REVISED FINAL ENVIRONMENTAL IMPACT STATEMENT

Volume I

MALAEKAHANA GOLF COURSE

Malaekahana, Koolauloa District, Oahu, Hawaii

Applicant:
Kuilima Resort Company
Honolulu, Hawaii

June 1989

Group 70 Limited • Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX (808) 523-5874

REVISED FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME I

MALAEKAHANA GOLF COURSE

Malaekahana, Koolauloa District, Oahu, Hawaii

JUNE 1989

Prepared for:

KUILIMA RESORT COMPANY
Honolulu, Hawaii

Prepared by:

GROUP 70 LIMITED
Architecture • Planning • Interior Design
Honolulu, Hawaii

BASIS FOR FILING A REVISED FINAL EIS

Subsequent to the filing of the Final EIS for The Country Courses at Kahuku (April 1989), which included three golf courses at Punamano and one golf course at Malaekahna, Kuilima Resort Company's option to purchase the Punamano site lapsed. Since the applicant no longer has an interest in the Punamano property, its application proposing three golf courses on this site has been withdrawn.

The enclosed Revised Final EIS is only for the Malaekahana Golf Course. Volume II of the Final EIS for The Country Courses at Kahuku, which includes technical appendices for the Malaekahana site and was published and distributed in April 1989, is referenced in the Revised Final EIS Volume I for the Malaekahana Golf Course.

MALAEKAHANA GOLF COURSE

TABLE OF CONTENTS

MALAEKAHANA GOLF COURSE

TABLE OF CONTENTS

VOLUME I

MALAEKAHANA GOLF COURSE

TABLE OF CONTENTS

VOLUME I

MALAEKAHANA GOLF COURSE

TABLE OF CONTENTS

MALAEKAHANA GOLF COURSE

TABLE OF CONTENTS

VOLUME I

VOLUME II

MALAEKAHANA GOLF COURSE

TABLE OF CONTENTS

VOLUME II

MALAEKAHANA GOLF COURSE

LIST OF FIGURES

MALAEKAHANA GOLF COURSE

LIST OF TABLES

EXECUTIVE SUMMARY

MALAEKAHANA GOLF COURSE

APPLICATION FOR DEVELOPMENT PLAN AMENDMENT AND
FINAL ENVIRONMENTAL IMPACT STATEMENT

ESSENTIAL INFORMATION

1. APPLICANT:	Kuilima Resort Company 1001 Bishop Street, Pauahi Tower, Suite 2000 Honolulu, HI 96813 Contact: Alan Nii, Esq. Telephone: (808) 524-7622
2. LAND OWNER:	The Estate of James Campbell 828 Fort Street Mall, Suite 500 Honolulu, HI 96813 Telephone: (808) 536-1961
3. REQUEST:	To designate certain land in Koolauloa as Preservation on the Development Plan Land Use Map
4. AREA:	228 acres
5. LOCATION:	In Koolauloa, mauka of Kamehameha Highway, across from Malaekahana State Park.
6. TMK	TMK 5-6-06: Por. 6 and TMK 5-6-07: Por. 1.
7. EXISTING USE:	Vacant and Grazing
8. STATE LAND USE:	Agriculture
9. DEVELOPMENT PLAN	
LAND USE:	Agriculture
PUBLIC FACILITIES:	None
10. COUNTY ZONING:	AG-2 Agriculture

EXECUTIVE SUMMARY

This summary includes brief descriptions of the proposed Malaekahana Golf Course, beneficial and adverse impacts, proposed mitigative measures and alternatives. The project's relationship to existing government policies and plans for the area is also summarized, along with required permits and approvals.

Description of the Proposed Project

The proposed Malaekahana Golf Course is planned for 228 acres in Malaekahana, between Kahuku and Laie, in the Koolauloa District of Oahu. The Kuilima Resort Company, the applicant, is seeking the necessary government approvals to develop a golf course project consisting of: one 18-hole golf course, a golf clubhouse, and a golf driving range.

The project site (228 acres) is located between Kahuku and Laie, mauka of Kamehameha Highway across from Malaekahana State Recreation Area. Agricultural lands are located adjacent to the site on its north and south boundaries, and makai of the site up to Kamehameha Highway. Mauka of the site lies military lands of the U.S. Army Kahuku Training Area. The site has generally rolling terrain with many hills and valleys in its mauka portions. The land has historically been used for sugar cane production, and is currently being used for grazing horses and cattle.

Construction of the project will require site disturbances such as clearing, grubbing, grading, and excavation for the golf course and support facilities. Building construction that will occur will involve the golf clubhouse and maintenance building. Infrastructure requirements that will be constructed include: roadways; wastewater collection, treatment and disposal facilities; potable water and irrigation water supply and distribution systems; and other utilities (electricity, telephone, etc.) installations.

The proposed project will create both beneficial and adverse effects on the natural and human environment. A detailed description of the existing environmental conditions was prepared for each environmental factor, and this was used as a background to assess potential benefits and adverse effects.

Beneficial Impacts

There are a number of project impacts that will be beneficial to residents of the Koolauloa area, and Oahu residents in general. Anticipated beneficial impacts of the proposed project are listed below.

1. A new, high-quality 18-hole golf course and golf driving range. The facilities will be fully open to public use for a fee.

2. Approximately 109 acres of the project site will remain unaffected as natural areas in gulches and buffer areas.

3. Development of drainage controls will limit stormwater runoff generated by the project site, to no more than existing runoff volumes. Suspended sediments eroded from the site will be less with development than under existing conditions.

4. Archaeological resources have been inventoried in the project area, and sites with sensitive resources will have intensive surveys conducted or will be preserved for future education and research.

5. Approximately 66 direct construction jobs will be created over the period between 1992-1994. The total direct, indirect and induced construction employment will amount to 148 jobs at the peak of construction.

6. The golf courses will generate approximately 58 to 72 direct operational jobs (full-time equivalent) by 1994. Total direct, indirect and induced operational employment positions created by the project will be 133 to 165 jobs.

7. Net fiscal benefits to the State government as a result of the project are expected to be $110,000 (1989 dollars) annually by 1994. Net fiscal benefits to the City and County of Honolulu are projected to be $72,000 (1989 dollars) annually by 1994.

8. Community benefit programs will be undertaken, such as job training for positions at the development and local resident discounts for golfing.

Anticipated Short-term Adverse Impacts and Mitigative Measures

Project development activities at the site will involve the construction of the golf course, roadways, utilities and support facilities. Short-term construction-related impacts on the environment will be generated by the project, and mitigative measures will be implemented to minimize these impacts.

Anticipated short-term adverse impacts and mitigative measures are listed below.

1. Soils will be disturbed for grading and excavation, and some soil erosion will occur. An Erosion Control and Sedimentation Plan for the construction will be prepared for the project, which must be approved by the City and County of Honolulu Department of Public Works. Proposed mitigation will include soils management measures and drainage controls that will minimize soil erosion.

2. Surface water (as storm runoff) will be slightly affected by additional suspended sediments as a result of soils erosion during the construction period. Proposed soils management measures and drainage controls will minimize soil erosion and subsequent addition of suspended sediments to storm water runoff.

3. Introduced wildlife species occurring in areas of the project site that will be cleared for construction will be displaced temporarily to undisturbed areas. Landscape plantings are expected to provide replacement habitat for some wildlife types. Approximately 109 acres of the site will remain as undisturbed habitat areas.

4. During high precipitation periods, slight amounts of suspended sediments contained in surface runoff from the project site will enter the coastal waters. Measures proposed for soils management and drainage controls will minimize water quality effects so that they are no greater (and will probably be less) than existing conditions.

5. Trucks and worker vehicles will create a short-term effect on traffic conditions on local roadways, mainly Kamehameha Highway and its nearby intersections. Mitigative measures that will be implemented to minimize short-term traffic effects will include off-peak truck use of highways, and possibly staggered worker start and finish times.

6. Noise will be generated by construction activities on the project site. Construction operations must comply with the City and County of Honolulu Noise Ordinance, which limits construction operations and resultant noise to daytime hours and maximum levels.

7. Air quality will be affected by the generation of fugitive dust, and construction equipment and worker vehicle emissions. Dust conditions will be controlled by frequent watering of roadways, and equipment will be maintained in proper working order to minimize emissions.

8. Construction activities will be most visible at the entrances to the project site. The construction of some structures located at higher elevations will be visible, possibly including the clubhouse and maintenance building. Views of the construction operations on the site will be minimized by proper equipment and materials storage, minimized vegetation clearing, expedient re-vegetation and non-intrusive security lighting.

9. Slight modifications to Kamehameha Highway will be done to construct the site entrance at the new project access road. Highway construction will be limited to off-peak hours, and maintenance and protection of traffic will be undertaken according to Hawaii Department of Transportation requirements.

10. Emergency medical facilities in Kahuku may occasionally be utilized by construction workers during the period 1992 to 1994.

<u>Anticipated Long-term Adverse Impacts and Mitigative Measures</u>

Once the Malaekahana Golf Course is completely developed and full operations are underway, some long-term adverse effects will have occurred or will continue to occur. Mitigative measures have also been proposed to minimize the long-term adverse effects of the project.

Anticipated long-term adverse impacts and proposed mitigative measures are listed below.

1. Grading of the project site will change some of its topographic features. Grading changes will only be undertaken where necessary and will be coordinated with drainage improvements. Under the City and County Ordinance, only 15 contiguous acres of land can be cleared at one time. A City and County of Honolulu Grading Permit must be obtained prior to construction, and proposed grading changes will be fully reviewed and approved.

2. Minor contributions of fertilizer constituents and pesticides will enter stormwater runoff generated on the project site. Fertilizers, except nitrates, and pesticides bind to soils and turf, and most will not travel far from the site of application. Surface runoff will transport some of this stormwater during peak precipitation periods. Fertilizers and pesticides (approved types) will be carefully controlled in amounts applied, and no applications will be made during high precipitation periods. A certified golf course manager will supervise irrigation and maintenance activities.

3. Minor concentrations of nitrates from treated sewage effluent and fertilizer application, and some pesticides will enter groundwater through irrigation water leachate. Fertilizers, except nitrates, and pesticides bind to soils and turf, and most will not travel far from the site of application. Application of irrigation water, fertilizers and pesticides will be carefully controlled by a certified golf course manager to avoid over-application.

4. Approximately 40,000 gpd of potable groundwater will be utilized at the site, derived from private on-site wells to be developed. The impact of this withdrawal on the Koolauloa Basal Aquifer will be negligable.

5. Up to 0.52 million gpd of irrigation water (maximum rate) will be drawn from the Koolauloa Basal Aquifer underlying the site and will be utilized by the golf course, golf driving range and project landscaped areas. The sustainable yield of this aquifer is more than adequate to meet this demand. Overpumping of groundwater will be avoided by careful management of pumping

facilities. Safe pumping rates for these facilities will be approved by the Board of Water Supply and the Department of Land and Natural Resources. Irrigation use of treated sewage effluent (mixed with pumped brackish water) will allow recharge of some groundwater withdrawn, increasing overall groundwater recharge at the site.

6. Approximately 119 acres of existing vegetation over the two sites will be removed in the process of constructing the proposed golf course. No substantial stands of native plants will be affected by the project. Extensive landscaping will be performed to re-establish vegetation across much of the area.

7. Existing habitat for birds and other wildlife species will be eliminated over the 119-acre cleared area. Some wildlife species will leave these areas, and relocate in adjacent open space areas within the project site. Landscape plantings will re-establish habitat areas in the golf course perimeter and other planted areas around roadways and buildings.

8. Slight amounts of suspended sediments, fertilizer constituents, organic material and pesticides will be contained in runoff during peak precipitation periods. The concentration of suspended sediments in runoff from the project will be lower than current levels after the project is completed. Drainage controls and restrictive fertilizer and pesticides application rates will minimize the effect of these potential contaminants on runoff water quality.

9. Sensitive archaeological resources will be affected in two locations on the site. Through intensive surveys, these materials will be carefully recovered, recorded or relocated on the site to preserve their historical and research value. Six archaeological or historical sites were located within the project site, and recommendations for treatment of sensitive sites will be reviewed and approved by the Department of Land and Natural Resources, Historic Sites Section.

10. Traffic generated by the completed development (1994) will represent an increase of 78 peak hour vehicle trips (ingress and egress) at the intersections of Kamehameha Highway and the project entrance. The addition of these vehicles will represent a maximum of five percent increase in the 1994 traffic volume on Kamehameha Highway, as compared to 1994 traffic volumes without the project. The availability of shuttle bus service for golfers staying at the Kuilima Resort (about 50 percent of the total users of the four courses) will reduce the actual traffic impacts below these levels, with the increases more likely to be about four percent. The increase in ambient peak hour traffic volumes will be an average of 446 vehicles above present conditions or average increase of 52 percent. This will create a much greater future traffic impact on Kamehameha Highway in this area. Even with the increases attributed to ambient and project-related traffic, an acceptable Level-of-Service will be maintained at the project entrance.

11. Noise will be generated by vehicles traveling to and from the project site on Kamehameha Highway, and by the operation of maintenance equipment on the site. Golf course traffic from the site will not create a noticeable increase in noise levels along Kamehameha Highway.

12. Most of the Malaekahana Golf Course will not be visible from Kamehameha Highway. Visible elements of the project will include: the project entrance, parts of the project access road and golf course, and, possibly, the clubhouse. Design plans will minimize the visibility of structures, roadway features and lighting from the areas near the project.

13. The project will create a maximum of 1,000 pounds per day of refuse for removal and disposal by a private carting firm at an appropriate City and County landfill or other solid waste disposal facility. Other public services such as police and fire protection, emergency medical facilities and recreational facilities will be required by the project, but only a minor effect is expected on

these services. Property tax revenues generated by the project are expected to more than cover any increase in operational costs caused by the project.

Alternatives to the Proposed Project

Three alternatives to the proposed project have been considered involving different land use and development concepts. These alternatives include: the no-action alternative, an agricultural alternative, and an agricultural subdivision alternative. Included below are brief discussions of each alternative, selected associated impacts, and a comparison with the proposed project.

The no-action alternative would keep the project site in their present undeveloped condition. Agricultural use for grazing would be continued on the site. No beneficial or adverse effects would be generated by this alternative. The owner of the land would continue to pay property taxes for this land without gaining any significant return on the initial investment or tax payments. Public access to the site would not be allowed. In terms of environmental consequences, this alternative would create the least adverse and beneficial effects of all alternatives considered.

An agricultural use alternative was considered which would involve the intensification of agricultural use on the site. Approximately 78 acres could be utilized for cultivated crops, tree fruit crops and grazing. Extensive land clearing would occur under this plan, and soil erosion and drainage problems would be created. Water quality and water use considerations would also be significant under this alternative. Public access to the site would not be allowed. The establishment of a profitable agricultural enterprise on this land would not be realistic due to high crop production costs and existing market conditions.

An agricultural subdivisions could be developed on the site under the existing AG-2 zoning. Approximately 48-two acre lots could be subdivided on the site with adequate roads and utilities. There would be requirements for wastewater collection, treatment and disposal facilities to support the residential development. School facilities would have to be available for children living in the subdivision. Traffic generated by this development would be approximately 43 peak hour vehicle trips. Public access to the site would not be allowed. In comparison to the proposed project, this alternative would generally create similar to greater impacts on the physical environment without the benefits of golf course facilities development. The demand for public services would be considerably greater.

Relationship to Existing Policies and Plans

The Final Environmental Impact Statement includes a detailed discussion of how the proposed project is generally consistent with most existing State and City/County policies and plans for the area. Specific measures are being taken to minimize project plans which contradict any of these policies and plans. Plans and policies considered in this evaluation were:

1. Hawaii State Plan Objectives and Policies, Priority Guidelines, and Functional Plans
2. City and County of Honolulu General Plan
3. Koolauloa Development Plan

An extensive discussion of the project as compared to these policies and plans is contained in Section 6.

Required Permits and Approvals

Several "discretionary" permits and approvals will be required to implement the proposed project. These are as listed below with their related agencies.

1. State Land Use District Boundary Amendment – Agriculture to Urban
   Agency: State Land Use Commission

2. North Shore Development Plan Land Use Map Amendment -- Agriculture to Park (Golf Course)
   Agency: City and County Department of General Planning/City Council

3. Zoning District Change -- Agricultural (AG-2) to Preservation (P-2) District
   Agency: City and County Department of Land Utilization/City Council

4. Conditional Use Permit -- Wastewater Treatment Plant
   Agency: City and County Department of Land Utilization

5. State Special Use Permit -- Wastewater Treatment Plant
   Agency: State Land Use Commission

SECTION 1
Introduction

I. INTRODUCTION

This section presents the background information on the project site, a general description of the proposed development plan, and the purpose of this Final Environmental Impact Statement. Detailed information regarding the project plans, environmental factors, assessment of environmental impacts, alternative and consistency with existing land use plans and policies is presented in the following sections of this report.

1.1 BACKGROUND

The applicant, Kuilima Resort Company, is planning the development of an 18-hole golf course located at Malaekahana between Kahuku and Laie on the North Shore of Oahu. Kahuku is located approximately 70 to 85 minutes driving time from Honolulu. Figure 1 shows the project site in relationship to the island of Oahu. Figure 2 shows the regional location of the site in relationship to Kahuku and Laie.

The project site is located on variable topography, with rolling hills and some broad areas of gently sloping grasslands. The elevation of the site ranges from approximately 25 feet above msl along Kamehameha Highway, to approximately 350 feet above msl in the mauka areas. Vantage points from several hill tops in the mauka portions of the site provide broad panoramic views of the upper windward coast of Oahu.

The site currently contains a ranching operation (Gunstock Ranch) which includes horse grazing and boarding, and cattle grazing. Two other lessees of portions of the site are not utilizing their lands. The mauka section of the site is the most actively used area for grazing, supporting approximately 75 to 100 cattle. Formerly, the site was more actively utilized for sugar cane production and ranching activities, as evidenced by overgrown fields and grazing pastures in the gently sloping areas. A water reservoir also exists in the middle of this site. Lands adjoining the site include: the U.S. Army Kahuku Training Area on the mauka side; the Cackle Fresh Egg Farm and vacant lands of Laie on the southern side; vacant and grazing lands leased from Campbell Estate on the makai side; and agriculture/aquaculture operations on leased lands of Campbell Estate to the north.

Kuilima Resort Company is acquiring the fee simple ownership interest in the project site. The intent of the project is to provide a quality daily fee golf course that will help to meet the expected demand for golfing opportunities from visitors staying at the Kuilima Resort, which is owned by Asahi Jyuken Hawaii, Inc., and from other golfers (both visitor and resident) on Oahu.

1.2 GENERAL DEVELOPMENT PROPOSAL

The following discussion briefly outlines the extent of facilities planned for the site.

The Malaekahana Golf Course is planned to include one 18-hole golf course, a golf driving range and a clubhouse on the 228-acre site. Other major elements of the golf course will include: access roadway; potable and non-potable water systems; drainage facilties with retention and detention ponds; a wastewater collection, treatment and disposal system; and electrical, telephone and cable television services. Details of these project elements are included in Section 2.2.

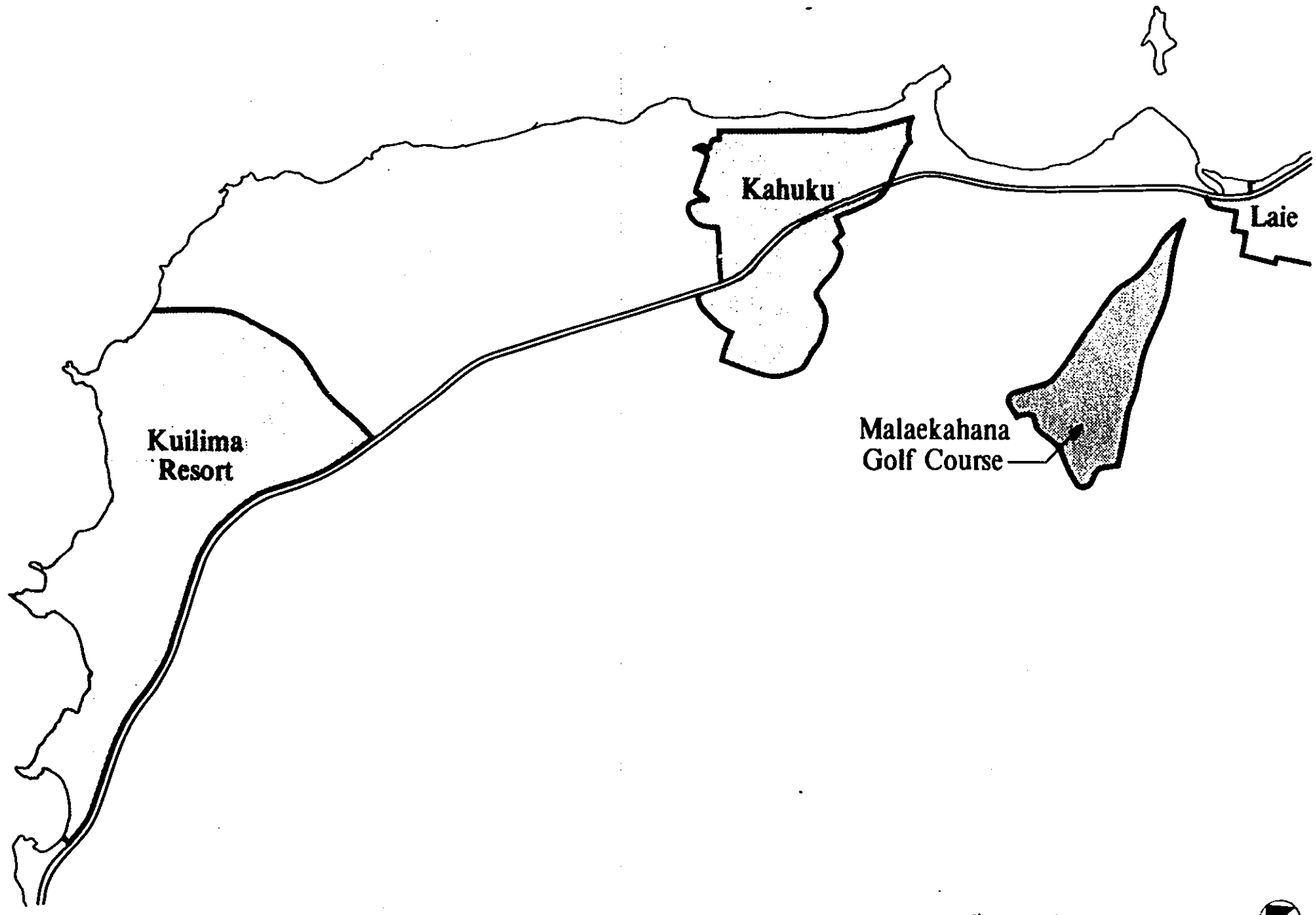
Required development approvals are discussed in Section 3.2.

OAHU LOCATION MAP
MALAEKAHANA GOLF COURSE

FIGURE 1

OAHU LOCATION MAP
MALAEKAHANA GOLF COURSE

FIGURE 1



REGIONAL LOCATION MAP
MALAEKAHANA GOLF COURSE

FIGURE 2

1.3 PURPOSE AND NEED FOR THE PROJECT

The development of the new 18-hole golf course at Malaekahana will provide golf facilities for visitors to the Kuilima Resort, and resident and visitor golfers on Oahu. Existing Oahu golf facilities can only serve approximately three percent of the average daily visitor population. In addition, most Oahu golfers currently are limited to play in crowded conditions on municipal and daily-fee courses. The availability of starting times at municipal and daily-fee courses is very limited. To avoid these crowded play situations, some Oahu golfers end up paying high green fees to play resort courses at Turtle Bay or Makaha. There is a strong market to expand the number of golf facilities throughout Oahu, as discussed in Section 2.3.

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 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 impact on what is large, virtually untapped market.

Interviews with representatives of Waikiki hotels have indicated that approximately 10 to 30 percent 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. Often the requests cannot be filled because of the unavailibility of starting times at existing courses. Many visitors are now making arrangements well in advance with golf tour operators, in order to ensure themselves of the opportunity to play golf.

Existing Oahu golf courses can, at most, take care of less than 10 percent 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 starting times, also show the demand is greatly exceeding supply.

The new golf course developed by this project will be a daily-fee course that will be available for public play, with no private membership. As a result of the project, Oahu golfers will benefit from having a new, high-quality golf course in Koolauloa with reasonable access and rate conditions.

1.4 PURPOSE AND CONTENTS OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT

This Final Environmental Impact Statement (Final EIS) has been prepared to identify and evaluate the existing conditions and potential impacts of the development of the golf course planned at Malaekahana on the natural and human environment. The Final EIS is required as part of an application to the City and County of Honolulu Department of General Planning for a Koolauloa Development Plan Land Use Map amendment. This document has been prepared in accordance with the provisions of Chapter 343, HRS and Title 11, Chapter 200 of the State Department of Health Administrative Rules, which together set forth the requirements for the preparation of environmental impact statements.

There is an Executive Summary prepared which summarizes the entire document, and includes a Summary Sheet. Section 1 is the Introduction which presents background on the project, the generalized development proposal, and the purpose and contents of the document. Section 2 contains a detailed project description, including ownership and present use of the site, the master plan, construction activities, market demand, scheduling and costs, and benefits to the community.

Section 3 includes a discussion of existing State and County land use and zoning designations for the project site. Changes in land use and zoning classification are also discussed in this section, along with other approvals required to complete the project. Section 4 includes the description of existing environmental conditions, anticipated environmental impacts and recommended mitigation measures. All environmental factors are considered in this Final EIS, such as soils, water quality and use, ecology,

traffic, archaeological resources, views, noise and community services, along with other factors. Mitigative measures are recommended to minimize potential adverse impacts generated by the project.

Section 5 is a presentation of alternatives to the proposed action, including no-action, agricultural use, residential use and mixed-use golf course/residential development. Section 6 includes a discussion of the relationship of the project to existing policies and plans for the area. References, a List of Preparers, and Resumes of Preparers are included in Section 7. This section also includes a List of Consulted Parties, written comments on the Draft EIS, and responses to the written comments.

Section 8 (Volume II) includes copies of technical reports prepared by consultants for the project. Specific technical reports have been prepared to evaluate the disciplines of agricultural feasibility, stormwater runoff, fertilizer and pesticide use, botany, terrestrial vertebrates, archaeological resources, traffic, noise, air quality, water supply, wastewater collection/treatment/disposal, marketing, fiscal concerns, and demographics and social character. Information contained in these reports has been highlighted in the applicable parts of Section 4.

SECTION 2
Project Description

2.0 PROJECT DESCRIPTION

This section presents a discussion of the ownership and present use of the project site, and details of the proposed Malaekahana Golf Course, including the development goals and construction activities. Market demand for the new golf course is described in this section, along with the development timetable and project infrastructure costs. Various benefits to the community that will result from this project are also described herein.

2.1 OWNERSHIP AND PRESENT USE

The property encompassed by this project consists of the site briefly described in Section 1, located at Malaekahana between Kahuku and Laie on the North Shore of Oahu in the Koolauloa Judicial District.

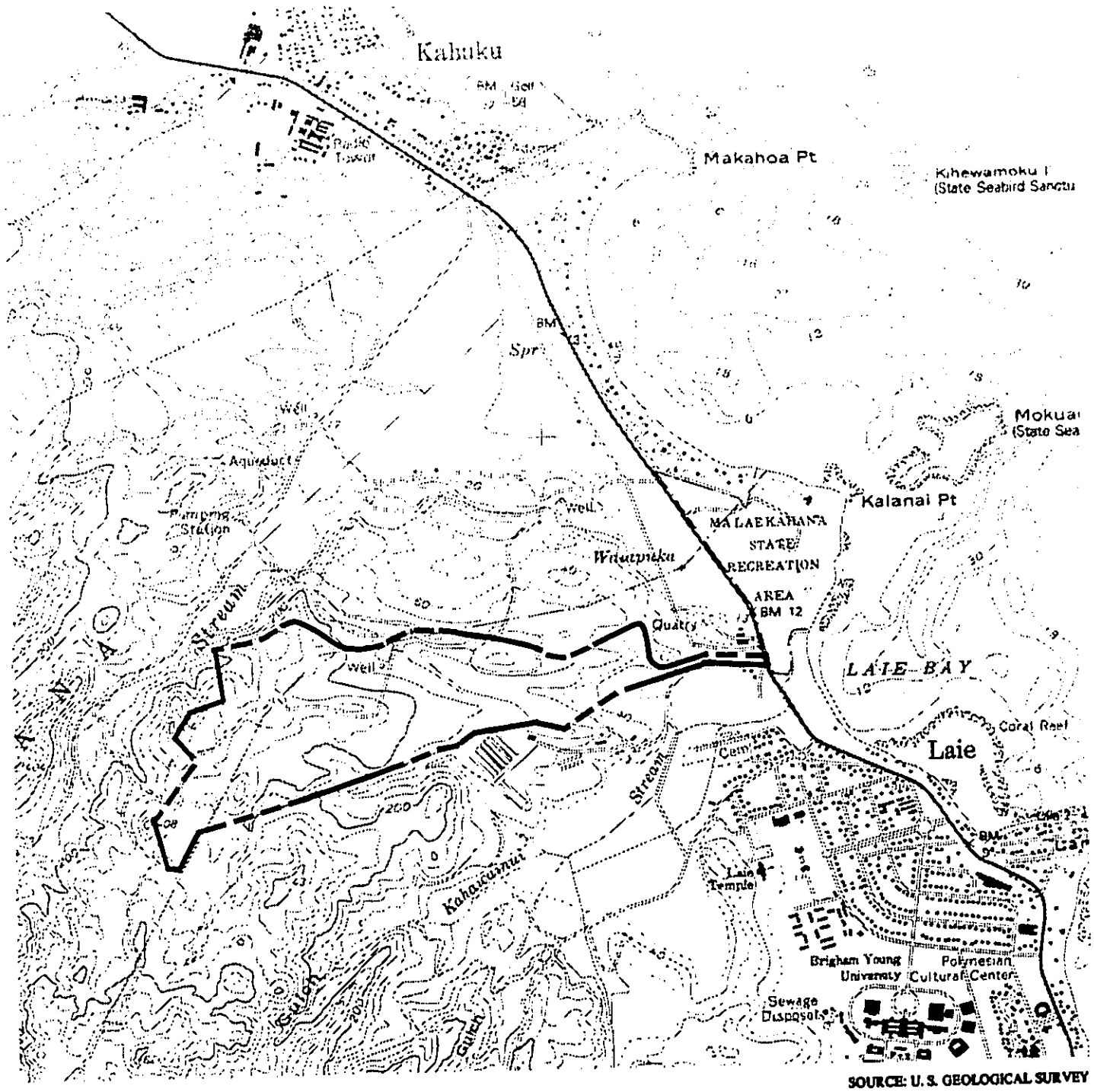
The Tax Map Key designations for this site are: TMK 5-6-06: Por. 6 and TMK 5-6-07: Por. 1. This land has been owned by the Campbell Estate since the 1890's, and several agricultural tenants currently hold leases on the site. Cackle Fresh Egg Farm holds a lease for a portion of the site which is currently not used. Gunstock Ranch and MBJ are tenants using portions of the site for horse and cattle grazing. Kuilima Resort Company is in the process of purchasing the fee simple interest in this site.

Figure 3 indicates the boundaries of the project site, and some site features. This site consists of many small hills that rise to elevations of 350 feet above msl. The site is connected to Kamehameha Highway by a narrow strip of land extending mauka to the main portion of the property. The site is vacant with some grazing uses. The former use of the site for extensive grazing and some sugar cane production is evident in the open pasture areas that have become overgrown. No stream gulches cross the site. Concrete-lined water ditches cross parts of the lowlands on the site, which once performed an irrigation purpose, but are now overgrown and generally disintegrated. Three buses are abandoned near the center of the site. Barbed wire fences extend through much of the site, and are maintained by the ranch tenants. A water reservoir of approximately 0.5 acres exists near the center of this site.

Land uses of adjoining properties are generally agricultural, military, recreational and vacant. Makai of the site lies agricultural lands used for grazing which extend to Kamehameha Highway. Across the highway is Malaekahana State Park. Along the southern boundary of the site is the Cackle Fresh Egg Farm and vacant land. The mauka boundary of the site adjoins other grazing lands and military use lands of the Kahuku Training Area. At the northern boundary of the site, an agriculture and aquaculture operation is currently active, utilizing lowlands for their culture ponds.

The nearby communities of Kahuku and Laie are primarily low density residential areas with small village commercial shopping centers, churches, schools and similar institutions. Malaekahana State Park is a large oceanfront park with picnic and camping facilities located across from the Malaekahana Golf Course site. Further south from this site in Laie village are located the Brigham Young University - Hawaii Campus, the Mormon Temple and Polynesian Cultural Center.

Figure 4 shows the master plan of Kahuku area lands owned by The Estate of James Campbell (November 1988). This plan identifies current and planned future land uses in the area. The plan identifies the project site Malaekahana as a future golf course development area.

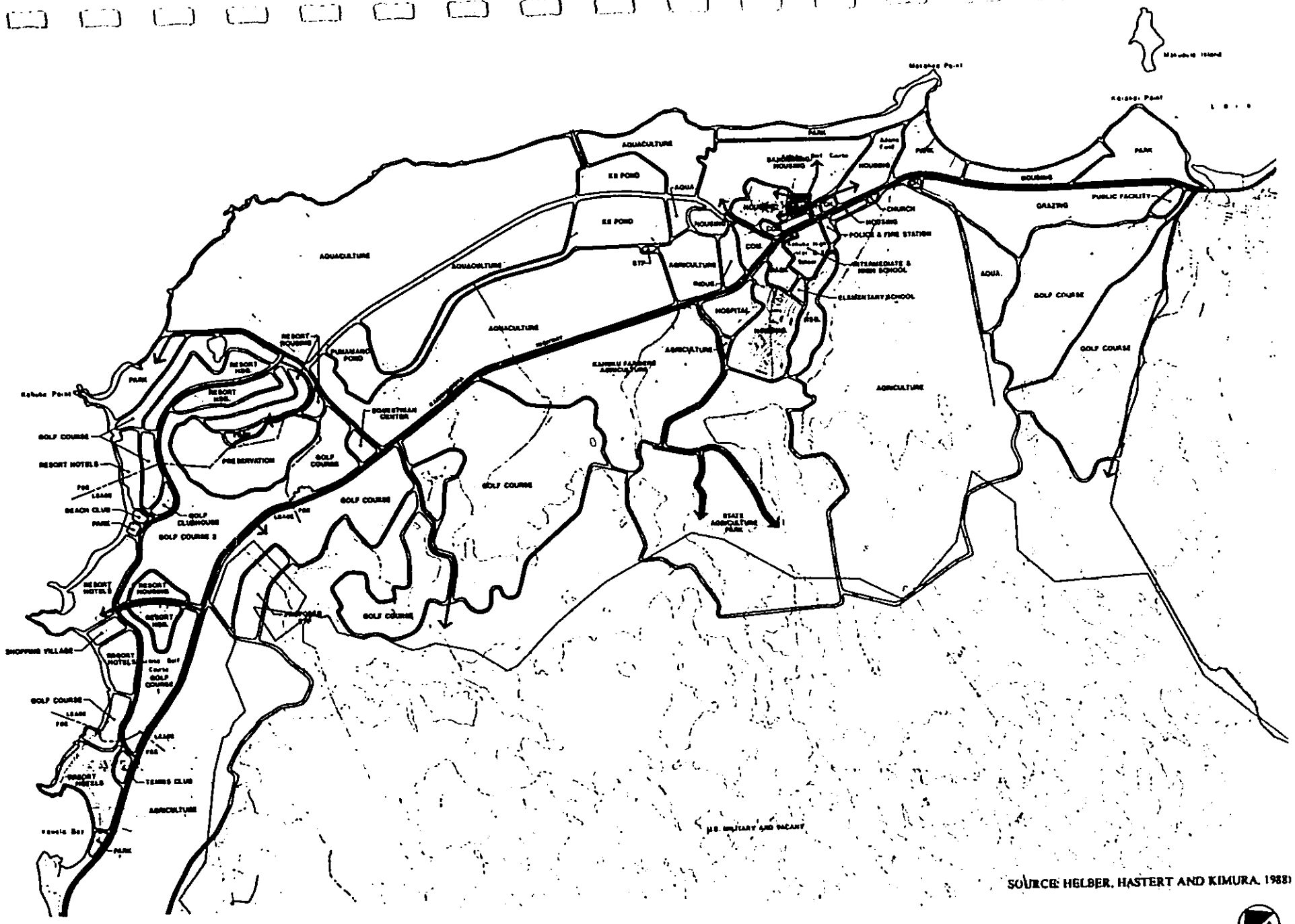


SOURCE: U. S. GEOLOGICAL SURVEY

PROPERTY BOUNDARY

MALAEKAHANA GOLF COURSE

FIGURE 3



ESTATE OF JAMES CAMPBELL KAHUKU AREA LANDS MASTER PLAN

MALAEKAHANA GOLF COURSE

FIGURE 4

2.2 PROPOSED PROJECT

This section describes the development project element in the master plan prepared for the Malaekahana Golf Course and the related construction activities necessary to complete the project.

2.2.1 PROJECT ELEMENTS

The overall goal of the project is to develop an 18-hole golf course and related support facilities on the site. A discussion of specific development goals is presented below.

The various elements of the development plan for the site are shown in Figure 5. These elements include one 18-hole golf courses, a golf driving range, a clubhouse and a maintenance area. In support of the development of this course, facilities that will be constructed include: access roadways; a wastewater collection, treatment and disposal system; a potable water supply and fire protection system; a non-potable irrigation water system; and other utilities systems. Table 1 shows the breakdown of areas required to construct each of the project elements. Approximately 109 acres of the site will not be used and will remain as open space. This area is planned to generally remain unaffected by site clearing, construction or operations at this project.

Each element in the Malaekahana Golf Course is described in more detail below.

A. Golf Course

One 18-hole golf course is planned for the site covering approximately 228 acres. The course will be a tournament-level golf course that will involve complex topography, and will be very challenging for even the better golfer. Additional tees and varied pin placement will make this course especially suited for tournament play.

Of the 228 acres within the site, approximately 90 acres will be developed for greens, tees, fairways and roughs. Figure 5 shows the proposed layout of the Malaekahana Golf Course. The course will have detention and retention ponds constructed on several holes to serve as drainage basins, water hazards and aesthetic features, and will also provide irrigation and fire protection water storage. The Malaekahana Golf Course will provide spectacular ocean, mountain and valley views.

