia, October 2-7, 1983. Paper in Conference Industrial Waste Symposia Proceedings. *Presented paper.
- Dugan, G.L., "Upgrading Municipal Effluent by Pulsed-Bed Filtration Sand Island Wastewater Treatment Plant, Oahu, Hawaii", Technical Memorandum Report No. 74, Water Resources Research Center, University of Hawaii, Honolulu, Hawaii, October 1983.
- Dugan, G.L., "Water Quality of Airport Storm Runoff Phase II, Technical Report No. 153, Water Resources Research Center, University of Hawaii, Honolulu, Hawaii, May 1983.
- Dugan, G.L.*, and Chun, M.J., "Water Quality Aspects from Kapaa Landfill Expansion". Paper presented at the ASCE National Specialty Conference "Water Supply - The Management Challenge", Tampa, Florida, March 14-16, 1983. *Presented paper.
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- Dugan, G.L., "Algal Mass Culture: Principles, Procedures, and Prospects". HNEI 81-02, Hawaii Natural Energy Institute, University of Hawaii, Honolulu, Hawaii, November 1980.
- Tasato, G.T. and Dugan, G.L., "Leachate Quality from Lysimeters Treating Domestic Sewage". Technical Report No. 131, Water Resources Research Center, University of Hawaii, Honolulu, Hawaii, April 1980.
- Lau, L.S., Ekern, P.C., Loh, P.C.S., Young, R.H.F., Dugan, G.L., Fujioka, R.S., and How, K.T.S., "Recycling of Sewage Effluent by Sugarcane Irrigation: A Dilution Study October 1976 to October 1978, Phase II-A, Technical Report No. 130, Water Resources Research Center, University of Hawaii, Honolulu, Hawaii, March 1980.
- Lau, L.S. and Dugan, G.L., "Reclaimed Sewage Effluent for Sugarcane Production in a Subtropical Area". Third World Congress on Water Resources, Proceedings, Vol. 1, pp. 16-25, International Water Resources Association, 1979.
- Santerre, M.T., Dugan, G.L., and Takahashi, P.K., "Preliminary Laboratory Experimentation on the Potential of Mass-Scale Cultivation of a High-Protein Blue-Green, Alga, Spirulina Geitleri, Utilizing Cattle Feedlot Manure". Technical Report No. 8, Hawaii Natural Energy Institute, University of Hawaii, October, 1978.
- Santerre, M.T., Dugan, G.L., and Takahashi, P.K., "A Computerized Selected Bibliography of Relevant Aspects of the Aquaculture of Unicellular and Filamentous Algae", Technical Report, Hawaii Natural Energy Institute, University of Hawaii, September 1978.
- Bartram, P.D., and Dugan, G.L., "Sediment Movement in a Small Humid Watershed". Paper presented at the American Society of Civil Engineers Hydraulic Division 26th Annual Specialty Conference, College Station, Maryland, August 9-11, 1978. *Presented paper.

C. V. of C. L. Murdoch

Charles L. Murdoch, Professor of Horticulture, Horticulture Department, University of Hawaii, 3190 Maile Way, Honolulu, HI 96822

Personal Data

Born: Atkins Arkansas, August 23, 1932

Wife: Margaret Ann (Turner); Children: Kathryn, age 21; Martha, age 19

Military Service: U. S. Navy, 1950-1955; Honorable Discharge

Education:

B. S. General Agriculture, University of Arkansas, 1959

M. S. Agronomy, University of Arkansas, 1960

Ph. D. University of Illinois, 1966

Employment:

1970-present: Professor (1978-present); Associate Professor (1974-78); and Assistant Professor (1970-74) of Horticulture, University of Hawaii. Chairman, Horticulture Department Graduate Faculty (July, 1986-present); Acting Department Chairman (December, 1983 to September, 1984). Research (60%), Extension (20%), and instruction (20%) in Turfgrass Management. State Extension Turfgrass Specialist.

1966-70: Research Associate, Agronomy Department, University of Arkansas, Fayetteville, Arkansas.

1962-66: Graduate Research Assistant (1964-66) and Graduate Teaching Assistant (1962-64), Agronomy Department, University of Illinois, Urbana Illinois.

1960-62: Research Assistant, Southwest Branch Experiment Station, Hope, Arkansas.

Professional Society Membership:

American Society for Horticultural Science
American Society of Agronomy
Crop Science Society of America
Soil Science Society of America
Hawaii Turfgrass Association (President, 1975), member, Board of Directors, 1970-present.

C. V. of C. L. Murdoch

Honorary Societies:

Alpha Zeta, Sigma Xi, Gamma Sigma Delta
[Treasurer, 1981-83; Secretary, 1983-84; President, 1984-85 (local chapter)].

Publications (since 1976):

- Murdoch, C. L. 1988. Watering turfgrasses. Hawaii Cooperative Extension Service. College of Tropical Agriculture and Human Resources. University of Hawaii. Turf Management Series No. 4. 3pp.
- Murdoch, C. L. 1987. Water: the limiting factor for golf course development in Hawaii. U. S. G. A. Green Section Record 25:11-13.
- Murdoch, C. L. 1986. Spray systems for turfgrasses: calibrating sprayers and mixing pesticides. Res. Ext. Ser. 066. Coll. Trop. Ag. and Human Resources. Univ. Haw. 11 pp.
- Murdoch, C. L., J. A. Jackobs, and J. W. Gerdemann. 1985. Utilization of phosphorus sources of different availability by mycorrhizal and non-mycorrhizal maize. In: Y. K. Soun (ed.) Soil Nutrient availability. Van Nostrand Reinhold Co. N.Y. pp 326-331.
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- Huang, Ruey-Shyang, R. S. Yost, R. L. Fox, M. Habte, and C. L. Murdoch. 1983. Effects of three mycorrhizal isolates on Leucaena leucocephala growth at three soil pH levels. Leucaena Res. Rept. 4:83-85.
- Fujimoto, T. B. H., and C. L. Murdoch. 1983. Nitrogen sources and application schedules for turfgrasses in Hawaii. Proc. 1st Fert. and Ornamentals Short Course. Coop. Ext. Ser., Univ. Haw. pp 51-58.
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- Murdoch, C. L., and R. K. Nishimoto. 1982. Diclofop for goosegrass control in bermudagrass putting greens HortScience 17:914-915.
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- Tashiro, H., C. L. Murdoch, and W. J. Apt. 1977. Nematodes associated with golf putting greens in Hawaii. *Plant Dis. Repr.* 61:919-922.
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- Murdoch, C. L., and J. P. Barr. 1976. Ineffectiveness of commercial microorganism inoculum in controlling thatch in common bermudagrass in Hawaii. *HortScience* 11:488-489.
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- Van Dam, J., and C. L. Murdoch. 1976. Turfgrass management on the island of Oahu. *Deptl. Paper* 41, Hort. Dept., Univ. Haw. 9 pp.

BIOGRAPHICAL RESUME

for

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PERSONAL INFORMATION:

Date of birth: March 23, 1931
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Social Security No.: 523-42-7715
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EDUCATION:

B.S. 1953 Colorado State University	Agriculture
M.S. 1957 University of Nebraska	Soil Fertility
Ph.D. 1962 Iowa State University	Soil Physics

PROFESSIONAL EMPLOYMENT:

1957-58 Univ. Nebraska Instructor (Soils research)
1958-62 Iowa State Univ. Research Assoc. (Soil mgt. research)
1962-present University of Hawaii, Asst., Assoc. and Prof.

OTHER EXPERIENCE:

Sabbatical leaves:
1968-69 AEC Savannah River Lab., Aiken, SC
1975 University of Florida, Gainesville
1983 EPA Environ. Research Lab., Athens, GA
Occasional consultant for consulting engineers, mining
company, pineapple industry, 1975-87
IAEA Expert in soil physics, Malaysia, Apr/May 1982
Associate Editor, SSSA Jour. (Soil Physics) 1980-86
Chairman, Div. S-1 (Soil Physics), Soil Sci. Soc. Amer., 1987

PROFESSIONAL INTERNATIONAL TRAVEL:

Australia, N.Z., Fiji (1968); Papua-New Guinea (1975);
Israel, Sweden, Netherlands (1976); Philippines (1979,80);
Taiwan (1980); USSR (1981); Malaysia (1982).

CURRENT RESEARCH PROJECTS:

Matching Drip-Irrigation System Design and Operation to
Soil Hydraulic Properties (CSRS-USDA support, 1985-88)

Pesticides and Other Organics in Soil and Their Potential
for Groundwater Contamination (Western Regional Project
W-82, CSRS-USDA support, 1983-88)

Evaluation of Fumigants and Non-Volatile Nematicides for
Control of Reniform Nematodes (supported by special State
legislative action to assist the pineapple industry, 1984-88)

Movement of Fenamiphos and Its Principal Oxidation Products
Below the Root Zone of Pineapple (Pesticide Impact Assessment
Program, CSRS-USDA, 1986-87)

Pesticide Mobility Assessment Methodology for Agricultural
Soils Contributing Recharge to Groundwaters in Hawaii
(EPA grant, 1984-88)

Physical and Mineralogical Properties of Saprolite in the
Vadose Zone in Relation to Water and Contaminant Transport
(U.H. Water Resources Research Center, 1985-87)

Procedure for Estimating Movement of Pesticides to Groundwater
in Hawaii: Application and Evaluation on Oahu (State of
Hawaii Office of Environmental Quality Control, 1986-87)

INSTRUCTION:

Chairman of Graduate Field of Agronomy and Soil Sci., 1983-87
Graduate course, Soils 660 Hydrologic Processes in Soils
Direct thesis research of five graduate students currently
Member of several thesis committees within and outside dept.

SERVICE:

Department: Personnel Committee (1983 to present)
College: College Senate Executive Committee (1984-86);
currently a senate member
University: University Research Council (1986-89)
International Student Office Advisory Comm.(1986-)
Tenure and Promotion Review Committees (1986,1987)

Publication List for Richard E. Green

1. Green, R.E., R.J. Hanks, and W.E. Larson. 1964. Estimates of field infiltration by numerical solution of the moisture flow equation. Soil Sci. Soc. Amer. Proc. 28:15-19.
2. Green, R.E., R.L. Fox, and D.D.F. Williams. 1965. Soil properties limit water availability to crops. Hawaii Farm Sci. 14(3):6-9.
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4. Green, R.E. 1966. Evaluation of liming materials derived from a calcareous beach deposit in Hawaii. Hawaii Agr. Expt. Sta. Tech. Bull. 54, 31 pp.
5. Green, R.E. 1966. Herbicides in soils. Proceedings 2nd Annual Turfgrass Management Conference. HES Misc. Publ. 42, 7:1-3.
6. Larson, A.B., R.E. Green, L.B. Rankine, and R.R. Romanowski, Jr. 1966. Progress Report on the Molokai Demonstration Farm of the University of Hawaii for the 1963-64 fiscal year. Hawaii Agr. Expt. Sta. Tech. Prog. Report No. 151, 23 pp.
7. Rankine, L.B., A.B. Larson, and R.E. Green. 1966. Economic evaluation of winter vegetable production on Molokai. Molokai Demonstration Farm, Results for 1964-65. Univ. of Hawaii Agr. Econ. Report 71.
8. Green, R.E., M. Mori, and W.W. McCall. 1967. Soil acidification under flower culture in the Kula area. Hawaii Farm Science 16(4):4-8.
9. Green, R.E. 1967. Soil factors pertinent to chemical weed control. Proceedings of the First Asia-Pacific Weed Control Symposium: 115-117.
10. Green, R.E., V.K. Yamane, and S.R. Obien. 1968. Transport of atrazine in a latosolic soil in relation to adsorption, degradation, and soil water variables. Trans. 9th. Int. Congr. Soil Sci. 1:195-204.
11. Cagauan, B.G. Jr., L.S. Lau, R.E. Green, and G. Uehara. 1968. Solute dispersion in two Hawaiian soils under saturated flow. Proceedings of the 9th International Congress of Soil Science. Trans. 9th Int. Congr. Soil Sci. 1:185-194.
12. Green, R.E. and G. Uehara. 1968. Use of soil-water tensiometers to guide irrigation practice on Hawaii soils. Hawaii Farm Science 17(1-4):7-8.