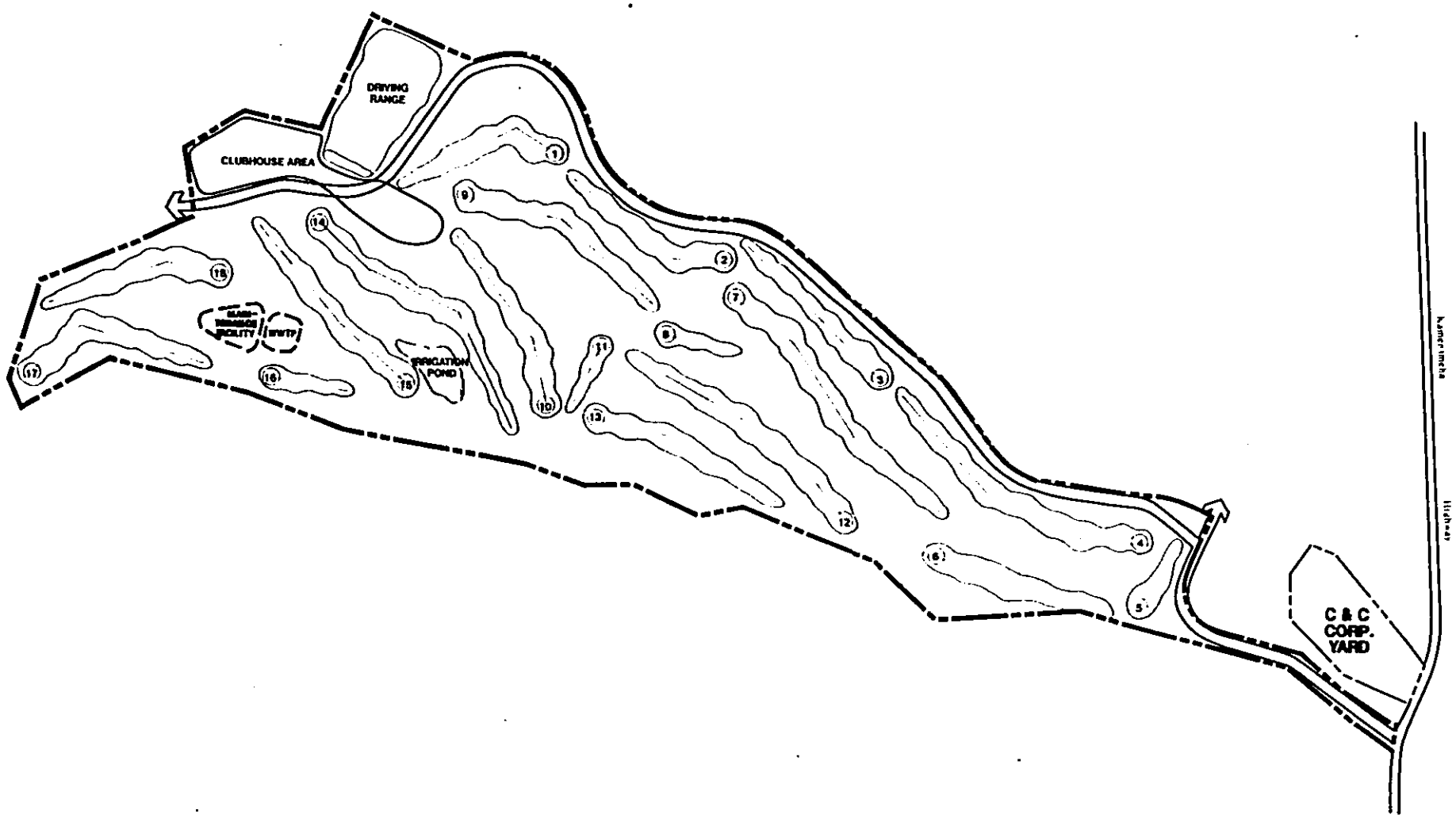
This golf course will be a daily-fee course, open to the public and with no private membership. The construction of the golf course and support facilities is expected to require 18 to 24 months. At the earliest, the completion of this course could occur by 1994, assuming all necessary government approvals are obtained.

B. Clubhouse

The clubhouse area for this golf course will encompass approximately 10 acres. The clubhouse building will be over 20,000 sq. ft. in area, providing a full range of services because of its distance from the Kuilima Resort facilities. It will include a men's locker room, women's locker room, pro-shop, lounge/snack bar/kitchen, restaurant, small meeting room(s) and administrative offices. Approximately 160 to 200 parking spaces will be provided. Features surrounding the clubhouse are likely to include a lanai, walkways, small gardens and practice putting greens.

C. Driving Range

At the mauka boundary of the site, a golf driving range is planned to be developed, involving a total of approximately 10 acres of the site. The driving range will have 24 to 30 tee positions. Parking for the



GOLF COURSE LAYOUT
MALAEKAHANA GOLF COURSE

FIGURE 5

MALAEKAHANA GOLF COURSE

TABLE 1

PROJECT AREAS

MALAEKAHANA GOLF COURSE	Area (acres)
Golf Course (18 holes) (green, tees, fairways, roughs)	90
Clubhouse	10
Driving Range	10
Roadways	7
Wastewater Treatment Plant Area	1
Maintenance Area	2
Open Space	109
TOTAL	228

driving range will be accomodated at the adjacent clubhouse area. This practice area will be open to the public for a fee, and will operate only during daylight hours.

D. Access Roadways

As shown in Figure 5, there will be one entrance to this site, located adjacent to the City and County Corporation Yard on Kamehameha Highway. The entry road will extend for approximately 7,000 feet, providing access to the clubhouse at the mauka boundary of the site.

The access road will occupy approximately seven acres on the site. It will have an asphalt surface and grassed shoulder area with landscaping, and will be privately owned and maintained.

E. Wastewater Collection, Treatment and Disposal

A Wastewater Management Report has been prepared for the project by Engineering Concepts, Inc. (February 1989). Information from the report is included in this section, and the complete report is included as Appendix B. Wastewater will be generated from the clubhouse and golf course maintenance buildings. Average wastewater flow from the Malaekahana site facilities is estimated at 20,000 gallons per day (gpd) (Engineering Concepts, Inc., February 1989). Wastewater generated from the golf course clubhouse and maintenance buildings is expected to be of typical domestic composition.

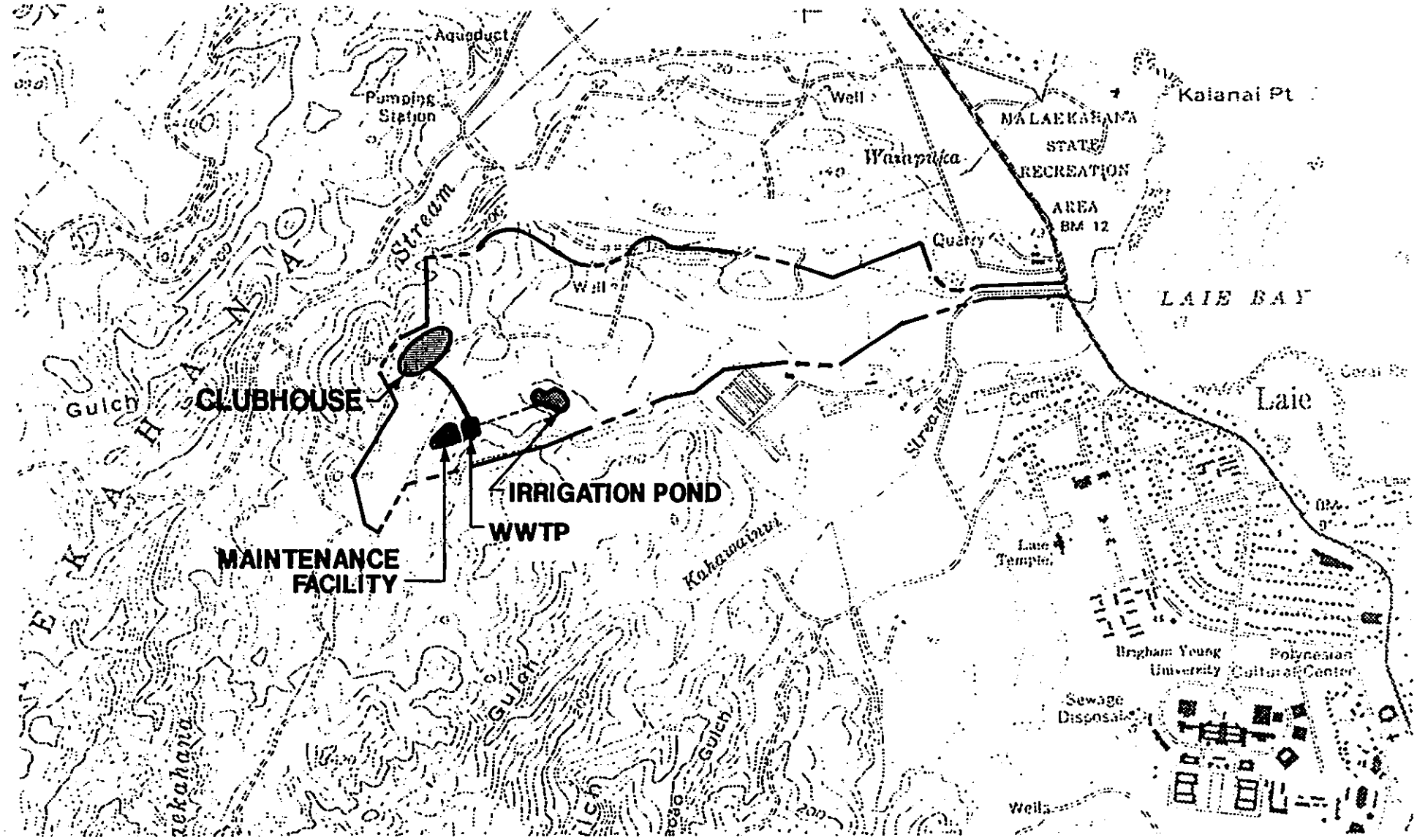
Wastewater collection systems will be installed primarily along the proposed access roadway system, and will be connected to all buildings where wastewater will be generated. Gravity sewers will be used, where topography permits, to convey wastewater to a wastewater treatment facility. Sewage pump stations will be installed where required. Details relating to wastewater treatment and disposal provisions for the golf course are included below.

The wastewater generated from the facilities at this golf course will be conveyed to an on-site wastewater treatment facility to be constructed as part of this project. The location and relationship of wastewater collection, treatment and disposal facilities are shown in Figure 6. Wastewater from the clubhouse and maintenance building will be collected in gravity sewers and conveyed to a small sewage pump station. Intermittently, as sewage collects in the station's wet well, pumps will automatically activate and transfer the wastewater to the wastewater treatment facility for treatment and disposal.

This wastewater treatment facility will be privately owned and operated. The proposed method of wastewater treatment is by activated sludge process. The activated sludge process is a biological wastewater treatment technique that includes aeration tanks, settling tanks, and a waste sludge pumping station. Details of the treatment process and equipment are described in Appendix B.

Waste-activated sludge will be stabilized in an aerobic digester prior to disposal. The holding tank will be aerated to maintain aerobic conditions, thus reducing odors. Based on typical domestic wastewater conditions, approximately 570 gpd of waste-activated sludge is expected to be generated. The digested sludge will be pumped from the holding tank two to three times each week into a tanker truck, and transported to the nearest available City and County wastewater treatment facility for additional solids treatment and disposal. Currently, treatment facilities at Kalihi (Sand Island), Pearl City, Waianae and Ewa Beach accept sludge from private facilities for treatment and disposal. Disposal of sludge requires a permit from the City and County Department of Public Works (Division of Wastewater Management).

Filtered, secondary-treated wastewater will be pumped to a storage pond to be mixed with water pumped from on-site wells (10 to 20 percent effluent mixed with 80 to 90 percent water). The pond will have adequate storage capacity for effluent storage during high precipitation periods, when irrigation is not required. The effluent/irrigation water will be sprayed on portions of the golf course through an irrigation system.



SOURCE: ENGINEERING CONCEPTS, INC. (1989)

LEGEND

GRAVITY SEWER

SEWER FORCE MAIN

PROPOSED WASTEWATER COLLECTION, TREATMENT AND DISPOSAL SYSTEM

MALAEKAHANA GOLF COURSE

0' 800' 1600' 3200'

FIGURE 6

Only extremely minor amounts of biochemical oxygen demand (BOD), suspended solids, nitrogen compounds, phosphorous and total coliform bacteria will be present in the discharged effluent. The effluent will meet or exceed California Wastewater Reclamation Criteria (Title 22, Division 4, California Administrative Code, 1978). These standards are also applied in Hawaii by the proposed Hawaii Administrative Rules, Title II, Department of Health (Chapter 62, Wastewater Systems).

Back-up measures will be taken with the private wastewater treatment and disposal facilities to ensure the safety of the surrounding communities and environment in the case of a mechanical or electrical failure. The following are the safeguards which will be used:

- Provisions to incorporate odor control measures will be implemented, if necessary, at the wastewater treatment facility headworks to vent gases to chemical scrubbers in order to remove odors.
- Generators will be installed to provide back-up power in case of an electrical power outage.
- Storage vaults will be used for wastewater overflow and storage.
- Redundancy will be employed at each sewage pump station, in the form of dual tanks and back-up pumps.
- Alarms and telemetering will be installed to provide warnings to indicate high/low liquid level conditions, equipment malfunction and other emergency conditions.

At present, the wastewater infrastructure is planned to serve only this project. The State Department of Health, City and County Board of Water Supply and the State Water Commission must approve the design and operation of this treatment facility and its disposal process prior to start-up.

F. Potable Water System

Plans for potable water supply to the site has been analyzed by Engineering Concepts, Inc. (February 1989). Information from this report is included in this section, and the report is included in Appendix D.

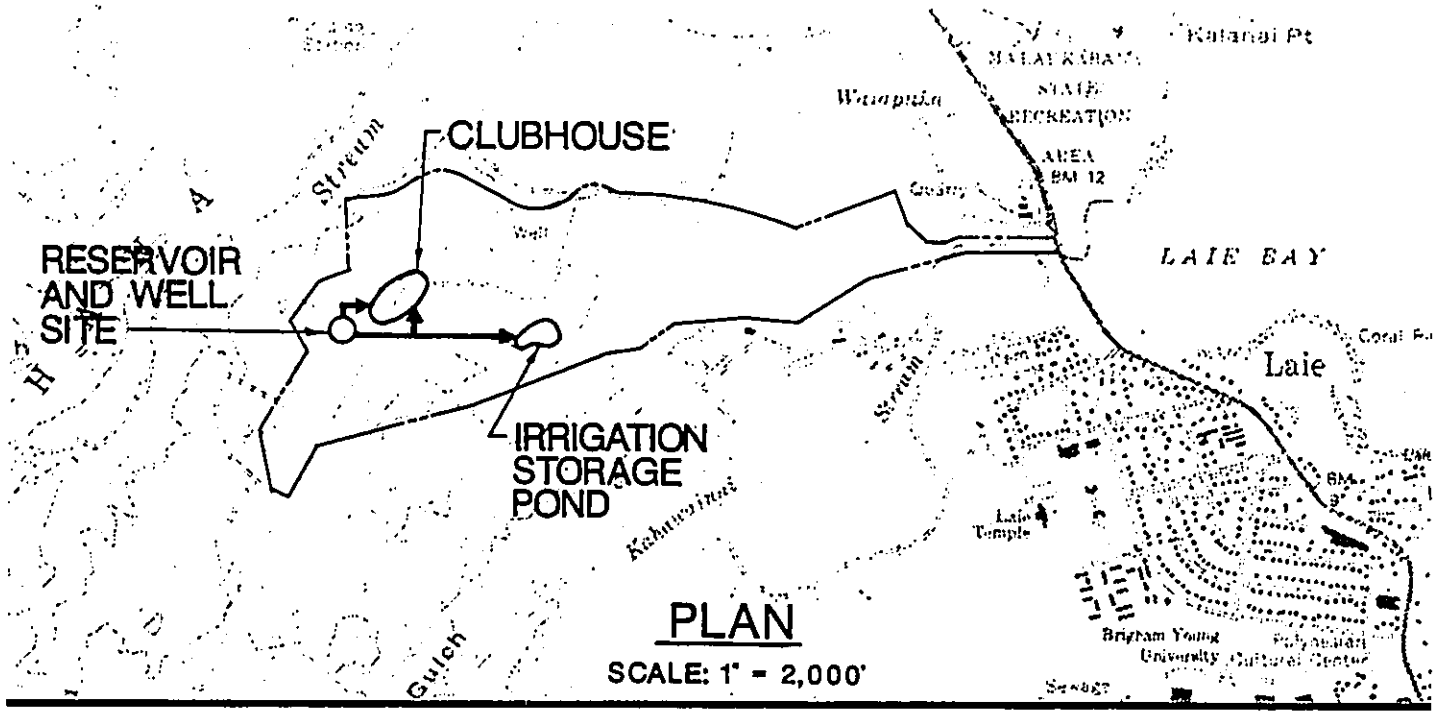
The potable water demand for this golf course is estimated to be 40,000 gpd on the average. The existing water systems in the area -- the BWS Kahuku, Campbell Estate and Zion Securities water systems -- are either inadequate or too distant to serve this project. As a result, it is planned to develop an on-site water system. Details of the analysis of existing water systems and the planned water system are included in Appendix D.

The layout of the planned water system for the Malaekahana Golf Course is shown in Figure 7. Two wells will be required (one standby) to meet the project demands. The wells will be located near the mauka boundary of the site. The wells will pump to a reservoir located mauka of the clubhouse site for irrigation and fire protection storage. Elevation of the reservoir will be sufficient to provide 20 psi to fire hydrants at the clubhouse. An extension of the transmission main to the clubhouse fire hydrants will transport water from the reservoir to golf course ponds for irrigation.

The wells will also supply potable water to the clubhouse and maintenance facility via a separate potable water system. A hydropneumatic system will be necessary to deliver adequate water pressure (40 psi minimum) to the clubhouse. A chlorination system will also be required to protect against bacterial contamination.

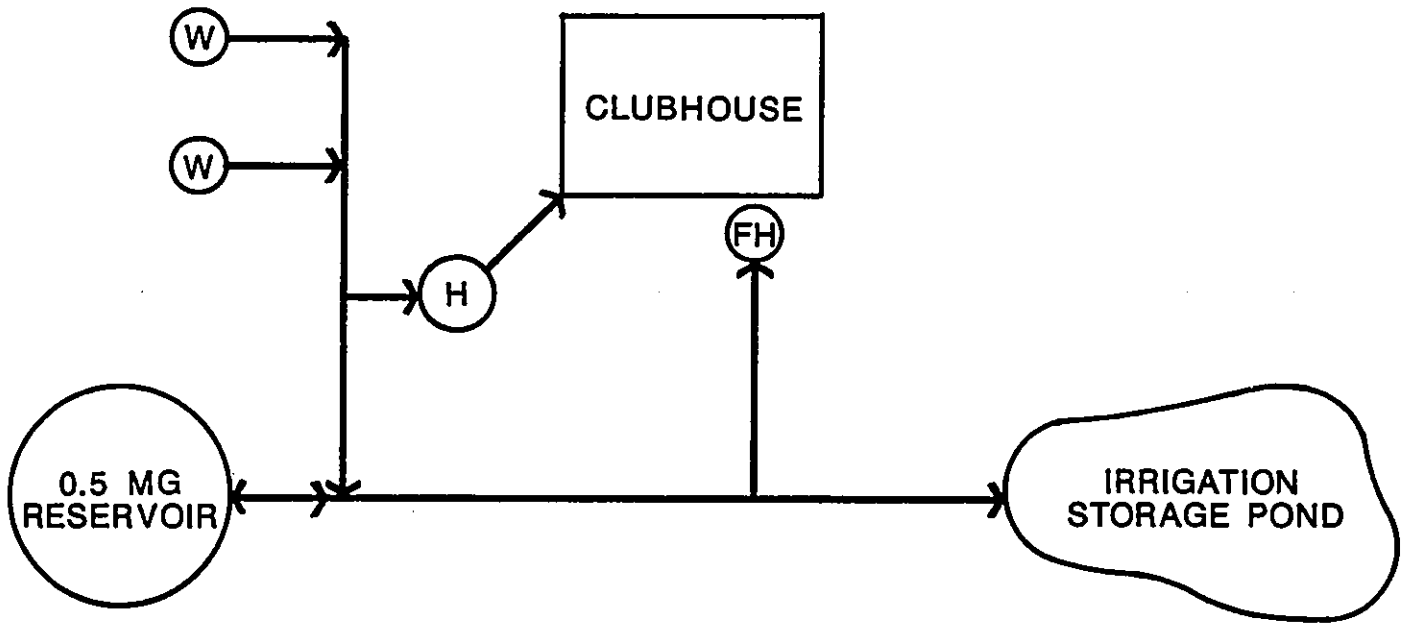
G. Non-Potable (Irrigation) Water System

Irrigation water requirements for the Malaekahana Golf Course have also been studied by Engineering Concepts, Inc. (February 1989). Information from this report is included in this section, and the report is included in Appendix D.



PLAN

SCALE: 1" = 2,000'



WATER SYSTEM SCHEMATIC

(NO SCALE)

LEGEND

(FH) FIRE HYDRANT

(W) WELL

(H) HYDROPNEUMATIC SYSTEM

SOURCE: ENGINEERING CONCEPTS, INC. (1989)

0' 1000' 2000' 4000'

PROPOSED WATER SYSTEM

MALAEKAHANA GOLF COURSE

FIGURE 7

The on-site source for potable water will also serve as the source for irrigation water to this golf course. It is estimated that the total irrigation water demand for the golf course will be 0.52 mgd (Murdoch and Green, February 1989). Irrigation water will be stored in ponds within the golf course.

In addition to water drawn from on-site wells, an estimated 20,000 gpd of wastewater effluent will be available for irrigation (once mixed with well water) once the project is operational. Chlorinated effluent will be pumped from the on-site wastewater treatment facility to a storage pond. Effluent and non-potable water will be blended in the pond for irrigation. This effluent/irrigation pond will have a one to two million gallon capacity, providing 10 to 14 days of effluent storage capacity, even during high precipitation periods. In addition, the pond will be lined to prevent infiltration of irrigation water. Additional irrigation water storage ponds will be located throughout the golf course. These other ponds will not receive treated effluent.

H. Drainage Facilities

A drainage report prepared for the golf course site is included in Appendix F.

Grading of the golf course site will include the creation of retention and detention areas to which storm water runoff will be routed. Some of these areas will serve as temporary detention and sedimentation basins during construction, while others will be designed as permanent water detention features within the golf course layout. Certain water features will provide for both retention of runoff water during heavy storms and serve as aesthetic features in the landscaping.

The main control of runoff on the golf course will be provided by detention areas. Low areas mostly between the play areas on the golf course, will be confined by cart paths or roadways to create these areas. Water flow will be controlled by selective sizing of culverts under the cart paths and roadways. The detention basins will control the potential increase of on-site runoff so that the peak runoff rate from the developed project will be at most equal to that which occurs under existing undeveloped conditions.

I. Solid Waste Disposal

Solid waste generated during construction, such as landscaping debris, will be trucked off-site. Solid waste generated in connection with the operation of the golf course, clubhouse and maintenance building will be collected by a private collection company and disposed of at the nearest available City and County sanitary landfill. Upon completion and full operation, it is estimated that a maximum of approximately 1,000 lbs. per day of refuse will be generated from the Malaekahana Golf Course facilities.

J. Other Utilities and Services

Electricity, telephone and cable telvision conduits to the clubhouse, maintenance building and wastewater treatment facility will be installed underground along the proposed access roadway. Utility lines will be installed underground into the golf course site.

2.2.2 CONSTRUCTION ACTIVITIES

Construction activities at the project will involve vegetation clearing, grading (cut and fill), excavation, rock drilling and blasting (if necessary), construction of roadways and buildings, and planting and landscaping. A brief description of the extent of each construction activity follows. The development timetable is presented in Section 2.4.

A. Vegetation Clearing and Grubbing

Selective vegetation clearing will occur to create buildable areas on the site for the various project elements described in Section 2.2.1. Within the site, some sections will be completely cleared, while others will be selectively cleared or retained as buffers and natural area transition zones. The clearing of vegetation planned for the site is discussed below.

Over the 228-acre site, complete clearing and grubbing will occur over approximately 119 acres to accommodate construction of the project features. Extensive vegetation clearing will be required for the golf course (±90 acres), roadways (±7 acres), clubhouse (±10 acres), golf driving range (±10 acres), maintenance area (± 2 acres) and wastewater treatment facility (± one acre). Approximately 109 acres of the site will remain as uncleared open space.

Impacts to vegetation are discussed for both sites in Section 4.7. Cleared vegetation from the site will be trucked off-site.

B. Grading (Cut and Fill)

Site grading will be required to accommodate the construction of the project design elements, described in Section 2.2.1. Earthwork on-site will grade the land to allow for structures and roadway to be constructed. Grading will also be required to complete the golf course. Most, if not all, excavated materials will be retained on-site to minimize the quantity and cost of transporting materials off-site.

C. Excavations

Excavations for roadways, building foundations, stormwater detention and retention ponds, irrigation water storage reservoirs, piping and utility trenches will be required to complete the golf course development. Utility installations will mainly occur along the access roadway, extending approximately 7,000 feet into the Malaekahana site. Additional excavation work may be necessary along Kamehameha Highway to connect proposed utilities to the existing distribution systems. Materials excavated for the trenches and foundations are expected to be reused on-site.

D. Rock Drilling and Blasting

To enable the construction of some sections of the access roadway and other facilities on the site, it may be necessary to conduct rock drilling and/or blasting to remove rock. Rock debris will be utilized on-site and not transported off-site for disposal. The amount of rock drilling and/or blasting required for the site is expected to be small. Actual amounts required will be determined after the completion of geological studies and the preparation of construction plans.

E. Construction of Roadways and Buildings

Construction of the access roadway will be the first construction activity performed at the site. Roadway development will involve clearing, grading, road bed construction, drainage facilities installation, paving, lighting and other safety provisions. The clubhouse, maintenance building and the wastewater treatment facility will be constructed in areas designated in the golf course layout (Figure 5).

F. Planting and Landscaping

Extensive landscape plantings will be incorporated with the entire project. The golf course, clubhouse, entrance and roadways will be landscaped extensively with ornamental and native plants designed to frame the course features and enhance the aesthetic beauty of the completed course. The entrance area will be tastefully designed with ornamental plantings to complement the Kamehameha Highway corridor through the Kahuku and Laie area.

2.3 MARKET DEMAND

The market demand for daily-fee golf course at Malaekahana has been identified through a Market Assessment prepared for this project by Peat Marwick Main & Co. (February, 1989) (Appendix G). A synopsis of the Market Assessment report is given below.

The golf course will have a clubhouse and driving range. For the purpose of the market assessment, it was assumed that the golf course will be complete and operational by 1994. Actual timing of the completion of the golf course may depend on market conditions.

The anticipated demand for use of the golf course is expected to include the following market mix: Kuilima Resort guests (43 percent), Kuilima Resort condominium guests and residents (16 percent), other Oahu visitors (19 percent), other Oahu residents (17 percent) and complimentary players (four percent). The Oahu visitor golf market consists of traveling golfers staying mainly in Waikiki and visitors who purchase golf packages. The golf course will be available for play by the general public, and local recreational players will be able to utilize the course through golfing clubs, individual play and foursomes.

A major attraction of Hawaii for many visitors is the opportunity to play golf in such a magnificent setting. This is especially important for windward and North Shore resorts like Kuilima, where the weather sometimes limits water-related activities unlike leeward and southern shore locations. At present, there is a serious shortage of golfing opportunities for visitors and residents alike. The proposed project will greatly improve the level of recreational services available to residents, to Oahu visitors in general, and especially visitors to the Kuilima Resort.

There are 27 golf courses presently operating on Oahu that support the various golfing market segments. An inventory of golf courses on Oahu (as of 1988) is presented in Table 2. Nearly half are restricted-use golf courses with four private and eight military golf courses. Subsequent to compiling this information, a proposal for 3 golf courses at Punamano has been dropped. Of the 15 other golf courses on Oahu, nine are daily-fee golf courses, four are municipal golf courses, and two are resort golf courses. There is also a relative lack of golf courses in the Waikiki resort area, and golf tour operators presently package day-trip tours to several popular daily-fee and resort courses on the island.

At present, there is only one municipal golf course in the Koolauloa/North Shore area – a 9-hole City and County golf course at Kahuku. There are no daily-fee courses in the Koolauloa/North Shore area. Area players currently utilize the Kahuku 9-hole municipal golf course and the 18-hole Kuilima Resort golf course, or travel to other locations on the island. Area golfers would benefit from this project by having a new high-quality golf course in the area.

Based on the information available, 29 proposed golf courses are currently being planned at 23 developments on Oahu, which are listed in Table 3. Subsequent to compiling this information, a proposal for three golf courses at Punamano was dropped. Of these developments, eleven have obtained the permits necessary to begin construction in the near future.

Of the 22 planned golf developments, six would be located in the Koolauloa/North Shore area of the island, relatively near to the project. In this area, other planned golf course projects include: a second 18-hole course at the Kuilima Resort (Kuilima Resort Company); an additional nine holes of golf at the

TABLE 2

OAHU GOLF COURSE INVENTORY - 1989

Golf Course	Holes	Location
Resort:		
Sheraton Makaha Resort and Country Club	18	Makaha Valley
Turtle Bay Golf Course	18	Kahuku
Private:		
Waialae Country Club	18	Waialae/Kahala
Oahu Country Club	18	Nuuanu
Mid-Pacific Country Club	18	Lanikai/Kailua
Honolulu International Country Club	18	Salt Lake
Municipal:		
Ala Wai Golf Course	18	Honolulu
Kahuku Golf Course	9	Kahuku
Ted Makalena Golf Course	18	Waipio/Waipahu
Pali Golf Course	18	Kaneohe
Daily fee:		
Bay View Golf Center (Par 3)	18	Kaneohe
Hawaii Country Club	18	Kunia
Hawaii Kai Championship Golf Course	18	Hawaii Kai
Hawaii Kai Executive Golf Course (Par 3)	18	Hawaii Kai
Makaha Valley Country Club	18	Makaha Valley
Mililani Golf Course	18	Mililani
Moanalua Golf Club (1)	9	Moanalua
Olomana Golf Links	18	Olomana/Kailua
Pearl Country Club	18	Pearl City/Aiea
Military:		
Barbers Point Golf Course	18	Barbers Pt. NAS
Hickam Golf Course	18	Hickam AFB
Kalakaua Golf Course	18	Schofield Brcks.
Kaneohe Marine Golf Course	18	Kaneohe MCAS
Leilehua Golf Course	18	Schofield Range
Navy Marine Golf Course	18	Aliamanu
Fort Shafter Golf Course	9	Fort Shafter
Hickam (Par 3)	9	Hickam AFB

(1) Course is open for public play Mondays through Fridays only.

Source: Peat Marwick Main and Co. (February 1989)

TABLE 3

PROPOSED GOLF COURSE DEVELOPMENTS ON OAHU
(1989)

Region/ project/developer	Type of course	Number of holes	Location	Course designer	Approval status(1)	Comments
North Shore:						
Turtle Bay expansion, Kuilima Resort Company	Resort	18	Kuilima Resort	Arnold Palmer	Zoning approved August 14, 1986.	Proposed to be completed by 1991. Second course at resort.
Lihi-Lani Recreational Community, Obayashi Hawaii Corp.	Daily fee Private	18 18	Pupukea Pupukea	N/A Jack Nicklaus	Pending SLUC application. Pending SLUC application.	Proposed to be completed by 1993. Proposed to be completed by 1991.
Mokuleia Golf Course, Mokuleia Land Co.	Daily fee	18	Mokuleia	BCA Golf Design	CUP application rejected; archaeological study required. Application resubmitted.	-
Waialua Golf Course, Oceanic Properties, Inc.	Daily fee	18	Waialua	N/A	Development Plan amendment pending.	Construction cost estimated at $10.7 million.
Kahuku Golf Course, City and County of Honolulu	Municipal	9	Kahuku	N/A	N/A	To be developed near the Kuilima Resort. Proposed expansion from 9 to 18 holes to be completed by by 1992.
Punamano Golf Courses, Kuilima Resort Company Campbell Estate	Resort	18 18 18	Kuilima Resort	N/A	Development plan amendment pending.	-
Malaekahana Golf Course, Kuilima Resort Company Campbell Estate	Resort	18	Kuilima Resort	N/A	Development plan amendment pending.	-
Windward:						
Waikane Golf Course No. 1, Waikane Development Co.	Semiprivate	27	Waikane Valley	BCA Golf Design	Development plan amendment pending from agriculture to preservation.	Local and Japanese memberships to be offered. Open to outside play also. Shares to be sold on Tokyo Stock Exchange. Extensive course and clubhouse improvements.

TABLE 3 (Continued)

PROPOSED GOLF COURSE DEVELOPMENTS ON OAHU
(1989)

Region/ project/developer	Type of course	Number of holes	Location	Course designer	Approval status(1)	Comments
Windward, Cont.:						
Waikane Golf Course #2,	N/A	27	Waikane Valley	N/A	Preliminary inquiry.	-
Royal Hawaiian Country Club, Inc., YY Valley Corp.	Daily fee Private	18 18	Maunawili	Pete Dye	CUP approved June 13, 1986.	State-owned road runs through the middle of the property. The Board of Land and Natural Resources is expected to discuss the state's options.
Minami Golf Course, Minami Corp.	Private	18	Kaneohe	Robert Trent Jones	CDUA approved March 13, 1987	Iolani School site; construction cost estimated at $60 million.
Central and West:						
Ko Olina Golf Course #1, West Beach Estates	Resort	18	Ko Olina Resort	Ted Robinson	Zoning approved 3/11/86.	Course expected to be ready for play by mid-1989. Construction to begin in 1988.
Ko Olina Golf Course #2, West Beach Estates	Resort	18	Ko Olina Resort	N/A	Preliminary inquiry.	Long-range plans for the resort. No completion date set.
Makakilo Golf Course, Finance Realty	Daily fee	18	Makakilo	N/A	CUP application rejected based on water issue.	Resubmitted and application was accepted.
Kapolei Golf Course, Hawaii Housing Authority	Municipal	18	Kapolei Village	N/A	Exempt from city permits.	Proposed for 1991.
Waikele Golf Course, Amfac Properties	Daily fee	18	Waikele	Ted Robinson	Zoning approved December 1, 1986.	Completion expected in 1991.
West Loch Golf Course, City and County of Honolulu	Municipal	18	West Loch	BCA Golf Design	SUP approved.	Proposed for 1990.
Ewa Golf Course Myers Corp.	Daily fee	27	Ewa Beach	Arnold Palmer	CUP approved 10/7/88.	Expected to be operational in 1991. To be designed to play as three different courses.
Royal Kunia Golf Course, Halekua Dev. Co.	Private	18	Kunia	N/A	Development plan amendment pending.	Members only course with construction cost of $18 million.

TABLE 3 (Continued)

PROPOSED GOLF COURSE DEVELOPMENTS ON OAHU
(1989)

Region/ project/developer	Type of course	Number of holes	Location	Course designer	Approval status(1)	Comments
Central and west, Cont.: Ewa Gentry Golf Course, Gentry Pacific Corp.	Daily fee	18	Ewa	N/A	Pending SLUC boundary adjustment.	Course to be operational by 1990.
Puuloa Golf Course, H. Horita Realty/ Puuloa Homes, Inc.	N/A	18	Puuloa	N/A	Permit for 9 holes approved; rezoning for additional 56 acres being processed.	-
Waianae: Maili Kai Golf Course, Kaiser Cement	N/A	27	Maili Kai	N/A	CUP application withdrawn based on agricultural and water issues.	-
Waianae Kai Golf Course, H. Horita Investment/ Shinwa Golf Co.	N/A	18	Waianae	N/A	CUP application rejected based on water issue. Resubmitted and application accepted. 12/16/88.	-
Lualualei Golf Course, Sanjiro Nakode	N/A	18	Waianae	N/A	Preliminary inquiry.	-
Okukilolo Golf Course, Alpha Kai Corp.	N/A	18	Waianae	N/A	Preliminary inquiry.	-

(1) Abbreviations:
N/A - Not available
SLUC - State Land Use Commission
CUP - Conditional Use Permit
CDUA - Conservation District Use Application
SUP - Special Use Permit

Source: Compiled by KPMG Peat Marwick based upon discussions with developers and other published information.

Kahuku Golf Course; two 18-hole golf courses at the Lihi Lani Recreational Community in Pupukea (Ohbayashi Hawaii Corporation); two 18-hole golf courses in Mokuleia (Mokuleia Land Co.), and an 18-hole golf course in Waialua (Oceanic Properties). Except for the Kahuku Golf Course, these area golf courses could be considered as the competition for the Malaekahana Golf Course.

With appropriate market planning, the proposed project, along with the Kuilima, Pupukea, Waialua and Mokuleia courses, could serve complementary markets and support the emergence of the North Shore/Koolauloa area of the island as a golf center, with a variety of high-quality courses for both resident and visitor golfers.

Full operations of the proposed golf courses could be anticipated within two years following first marketing, or by about 1994. At full operations, the Malaekahana Golf Course could be anticipated to accommodate between 45,000 to 55,000 rounds of golf annually.

2.4 DEVELOPMENT TIMETABLE

The completion of various project elements is expected to involve a four year process. Project planning and administration began in August 1988. As of September 1988, an Environmental Assessment was filed as part of an application for a Koolauloa Development Plan Amendment. (Note: The original application contained plans for five golf courses. Two courses were originally planned for the Malaekahana site and three courses were planned for a site at Punamano. The September 1988 application included four golf courses: one at Malaekahana and three at Punamano. Plans for Punamano golf courses have since been dropped.) The processing and approval of this application, and of the several other required State and City and County approvals, is projected to be completed by mid to late 1991. Final approvals for site design plans and engineering details for infrastructure elements could be received by late 1991 or early 1992.

Assuming all required approvals are obtained as scheduled, construction will begin in late 1991 or early 1992. It is anticipated that the course will be completed by 1994.

2.5 PROJECT DEVELOPMENT COSTS

Preliminary estimates of project construction costs for infrastructure improvements at the Punamano and Malaekahana sites have been prepared by Engineering Concepts, Inc. (February 1989). The total estimated construction cost for infrastructure improvements for the Malaekahana Golf Course is approximately $8.1 million (1989 dollars). These costs do not include costs for engineering, administration and construction management. The construction cost for the Malaekahana Golf Course is estimated at $10 million (1989 dollars), and $5 million for the clubhouse and driving range.