13. Rankine, L.B., A.B. Larson, and R.E. Green. 1968. Economic evaluation of winter vegetable production on Molokai. A final report for the Molokai Demonstration Farm with an analysis of trellis systems for tomato and cucumber production. Univ. of Hawaii Agr. Econ. Report 80.
14. Whitney, A.S. and R.E. Green. 1969. Pangolagrass performance under different levels of nitrogen fertilization in Hawaii. Agron. J. 61:577-581.
15. Whitney, A.S. and R.E. Green. 1969. Legume contributions to yields and compositions of Desmodium Spp. - Pangolagrass mixtures. Agron. J. 61:741-746.
16. Obien, S.R. and R.E. Green. 1969. Degradation of atrazine in four Hawaiian soils. Weed Sci. 17:509-514.
17. Green, R.E. and S.R. Obien. 1969. Herbicide equilibrium in soils in relation to soil water content. Weed Sci. 17:514-519.
18. Whitney, A.S. and R.E. Green. 1969. Nitrogen fertilization of pangolagrass. Hawaii Farm Sci. 18(4):8-10.
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20. Green, R.E. and Y. Kanehiro. 1970. Soil and water pollution by agricultural chemicals. Proceedings 4th Annual Hawaii Fert. Conf., pages 3-20. Univ. of Hawaii, CES Misc. Publ. 68.
21. Corey, J.C., R.H. Hawkins, R.F. Overman, and R.E. Green. 1970. Miscible displacement measurements within laboratory columns using the gamma-photon neutron method. Soil Sci. Soc. Amer. Proc. 34:854-858.
22. Green, R.E. and J.C. Corey. 1971. Calculation of hydraulic conductivity: A further evaluation of some predictive methods. Soil Sci. Soc. Amer. Proc. 35:3-8.
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37. Rao, P.S.C., R.E. Green, L.R. Ahuja, and J.M. Davidson. 1976. Evaluation of a capillary bundle model for describing solute dispersion in aggregated soils. Soil Sci. Soc. Amer. Proc. 40:815-820.
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39. Khan, M.A., R.E. Green, L. Santo and M. Isobe. 1977. Nitrate and water distribution in the soil under drip-irrigated sugarcane. Hawaiian Sugar Technologists 1976 Reports: 215-222.

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63. Lee, C.-C., R.E. Green and W.J. Apt. 1986. Transformation and adsorption of temamiphos, f. sulfoxide and f. sulfone in Molokai soil, and simulated movement with irrigation. *Contaminant Hydrology* 1:211-225.

64. Green, R.E., C.C.K. Liu and N. Tmrakar. 1986. Modeling pesticide movement in the unsaturated zone of Hawaii soils under agricultural use. In Evaluation of Pesticides in Ground Water, Eds. W.Y. Garner, R.C. Honeycutt and H. N. Nigg. ACS Symposium Series No. 315, p. 366-383. Amer. Chem. Society, Wash. D.C.
65. Khan, M.A., R.E. Green and T. Liang. 1986. Nitrogen transformations in soils: experimental and mathematical considerations for computer modeling. HITAHR Research Series 045, University of Hawaii, 40 pp.
66. Mapa, R.B., R.E. Green and L. Santo. 1986. Temporal variability of soil hydraulic properties with wetting and drying subsequent to tillage. Soil Sci. Soc. Am. J. 50:1133-1138.
67. Green, R.E. and M.A. Khan. 1987. Pesticide movement in soil by mass flow and diffusion. p. 87-92. In Fate of Pesticides in the Environment, Symposium Proceedings March 4-5, 1986. Sacramento, CA. J. Seiber and J. Biggar (Eds), Univ. California Publ. 3320, Div. Agric. Sci., Berkeley, CA.
68. Bresler, E. and R.E. Green. 1987. Transport of a degradable substance and its metabolites under drip irrigation. Agric. Water Mgt. 12: 195-206.
69. Liu, C.C.K., N.K. Tmrakar, and R.E. Green. 1987. Biodegradation and adsorption of DBCP and the mathematical simulation of its transport in tropical soils. Toxicity Assessment: An International Quarterly 2:239-252.
70. Rao, P.S.C. and R.E. Green (Ed.) 1987. Toxic Organic Chemicals in Hawaii Water Resources. HITAHR Research-Extension Series 086, Univ. Hawaii, Honolulu. 67 p.
71. Rao, P.S.C. and R.E. Green. 1988. Pesticide Fate: current knowledge and applications. In Proceedings of a SSSA Workshop on "Perspectives on the Contamination of Groundwater from Agriculture", New Orleans, Dec. , 1986 (accepted).
72. Khan, M.A. and R.E. Green. 1988. Use of the Pesticide Root Zone Model (PRZM) for assessing DBCP leaching in Hawaii. Accepted for publication as HITAHR Research-Extension Series.
73. Green, R.E. and S.W. Kerickhoff. 1988. Estimating pesticide sorption coefficients for soils and sediments. Volume III, Small Watershed Model. ARS/USDA (in press).
74. Loague, K.M., R.E. Green, C.C.K. Liu and T.C. Liang. 1988. Simulation of organic chemical movement in Hawaii soils with PRZM: 1. Preliminary results for EDB. Accepted for publication in Pacific Science.
75. Loague, K.M., R.S. Yost, R.E. Green and T.C. Liang, 1988. Uncertainty in a pesticide leaching assessment for Hawaii. Submitted to J. Contaminant Hydrology.

76. Green, R.E., K.M. Loague and R.S. Yost. 1988. Assessment of pesticide leaching using soil survey and taxonomy. In Soil Resources: Their Inventory, Analysis, and Interpretation for use in the 1990's. Proceedings of an international interactive workshop, Minneapolis, Minnesota, March 22-24, 1988.

John F. Mink
Hydrologist and Geologist
P.O. Box 4452
Honolulu, Hawaii 96813

Biographical Information

1. Born in Pennsylvania, U.S.A.
2. Education:
 - a. Pennsylvania State University, B.Science, 1949.
 - b. University Chicago, M.Science, 1951.
 - c. University of Hawaii, 1960-1964.
 - d. The Johns Hopkins University, 1965-1967.
3. Professional Positions:
 - a. Hawaiian Sugar Planters Association, 1952-1953.
 - b. Pacific Chemical and Fertilizer Co., Honolulu, Hawaii, 1953-1956.
 - c. Groundwater Geologist, US Geological Survey, Honolulu, Hawaii, 1956-1960.
 - d. Hydrologist, Honolulu Board of Water Supply, 1960-1964.
 - e. Environmental Analyst, Research Analysis Corporation, McLean, Va., 1967-1968.
 - f. Vice President, The Earth Sciences Group, Inc., Washington, D.C., 1968-1972.
 - g. Consultant in Hydrology and Geology, 1960-present.
4. Some Major Projects since 1970.
 - a. Continuing studies of optimal water resources development in the Hawaiian Islands. Work performed for the Honolulu Board of Water Supply, the University of Hawaii, the State of Hawaii, the U.S. Geological Survey, and numerous private clients.
 - b. Evaluation of the groundwater resources of Micronesia for the U.S. Environmental Protection Agency. The study includes all of the islands in the Marshall Islands, the Federated States of Micronesia, and the Republic of Belau. In progress.
 - c. Director of the Northern Guam Lens Study for the Government of Guam. The project was funded at 1.3 million dollars and included geophysical surveys, drilling of wells, mapping, and mathematical modeling. 1980-1983.
 - d. Water supply studies for the Jaffna Peninsula, Sri Lanka. Evaluation of prevailing conditions and exploration for additional water supplies. 1982-1983
 - e. Survey of the groundwater resources of Cheju Island, Korea, for the Korean Government. Basic hydrogeological reconnaissance of the entire island. 1981.
 - f. Investigation of the water resources of the coastal plain of Ehr Jen Chi, Taiwan, for the Taiwan Sugar Company, as part of a University of Hawaii team. 1970.
 - g. Investigation of groundwater opportunities in Tahiti and Bora Bora. 1972-1973.

5. Projects in other locations: Okinawa, Saipan, Diego Garcia, Egypt, Venezuela, mainland United States, Philippines, Fiji, Samoa.

6. Publications:

a. International Scientific Journals: Science; Journal of Geophysical Research; Bulletin of the Seismological Society of America; Pacific Science; Bulletin of the International Association of Scientific Hydrology; Groundwater.

b. Government and University: U.S. Geological Survey; State of Hawaii; University of Hawaii; City and County of Honolulu; University of Guam.

c. Numerous consulting reports.

7. Professional Societies, Recognitions and Affiliations:

a. Registered Geologist #364, State of California.

b. Registered Hydrogeologist #283, American Institute of Hydrology.

c. Registered Geologist #1693, American Institute of Professional Geologists.

d. State of Hawaii Water Commission, 1977-1979.

e. Acting Chairman, Expert Group on Guidelines for Freshwater Statistics, United Nations. 1983.

f. Research Affiliate, University of Hawaii.

g. Research Affiliate, University of Guam.

h. Member: American Institute of Hydrology; American Water Works Association; Geological Society of America; American Geophysical Union; American Association for the Advancement of Science; American Association of Professional Geologists.

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RESUME

of

STEVEN J. DOLLAR, Ph.D.

PRINCIPAL

of

MARINE RESEARCH CONSULTANTS
Honolulu, Hawaii

SUMMARY OF QUALIFICATIONS

*** Extensive educational background and practical research experience in the fields of biological and chemical oceanography, marine ecology, coral reef ecosystem stress, benthic community metabolism, sediment-water interactions, water quality monitoring and environmental impact assessment.

*** Experienced in organizing, designing and conducting research programs including proposal preparation, logistical coordination, field and laboratory techniques, data reduction and analysis, report preparation and supervision of professional and technical employees.

*** Skilled in all phases of underwater work including commercial and marine field research techniques and familiar with all equipment utilized in these areas.

*** Proficient and fully equipped for all types of technical photography with special expertise in underwater photography.

FOR FURTHER DATA PLEASE SEE FOLLOWING PAGES

ACADEMIC EXPERIENCE

- B.S. 1971., University of Miami, Coral Gables, Fla. Majors in Biology and Chemistry, Graduated with honors, magna cum laud
- M.S. 1975., University of Hawaii, Honolulu, Hi. Biological Oceanography. Thesis title: Zonation of Reef Corals off the Kona Coast of Hawaii.
- Ph.D. 1986., University of Hawaii, Honolulu, Hi. Dept. of Oceanography, Dissertation title: Response of Benthic Ecosystems to Deep Ocean Sewage Outfalls in Hawaii: Nutrient Cycling at the Sediment-Water Interface.

PROFESSIONAL EXPERIENCE

- 1980 - present PRINCIPAL
 MARINE RESEARCH CONSULTANTS
 Honolulu, Hawaii
- 1975 - present RESEARCH ASSOCIATE
 Hawaii Institute of Marine Biology &
 Department of Oceanography
 University of Hawaii, Honolulu, HI

PUBLICATIONS

- Russo, A. R., Dollar, S. J. and E. A. Kay. 1976. An ecological survey of the Mokapu Point sewage treatment plant outfall area. Water Resources Research Center, Univ. of Hawaii. Tech. Rpt. No. 101.
- Kay, E. A., Lau L. S., Stroup, E. D., Dollar, S. J. Fellows, D. P., Young, R. H. F. 1977. Hydrologic and ecological inventory of coastal waters of West Hawaii. Water Resources Research Center, Univ. of Hawaii. Tech. Rpt. No. 105.
- Dollar, S. J. 1978. Guide to research logistics in the Northwestern Hawaiian Islands. University of Hawaii Sea Grant Working Paper No. 33.
- Russo, A. R. Dollar, S. J. and E. A. Kay. 1979. Ecological observations off the Mokapu, Oahu ocean outfall: a post-installation study. Water Resources Research Center, Univ. of Hawaii. Tech Rpt. No. 122.

- Dollar, S. J. 1979. Sand mining in Hawaii - research, restrictions and choices for the future. Sea Grant Technical paper, UNIHI-SEAGRANT-TP-79-01, Univ. of Hawaii.
- Dollar, S. J. 1979. Ecological response to relaxation of sewage stress off Sand Island, Oahu, Hawaii. Water Resources Research Center, Tech. Rpt. No. 124.
- Russo, A. R., Dollar, S. J. and E. A. Kay. 1980. Benthic ecosystem and fish populations off the Mokapu outfall: a second post-installation study. Water Resources Research Center, Univ of Hawaii. Tech Rpt. No. 132.
- Grigg, R. W. and S. J. Dollar, 1980. The status of reef studies in the Hawaiian Archipelago. In: Proceedings of the Symposium on the Status of Resource Investigations in the Northwest Hawaiian Islands. Sea Grant Miscellaneous Report UNIHI-SEAGRANT-MR-80-04, Honolulu, Hawaii.
- Dollar, S. J. and R. W. Grigg. 1981. Impact of a kaolin clay spill on a coral reef in Hawaii. Marine Biology 65:269-276.
- Dollar, S. J. 1982. Wave stress and coral community structure in Hawaii. Coral Reefs 1:71-81.
- Dollar, S. J. 1982. Sand Island, Oahu: Assimilative capacity at a tropical ocean outfall. In: Proceedings, Marine Pollution Sessions OCEANS '82. Washington, D.C.
- Smith, S. V., S. J. Dollar, plus 6 others. 1987. Stoichiometry of C, N, P and Si fluxes in a temperate-climate embayment. Journal of Marine Research 45:427-460.
- Smith, S. V., and S. J. Dollar, 1987. Response of benthic ecosystems to deep ocean outfalls in Hawaii: a nutrient cycling approach to biological impact assessment and monitoring. EPA Report No. EPA/600/3-87/006 ERLN-NX02.
- Grigg, R. W., and S. J. Dollar, 1987. Natural and anthropogenic disturbance on coral reefs. In press.
- Dollar, S. J. Response of the benthic ecosystem to deep ocean sewage outfalls in Hawaii: Comparison of the functional community metabolism approach to community structure analysis as methods for assessing impact. In prep.
- Dollar, S. J. The influence of anthropogenic organic loading on benthic nutrient fluxes in an oligotrophic subtropical environment. In prep.

Dollar, S. J. Deep ocean sewage discharge in Hawaii: a case history of effective waste disposal. In prep.

Dollar, S. J. A deep ocean sewage outfall in Hawaii acts as a natural trickling filter. In prep.

PAPERS PRESENTED AT SYMPOSIA

Dollar, S. J. 1980 Ecological response of benthic communities to relaxation of sewage stress off Sand Island, Oahu. Environmental Survey Techniques for Coastal Water Assessment Conference, Honolulu, Hawaii.

Dollar, S. J. 1981. Wave stress and coral community structure in Hawaii. IV International Coral Reef Symposium, Manila, Philippines.

Dollar, S. J. 1982. Sand Island, Oahu - Assimilative capacity at a tropical ocean outfall. OCEANS '82, Washington, D.C.

Dollar, S. J. 1988. Effects of deep ocean sewage discharges on benthic biogeochemical fluxes in Hawaii. Ocean Sciences Meeting, ASLO/AGU, New Orleans, LA.

Smith, S. V., J. T. Hollibaugh, and S. J. Dollar. 1988. Net heterotrophy in Tomales Bay, California. Ocean Sciences Meeting, ASLO/AGU, New Orleans, LA.

ENVIRONMENTAL IMPACT ASSESSMENTS

Grigg, R. W. and S. J. Dollar. 1980. Environmental impact assessment of nearshore marine life at Princeville, Kauai, Hawaii. Prepared for Princeville Development Corp.

Dollar, S. J. 1980. Environmental impact assessment of nearshore marine life at Ninini Point, Kauai, Hawaii. Prepared for Belt, Collins & Assoc.

Dollar, S. J. 1980. Impacts of the nearshore marine community at Mahukona, Island of Hawaii. Prepared for Belt, Collins & Assoc.

Dollar, S. J. 1981. Environmental impact assessment of nearshore marine community structure at Kohala, Hawaii, in the vicinity of the Kohala Makai development. Prepared for Belt, Collins and Assoc.

- Dollar, S. J. 1983. Preliminary assessment of the marine environment at prospective seawater intake/outfall sites for the solid waste processing and resource recovery facility. Prepared for the City and County of Honolulu.
- Dollar, S. J. 1983. Preliminary assessment of the marine environment in the vicinity of Nanuku Inlet, Mauna Lani Resort, South Kohala, Hawaii. Prepared for Mauna Lani Resort, Inc.
- Dollar, S. J. 1983. Baseline Assessment of the Marine environment and fishponds at the Mauna Lani Resort, South Kohala, Hawaii. Prepared for Mauna Lani Resort, Inc.
- Dollar, S. J. 1984. Marine biological impact assessment for the proposed Ford Island Causeway, Pearl Harbor, Hawaii. Prepared for Belt, Collins and Associates.
- Dollar, S. J. 1984. Baseline assessment of the marine environment in the vicinity of the Hapuna Beach Resort, South Kohala, Hawaii. Prepared for Belt, Collins and Associates.
- Dollar, S. J. 1984. Baseline assessment of the marine environment at Halepalaoa Landing, Lanai, Hawaii. Prepared for Belt, Collins and Associates.
- Dollar, S. J. 1984. Marine biological impact assessment of the Hawaii Kai Ocean Sewage Outfall - A continuing monitoring program. Prepared for M & E Pacific.
- Dollar, S. J. 1984. Baseline assessment of the marine environment in the vicinity of Makaiwa Bay, Mauna Lani Resort, South Kohala, Hawaii. Prepared for Belt, Collins and Associates.
- Dollar, S. J. 1984. Submersible investigations of the deep marine environment in the vicinity of French Frigate Shoals and Necker Island, Northwestern Hawaiian Islands. Prepared for the State of Hawaii, Dept. of Planning and Economic Development, and the U. S. Dept. of Interior Minerals Management Service.
- Dollar, S. J. 1985. Environmental assessment of Hilo Bay: Marine biological community structure in the vicinity of the proposed Hilo sewage outfall extension. Prepared for M & E Pacific, Inc.
- Dollar, S. J. 1985. Baseline assessment of the offshore marine environment in the vicinity of Kaupulehu Developments, North Kona Hawaii. Prepared for Belt, Collins & Assoc.

- Dollar, S. J. 1986. Effects to the marine ecosystem from beach construction at Makaiwa Bay, Mauna Lani Resort, South Kohala, Hawaii (Phase I). Prepared for Mauna Lani Resorts, Inc.
- Dollar, S. J. 1986. Baseline assessment of the marine environment in the vicinity of the O'oma II Resort Development. Prepared for Helber, Hastert, Van Horn and Kimura, Planners.
- Dollar, S. J. 1986. Baseline assessment of the marine environment and anchialine ponds at Awake'e, North Kona, Hawaii. Prepared for Helber, Hastert, Van Horn and Kimura, Planners.
- Dollar, S. J. 1986. Baseline assessment of the marine environment at Pauoa Bay, South Kohala, Hawaii. Prepared for Belt, Collins & Assoc.
- Dollar, S. J. 1987. Baseline assessment of the water chemistry of the Hilton Hawaiian Village Lagoon, Honolulu, Hawaii. Prepared for Belt, Collins & Assoc.
- Dollar, S. J. 1987. Effects to water quality and marine community structure from beach reconstruction at Makaiwa Bay, Mauna Lani Resort, South Kohala, Hawaii. Prepared for Mauna Lani Resort, Inc.
- Marine Research Consultants. 1987. A second baseline assessment of the marine environment in the vicinity of the South Kohala Resort, South Kohala, Hawaii. Prepared for Belt, Collins & Assoc.
- Marine Research Consultants. 1987. Baseline assessment of the marine and anchialine pond environments in the vicinity of the Hawaiian Riviera Resort, Ka'u, Hawaii. Prepared for Belt, Collins & Assoc.
- Marine Research Consultants. 1987. Marine environmental assessment of cooling water discharge and offshore diffuser construction associated with the addition of Unit 7, Kahe Generating Station, Hawaiian Electric Company. Prepared for Belt, Collins & Assoc.
- Marine Research Consultants, 1987. Baseline assessment of the marine environment at Waiulua Bay, South Kohala, Hawaii. Prepared for Belt, Collins & Assoc.

STEVEN J. DOLLAR

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PROFESSIONAL ORGANIZATIONS

International Society for Reef Studies
American Association for the Advancement of Science
American Society of Limnology and Oceanography
American Geophysical Union

SCHOLARSHIPS

Achievement Rewards for College Scientists (ARCS Foundation Inc.) Scholarship Award, 1983 and 1984.

PERSONAL DATA

Born 6-30-49, Single, excellent health, willing to relocate.
SS# 212-54-0845

ADDITIONAL INFORMATION AND REFERENCES ON REQUEST

CURRICULUM VITAE

Andrew John Berger

Born: August 30, 1915; Warren, Ohio.

Children: John D., born 1950; Diana M., born 1952.

Degrees: Warren G. Harding High School, Warren, Ohio, 1933.
A.B., 1939, Oberlin College.
M.A., 1947, The University of Michigan.
Ph.D., 1950, The University of Michigan.

Military service:

U.S. Air Force, March 1941 to February 1946. Now
Lieutenant Colonel, Air Force Reserve, Retired.

Positions Held:

Laboratory Assistant, general zoology, Oberlin
College, 1938-1940.
Teaching Fellow, general zoology, comparative
anatomy, and comparative embryology, The
University of Michigan, 1946-1949.
Research Assistant, Museum of Zoology, The
University of Michigan, summer 1949.
Instructor, Anatomy Department, The University
of Michigan Medical School, 1950-1954.
Assistant Professor, Anatomy Department, The
University of Michigan Medical School, 1954-1957.
Associate Professor, Anatomy Department, The
University of Michigan Medical School, 1957-1964.
Visiting Professor, Department of Zoology, University
of California at Los Angeles, summer session 1960.
Carnegie Visiting Professor, Department of Zoology,
University of Hawaii, 2nd semester, 1963-1964.
Senior Fulbright Lecturer, Maharaja Sayajirao
University of Baroda, Baroda, India, 1964-1965.
Visiting Professor, University of Minnesota
Biological Station, Lake Itasca, summer 1974.
Visiting Professor, Cornell University, summer 1977.
Professor, Department of Zoology, University of
Hawaii, 1965 to 1981; Chairman, 1965-1971;
Acting Chairman, 1975-1976. Professor Emeritus, 1981.

Research Fellowships:

Edward K. Love Research Fellow (Game Management),
University of Missouri, 1940-1941; resigned
for war service.
Horace H. Rackham Special Fellow, The University
of Michigan, 1949-1950.
The University of Michigan Faculty Summer Research
Fellowship, 1956.
American Philosophical Society Research Grant, 1957.
Horace H. Rackham Faculty Research Grant (Project
no. 111), 1957.
McGregor Fund, Detroit, Michigan, summer 1958.
Horace H. Rackham Faculty Summer Grant, 1962.
John Simon Guggenheim Fellow, 1963.
University of Hawaii Research Administration Grant, 1965.
National Science Foundation grants: 1966-1969; 1970-1975.

Scientific and Honorary Societies:

American Association of Anatomists.
Member of the Editorial Board of The University of
Michigan Medical Bulletin, 1961-1964.
American Ornithologists' Union; elected a Fellow, 1958;
member of committee on research; Assistant Editor
of The Auk, 1953-1954; member of Editorial Board.
Wilson Ornithological Society; Assistant Editor of
The Wilson Bulletin, 1950-1951; member of Editorial
Board, 1951-1966; elected Member of Council,
1956-1959, 1967-1970; Second Vice-President, 1971-1973;
First Vice-President, 1973-1975; President, 1975-1977.
Fellow, American Association for the Advancement of
Science, 1965.
Cooper Ornithological Society.
American Society of Zoologists.
Science Research Club, The University of Michigan.
Senior Research Club, The University of Michigan.
Phi Sigma.
Sigma Xi.
Phi Kappa Phi.
Honorary member of Psi Omega Professional Dental
Fraternity, 1963.
Association for Tropical Biology.
Hawaii Audubon Society; Vice-President, 1966-1968.
Executive Board, The Conservation Council for
Hawaii, 1966-1968.
Honorary Associate in Ornithology at the Bernice P.
Bishop Museum, 1965 to date.
Honorary member of the Laboratory of Ornithology,
Cornell University, 1968 to date.
Honorary Consultant Ornithology, Waimea Arboretum Foundation,
Oahu, Hawaii.