2.6 BENEFITS TO THE KOOLAULOA AND NORTH SHORE COMMUNITY

The golf course and driving range will be open to the public as well as to golfers staying at the Kuilima Resort and other resorts on Oahu. The clubhouse facilities will also be open to the public, including mens and womens locker rooms, a lounge/snack bar and golf pro shop at all four courses, and a restaurant.

It is anticipated that other community benefits will be provided, but these have not yet been determined. Meetings with residents of the area will be held to discuss issues and concerns, including any possible "give-backs" to the community by the project developer. Plans for the provision of additional community benefits will be based on the results of these meetings.

SECTION 3

Land Use and Zoning Controls

3.0 LAND USE AND ZONING CONTROLS

This section includes a description of the existing State and City and County land use and zoning designations for the project site and lands surrounding it. Changes in land use classification, zoning and other approvals required to implement the proposed action are also described.

3.1 EXISTING DESIGNATIONS

3.1.1 State Land Use

The entire 228-acre project site at Malaekahana is located within the State Land Use Agricultural District. In 1972, the Land Study Bureau of the University of Hawaii classified all lands on Oahu according to productivity and suitability for agriculture. Overall rating of crop productivity range from Class A to E, with A being the best.

There are no Class A soils and approximately 42 acres of Class B soils on the project site. The remainder of the area (186 acres) is classifed as either Class C, D or E soils. LSB soil classifications for the site are shown in Figure 8.

The provisions of the Hawaii Revised Statutes relating to the State Agricultural District (Sections 205-2 and 205-4.5 HRS) distinguish between uses permitted on A and B classified lands (commonly referred to as "prime" or "good" agricultural lands) and those permitted on C, D and E (or "marginal") lands.

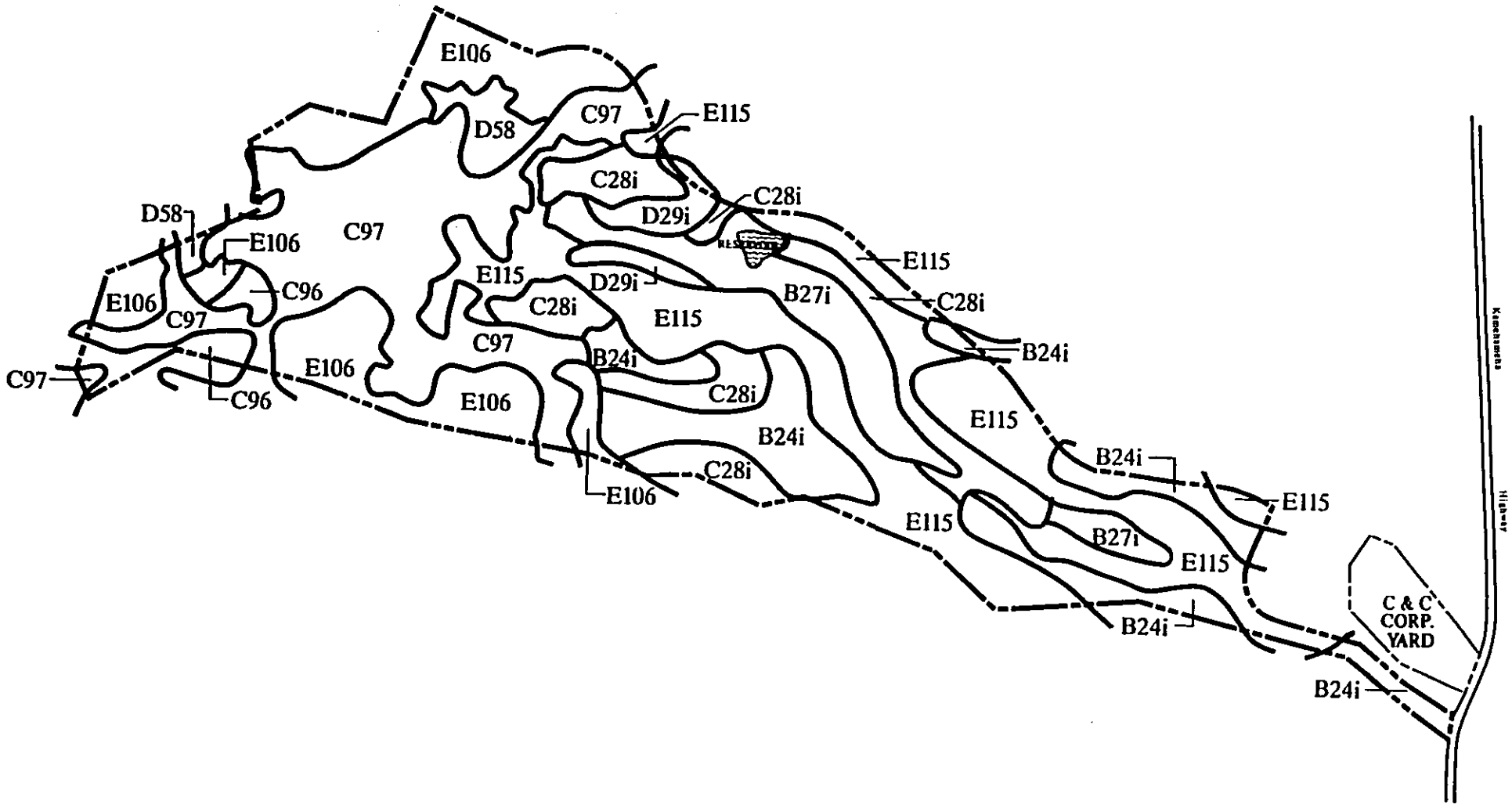
Permissible uses of LSB Class A or B lands generally include crop cultivation, farming, wind energy facilities, aquaculture, livestock raising, and related support uses. For lands with LSB classification C, D or E, additional uses are possible, such as open area recreational facilities, including golf courses and golf driving ranges. Section 205-2, HRS recognizes the inclusion of substantial areas of marginal lands in the Agricultural District with the following statement: "These districts may include areas which are used for, or are not suited to, agricultural and ancillary activities by reason of topography, soils and other related characteristics".

3.1.2 City and County General Plan

The objectives and policies of the City and County of Honolulu General Plan set forth comprehensive statements concerning the needs of the people of Oahu and the functions of government. According to the General Plan, the Koolauloa area is to remain as a rural area, with 1.3 to 1.4 percent of the projected 2010 Oahu population. (In 1985, an estimated two percent of the Oahu population lived in the Koolauloa District). In addition, it is a policy of the General Plan to "encourage the private provision of recreation and leisure-time facilities and services".

3.1.3 City and County Development Plan

The area is designated "Agriculture" on the Koolauloa Development Plan Land Use Map. The agricultural category of land use is defined as including those areas suitable for crop growing, grazing and the raising of livestock, flower gardening, nurseries or orchards, aquaculture or similar activities. This classification also includes areas surrounded by or contiguous to such lands but not well-suited to agricultural or accessary activites due to topography, soils or similar constraints. According to the designation definition, uses complementary to agricultural uses may be permitted in these areas.



SOURCE: LAND STUDY BUREAU (1972)

LAND STUDY BUREAU CLASSIFICATIONS
MALAEKAHANA GOLF COURSE

0' 450' 900' 1800'

FIGURE 8

3.1.4 City and County Zoning

The zoning of this site is AG-2 General Agricultural District. Figure 9 shows the classification of lands on the site under ALISH. Approximately 25 percent (58 acres) of the property is classified as "Prime", another 43 percent (97 acres) is classified as "Unique", and 32 percent (73 acres) is classified as "other" areas under ALISH because of steep slopes or other conditions that are unfavorable for agriculture.

The City and County recognizes that the overall feasibility of agriculture on AG-2 District lands is limited due to extreme topographic variations and/or separated agricultural soil sections. In the AG-2 District, outdoor recreational facilities are permitted as conditional uses.

3.1.5 The Estate of James Campbell -- Kahuku Area Lands Master Plan

Campbell Estate has prepared a master plan for its lands in the Kahuku Area. The master plan, shown in Figure 5, identifies existing and proposed land uses in this area. The project site at Malaekahana is listed as a future golf course location.

3.2 CHANGES IN LAND USE CLASSIFICATION, ZONING AND OTHER APPROVALS REQUIRED TO IMPLEMENT THE PROPOSED ACTION

In order to construct the project as proposed it will be necessary to obtain the following land use approvals from the City and County of Honolulu and the State of Hawaii. Each of the required approvals is described below.

3.2.1 State Land Use

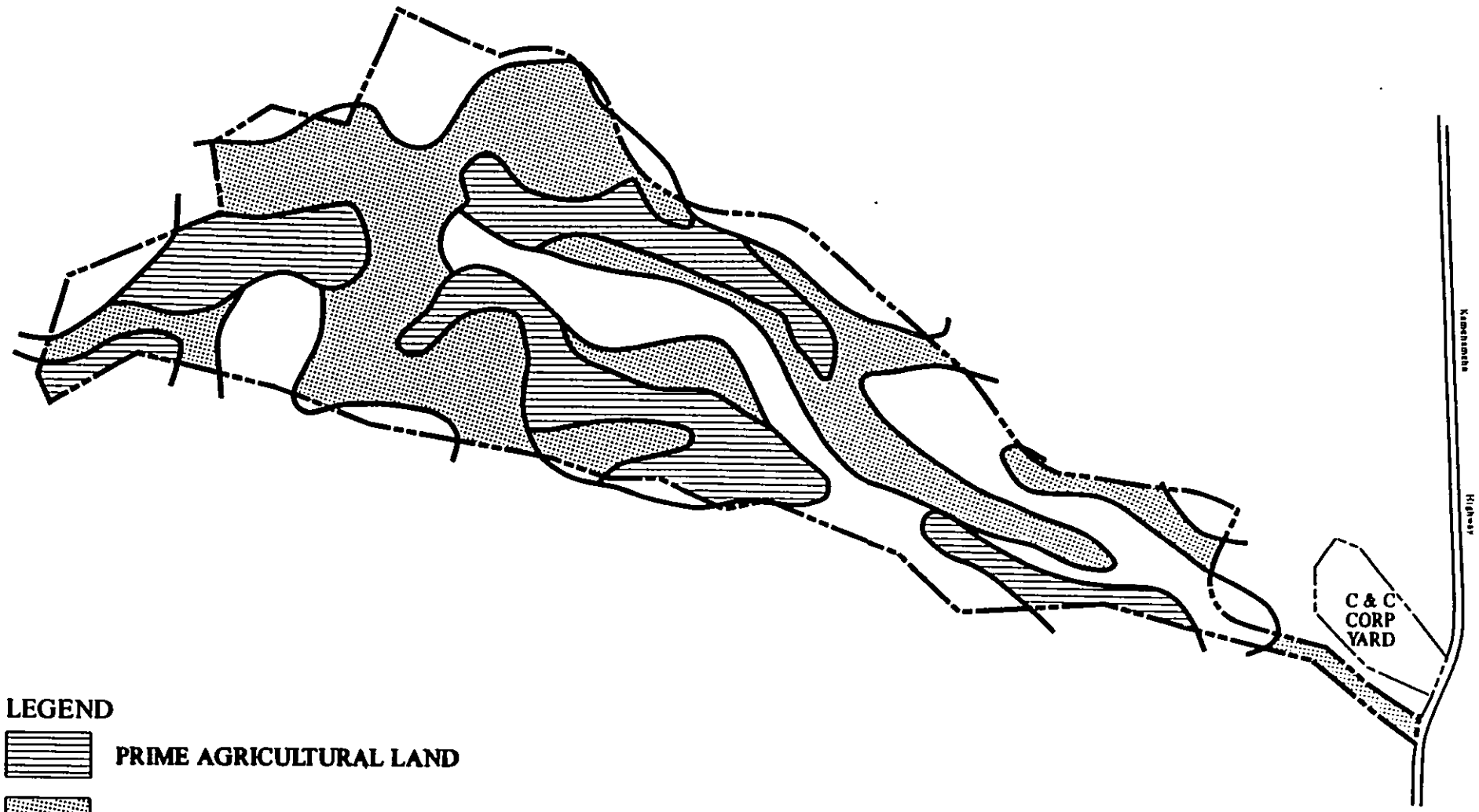
A State Land Use District Boundary Amendment from Agriculture to Urban will be required for the development of the golf course and related facilities at the site. Golf courses are not permitted on State Agricultural Districts containing lands classified as "A" and "B" agricultural lands by the University of Hawaii Land Study Bureau. Significant portions of both sites contain "A" and "B" lands. A petition for a boundary change is subject to the approval by the State Land Use Commision. The review process will include a public hearing.

3.2.2 City and County Development Plan Land Use Map Amendment

A Koolauloa Development Plan Land Use Map Amendment from "Agriculture" to "Park (Golf Course)" is being requested for the Malaekahana Golf Course. Although golf courses are permitted (subject to the issuance of a Conditional Use Permit) in the AG-2 General Agricultural District, which is the prevailing zoning at Malaekahana, Development Plan Amendment from Agriculture to Park (Golf Course) is also being requested. The review process involves public hearings before both the Planning Commission and the City Council.

3.2.3 City and County Zoning Change

Once the project site is designated "Park (Golf Course)" on the Development Plan, a Zoning District Change from Agriculture (AG-2) to P-2 General Preservation District will be required for the development of the golf course and related facilities. Golf courses are permitted uses in this district. This change is subject to approval by the City Council. The review process involves public hearings before both the Planning Commission and City Council.



LEGEND

PRIME AGRICULTURAL LAND

UNIQUE AGRICULTURAL LAND

OTHER IMPORTANT AGRICULTURAL LAND

SOURCE: STATE OF HAWAII, DEPARTMENT OF AGRICULTURE (1977)

ALISH DESIGNATIONS

MALAEKAHANA GOLF COURSE

0' 450' 900' 1800'

FIGURE 9

3.2.4 State Special Use Permit and Conditional Use Permit for Wastewater Treatment Facility

To construct and operate a new wastewater treatment facility to serve the Malaekahana site, a Conditional Use Permit must be obtained from the City and County Department of Land Utilization. The wastewater treatment facility is classified as a "Type B" utility, which requires a "Type 1" Conditional Use Permit. No public hearing is required.

A Special Use Permit must also be obtained for this facility from the State Land Use Commission. A public hearing is required as part of this approval process.

3.2.5 Other Approvals

Other approvals will be required to implement the proposed action, including: Well Drilling/Withdrawal Permit (State Water Commission), Wastewater Treatment and Disposal System approval (Department of Health) and a State Highway Entrance Approval (Department of Transportation). These are generally classified as "ministerial" review and approval processes, as opposed to the previously described approvals which are more "discretionary" in nature, and do not normally include public hearings.

3.2.6 Summary

The currently estimated timing and duration of the above described "discretionary" review processes are shown in the Project Schedule. The total time required to obtain the approvals for project construction is anticipated to be approximately two years. Construction is anticipated to start in late 1991 or early 1992.

SECTION 4

Environmental Setting, Anticipated Impacts & Mitigative Measures

4.0 DESCRIPTION OF ENVIRONMENTAL SETTING, ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

This section presents background information on the existing human and natural environment. Utilizing this background, the proposed project is evaluated as to the potential for it to generate significant environmental impacts. Impact discussions are divided into short-term construction-related impacts, and long-term operations-related impacts.

Mitigative measures have also been recommended to minimize the potential impact of the project construction and operation. Technical consultant reports have been prepared to supplement the impact assessment. Findings from these reports are included herein, and the report texts are enclosed as Appendices A-S.

4.1 CLIMATE

A. Existing Conditions

Average daily maximum and minimum temperatures have been recorded at the State Key Station No. 912.00 located in Kahuku, which is the closest station to the site which has continuous temperature recordings. Temperatures range from the low 60's (degrees Fahrenheit) to the mid-80's depending on the time of day and the season. Daily temperatures vary by about seven degrees between winter and summer seasons, and 15 to 18 degrees between day and night. Cooler temperatures are experienced at higher elevations in this area.

Precipitation has a definite seasonality on Oahu and at the site. Rainfall has been recorded at the Kuilima Resort, at State Weather Station No. 907.00. Median annual rainfall for Station No. 907.00 over a 60-year period amounted to 39.4 inches. The distribution is uneven and varies from month to month, heavy at some times and non-existent at others. Winter months typically have the most rainfall.

The Kahuku area is subject to both trade winds and Kona storms. Kahuku has average wind velocities of fourteen to sixteen miles per hour, with the prevailing wind directions being northeasterly and easterly. Winds at Kahuku are generally of greater velocity than experienced elsewhere on Oahu.

Cloud cover is an indication of the amount of sunshine an area receives. On this particular area of the island, slightly less than one-third of the days per month are clear, about a third are partly cloudy, and a little more than a third of the days are cloudy.

The average relative humidity approximates 74.6 percent on the northern coast of Oahu, slighlty lower in the summer and higher in the winter.

B. Anticipated Impacts and Mitigative Measures

Buildings at the proposed golf course project will be designed for a tropical climate. The project will have no effect on climatic conditions, and no mitigation measures are required.

4.2 TOPOGRAPHY

A. Existing Conditions

The site consists of many small hills (pu'u) that rise to elevations of 350 feet above msl. The site has a narrow connection to Kamehameha Highway where elevations are approximately 20 feet above msl. There are no stream gulches crossing the site, however, there is a small (0.5 acre) reservoir located near the northern boundary of the site.

General topography on the site is shown in Figure 3. The terrain on the site is uneven, with approximately 25 percent of the site having very slight slopes (0 to 10 percent). Approximately 35 percent of the site is moderately sloping (10 to 20 percent), and the remaining 40 percent is characterized by steep slopes (20 to 30 percent) and very steep slopes (over 30 percent).

B. Anticipated Impacts and Mitigative Measures

The development of the site for a golf course and support facilities will require substantial disturbance of the natural vegetation and grades. Details for the site are described below.

As discussed in Section 2.3.2, clearing and grading will occur on the site to prepare the land for the construction of the golf course and support facilites. Approximately 119 acres of the site will be cleared and graded for construction.

Blasting and/or rock drilling should be required only to a minor degree, if at all, to construct improvements on either site, and will be kept to a minimum. Material from grading will be retained on the project site as much as possible. The amounts of cut and fill will be balanced in the grading plan to minimize the need to import fill or to export excavated material.

All grading operations will be conducted in a manner which will ensure full compliance with dust and erosion control and other requirements of the City and County Grading Ordinance. A grading permit must be obtained from the City and County to modify the topography of the site. The grading plans for the site are reviewed and approved in this process.

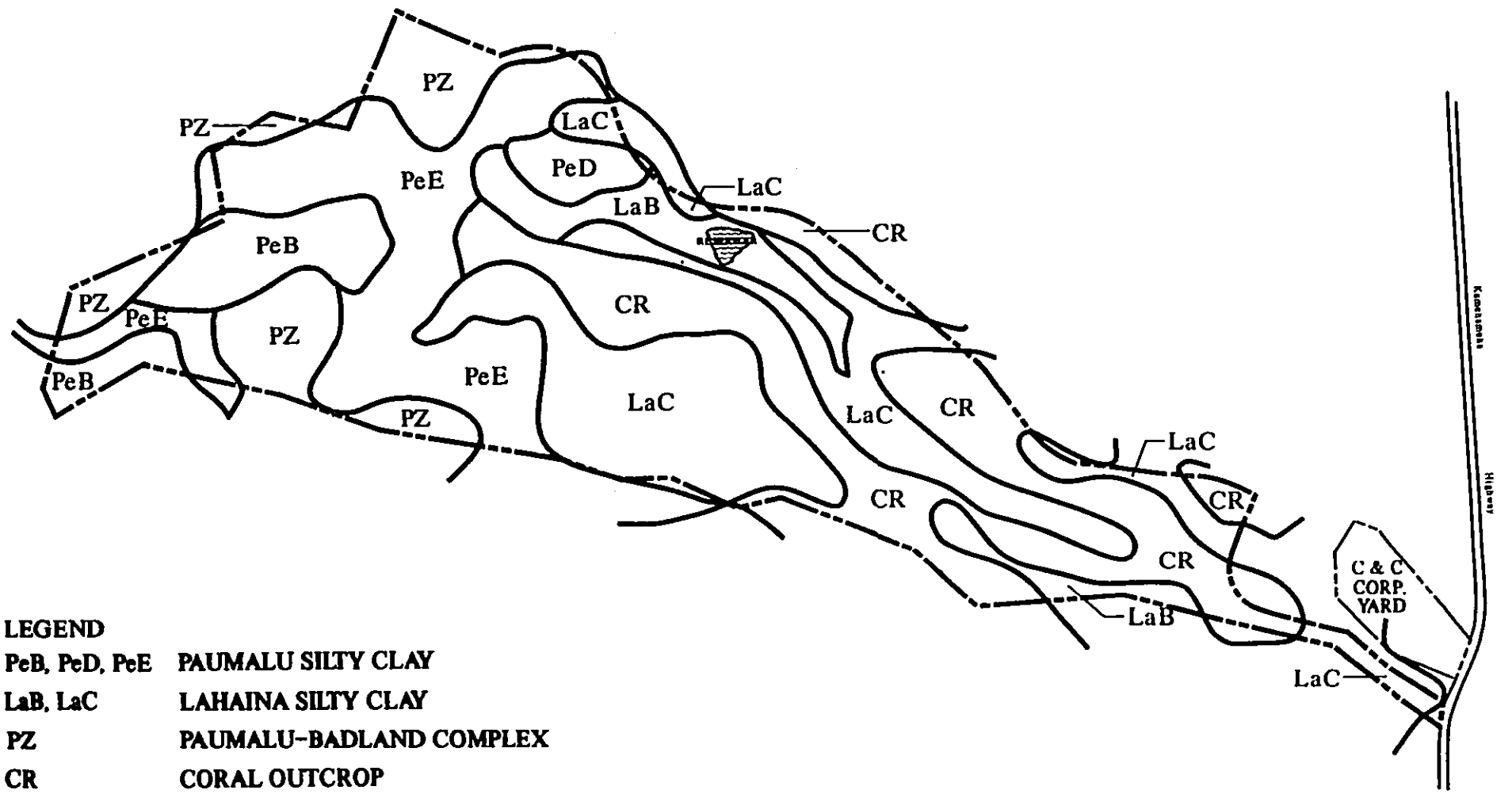
4.3 SOILS

A. Existing Conditions

Soil types or classifications for the project sites are based on soil surveys by the USDA Soil Conservation Service (SCS)(1972), shown in Figure 10. The University of Hawaii Land Study Bureau (LSB) classifications, and the Agricultural Lands of Importance to the State of Hawaii (ALISH) designations are used to show the agricultural viability of the land considering its soils and slopes. Discussions of agricultural land designations, and Figures 8 and 9 showing LSB and ALISH classifications, are included in Sections 3.1.1 and 3.1.4, respectively. SCS and LSB soil classifications and their distribution on the site are included in Table 4.

Based on the SCS, LSB, ALISH and LESA soil classification systems, a description of the soil types occur on the project site is included below. Soils on this site are generally silty clay soils, as described by SCS and shown in Figure 10.

Based on the SCS Soil Survey, a total area of 133 acres, or 58 percent is categorized as soil classifications IV-VIII. These classifications denote a poor soil quality if non-irrigated. Good quality



LEGEND

PeB, PeD, PeE	PAUMALU SILTY CLAY
LaB, LaC	LAHAINA SILTY CLAY
PZ	PAUMALU-BADLAND COMPLEX
CR	CORAL OUTCROP

SOURCE: U.S. DEPARTMENT OF AGRICULTURE (1972)

0' 450' 900' 1800'

SCS SOILS CLASSIFICATIONS

MALAEKAHANA GOLF COURSE

FIGURE 10

(class I and II) soils are found on 34 acres (15 percent) of the site, with 61 acres (27 percent) of class III soils on the land.

Under the LSB classification system, 103 acres or 45 percent of the land is poorly rated in the D and E categories (similar to the SCS IV-VIII categories). There are 42 acres of B lands on the site (18 percent) and 83 acres of C lands (35 percent of site). SCS and LSB soil areas totals are shown in Table 4. LSB soils classifications are shown in Figure 8.

ALISH designations for the project site are shown in Figure 9. Prime Agricultural Land constitutes 58 acres, or 25 percent of the total land. Unique Agricultural Land makes up 97 acres or 43 percent of the land. Other Important Agricultural Land makes up 73 acres, or 32 percent of the land.

The Department of Agriculture's Land Evaluation and Site Assessment (LESA) analysis shows that 58 percent of the total project site ranks below the agronomic cutoff value of 66, or is of a poor soil quality for agricultural use. Approximately 42 percent of the site ranks as acceptable soils for agricultural use.

B. Anticipated Impacts and Mitigative Measures

Preparation of the land for construction at the site will involve grading and clearing operations. Approximately 119 acres of the site, will be cleared of vegetation and graded to accomodate the project development. The proposed layout and design of the golf course and support facilities will include a natural setting which will maintain extensive amounts of the existing vegetation. Approximately 109 acres of the site will remain uncleared. These areas will include golf course edges and buffers around the support facilities.

Clearing and grubbing activites during construction will temporarily disturb the soil retention value of the existing vegetation, exposing the soil to erosion forces. Since the developing areas of the project site are located in an unusually windy area, wind erosion of the soils could occur. Precipitation events will also cause the erosion of soils over disturbed areas of the land.

The impact of construction activities on soils will be mitigated by conducting construction activities following strict erosion control measures, particularly those specified in the following:

a. City and County of Honolulu's Grading, Grubbing and Stockpiling Ordinance No. 3968 (1972);

b. City and County of Honolulu, Department of Public Works, Soil Erosion Standards and Guidelines (1975);

c. State of Hawaii, Department of Health, Water Quality Standards, Chapter 37-A, Public Health Requirements (1968);

d. USDA Soil Conservation Service, Erosion and Sediment Control Guide for Hawaii (1968).

In particular, an effective watering program will be used to minimize fugitive dust particulate emission levels from the construction site. Other control measures include good housekeeping on the job site, and prevent or landscaping of bare soils areas as quickly as possible. Planting of the golf course and landscaping of the site will generally return the soil retention values of the removed vegetation, and in some areas improve the site over current soil retention conditions.

MALAEKAHANA GOLF COURSE

TABLE 4

AGRICULTURAL SOIL CLASSIFICATION AND DISTRIBUTION

Classification System	Crop Capability Class	Agriculutral Capability	Percent of Soils
USDA Soil Conservation Service	Class I-II	Excellent	15
	Class III	Moderate	27
	Class IV-VIII	Poor	48
Land Study Bureau University of Hawaii	Class A and B	Excellent	18
	Class C	Moderate	37
	Class D and E	Poor	45

Source: Decision Analysts Hawaii, Inc. (February 1989)

4.4 AGRICULTURE

The following section includes a discussion of previous and current agricultural uses of the project site and their potential for further agricultural use. Impacts of the proposed project on agriculture are evaluated herein, along with mitigative measures to minimize effects on agriculture. The findings of a report prepared by Decision Analysts Hawaii, Inc. (February 1989) to assess agricultural feasibility and need for the lands proposed for the Malaekahana Golf Course are summarized below. The entire report is included in Appendix H.

A. Existing Conditions

Until 1971, the site was cultivated in sugarcane as part of Kahuku Plantation. This plantation closed primarily because of poor agronomical conditions in the Kahuku area, and because of its small size and lack of economies of scale. Part of the property is now being leased by Gunstock Ranch under a short-term lease for grazing about 100 head of cattle and 40 horses. The two other tenants do not utilize their portions of the land.

Soil analyses for agricultural purposes have identified soils on the site as valuable for agricultural purposes in some areas, and deficient in others. Approximately 25 to 42 percent (40 to 100 acres) of the site is considered acceptable for agriculture, if irrigated. Under the SCS, LSB, ALISH, and LESA classification systems, acceptable agricultural land amounts vary widely.

B. Anticipated Impacts

Golf course development at the site would result in the development of approximately 228 acres of land currently designated for agriculture on the Koolauloa Development Plan.

The Gunstock Ranch grazing operations on the site will be eliminated by the proposed development. The tenant is fully aware of this proposed project and will relocate the grazing operation elsewhere. The operation will continue on other lands already leased by the Ranch, but the number of livestock would have to be halved, unless other lands can be leased from Campbell Estate.

The development of the Malaekahana Golf Course would eliminate the possiblity of using the affected lands for diversified agriculture. However, it is extremely doubtful that the project would adversely affect the growth of diversified agriculture in Hawaii. There are four reasons for this assessment: (1) an extensive amount of prime agricultural land and water has been freed from sugar and pineapple production because of past plantation closings and reductions in operations, with most of this land and water remaining available for diversified agricultural activities; (2) a very real possibility exists that additional land and water will be freed from sugar production given the outlook for low sugar prices; (3) most of the sugar operations would make their lands available for profitable replacement crops to the extent that such crops are available; and (4) compared to the available supply, a very small amount of land and water is required to grow proven and promising crops to achieve a realistic level of food and animal feed self-sufficiency, and to increase exports.

The proposed project would not adversely affect plantation agriculture, because none exists on the involved property; would not affect existing diversified agricultural crop production, since none exists on the property; probably would not adversely affect grazing operations, because other lands could be made available for relocating the cattle and horses which now occupy the Malaekahana lands; and would not limit the growth of diversified agriculture.

C. Mitigative Measures

No mitigative measures are needed to minimize affects on agriculture as a result of the project. Except for the small grazing operation on the site, no existing agricultural uses will be affected. Furthermore, the future potential for establishing viable agricultural operations will not be affected.

4.5 GROUNDWATER

This section contains a discussion of the existing aquifers which are located below the site, the potential for deriving water supply from these aquifers, and the anticipated impacts that could result from the proposed project. Mitigative measures have also been recommended to minimize effects on groundwater.

A. Existing Conditions

Groundwater conditions in the area of the site are described in water supply reports on the area prepared by Engineering Concepts (February 1989). Information from this study is included in this section, and the report is included in Appendix D.

The project site is located above the Koolauloa Basal Aquifer. In the Kahuku area, the basal lens extends in a northwest direction, parallel to the high level dike zone and the crest of the Koolau Mountain Range. Rainfall is responsible for groundwater recharge in the area. A thin caprock layer allows offshore leakage, which accounts for groundwater flow in the lens.

In general, water quality improves as the distance toward the dike zone decreases. This is a result of seepage of dike water, which reduces salinity. It is thought that the basal lens in the region mauka of Kamehameha Highway is of high quality. Wells drilled in this portion of the aquifer may produce a potable water source.

There are three water systems in the vicinity of the project site, including the BWS Kahuku Water System, the Campbell Estate Water System and the Zions Securities Corporation Water System. All three systems have a limited service zone at present. Descriptions of these three systems follow.

The BWS Kahuku Water System is an independent system serving the village of Kahuku. Two wells with 700 gpm capacity and 250-foot hydraulic head tap the basal aquifer source. The wells have a pumping capacity of 2.0 mgd and an average daily draft of 0.3 mgd. Storage for the Kahuku system is provided by the Kahuku 228-foot elevation reservoir, which has a capacity of 0.5 mg. The zone of service for this water system extends along Kamehameha Highway to the Kahuku Fire Station.

Tha Campbell Estate Water System services homes makai of Kamehameha Highway located between the two halves of the Malaekahana State Recreation Area. The water source is a well field known as Pump 7, located about 750 feet mauka of Kamehameha Highway. A reservoir, located about 250 feet mauka of Pump 7, provides fire flow storage for the system.

Zion Securites Corporation Water System supplies water to Laie, including the Mormon Temple, BYU Hawaii Campus and the Polynesian Cultural Center. Its zone of service ends in the vicinity of the project site access road on Kamehameha Highway. The City Corporation Yard and Malaekahana State Recreation Area are among the water users at the extreme north end of the service zone. A number of wells in the Laie area supply water for the system. Storage is provided by two reservoirs with total capacity of 2.25 mg and spillway at 268 feet.

B. Anticipated Impacts

The potential for the project affecting groundwater resources at the site involves impacts associated with potable water extraction, irrigation water extraction, fertilizer and pesticide contamination, and treated sewage effluent contamination. Each of these potential impacts are discussed below.

1. Potable Water Use

Potable water use projections are based on information provided in a water supply report prepared for the site by Engineering Concepts, Inc. (February 1989). Demand projections are based on the BWS Water System Standards (1985) and demands from similar developments. Information from this report is provided in this section, and the report is included in Appendix D.

An estimate of domestic water demand can be calculated using the BWS water demand rate for resort areas of 4,000 gallons per acre per day. Based on a 10-acre clubhouse site, the calculated demand is 40,000 gpd. Due to the inadequacies of and/or excessive distances to the existing water systems for connection of the Malaekahana Golf Course facilities, it is planned to develop an on-site water system. Two wells will be required (one standby) to meet the project demands, to be located near the mauka boundary of the site. The wells will pump to a reservoir located mauka of the clubhouse site for irrigation and fire protection storage. The wells will also supply potable water to the clubhouse and maintenance facility via a separate potable water system. Details of the water system features are described earlier in Section 2.2.

The water requirements of the Malaekahana Golf Course will have a long-term impact on the Koolauloa Basal Aquifer due to the withdrawal of available potable water. The project will remove an average of 40,000 gpd from this aquifer for potable water purposes, which will not affect existing wells in the area of the site, because of the mauka location of the wells on the site.

2. Irrigation Water Supply

The irrigation water supply requirements for the Malaekahana Golf Course has been analyzed by Engineering Concepts, Inc. (February 1989). Information from this report is included in this section, and the report is included in Appendix D.

An average irrigation rate of 0.35 mgd is estimated for the proposed golf course, based on Kuilima Resort requirements. Murdoch and Green (February 1989) predict a maximum irrigation rate of 0.52 mg for this golf course. Irrigation typically emcompasses the tees, greens and fairways of the golf course and a limited portion of the rough area around the course. The frequency of irrigation varies from every day to twice weekly depending on the type of soil and turf water use rate. For the purpose of this analysis, it is assumed that a rate of 0.52 mgd will be required.

The wells planned for the site will pump to a reservoir located mauka of the well site for irrigation and fire protection storage. Adequate storage will be provided to supply hydrants at the clubhouse. Water will be transported from the reservoir to golf course ponds for irrigation use.

The project wells may draw irrigation water of potable quality from the Koolauloa Basal Aquifer, along with the potable water for domestic use at the project. The withdrawal of a maximum of 0.52 mgd of potable water for irrigation will represent a long term impact on the potable water reserves in the Koolauloa Basal Aquifer, although excess capacity exists in this aquifer.

3. Fertilizer and Pesticide Contamination

Irrigation and fertilization of lands on Oahu currently takes place over several important basal aquifers without compromising their utility (except where chemicals have been misused). The Pearl

Harbor aquifer, for example, is overlain by about 10,000 acres of sugar cane and pineapple. This aquifer is the potable water supply for the most populated portion of the State, and the land above it is fertilized and irrigated without noticeable adverse water quality effects to the basal lens. Similarly, the Waialua basal aquifer is located beneath areas planted in these crops.

Murdoch and Green (February 1989) studied the effects of fertilizer and pesticides application on the Malaekahana Golf Course. Information from this report is included in this section, and the report is included in Appendix J.

Fertilizer use rates differ for the various areas of a typical 18-hole golf course in Hawaii. Greens and tees receive the most frequent application (two and four weeks, apart respectively) while fairways and roughs are fertilized less frequently (eight weeks and three months apart, respectively). Complete fertilizers are usually applied, meaning those that include nitrogen, phosphorous and potassium. Nitrogen is applied in larger quantities and is the only fertilizer element likely to enter the groundwater.

For the proposed project, the total annual fertilizer application over the Malaekahana Golf Course is expected to involve approximately 15 tons of nitrogen is expected to be applied annually. Details about application amounts are included in Appendix J.

Seventy-five percent of the applied fertlizer nitrogen is used by the plants. Several experts claim that up to 90 percent of applied fertilizer nitrogen is used by plants. A conservative estimate of 25 percent (maximum) of the fertilizer nitrogen (3.8 tons annually at Malaekahana) will leach below the root zone of plants on the golf courses, and eventually enter groundwater. (As discussed in the following section, diluted wastewater effluent will be applied to parts of the Malaekahana Golf Course in lieu of fertilizer.) The overall effect of groundwater due to nitrogen application on the Malaekahana Golf Course will be minimal due to dilution effects. As described earlier, groundwater concentrations in other Oahu aquifers have shown minimal degradation by fertilizer nitrogen application. The quality and quantity of nitrate infiltration from irrigation on the proposed golf course is not expected to degrade the basal aquifer.

Pesticides will be applied in small quantities to the tees and greens of the golf course. The chemicals used will only be those approved for golf course application in Hawaii. Pesticides are highly adsorbed to soils in the turf, and very little passes below the soil profile and reaches the groundwater aquifer. There will be no adverse impact on groundwater quality as a result of pesticides application at the Malaekahana Golf Course.

Management by trained professionals and the need to keep costs down should ensure that reasonable measures will be taken to avoid over-irrigation and excessive fertilization, and preclude the use of undesirable volatile organic pesticides. Further mitigative measures are described later in this section.

4. Wastewater Disposal

A wastewater management report has been prepared for the Malaekahana Golf Course by Engineering Concepts, Inc. (February 1989) (Appendix B).

The Malaekahana golf course is expected to generate approximately 20,000 gpd of wastewater, all of it classified as domestic. The wastewater will be treated by activated sludge process at the secondary level, then disposed of on the golf course in an acceptable manner approved by the State and County agencies. Treated wastewater effluent will have the following characteristics: BOD - 10 to 15 milligrams per liter (mg/l); suspended solids - 10 to 15 mg/l; nitrogen - 20 mg/l; phosphorus - 6 mg/l; and total coliform bacteria - 23/100 ml. These levels are acceptable for secondary treated effluent according to proposed Hawaii Administrative Rules, Title 11, Department of Health, Chapter 62, Wastewater Systems (to be promulgated in the near future).

Local disposal of the secondary treated effluent is technically possible by means of injection wells, land spreading, infiltration ponds, and golf course irrigation. Most of the site lies inland of the Board of Water Supply "pass/no-pass" line, which extends parallel to Kamehameha Highway approximately 200 feet mauka of the highway. Mauka of this line, injection wells and infiltration ponds are not permitted except by variance. Disposal of treated effluent by irrigation methods is also regulated by the State Department of Health, the Department of Land and Natural Resources and the Board of Water Supply. There are no "clear-cut" regulations permitting irrigation disposal of effluent. Previous projects with disposal planned in areas makai of the "pass/no-pass" line have gained approvals for irrigation disposal on a case-by-case basis.

A reasonable way for the Malaekahana Golf Course facilities to dispose of effluent is in golf course or other irrigation. Current plans are to mix the secondary-treated effluent with irrigation water (10 to 20 percent treated effluent with 80 to 90 percent irrigation water), and then spread this mixture on the golf course. This is a proven technique of effluent disposal in Hawaii, and its practicality has been demonstrated by field investigations conducted by the Water Resources Research Center of the University of Hawaii. Tests showed that percolate from irrigation water consisting of secondary effluent does not carry bacteria or viruses through the soil mantle. Judicious irrigation applications at the project will minimize infiltration of nitrates and other nutrients. A conceptual diagram of the irrigation process for treated wastewater disposal is shown in Figure 11.

The volume of treated wastewater effluent (20,000 gpd) will amount to about four percent of the golf course irrigation needs (0.52 mgd). Approximately 3.0 lbs./day of nitrogen will be contributed by effluent, and it is assumed that all of this will be applied to the golf course turf. Typically, 25 percent of applied nitrogen eventually infiltrates the groundwater with the other 75 percent utilized by plant uptake. This utilization rate applies to all nitrogen applied to the golf courses from both fertilizer and treated effluent. Approximately, 0.9 lbs./day of nitrogen from wastewater effluent is expected to eventually percolate to the groundwater (brackish water), but dilution is likely to minimize its concentration as it enters the aquifer. The nitrogen contibution of groundwater seeping into coastal waters will even be smaller due to the great mixing of groundwater upon entering coastal waters.

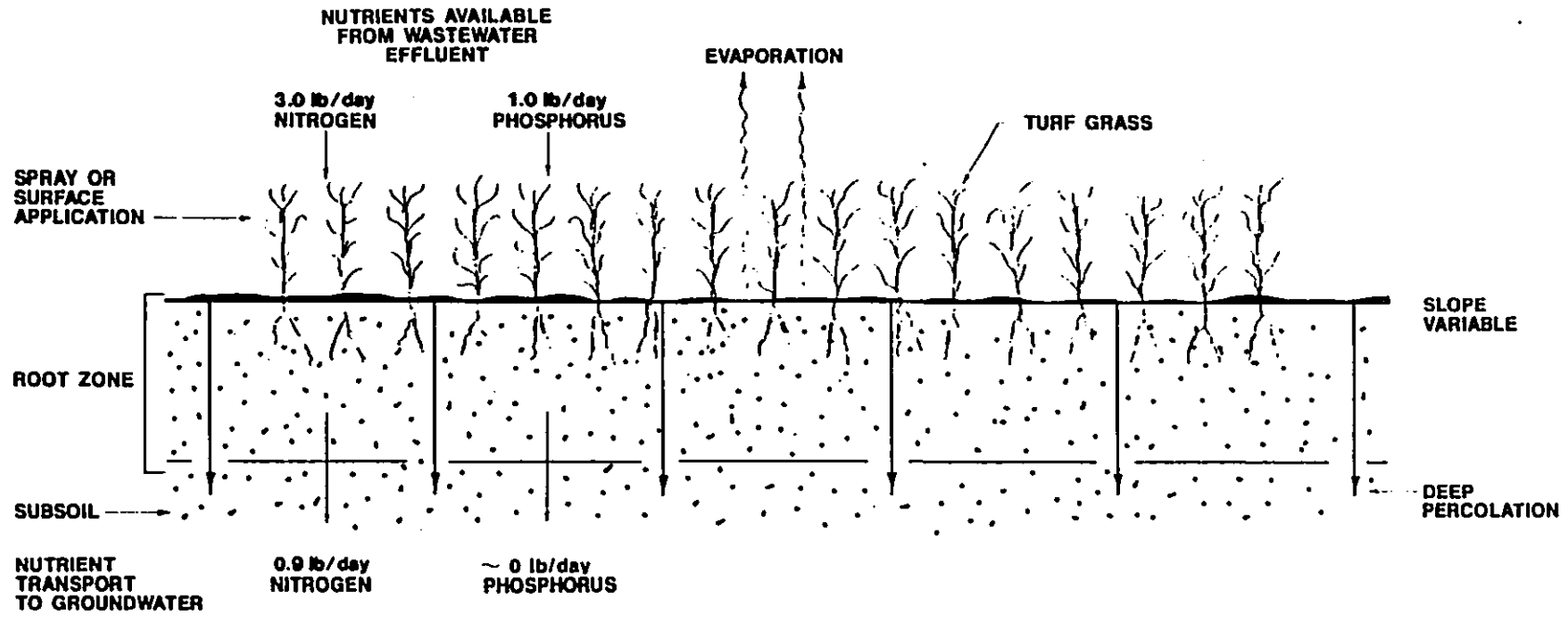
An important point to be emphasized is that approximately four percent of the nitrogen needs for the golf course will come from treated effluent application. As a result, four percent less fertilizer will be applied. The effluent nitrogen will effectively substitute for the use of fertilizer in the areas where treated effluent is applied. Treated effluent disposal at this site, therefore, will introduce no more nitrogen to groundwater than that which would occur without irrigation disposal of effluent.

Approximately 1.0 lbs./day of phosphorous will be applied in the fertilizer mix to the golf course turf. Unlike nitrogen, phosphorous remains fixed to soil particles and will not infiltrate to groundwater. The presence of bacteria and viruses will be within allowable limits and will not reach aquifers.

C. Mitigative Measures

Disposal of effluent from the the Malaekahana Golf Course's wastewater treatment facility will be under the control of certified golf course managers, who will ensure proper irrigation water use. Fertilizer and pesticides will be applied under the supervision of the golf course managers, who will control the amounts and avoid over-application.

As described earlier, treated wastewater effluent will be disposed through dilution with irrigation water and application to the golf course. The total nitrogen applied to the golf course will be the combined contribution of fertilizer and treated wastewater effluent. Thus, total nitrogen compound contributions to groundwater will not be affected by this method of wastewater disposal. Caution will be used in the irrigation scheduling to avoid over-irrigation, and this will minimize the infiltration of nitrate and other nutrients.



EFFLUENT IRRIGATION

LAND APPLICATION OF TREATED EFFLUENT
MALAEKAHANA GOLF COURSE

SOURCE: ENGINEERING CONCEPTS, INC. (1989)

FIGURE 11

4.6 SURFACE WATER

This section presents a discussion of the existing surface water conditions at the proposed golf course at Malaekahana. Potential impacts of the proposed project on surface water are discussed in detail, including technical consultant reports to address stormwater runoff and fertilizer and pesticide effects on water quality. Mitigative measures are recommended to minimize drainage and water quality impacts.

4.6.1 STORMWATER RUNOFF

Drainage conditions within the project site, and potential project impacts on drainage, were evaluated by Engineering Concepts, Inc. (February 1989). Their report for the site is included as Appendix F. The findings from these reports are summarized below.

A. Existing Conditions

The project site exhibits varying terrain, with elevations ranging from 10 feet above mean sea level along Kamehameha Highway to 375 feet at the mauka boundary. Slopes of three to 10 percent are found over most of the central and mauka portions of the site. Steeper slopes of 20 to 30 percent occur around isolated peaks and along gulches. The central area is dominated by a wide, shallow gulch that begins near the mauka boundary and traverses 75 percent of the site, exiting the southeastern boundary.

The project site is located between the Malaekahana Stream and Kahawainui Stream drainage basins (Figure 12). Including the project site, these drainage basins consist of approximately 3,400 and 3,200 acres, respectively. About 204 acres, or 90 percent, of the project site lies within the Kahawainui Stream drainage basin, and the remaining 24 acres lie within the Malaekahana Stream drainage basin. The project site represents only three percent of the total drainage area. Runoff from the drainage basins is transported beneath Kamehameha Highway at the Malaekahana Stream Bridge and the Laiewai Stream Bridge.

Calculations for runoff were based on rainfall intensities of 2.3 inches perhour for 10-year storms and 3.2 inches per hour for 50-year storms. Table 5 summarizes runoff quantities for the project site under existing conditions. The site is outside the areas subject to inundation by the 100-year flood.

B. Anticipated Impacts

Estimated peak runoff for the 10- and 50-year storms and percent increase from existing conditions are shown in Table 5. Without mitigation, the downstream discharge of the total on-site runoff has the potential to increase as average of 26 percent for the 10- and 50-year storm. Runoff leaving the project site, however, will remain near levels experienced for existing conditions when control measures are employed.

There is also a potential impact of the project site's drainage and runoff on an aquaculture farm located approximately 2,000 feet north of the site. Under existing conditions, the 10- and 50-year runoff to the aquaculture farm is 139 and 193 cubic feet per second (cfs), respectively. The amount of on-site area contributing runoff to the farm is only six acres, and post-development runoff is expected to increase only 1.4 percent for a 50-year storm. With drainage controls employed, the potential impact of the golf course will be reduced.

A beneficial impact of the proposed development will be the probable reduction of erosion and sediment transport to open areas on the makai side of Kamehameha Highway. Bare soil areas currently found on the site will be planted, with the entire site as a whole having better control and maintenance of its landscape.

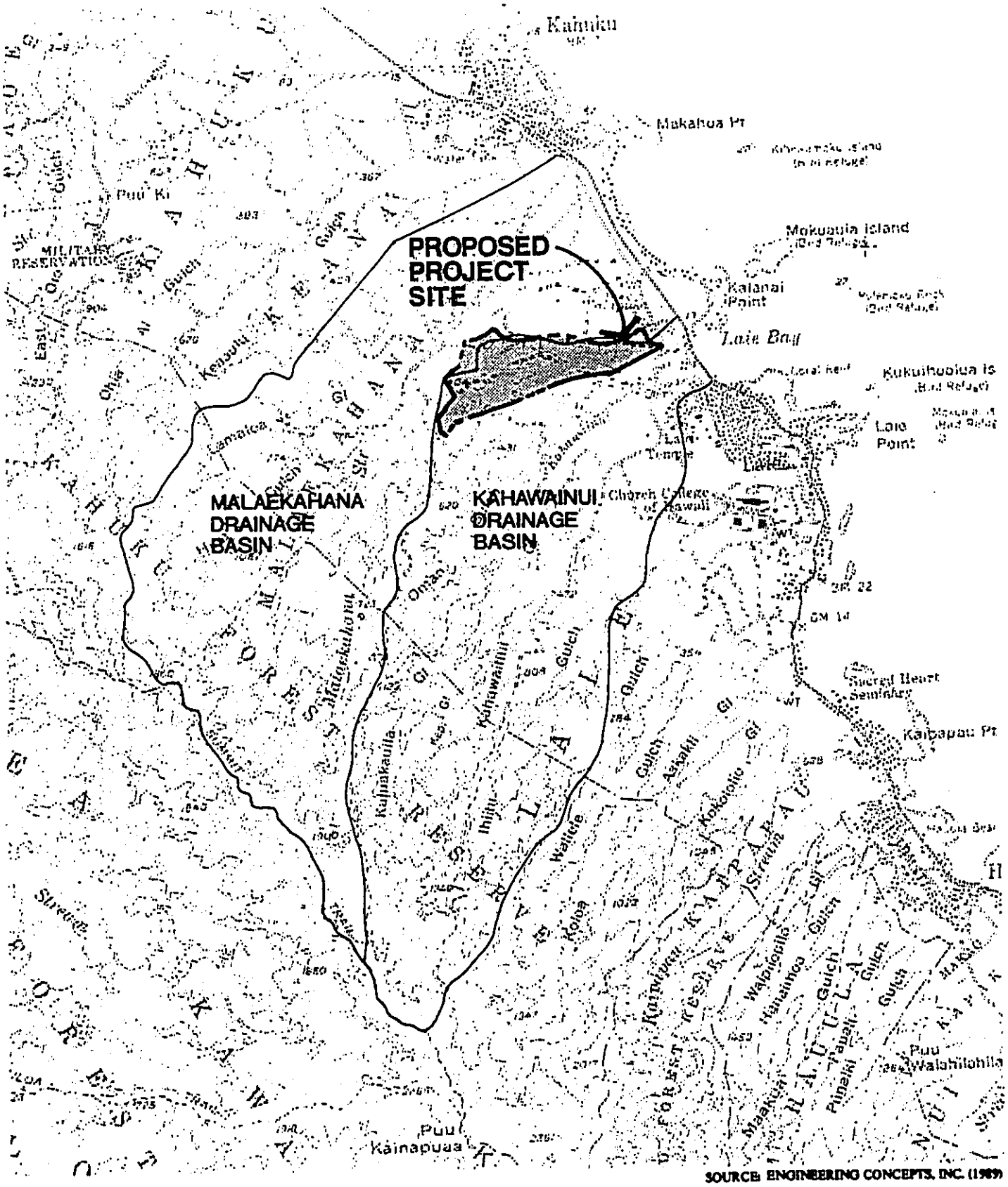
MALAEKAHANA GOLF COURSE

TABLE 5

STORMWATER RUNOFF RATES

Location	Existing (cfs)		Developed (cfs)		% Increase	
	10-yr.	50-yr.	10-yr.	50-yr.	10-yr.	50-yr.
TOTALS	336	468	425	591	26.5	26.3

Source: Engineering Concepts, Inc. (February 1989)



SOURCE: ENGINEERING CONCEPTS, INC. (1989)

DRAINAGE AREA MAP
MALAEKAHANA GOLF COURSE

FIGURE 12

C. Mitigative Measures

Measures planned to mitigate the increase in on-site runoff volume created by golf course development at the site include routing runoff to ponds and detention basins within the golf course layout. It is intended that the ponds serve as detention basins, dampening the peak runoff rates generated on-site. Additional detention basins can be created to dampen major storm runoff by selective sizing of drain culverts under cart paths crossing gullies and depressed areas between fairways. By incorporating these detention basins into the golf course design, the discharge of peak storm runoff from the project site is not expected to increase, and can be kept at, and even reduced below, existing levels.

The impacts of the increased on-site runoff are greatly reduced when compared to the impact of peak runoff generated over the entire drainage basin. The increase in on-site peak runoff represents two percent of the total peak runoff from the drainage basins including the Malaekahana site. Again because of mitigative measures, the resulting discharge of runoff from these site will be at or below runoff volumes under existing conditions.

As mentioned earlier, a positive impact of the project is the expected reduction of erosion and sediment transport to areas off the project site. Bare areas currently existing on this site will be planted, with the project site having better control and maintenance of vegetation cover and landscaping.

4.6.2 SURFACE WATER QUALITY

Murdoch and Green (February 1989) studied the effects of fertilizer and pesticides application on the Malaekahana Golf Course. Information from this report is included in this section, and the reports are enclosed in Appendix J.

A. Existing Conditions

The only perenniel surface water body that exists on the project site is an agricultural reservoir of approximately 0.5 acres. This pond collects overland runoff and suspended silt, and exhibited poor water quality conditions (high suspended silt) during a field visit in December 1988. The overland runoff from the site is collected within drainage basins of Malaekahana and Kahawainui Streams. Drainage characteristics of the site are described in Section 4.6.1.

B. Anticipated Impacts

The project site will have approximately 119 acres cleared by construction activities, defined by substantial clearing and grubbing of vegetation and grading. Much of the remaining undisturbed area consists of steep terrain along the slopes of the gulches and buffer strips separating the golf course fairways and other project elements.

Short-term construction-related effects on surface water quality include erosion and sedimentation due to construction area runoff, runoff channel modifications for roadway and golf course construction, and the installation of culverts and retaining walls. The site clearing operations, and subsequent grading for golf course development, will create exposed soil areas that could be eroded by stormwater runoff without the implementation of soils management measures during construction.

Drainage patterns on the site are expected to remain similar to existing conditions, although some diversion of runoff through the golf course areas and the provision of detention basins in scattered locations throughout the site are proposed. The natural slopes and vegetation of areas unaffected by the construction of improvements will be maintained.

The golf course and support facilities will increase the volume of peak runoff generated to various degrees, depending on storm conditions. Changes in land surface types will be made by the construction of impervious surfaces such as roads and buildings.

The calculated increased runoff generated correspondingly indicates less potential groundwater recharge within the site. In this situation, however, the calculated reduction in potential recharge will be abated somewhat by the planned layout of the project, in that developed areas are interwoven with undeveloped areas. This should tend to increase the recharge potential in the undeveloped areas.

Peak discharge rates will be calculated during the engineering design of grading and drainage plans for the golf course and other areas to be altered for construction of the project's facilities. These rates will be calculated using City and County of Honolulu Drainage Standards.

Long-term operational activities are not expected to create significant adverse effects. Activities which may create the most environmental concerns with regard to surface water quality include: the application of pesticides and fertilizers; suspended sediments contained in storm water runoff; and the reduction in intermittent stream flow due to ground water withdrawals. These concerns are all addressed below.

1. Fertilizer and Pesticides Application Impacts

The development of the golf course will require application of fertilizers to supply essential nutrients to turf grasses (and ornamental plants). Pesticides will also be required to control the associated weed, disease and insect pests that affect grasses and plants. These chemicals will be applied to the greens, tees, fairways and parts of the roughs on the golf course. The clubhouse area, driving range and landscaped areas along roadways will also use small amounts of fertilizers and pesticides.

The potential for adverse water quality effects that may result from fertilizer and pesticide application was evaluated in technical studies by Murdoch and Green (February 1989)(Appendix J). Their findings are summarized below.

Fertilizers and pesticides may be subject to movement from the application point by runoff during high intensity storms, or by movement toward ground water. The primary fertilizer elements of concern for possible contamination of ground and surface waters are nitrogen and phosphorus. Under normal conditions of irrigation and precipitation, phosphorus attaches itself very tightly to iron and aluminum hydroxides which are plentiful in the soils. Phosphorus is expected to move little if any from the site of application.

Under extreme storm conditions, recently applied phosphorus may not reach the soil. Phosphorus is not expected to cause significant contamination of runoff water that drains from each site. This is because runoff will be controlled by detention basins, and released slowly to the drainage areas. Phosphorus is also expected to accumulate within silt collected in these basins.

The fertilizer constituent of primary concern is nitrogen. While ammonium nitrogen (NH4) moves little in soils, nitrogen applied in the ammonium form can be converted to the nitrate form (N03) which is not bound to the soil and moves readily with water. Because of high nitrogen uptake by turf grasses, 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 of nitrogen by surface runoff, or by leaching below the root zone.

Nitrogen movement can be controlled by applying a slow-release nitrogen fertilizer. With the use of such fertilizers, the concentration of nitrogen in storm runoff is expected to be similar to that which occurs under existing conditions on both sites.

Pesticides application, including herbicides, insecticides and fungicides, will be required at the golf course. With the exception of herbicides, pesticide applications are normally made only to greens on golf course. Greens comprise only approximately 3.0 acres of a typical 18-hole golf course. Therefore, the contamination of surface runoff by fungicides and insecticides is expected to 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 very little potential for water contamination. Herbicide usage is not expected to cause adverse water quality impacts on or off the sites.

2. Impacts Due to Suspended Sediments in Runoff

As described in Section 4.6.1, stormwater runoff volume under full development of the project during the two-year storm will be greater at the site than under present conditions. The increase in stormwater runoff rate and volume will create the potential for increasing the transport of suspended sediment.

The incremental load increase in suspended sediment will be very slight for the 10-year storm, and a decrease is expected for the stronger storms. The interspersion of developed areas among undeveloped areas should tend to notably decrease the suspended sediment loads flowing from the project site.

C. Mitigative Measures

The extensive open nature of the golf course will allow the incorporation of detention basins and other mitigative measures into the project design, such that both on-site and off-site drainage impacts will be minimal. Specific measures will be taken to ensure that the maximum stormwater volumes and flow rates in runoff leaving the site will be similar or less than the volumes and rates which occur on the site without the project.

Soil managment measures will be implemented during construction to minimize the short-term impact of soil erosion on stream water quality and suspended sediment input. For example, clearing of vegetation will be limited to 15 contiguous acres at one time, following the County grading ordinance. Soils on cleared areas must be stabilized by temporary vegetation or other measures prior to the clearing of new areas. Diversion ditches will be constructed to divert overland runoff into collection/detention areas on the project site. In addition, soil stockpiling will be conducted to contain excavated earth in controllable areas prior to its use elsewhere on the site. Expedient re-vegetation of exposed areas on the site will also minimize erosion of soils. Detention basins to be developed within the golf course will contain a large percentage of suspended sediments generated by runoff once construction is completed.

The surface water quality impacts on the project site will be minimized in two ways: (1) The increased stormwater runoff volume resulting from development of the project will primarily be generated from impermeable surfaces such as roadways and parking areas. This runoff water will not be exposed to fertilizer or pesticides which will be applied to the golf course and other areas. (2) Percolation of precipitation into turfed areas will also be increased over the present undeveloped conditions; therefore, runoff and its constituents will be decreased.

Irrigation management is critical to minimizing fertilizer and pesticide impacts on surface waters. If excessive irrigation water is applied, the liklihood of nitrate movement in surface waters or movement to ground water is increased. Murdoch and Green (February 1989) recommend that a U.S. Weather Bureau Class A evaporation pan be used to measure evaporation and aid in scheduling irrigation application in the management of the golf course. Irrigation scheduling should follow programs described in Golf Course and Grounds Irrigation and Drainage (Jarret, 1985). Likewise, fertilizer application schedules should be timed so that heavy applications of soluble fertilizers are not made during the rainy months of this area (October through January). During the rainy season, slow-release fertilizers can be applied which will release nitrogen at a rate comparable to the rate which it is used by turf.

Mitigative measures proposed above are also based on sound management practices that will be followed with regard to fertilizer and pesticide application and irrigation. Recommendations of Murdoch and Green (February 1989) will be followed regarding marsh water monitoring before, during and after development for nitrogen enrichment. Runoff on the golf courses will be routed circuitously where possible to allow for maximum uptake of fertilizers and pesticides by turf and soils. A well-qualified golf course superintendent will be given the responsibility of managing the golf course.

4.7 TSUNAMI/FLOOD HAZARD

A. Existing Conditions

The entire project site lies outside the 100-year boundary for floods attributable to either storms or a tsunami. According to the Flood Insurance Rate Map (FEMA, 1987), the project site lies within Zone D, where flood hazards are undetermined. There are some areas of flat land containing poorly drained soils which hold standing water during peak precipitation periods. Other than those areas, flooding is not known to occur on the site.

B. Anticipated Impacts and Mitigative Measures

The project site has no known areas of flooding hazards. Storm drainage within the site will be controlled by detention and retention areas established throughout the project. These measures will minimize flooding both within and downstream of the project. Discharge of runoff from the project site will be no greater than existing conditions. Details of storm drainage control are discussed in Section 4.6.1.

The only mitigative measures proposed to avoid flood hazard is the avoidance of known drainage collection areas for construction of support infrastucture and buildings. Drainage improvements, as discussed in Section 4.6.1, will include adequate provisions to prevent any flooding problems in the uplands of this site or along Kamehameha Highway, as well as lands adjacent to the project.

4.8 VEGETATION

A detailed botanical survey of the project site was conducted by Kenneth Nagata (January 1989). Existing conditions on the site are discussed in this section, along with anticipated impacts on vegetation. Mitigative measures have been proposed to minimize effects on vegetation in some parts of the project. The report on vegetation at the project site is included in Appendix L.

A. Existing Conditions

Much of the land in this region had been put into sugar cane cultivation. The vegetation of the site was found to consist of grassland, thickets, scrublands and a small abandoned banana plantation. Although several common native species and two severely degraded remnants of a native community were found, the vegetation can be described as secondary. Five vegetation types were recognized, as shown in Figure 13, and are discussed below.

Eleven native plant species were found on the project site. Eight of these plants are considered indigenous and three are endemic. All of these native plants are considered to be common and widespread in Hawaii.

1. Grasslands (G): A significant portion of the project site is occupied by Grasslands of varying origins. Some appear to have been intentionally created by bulldozing, while others have developed from abandoned agricultural fields. Open range grazing in forests or thickets has also crated Grasslands. The entire site appears to be open range for cattle despite the presence of fence lines and several well-mainatained and well-grazed pastures. Well-maintained pastures are short-cropped and dominated by Bermuda grass, garden spurge, Hilo grass and other species. Other Grasslands appear to be over-grown pastures of Guinea grass and/or Paragrass with emergent Christmas berry, koa-haole, pluchea and Macaranga. Some of the grasslands appear to originally have been agricultural fields, as evidenced by networks of irrigation flumes.

2. Mixed Thickets (MT): This is the second of the two dominant vegetation types on the project site. This type consists of a mosaic of dense koa-haole stands, Christmas berry stands and energent Macaranga, Java plum, Formosan koa and ironwood. Typically, the koa-haole and Christmas berry stands are 10 to 20 feet tall, but in drainage valleys the canopy may reach 35 to 40 feet in height. In less dense thickets, the understory consists of a well-developed herb layer consisting of dense Paragrass and sourgrass. Common shrubs in this area is burbush, lantana, castor bean, hairy abutilon and three-flowered beggarweed.

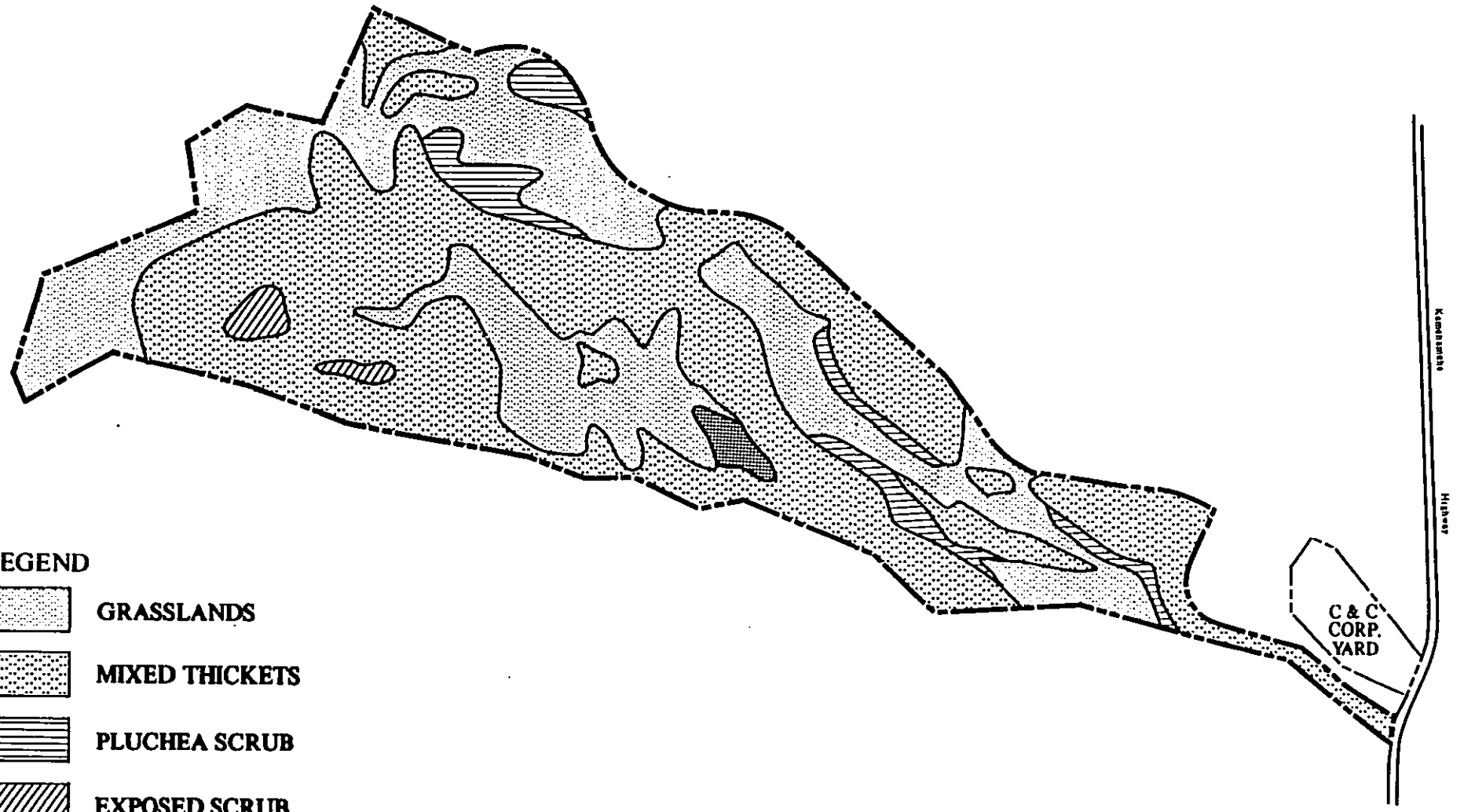
3. Pluchea Scrub (PS): Pluchea Scrub is characterized by stands of pluchea five to eight feet tall providing 60 to 90 percent canopy cover, with occasional emergent guava, koa-haole and Christmas berry. Sourgrass and Paragrass are dominant in the herb layer. Other associated species include Jamaiaca vervain, partridge pea, three-flowered beggarweed and lantana. In areas where cattle have not intruded recently, the Pluchea Scrub is extremely dense with Paragrass as tall as six feet. Some of the Grasslands are being invaded by pluchea and are being transformed into Pluchea Scrub.

4. Exposed Scrub (ES): One of the two smallest plant communities on the site, the Exposed Scrub is restricted to the exposed, windswept summits of two hills near the mauka boundary. It is characterized by Jamaica vervain and dwarfed Christmas berry, lantana and 'akia. Taller Java plum and ironwood are scattered throughout the community. The native 'ulei is a common species and the herb layer is dominated by golden beardgrass, and also includes Bermuda grass, Paragrass and Natal red top. Although moa, 'akia and 'ulei are the only native species remaining in this community, it is thought to bbe the vestiges of an ecosystem which once prevailed on the ridges and upper slopes throughout the region.

5. Abandoned Banana Field (B): An abandoned banana plantation with relatively intact rows of banana is located in the makai end of what apparantly was a large agricultural complex. Except for this remnant banana field, the entire complex has been transformed into Grasslands or Mixed Thickets. The banana field is being invaded primarily by Macaranga, which forms closed-canopied groves in some sections. This is the smallest of vegetation types found within the project site.

The most abundant on the site is 'uhaloa, which is an occasional species in the Grasslands and Exposed Scrub types. The endemic 'akia, the second most common native species on the site, is a common shrub in the Exposed Scrub type. Except for the 'ulei, common in the Exposed Scrub type, the rest of the native species are found in very small numbers in only one or two vegetation types.

No rare or endangered species were observed on the site. The Exposed Scrub contains elements of the ecosystem which probably once prevailed on the summits and ridges at low to medium elevations throughout the region. Despite the presence of native species, however, the Exposed Scrub is not to be considered a native community.



LEGEND

- GRASSLANDS
- MIXED THICKETS
- PLUCHEA SCRUB
- EXPOSED SCRUB
- ABANDONED BANANA FIELD

SOURCE: NAGATA (1989)

0' 450' 900' 1800'

VEGETATION COVER TYPES
MALAEKAHANA GOLF COURSE

FIGURE 13

B. Anticipated Impacts

Development of the project will involve transforming portions of the existing site into a recreational community. Approximately 119 acres of vegetation will be cleared to allow development of the project. The majority of the layout for the golf course will be on land covered by Grasslands and Mixed Thickets. Pasture land will be changed into golf course fairways, roughs, tees and greens, with some new landscaping and buffer areas retained.

Numerous common native plant species found in parts of the site will be removed as part of the construction activites. No native plant communities will be affected by the project. The removal of the plants will not be significant because they are common on Oahu.

C. Mitigative Measures

Measures will be taken to alleviate runoff and soil erosion effects on vegetation throughout the site. Steps will be taken during the construction phase to reduce erosion tendancies, as discussed in Section 4.2.

4.9 WILDLIFE

A study of the existing wildlife (terrestrial vertebrate) populations on the project site, including amphibians, reptiles, mammals, and introduced and indigenous birds was prepared by Andrew J. Berger, Ph.D. (January 1989). Resident and migratory species were considered in this study. This inventory is based on field studies of the project area and research of existing information regarding the area and its habitat types. The complete report is included in Appendix M.

A. Existing Conditions

The entire region including the project site has been greatly altered for more than 100 years. There is no semblance of any endemic or native ecosystem on or near the site of the proposed golf course. Nearly all plants on the site are introduced or alien plant species, as described in Section 4.8.

The project site contains a variety of mostly introduced vegetation types and has both uncleared areas and some cleared areas presently under agricultural uses. This habitat diversity allows for some variety in wildlife types occurring in the area of the site.

There are several species of birds inhabiting the site, but none are an endangered species. Because of the geographic mobility of birds, they can appear on this site at any time. Table 6 presents a complete listing of wildlife at the project site, including introduced and indigenous birds.

Several of the bird species found in the area of the site are considered as serious pests which cause damage to crop and flower gardens. These species include the Spotted Munia, Red-vented Bulbul and the Japanese White-eye. The House Finch is another destructive bird. It is also known as the Papaya Bird in Hawaii, and is predominantly a seed-eater which prohibits the potential growth of such crops.

Cattle Egrets are common throughout the site. Other birds often found within the area include: Spotted or Lace-necked Dove; the Barred or Zebra Dove, which is a game bird; and the Melodious Laughing-thrush (Chinese Thrush). The Lesser Golden Plover is a migratory bird found in the area. This bird frequents lawns in residential areas and golf courses.

Several mammal species are found on the project site, including the house mouse, various rat species and the small Indian mongoose. None of these mammals are an endangered species. With the possible exception of the house mouse, all of the smaller mammals prey on birds, their eggs and their young.

There are no endemic amphibians or land reptiles in the Hawaiian Islands. All have been introduced, such as the Giant Neotropical Toad, several frog species, blind snake, and many species of skinks and geckos. These amphibians and land reptiles are in the area of the site, but none are rare, endangered or of any special significance.

B. Anticipated Impacts

None of the birds found in the area of the site are considered to be an endangered species, and some of them are actually destructive pests. Other species found on the project site provide pleasure for people through their song and beauty. The development and operation of the proposed golf course and support facilities are not expected to have a significant effect on the area's available habitat for the bird species found on the site.

Currently, there are no habitats found on the site for the four endangered Hawaiian waterbirds -- the Koloa, Hawaiian gallinule, Hawaiian coot, and Hawaiian stilt. The reservoir on the site does not possess the habitat features of water quality and fringe vegetation necessary for these species. There also is no habitat for the Hawaiian black-crowned night heron on the site.

The Hawaiian owl or Pueo could occupy the general region including the site, although none were identified. The Pueo is an uncommon species on Oahu, and there are no known published reports of its occurrence in this area. The Barn Owl has been reported from locations on the windward coast of Oahu, and it is likely that one or more individuals forage over the site. Ironwood habitat is present along both sides of Kamehameha Highway in the area of the site. The project will not have an adverse effect on the habitat for this species.

The existing introduced vegetation on the project site does not provide suitable habitat for any of Hawaii's endemic forest birds. Disturbance to this on-site vegetation, therefore, is expected to have no significant impact on available habitat for endemic birds.

All the amphibians and land reptiles that occur in the project area are introduced animals, and none are considered to be a rare or endangered species. Loss of some individuals or their displacement due to the development of the property is not expected to be a significant environmental effect on amphibian or reptile species.

According to Berger (January 1989), all of the introduced species of mammals in Hawaii have proven to be highly destructive to man, his buildings, products, agricultural crops and/or the native forests and their animal life. None of the mammals occurring in the project area is an endangered species, and none is of any concern as far as detrimental effects resulting from this or any other proposed project. The extermination of any of these species would in fact be a benefit to the islands.

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 the golf course. Fertilizers are relatively non-toxic unless ingested in large amounts, and all herbicides and fungicides used in golf course maintenance in Hawaii are of low to moderate toxicity. The only chemicals used in Hawaiian golf course maintenance which are highly toxic to birds are the organic phosphate insecticides, especially chloropyrifos. However, chloropyrifos are strongly adsorbed on the thatch layer of turf and move little from the site of application.

Because of the adsorption of organic phosphate insecticides on organic layers in turf and their rapid breakdown, there is little chance of their movement from grassed areas into the ponds and waterways associated with the proposed golf course. Label instructions strictly prohibit their direct application to be substituted for chloropyrifos with little loss of effectiveness. The threat to birds by pesticides application is expected to be minimal.

MALAEKAHANA GOLF COURSE

TABLE 6

WILDLIFE SPECIES

The following listing presents wildlife species which were identified on the project site, or are expected to occur on this site. This inventory is based on field studies and research by Andrew J. Berger, Ph.D. (January 1989).

COMMON NAME	SCIENTIFIC NAME
Amphibians	
Giant Neotropical Toad	Bufo marinus
American Bullfrog	Rana catesbeiana
Reptiles	
Blind Snake	Typhlops braminus
Skinks	Family Scinicidae
Geckos	Family Gekkonidae
Iguanas/Lizards	Family Iguanidae
Jackson's chameleon	Chamaeleo jacksoni
Introduced Birds	
Cattle Egret	Bulbucus ibis
Spotted or Lace-necked Dove	Streptopelia chinensis
Barred or Zebra Dove	Geopelia striata
Barn Owl	Tyto alba pratincola
Melodious Laughing-thrush	Garrulax canorus
Red-vented Bulbul	Pycnonotus cafer
White-rumped Shama	Copysychus malabaricus
Japanese White-eye	Zosterops japonicus
Japanese Bush Warbler	Cettia diphone
Common Indian Myna	Acridotheres tristis
Nutmeg Mannikin or Ricebird	Lonchura punctulata
House Finch	Carpodacus mexicanus frontalis
Lesser Golden Plover	Pluvialis dominica fulva
Common Waxbill	Estrilda astrild
House Sparrow	Passer domesticus
Red-Crested Cardinal	Paroaria coronata
Cardinal	Cardinalis cardinalis
Mammals	
House Mouse	Mus musculus
Small Indian Mongoose	Herpestes auropunctatus
Pig	Sus scrofa
Roof Rat	Rattus rattus
Polynesian Rat	Rattus exulans
Norway Rat	Rattus norvegicus
feral cat	Felis catus
feral dog	Canis familiaris

C. Mitigative Measures

No significant impact is expected to occur to any wildlife species on the project site; however, several measures will be implemented that will minimize effects on wildlife due to project development. These will include: minimized clearing of vegetation, extensive re-vegetation and landscaping planting, establishment of aquatic habitat areas, and control of pesticide application.

Vegetation will be cleared over approximately 119 acres (53 percent) of the site. Existing vegetation will remain in the most steeply sloped areas along the ravines and between the roads, golf holes and other elements of the project. Nearly half of the existing habitat areas will remain unaffected.

Re-vegetation of many cleared areas will occur, with nearly all disturbed golf course areas being replanted with turf and other grasses. Extensive native and ornamental vegetation species will be planted for buffer, wind protection and perimeter areas. These landscaped areas will again serve as habitat areas for some wildlife species.