Scientific and Honorary Societies (continued):

Explorers Club of New York; elected an active nonresident member, 1967 to date.
Member of Task Force of the International Biological Program for the Hawaii Terrestrial Biology Project, 1967-1968.
Co-Director of Hawaii Terrestrial Biology Subprogram of the International Biological Program, 1968-1975.
Member of Hawaiian Academy of Science, 1968 to date.
East-West Center Press Editorial Committee, 1968-1970.
University of Hawaii representative to the Organization for Tropical Studies Advisory Council, 1968-1971; member of Board of Directors, 1971-1973.
Member of Governor's Committee to Prepare a Program for the Preservation of Scientific Areas in Hawaii, 1969-1970.
Member of the Advisory Committee on Land Vertebrates of The Board of Agriculture, 1970-1972.
Member of Oceanic Institute Alliance, 1970-1972.
Member of Governor's Animal Species Advisory Commission (Act 195, 1970); Acting Chairman, 1970-1971; member, 1971-1975.
Member of the International Committee for Avian Anatomical Nomenclature, 1971 to date.
Leader, Palila Recovery Team, U.S. Department of the Interior, 1975 to date.
Member of the Hawaii Forest Birds Recovery Team, U.S. Department of the Interior, 1975 to date.

Biographical Notations in the Following:

American Men of Science
World Who's Who in Science
Who's Who in the West
Who's Who in America
Who's Who in the World
Dictionary of International Biography
International Who's Who in Community Service
Men and Women in Hawaii
American Men and Women of Science
Men of Achievement
Contemporary Authors
The World Who's Who of Authors
Men and Women of Distinction

Publications:

Books

Fundamentals of Ornithology (with Josselyn Van Tyne).
John Wiley & Sons, New York, 1959, 624 pp., 254 illus.

"The Musculature." In A. J. Marshall, ed., Biology and Comparative Physiology of Birds, vol. 1, pp. 301-344,
Academic Press, New York, 1960.

Bird Study. John Wiley & Sons, New York, 1961,
389 pp., 178 illus.

Elementary Human Anatomy. John Wiley & Sons, New York,
1964, 538 pp., 186 illus.

Avian Myology (with J. C. George). Academic Press,
New York, 1966, 500 pp., 248 illus.

"Bird." In Merit Students Encyclopedia, vol. 3,
pp. 168-191, Crowell-Collier Educ. Corp., New York,
1967.

"Kleidervogel" (with Wilhelm Meise). In Grzimek's
Tierleben, Band IX, pp. 369-377, München, Germany, 1970.

"Muscular System" and "Musculature." In O. S. Pettingill,
Ornithology in Laboratory and Field, 4th ed., pp. 72-81,
102-105, Burgess Publ. Co., Minneapolis, 1970.

"Internal Anatomy." In Seminars in Ornithology,
pp. 125-174, Laboratory of Ornithology, Cornell
University, 1972.

Hawaiian Birdlife. University Press of Hawaii, Honolulu,
1972, 270 pp., 59 color plates, 126 black and white
photographs.

"Birds." In R. W. Armstrong, ed., Atlas of Hawaii,
University Press of Hawaii, Honolulu, 1973.

"Hawaiian Honeycreepers" (with Wilhelm Meise). In
Grzimek's Animal Life Encyclopedia, vol. 9, pp.
386-394, Van Nostrand Reinhold Co., New York, 1973.

Fundamentals of Ornithology. 2nd ed. John Wiley & Sons,
New York, 1976, 808 pp., 528 illus.

Publications (continued):

The Exotic Birds of Hawaii. Island Heritage Ltd.,
Norfolk Island, Australia, 1977, 48 pp.

"Fitness of Offspring from Captive Populations" and
"Reintroduction of Hawaiian Geese." In S. A. Temple,
ed., Endangered Birds: Management Techniques for
Threatened Species, pp. 315-322, 339-344, University
of Wisconsin Press, Madison, 1978.

The Hawaiian Goose. An Experiment in Conservation
(with Janet Kear), T. & A. D. Poyser, Ltd.,
Berkhamstead, England, 1980.

Hawaiian Birdlife, 2nd edition, University Press of
Hawaii, Honolulu, 1981, 260 pp., 67 color plates,
137 black-and-white photographs.

"Birds," in Atlas of Hawaii, R. W. Armstrong, editor,
2nd edition, University of Hawaii Press, Honolulu,
1983.

Birdlife in Hawaii, Island Heritage, Ltd. Norfolk Island.
Australia, 1973, 72 pp.

"Avifauna" and "Birds of Enewetak Atoll," in The Natural
History of Enewetak Atoll, E. S. Reese and Philip
Helfrich, editors, Department of Energy, Oak Ridge,
Tennessee, 1984.

"Anatomy and Physiology," in Ornithology in Laboratory
and Field, 5th edition, by Olin Pettingill, Jr.,
Academic Press, New York, 1985.

Plus about 145 papers (including reviews) in scientific journals.



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Andrew J. Berger
Professor Emeritus

During the past decade I have done ecological consulting work (terrestrial vertebrates) on Kauai, Oahu, Lanai, Maui, Hawaii, Kahoolawe, and Kaula Island for the following agencies and companies:

1. Parsons, Brinkerhoff-Hirota Associates, Honolulu.
2. Ralph M. Parsons Company, Honolulu.
3. Sunn, Low, Tom & Hara, Inc., Honolulu.
4. Department of Land and Natural Resources, State of Hawaii.
5. R. M. Towill Corporation, Honolulu.
6. Austin, Smith & Associates, Honolulu.
7. Environmental Communications, Inc., Honolulu.
8. Nuclear & Systems Sciences Group, Holmes and Narver,
Anaheim, California.
9. Maui Electric Company, Kahului, Maui.
10. U.S. Department of Agriculture, Honolulu.
11. Great Hawaiian Realty, Inc., Honolulu.
12. Wong, Sueda, and Ching, Inc., Architects and Planners, Honolulu.
13. Aquatic Sciences Corporation, Honolulu.
14. Paradise Park, Honolulu.
15. Park Engineering, Inc., Honolulu.
16. U.S. Fish and Wildlife Service, Honolulu.
17. Gray, Hong & Associates, Inc., Consulting Engineers, Honolulu.
18. Kennedy/Jenks Engineers, Honolulu.
19. Belt, Collins & Associates, Honolulu.
20. EDAW, Inc., Honolulu.
21. Mid-Pacific Geothermal, Inc., Casper, Wyoming.
22. Group 70, Honolulu.
23. PBR, Phillips, Brandt, Reddick, Honolulu.
24. Alexander & Baldwin, Inc., Honolulu.

AN EQUAL OPPORTUNITY EMPLOYER

Paul H. Rosendahl, Ph.D., Inc.
Consulting Archaeologist

Brief Resumes of Supervisory Staff

Name and Title: Paul H. Rosendahl, Ph.D.
President and Principal Archaeologist

Years Experience: With this firm 6 With Other Firms 14

Education: A.B./1966/Anthropology
M.A./1970/Anthropology (Archaeology)
Ph.D./1972/Anthropology (Archaeology)

Active Registration:

- Society for American Archaeology
- American Anthropological Association
- Society for Hawaiian Archaeology
- Hawaii Island Archaeological Group

Other Experience and Qualifications:

Dr. Rosendahl has almost 20 years of archaeological experience in Hawaii, involving more than 340 projects. He has also done field work in the Solomon Islands and in Eastern Micronesia. His background includes teaching experience (archaeology) at the University of Hawaii-Hilo (seven years, part-time), seven years as staff archaeologist at Bishop Museum, and almost nine years as an independent consulting archaeologist. He has also worked as an archaeologist with the National Park Service in Hawaii. As President and Principal Archaeologist of FHRI, Dr. Rosendahl personally oversees all archaeological work conducted by FHRI. This work includes initial contact with clients, proposal preparation, actual staffing and conduct of field work, review of written reports, and necessary consultations with appropriate government agencies. In addition to his position as President and Principal Archaeologist of FHRI, Dr. Rosendahl holds a University of Hawaii-Board of Regents appointment as Affiliate Professor of Anthropology.

Dr. Rosendahl has testified as an expert witness before the Hawaii State Land Use Commission, and State Board of Land and Natural Resources, the Hawaii County Planning Commission, and the County Council-City and County of Honolulu. Proceedings have dealt with rezoning requests, Land Use Boundary Amendment petitions, Special Management Area (SMA) permit applications, Conservation District Use Application (CDUA) permits, and County General Plan Amendments (GPA). His knowledge of the county, state, and federal historic preservation laws, ordinances, guidelines, and procedures enables FHRI to develop appropriate archaeological programs to address the needs of clients, in conformance with existing governmental regulations, while dealing responsibly with Hawaii's cultural resources.

Paul H. Rosendahl, Ph.D., Inc.
Consulting Archaeologist

Name and Title: Alan E. Haun, Ph.D.
Senior Archaeologist

Years Experience: With this firm 2 With Other Firms 11

Education: B.A./1974/Anthropology
M.S./1977/Anthropology (Archaeology)
Ph.D./1984/Anthropology (Archaeology)

Active Registration:

- Society for American Archaeology
- Society for Hawaiian Archaeology

Other Experience and Qualifications:

Dr. Haun has over 12 years of archaeological experience in Hawaii, Micronesia, and the mainland United States involving more than 100 archaeological projects. He joined PHRI in August 1985 as a full-time staff member in the position of Senior Archaeologist. Between 1976 and 1981, he was involved in major archaeological investigations on Ponape in the Eastern Caroline Islands. The Ponape research formed the basis for his doctoral dissertation, which deals with prehistoric agriculture, demography, and sociopolitical evolution on Ponape. Prior to joining PHRI, Dr. Haun administered the Contract Archaeology Program at B.P. Bishop Museum in Honolulu. The Micronesian experience and his more than three years of work in Hawaii give him a solid background in Pacific archaeology.

As PHRI Senior Archaeologist, Dr. Haun has been involved in numerous projects in the capacity of project director and/or co-principal investigator. These projects range from reconnaissance surveys to major mitigation excavation programs conducted on all of the main Hawaiian Islands and in Micronesia. Dr. Haun has a broad range of experience in all phases of cultural resource management, including a thorough knowledge of the various county, State of Hawaii, and especially federal historic preservation laws, guidelines, and procedures.

In addition to his position as Senior Archaeologist with PHRI, Dr. Haun holds a University of Hawaii-Board of Regents appointment as Affiliate Professor of Anthropology. He also is a trained palynologist and has extensive experience with computer-based statistical analyses of archaeological data.