New aquatic habitat areas will be developed as part of the project's design, mostly integrated with the golf course as water hazards, irrigation water reservoirs, retention ponds and aesthetic features. Aquatic vegetation will become established at those water features, and aquatic wildlife will become added to the faunal component, such as aquatic birds and fish.

Use of pesticides will be controlled on the site. Only those pesticides which are allowed by law will be applied. Application will be supervised by a certified golf course manager.

4.10 ARCHAEOLOGICAL AND HISTORIC RESOURCES

An investigation of archaeological and historic features on the site was conducted by Paul H. Rosendahl, Ph.D., Inc. (PHRI) during December 1988 and January 1989. The findings of this report (PHRI, February 1989) are summarized in the following discussion, and the entire report is included as Appendix N. Evaluations and recommendations presented in this report will be discussed with Dr. Joyce Bath, Staff Archaeologist at the State of Hawaii, Department of Land and Natural Resources (DLNR), Historic Sites Section.

A. Existing Conditions

1. Previous Archaeological Work

Previous archaeological work within the immediate and general vicinity of the project area consisted primarily of reconnaissance research, although several subsurface testing and data recovery projects have also been completed at the nearby Kuilima Resort and on Kahuku Point.

The earliest documented archaeological research is the 1930 survey of Oahu by McAllister (1933). McAllister's work adjacent to the Punamano site resulted in identifying one site called Kukio Pond. Located near Kahuku Point, the pond was described as "...a natural basin filled with brackish water, located about 300 feet from the sea, Kahuku Point." This pond was formerly much larger and contained several varieties of fish. McAllister suggested that the pond system was undoubtedly associated with a large Hawaiian settlement. Shallow graves were purported to exist in the land between the pond and the sea. In earlier times, trees which now exist on the mountains to the south had covered the Kahuku plain. The entire Kukio Pond system was destroyed during the construction of Kahuku Air Base.

During the 1970's and early 1980's, a number of reconnaissance surveys were conducted in the general vicinity of Kahuku Point (Barrera 1979, 1981, 1984; Clark 1978; Davis 1981, 1982; Rogers-Jourdane 1982; Schilt 1979; and Sinoto 1981). An historical account of the Kahuku area was also prepared at this time (Nakamura, 1981). Collectively, these various projects resulted in expanding the information base regarding the number and types of prehistoric and historic site types present along the northernmost shores of Oahu.

Of particular relevance to the present project area is the Kahuku Wind Farm project area survey (Davis 1981). Only four cultural sites were located during an examination of approximately 100 acres of land located between about 150 to 250 feet above mean sea level. Three of the sites, including two small habitation sites and a probable religious structure, were presumed to be prehistoric, all of which were situated in a protected upland swale. Davis' findings highlight the negative impact on prehistoric resources which have accompanied historic agricultural activities. Similar results were expected within the project site, most of which involve lands which have been extensively cultivated since the latter part of the 19th century.

Subsurface reconnaissance studies by Dye (1977) and Bath (1984) of the Kahuku Point area uncovered potentially valuable prehistoric cultural deposits. This complex of sites was designated as Site 50-OA-2911, the Kahuku Point Archaeological Area, which was determined by the State Historic Preservation Office (SHPO) to be eligible for inclusion on the National Register of Historic Places.

In 1984, SHPO conducted a limited reconnaissance survey along the eastern portion of Kahuku Point. Several burial pits were discovered which had been excavated into an older midden deposit of charcoal and marine shell. Laboratory analysis of the burial remains resulted in the identification of three individuals, and provided some
additional insight into the relationship between late prehistoric and early historic use/occupation within the area.

PHRI (1986) conducted further subsurface investigations in the Kahuku Point Archaeological Area, and a charcoal dating sample yielded a calendrical age of 165 BC to AD 210. Upper layer deposits contained human skeletal remains with a calendrical calibrated age of AD 1655 to 1950. Based on these findings, this area (Site 2911) was evaluated as having potentially high scientific research value, and appropriate further archaeological work was implemented by PHRI in 1986. This research defined the spatial extent of archaeological remains representing prehistoric, protohistoric/early historic, and recent historic period occupation at this site. Additional age determinations on volcanic glass and radiocarbon samples yielded an overall maximum age range of A.D. 1065 to A.D. 1950 for Site 2911.

Finally, a substantial archaeological excavation program was undertaken during the late 1970's at Malaekahana State Recreation Area (Yent and Estioko-Griffin 1980). The research involved reconnaissance, testing and mitigative-level excavations at several sites located in the extensive dune formations fronting Malaekahana and Laie Bays. The excavations revealed three major cultural occupations dating to the late prehistoric period (AD 1600 to 1780). Each of the three occupations was stratigraphically and temporally distinct, and suggected an increase in the local population and expansion in the subsistence base over time. In addition, the presence of terrestrial products coupled with certain changes in settlement pattern indicated greater reliance on inland products along with increased sedentism through time. These findings generally support those from nearby Kahuku Point, although for the latter area an earlier period of initial occupation coupled with a larger prehistoric population is indicated.

2. Historial Background

Historical documentary research by PHRI who examined and analyzed available archaeological and historical literature, and other documentary resources relating to the project site. Potential sources of information for the project area included early historical accounts by native and foreign residents of the Hawaiian kingdom, written descriptions by visitors, land records and historic maps. Of these, a large number yielded information relevant to the project site.

According to Handy and Handy (1972), the windward coast of Oahu extending from Laie to Kahana was an area of early historic settlement and dense population. At Laie, the lo'i system of wet taro production, involving spring irrigation, was most intensive. Agricultural terraces existed in association with both the streams and springs in the Malaekahana ahupua'a. There is an old terrace system concentrated along the lower reaches of Kahawainui Stream which was called Waieli, but the crops were irrigated with water from a spring. Although at one time such features must have been encountered throughout the entire project area, much of the terracing was disturbed or destroyed by sugar cane cultivation.

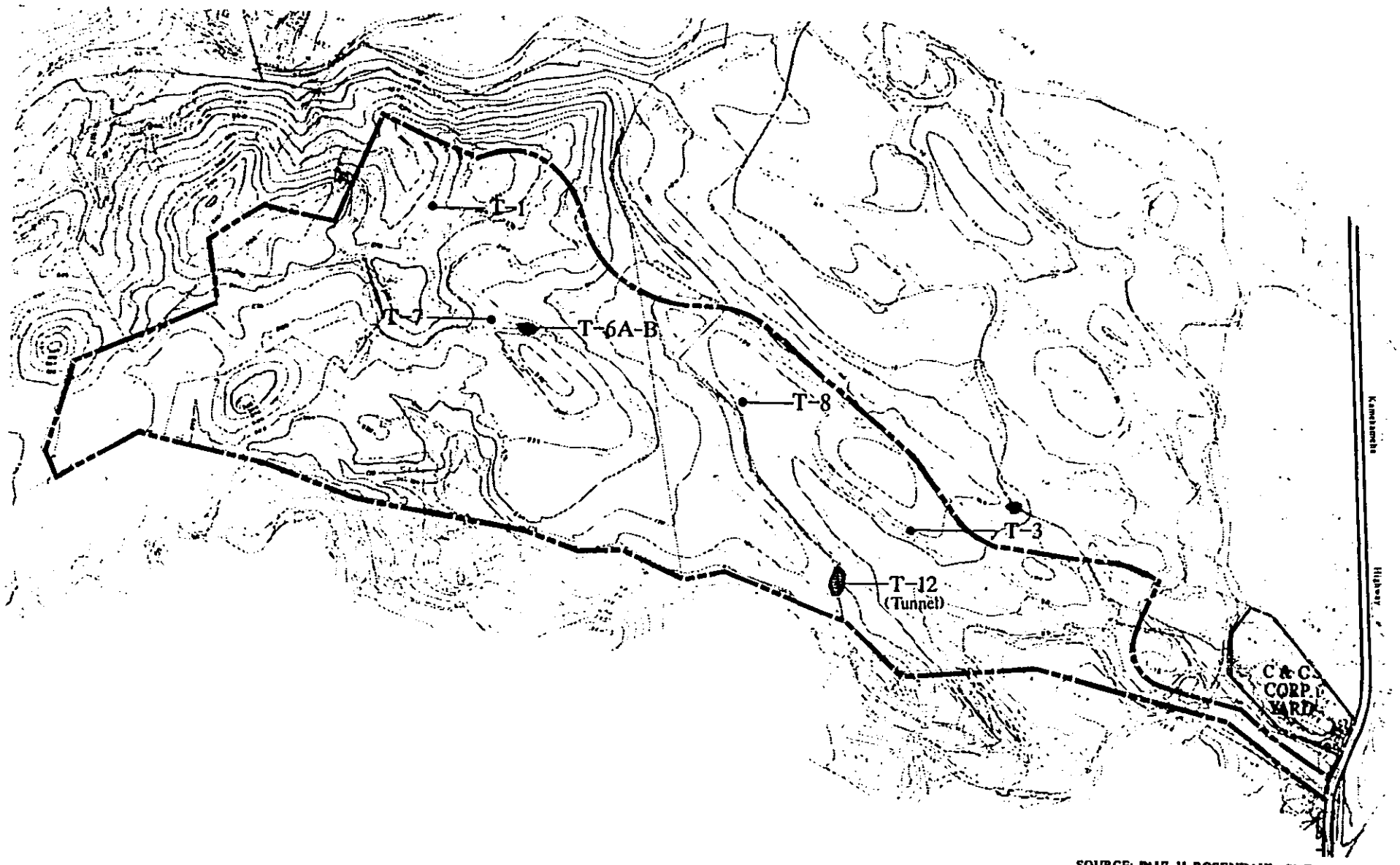
In 1846, prior to the distribution of lands known as the Mahele, Moffit had gained control of the konohiki land in Kahuku. Moffitt raised cattle and sheep, eventually selling out to Charles Hopkins who established the Kahuku Ranch.

By 1865, the Mormon Church had extended its initial holdings in Laie by purchasing approximately 6,000 additional acres of land (Cummings 1965). An 1884 map by Jackson shows sugar cane fields throughout much of the Laie area. It is assumed that these fields belonged to the Mormons, as the rest of the area was still part of the extensive Kahuku Ranch. Parts of Malaekahana, Laie and Kahuku were conveyed to Herman Widemann in 1867. By 1873, Kahuku Ranch, now totalling approximately 15,000 acres, was solely owned by Widemann. In 1874, the ranch was re-named the Kahuku and Malaekahana Ranch, and was sold to Julius Richardson. James Campbell bought the ranch from Richardson in 1876. In 1889, Campbell leased portions of Malaekahana and Kahuku to Ben Dillingham. Dillingham subleased some of the lands to Oahu Railway and Land Co. for a period specified at forty-nine years and eleven months beginning in1890. Included in this lease were sugar lands in Kahuku and the surrounding areas. The Kahuku Plantation Co. was incorporated in 1890, with Castle as its first president (Yent and Estioko-Griffin 1980). Koolau Railway Co. was formed and tracks were built in 1902 from Kahuku through Malaekahana. Service as a common carrier ceased in 1931 when the Koolau Railway Co. merged with Kahuku Plantation Co. The railway remained in operation through the 1950's transporting sugar cane to the Kahuku Mill.

In 1917, pineapple cultivation was initiated within the project area as the Kahuku Plantation Co. leased 171 acres to C. Okayama for this purpose. During the 1920's and 1930's Oahu Railway and Land Co. subleased parcels in Malaekahana for the same reason. In 1971, the Kahuku Plantation closed after 80 years of sugar cultivation and processing. In 1975, the State of Hawaii purchased acreage from Campbell Estate in order to establish the Malaekahana State Park.

3. Archaeological and Historic Findings on the Project Sites

During the present inventory survey of the Malaekahana Golf Course site, a total of six archaeological sites containing seven component features were identified. Formal feature types include caves, overhangs, walls, terraces and platforms, enclosures, isolated midden deposits, and historic components including World War II emplacements, historic dumps, roads and agricultural ditches. Functional types present include habitation, burial, historic agriculture and World War II activities. The locations of archaeological and historic sites on the project site are shown in Figure 14.



SOURCE: PAUL H. ROSENDAHL, Ph.D., INC. (1989)

ARCHAEOLOGICAL SITES
MALAEKAHANA GOLF COURSE

0' 450' 900' 1800'

FIGURE 14

4. General Significance Assessments and Recommended General Treatments

To facilitate State and County review, general significance assessments and recommended general treatments for the six identified sites are summarized in Table 7. Significance categories used in the evaluation process are based on the National Register criteria contained in the Code of Federal Regulations (36 CFR Part 60). The State Department of Land and Natural Resources-Historic Sites Section (DLNR-HSS) uses these criteria to evaluate eligibility for both the Hawaii State and National Register of Historic Places. Table 8 shows a summary of general significance assessments and recommended treatments for the six identified sites. Sites determined to be potentially significant for information content (Category A, Table 8) fall under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in pre-history or history." Sites potentially significant as representative examples of site types (Category B, Table 8) are evaluated under Criterion C, which defines significant resources as those which "...embody the distinctive characteristics of a type, period, or method of construction..., or that represent a significant and distinguishable entity whose components may lack individual distinction."

Sites with potential cultural significance (Category C, Table 8) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (ACHP, 1985). The guidelines define cultural value as "...the contribution made by an historic property to an on-going society or cultural system. A traditional cultural value is a cultural value that has historical depth" (1985:1). The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value" (1985:7).

There are four significant archaeological sites located within the project site. These sites, listed by PHRI and State site number, include sites T-1 (4088), T-3 (4089), T-6 (4090) and T-12 (4093). There are also two archaeological sites located within the project site that are considered not significant beyond the present study. These sites include sites T-7 (4091) and T-8 (4092).

Further data collection and preservation "as is" are recommended for one site, T-3 (4089). If preservation is not compatible with development plans, however, further data collection would be satisfactory for this site. After further data collection is completed, physical preservation of this site would not be considered essential, although some features might be considered for inclusion into development landscaping. This site is assessed as significant for information content, as an excellent example of a site type.

In order to facilitate future decisions regarding site treatments, sites are further evaluated in terms of three value modes which are derived from the State and Federal evaluation criteria. The archaeological sites are evaluated in terms of potential scientific research, interpretive and/or cultural values. Research value refers to the potential of archaeological resources for producing information useful in the understanding of culture history, past lifeways, and cultural processes at the local, regional, and interregional levels of organization. Interpretive value refers to the potential of archaeological resources for public education and recreation. Cultural value refers to the potential of archaeological resources to preserve and promote cultural and ethnic identity and values.

B. Anticipated Impacts

Current plans for the golf course would cause some direct effects to one non-significant site [T-8 (4092)] and one significant site [T-1 (4088)]. Direct effects constitute activities such as grading and excavation, which could cause partial or complete destruction of the archaeological features at a site.

Of the two affected sites, one [T-8 (4092)] is recommended for no further work of any kind. Site T-8 is a cave located at the edge of a proposed golf hole, that once served a habitation purpose. Sufficient data were collected during the archaeological survey, during which it was determined that these sites have

MALAEKAHANA GOLF COURSE

TABLE 7

ARCHAELOGICAL SITES SUMMARY

SITE #	TYPE	FUNCTION	INTEGRITY	SPECIFIC ADDITIONAL WORK TO BE REQUIRED
T-1	Platform/Md	Habitation/ Burial?	Fair to poor	Partially dismantle esp. center
T-3	Cave, large	Habitation	Good	Testing, 4-6 units, surface collection
T-6(A)	Overhang	Habitation	Fair	1-2 units, surface collection
T-6(B)	Overhang	Habitation	Fair	1-2 units, surface collection
T-7	Overhang	Habitation	Fair	1-2 units, surface collection
T-8	Cave	Habitation	Good	None
T-12	Ditch/Tunnel	Agriculture	Fair to good	Historic documentry research

MALAEKAHANA GOLF COURSE

TABLE 8

SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED TREATMENTS

SITE	SIGNIFICANCE ASSESSMENTS				RECOMMENDED TREATMENT			
	A	X	B	C	FDC	NFW	PID	PAI
T-1	+	-	-	+	+	-	-	-
T-3	+	-	+	-	+	-	-	+
T-6(A)(B)	+	-	-	-	+	-	-	-
T-7	-	+	-	-	-	+	-	-
T-8	-	+	-	-	-	+	-	-
T-12	+	-	-	-	-	+	-	-

Recommended General Treatments:

FDC = Further data collection necessary (intensive survey and testing, and possibly subsequent data recovery/mitigation excavations);

NFW = No further work of any kind necessary. Sufficient data collected, archaeological clearance recommended, no preservation potential (possible inclusion into landscaping suggested for consideration);

PID = Preservation with some level of interpretive development recommended (including appropriate related data recovery work);

PAI = Preservation "as is", with no further work (and possible inclusion into landscaping), or minimal further data collection necessary; and

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, SHPO-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).

no preservation value. Based on this information, the project's effect on this site (alteration) will not constitute any significant impact on archaeological resources.

One affected site [T-1(4088)] is recommended for further data collection, including intensive survey and testing. Construction activities at this site, which is proposed for a driving range, may destroy or alter its present condition. Site T-1 is a platform/mound feature which served a habitation/burial function, and is in poor condition. It is recommended that this feature be partially dismantled from its interior for further data collection.

Of the four archaeological sites on the site which will not be directly affected, all could potentially be exposed to indirect effects of construction and operation. These sites include one non-significant site [T-7 (4091)], and three significant sites [T-3 (4089), T-6 (4090), and T-12 (4093)]. Indirect effects constitute the potential disturbance of an archaeological site by individuals whom may purposely or accidentally encounter them. There are no plans to disturb any of these four sites by construction or operational activities required for the golf course and support facilities.

C. Mitigative Measures

Information gathering on the site to date has been extensive, and PHRI has produced an in-depth inventory of archaeological sites. Measures have been recommended by PHRI to minimize the effect of the project on existing archaeological and historic resources. Recommendations for treatment of archaeological resources are currently being reviewed by Dr. Joyce Bath, DLNR - Historic Sites Section A formal mitigation plan will be prepared for the project site, which must be reviewed and approved by DLNR prior to initiation of any construction. The mitigation plan will include a site-specific data recovery plan and, where appropriate, a preservation plan.

Through the PHRI method of site sensitivity classification, the most sensitive sites have been recommended for additional data collection and interpretation or preservation by accepted methods. For the two significant sites affected by the project development, both are recommended for further data collection (intensive survey and testing, and possibly subsequent data recovery/mitigation excavations). Where possible, these sites will be preserved "as is", or will possibly be included into the project's landscaping. Site specific data recovery tasks are outlined in Appendix N.

Upon approval by the DLNR Historic Sites Office, the treatment of the six archaeological sites on the project site will involve the following measures:

1. Two sites will require no further work, having minimal archaeological significance. One of these sites [T-8(4092)] will be directly affected by the project. No additional information will be collected at these sites.

2. Four sites are recommended for further data collection. Of these sites, one [T-1(4088)] will be directly affected by the project. Further data collection will be conducted at this site.

Aside from the sites directly affected by the development plans, there are numerous other sites with archeological significance that have been documented in the archaeological study inside and outside the project site that will only potentially be affected by the project (indirectly affected). One of these sites [T-3 (4089)] will have preservation "as is", and the other five sites will be available for further data collection.

Where development activities for the project will involve extensive modification of the land surface, there is the remote possibility of encountering unknown or unexpected cultural features, deposits, or burials. In such a situation, work in the area of such remains would be suspended immediately until the monitoring archaeologist has the opportunity to inspect and evaluate the significance of the newly discovered materials. The Historic Sites Office of the State DLNR would be immediately notified to determine the appropriate course of action.

4.11 ROADWAYS AND TRAFFIC

This section includes a presentation of the existing roadways and traffic conditions at the project site and the surrounding area. The potential impact of the project on future traffic conditions is assessed in this section, as well as the recommended mitigative measures to minimize effects on traffic and transportation. A detailed Traffic Impact Assessment Report was prepared for the project by Pacific Planning and Engineering, Inc. (PPE) (February, 1989). A summary of this report is included in this section, and the entire report is included as Appendix 0.

A. Existing Conditions

The proposed project is surrounded by a largely rural community consisting of primarily agriculture and resort uses, along with residential, commercial and recreational uses. Vehicular access to the proposed development will be from Kamehameha Highway, which is the only highway in the area providing for through-traffic along the Koolauloa and North Shore areas of Oahu. A small agriculture access road forms an intersection with Kamehameha Highway at the project site, which will become the project access road.

1. Roadway Conditions

As noted, Kamehameha Highway is a rural arterial highway connecting major population centers along the North Shore of Oahu such as Haleiwa, Pupukea, Kahuku and Laie. It is a State-maintained highway with a 50-foot wide right-of-way and a 22-foot wide pavement. There is one 11-foot wide lane in each direction.

The shoulders are grassed and vehicles park along both sides of this road. Paved pullouts are provided at most bus stops. The posted speed of Kamehameha Highway is 45 miles per hour (mph) along both project sites. In Kahuku Village and Laie, however, the posted speed is 25 mph.

2. Observed Traffic Conditions

Data from the State Department of Transportation (DOT) 24-hour continuous traffic count station on Kamehameha Highway near Kualoa (Station C-29-B) indicate that the heaviest traffic along the Koolauloa and North Shore areas occurs on Saturday afternoons.

Additional turning movement counts were taken at the existing intersections of Kamehameha Highway at the farm access road to the site. The traffic counts at these locations were taken on Saturday, January 21, 1989, between 2:00 and 3:00 p.m. The present counts were used as a baseline to which future traffic estimates were added.

At the project site during this period, two-way traffic on Kamehameha Highway was about 941 vehicles, with 49 percent heading toward Laie and 51 percent toward Kahuku Village. Only a small portion used the access road into the farm area.

3. Level-of-Service

Traffic movements at intersections can be classified using a Level-of-Service (LOS) methodology. The LOS at an intersection is classified into six categories ranging from little or no delay (LOS A) to extreme delays (LOS F). Existing conditions at the intersection of Kamehameha Highway at the project site were determined in this study as a baseline for comparison with future conditions.

B. Anticipated Impacts

1. Analysis Methodology

The focus of the traffic impact analysis was to determine the impact of the project-generated traffic at the intersection of Kamehameha Highway and the the project access road to the Malaekahana Golf Course when the project is completed in 1994. Future traffic forecasts with and without the project were estimated for about 1994. Forecasts were made for the Saturday afternoon peak hour between 2:00 and 3:00 p.m. because it represents the worst case condition for ambient traffic.

The estimated traffic is calculated by adding the expected project traffic to the estimates of future traffic on Kamehameha Highway. The intersection of Kamehameha Highway with the project access road were then analyzed for conditions without and with the 1994 project-generated traffic.

2. Future Ambient Traffic

The expansion of the Kuilima Resort and growth on other areas of the island are expected to contribute to an increase in ambient traffic on Kamehameha Highway. Future ambient traffic for the study area was calculated considering development of the Kuilima Resort. The estimated weekday peak hour traffic from the completed Kuilima Resort will be 530 vehicles entering and 520 exiting. During the Saturday peak hour, the estimated vehicle trips generated by the Kuilima Resort will be 465 entering and 468 exiting. According to the existing traffic pattern, these trips were distributed and assigned to the roadways. A 2.5 percent annual growth factor for traffic volumes on Kamehameha Highway was included. Details of the determination of future ambient traffic are included in Appendix O.

3. Trip Generation

Future traffic generated by the Malaekahana Golf Course was derived based upon vehicle trips expected for a golf course development. Traffic assignment is the process by which trips are assigned to the roadway network in the project area. Traffic from the project was assigned to Kamehameha Highway which is the only access to the North Shore, Koolauloa and major population centers.

Data from previous traffic counts was used to estimate the traffic generated by the project. Traffic entering and exiting the Pearl Country Club in Honolulu was recorded on Sunday, February 14, 1988 between the hours of 2:00 and 3:00 p.m. Thirty-seven vehicles were observed entering and and 41 vehicles exiting the golf course during this hour.

When compared to the Pearl Country Club, the project's traffic is expected to be less because it is not in urban Honolulu and much of the users (50 percent) are expected to be bussed from the Kuilima Resort. The larger counts at the Pearl Country Club are, nevertheless, used without adjustments to account for unforeseen or unexpected factors of traffic.

The distribution and assignment of vehicles to and from the golf course will be via Kamehameha Highway either in the direction of Haleiwa or Kaneohe. Based on the predicted target groups, the assignment of traffic was assumed to be Kuilima Resort visitors - 50 percent; other Oahu visitors - 30 percent; and Oahu residents - 20 percent. Kuilima Resort visitors will all travel to and from the Haleiwa direction to and from each site. The other Oahu visitors and Oahu residents coming to and from the site were assumed to be equally split in the Haleiwa and Kaneohe directions.

4. Construction Traffic Impacts

Short-term traffic impacts will occur as a result of construction-related traffic entering and exiting the project site. Trucks hauling construction materials such as cement, pipes, lumber, crushed rock and asphalt concrete will average one or two trips per day initially. For several short period (two weeks) during roadway construction periods, a maximum of 5 to 10 trucks per hour or 40 to 80 trucks per day will be hauling asphalt concrete to the project site. The Malaekahana Golf Course construction will continue over a two year time period.

Traffic generated by construction workers will occur during the early morning hours and when workers leave the project in the afternoon. An estimated 60 workers are expected at the project each day, which are expected to generate approximately 20 vehicle trips during the morning and afternoon peak hours. Many of the workers will be transported to the project on company trucks from base yards in Honolulu. Preliminary plans call for all earth moving operations to be confined to the project site, therefore, no trucks are expected to haul fill material onto or remove excess excavated material from the site. This will further minimize truck traffic in and out of the project and along Kamehameha Highway.

5. Traffic Impacts

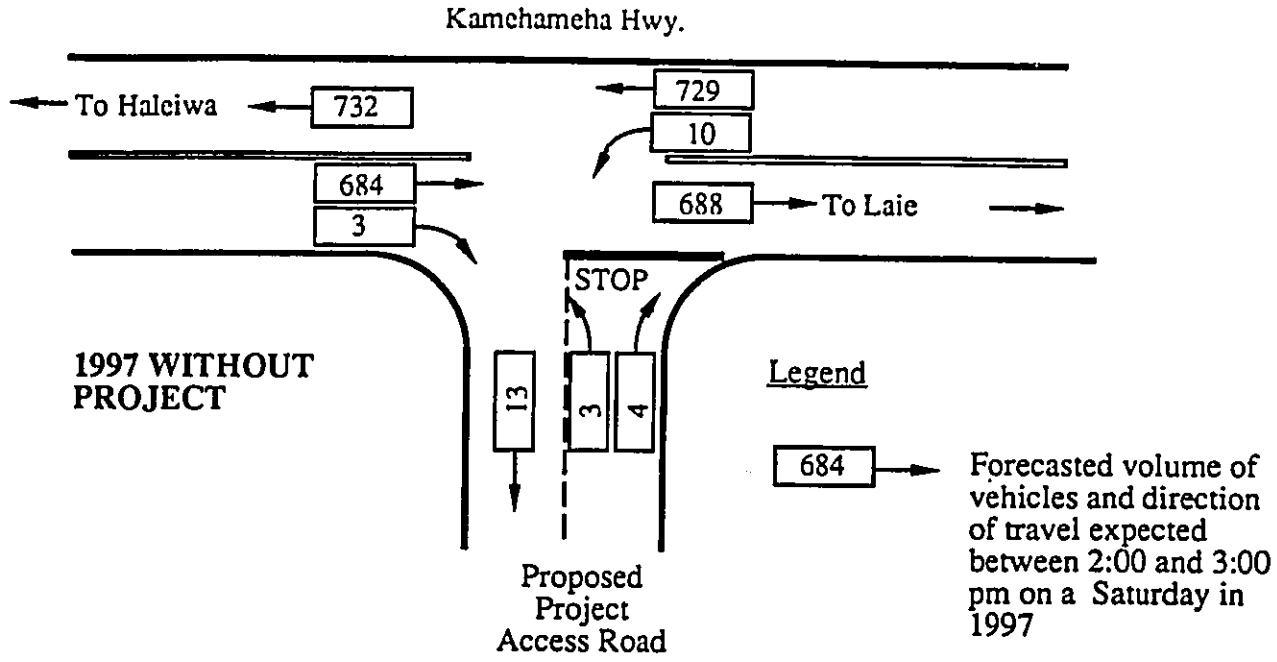
Traffic generated by the golf course will amount to approximately 78 vehicle trips (enter and exit) during the Saturday peak hour (2:00 to 3:00 p.m.). Figure 15 shows traffic flow at these entrances. The addition of these vehicles to Kamehameha Highway will represent an average of a 5.0 percent increase at the Malaekahana Golf Course entrance, as compared to 1994 traffic volumes without the project.

Impacts of the forecasted increase in traffic were assessed by the change in Level-of-Service (LOS) at the project entrance intersection for two separate conditions: without the project traffic, and with the project traffic. It was assumed that the project intersection would not be signalized. The results of the LOS analysis for the project entrance are shown in Table 9.

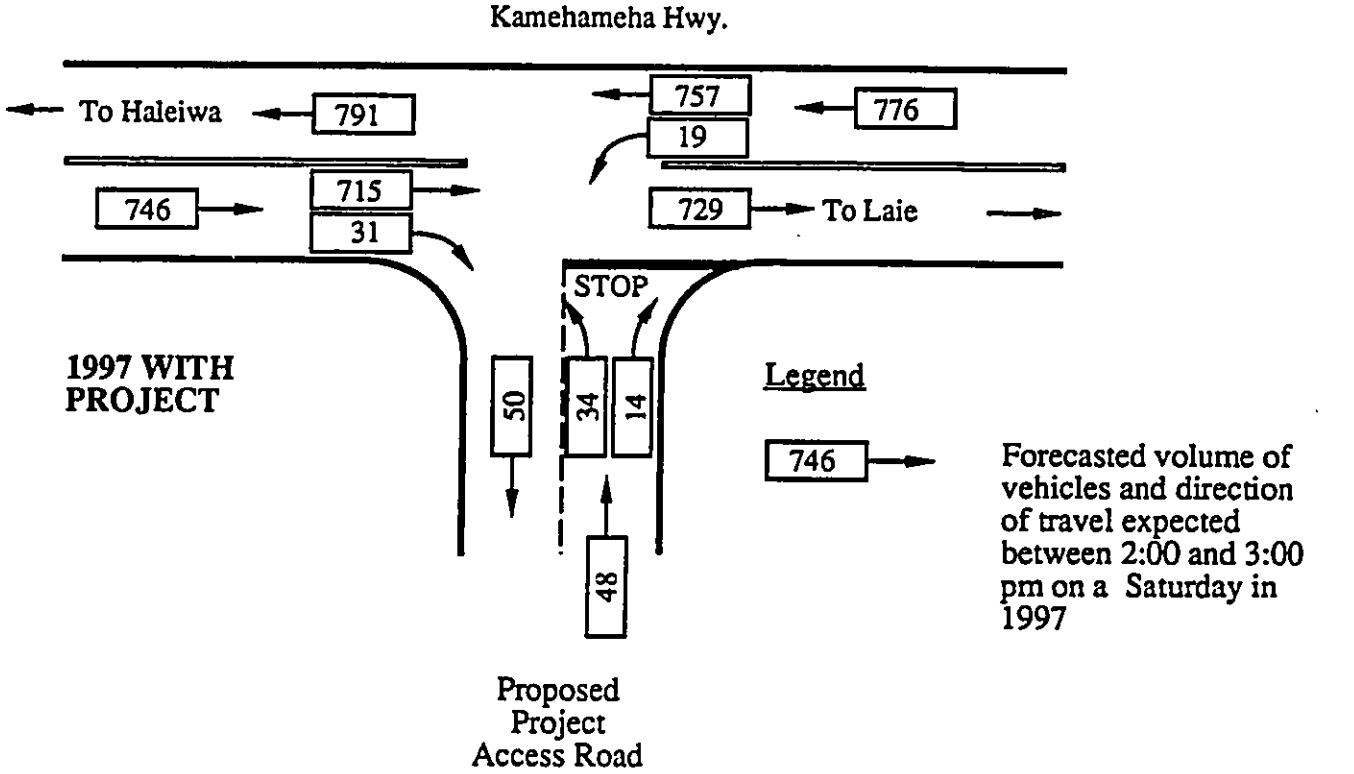
The analyses of the project entrance intersection indicate that Level-of-Service ratings will be LOS A on Kamehameha Highway approaches for the future with or without the Malaekahana Golf Course. The project-generated traffic will have a minor adverse affect on the turning movements from Kamehameha Highway onto the access road to the golf course.

The results indicate that traffic in general along Kamehameha Highway will not be materially affected by the addition of the traffic which will be generated by the project. The future increase in ambient traffic is the primary cause of changes in the Level-of-Service. The project's impact on the Level-of-Service anywhere along Kamehameha Highway is expected to be minimal.

The primary traffic problem will be with left turn movements out of the project entrance onto Kamehameha Highway, which will experience very long delays or extreme delays. Left turn movements out of local side streets will also experience these delays. These results are largely due to the traffic volumes along Kamehameha Highway. Right turn movements out of the golf course entrance and side streets onto Kamehameha Highway will experience short traffic delays. The traffic volumes, however, are relatively low and this condition is forecasted only for the peak hour period of the week. As indicated in Table 9, left turn movements out of the project for traffic heading toward Haleiwa on Kamehameha Highway will operate at LOS E, which is considered a long delay condition.



MALAEKAHANA SITE



SOURCE: PACIFIC PLANNING AND ENGINEERING, INC. (1989)

TRAFFIC FLOW DIAGRAM
MALAEKAHANA GOLF COURSE

FIGURE 15

MALAEKAHANA GOLF COURSE

TABLE 9

LEVEL-OF-SERVICE AT PROJECT INTERSECTION

Intersection	Level-of-Service 1989	1994 without project	1994 with project
Kamehameha Highway at Malaekahana Access Road			
• Highway left turn	A	A	A
• Access Road left turn	C	D	E
• Access Road right turn	A	A	A

Level-of-Service Ratings Range

A = Free Flowing
F = Extremely Congested Flow
NA = Not Applicable

Source: Pacific Planning & Engineering, Inc. (February 1989)

8. Area-wide Traffic Impacts

With respect to North Shore and Koolauloa area-wide traffic conditions, weekend peak hour traffic flow in 1994 along Kamehameha Highway at Laie and Kahuku is expected to operate at LOS E without the addition of project-generated traffic. The future traffic volume increases will largely be due to the growth of ambient traffic. The increase in ambient traffic volumes from 1988 to 1994 at Kahuku is expected to be nearly 70 percent.

C. Mitigative Measures

The estimate of traffic volumes generated by the project are actually very conservative, because it is anticipated that small buses and vans will be used to transport golfers to and from the Kuilima Resort. Up to 50 percent of the play at the Malaekahana Golf Course will be from Kuilima Resort hotels and condominiums. It is expected that at least one-half of these players will be transported by bus or van, which will reduce expected traffic volumes by 25 percent.

Exclusive left turn and right turn lanes exiting from the project entrance will be provided so that left turning vehicles do not also delay those wanting to turn right onto Kamehameha Highway.

No special requirements beyond those required by the State and County are recommended at this time. As ambient traffic on Kamehameha Highway increases beyond 1994, the left turn movement exiting the golf course will encounter longer delays. Further studies will be conducted at that time to reassess the change and determine appropriate improvements required, such as turning lane additions or installation of traffic signals.

4.12 NOISE

Existing noise conditions and the potential future noise conditions at the project and its surrounding areas were evaluated by Darby & Associates (February 1989). This technical report is included in its entirety as Appendix P. Excerpts from the report are included for the following discussion of noise conditions.

A. Existing Conditions

Noise from sources such as traffic is commonly measured in A-weighted decibel units (dBA). The A weighting refers to the emphasis of certain sound frequencies over others to simulate the sensitivity of the human ear. The decibel scale is logarithmic, and a 10-fold increase in sound energy results in an increase of 10 dBA. With an instantaneous change in noise, doubling of the noise level results in an increase of three dBA, the smallest change in noise level considered to be noticeable by the majority of the people. Typical construction equipment noise levels are shown in Figure 16.

Ambient noise conditions at the project site are generally quiet due to its rural setting. Ambient noise level measurements were made at several locations along Kamehameha Highway in the area of the project site (January 1989). At locations near the highway, noise is dominated by traffic sounds of about 63 dBA at a distance of 65 feet. Ambient sound levels at residential locations away from the highway are dominated by neighborhood self-generated sounds, such as local vehicle movements, lawn mowers, weed wackers, radios and sounds from children and animals. Wind blowing in the foliage may often be the dominant sound along with occasional muffled noise events from traffic on Kamehameha Highway. Occasional military helicopters from the Kahuku Training Area cause audible noise throughout the project area and may be the dominant noise source at times. The surf sound dominates the acoustical environment at locations near the coastline and during hours when traffic noise is minimal. Sound levels

ranging from about 60 to 62 dBA generated by the surf were measured at a distance of about 100 feet from the coastline during night-time hours.

Traffic noise level estimates were also made near the project site at four locations along Kamehameha Highway, including:

(1) Kawela Bay area, west of Kuilima Resort, 350 feet mauka of highway

(2) Kuilima condominiums, 500 feet makai of the highway;

(3) Kahuku Village, 65 feet from highway near Kahuku Sugar Mill; and

(4) Laie area, one-half mile southeast of site, 120 feet mauka of highway.

Noise measured at these locations ranged from 54.0 to 63.9 dBA over a 10-minute period. Traffic counts (including the mix of vehicle types) were also made during the noise sample periods in order to validate the FHWA Traffic Noise Prediction Model.

B. Anticipated Impacts

Future activities at the project site that were considered include: construction activities, project-generated traffic, stationary equipment operation (such as air conditioners and pumps), golf course maintenance equipment operations, and clubhouse activities. Potential increases in traffic noise impacts on Kamehameha Highway residences and other receptors within the project area were also considered.

1. Construction Impacts

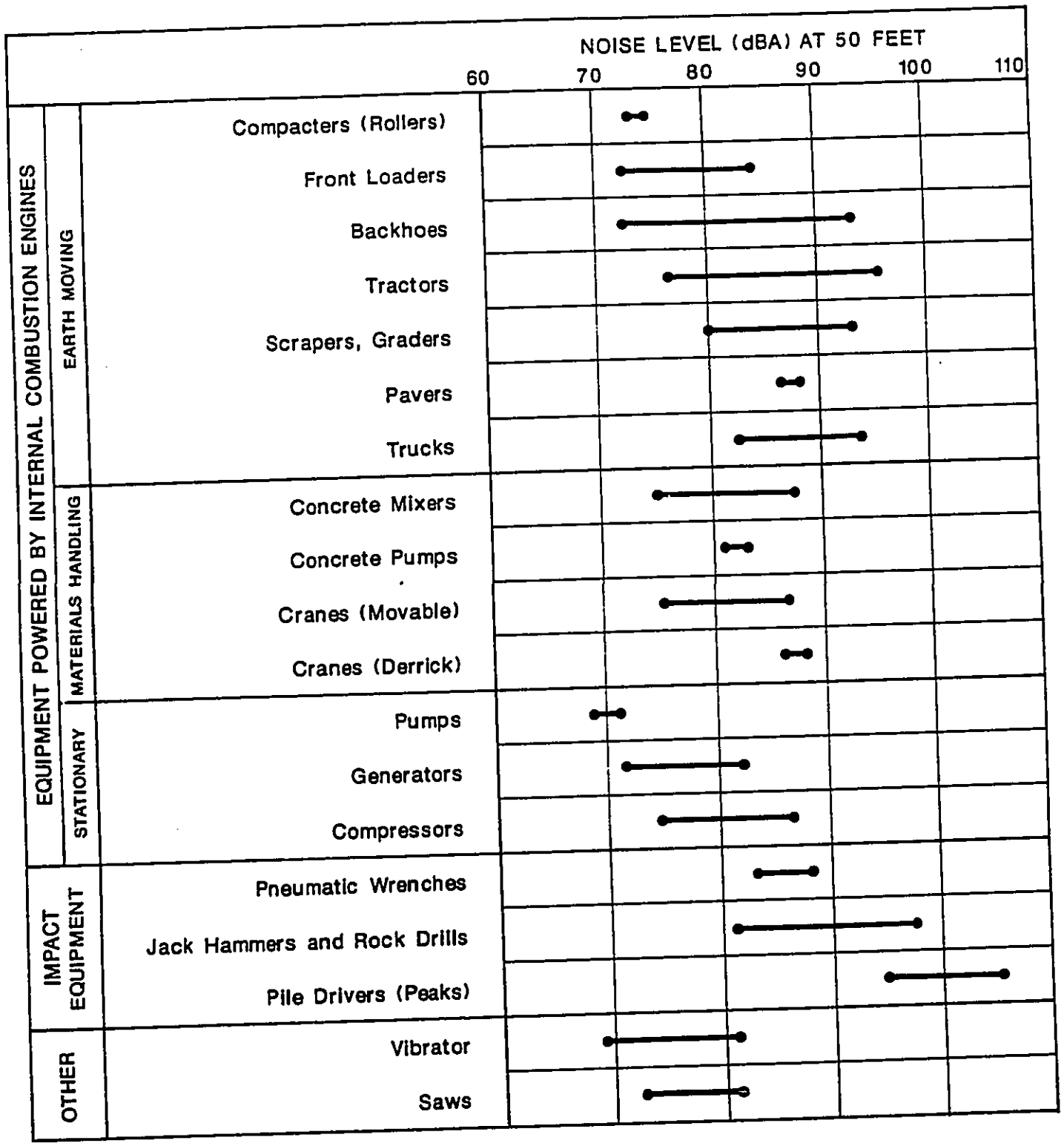
Development of the project will involve clearing, grubbing, grading, and the construction of infrastructure and buildings. The actual amounts of noise generated in construction are dependent on the methods employed during each construction phase. Earth moving equipment, such as bulldozers and diesel powered trucks, will probably be the loudest equipment used in construction.

The construction of the access road and other features on the site may require rock removal. Equipment typically used for rock removal include rock hammers and drills, as well as blasting equipment. Equipment using impact to break rock is noisy, as shown in Figure 16, where 82 to 98 dBA at 50 feet is typical of jack hammers and rock drills. The breaking of rock by explosion usually creates a muffled "thump" sound. Noise created during rock removal may affect the nearby residents. This impact will be short-term in duration, and the actual time period required for drilling and blasting will be assessed after final design and geotechnical studies for the access road are complete.

A permit will be obtained from the City and County Department of Health for the operation during project construction of equipment, power tools and vehicles which emit noise levels in excess of the allowable limits. Measures will be employed to minimize the effects of noise on the noise-sensitive locations such as hospitals, churches, parks, schools and nearby residences, as discussed later in this section.

2. Traffic Noise Impacts

Federal Highway Administration (FHWA) noise modeling results showed that typical receptors that are located about 120 feet from the center of Kamehameha Highway will have traffic noise levels in 1994 of approximately 65 dBA during the busiest hour of the week (worst case). The expected future traffic noise level increase along Kamehameha Highway will be due primarily to the projected increase



Note: Based on Limited Available Data Samples

SOURCE: U.S. ENVIRONMENTAL PROTECTION AGENCY, 1972

TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS
MALAEKAHANA GOLF COURSE

FIGURE 16

in traffic volumes resulting from other developments and area growth. The potential traffic noise level increase at receptors located along Kamehameha Highway due to the project will be less than one dBA, and is not considered to be a significant noise impact.

3. Ground Maintenance Noise

Noise associated with ground maintenance equipment, such as lawn mowers and leaf blowers, will be generated by the activites on the golf course. There are no sensitive receptors within 1,000 feet adjacent to the site that will be affected by this noise.

4. Clubhouse Activities Noise

Noise sources from clubhouse operations could include kitchen equipment, fans, air conditioners, refrigeration equipment, pool pumps, as well as sound systems for announcements and music. There are no sensitive receptors within 1,000 feet adjacent to the site that will be affected by this noise.

5. Stationary Equipment Noise

Noise from air conditioning equipment, pool pumps, exhaust fans, trash compactors and any other stationary equipment at the golf clubhouse will not exceed the noise levels allowable by State and County noise regulations. Trash pick-up and delivery vehicles will be operated and scheduled to cause minimum disturbance to distant residential units. These operations will meet the requirements of State and County noise regulations. There are no sensitive receptors within 1,000 feet adjacent to the site that will be affected by this noise.

C. Mitigative Measures

1. Construction Noise Mitigation

Compliance with existing regulations will mitigate construction noise generated by the project to acceptable levels. State and County regulations have been established to limit construction noise generation. Required permit conditions for construction activities include:

"No permit shall allow construction activities creating excessive noise... before 7:00 a.m. and after 6:00 p.m. 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 Sunday and 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. Construction vehicles using local roadways will satisfy the noise level requirements defined in Hawaii Administrative Rules, Title 11 (1981).

During rock removal, numerous small charges will be detonated using small time delays along with a blast mat covering the immediate blast area. This measure directs the explosive energy into the rock, muffling the airborne pressure pulse, and controlling flying debris. The actual blast will be perceived as a muffled "thump" sound and should cause minimal vibration through the ground to structures located below the bluff.

2. Operations Noise Mitigation

The design of the facilities will include noise mitigation measures in the planning of the location and orientation of the air conditioning equipment, exhaust fans, pool pumps and other equipment, such that local noise regulations will be satisfied.

Ground maintenance equipment will be powered by internal combustion engines with exhaust mufflers. Schedules for maintenance will be arranged so noisier operations do not occur (on and off the project area) before 7:00 a.m.

4.13 AIR QUALITY

An air quality study of the proposed project has been prepared by Root & Neal (January 1989). The information included in this study is summarized below, and the actual report is included in Appendix Q.

A. Existing Conditions

Present air quality in the area of the Malaekahana Golf Course could potentially be affected by air pollutants from four different types of sources: natural, industrial, agricultural and vehicular. Natural air pollutant producers which could affect the area include the ocean sea spray, aero-allergens from plants, dust from bare soil areas, or perhaps distant volcanic emissions from the Island of Hawaii. Industrial and agricultural sources of air pollutants are located generally on the leeward and central portions of Oahu, which are generally down wind from the project. Upwind there are no industrial or agricultural air pollution sources for thousands of miles.

The only long-term State of Hawaii air monitoring station is located in Waimanalo. This monitoring site was selected to measure background levels of particulates. None of the other regulated air pollutants are measured at this station. In 1987, the average annual Total Suspended Particulate (TSP) concentration at Waimanalo was 27 micrograms per cubic meter (ug/m3), which is well within the State standard for TSP, and is probably typical of most locations on the Windward Coast. The maximum 24-hour average concentration was also well within the allowable limit.

Any air pollution currently affecting the project area is probably a result of either natural or vehicular sources. Due to the low level of activity and development in the area and persistent trade winds from the northeast, current air pollution levels are almost certainly low.

B. Anticipated Impacts

1. Short-Term Air Quality Impacts

There will be two types of short-term direct air quality impacts from project construction, including fugitive dust generation and on-site emissions from construction equipment. There will also be short-term indirect impacts from slow moving construction equipment traveling to and from the project, and from an increase in local traffic caused by commuting construction workers.

Fugitive dust emissions will arise from grading and dirt moving activities within the project. A rough estimate of uncontrolled fugitive dust emissions from construction activity has been provided by the U.S. EPA (1987), estimated at 1.2 tons per acre per month under conditions of "medium" activity and moderate climactic conditions. Uncontrolled fugitive dust emissions from construction at the site would probably be

lower than this because the area is relatively wet. State of Hawaii Air Pollution Control Regulations require that no visible emissions of fugitive dust from construction activity should occur.

On-site mobile and stationary construction equipment will also emit some air pollutants in the form of engine exhausts. The larger types of equipment are usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, 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. Carbon monoxide emissions from diesel engines, on the other hand, are very low and should be relatively insignificant compared to normal vehicular emissions on nearby Kamehameha Highway.

2. Long-Term Air Quality Impacts

On-site long-term direct air quality impacts are not expected to be significant. Application of chemical fertilizers and pesticides to maintain the golf course will be required. The primary risk of using these chemicals is to the applicator rather than to individuals at possible receptor sites down wind. Individuals at down-wind sites should encounter airborne concentrations of these chemical substances only in greatly diluted form, if at all. Precautions will be taken in the application, as described in the following mitigative measures discussion.

There will be a minor long-term indirect impact on air quality along the project area's roadways due to project-related traffic. By serving as an attraction for increased motor vehicle traffic, the project is considered to be a potential indirect air pollution source.

In order to evaluate the potential long-term indirect air quality impact of increased traffic associated with project development, a carbon monoxide modeling effort was carried out. Carbon monoxide was selected for modeling because it is both the most stable and the most abundant of the motor vehicle generated pollutants, and it is also the air pollutant with the greatest likelihood of violating Ambient Air Quality Standards (AAQS).

Three critical receptor areas at the project entrance were identified for analysis. The results of the modeling effort are presented in Table 10. Estimated present (1989) peak-hour carbon monoxide concentrations were calculated at 0.8 mg/m3 for the site access road intersection.

In 1994 without the project, the predicted maximum one-hour carbon monoxide concentration is less than the 1989 value at the proposed project access road intersection for the Malaekahana Golf Course, even though ambient traffic is predicted to increase substantially. This is because the increase in traffic will be offset by newer vehicles with more efficient emission control devices as older model cars are removed from service.

The predicted peak-hour carbon monoxide concentration for the 1994 scenario with the project would be 2.3 mg/m3 at the golf course access road intersection. Thus, present and future peak-hour carbon monoxide levels with or without the proposed project are expected to be within all Federal and State AAQS even under the worst-case scenarios considered here. Future eight-hour carbon monoxide levels were also found to be within AAQS.

It is important to note that the worst-case meteorological conditions used for modeling have a very low probability of occurrence. A slight increase in the assumed worst-case wind speed from two mph to four mph would reduce the predicted carbon monoxide concentrations to nearly 50 percent of the levels shown in Table 10.

MALAEKAHANA GOLF COURSE

TABLE 10

ESTIMATED PEAK-HOUR AND EIGHT HOUR
CARBON MONOXIDE CONCENTRATION

Intersection	Peak Hour/Eight Hour Concentrations (1)		
	1989	1994 without project	1994 with project
Kamehameha Highway and Project Access Road	0.8/0.5	1.3/0.8	2.3/1.4

Source: Root & Neal (February 1989)

(1) milligrams per cubic meter

3. Pesticides Impact on Air Quality

The pesticides used on golf courses are at relatively low mammalian toxicity, ranging from hundreds to several thousand milligrams per kilogram of body weight. Because they 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. In addition, the use of ground spray equipment with low spray pressures (20 to 40 psi) and course spray droplets further reduces the potential for creating airborne fine droplets. Spray applications are only made in late afternoon or early morning hours when golfers are not on the golf course, which reduces the risk of any exposure of people to airborne spray particles.

C. Mitigative Measures

During construction of the project, adequate fugitive dust control will be accomplished by establishing 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 as possible in the construction process will also be done to lower the potential for fugitive dust emissions.

Indirectly, slow-moving construction vehicles on Kamehameha Highway can obstruct the normal flow of traffic to such an extent that overall vehicular emissions of carbon monoxide are increased. This impact will be mitigated by moving heavy construction equipment during periods of low traffic volume whenever possible.

There are certain precautions that must be followed by pesticide applicators in order to prevent significant down-wind drift when spraying. Primary among these are the use of a coarse rather than a fine spray and application under low wind speed conditions when the wind direction will not contribute to drift towards the clubhouse area. Off-hours application scheduling and buffer establishment will also minimize pesticide effects on air quality. Provided that proper safety precautions are followed, the potential for serious air quality degradation from chemical spraying for golf course maintenance will likely be minimal.

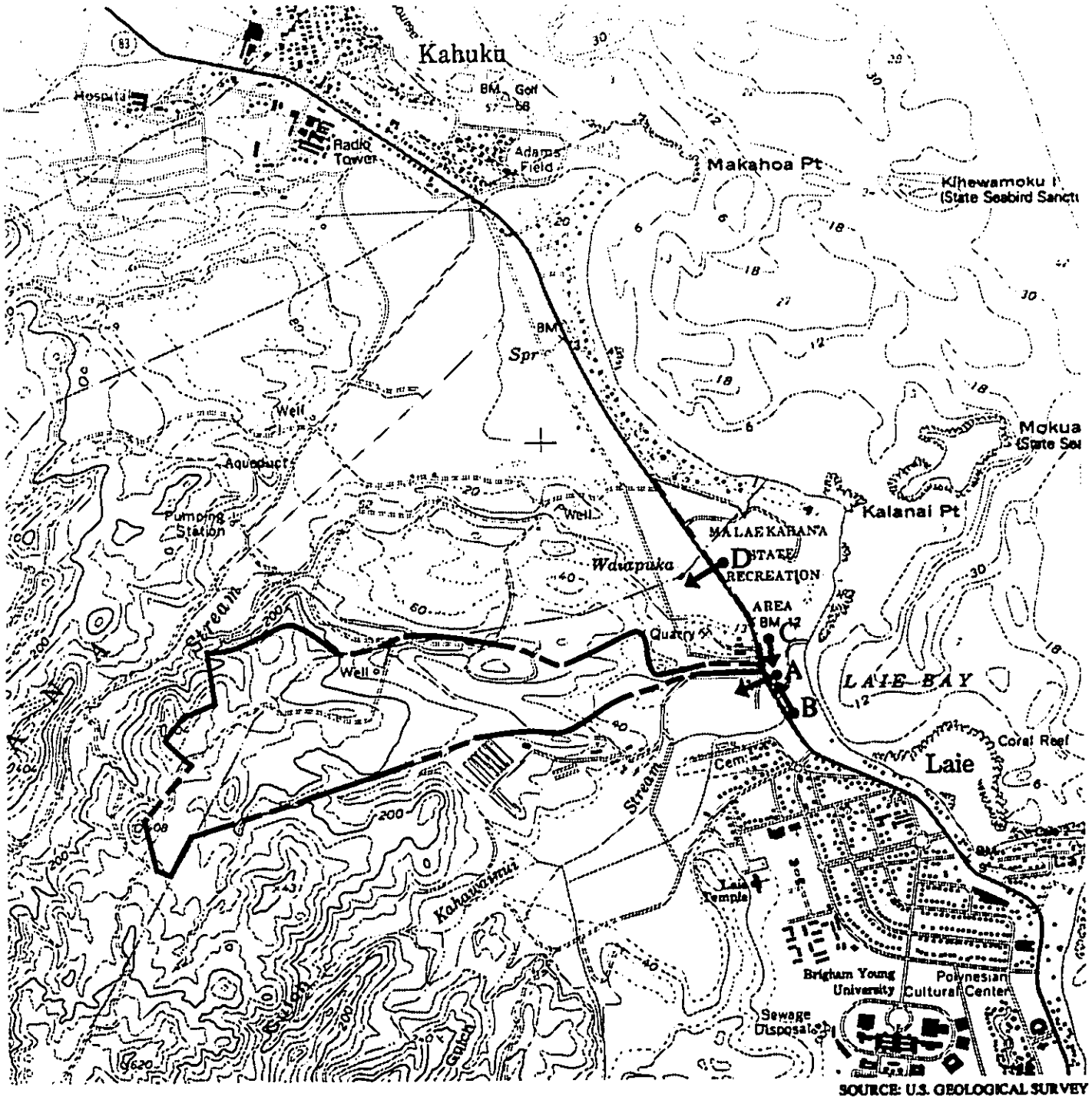
No specific mitigative measures are proposed to reduce vehicle-generated carbon monoxide levels at roadway intersections in the area of the project. Worst-case projected levels of emissions at these locations will be within State of Hawaii and Federal Ambient Air Quality Standards.

4.14 VISUAL RESOURCES

Existing views of the project site from the surrounding areas have been inventoried in this seciton, both descriptively and by photographs. Short-term and long-term effects on views of the site which will result from development of this project are assessed, and measures are proposed to minimize adverse effects.

A. Existing Conditions

Distant views of the project site are available from Kamehameha Highway and adjoining agricultural, recreational and military lands. The site is mainly located between 400 and 4,000 feet from the highway, and direct views of the site are blocked by vegetation and topography in most areas. A view study key map (Figure 17) identifies photographs showing various views of the project site, included in Figure 18.



SOURCE: U.S. GEOLOGICAL SURVEY

LEGEND

→ **PHOTO LOCATION**

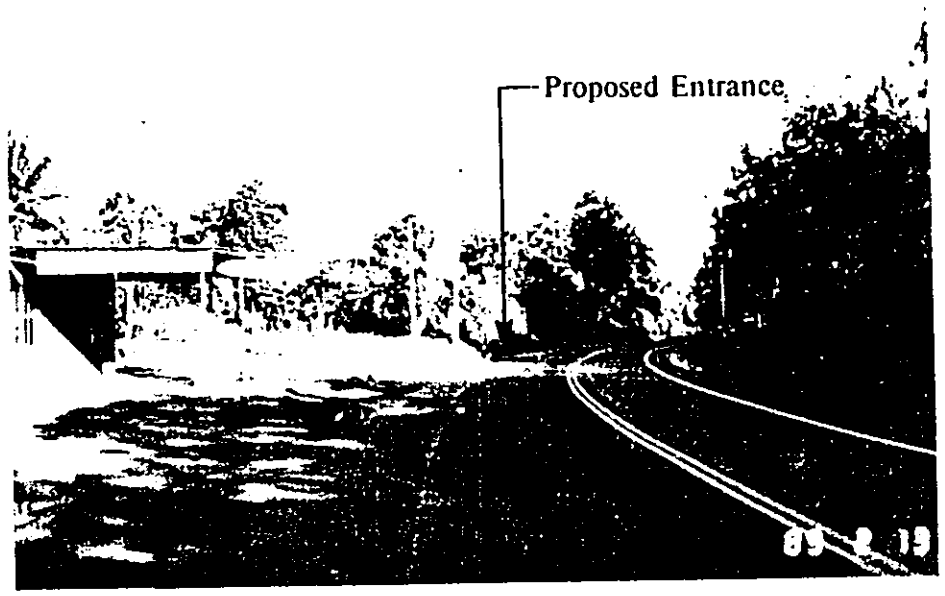
0' 1000' 2000' 4000'

VIEW STUDY KEY MAP

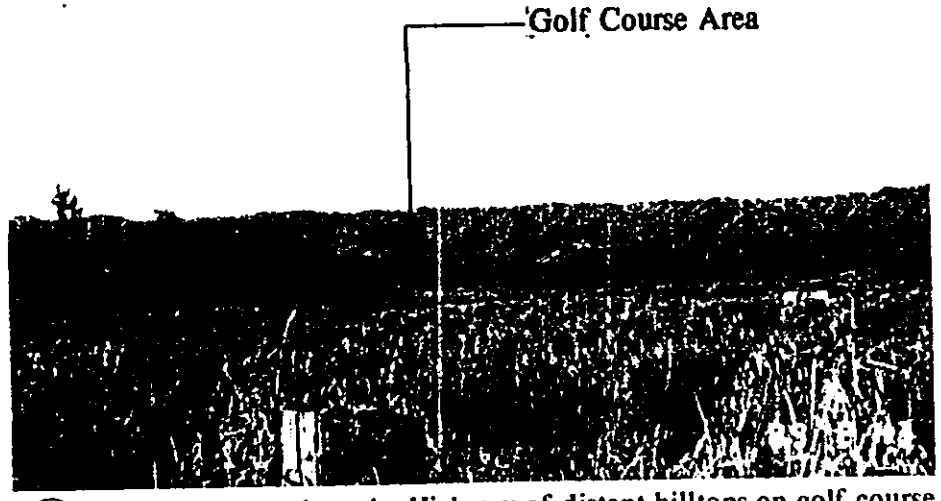
MALAEKAHANA GOLF COURSE

FIGURE 17

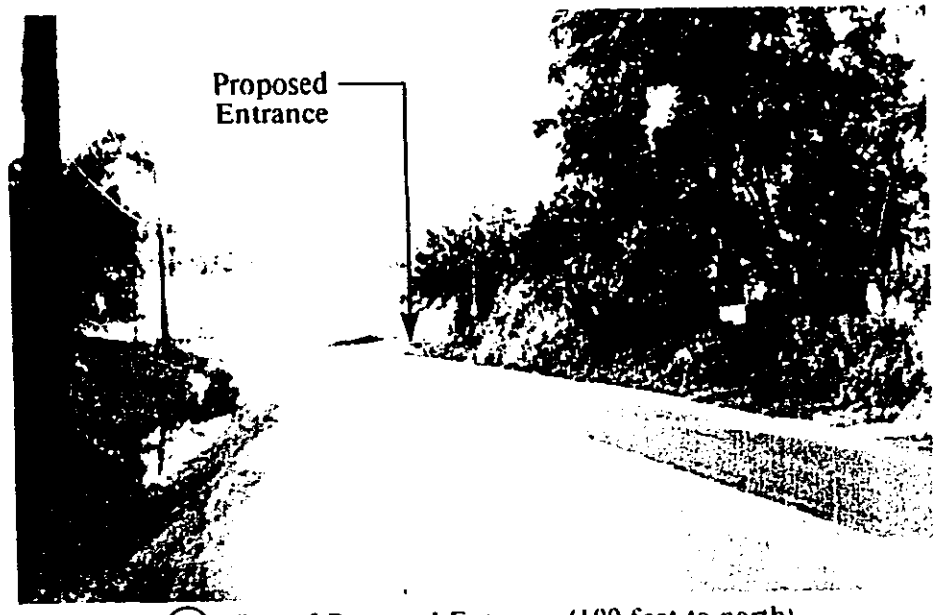
Ⓐ View of Proposed Entrance at Kamehameha Highway



Ⓑ View of Proposed Entrance (100 feet to south)



Ⓒ View from Kamehameha Highway of distant hilltops on golf course



Ⓓ View of Proposed Entrance (100 feet to north)

PHOTOGRAPHS OF PROJECT SITE
MALAEKAHANA GOLF COURSE

FIGURE 18

Views of the project site from the adjoining lands are generally similar to the available views from the highway. The site has rolling hills with extensive vegetation cover, and some broad areas of grasslands. Cattle and horse grazing activities are visible on lands which are located mauka of the highway, but between the site and the highway. Grazing uses of the site are visible from mauka locations on land to the south of the site.

The site lies within the Kahuku Viewshed, as defined by the Coastal View Study, within the Malaekahana section. Makai views from the coastal highway are blocked by the thick vegetation occuring at the Malaekahana State Park. Views mauka from the highway provide a rural agricultural setting at the project site, which is an important feature of the area's character. The hills in mauka portions of the site are considered to be "important coastal land forms", most likely relating to the views of these features from the lowlands.

From the project site, a variety of views are available. In the lowlands views of adjoining grazing and agricultural lands are available. From mauka portions of the site, there are spectacular panoramic views of the coastline from Kahuku to the Kaneohe Marine Corps Air Station peninsula. Mauka views from the site are also interesting, including the ridges and ravines of the upper section of the Koolau Mountain Range.

B. Anticipated Impacts

1. Short-Term Visual Impacts

Construction activities at the project site will create some minor adverse effects on views of the project site. Construction of the project entrance will be the main visible activity. Because of the distance between the highway and the main part of the site, there will only be minor views of the mauka area where golf course grading, structure development and infrastructure development will occur. Vegetation and topography prevent most direct views of the site from Kamehameha Highway and adjoining lands.

The most evident construction views will be of the project entrance. This area will include some vegetation clearing, grading and equipment storage which will be visible from the highway. This impact will be short-term, involving less than three of four months for actual work at the entrance.

2. Long-Term Visual Impacts

Long-term visual effects will result from the completed entrance, and distant views of the completed golf course and support facilities. Because of topographic variation on the site, it is unlikely that the clubhouse structure will be visible from the highway. Views of vehicle traffic, an entry sign and some lighting fixtures will be associated with the entry road. Views from some adjoining high land areas to the south (zoned for agricultural use) will includes the completed golf course and some support facilities.

C. Mitigative Measures

Several mitigative measures have been proposed to minimize the impact on visual resources at the site. During construction at the site, equipment will generally be contained in storage areas which will in most cases, be out of sight from Kamehameha Highway. To minimize a variety of impacts including visual effects, work on the entrance areas will be completed in the shortest possible time period.

To preserve existing views, vegetation clearing along the entrance, access road and golf course fairways will be limited to only those areas which area necessary. Revegetation and new landscape planting will be accomplished as soon as possible to protect bare areas.

Design of the entrance will be tasteful and complement the existing country atmosphere and style. Lighting of the entrance, access road and on-site structures will also be subdued to avoid adverse glare and other undesirable lighting effects.

4.15 SOCIAL AND ECONOMIC CHARACTERISTICS

This section includes a presentation of demographic conditions in the project area, and the potential effects of the project on population. Economic factors and employment are also considered in this section, as well as government expenditures and revenues. A brief discussion of lifestyles is also presented herein.

4.15.1 Population

A detailed demographic study was conducted for the project by Community Resources, Inc. (February 1989) and is included in Appendix R. Information from this report is summarized in this section.

A. Existing Conditions

The project site is located within the Koolauloa census district. Total population of this study area as of 1987 was estimated at 14,195. The area's population has amounted to approximately two percent of Oahu's population for decades. If the growth in area population continues at current rates, the January 1989 population would be 16,400.

The larger ethnic groups in the study area are Caucasian (38 percent), Hawaiian (23 percent) and Filipino (7 percent). Japanese (7 percent), Chinese (three percent) and other ethnic groups (21 percent) make up the remainder.

Approximately 46 percent of people in the study area have lived in the same house for the last five years. Nearly half the area's population was born outside Hawaii, and new mainland immigrants represent approximately 15 percent of the population, a proportion which is slightly below the surrounding area and the County as a whole.

B. Anticipated Impacts

There will be no residential development at this project, therefore, no resident population will be added at this site.

Population impacts involved with the golf course development will be on-site employment population and daily visitor population at the site. As discussed in greater detail in Section 4.15.2, employment at the golf course will create a daily population of between 63 to 82 employees at the Malaekahana Golf Course. By 2001, it is assumed the project will be at full employment, and 75 percent of this staff will be on-side at any moment. Visitors to the sites will consist mainly of golfers, with total average rounds of 150 per day per course. The estimated number of golfers at the course on a peak day will consist of golfers waiting to play (12), golfers on the course (72), and golfers finished playing (12). Total "de facto" population of the project (employees and golfers) will be approximately 130 to 150 people on a peak day.

C. Mitigative Measures

The project does not involve the development of new residential housing and therefore, does not require mitigative measures related to population in the area of the project.

4.15.2 Employment

This section includes a discussion of the relationship of the project to employment. Information from Community Resources, Inc. (February 1989) was utilized to compile this section, and their report is included in Appendix R.

A. Existing Conditions

As of 1980, approximately 6,115 residents of the Koolauloa districts are part of Oahu's labor force. According to the State Department of Transportation, nearly 25 percent of these workers commute more than 45 minutes, with may of these workers commuting to Honolulu. Others commute to central Oahu and Ewa. The 1980 unemployment rate for the combined study area was 4.7 percent.

The majority of the study area workforce was employed in service and white collar occupations. Agricultural workers and fishermen are somewhat more numerous than found elsewhere on Oahu, but still form only a small part of the workforce.

The major employers in the study area are the Turtle Bay Hilton and Country Club in Kahuku, and the Brigham Young University - Hawaii Campus and Polynesian Cultural Center in Laie. Several small businesses operate in Kahuku and Laie. Several agricultural operation, service stations and "cottage industry" businesses exist in this area. Introduction of the Kuilima Resort will create approximately 4,500 new jobs in the study area, however, this level will not be reached until after the year 2000.

B. Anticipated Impacts

Two types of employment opportunites will be generated by the project – construction jobs and operational jobs. Direct employment effects would be those supported by construction and consumer expenditures generated by the project. The total employment effects include the direct employment effects in addition to indirect and induced effects, which are supported through spending multipliers throughout the State.

Approximately 66 construction jobs will be available at the beginning of the project. The golf course will construction will extend for approximately two years. Jobs in construction will be broken down into golf course construction, golf course preparation and building/clubhouse construction, with over 20 jobs in each category. All construction employment is expected to be finished by 1994.

Any construction project involves both on-site and off-site employment. Off-site jobs include support personnel and administration, and are estimated as numbering 25 percent of on-site construction jobs (approximately 17 jobs). Construction further supports secondary employment generated by the purchase of materials from other businesses and the expenditure of worker's wages. Secondary employment can be estimated at 80 percent of the total on- and off-site construction jobs, based on the State of Hawaii's construction model (approximately 65 jobs).

The operational phase would begin when the golf course is open and operating. The full operation of the golf course is expected to be in place by 1994. Based on interviews with golf course and country club managers in Hawaii and California, it is estimated that the golf course project would generate between 58 to 72 full-time equivalent jobs. Some of these may be broken into part-time jobs. There would be approximately 76 to 93 indirect and induced jobs created by the project. Total employment resulting from the project will be 133 to 165 jobs.

Jobs at the project will be in the areas of grounds and maintenance, golf and pro shop operation, administration and support, and food and beverage. The great majority of the anticipated jobs will

require little technical training or experience. They accordingly will offer the characteristic advantages and disadvantages of service jobs -- relatively few high-paying skilled jobs, but easy entry for younger and/or less educated workers.

C. Mitigative Measures

The impacts of the project on employment will be beneficial to the area residents and businesses. Consequently, no mitigative measures are needed or recommended.

4.15.3 Housing

A. Existing Conditions

The housing market on Oahu is characterized by high land costs, the presence of many condominium units, and pent-up demand for housing. In the area surrounding the project sites, there are a large number of housing units that are vacant or held for occasional use (over 28 percent). The total year-round occupied units in the area is 6,586 (1980). A majority of the occupied housing units are rentals (62 percent).

No major changes have been proposed for the housing stock in the immediate area of the project. In the surrounding area, planned and proposed residential projects are largely intended for the visitor market, and not to meet the housing needs of persons now living in Hawaii.

Affordable housing for low- to moderate-income families is being constructed at Kahuku as part of two programs. The Kahuku Village Association expects to have new or rehabilitated structures on over 100 lots by the end of 1988. Another 176 homes should be available by the early 1990's. The bulk of these home sites are reserved for Kahuku residents.

The other housing development program planned in Kahuku involves the provision of up to 200 housing units as a condition of the City and County approval of the Kuilima Resort expansion (1985 approval). These are for low- to moderate income families residing in Koolauloa or the North Shore.

B. Anticipated Impacts

Development of the Malaekahana Golf Course will not include development of new residential housing. Consequently, there are no housing-related impacts.

C. Mitigative Measures

The proposed project is a golf course development and, therefore, no mitigative measures are necessary in relation to the development.

4.15.4 Government Revenues and Expenditures

A fiscal impact study was completed for the project by Decision Analysts Hawaii, Inc. (February 1989). Findings from this study are presented in this section, and the report is included in Appendix S.

A. Existing Conditions

The site is being used for grazing, which qualifies it for a property tax assessment based on the agricultural value of the land, rather than its market value. Currently, property tax on this site is $686 per year.

Current economic activity at the site is at a low level. Correspondingly, State revenues are negligible from the land.

B. Anticipated Impacts

1. Revenues

When land assessed and taxed at its agricultural value is developed, the action triggers "rollback" taxes which recover 10 years of back taxes based on the difference between taxes computed on the market assessment and the agricultural assessment, plus a penalty of 10 percent. Development of the site would trigger the rollback tax. For 1988, the tax would have been $12,684 if based on its market value, rather than its agricultural value. Subtracting the actual tax, adjusting for inflation and adding the penalty, the 10-year rollback tax would be estimated at $117,800.

Upon full development, Malaekahana Golf Course would be assessed at about $8.43 million. This is based on the property assessments for the Turtle Bay Golf Course at $425,000 per hole and $522,000 for the clubhouse. Values of other improvements such as roads, water systems, sewers and drainage are not included in this estimate.

Property taxes on the golf course would exceed $75,750 per year, based on a tax rate of $9 per $1,000. Additional revenues to the County would be derived from miscellaneous taxes and user fees. In addition, revenues would be derived from County taxes paid by employees of the golf course. However, these taxes would be offset by corresponding governement expenditures on facilties and services provided to these residents.

The State would derive an estimated $0.34 million in general excise taxes on construction expenditures for the golf course and related facilties. This estimate is based on four percent of the construction value, which is approximated by the $8.43 million property assessment.

At full development, revenues from golf operations, the pro-shops and restaurants are estimated at $2.75 million per year. This based on as estimated 150 rounds of golf per day for the golf course, and an average expenditure of $50 per golfer. The four percent general excise tax on this amount is $110,000 per year. Additional revenues to the State would derive from corporate income taxes, taxes paid by suppliers, and miscellaneous taxes and user fees.

Further State revenues would be derived from income taxes paid by employees of the golf course and excise taxes on their expenditures. However, these taxes would be offset by corresponding government expenditures on facilities and services provided to support these residents.

In summary, the County would net approximately $117,800 in rollback taxes after the project is approved, and the State would net about $0.34 million from taxes on construction expenditures. Upon full development, the State and County would net over $175,000 per year from taxes on operations.

2. Expenditures

No significant State or County expenditures are anticipated for infrastructure development, facilities or services in support of the golf course, since these items would be paid by the developer, operator and/or users.

3. Net Fiscal Impacts

A comparison of projected public revenues and expenditures attributable to the project's development yields the net fiscal impacts expected to the County and State. The County government could expect to net $71,500 per year at project stabilization in 1994. Net fiscal benefits to the State government are projected to be about $110,000 per year by 1994.

C. Mitigation Measures

Future tax revenues that will be collected by the City and County and the State are expected to offset the costs of providing some public services. No additional mitigation measures are considered necessary with respect to government expenditures.

4.15.5 Lifestyles

A. Existing Conditions

Lifestyles and values result in a large part from an area's history, geography, economic base, and the ethnic heritage of its people. The idea of "country" is one crucial concept for understanding lifestyles and values in Koolauloa. Equally important, however, is the concept of "community".

The study area is part of one of Oahu's two major regions usually considered "country" (the other being Waianae) by both the City and County and also by many residents. The region includes about 15 percent of Oahu's land area, but only about two percent of the estimated 1987 islandwide population.

However, of the area's 14,195 people (1980), nearly two out of three live in small towns with business service centers and clearly demarcated neighborhoods. These towns include Hauula, Laie and Kahuku. By contrast to these "community" dwellers, only one-third of the population live in actual "country" settings or more strip-development neighborhoods such as Kaaawa and Punaluu.

The various communities differ from one another in many ways. However, "community" dwellers generally differ from the more rural "country" residents in that their homes are less isolated and there are more typical small-town pressures for cooperation and social cohesiveness. Additionally, some the communities are or were once "company towns", resulting in some clear lines of social organization.

Ethnic factors also contribute to the country/community differences. The majority of Caucasians in the study area live in the country locals, while Filipinos tend to concentrate in Kahuku. People with South Pacific backgrounds have concentrated in Laie.

The country/community distinction is not absolute. Community residents value their country surroundings, and people living in the country areas report a sense of community also.

B. Anticipated Impacts

The Malaekahana Golf Course could potentially affect the lifestyles of some area residents in two ways. Because of the golfing facilities the project will offer, the development will supplement and expand the existing recreational activities available to area residents. The project will also bring new jobs and business to the area. The presence of these new activities, however, will be perceived by some area residents as a threat to the continuing existence of this relatively uncrowded rural setting. The added traffic and visual effects of the project could somewhat detract from this rural setting, although golf courses are often thought of as open space uses and visual amenities for an area.

The golf course will be a low intensity park use, highly compatible with the intensity of the land use and visual character of a rural or "country" area. Golf course work also fits the lifestyle of many residents in the Koolauloa area. The maintenance of golf courses is much like an agricultural operation. Golf course operators have indicated to us that they find unemployed agricultural workers to be well-qualified and suited to golf course maintenance work. A golf course is also one of the few non-agricultural uses of land which could be converted to agricultural use with little difficulty.

C. Mitigative Measures

The design and operation of the golf course is planned to complement the existing country atmosphere of the area. The intent is not for the new project to intrude on the community, but to blend into the surrounding area and become an integral part of the Koolauloa. The golfing facilities will add to the recreational-oriented lifestyle of the area.

4.16 INFRASTRUCTURE

This section includes brief descriptions of the existing infrastructure at the project site and the surrounding areas for water supply, wastewater collection, treatment and disposal. Solid waste disposal, drainage facilities and roadways are also addressed in this section. Anticipated project impacts are evaluated along with mitigative measures proposed to minimize impacts on infrastructure. Enginering Concepts, Inc. (February 1989) has prepared technical studies of wastewater management, water supply and drainage for this project, and the complete reports are included in Appendices B, D and F, respectively. Information from these reports is included in this section.

4.16.1 Water Supply Facilities

A. Existing Conditions

The existing water supply systems currently serving the area near the site include three systems: the BWS Kahuku system, the Campbell Estate water system, and the Zion Securities water system in Laie. These water systems are described in Section 4.5 and Appendix D.

B. Anticipated Impacts

The potable water demand of the Malaekahana Golf Course will be approximately 40,000 gpd. This quantity cannot be provided by the existing systems in the area because of distance and/or inadequate water supply. The developer is planning to develop a water source on the site to serve this project alone, and will have no impact on the existing water supply infrastructure in the area. The mauka location of the well on this site will not create adverse effect on other local wells.