VITAE
KENNETH M. NAGATA

BORN: 26 June 1945, Honolulu, Hawaii

STATUS: Married, two children

EDUCATION

High School - Kaimuki, 1963
BA, Botany - University of Hawaii at Manoa, 1968
MA, Geography - University of Hawaii at Manoa, 1980
Thesis title: "The Phytogeography of Pahole Gulch, Waianae Mts., Oahu"

JOB EXPERIENCE

Research Assistant, Lyon Arboretum, UHM - 1968-1974
Research Associate II, Lyon Arboretum, UHM - 1974-present

TEACHING EXPERIENCE

Instructor in Botany - UHM, 1972-1974
Instructor in Botany - Chaminade University of Hawaii, 1977
Instructor in Botany - Kapiolani Community College, Fall 1978; Fall 1980
Instructor in Botany - Leeward Community College, Spring 1984

AWARDS

Hamilton Library Prize in Pacific Islands Research - 1980

PROFESSIONAL MEMBERSHIPS

Sigma Xi
Society for Economic Botany
Smithsonian Associates
Texas Academy of Science
Hawaiian Botanical Society

OTHER PROFESSIONAL ACTIVITIES

Academic Advisor, Liberal Studies Program, UHM - 1975-present
Botanical Consultant - 1976-present
Field Botanist, Bernice P. Bishop Museum - 1978-present
Botanist, State Animal Species Advisory Commission - 1979-present
Judge, Senior Division, Hawaiian Science & Engineering Fair - 1982-present
Botanical Consultant, C & C of Honolulu Parks & Rec. Dept. May Day Lei Contest

BIOGRAPHICAL LISTINGS

Who's Who In The West
Who's Who In America
Community Leaders Of America
Directory of Distinguished Americans
Two Thousand Notable Americans
Men of Achievement
Dictionary of International Biography
Personalities of America

FIELD EXPERIENCE AND BOTANICAL PROFICIENCY

As botanist and taxonomist at the Lyon Arboretum, one of my duties is to identify all undetermined species in the collections as well as any plants scientists

or laymen may bring for identification. In addition, I am the Curator of the Herbarium and in charge of all plant records and accessions. From 1968 to 1974 I was employed on a contract from the National Institutes of Health to identify and collect plants throughout Hawaii for cancer research. This involved extensive field and laboratory work. In 1975 my position was transferred to regular state funds and the contract was turned over to other federally-funded positions. However, I was retained as a botanical consultant until the contract expired in approximately 1979. In this capacity I spent nearly two weeks in the Caroline Islands botanizing on Ponape.

Since 1976 I have been a private botanical consultant specializing in surveys for environmental assessments. I have participated in numerous such projects including the Installation Environmental Impact Statement for the U.S. Army Support Command, Hawaii for which I surveyed several facilities.

For the past three years I have been engaged in taxonomic studies in the genera Bidens and Urera. Several papers towards a complete revision of the genus have already been published on Bidens, in collaboration with a colleague from the University of British Columbia. A monographic treatment of Urera is presently in preparation.

SELECTED PUBLICATIONS

- Hawaiian medicinal plants. Economic Botany. 25(3):245-254. 1971.
- A Checklist of Indigenous and Endemic Plants of Hawaii in Cultivation at the Harold L. Lyon Arboretum. Lyon Arboretum Publication. n/p. 1972
- Campus Plants, University of Hawaii at Manoa. University of Hawaii Publication. August 1976. (revision).
- Popolo. The Kukui Leaf. 3(2):2. 1977.
- Hawaiian coastal environments: observations of native flora. Sea Grant Quarterly. 2(2):1-6. 1980. K.M. Nagata & B.Y. Kimura.
- Hawaii's Vanishing Flora. Oriental Publishing Co. Honolulu. 88 pp. B.Y. Kimura & K.M. Nagata. 1980
- Campus Plants, University of Hawaii at Manoa. University of Hawaii Publication. 24 pp. July 1980. (revised 2nd edition).
- "Native Strand Flora". pp 6-7. in Conserving Hawaii's Coastal Ecosystems Abstracts. Sea Grant Cooperative Report. UNIH-SEAGRANT-CR-81-01. June, 1981.. 43 pp.
- Predation of Pipturus albidus fruit by rodents. Elepaio. 41(12):134. 1981. W. Teraoka, K.M. Nagata & C. Corn.
- New taxa and new combinations in Hawaiian Bidens (Asteraceae). Lyonia. 2(1):1-16. 1983. F.R. Ganders & K.M. Nagata
- A new subspecies of Bidens (Asteraceae) from Maui. Lyonia. 2(2):17-21. 1983. H. St. John, K.M. Nagata & F.R. Ganders.
- Relationship and floral biology of Bidens cosmoides (Asteraceae). Lyonia. 2(3):23-31. 1983. F.R. Ganders & K. M. Nagata.



**DARBY
& ASSOCIATES**
ACOUSTICAL CONSULTANTS

RESUME OF RONALD A. DARBY, P.E.

- EDUCATION:** B.S. in Mechanical Engineering, Pennsylvania State University, 1954. M.S. in Engineering, 1967, and all course work for Doctor of Engineering at Catholic University, Washington, D.C., Graduate courses at University of Maryland and the University of Hawaii.
- PROFESSIONAL ENGINEER:** State of Hawaii, PE 3002-E
State of Maryland, PE 6482-ME
- PROFESSIONAL AFFILIATION:** Member of Acoustical Society of America, National Society of Professional Engineers, Tau Beta Pi, and Pi Tau Sigma.
- 1970 TO PRESENT:** President of Darby & Associates* which specializes in acoustics and noise control engineering. Airport, community and industrial noise exposure measurements, evaluations, and studies have been performed in the Hawaiian Islands, Guam and the mainland U.S.A. Architectural and mechanical equipment noise control efforts have been made for new and existing building projects in the Pacific Basic, mainland U.S.A. and Japan.
- 1967 TO 1970:** Research Scientist, LTV Research Center, Hawaiian Division. Involved in all phases of deep ocean underwater acoustic measurement exercises: planning, data collection, data processing (analog and digital), analysis, and reporting. Typical results were long range sound transmission loss values, ambient noise levels and source levels. Developed unique method to measure radiated noise levels of submarines using aircraft. Served as a member of Tactical Analysis Group for Commander, Anti-submarine Warfare Forces, Pacific at Pearl Harbor.
- 1960 TO 1967:** Research Mechanical Engineer at the Marine Engineering Laboratory Annapolis, Maryland (Now NSRDC). Was technical secretary for the "Submarine Noise Measurement Panel", Committee of Undersea Warfare, National Academy of Science for one and a half years. Developed practical technique for predicting radiated noise from ship's machinery. Developed laboratory techniques and special transducers for measuring structural noise transmission from machines. Created technological forecasts and cost effectiveness studies on machinery noise. Devised practical experiments to evaluate machinery noise quieting devices, i.e., isolation mounts, flexible hoses, sound enclosures, etc.
- 1959 TO 1960:** Engineer at Westinghouse Electric Corp., Defense Center, Baltimore, Maryland. Team member in developing high frequency sonar transducers for Navy Applications.

* Formerly Ronald A. Darby & Associates and Darby-Ebisu & Associates, Inc.

PALI PALMS PLAZA • 970 NO. KALAHEO AVENUE • SUITE A-311
KAILUA, HAWAII 96734 • (808) 254-3318

- 1957 TO 1959: Research Engineer at Chesapeake Instrument Corp., in Shadyside, Maryland. Initiated program in study of dynamic mechanical properties of elastomers. Developed new products, i.e., hydrophones, accelerometers, special microphones, etc.
- 1956 TO 1957: Engineer in Vitro Corporation in Silver Springs, Maryland. Involved in acoustic homing torpedo development.
- 1955 TO 1956: Engineer at ERCO in Riverdale, Maryland. Did original development of novel techniques to simulate missile noise cone heating.
- 1954 TO 1955: University of Maryland, College Park, Maryland. Instructor. Taught full time in C.E. Department: Undergraduate Strength of Materials, Statics and Dynamics and Elementary Surveying.

PATENTS, AWARDS, ETC: Four patent grants; one patent pending; George Melville Award "for distinguished scientific and engineering achievement" at MEL in 1963; Severn Technical Society Award for Best Technical Paper at MEL in 1964.

- MAJOR REPORTS AND PUBLICATIONS:
1. National Academy of Science Panel, "Measurement of Submarine Radiated Noise," NRC: CUW: 0331, Oct 1966 (Confidential).
 2. R.A. Darby, "A Practical Method for Predicting Acoustic Radiation or Shock Excursions of Navy Machinery," Part 3, 34 Shock and Vibration Bulletin, The Shock and Vibration Information Center, USNRL, Dec. 1964.
 3. H.A. Deferrari, R.A. Darby and F.A. Andrews, "Vibrational Displacement and Mode-Shapes Using a Laser Interferometer." J.A.S.A. Vol 42, No. 5, November 1967.
 4. R.A. Darby, "Noise from Sugar Operations in Hawaii - A Study of the Extent and Effect on the Community," January 1971.
 5. R.A. Darby, "A Study of Noise in the Kalihi-Palama Area and Practical Soundproofing of Housing," March 1971.
 6. R.A. Darby, "Typical Noise Problems and Some Practical Solutions," Hawaiian Sugar Technicians Symposium, November 1972.
 7. R.A. Darby, "Mechanical Impedance Measurements in Foundation Studies," Part 4, 33 Shock and Vibration Bulletin, The Shock and Vibration Information Center, USNRL, March 1964.
 8. R.A. Darby, "The Quantitative Evaluation of Vibration Isolation Devices for Mounted Machinery Installations," MEL Report 82-287E. August 1963.
 9. Film "Fundamental of Mechanical Impedance - Concepts Applicable to Ship Silencing," Navy Training Film MN9960.

BARRY D. NEAL
2377 St. Louis Drive
Honolulu, Hawaii 96816

Telephone: (808) 732-1995

OCCUPATION: Meteorologist/Environmental Specialist

EDUCATION: University of Nebraska at Omaha, 1971 to 1973.
B.S. Meteorology, San Jose State University, 1976.
Graduate Studies, Meteorology, San Jose State
University, 1977.

EXPERIENCE: Private Consulting, Honolulu, Hawaii, April 1988 to
present. Meteorologist/Environmental Specialist
providing consulting services in applied meteorology
and air quality.

Amartech, Ltd., Saudi Arabia, April 1983 to July
1987. Employed as Senior Meteorologist. Provided
air quality and meteorological consulting services to
industrial and governmental clients. Major
assignments included managing an environmental study
for a new oil-fired power plant and operating a
network of nine meteorological/air quality monitoring
stations surrounding a new industrial center. Other
duties included supplying expertise in the use of
meteorological data for engineering design, providing
advice on air pollution emissions and emissions
control, and performing atmospheric dispersion
assessments. Skills in computer programming,
technical writing, and scientific/engineering problem
solving used frequently.

Bechtel Group, Inc., San Francisco, November 1977 to
March 1983. Hired initially as Assistant Engineer;
progressed to position of Senior Scientist. Provided
expertise in many areas of industrial and applied
meteorology including: air quality modeling, air
quality and meteorological monitoring, air pollution
emissions and emissions control equipment,
engineering design, and environmental regulations.
Skills in technical writing, computer programming,
and scientific/engineering problem solving used
routinely.

PROFESSIONAL: Member of the American Meteorological Society and
the Air Pollution Control Association. Co-authored
papers presented at the 1979 and 1980 annual
meetings of the Air Pollution Control Association.
Co-authored report on fugitive emissions from
coal-fired power plants published by Electric Power
Research Institute, June 1984.

BARRY D. ROOT
AIR POLLUTION CONSULTING

46-198 Lilipuna Road
Kaneohe, Hawaii 96744

808 247-6827

WORK EXPERIENCE

CURRENT, since 1976: ENVIRONMENTAL CONSULTANT. Responsible for preparing the air pollution and energy portions of Environmental Impact Statements. The work involves description of existing air pollution or energy use levels, occasional on-site measurements, and evaluation of potential future impact of project development using mathematical computer models.

CURRENT, since 1986: STAFF OCEANOGRAPHER for Commander Anti-Submarine Warfare Forces, Pacific Fleet, U.S. Navy, Pearl Harbor.

1978 - 1986: GEOPHYSICS ASSISTANT to Commander Third Fleet, Ford Island, Hawaii.

1977: EDUCATOR/CONSULTANT, State of Hawaii Department of Labor, Division of Occupational Safety and Health.

1970 - 1976: GRADUATE RESEARCH/TEACHING ASSISTANT AND INSTRUCTOR, University of Hawaii Department of Geography. Taught courses titled ATMOSPHERIC POLLUTION; ENERGY AND ENVIRONMENT; MAN'S NATURAL ENVIRONMENT; and CONSERVATION AND RESOURCE MANAGEMENT.

1966 - 1970: WEATHER OFFICER, U.S. Air Force. Served as Officer-in-Charge at weather stations in California, Virginia, and Thailand.