C. Mitigative Measures

The Malaekahana Golf Course water system will not require mitigative measures to be implemented, because it will involve a development of a private water system.

4.16.2 Wastewater Facilities

A. Existing Conditions

Existing facilities for wastewater collection, treatment and disposal in the area of the project include individual cesspools and holding tanks which exist on private residential and commercial properties.

Laie has a wastewater collection and treatment system which serves the BYU Hawaii campus and the Polynesian Cultural Center, as well as portions of Laie. There are no known plans for development of an area-wide wastewater collection, treatment and disposal system for the Malaekahana area.

B. Anticipated Impacts

The Malaekahana Golf Course support facilities will generate approximately 20,000 gpd of wastewater that will be handled by an on-site collection system and directed to an on-site wastewater treatment and disposal facility. Secondary wastewater treatment will be conducted by activated sludge process, and sludge residue will be transported off-site (by permit) to one of four municipal treatment facilities, described earlier. The Malaekahana Golf Course will create only a minor adverse impact on public wastewater treatment and disposal facilities, resulting from the need to treat and dispose of 540 gpd of sludge residue from the project's treatment plant.

C. Mitigative Measures

Because public wastewater facilities are expected to be minimally affected by this project, there will be no mitigative measures proposed for that purpose.

Back-up measures will be taken with the Malaekahana Golf Course wastewater treatment and disposal facilities to ensure the safety and public health concerns of the community, in the case of a mechanical or electrical failure. The following list identifies the safeguards proposed for the wastewater treatment facility and sewage pumping stations.

- Provisions to incorporate odor control measures will be implemented, if necessary, to vent gases at the wastewater treatment facility headworks to chemical scrubbers to remove odors.
- Generators will be installed to provide back-up power in case of electrical power outage.
- Storage vaults will be used for wastewater overflow and storage.
- Redundancy will be employed at the sewage pump station in the form of dual tanks and back-up pumps.
- Alarms and telmetering will be installed to provide warnings to indicate high/low liquid level conditions, equipment malfunction and other emergency conditions.

4.16.3 Solid Waste Disposal Facilities

A. Existing Conditions

Only small amounts of solid waste are presently generated by the agricultural uses on the site. This waste is either landfilled on-site (organic agricultural wastes) or carried off-site by the farm workers to transfer stations or public or private landfills.

B. Anticipated Impacts

At full development of the golf course and support facilities, the entire project is expected to generate between 750 and 1,000 lbs. per day of refuse daily. Solid waste will be collected by private collection companies and disposed of at public and private landfills. This will place only a small additional demand on City and County waste disposal facilities.

C. Mitigative Measures

It is expected that City and County revenues derived from the completed project will be sufficient to finance the project's fair share of the cost for major capital improvements, such as solid waste disposal facilities. The County has constructed a solid waste transfer station in Kawailoa, which is currently operating. Solid waste collected at this transfer station will be hauled either to a windward sanitary landfill site for disposal, or the proposed refuse-to-energy plant in Campbell Industrial Park.

4.16.4 Drainage Facilities

A. Existing Conditions

Public drainage facilities are not installed on or adjacent to the site. Drainage on the site involves overland runoff and no intermittent streams. A reservoir on the site collects runoff from a portion of the site.

B. Anticipated Impacts

At the project site, an increase in storm water runoff will be created by the development of some impervious surfaces such as roads and buildings. Details regarding drainage impacts are discussed in Section 4.6.1.

C. Mitigative Measures

Development of the golf course and support facilities at the site will not place any additional burden on public drainage facilities along Kamehameha Highway, or create any new potential flood hazards for properties in the area of either site. Control of runoff within each site will be achieved through the construction and operation of detention basins. Storm water runoff will be detained during major storms which will effectively maintain existing runoff conditions.

Public drainage facilities will not be affected by the project, therefore, no additional measures are proposed beyond the planned on-site detention basins.

4.16.5 Roadways

A. Existing Conditions

The project site has a narrow connection to Kamehameha Highway, next to a Corporation Yard. Other road connections to the highway in the area of the project include the entrance to the Malaekahana State Park, located north of the site entrance. Several other connections exist in the area serving residences and small commercial operations to the south.

The condition of roadways in the area of the site is rough pavement, and in some areas, roadways are overdue for maintenance. Most roadways have grass shoulders and are paralleled by drainage ditches. Guide rails are present along some bends in the highway. Lighting and signage are also present on the highway.

B. Anticipated Impacts

The impact of the development of the golf course and support facilities on local roadways will consist of both construction impacts and opertional impacts. The short-term effects of the project will be due to

construction activities, which are not expected to be significant. Delays on Kamehameha Highway due to roadway improvements for the project entrance will be minor.

Long-term operational impacts of the project will not cause a substantial adverse effect on roadway surfact conditions. as compared to other traffic added to the area's roads by the project's completion (1994), the vehicles added by the project will represent approximately 5.0 percent of all vehicles on the road at the site. This traffic volume is not expected to create a substantial effect on the roadway facilties.

C. Mitigative Measures

Roadway surfaces affected by construction of the project entrance will be repaved once construction is completed. Approved traffic control plans will be followed during the construction period to avoid unnecessary delays to traffic flow.

4.17 PUBLIC SERVICES

Public services for education, police and fire protection, health care/hospitals and recreational facilties are all addressed in this section. Existing conditions, anticipated impacts and mitigation needs were evaluated based on existing information and conversations with respresentatives from public services entities.

4.17.1 Schools

A. Existing Conditions

The nearest elementary school is the Kahuku Elementary/High School (grades kindergarten to twelve) is located in Kahuku Village. Laie Elementary School (grades kindergarten through six) is located in Laie village. These are the closes public shcools to the two sites.

B. Anticipated Impacts and Mitigative Measures

The proposed project includes the development of a golf course and related support facilities at the site. This development will include no new residential development, and will add no new school-age children to the local schools. No mitigative measures are considered necessary since there will be no impact on local schools. Junior golfing programs may be established to encourage golf education and allow for school golf team training, practice and competition.

4.17.2 Police Protection

A. Existing Conditions

The project area is located in the Honolulu Police Department, Area 2, District 4. The region encompasses Kailua, Kaneohe and Kahuku. Police protection is provided to the area of the golf course site from the Kahuku substation.

The Kahuku Substation patrols from Kaaawa to the Haleiwa Bridge. The police force for the area is six regular duty officers for each shift. Under normal conditions where men area available, response time is five to ten minutes to locations near each site.

B. Anticipated Impacts

It is estimated that a visitor and working population of approximately 108 to 122 people will introduced to the site by the golf course. There will be an occasional and sometimes unavoidable demand for police services at the site. During a large event which may be held at the golf course, additional police protection would be required to control traffic and pedestrains.

C. Mitigative Measures

The developer/owner will take measures to provide security on-site during construction. In addition, private security services will be provided within the golf course site upon completion. Besides private security measures, additional private manpower would be provided by event sponsors, and they would coordinate with local police officials. Tax revenues generated by the project should more than cover the costs of additional police services attributable to the development.

4.17.3 Fire Protection

A. Existing Conditions

The Kahuku Fire Station is nearest to the site, approximately two miles from the project site. The Hauula Fire Station is the next closest fire station to the site, approximately four miles south. From the Kahuku Fire Station, fire trucks are expected to be able to access these sites in about five minutes. Back-up fire fighting support for the site could be expected within approximately 10 minutes.

B. Anticipated Impacts

The golf course will include one clubhouse and a maintenance building. These facilities will require fire protection from the local municipal fire department.

C. Mitigative Measures

Water lines and storage with adequate fire fighting capacity will be installed by the applicant within the site. The location of fire hydrants will be reviewed and approved by the BWS and the Fire Department.

Buildings and facilities within the project will be designed with adequate attention to the principles of fire safety, and will also be built to follow necessary City and County fire protection standards. Safety precaution measures such as the installation of sprinkler systems and smoke detection equipment will also be undertaken.

The additional potential demand on fire protection services is not expected to place an unusual burden on the existing fire department or require the provision of additional facilities or equipment.

4.17.4 Health Care/Hospitals

A. Existing Conditions

The nearest health care facility is the 26-bed Kahuku Hospital located in Kahuku Village. This facility also provides ambulance service and a helipad for medical evacuation by helicopter. The Kahuku Hospital offers comprehensive medical services on a 24-hour per day basis. Other facilities at the hospital include a private dental office and a medical office/clinic with five physicians in private practice.

B. Anticipated Impacts and Mitigative Measures

The visitors and workers at the Malaekahana Golf Course can be expected to place a slight demand on the operations of the Kahuku medical facilities. The impact upon these facilities will be slight since there will be no residents at the site, possibly greatest during the construction period. No mitigative measures are considered to be necessary.

4.17.5 Recreational Facilities

A. Existing Conditions

There are several City and County recreational facilities and a State recreational facility located in the general area of the project site. Private commercial recreational attractions are also located in the area. The beaches and ocean are major recreational attractions in this part of Oahu.

The City and County of Honolulu has a nine-hole golf course located in Kahuku village, which is very popular with local people and tourists. The City and County also has lifeguard-protected ocean beaches located in Sunset Beach and Hauula. The Malaekahana State Recreation Area is located makai of the Malaekahana Golf Course site. Other beach parks are planned to be developed at two sites at the Kuilima Resort and at Waialee.

The Polynesian Cultural Center in Laie is a heavily-visited commercial recreational attraction located in the area of the project site.

B. Anticipated Impacts

Development of the Malaekahana Golf Course will create new recreational facilities for golfing. The golf course will be daily-fee course which will be available to the public. The new golf course will have a beneficial effect on golf course availability in the area, although the Kuilima Resort is planned to reserve a significant percentage of available tee times at the course.

C. Mitigative Measures

No mitigative measures are proposed because no adverse effect is expected to occur with respect to use of public recreational facilities. Overall, the project will have a positive effect on the availability of recreational opportunities in the North Shore and upper windward coast area.

4.18 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The Malaekahana Golf Course will create limited adverse environmental impacts which cannot be fully mitigated by the measures planned to be implemented at the site. The following list includes those short-term and long-term impacts that are expected to be unavoidable, including those that are minor in significance.

4.18.1 Unavoidable Adverse Short-Term Environmental Impacts

1. Soils will be temporarily disturbed by grading, excavation and mounding activities at the site during construction.

2. Temporary increases in soil erosion will also result from construction operations, and minor amounts of soil will be carried off-site in surface runoff water.

3. Vegetation will be removed from 119 acres on the project site to allow for golf course and infrastructure construction.

4. Wildlife utilizing the site and immediate adjacent areas will be displaced by construction activities into nearby woods and fields. Construction operations will temporarily discourage wildlife from feeding at or migrating through the site.

5. Operation of construction equipment, trucks and worker vehicles may temporarily impede traffic in the area during the construction period.

6. Negligible releases of air contaminants will occur from construction equipment. Emissions of fugitive dust may occur during dry periods as a result of construction operations.

7. The visual character of the area will be affected by construction activities and by the presence and operation of construction equipment.

8. Minor increases in noise levels may result from construction activities.

4.18.2 Unavoidable Adverse Long-Term Environmental Impacts

1. Modifications to the current topography will be made at the site to accomodate project development.

2. There will no longer be the potential to use the 228 acres for agriculture.

3. Up to an average of 0.52 million gallons of groundwater will be utilized each day for irrigation of the golf course. Up to 40,000 gpd of potable water will be used.

4. Small contributions of nitrogen coumpounds will enter groundwater from treated wastewater effluent irrigation and fertilizer application.

5. Stormwater runoff from the project site will contain some minor quantities of fertilizer nitrates and pesticides.

6. Two archaeological sites on the project site will be altered by construction of the golf course and support facilities.

7. Vehicles associated with the golf course using Kamehameha Highway and other local roadways will have a minor effect on traffic flow.

8. Some additional noise will be generated by the golf course traffic which will cause a very slight increase in noise levels along Kamehameha Highway.

9. Air quality at area roadways will recieve a minor addition of traffic-related emissions.

10. Views of the project site will be changed to include golf course and some structures and roadways.

11. There will be an additional 1,000 lbs. per day of refuse generated by the project which must be accommodated by public solid waste management facilities.

12. Minor demand on public services will result from the golf course development, including police and fire protection.

4.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The construction and operation of the proposed golf course will involve the irretrievable commitment of certain natural and fiscal resources. The most major resource commitment will be the 228 acres of land required for the development of the project. Money, construction materials, manpower and energy will all be expended to complete construction and operate these facilities. The impact of utilizing these resources should, however, be weighed against the economic benefits to the residents of the region, County and State, and the consequences resulting from not proceeding with the project.

Approximately 90 acres of the 228 acres at the site will be used for the golf course, including areas for the golf course fairways, greens, tees and roughs. Approximately 30 acres will be used for the clubhouses, driving ranges, maintenance areas, roadways, and wastewater treatment facilities. The remaining 108 acres will remain as open space in areas around the golf course holes, support facilities and property boundary. The lands involved with this project will not be available for agricultural use as long as the golf course exist, however, golf course are landscaped areas which are compatible with agricultural and rural uses. Future agricultural use of the site would be questionable since studies conducted for the project site have shown that agriculture is infeasible due to adverse because of site conditions and poor marketability of crops which could be grown there.

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 increase in economic activity and appreciated value of the golf course.

Beyond the on-site improvements constructed and operated by the developer, there will be an increased useage of public facilities such as the Kamehameha Highway for project-related traffic, and greater load on the City and County facilities for solid waste and sludge disposal.

The commitment of resources required to accomplish the project includes labor and materials, which are mostly unrenewable and irretrievable. The operation of the project will also include the consumption of potable water and petroleum-generated electricity which also represents irretrievable commitments of resources.

4.20 SUMMARY OF UNRESOLVED ISSUES

During the preparation of the Final Environmental Impact Statement, some issues were raised which have not yet been resolved. Because the project has recently been planned and introduced to the community over the last year, details of the project are just beginning to be addressed by agencies and the public. The review of the Draft EIS and subsequent public comment period has allowed for the discussion of public issues and concerns regarding the project. Currently unresolved issues include the following.

1. Golfing rates for the golf course, and resident and local discounts for golfing at this course.

2. Any other specific, negotiated community benefits.

3. Impact of the golf course on property values, taxation levels and area development pressures.

These and other concerns that may arise in the future will be addressed in the review and approval process. Interested parties from affected communities will be given extensive opportunities to be involved in their resolution.

SECTION 5
Alternatives

5.0 ALTERNATIVES

Alternatives for the project have been considered which would utilize the land at the Malaekahana site for several different purposes. A No-Action Alternative was considered, which would leave the project site as it is presently being used. An Agricultural Alternative was evaluated for the site, which would initiate more intensive agricultural uses. Development of the site as an Agricultural Subdivision was also considered as a potential alternative.

The three alternative concepts are evaluated in this section for each of the environmental factors addressed in Section 4. A comparison of each alternative with the proposed project is also included.

5.1 NO-ACTION ALTERNATIVE

The no-action alternative would involve no changes to the existing project site for the foreseeable future. The agricultural use for grazing of portions of the site would likely continue for the near future.

Access to the site would be restricted under the no-action alternative. To avoid disturbance of agricultural grazing activities and to eliminate any trespassing, no public access to the site would be allowed. The restricted access would also be necessary for safety and liability reasons.

With respect to the environmental characteristics of the project site, its topography, soils, surface water, ground water, runoff, flooding, vegetation and wildlife would not change. Other factors that would not be affected under the no-action alternative would include archaeological resources, traffic, noise, air quality, population, employment, government expenditures, infrastructure and public services.

The lack of the new golf course and support facilities would not create additional employment, personal income and recreational opportunities for residents of the area. It would not provide the desired variety of golfing opportunities for visitors staying at the Kuilima Resort. This is considered important to maintaining appropriate occupancy levels at the resort.

The generation of property taxes by the site would continue at the existing levels ($686 per year). The no-action alternative would force the owner to continue paying property taxes without gaining an offsetting income from the site. It is possible that the State or County could arrange to purchase this land for conservation purposes. However, there are no known plans for this to occur.

As compared to the proposed project, the no-action alternative would create less environmental effects. Social and economic benefits, as well as recreational benefits, would not be generated by the no-action alternative.

5.2 AGRICULTURAL ALTERNATIVE

This section presents a discussion of the existing agriculture that occurs on the project site, and the potential for establishing more intensive agricultural uses, instead of the proposed golf course. An agricultural feasibility study was prepared for the site by Decision Analysts Hawaii, Inc. (February 1989). Information from this report is included in this section, and the entire report is included as Appendix H.

Current agricultural activity on the site is limited to cattle and horse grazing, with approximately 100 cattle and 40 horses. Gunstock Ranch is a tenant that conducts this type of agriculture. No crop cultivation is presently undertaken within this site.

Soil analyses for agricultural purposes have identified soils on the project site as suitable for agricultural purposes in some areas, and deficient in others. Approximately 25 to 42 percent (40 to 100 acres) of the site is considered as acceptable for agriculture. For this analysis, 34 percent (78 acres) was considered as acceptable land for agriculture, if irrigated. The site has substantial topographic variations that could present problems of economies of scale, and would increase the cost of infrastructure for crop production.

Existing water availability would further limit the actual agricultural potential of the site. Because the seasonal distribution of precipitation is uneven, irrigation could be required in any month of the year. Assuming all 78 acres of the Malaekahana site would be irrigated, the water system needed for this area would need to be capable of delivering approximately 0.4 mgd, based on a usage rate of 4,500 gallons per acre per day (Scott, August 1988).

None of the water required for the Malaekahana site could be adequately provided by existing water systems. The remainder of irrigation water requirements for agriculture at the site would have to be satisfied by new project wells that would be costly to develop.

Existing limited market potentials for crops that are ecologically adapted to the site's soils and climate would also constrain viability of expanded agriculture in this area. The crops grown on this site would be at an economic disadvantage as compared to crops grown at other locations.

Anticipated Impacts

It is estimated that approximately 78 acres of the project site combined are ecologically adaptable to agricultural production. Impacts of agricultural use on topography would not be substantial, because of leveling of most of this 78-acre area has occurred under previous agricultural development. Benching of some slopes could be required for agricultural production and construction of access roadways. The impact of grading and topography changes would be less than the proposed project.

Vegetation clearing to allow for agricultural development of 78 acres on the site would result in soil erosion over much of the site. Total soil erosion would be substantial -- much greater than would occur under the proposed golf course development -- because of the exposure of soils. Suspended clay soil particles would be carried off the land by stormwater runoff.

Water use for irrigation of the 78 acres on the site would be extensive, and development for that purpose may not be economically feasible, depending on the types of crops planted. New wells would be required for agriculture, and water use would be expected to be similar to that required for the proposed project. Fertilizer and pesticide use would be two to three times greater for agricultural use of this site.

Drainage conditions on the site would be affected by crop cultivation, and runoff would be increased due to the elimination of ground cover vegetation over 78 acres on the site. Unless extensive measures would be taken to control runoff, lowland areas off-site and, possibly, the ocean would be adversely affected by storm runoff. The potential effect on these downstream areas could include added silt, nitrogen compounds and pesticides contained in overland runoff discharge waters, all of which would be greater under this alternative than under the proposed project.

Drainage controls would not be as effective for the agricultural development as compared to the proposed project.

Vegetation clearing of 78 acres over the site for the agricultural alternative would also eliminate wildlife habitat in those areas. Replanting of cleared areas would be done to accomodate crop production and grazing areas, and would not provide stable wildlife habitats. In comparison, planting of the golf course for the proposed project will be done with indigenous plant species in many places, and new water habitat will be established. Both of these measures will enhance wildlife habitats on the land.

Development of intensive agricultural use on the project site would have to consider the preservation of existing archaeological resources, and would probably have a similar effect on archaeological resources as would the proposed golf course development.

With the agricultural alternative, the project entrance and access road would be located in a fashion similar to the proposed project, including an entrance onto Kamehameha Highway. Traffic impacts on Kamehameha Highway travel due to the agricultural project would be substantially less than the proposed project, because only a small worker population and several trucks would utilize the project entrance daily.

Agricultural use of the project area would probably require heavy equipment operation during planting and harvest periods, which would generate noise during daytime periods. Truck operations on the project site and Kamehameha Highway would create some noise effects. As compared to the proposed project, noise impacts would be less because of fewer vehicle trips generated by the agricultural activities.

Fugitive dust, crop burning smoke (possibly) and heavy equipment exhaust emissions would be created by operations required for agriculture. There would be few worker and resident vehicles added to local roadways and little related exhaust emissions as a result of the agricultural development. Air quality impacts in the vicinity of the sites due to dust and (possibly) smoke would be greater for the agricultural land use than for the proposed project.

Areas at higher elevations on the site would be cleared and planted, creating views of agricultural activites on the slopes, as compared to landcaped golf course areas in the proposed project.

The agricultural use of the land would not increase the population of the area. It would provide employment to a relatively small number of people. The proposed project would generate many more jobs and higher personal income than the agricultural development.

Few, if any, government expenditures and revenues would be involved with the agricultural development because no community services would be required. Although the proposed project would involve greater government expenditures than agricultural use, it will also generate greater revenues and should provide a tax surplus. The tax surplus under agricultural use would be substantially less than that generated by the proposed project.

Some infrastructure would be required by the agricultural alternative. There could be a need for potable water supply for irrigation via municipal sources, however, irrigation water could be derived from on-site wells. Little domestic wastewater or solid waste would be generated by the agricultural development. Drainage facilities would have to be constructed to control runoff within the project. Less impact on infrastructure would occur as a result of agricultural use of the project site.

No impact on public services would be expected to result from the agricultural land use, as opposed to a small effect by the proposed project. Less property taxes would be paid on this land if it is placed into active agriculture. Approximately $2,500 in property tax would be paid annually under this alternative, versus over $75,000 for the proposed project.

5.3 AGRICULTURAL SUBDIVISION ALTERNATIVE

Subdivision of the project site under the existing AG-2 General Agricultural District zoning classification at would involve the creation of a total of approximately 48 two-acre minimum lots. There would be a requirement for agricultural use of some type on these lots, and farm dwellings which could be constructed on each lot as allowed under the City and County of Honolulu Land Use Ordinance (LUO). No zoning change would be required for this alternative development, however, several other permit approvals would be required.

In support of the agricultural subdivision development, various infrastructure features would be constructed at the site. Approximately 24 acres at the site would be utilized for the construction of roadways and the installation of utilities. Water, sewage, drainage and road systems would be designed to City and County of Honolulu standards for agricultural subdivisions. Utility infrastructure would be dedicated to the City and County for ownership and maintenance.

Anticipated Impacts

Extensive topographic modifications would be required to develop the subdivision of 48 agricultural lots and its support infrastructure. Topography changes for this alternative would probably be similar to that required for the proposed golf course due to extensive grading requirements for both. However, greater soil disturbance would occur under the agricultural subdivision plan.

Water resources would be affected under the alternative, including extensive potable water requirements estimated at 4,000 gpd per lot, or a total of approximately 0.2 mgd. This potable water requirement would be less than the average amount required for the proposed project. (In theory, separate potable and non-potable water systems could be installed, potentially reducing the potable water demand to less than 0.1 mgd. However, the added costs of serving 48 separate lots with dual water systems would be prohibitive. Also, the State Department of Health has to date prohibited the installation of dual systems within subdivisions).

In terms of water quality, fertilizers and pesticides would be applied to individual lots, and stormwater runoff would include some minor amounts of these contaminants. Within the agricultural subdivision there would be less control over, and knowledge about, proper pesticides and fertilizer usage at individual lots. As compared to the golf course, the 48 agricultural lots would have the potential to create a greater impact. Each of the 48 lots in this alternative would be required to conduct some type of agriculture, and this activity would be under the control of many more individual landowners than would be expected under the proposed project.

Runoff from the agricultural lot development would be greater since it would involve more roadways and developed surfaces than under the proposed development. The subdivisions would have to either include more extensive detention facilities to control runoff than will be required for the golf course, or an increase in runoff downstream of the project site would have to be acceptable.

Vegetation clearing involved with this alternative would be greater than for the proposed golf course project due to site clearing required for residential development, agricultural areas on each lot, and extensive infrastructure development. Wildlife effects under this alternative would also be greater than the proposed project, albiet not significant.

Archaeological resources could potentially be affected to a greater extent under this alternative, as compared to the proposed project, because of the individual lots being developed. Private ownership of valleys and bluff sides will be more conducive to the disturbance of existing archaeological remains.

Traffic generated by the agricultural subdivision would be less than the traffic generated by the golf course. Peak hour vehicle trips for the alternative would be approximately 43 trips (ingress and egress), as compared to 78 trips (ingress and egress) for the proposed project.

Noise effects of the alternative would involve construction effects and operational effects from traffic and maintenance activities. Some of the noise generated by the alternative would be similar to that generated by the proposed project, due to residential vehicle traffic and infrastructure maintenance requirements.

Air quality effects of the agricultural subdivision would involve construction and operational activities. Construction of this alternative project would be comparable to the proposed project in terms of equipment operations for clearing, grubbing, grading and building. Traffic from future operations would generate slightly greater air quality effects under the proposed project. Cultivation activities on the agricultural lots will introduce more particles into the air than can be expected from golf course maintenance operations.

Visual resources would be affected to a greater extent under the alternative plan, as compared to the proposed project. Lots with farm dwellings would possibly be visible from Kamehameha Highway at the site. The view of these structures would create a much more urbanized appearance to the site as compared to the golf course in the proposed project.

Full-time residential population of 97 to 138 persons at the site would result from the agricultural subdivision alternative. No residential development is involved with the proposed project.

Infrastructure requirements of the agricultural subdivision would be substantial, and greater than the proposed project. Domestic wastewater generation would be greater under the alternative plan due to the residential component, and internal roadways would be necessary to access homes.

Public services that would be required by the alternative development would include schools, police and fire protection, health care and recreational facilities. The alternative plan would generate more school children and demand upon other public services and facilities than would the proposed project.

An agricultural subdivision would generate much less annual property taxes to the City and County as that created by the proposed project. The total annual property taxes generated by the site would be about one-half of that generated by the proposed project. Government

Runoff from the agricultural lot development would be greater since it would involve more roadways and developed surfaces than under the proposed development. The subdivisions would have to either include more extensive detention facilities to control runoff than will be required for the golf course, or an increase in runoff downstream of the project site would have to be acceptable.

Vegetation clearing involved with this alternative would be greater than for the proposed golf course project due to site clearing required for residential development, agricultural areas on each lot, and extensive infrastructure development. Wildlife effects under this alternative would also be greater than the proposed project, albiet not significant.

Archaeological resources could potentially be affected to a greater extent under this alternative, as compared to the proposed project, because of the individual lots being developed. Private ownership of valleys and bluff sides will be more conducive to the disturbance of existing archaeological remains.

Traffic generated by the agricultural subdivision would be less than the traffic generated by the golf course. Peak hour vehicle trips for the alternative would be approximately 43 trips (ingress and egress), as compared to 78 trips (ingress and egress) for the proposed project.

Noise effects of the alternative would involve construction effects and operational effects from traffic and maintenance activities. Some of the noise generated by the alternative would be similar to that generated by the proposed project, due to residential vehicle traffic and infrastructure maintenance requirements.

Air quality effects of the agricultural subdivision would involve construction and operational activities. Construction of this alternative project would be comparable to the proposed project in terms of equipment operations for clearing, grubbing, grading and building. Traffic from future operations would generate slightly greater air quality effects under the proposed project. Cultivation activities on the agricultural lots will introduce more particles into the air than can be expected from golf course maintenance operations.

Visual resources would be affected to a greater extent under the alternative plan, as compared to the proposed project. Lots with farm dwellings would possibly be visible from Kamehameha Highway at the site. The view of these structures would create a much more urbanized appearance to the site as compared to the golf course in the proposed project.

Full-time residential population of 97 to 138 persons at the site would result from the agricultural subdivision alternative. No residential development is involved with the proposed project.

Infrastructure requirements of the agricultural subdivision would be substantial, and greater than the proposed project. Domestic wastewater generation would be greater under the alternative plan due to the residential component, and internal roadways would be necessary to access homes.

Public services that would be required by the alternative development would include schools, police and fire protection, health care and recreational facilities. The alternative plan would generate more school children and demand upon other public services and facilities than would the proposed project.

An agricultural subdivision would generate much less annual property taxes to the City and County as that created by the proposed project. The total annual property taxes generated by the site would be about one-half of that generated by the proposed project. Government

expenditures for this development could be greater, as compared to the proposed project, because of the households that will need to be provided with public services.

SECTION 6

Relationship to Existing Policies & Plans for the Affected Area

6.0 RELATIONSHIP TO EXISTING POLICIES AND PLANS FOR THE AREA

This section includes a discussion of the relationship of the project to the objectives and policies of the Hawaii State Plan, the City and County of Honolulu General Plan, and the City and County Koolauloa Development Plan.

6.1 HAWAII STATE PLAN

This section includes an assessment of the conformity of the reclassification to the applicable goals, objectives and policies of the Hawaii State Plan, Chapter 226, HRS, and applicable priority guidelines and functional plan policies.

6.1.1 Objectives and Policies

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

(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.

Section 6(b): Applicable policies:

(2) Promote Hawaii as an attractive market for environmentally and socially sound investment activities that benefit Hawaii's people.

(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 project is expected to generate between 58 and 72 full-time equivalent jobs upon completion, which is anticipated to be about the year 1994. The Koolauloa District has a slightly higher than average unemployment rate at 4.7 percent (U.S. Bureau of Census, 1980). Thus, the jobs expected to be generated from the construction and operation of the golf course, together with those generated by the development of the Kuilima Resort, should eliminate the current shortage of job oppportunities in Koolauloa. Golf course jobs represent a different type of work opprotunity than is offered by most visitor facilities (i.e. hotels, shops), and will be less vulnerable to fluctuations in the visitor industry market.

Because of Hawaii's distinct geography, tropical climate and central Pacific location, it is an attractive market for real estate investment. The project design is environmentally and socially sound, compatible with the rural character of the area, and will benefit Hawaii's people. The aloha spirit indiginous to the area and the scenic beauty of the site can be seen both as a resource and an asset of the project, to be protected and promoted by the developer.

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

(1) Prudent use of Hawaii's 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.

(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii.

(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: The subject site has a distinct physical environment including topography and natural resources. The golf course is a very low intensity development and will be designed with consideration of the natural features on the site and, where possible, their preservation. By maintaining 109 acres of open space, substantial preservation of the natural environment on the site will be achieved.

No rare or endangered plant or animal species are found on the project site.

The development of the golf course, in addition to providing a public recreational facility, will allow enjoyment of the natural environment of the site and views of the surrounding lands, mountains and ocean.

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

Enhancement of Hawaii's scenic assets, natural beauty, and multicultural/ historical resources.

Section 12(b): Applicable policies:

(1) Promote the preservation and restoration of significant natural and historic resources.

(2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities.

(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.

(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. Scenic views and open space will be

maintained and enhanced. The proposed golf course will complement the rural character of the Koolauloa area.

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 environment 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 project site will be properly managed. Nearly all of the land will be reserved in undisturbed and recreational open space. The project will not stress the potable water resource capabilities of the aquifer. Stormwater runoff will be controlled through the use of detention basins and other measures, so that total runoff with the project will not exceed existing conditions. Soil erosion will be less than under existing conditions. Fertilizer and pesticide application at the golf course will be professionally managed to ensure that there are no adverse impacts on groundwater.

Noise and air quality levels at the project will be well within government standards. The architecture of the clubhouse will be a country style in recognition of the rural surroundings.

Section 17(a): Objective for facility systems - transportation:

A statewide transportation system consistent with planned growth objectives.

Section 17(b): Applicable policies:

(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment.

Discussion: In order to alleviate the expected traffic increase associated with the development, the project entrance road will have separate turning lanes onto Kamehameha Highway with proper signs and lighting for recognition. Shuttle buses will also be available for those golf course users (approximately 50 percent of the total) who will be coming from the Kuilima Resort.

6.1.2 Priority Guidelines

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

Economic Priority Guidelines:

Section 103 (e)(2):

Encourage the improvement of irrigation technology and promote the use of non-potable water for agricultural and landscaping purposes.

Discussion: The project proposes to use water drawn from on-site wells for irrigation of the golf course and other landscaping purposes. Refer to Section 4.5 and Appendices C and D.

Land Resource Priority Guidelines:

Section 104 (b)(2):

Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

Discussion: As previously noted, the site contain lands which are marginal and non-essential for agricultural use due to poor soil types, and some steep slopes and gullies that exist on these sites. The proposed "urban" uses are of very low intensity and appropriate to the rural character of the area.

Section 104 (b)(6):

Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces.

Discussion: The applicant will build necessary infrastructure such as turning lanes from the project entrance, on-site roadways, potable and irrigation water supply systems, a wastewater treatment and disposal system, and drainage and erosion control systems.

Section 104 (b)(13):

Protect and enhance Hawaii's shoreline, open spaces, and scenic resources.

Discussion: A total of approximately 109 acres, or approximately 47 percent of land, will be undisturbed open space, with the remaining acreage all being outdoor recreational land use (golf course, driving range and support facilities). The scenic views of and from within the site will be maintained and enhanced as a natural resource and asset.

6.1.3 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 to the relevant State Functional Plan objectives and implementing actions 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) (c). 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: Various soils surveys and classifcations systems provide evidence that the land within the project site is of fair to marginal agricultural importance (as discussed in Section 4.3 and Appendix G). A study of the site by Decision Analysts Hawaii, Inc. (February 1989) concluded that commercial agricultural operations would be economically infeasabile. The very limited agricultural use of the project site, despite the fact that the land is leased for agricultural use, supports this conclusion. As noted in Section 6.1.1, implementation of the proposed project would fulfill objectives and policies for the economy in general.

State Recreational Functional Plan

The primary purpose of the project is to provide recreational facilities -- an 18-hole golf course and a golf driving range. All facilities will be open to the public.

State Transportation Functional Plan

None of the policies or implementing actions in this functional plan address specific developments such as the proposed project. The overall objective of the plan is to provide for the efficient, safe, and convenient movement of people and goods. The impacts of the proposed project on existing transportation facilities are addressed in Section 4.11.

State Tourism Functional Plan

The policies and implementing actions of this functional plan deal with tourism promotion, the development of visitor promotion, the development of visitor accommodations, employment and career development, and community relations. No references to the independent provision of recreational facilities are included.

The proposed project is intended to provide golfing opportunities for both residents of Oahu and visitors, with primary emphasis to Kuilima Resort visitors. By helping to attract visitors to the Kuilima Resort and other resort areas on Oahu, the project will contribute to the health and viability of the State's visitor industry. The success of the project will be especially important to the long-term health and viability of the Kuilima Resort.

State Health Functional Plan

The State Health Functional Plan focuses primarily on public health programs under the jurisdiction of the State Health Department. Several of the implementing actions relate to operating Department of Health permit programs to which the proposed project is subject. 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

Almost all 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 Land Functional Plan

The project site does not include any conservation lands. Consequently, the implementing actions of the State Conservation Functional Plan do not pertain to the proposed project.

State Water Resources Development Functional Plan

This functional plan primarily affects State operations. The proposed water supply system for this project is discussed in Section 2.1 and Appendix D.

The remaining functional plans -- State Education Functional Plan, State Higher Education Functional Plan, and State Energy Functional Plan -- are not directly relevant to the proposed project.

6.2 GENERAL PLAN FOR THE CITY AND COUNTY OF HONOLULU

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

6.2.1 Economic Activity

Objective A:

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

Objective A. Policy 1:

Encourage the growth and diversification of Oahu's economic base.

Discussion: The proposed project will generate two types of employment opportunities, those in construction and those in operations. An estimated 58 to 72 on-site operational jobs will be created by 1994. There will be another 63 to 97 indirect and induced jobs generated by the project. Construction jobs over a ten-year period should result in 65 positions up to 1994. This employment will contribute to the overall economy through additional income and resulting taxes and spending. Refer to Section 4.16.2 and 4.16.4 of this document.

Objective B:

To maintain the viability of Oahu's visitor industry.

Objective B, Policy 8:

Preserve the well-known and widely publicized beauty of Oahu for visitors as well as residents.

Discussion: The North Shore and Koolauloa is known worldwide for its beaches, surf, rural setting and natural beauty. The proposed golf course will be designed in a way that will complement the area's rural setting. Views of the project will include rolling hills and plains on golf holes interspersed with wooded and shrub areas. Views from the site will yield panoramic mountain and ocean views at many locations.

Objective B, Policy 9:

Encourage the visitor industry to provide a high level of service to visitors.

Discussion: A major attraction of Hawaii for many visitors is the opportunity to play golf in such a magnificent setting. This is especially important for resorts like Kuilima, where the climate is at times not as attractive for water-related activities as at resort destinations located along leeward and southern shores.

At present, there is a serious shortage of golfing opportunities for visitors and residents alike. The proposed golf course will greatly improve the level of recreational services available to residents, to Oahu visitors in general, and especially to visitors staying at the Kuilima Resort.

Objective C:

To maintain the viability of agriculture on Oahu.

Objective C, Policy 5:

Maintain agricultural land along the Windward, North Shore, and Waianae coasts for truck farming, flower growing, aquaculture, livestock production, and other types of diversified agriculture.

Discussion: Agricultural land at the project site will be replaced by a golf course as a result of this project. The proposed golf course is a low intensity park use, highly compatible with the intensity of the land use and visual character of a rural or "country" area. The maintenance of golf courses is much like an agricultural operation. In addition, a golf course is also one of the few non-agricultural uses of land which could be converted to agricultural use with little difficulty.

6.2.3 Natural Environment

Objective B:

To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.

Objective B, Policy 4:

Provide opportunities for recreational and educational use and physical contact with Oahu's natural environment.

Discussion: The proposed golf course will offer a recreational activity that can also put one into direct contact with Oahu's environment. Golfers and visitors will be able to experience the scenery of the North Shore and upper Windward Coast.

6.2.4 Transportation and Utilities

Objective B:

To meet the needs of the people of Oahu for an adequate supply of water and for environmentally-sound systems of waste disposal.

Objective B, Policy 1:

Develop and maintain an adequate supply of water for both residents and visitors.

Objective B, Policy 5:

Provide safe, efficient, and environmentally sensitive waste-collection and waste disposal services.

Discussion: A separate, private water system will be developed to serve the Malaekahana Golf Course, as discussed in Appendix D. The system will be designed and operated in accordance with State Department of Health regulations.

If approved by the various regulatory agencies, wastewater from the site will be secondary-treated, and irrigation disposed on the golf course.