EDUCATION

CURRENT: Have completed all course work and all written and oral exams for a Ph.D. in Geography, University of Hawaii. Final Dissertation currently in abeyance.

1974: Master of Public Health in Environmental Management, University of Hawaii School of Public Health.

1972: Master of Arts in Geography, University of Hawaii. Thesis title: Open Field Agricultural Burning and Air Quality Management in Hawaii.

1966: Completed equivalent of B.S. in Meteorology, New York University.

1965: B.S. in Aero-Space Engineering, Penn State University.

LICENSED

CURRENT, since 1975: REGISTERED SANITARIAN, State of Hawaii (No. 190).

RESUME

Jonathan K. Shimada, Principal

Education & Degrees

1. Bachelor of Science in Civil Engineering, University of Hawaii, 1968. Member and Officer, Chi Epsilon (National Honor Organization in Civil Engineering).
2. Master of Science in Civil Engineering, Pennsylvania State University, 1973. Graduate Assistant, Pennsylvania Transportation Institute.
3. Doctor of Philosophy in Civil Engineering, Pennsylvania State University, 1976. Research Assistant, Pennsylvania Transportation Institute.
4. Certificate, Wharton School, University of Pennsylvania, Fundamentals of Finance and Accounting for the Non-Financial Executive, March 1984.

Professional

1. Professional Engineer, State of Hawaii, # PE-4840.

Work Experience

1. President, Pacific Planning & Engineering, Inc. (1987-Present). Responsible for management, technical, administrative, and personnel activities.
2. Coordinator, Asia/Pacific Basin Region, Airport Operators Council International (AOCI), (1987-Present).
 - a. Responsible for communication and liaison with Member Airports around the Pacific Basin including Hawaii.
 - b. Conducts and assists on airport member programs on behalf of AOCI.
3. Deputy Director for Airports and First Deputy, Hawaii Department of Transportation (1980-1986).
 - a. Managed the engineering, finance and accounting, property management, program analysis, budgeting, operations and maintenance offices of the Hawaii Airport System.
 - 1) Negotiated various airport ground leases, and airport/airline use agreement. Administered and developed various concession leases such as duty-free and minority business leases. Identified new types of concession types. Started business center concept evaluation for HIA. Negotiated U.S. Postal Service land exchange/purchase.
 - 2) Administered engineering program for new Lihue Airport Terminal, Airport Master Plans.

International Arrivals Facilities. Instituted innovative advertising concession. Instituted aesthetic program for storefronts and international arrivals with local arts and tourism sectors. Worked on various parking and roadway plans at airports. Worked with ground transportation operators and parking lot operators. Initiated various pedestrian safety and convenience improvements.

3) Oversaw Management Information System program and design for airports system administrative functions. Selected consultants and range of system specifications and functions.

4) Responsible for employee hiring and promotions. Handled labor/employee relations and negotiations on grievances. Selected several airport managers and program administrators. Established excellent and on-going relations with personnel.

5) Worked with State and County Executive and Legislative bodies, handled all media situations, various public hearings and special interest group meetings on airport noise and development.

6) Coordinated airport programs with tour group operators, airlines, and ground transportation operators. Administered shuttle bus and taxi contracts at all state airports.

b. Responsible for Statewide Transportation Planning Office, 1980-1984. Coordination of Department planning responsibilities throughout state.

c. Responsible for the Visitor Information Program, 1980-1986. State-wide program for visitor information and state protocol events. Responsible for budget, employee relations, public contact.

2. Acting Director of Transportation, Department of Transportation, State of Hawaii. Various occasions.

3. Chairman, 1984 and 1986 Workshop/Seminars on Pacific Airports/Aviation for Airport Directors.

4. International Director, AOCI 1986 Board of Directors. Member, AOCI Goals and Programs Committee, 1985, 1986.

5. Regional Manager, Alan M. Voorhees & Associates, Honolulu Office (1978-1980). Conducted various planning studies and traffic assessments. Completed study on Oahu-wide transportation impacts of the Development Plans in 1979. Evaluated and assisted Maui and Hawaii County transit operations. Provided traffic analysis, roadway and parking area design service to resort and shopping center owners and developers in all counties.

6. Transportation Engineer, JHK & Associates. (1976-1978) Worked on transportation planning studies such as highway forecasts for Maryland DOT, transit studies for Washington Metro. Coordinated, developed, and taught federally sponsored seminars on public transit in various locales. Conducted traffic analysis data collection for Atlanta.

7. Research Assistant, Pennsylvania Transportation Institute (1974-1976). Awarded Federal study on evaluation of traffic technician community college program. Served as Principal Investigator, evaluated impact of training on various county and state transportation agencies. Acted as primary researcher for Institute on several federal grant studies dealing with driver behavior and safety studies. Participated in national accident investigation team representing Pennsylvania. Author and co-author of several transportation research papers, e.g. in Accident Analysis and Prevention.

CURRICULUM VITAE

Frank S. Scott, Jr.

Business Address: Department of Agricultural and Resource Economics, University of Hawaii, Gilmore 112, 3050 Maile Way, Honolulu, Hawaii 96822
Telephone: (808) 948-8420 (948-7039 for messages)

Home Address: 275 Kaelepu Drive, Kailua, Hawaii, 96734

Education

- University of Illinois, Urbana, 1948-51, Ph.D. 1953.
Major: Resource Economics
- University of Missouri, Columbia, 1946-47, M.A. 1947.
Major: Marketing of Agricultural Products
- Oregon State University, Corvallis, 1942-43, B.S. 1944.
Major: Animal Science, Minor: Agricultural Economics
- University of Wyoming, Laramie, 1939-41.
Major: Animal Science

Language Proficiency

	<u>Speaking</u>	<u>Reading</u>	<u>Writing</u>	<u>Understanding</u>
English	Excellent	Excellent	Excellent	Excellent
Spanish	Good	Good	Good	Good
Portuguese	--	Fair	--	Fair
French	--	Fair	Fair	Fair
German	--	Fair	Fair	Fair

Special Areas of Competence

1. Market potentials and market development
2. Feasibility of resource development
3. Agricultural economic development
4. Economic feasibility of tropical crops

Employment, University

Professor, Department of Agricultural and Resource Economics, University of Hawaii, 1959 to date (Chairman of Department, 1960, 1964, 1971-1980, 1984-86), (Chairman of Graduate Field in Agricultural Economics, 1959-60, 1962-67, 1970 to 1981)

Associate Professor, Department of Agricultural and Resource Economics, University of Hawaii, 1954-59.

Assistant Professor, Department of Agricultural Economics, University of Nevada, Reno, 1951-54.

Employment, University (continued)

Research Assistant, Department of Agricultural Economics, University of Illinois, 1950-51.

Assistant Professor of Agricultural Economics, Stephen F. Austin State University, 1948-50.

Instruction (past 5 years)

Scheduled courses (each course usually taught once annually)

AREC 640 Market Development for Agricultural Products (3)
AREC 322 Marketing Agricultural Products (3)

AREC 399, 699 (Average 6 courses annually)

Chairman, Ph.D. Dissertation Committees (Past 5 years), 16

Chairman, M.S. Committees (Past 5 years), 8

Service

Department Personnel Committee, 1982-83 and 1983-84 (Chairman)
Aloha United Way, Representative for College of Tropical Agriculture and Human Resources
HITAHR Industry Analysis Groups, Macadamia Nuts, Papayas, Avocados
UNPA Representative
Ph.D. Marketing Comprehensive Committee, Chairman

Research Projects (current)

HITAHR 400 Department Planning
452 Economic Viability of Fruit and Nut Crops, Project Leader
475 Characteristics of Consumer Demand for Fruit and Nut Crops, Project Leader
485 The Economic Feasibility of Import Barriers to Protect Hawaii Agriculture, Project Leader

PAC - HITAHR Characteristics of Consumer Demand for Fresh Papayas in Los Angeles

GACC - HITAHR Characteristics of Consumer Demand for Macadamia Nut Products in Los Angeles

Characteristics of Consumer Demand for Macadamia Nut Products in Honolulu

Market Potentials for Macadamia Nuts

Economic Viability of Macadamia Nut Farms

Research during the 1982 to 1987 period was concentrated primarily in the areas of consumer demand, market development, economic viability and import barrier feasibility in HITAHR. Consulting research was primarily in the area of agricultural feasibility.

Consumer Demand and Market Development

Characteristics of consumer demand, estimation of market potentials and development of and measurement of response to promotional programs are crucial to the success of diversified agriculture in Hawaii. These research areas have been given high priority by industry analysis proceedings, coordinated by HITAHR. I have worked closely with industry groups and have provided leadership in researching these activities. Involvement in these activities under HITAHR Project 475 plus various grant supported projects by PAC and the Governor's Agricultural Coordinating Committee has resulted in both applied and basic research, which has been published as papers in annual proceedings of commodity groups, HITAHR Research Series publications, and in papers presented at professional conferences oriented toward the social sciences (see bibliography). The macadamia and papaya industries, in particular, have made use of my marketing research findings in market development programs. Several Ph.D. students have conducted their doctoral research programs under my HITAHR marketing research projects. My research in market development and consumer demand for new food products has been recognized both nationally and internationally as attested by my invitation to participate in workshops and present papers on methodology relating to market development. As a recent example, I was invited to present a paper entitled "Need for Design and Implementation of National Agricultural Marketing Development Plans: Some Perspectives" and serve as a resource person at a one week international seminar on Agricultural Market development in Bangkok, Thailand, in December 1986.

Economic Viability

I have been involved in a continuing program of research in economic viability of fruit and nut crops under HITAHR Project 452. Research findings have been published in the form of HITAHR Research Series publications and annual industry group proceedings. Research findings have been in demand by potential investors as well as existing producers. The research has involved determinations of internal rate of return, economies of scale and other pertinent indicators of profitability and efficiency. New basic concepts have been tested through application to the applied research.

Economic Feasibility of Import Barriers

The economic feasibility of import barriers to protect Hawaii agriculture has been conducted for sugar, macadamias, and papayas. The research has resulted in two Ph.D. dissertations, five professional conference presentations and two research series publications (one printed and one in press). The Hawaiian Sugar Planters Association (HSPA) requested a digest of the research on the feasibility of import barriers to protect the U.S. sugar industry to present to a nationwide meeting of sugar producers concerned with sugar policy. A research series report and one or more papers to be submitted to professional journals with respect to the feasibility of U.S. import barriers to protect the U.S. macadamia industry are in progress.

Foreign Assignments

Economist, Taleghani-Doftary Engineering Company, Tehran, Iran (Economic Feasibility, Mond-Shespir Reclamation Project), February-March, 1978.

Economist, FAO, Turrialba, Costa Rica (Economic Feasibility of a Macadamia Nut Industry in Costa Rica), June-August, 1975.

Research Economist, Hawaiian Agronomics, Moghan Regional Economic Development Project, Iran, February-May, 1971.

Marketing Advisor to Argentina, Texas A & M University-AID, Buenos Aires (Advisor to Instituto Nacional Technologica Agropecuaria in Buenos Aires and at provincial institutes, taught graduate courses in marketing and chaired M.S. committees as a member of the graduate faculty of Texas A&M University), September, 1967 - December, 1969.

Research Economist, Hawaiian Agronomics-AID (Mechanization and Modernization of the Sugar Industry in N.E. Brazil, Acting Chair of Party and co-author of report with Ernest Smith), November, 1965 - May, 1966.

Marketing Advisor to Argentina, FAO (taught graduate courses in marketing, advised and established research and extension plans in marketing for 10 regional stations of Instituto Nacional Technologica Agropecuaria), December 1960 - January 1962.

Consulting Assignments

I have provided service to both the private and public sectors in Hawaii and Guam in the form of consulting assignments to determine the economic feasibility of agricultural lands. Reports emanating from this work are included in my attached bibliography. Primary consulting activities were as follows:

- Agricultural Feasibility - Waikane Golf Course Lands, Pan Pacific Development, Inc., 1987.
- Agricultural Feasibility - Obayashi Corporation Pupukea Project Lands, Obayashi Hawaii Corporation, 1987.
- Agricultural Feasibility - Guam Naval Base Lands, Biosystems Analysis, Inc., Sausalito, California, 1987.
- Budget Analysis - Kapulena Orchards, 1986.
- Agricultural Feasibility - Kuilima Resort Expansion Project, 1984.
- Agricultural Feasibility - Queens Beach Development Project, Jackson, Jacobson and Banks, San Francisco, 1985.
- Agricultural Feasibility - Kaopa 5 Subdivision, Agricultural Concepts, Inc., and Lone Star Hawaii, Honolulu, Hawaii, 1984.
- Agricultural Feasibility - Kuilima Resort Expansion Project, Group 70, Inc., Honolulu, Hawaii, 1984.
- Crop Feasibility - Foster Petroleum Corporation Lands on Kauai, Environmental Capital Managers, Inc., Honolulu, Hawaii, 1984.
- Tomato Feasibility - Campbell Estate Lands at Kahuku, The Estate of James A. Campbell, Honolulu, Hawaii, 1984.
- Orchard Crop Feasibility - Maui Uplands, Theo Davis Properties, Honolulu, Hawaii, 1982-83.
- Agricultural Feasibility - Farms of Kapua, Agricultural Concepts, Inc., 1982-84.
- Agricultural Lease Rent Determinations for Bananas and Watercress on Hawaiian Electric Company Lands, Hawaiian Electric Co., Inc., 1982.
- Agricultural Feasibility Analysis of Waikane Agricultural Subdivision, 1982.
- Agricultural Feasibility - Mokuleia Homesteads, Mokuleia Homesteads, Inc., 1980-82.
- Agricultural Feasibility - The Meadows Agricultural Subdivision, Wilson Okamoto & Associates, Inc., 1981-82.
- Agricultural Feasibility - Kaluanui Ventures, Kaluanui Ventures, George H. Sakoda Realty, 1980-82.
- Agricultural Feasibility and Environmental Impact - Waiahole Valley Agricultural Park, Calvin Kim & Associates, Inc., 1980-81.
- Agricultural Feasibility and Environmental Impact - Waiahole Valley Agricultural Park, M&E Pacific, Honolulu, report submitted May, 1980.
- Agricultural Feasibility and Environmental Impact, Keahole Agricultural Park, M&E Pacific, Honolulu, report submitted July, 1977.

Consulting Assignments (continued)

Agricultural Feasibility, Waiahole Valley, Architects Hawaii, Honolulu, report submitted October, 1977.

Agricultural Economic Potential - Kona, Hawaii, Donald Wolbrink and Associates, Honolulu, report submitted in October, 1974.

Economic Feasibility - Honomalino Macadamia Nut Project (now MAC FARMS) with Edmund Barmettler, Associated Economic Research, Honolulu, 1964.

Committee Membership and Organizational Representation

Department Personnel Committee, 1982-83, 1983-84 (Chairman).

Ph.D. Marketing Comprehensive Committee (Chairman).

Graduate Program Planning Committee, 1986-87.

UHPA representative, 1980-82.

Current member of HITAHR industry analysis groups for avocados, coffee, bananas, guavas, papayas, and macadamias.

Current member of UH Environmental Center EIS Review Committee.

CTAHR representative, Aloha United Way, 1978-79, 1979-80.

Membership in Professional Organizations and Honorary Societies

American Agricultural Economics Association
 American Society of Farm Managers and Rural Appraisers
 North Central Journal of Agricultural Economics
 Northeastern Agricultural and Resource Economics Association
 Southern Agricultural Economics Association
 Western Agricultural Economics Association
 Gamma Sigma Delta

Over 100 professional publications.

RESUME: JOHN M. KNOX, Ph.D.

Professional Experience

- 1983- President of Community Resources, Inc., an independent consultancy specializing in community dialogue programs, social impact assessment, public opinion research, and social program design/evaluation.
- 1981-83: Director of Research at SMS Research. Duties involved creation and implementation of systems for overall corporate research efforts; direct supervision of individual projects; preparation of written reports; and general marketing.
- 1979-80: Operated private consulting company, "Community Resources" (which became a division of SMS Research in 1981, then was renewed as an independent company in 1983). Conducted planning research, social impact analysis, and community dialogue for clients in both the public and private sectors.
- 1976-79 Research assistant (technically half-time), School of Travel Industry Management, University of Hawaii. Primary function was to coordinate the Tourism Research Project, conduct research and write and/or edit research papers. Other duties included press relations, supervising small staff, conducting survey research, and coordinating conferences and seminars.
- 1974-76: Teaching assistant (half-time), Department of Psychology, University of Hawaii.
- 1973-74: Full-time graduate student, University of Hawaii. Some part-time journalism work (KHVH news radio, Honolulu Star-Bulletin).
- 1970-73: Journalist, Honolulu Advertiser; duties primarily involved covering planning, government, and political news. President, City Hall Correspondents Association, 1971-72.
- 1970: Reporter and Editor, Kona Times biweekly newspaper.
- 1969-70: Radio announcer and newsman, Hilo Radio KHLO.

Education

- * National Merit Scholar, Findlay (Ohio) High School, 1964.
- * B.A. (Speech), University of Michigan, 1968.
- * M.A. (Social Psychology), with Certificate in Planning Studies, University of Hawaii, 1977.
- * Ph.D. (Psychology), University of Hawaii, 1983
(dissertation topic: social impact assessment)

Selected Publications

(Through Community Resources and/or SMS Research)

- * Socio-Economic Assessment of Proposed Additional Development at the Kuilima Resort (with A. Lono Lyman, Inc.). Presented to Group 70 and Kuilima Development Co., 1985.
- * The Puna Community Survey (2 vols). Detailed public opinion survey on geothermal energy impacts and other planning issues. Presented to State of Hawaii Department of Planning and Economic Development and Hawaii County Planning Dept., 1982.
- * A Survey of Employee Characteristics and Housing Patterns: Mauna Kea and Mauna Lani Resorts, 1987.

(Through Government)

- * Oahu Community Handbook for Publicity and Communication. A 40-page guide to communication and public relations techniques for citizen groups. Published and distributed by the City and County of Honolulu, 1976 (with several subsequent updated editions).
- * Out-of-State Recreational Travel by Hawaii Residents. (Co-author) Through University of Hawaii School of Travel Industry Management, for Hawaii State Department of Planning and Economic Development, 1980.

(Through University of Hawaii Tourism Research Project)

- * "Resident-Visitor Interaction: A Review of the Literature." (Co-author) Through University of Hawaii School of Travel Industry Management, for Hawaii State Department of Planning and Economic Development, 1980.
- * Tourism Research Priorities in Hawaii and the Pacific (3 vols.), Tourism Research Project Occasional Papers No. 3, 4, and 5, University of Hawaii, 1979.

Community Participation

- * Neighborhood Organizations: Waimanalo Neighborhood Board, 1975-80 (first chairman, 1975-76); Waimanalo Teen Project, 1974-present; editor of monthly community newsletter, 1976-78.
- * Islandwide Service Organizations: Hawaii Visitors Bureau Research Committee, 1979-81 (chairman, subcommittee for revision of Visitor Satisfaction Survey); Chamber of Commerce Visitor Industry and Planning committees, 1981-present (chairman, subcommittee on Economic Development and Education).
- * Professional Organizations: International Association for Impact Assessment, 1981-present; co-founder, Pacific chapter of The Travel Research Association, 1979-80; American Planning Association, 1985-present; Chamber of Commerce.

RESUME: JOHN T. KIRKPATRICK, PH.D.

Professional Experience

- 1987- Research Associate for Community Resources, Inc., an independent consultancy specializing in community dialogue programs, social impact assessment, public opinion research, and social program design/evaluation.
- 1985- Consultant. Analyzed materials on values and attitudes towards education of Hawaii residents. Contributed to studies of the social impact of development projects.
- 1985-87 Research Anthropologist, Nomos Institute. Conducted ethnographic studies of ethnic relations and attitudes in Hawaii.
- 1978-87 Taught sociocultural anthropology and supervised student social science research in academic settings, including the Department of Anthropology, Wesleyan University, and programs at the University of Hawaii, Manoa and Hawaii Loa College.

Education

- * M.A. (1973) and Ph.D. (1980) in Anthropology, University of Chicago. Awarded Lichtstern Fellowship, NSF Dissertation Award and NIMH Training Grant.
- * A.B. Princeton University (1971). Graduated summa cum laude.

Selected Publications

- 1987 Ethnic Antagonism and Innovation in Hawaii. In Ethnic Conflict (J. Boucher, D. Landis and K. Clark, eds.). Beverly Hills: Sage.
- 1985 Person, Self, and Experience. Berkeley: University of California Press. (edited, with G.M. White.)
- 1983 The Marquesan Notion of the Person. Ann Arbor: UMI Research Press.

In Press: Report on a Study of Values in Hawaii. To appear as a Technical Report, Center for the Development of Early Education, Kamehameha Schools/Bishop Estate.

Community and Professional Activities

- * Member, Educational Task Force, Military Affairs Council, Hawaii Chamber of Commerce.
- * Member, American Anthropological Association, Society for Psychological Anthropology, Association for Social Anthropology in Oceania, Hawaii Sociological Association, Hawaii Anthropological Association.
- * Reviewer for Choice, American Anthropologist, Ethos, Pacific Studies. Member of the editorial board, Biography.

KAY MURANAKA

CIVIL ENGINEER

Education: University of Hawaii, B.S. in Civil Engineering,
1964.

Registration: Civil Engineer, Hawaii, Certificate #2330-E, 1969
Civil Engineer, California, Certificate #17386, 1967
Civil Engineer, CNMI, Certificate #10, 1986

Professional Affiliations: American Society of Civil Engineers
Water Pollution Control Federation

Areas of Special Competence: Land Development
Water Supply and Distribution
Wastewater Systems
Pumping Systems
Subdivision Design
Roads and Highways
Drainage Studies
Dredging

Work Experience:

1986 - Present Engineering Concepts, Inc., Honolulu, Hawaii, Vice
President

1968 - 1986 M&E Pacific, Inc., Honolulu, Hawaii, Associate

1964 - 1968 California State Highway Department, Assistant
Highway Engineer

General Background:

Mr. Muranaka has been in charge of the planning and design of engineering projects for sewer, water, and drainage systems; roadways; single and multifamily residential developments; resort and recreational developments; shopping centers; dredging; and various public works improvements. He has extensive experience in masterplanning and design for numerous projects throughout Hawaii and the Pacific Basin.

Specific Project Experience:

Mr. Muranaka has been responsible for the masterplanning and design of numerous land development projects:

Preparation of water, sewerage, and drainage master plans; gravity sewers; sewage pump station and force main; and a five-acre waste stabilization pond for treatment of wastewater for the Kuilima Development.

Preparation of potable water, nonpotable water, roadway, grading, and drainage master plans for a 1,000-acre marina oriented residential development.

- . Preparation of plans, specifications, and cost estimates for a 44-unit residential planned development, including road, water, sewer, electrical, and drainage systems; grading; retaining walls; and tennis court.

He was involved in numerous water and wastewater systems planning and design:

- . Water and sewerage master plans for a resort-type development in Wailea, Maui.
- . Plans, specifications, cost estimates, environmental impact assessment, engineering studies, and topographic surveying and mapping for various Palau water and sewerage system improvements.
- . Masterplanning and design of water and sewerage systems for Yap Island.

He has been involved in the plans, specifications, and design work for the interstate Waiawa Interchange design, which included complete geometrics for an interchange at the confluence of two interstate freeway routes. Special sand drain design was necessary to stabilize poor substrata conditions.

He is very familiar with the Pacific Basin, having been the project manager for various projects on Palau, Saipan, and Yap.

- . Project manager for the Palau Capital Improvement Program, which included the preparation of environmental impact assessment, engineering studies, construction plans, specifications, and cost estimates for complete infrastructure improvements for the Palau District, Trust Territory of the Pacific Islands. Infrastructure improvements included a new airport; 14 miles of roads; expansion of the power plant and electrical transmission systems; river water source development; treatment plant expansion (4.0 MGD) including the addition of coagulation/flocculation treatment; four water booster pumping stations, two well pumping units, water catchment system with 1.0 MGD reservoir, three steel storage tanks, and approximately 70,000 feet of water mains; 23 sewage pumping stations and approximately 50,000 feet of force mains and gravity sewers; and improvements to the container yard at Malakal Harbor.

He has been responsible for many projects with the Navy in Hawaii, other Pacific Basin areas, and Diego Garcia.

- . Maintenance dredging of Pearl Harbor.
- . Combat arms training facility in Guam.

Various multi-discipline projects in Diego Garcia, including a milk and ice cream processing plant, a British Royal Navy vehicle and boat maintenance building, electronic maintenance building, fiber optic transmission line, jet blast shields, and aviation equipment storage building.

Projects:

Land Development

Kuilima Development (Oahu, Hawaii)
Makakilo Mala (Oahu, Hawaii)
Kahala View Estates (Oahu, Hawaii)
Country Club Vista (Oahu, Hawaii)
Aiea Hillside Subdivision (Oahu, Hawaii)
Wailea Development (Maui, Hawaii)
Koblerville Subdivision (Northern Mariana Islands)
Ewa Marina Community (Oahu, Hawaii)
Waterfront Row (Hawaii)
Haleakala Village (Hawaii)
Dole Iwilei Cannery Property (Oahu, Hawaii)

Wastewater Systems

Palau District Satellite Sewerage System
Yap Island Sewerage System (Federated States of Micronesia)
Wailea Development Sewerage (Maui, Hawaii)
Fort Kamehameha WWTM Modification (Oahu, Hawaii)
Palailai Trunk Sewer (Oahu, Hawaii)

Water Systems

Palau District Water System Improvements and Reservoir
Wailea Development Water System (Maui, Hawaii)
Yap Island Water System (Federated States of Micronesia)
Malaekahana Development Water System (Oahu, Hawaii)
Makakilo City Water System (Oahu, Hawaii)
Waiialae-Iki Water System (Oahu, Hawaii)
Makaha Water System (Oahu, Hawaii)
BWS 42-Inch Transmission System (Oahu, Hawaii)
Department of Transportation Nonpotable Water System (Oahu, Hawaii)

Highways and Roads

Palau District Roadway Improvements
Waiawa Interchange (Oahu, Hawaii)
Makakilo Drive (Oahu, Hawaii)
Route 101 (Marin County, California)
Route 238 (Oakland, California)

Dredging

Ala Wai Canal Dredging (Oahu, Hawaii)
Pearl Harbor Dredging (Oahu, Hawaii)

KAY MURANAKA - 4

CIVIL ENGINEER

Multidiscipline

Palau District Capital Improvement Program
Diego Garcia Multidiscipline Projects
Makana Development (Maui, Hawaii)
Port Allen Repairs (Kauai, Hawaii)
Various Multidiscipline Projects in the Pacific Area

Hydrology

Floodway Determination Study for Selected Streams on Oahu
Ala Wai Canal (Oahu, Hawaii)

KENNETH T. ISHIZAKI

SANITARY ENGINEER

Education: University of Hawaii, M.S. in Civil Engineering, 1967
University of Hawaii, B.S. in Civil Engineering, 1965

Registration: Civil Engineer, Hawaii, Certificate #2946-E, 1970
Laboratory Director, Hawaii, Certificate #173
Civil Engineer, CNMI, Certificate #24, 1986

Areas of Special Competence: Wastewater Collection, Treatment, and Disposal
Water Treatment
Wells and Pumping Stations
Environmental Impact Statements/Assessments
Water Quality Monitoring and Studies
Safe Drinking Water Standards Implementation
301(h) Secondary Treatment Waiver Application
Solid Waste

Professional Affiliations: American Society of Civil Engineers
Water Pollution Control Federation
American Water Works Association
Environmental Quality Commission, Board Member, 1984-1990

Work Experience:

1987 - Present Engineering Concepts, Inc., Honolulu, Hawaii, Vice President
1970 - 1987 M&E Pacific, Inc., Honolulu, Hawaii
1979 - 1987, Associate
1970 - 1979, Project Engineer/Project Manager
1967 - 1968 Austin, Smith & Associates, Honolulu, Hawaii, Project Engineer

General Background:

Mr. Ishizaki has been in charge of the planning and design of environmental engineering projects, including wastewater and sewerage systems; water source, storage, and distribution systems; marine ecology; water quality management; and drinking water standards studies. He was involved in the design of various site improvements including water supply, drainage systems, grading, and roadways and participated in consultation with government agencies, clients, and private groups. He has extensive experience in the development of environmental impact statements for wastewater treatment and disposal systems.

Specific Project Experience:

Mr. Ishizaki has directed numerous wastewater system projects including masterplanning, phasing, design, and construction management to meet water quality objectives and current EPA requirements.

- . Design and construction management services and the preparation of operation and maintenance manual for a 0.5 MGD secondary treatment facility, interceptor and collection system, and ocean outfall for Kulaimano.
- . Planning, design, and operation and maintenance manual for a 3.1 MGD secondary treatment facility at Schofield.
- . Planning; design of gravity sewers, pumping station, and force main; and expansion of a 0.5 MGD secondary treatment facility to 1.0 MGD, including O&M manual, for Kailua-Kona.
- . Development of design standards for the City and County of Honolulu relating to all areas of domestic wastewater treatment and disposal on Oahu for private and municipal treatment works, subsurface disposal by injection, and individual wastewater disposal systems.
- . Design of a 0.1 MGD sewage treatment plant on Johnston Island in which the wastewater contains high levels of chloride.
- . Facilities plans for the Marshall Islands, Hilo, Saipan, Poipu-Koloa (Kauai, Hawaii), Rota (CNMI), Lanai, and Waianae.
- . Waivers for secondary treatment requirements for Maui, Sand Island, Honouliuli, Mokapu, Hilo, and Waianae wastewater treatment plants.

He has extensive experience in water and water quality systems, having been involved in programs, studies, and designs for water systems and supply, source development, treatment, and distribution systems throughout the Pacific area.

- . Design of the Mililani water master plan, including groundwater source development and a storage and transmission system that will ultimately have a maximum daily demand of 12 MGD.
- . Evaluation of alternative measures to improve the quantity and quality of potable water for Osan (Korea) Air Force Base.
- . Baseline data and work plan for the future implementation of a water conservation program for the island of Guam.

- . Safe Drinking Water Act study of the water system, source, and treatment plants and ancillary facilities for the Northern Mariana Islands.
- . Master plan and preliminary engineering report for water supply and distribution for Mililani Mauka development.
- . Sanitary survey and system evaluation on thirty-five rural village potable water systems in American Samoa.
- . Water quality management program for Kauai and Oahu to develop long-range programs for wastewater management systems and to establish design criteria considering environmental impacts.
- . Evaluation of the existing coastal water quality in Hawaii relative to the proposed new water quality standards.

Mr. Ishizaki has extensive experience in the development of environmental impact statements, assessments, and studies.

- . EIS for a proposed agricultural park and limited residential development in Waiahole Valley.
- . EIS and EIA for a 0.5 MGD secondary treatment facility, interceptor, and collection sewers and an outfall sewer with shoreline discharge, all in accordance with EPA requirements.
- . Environmental study on the impact of constructing a small boat harbor on nearshore waters and its maintenance dredging at Nawiliwili.
- . Study identifying and evaluating actual contaminant levels of each contaminant, evaluation of alternative groundwater sources, and recommended treatment for Mililani water system.
- . Preparation of a comprehensive environmental impact assessment, preparation of U.S. Army Corps of Engineers' permit application and coastal permit application for a new hotel on Saipan.
- . Preparation and compilation of Special Management Area documents for a private development, including environmental assessment.

His experience in solid waste, industrial waste, and hazardous waste management includes:

- . Design of a proposed sanitary landfill on the island of Lanai.

- . Master plan for collecting, processing, and disposing of solid wastes from all Navy and Marine Corps facilities on Oahu.
- . Preliminary conceptual plans and program cost estimates for the proposed Waipio Peninsula sanitary landfill.
- . Identifying and monitoring the existing DBCP pesticide at Mililani.
- . Air flotation-clarifier system complex with provisions for chemical additive required for treatment of aircraft wastewater and wastes.
- . Development of a conceptual design for a new hazardous and industrial waste treatment complex at Pearl Harbor.

Projects:

Wastewater Systems

Design of Sewage Treatment Plants: Schofield (Oahu, Hawaii); Mililani (Oahu, Hawaii); Mililani Phase IV Expansion (Oahu, Hawaii); Kwajalein; Waianae (Oahu, Hawaii)

Design of Sewage Pump Stations: Kahului Airport (Maui, Hawaii); Johnston Island

Design of Sewerage Systems: Kulaimano (Hawaii); Eleele (Kauai, Hawaii); Kailua-Kona (Hawaii); Lanai (Hawaii); Manele (Lanai, Hawaii); Kapalua (Maui, Hawaii)

Outfalls: Waianae Outfall Extension (Oahu, Hawaii); Hawaii Kai (Oahu, Hawaii); Hilo Outfall Repair (Hawaii)

Kwajalein Sewage Disposal System; Kwajalein Infiltration Study

Preparation of 201 Facilities Plans: Waianae (Oahu, Hawaii); Marshall Islands; Hilo (Hawaii); Saipan (Northern Mariana Islands); Rota (Northern Mariana Islands); Lanai (Hawaii); Poipu-Koloa (Kauai, Hawaii)

Application for Modification of Secondary Treatment Requirements: Sand Island, Honouliuli, Mokapu, and Waianae (Oahu, Hawaii); Hilo, Hawaii; Maui, Hawaii

City and County of Honolulu Sewage Treatment Plant Standards (Oahu, Hawaii)

Statewide Wastewater Operator Training Facility

Effluent Polishing System, Fort Kamehameha WWTP (Oahu, Hawaii)

Lahaina SPS Evaluation (Maui, Hawaii)

Water Systems and Studies

Guam Water Conservation and Shoreline Investigation
Maui Water System Improvements (Maui, Hawaii)
Mililani Town Well No. 6 (Oahu, Hawaii)
Honokahu Well B (Maui, Hawaii)
Hawaii Technology Park Reservoir and Master Plan (Oahu, Hawaii)
Safe Drinking Water Act Study (Northern Mariana Islands)
Saipan Water Catchment (Northern Mariana Islands)
Makakilo Well (Oahu, Hawaii)
Mililani Mauka Water Development Plan (Oahu, Hawaii)
Osan Air Base Water Study (Korea)
Village Drinking Water Study (American Samoa)

Water Quality

Oahu Water Quality Program (Hawaii)
Kauai Water Quality Management Plan (Hawaii)
Hawaii 208 Plan
Hawaii Kai STP, Outfall, and Marina Monitoring (Oahu, Hawaii)
Maui Turbidity Control (Hawaii)

Environmental Studies

Waiahole Agricultural Park (Oahu, Hawaii)
Kulaimano Sewerage System EIS (Hawaii)
Heeia-Kai Reservoir (Oahu, Hawaii)
Waianae STP Supplemental EIS (Oahu, Hawaii)
Hotel Nikko, Saipan (Northern Mariana Islands)
Manele SMA Permit (Lanai, Hawaii)
Honokahu Well B (Maui, Hawaii)
O'oma II Development (Hawaii)
Kohanaiki Resort Community (Hawaii)
Maui Water Amendment (Hawaii)

Industrial/Solid Waste

Navy Oily Waste Handling Facility (Oahu, Hawaii)
Pearl Harbor Sanitary Landfill and Leachate Study (Oahu, Hawaii)
Industrial Waste Treatment Facility Assessment (Oahu, Hawaii)
Lanai Sanitary Landfill (Lanai, Hawaii)
Hazardous Waste Treatment Complex (Oahu, Hawaii)
Mililani Pesticides Study (Oahu, Hawaii)

Construction Management

Kulaimano Sewerage System (Hawaii)
Ala Moana Sewage Pump Station (Oahu, Hawaii)
Waianae Outfall Extension (Oahu, Hawaii)