Solid waste will be removed from the site and disposed at an appropriate City and County sanitary landfill or other solid waste disposal facility.

6.2.5 Physical Development and Urban Design

Objective D:

To create and maintain attractive, meaningful, and stimulating environments throughout Oahu.

Objective D, Policy 5:

Require new developments in stable, established communities and rural areas to be compatible with the existing communities and areas.

Discussion: The Kahuku area has a rural agricultural setting, and a below-average median income level. The proposed project will be a development of a similar rural style and will maintain 109 acres of undisturbed open space, as well as 120 acres in golf course and support facilities. The project will be designed to complement the country environment, and natural surroundings. Refer to Section 4.15 for a more detailed discussion.

6.2.6 Culture and Recreation

Objective B:

To protect Oahu's cultural, historic, architectural, and archaeological resources.

Objective B, Policy 1:

Encourage the restoration and preservation of early Hawaiian structures, artifacts, and landmarks.

Objective B, Policy 2:

Identify, and to the extent possible, preserve and restore buildings, sites and areas of social, cultural, historic, architectural, and archaeological significance.

Objective B, Policy 4:

Promote the interpretive and educational use of cultural, historic, architectural, and archaeological sites, buildings, and artifacts.

Discussion: A comprehensive archaeological survey of the project site has been done by a professional archaeologist. A program for data recovery, preservation and interpretive development, as approved by the State Historic Preservation Office, will be carried out. Refer to Section 4.10 for further information.

Objective D:

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

Objective D, Policy 10:

Encourage the private provision of recreation and leisure-time facilities and services.

Discussion: The proposed golf course and driving range will provide recreational opportunities for Oahu and other State residents, as well as for visitors. Refer to Section 4.17.5.

6.3 CITY AND COUNTY OF HONOLULU KOOLAULOA DEVELOPMENT PLAN

The project involves a Development Plan change from Agriculture to Preservation/Park. The following discussion provides an assessment of how the proposed golf course will conform to and implement the Development Plan (DP) for Koolauloa.

6.3.1 Development Plan Common Provisions

Section 4. General Urban Design Principals and Controls:

4.1 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: Views of parts of the North Shore and upper Windward Coast from Kahuku to Laie can be seen from atop the project site, and these views will now be made publically available from the golf course. No views of significant landmarks will be blocked by the proposed golf course and support facilities. Refer to Section 4.14 for a discussion of visual impacts.

4.2 Open Space:

The City's mountains, hills, shoreline and streams, 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: The project site will set aside approximately 228 acres of recreational open space consisting of hills and ridges, valleys and gulches. Views of the lowlands and coast from Kuilima Resort to Laie, and the Koolau Mountain Range, will be available from the site. This site was previously inaccessable to the public. One 18-hole golf course and a golf driving range will be available to the public for recreational purposes. Existing intermittent stream gulches on the site will be, for the most part, left in their natural state. No channelization is planned. Natural materials, such as stone, will be used where enhancement of the gulch environment is desired in connection with the development of the golf course.

4.3 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 access road connecting the project site with Kamehameha Highway will have an aesthetic quality that corresponds with the style and character of the surrounding area. Right-turn and left-turn lanes will be developed at the project entrances for traffic exiting onto Kamehameha Highway. Distinctive landscaping, lighting and signing will be installed at the project entrance. Refer to Sections 4.11 and 4.15 of this document.

Section 10. Social Impact of Development:

10.2 Social Impact Factors:

In evaluating any proposed development, the general plan policies and objectives relating to the distribution of social benefits shall be considered. The following factors shall be examined as they pertain to such objectives:

a. Demographic: Whether the development will:

(1) Increase or decrease the residential population.
(2) Increase or decrease the visitor population.
(3) Change the character or culture of the neighborhood.

b. Economic: Whether the development will affect:

(1) The rate and pattern of economic growth and development.
(2) The diversity of employment.
(3) The availability of jobs.
(4) The employment wage rate.
(5) The principal economic activities on Oahu.

c. Housing: Whether the development will affect:

(1) The availability of housing.
(2) The quality of housing.
(3) Speculation in land and housing.
(4) Property values of existing homes.

d. Public Service: Whether the development will affect:

(1) Medical facilities.
(2) Educational facilities.
(3) Recreational facilities.
(4) Transportation facilities.
(5) Police and fire protection.
(6) Public utilities facilities.

e. Physical; Environmental: Whether the development will affect:

(1) The natural environment.
(2) Existing natural monuments, landmarks and scenic views.
(3) Open space.
(4) The aesthetic quality of the area.

Discussion: The social impacts of the proposed development were studied by Community Resources, Inc. (February 1989). An economic impact study was prepared for the project by Decision Analysts Hawaii, Inc. (February 1989). The major findings of these studies are discussed in the following subsections.

a. **Demographic:** The proposed development is not expected to significantly add new or ethnically different people to the North Shore population. Including the visitor count, the total "de facto population" at the project could range between 131 and 150 persons by 2001. The North Shore and Koolauloa are rural country areas known for their easy-going lifestyle, scenic beauty, beaches and surfing. The influx of jobs due to the proposed project should not alter these existing community characteristics, as it will be designed in accordance to these values. Refer to Sections 4.15.1 and 4.15.3 of this document and Appendix R.

b. **Economic:** Planned golf course development at the site will generate short-term employment during the construction of new facilities and long-term employment in the operation and support of those facilities. The project is expected to generate between 58 and 72 on-site jobs once it is in full operation. Purchase of services and the spending of wages by employees are expected to generate another 79 to 97 "indirect" and "induced" jobs throughout the State. Refer to Section 4.15.2 of this document and Appendix R.

c. **Housing:** The proposed project is not intended to be a supplier of resident housing. Consequently, it will have little impact on the availability or quality of such housing.

d. **Public Services:** The effect of the development on public services in the area will be minimal, as expressed in Sections 4.16 and Section 4.17 of this document.

e. **Physical Environment:** As already discussed, the project will substantially preserve the natural environment, existing natural monuments, landmarks, scenic views, open space and aesthetic qualities of the subject area.

6.3.2 Development Plan Special Provisions

Section 2. Urban Design Principles and Controls for Koolauloa:

2.1.b Specific Urban Design Considerations - Public Views:

In order to protect and enhance the rural attractiveness of Koolauloa, views from public places of the lateral Koolau ridges and deep inland valleys of southern Koolauloa shall be protected wherever possible. Panoramic and continuous views from public places of the coast and the sea, as well as views of the expansive Kahuku plain, shall also be protected...

Kamehameha Highway provides the traveler with an exceptionally scenic experience. Development adjacent to the highway shall reflect the need to preserve the current panoramic roadway views of the sea, the coastline, the Koolau mountains and lateral ridges, inner valleys, and landmarks.

Discussion: Refer to the Common Provisions discussion of General Urban Design Principles and Controls - Public Views.

6.4 GOLF COURSE MORATORIUM

The recently enacted moratorium on the issuance of golf course permits is in response to 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 specific reasons for the moratorium.

The concerns behind the bill are addressed individually below to get a better perspective on the issues.

Long Term Impact On Agricultural Land

Golf course demand for agricultural 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 to use 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, Ph.D. 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 Michael Sklarz, Ph.D. 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.

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.

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 Kuilima Resort Company sees the Malaekahana Golf Course as a community project and will work to make the project an integrated and positive part of the Koolauloa community. A close and continuing relationship between the golf course developer/operator and the community can address the concerns covered by this subject.

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

Malaekahana 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 will be negotiated. Specific conditions will be incorporated as requirements of the various permits.

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 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.

SECTION 7
References

7.0 REFERENCES, LIST OF PREPARERS AND CONSULTED PARTIES

7.1 REFERENCES

Berger, A., February 1989
Terrestrial Vertebrate Animals of the Country Couses at Kahuku, Punamano and Malaekahana
Kailua, Hawaii

City and County of Honolulu, 1987
Coastal View Study. Department of Land Utilization,
Honolulu, Hawaii

Community Resources, Inc., January 1989
Socio-Economic Impact Assessment for the Country Courses at Kahuku, Oahu, Hawaii
Honolulu, Hawaii

Darby & Associates, Inc., February 1989
Noise Impact Evaluation for the Proposed Country Courses at Kahuku, Oahu, Hawaii
Kailua, Hawaii

Decision Analysts Hawaii, Inc., February 1989
Proposed County Courses at Kahuku: Impact on Agriculture
Honolulu, Hawaii

Decision Analysts Hawaii, Inc., February 1989
Proposed County Courses at Kahuku: Impact on State and County Finances
Honolulu, Hawaii

Engineering Concepts, Inc., February 1989
Drainage Report for the Proposed Punamano Golf Course
Honolulu, Hawaii

Engineering Concepts, Inc., February 1989
Drainage Report for the Proposed Malaekahana Golf Course
Honolulu, Hawaii

Engineering Concepts, Inc., February 1989.
Wastewater Management Plan for the Proposed Malaekahana Golf Course
Honolulu, Hawaii

Engineering Concepts, Inc., February 1989.
Wastewater Management Plan for the Proposed Punamano Golf Course
Honolulu, Hawaii

Engineering Concepts, Inc., February 1989
Water Supply Report for the Proposed Punamano Golf Course
Honolulu, Hawaii

Engineering Concepts, Inc., February 1989
Water Supply Report for the Proposed Malaekahana Golf Course
Honolulu, Hawaii

Federal Emergency Management Agency, September 4, 1987
Flood Insurance Rate Map, City and County of Honolulu, Hawaii,
Panel No. 150001 0005B, Washington, D.C.

Kuilima Development Company, October 1985
Revised Environmental Impact Statement for the Kuilima Resort
Expansion, Koolauloa District, Oahu, Hawaii Volumes I and II.
Prepared by Group 70, Honolulu, Hawaii

Mink, J., 1982
Groundwater Resources and Availability——Kahuku Region
Honolulu, Hawaii

Murdoch and Green, February 1989
Fertilizer, Herbicide and Pesticide Effects on the Punamano Golf Courses
Kaneohe, Hawaii

Murdoch and Green, February 1989
Fertilizer, Herbicide and Pesticide Effects on the Malaekahana Golf
Course
Kaneohe, Hawaii

Nagata, K., January 1989
Malaekahana Project, Botanical Survey, Malaekahana, Oahu
Kaneohe, Hawaii

Nagata, K., January 1989
Punamano Project, Botanical Survey, Punamano, Oahu
Kaneohe, Hawaii

Ohbayashi Hawaii Corporation, September 1988
Petition for Land Use District Boundary Amendment, Lihi—lani
Recreational Communicty, Pupukea, Oahu, Hawaii
Prepared by Group 70, Honolulu, Hawaii

Pacific Planning & Engineering, Inc., February 1989
Traffic Impact Assessment for the County Courses at Kahuku
Honolulu, Hawaii

Paul H. Rosendahl, Ph.D., Inc., February 1989
Archaeological Inventory Survey and Limited Subsurface Testing:
Punamano and Malaekahana Golf Courses
Hilo, Hawaii

Peat Marwick Main & Co., February 1989
Market Assessment for the Proposed Country Courses at Kahuku,
Kahuku, Oahu, Hawaii
Honolulu, Hawaii

Root & Neal, February 1989
Air Quality Impact Assessment for the County Courses at Kahuku, Oahu, Hawaii
Honolulu, Hawaii

State of Hawaii, Department of Agriculture, January 1977
Agricultural Lands of Importance to the State of Hawaii, Island of Oahu. Prepared with the Soil Conservation Service, U.S. Department of Agriculture and the University of Hawaii, College of Tropical Agriculture, Honolulu, Hawaii

State of Hawaii, Department of Business and Economic Development, 1988
Revised Long—Range Economic and Population Projections to 2010, State of Hawaii (Series M—K): Preliminary Report
Honolulu, Hawaii

State of Hawaii, Department of Land and Natural Resources, March 1982
State Water Commission Report
Honolulu, Hawaii

University of Hawaii, December 1972
Detailed Land Classification — Island of Oahu
Land Study Bureau, Honolulu, Hawaii

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

7.2 CONSULTED PARTIES, COMMENTS AND RESPONSES

Listed below are the agencies and organizations consulted in the preparation of the Final EIS. This is followed by the wqritten comments received and responses. An asterisk (*) indicates those who submitted written comments or letters stating they have no comments.

A. FEDERAL AGENCIES

U.S. Department of the Army - DAFE
U.S. Department of the Navy *
U.S. Department of the Army, Corps of Engineers*
U.S. Coast Guard
U.S. Department of the Interior, Fish and Wildlife Service*
U.S. Department of Agriculture, Soil Conservation Service

B. STATE AGENCIES

Office of State Planning*
Land Use Commission
Office of Environmental Quality Control
Department of Agriculture*
Department of Accounting and General Services*
Department of Defense*
Department of Health
Department of Land and Natural Resources*
Department of Business and Economic Development*
Housing, Finanace and Development Corporation*
Department of Transportation
State Energy Office
University of Hawaii Environmental Center*
University of Hawaii Water Resources Research Center
Office of Hawaiian Affairs*

C. CITY AND COUNTY AGENCIES

Board of Water Supply
Building Department*
Department of Housing and Community Development*
Department of General Planning*
Department of Land Utilization*
Department of Parks and Recreation
Department of Public Works*
Department of Transportation Services*
Fire Department*
Police Department*
Koolauloa Neighborhood Board No. 28
North Shore Neighborhood Board No. 27

D. COMMUNITY ASSOCIATIONS

Kahuku Community Association
Kahuku Housing Corporation
Kahuku Village Association
Laie Community Association

E. MISCELLANEOUS

Hawaiian Electric Company
American Lung Association
Amorient Aquafarm, Inc.
Zion Securities*
MBJ, Inc.
Mr. Max Smith

*** COMMENT LETTERS AND RESPONSES FOLLOW THIS PAGE

United States Department of the Interior
FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P.O. BOX 50167
HONOLULU, HAWAII 96850

APR 4 1989

City and County of Hawaii
Department of General Planning
650 S. King Street
Honolulu, Hawaii 96813

Re: Draft Environmental Impact Statement (DEIS) for The Country Courses at Kahuku

We have completed our review of the subject DEIS and offer the following comments for your consideration. The document does not fully disclose the potential environmental impacts of the proposed golf courses. We recommend that the report be expanded to address the effects of golf course construction and operation on adjacent lands outside the immediate project boundaries.

Specifically, we recommend that the document evaluate the long-term, downstream impacts of storm water runoff from the golf course into the Punamano Unit of the James Campbell National Wildlife Refuge (refuge). The document should describe the potential consequences of the projected increase in the volume of flood waters and pesticide residues on the suitability of the refuge as habitat for native and migratory waterbirds.

Thank you for providing this opportunity to comment.

Sincerely,

Ernest Kosaka
Field Office Supervisor
Environmental Services

cc: DLNR
DOFAW
OEQC
Group 70 Ltd.
Kuilima Resort Co.

GROUP 70
LIMITED

27 April 1989

U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Office
P.O. Box 50167
Honolulu, HI 96850

Attn: Mr. Ernest Kosaka
Field Office Supervisor, Environmental Sevices

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 4 April 1989 letter to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Storm Water Runoff Into the Punamano Unit of the James Campbell National Wildlife Refuge

Engineering Concepts, Inc. (February 1989) prepared a drainage report for the proposed golf courses based on the preliminary layout of the golf courses and other project features, and is enclosed as Appendix E in Volume II of the DEIS. This report indicates that the drainage system for the Punamano Golf Courses will be designed so that it will not increase the rate or amount of runoff from the site as compared to existing conditions. There is a real possibility that the golf course landscaping, drainage routing and runoff detention areas will reduce the rate and volume of runoff from the site. More detailed drainage and stormwater control plans which will be developed after the grading plan for the golf courses is completed, will carry out this design purpose.

B. Introduction of Pesticide Residues to the Refuge and Affects on the Suitablitity of the Refuge as Habitat for Native and Migratory Waterbirds

A thorough study of the environmental impact of fertilizer and pesticide use at the proposed Punamano golf courses was prepared by Murdoch and Green (February 1989). This report is enclosed as Appendix I in Volume II of the DEIS, and will also be included in the Final EIS.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

Pesticides

The findings of this report indicate that there is only a limited potential for pesticides to be carried off-site in runoff waters. Specifically, this may happen only during heavy rainfall events that occur soon after application. Any concentrations of pesticides which do occur in the runoff are expected to be highly diluted, since the total watershed contributing the runoff into the Refuge is large relative to the area being developed.

Runoff from an area of approximately 92 acres (three sub-watersheds) flows into the Refuge. Runoff from the rest of the 1,303-acre watershed encompassing the 605-acre site flows elsewhere than the Refuge. Within the 92-acre sub-watershed area, the approximate area of the project lands is about 55 acres, and about 25 acres will be treated with fertilizers and a much smaller area (less than one acre) with pesticides. The treated area will represent approximately 27 percent of the sub-watershed. While movement of applied chemicals in runoff from turfed areas is not considered a major problem under these conditions, caution will be exercised in applying chemicals during the rainy season (November through February).

Pesticide applications are normally made only to greens on golf courses. Greens comprise approximately 3.0 acres of a typical 18-hole golf course, therefore, the application of pesticides is very site-specific and limited. Pesticides are normally applied only in response to outbreaks of pests, and few chemicals are applied as part of a preventative program. In terms of the toxicity, the only chemicals used in golf course maintenance in Hawaii that are highly toxic to birds are the organic phosphate insecticides, especially chloropyrifos.

Although chloropyrifos is highly toxic to birds, it is strongly adsorbed on the thatch layer of turf and moves little from the site of application. Because of the adsorption of organic phosphate insecticides on organic layers in turf and their rapid breakdown, there is little chance of their movement from grassed areas into the drainage gulches which will collect runoff on the site, and eventually transport it to the Refuge. As a futher precaution, every effort will be made in the preparation of grading and drainage plans for the golf courses to route runoff water circuitously through vegetated swales to maximize the removal of any organic phoshates and other chemicals which might be in the storm water prior to their transport off-site.

Additional mitigative measures are proposed which are expected to further minimize the contribution of pesticides to runoff waters entering the marsh. These measures include: minimizing application of pesticides to only pest outbreak areas; minimizing the size of areas which normally require the most frequent pesticides application, such as greens; and substitution of pesticides used which are less toxic to birds than organic phosphate types. These will be specified in the Final EIS.

Fertilizers

Murdoch and Green (February 1988) also addressed the potential for fertilizer application to affect the Punamano Pond unit of the Refuge.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-58[illegible]

The primary fertilizer elements of concern for contamination of ground and surface waters are nitrogen and phosphorus. Phosphorus is attached very tightly to soil clays and moves little, if any, from the site of application. Phosphorus, therefore, will not cause any problem with 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 nitrogen use rates 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.

To avoid loss of nitrate in runoff water from the site, a slow-release nitrogen fertilizer will be applied in which the nitrogen is in an insoluble form at application. Over time this fertilizer releases small quantities of soluble nitrogen which is then utilized by the turf. Use of slow-release nitrogen fertilizer will minimize the potential for nitrate enrichment of runoff waters leaving the site, therefore, the Punamano Pond will not be affected by excess nitrate contamination from the golf courses.

Other potential mitigative measures that will be investigated to reduce off-site transport of nitrate are similar to those proposed for controlling pesticides from entering runoff waters. These measures include minimizing the areas which require fertilizer application; careful water management to avoid over-watering; and runoff routing to enhance turfgrass uptake of nitrate.

Coordination With U.S. Fish and Wildlife Service

The applicant intends to coordinate closely with the Fish and Wildlife Service to ensure that their concerns about potential adverse effects of pesticide and fertilizer inputs to the Punamano Pond Refuge are addressed. Implementation of the proposed mitigative measures will ensure that there will be no substantive adverse impacts to the marsh.

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

Sincerely,

GROUP 70 LIMITED

for Jeffrey H. Overton

Ralph E. Portmore, AICP
Vice President, Planning

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

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

April 6, 1989

REPLY TO
ATTENTION OF:
Planning Branch

Dr. Marvin Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for The Country Courses at Kahuku (Punamano and Malaekahana), Koolauloa District, Oahu, Hawaii. The following comments are offered:

a. If fill is placed in any gulches or streams, a Department of the Army permit may be required. The developer should contact Operations Branch (telephone 438-9258) for further information.

b. The flood hazard information presented in section 4.7.A. (Volume I, page 81) of the DEIS is accurate.

Sincerely,

C Jung

Kisuk Cheung
Chief, Engineering Division

Copies furnished:

City and County of Honolulu
Department of General Planning
650 S. King Street
Honolulu, Hawaii 96813

Alan Nii, Esq.
Kuilima Resort Company
1001 Bishop Street, Suite 2000
Pauahi Tower
Honolulu, Hawaii 96813

✓ Group 70 Ltd.
Ralph Portmore, AICP
924 Bethel Street
Honolulu, Hawaii 96813

GROUP 70
LIMITED

27 April 1989

Department of the Army
U.S. Army Engineer District, Honolulu
Planning Branch, Building 230
Ft. Shafter, Hawaii 96858-5440

Attn: Mr. Kisuk Cheung
Chief, Engineering Division

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 6 April 1989 letter to the State Office of Environmental Quality Control concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Fill Placement in Gulches and Streams

The project includes no specific plans to place fill in any of the intermittent stream gulches on the Punamano site. No intermittent stream gulches are known to exist on the Malaekahana site.

There is the possibility that some fill surrounding culverts will be placed in gulches at crossings for roadways and golf cart paths. The design plans for the golf courses and roadways have yet to be prepared, and efforts will be made to minimize the amount of fill required to construct these crossings. Once design plans are complete, the Operations Branch will be provided these plans for a determination of whether any permit is required from your agency.

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

Sincerely,

GROUP 70 LIMITED

for Jeffrey H. Overton

Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

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

IN REPLY REFER TO

5090 (1178)
Ser 032/531
27 Feb 1989

City & County of Honolulu
Department of General Planning
650 South King St.
Honolulu, HI 96813

Gentlemen:

THE COUNTRY COURSES AT KAHUKU

The Draft Environmental Impact Statement (DEIS) for The Country Courses at Kahuku has been reviewed, and we have no comments to offer. Since we have no further use for the DEIS, it is being returned to the Office of Environmental Quality Control.

Thank you for the opportunity to review the draft.

Sincerely,

W.K. Liu

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

Copy to:
Alan Nii, Esq.
Kuilima Resort Co.

Group 70 Ltd.
Ralph Portmore, AICP

OEQC (w/DEIS)

OFFICE OF STATE PLANNING
Office of the Governor
STATE CAPITOL, HONOLULU, HAWAII 96813 TELEPHONE (808) 548-5893
JOHN WAIHEE, Governor

Ref. No. P-9327

April 6, 1989

The Honorable Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (DEIS) for The Country Courses at Kahuku, Punamano and Malaekahana, Koolauloa District, Oahu, Hawaii

We have reviewed the DEIS and have the following comments.

It is our understanding that the Kuilima Resort Company is proposing to develop two golf course complexes consisting of the following:

Punamano Site (605 acres)
- Three 18-hole golf courses
- Three golf clubhouses
- Two golf driving ranges

Malaekahana Site (228 acres)
- One 18-hole golf course
- One golf clubhouse
- One golf driving range

According to the DEIS, there are 387 acres of Class A and Class B soils on the Punamano site and approximately 42 acres of Class B soils on the Malaekahana site. The DEIS further states that a Land Use District Boundary Amendment (LUDBA) from Agriculture to Urban will be required because golf courses are not permitted uses on these lands as designated by the former Land Study Bureau.

Information provided in the DEIS indicates that there are 28 golf courses presently operating on Oahu and further that there are 29 proposed golf courses currently planned at 23 developments on Oahu. The DEIS even mentions the North Shore/Koolauloa area as a possible golf center for both residents and visitors.

Due to the proliferation of golf courses on Oahu, the Office of State Planning will carefully analyze the environmental impacts and the need for additional golf courses on the North Shore and the costs/benefits to the residents of the area. We will focus on these issues during the Land Use Commission hearings on the proposed projects.

The Kahuku Land Use Plan (March 1988) by the Estate of James Campbell should also be discussed in the DEIS.

With respect to the Hawaii Coastal Zone Management (CZM) Program, we are concerned with the potential impacts upon coastal ecosystems. It is the CZM coastal ecosystem objective to protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems. In this regard the EIS should discuss the impacts of pesticides and fertilizers in surface water runoff on the James Campbell National Wildlife Refuge at Punamano Pond and the endangered Hawaiian waterbirds. Even small quantities of pesticides can adversely affect the endangered waterbirds due to chronic long-term exposure, and increased nutrient levels can adversely affect their habitat.

Thank you for the opportunity to provide our comments. If you have any questions, please feel free to contact our CZM office at 548-5973.

Sincerely,

Harold S. Masumoto
Director

cc: Alan Nii, Esq.
Kuilima Resort Company
√Group 70 Ltd.

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

Office of State Planning
Office of the Governor
State Capitol
Honolulu, HI 96813

Attn: Harold S. Masumoto, Director

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your letter to the City and County Department of General Planning and your memorandum to the Office of Environmental Control concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Kahuku Land Use Plan

The Estate of James Campbell's Kahuku Land Use Plan (March 1988) will be discussed in the Final EIS being prepared for the project.

B. Impacts of Pesticides and Fertilizers in Surface Water Runoff on the James Campbell National Wildlife Refuge at Punamano Pond and the Endangered Hawaiian Waterbirds

A thorough study of the environmental impact of fertilizer and pesticide use at the proposed Punamano golf courses was prepared by Murdoch and Green (February 1989). This report is enclosed as Appendix I in Volume II of the DEIS, and will also be included in the Final EIS.

<u>Pesticides</u>

The findings of this report indicate that there is only a limited potential for pesticides to be carried off-site in runoff waters. Specifically, this may happen only during heavy rainfall events that occur soon after application. Any concentrations of pesticides which do occur in the runoff are expected to be highly diluted, since the total watershed contributing the runoff into the Refuge is large relative to the area being developed.

Runoff from an area of approximately 92 acres (three sub-watersheds) flows into the Refuge. Runoff from the rest of the 1,303-acre watershed encompassing the 605-acre site

flows elsewhere than the Refuge. Within the 92-acre sub-watershed area, the approximate area of the project lands is about 55 acres, and about 25 acres will be treated with fertilizers and a much smaller area (less than one acre) with pesticides. The treated area will represent approximately 27 percent of the sub-watershed. While movement of applied chemicals in runoff from turfed areas is not considered a major problem under these conditions, caution will be exercised in applying chemicals during the rainy season (November through February).

Pesticide applications are normally made only to greens on golf courses. Greens comprise approximately 3.0 acres of a typical 18-hole golf course, therefore, the application of pesticides is very site-specific and limited. Pesticides are normally applied only in response to outbreaks of pests, and few chemicals are applied as part of a preventative program. In terms of the toxicity, the only chemicals used in golf course maintenance in Hawaii that are highly toxic to birds are the organic phosphate insecticides, especially chloropyrifos.

Although chloropyrifos is highly toxic to birds, it is strongly adsorbed on the thatch layer of turf and moves little from the site of application. Because of the adsorption of organic phosphate insecticides on organic layers in turf and their rapid breakdown, there is little chance of their movement from grassed areas into the drainage gulches which will collect runoff on the site, and eventually transport it to the Refuge. As a futher precaution, every effort will be made in the preparation of grading and drainage plans for the golf courses to route runoff water circuitously through vegetated swales to maximize the removal of any organic phoshates and other chemicals which might be in the storm water prior to their transport off-site.

Additional mitigative measures are proposed which are expected to further minimize the contribution of pesticides to runoff waters entering the marsh. These measures include: minimizing application of pesticides to only pest outbreak areas; minimizing the size of areas which normally require the most frequent pesticides application, such as greens; and substitution of pesticides used which are less toxic to birds than organic phosphate types. These will be specified in the Final EIS.

Fertilizers

Murdoch and Green (February 1988) also addressed the potential for fertilizer application to affect the Punamano Pond unit of the Refuge.

The primary fertilizer elements of concern for contamination of ground and surface waters are nitrogen and phosphorus. Phosphorus is attached very tightly to soil clays and moves little, if any, from the site of application. Phosphorus, therefore, will not cause any problem with 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 nitrogen use rates 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.

To avoid loss of nitrate in runoff water from the site, a slow-release nitrogen fertilizer will be applied in which the nitrogen is in an insoluble form at application. Over time

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

this fertilizer releases small quantities of soluble nitrogen which is then utilized by the turf. Use of slow-release nitrogen fertilizer will minimize the potential for nitrate enrichment of runoff waters leaving the site, therefore, the Punamano Pond will not be affected by excess nitrate contamination from the golf courses.

Other potential mitigative measures that will be investigated to reduce off-site transport of nitrate are similar to those proposed for controlling pesticides from entering runoff waters. These measures include minimizing the areas which require fertilizer application; careful water management to avoid over-watering; and runoff routing to enhance turfgrass uptake of nitrate.

Coordination With U.S. Fish and Wildlife Service

The applicant intends to coordinate closely with the Fish and Wildlife Service to ensure that their concerns about potential adverse effects of pesticide and fertilizer inputs to the Punamano Pond Refuge are addressed. Implementation of the proposed mitigative measures will ensure that there will be no substantive adverse impacts to the marsh.

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

Sincerely,

GROUP 70 LIMITED

for Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

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

April 6, 1989

MEMORANDUM

To: Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu

Subject: Draft Environmental Impact Statement (DEIS) for
The Country Courses at Kuilima
Four Golf Courses
Kuilima Resort Company
TMK: 5-6-05: por. 1, por. 2, 5, 6, por. 7
5-7-01: por. 21
5-6-06: por. 6
5-6-07: por. 1
Punamano and Malaekahana, Oahu
Area: 833 acres

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

According to the DEIS, the applicant is seeking to amend the Koolauloa Development Plan Land Use Map from "Agriculture" to "Preservation" for two separate sites.

References to the Agricultural Lands of Importance to the State of Hawaii (ALISH) system, the Detailed Land Classification for the Island of Oahu, the Soil Conservation Soil Survey, and the Land Evaluation scores according to the Land Evaluation and Site Assessment (LESA) system are correct.

We note that we were not a consulted party to the Environmental Assessment (DEIS, page 171).

Agricultural Potential of the Sites

We note that the lessees of the Punamano site, Amorient Aquaculture International, are said to have concluded "...that in today's economic environment the lands are unsuitable for commercial crop production, with the principal difficulties being the cost of pumping water to irrigate mauka fields, poor soils, difficult terrain, and excessive wind" (emphasis added) (DEIS, Vol. I, page 60). Crops investigated include Christmas

trees, pineapple, feed corn, sudex, hay, sorghum and other forage crops.

The DEIS also states that "...it is extremely doubtful that the project would adversely affect the growth of diversified agriculture in Hawaii" (DEIS, Vol. I, page 62). This conclusion is based on the supposed relative abundance of arable lands formerly in sugarcane and pineapple cultivation, the supposed availability of these lands for profitable replacement crops, and the supposed very small amount of lands and water required to grow diversified crops.

Appendix H states that the LESA Commission projections needed for diversified agriculture are "excessively high" (page 9) and that the total additional acreage needed to accommodate diversified agriculture to the year 1995 is about 1,500 acres for the State as compared to the LESA estimate of 2,314 for Oahu alone (Appendix H, page 14). In fact, the additional acreage required on Oahu for diversified crops by 1995 (including export crops) is closer to 5,100 acres, based on the LESA report.

Our long-standing response to this matter has been that the LESA Commission report takes a more optimistic and broad view of the future of diversified agriculture in Hawaii than does the subject DEIS and other documents that draw a similar conclusion. In the determination and protection of "important agricultural lands", it is the State's duty to assure the availability of agriculturally suitable lands. Therefore, it is appropriate that the State take a conservative, long range view and maintain what appears to be a surplus of productive lands as compared to the DEIS' findings. Incremental losses of a resource like arable lands, if left uncontrolled, will have a devastating and irreversible cumulative effect on the viability of agriculture. Once agricultural lands are urbanized there is no return. This cannot be overemphasized.

Adjoining Land Uses

On January 13, 1987, in commenting on the special use permit application for the proposed sewage treatment plant shown in Figure 5 (DEIS, Vol. I, page 21), we noted that: "it is our understanding that some farmers displaced by other phases of the Kuilima resort expansion have had difficulty locating replacement lands in the vicinity." We recommend that the Final EIS include map figures indicating the location of the existing land uses of adjoining properties referred to on page 18 of the DEIS (Vol. I). Our particular concern is that the tract of prime agricultural land to the west of the Punamano site, where

the Low corn operation once existed, be maintained in agricultural use as shown in Figure 5 ("Master Plan").

Thank you for the opportunity to comment. We would like to receive a copy of the Final EIS.

Yukio Kitagawa

YUKIO KITAGAWA
Chairperson, Board of Agriculture

cc: OEQC
Alan Nii, Kuilima Resort Company
Group 70, Ltd.
OSP (attn. LUD)

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

State of Hawaii
Department of Agriculture
1428 So. King Street
Honolulu, HI 96814-2512

Attn: Mr. Yukio Kitagawa, Chairman
Board of Agriculture

Gentlemen:

Subject: The Country Course at Kahuku DEIS/8769.14

Thank you for your 6 April 1989 letter to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Effects on the Growth of Diversified Agriculture

It was stated in the DEIS that "... it is extremely doubtful that the project would adversely affect the growth of diversified agriculture in Hawaii." In the 6 April 1989 comment letter, the Department of Agriculture (DOA) has not made a complete summary of the basis for this conclusion. In addition to most of the 90,000 acres that have been released from sugar and pineapple production since 1968, a portion of the land now in sugarcane is being held awaiting the discovery of profitable replacement activities. This land forms part of the supply of prime agricultural land available to profitable diversified agricultural crops, and amounts over 70,000 acres.

B. Projections of Land Needs for Diversified Agriculture

As clarified in Appendix H of the DEIS, and more specifically in Table 4 of the Appendix, the DOA figure of 5,100 acres required for diversified crops covers all diversified agriculture. The figure stated in the DEIS of 2,314 acres is for those crops and activities which generally require prime agricultural lands, and exclude those which generally do not require them. The agricultural consultant's (Decision Analysts Hawaii, Inc.) estimate of prime agricultural land needs is 1,500 acres. The DEIS addresses the impact on prime agricultural lands because inferior agricultural land is by definition less valuable, and the supply is greater and more readily available.

C. Loss of Potentially Arable Lands and Agriculture's Long-Term Viability

As discussed in the DEIS, a very large surplus of prime agricultural lands exists and, given the poor economic health of the sugar industry, this surplus is expected to grow. When the loss of agricultural land at The Country Courses at Kahuku is combined with other planned and proposed projects, the amount of land required for these projects is far too small to adversely affect this large and growing surplus of prime agricultural land.

D. Farmer Displacement

It is our understanding that one farmer displaced by a phase of the Kuilima Resort Expansion did, indeed, have difficulty finding land to make a major expansion to his operations. However, he was eventually successful in finding sufficient land.

E. Concern Over Prime Agricultural Land West of the Punamano Site

The site where the Low corn operation once existed is owned by The Estate of James Campbell, and is not a part of this project. We do not anticiapte that the proposed golf courses will have any impact on the continued use of this area for agriculture. It is recommended that the DOA express any concerns regarding the future of this land to the land owner.

Adjoining land uses are shown in figure 5 of the DEIS in the Estate of James Campbell Kahuku Area Lands Master Plan.

We will send you a copy of the Final EIS when it is completed. Thank you again for your suggestions and comments. Please feel free to call either me or Jeff Overton (523-5866) if you have any further questions or concerns.

Sincerely,

GROUP 70 LIMITED

for Ralph E. Portmore, AICP
Vice President, Planning

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

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

April 10, 1989

MEMORANDUM

To: Dr. Marvin T. Miura, Director
Office of Environmental
Quality Control

Mr. Donald Clegg, Chief Planning Officer
Department of General Planning
City & County of Honolulu

From: Deputy Director for Environmental Health

Subject: Draft Environmental Impact Statement (DEIS) for The Country Courses at Kahuku, Koolauloa, Oahu, Tax Map Key 5-5-05: Por. 1, 2, 5-7; 5-6-06: Por. 6; 5-6-07: Por. 1; 5-7-01: Por. 21

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

Drinking Water

1. The DEIS recommends the development of an onsite water system due to the inadequacies of the three existing water systems (Board of Water Supply Kahuku, Campbell Estate, and Zions Securities). Two wells are proposed to satisfy projected water demand (fire protection, domestic and irrigation).

   The applicant should be cautioned that golf course activities may affect its own proposed onsite water wells, as well as existing water wells in near proximity of the golf course.

2. Assuming that the Malaekahana Golf Course water system will serve 25 or more individuals at least 60 days per year or will have a minimum of 15 service connections, it will be subject to the Department's Administrative Rules, Title 11, Chapter 20, "Potable Water Systems."

3. Section 11-20-29 of Chapter 20 requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to their use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.

4. Section 11-20-30 of Chapter 20 requires that new or substantially modified distribution systems for public water systems be approved by the Director. However, if the water system is under the jurisdiction of the City and County of Honolulu, the Board of Water Supply will be responsible for the review and approval of the plans.

Noise

The DEIS addresses potential noise impact from construction activities and indicates that such operations will comply with City and County of Honolulu's Noise Ordinance. Statutory provisions relating to noise generated by construction activities are contained in the State Department of Health's Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu, and Chapter 42, Vehicular Noise Control for Oahu.

Hazardous Waste

The proposed project states that maintenance facilities are planned for each golf course. The solid wastes generated from these facilities may be subject to federal regulations. The developer/owner should be advised of hazardous waste regulations set forth in 40 CFR Parts 260-270.

Underground Storage Tank

If the proposed project intends to use underground storage tanks (UST) for fuels and/or hazardous substances, the developer/owner should be advised of applicable federal regulations. The UST's must be designed, installed and operated in accordance with 40 CFR Parts 280 & 281.

In addition to the above comments, attached are eight (8) Department of Health conditions applicable to this new golf course development.

BRUCE S. ANDERSON, Ph.D.

Attachment

cc: Mr. Alan Nii, Esq.
Mr. Ralph Portmore, AICP ✓

April 7, 1989

EIGHT (8) CONDITIONS APPLICABLE TO THIS NEW GOLF COURSE DEVELOPMENT

Conditions:

1. 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.

2. A 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.

3. If 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.

4. 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 #3. The entire system shall be approved by the State Department of Health in conformance with Administrative Rules Title 11, Chapter 62, Wastewater Treatment Systems, effective December 10, 1988.

5. 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 halminths 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 subsuface. 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.

6. 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.

7. 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.

8. 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 eight (8) 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.

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

State of Hawaii
Department of Health
P. O. Box 3376
Honolulu, HI 96801

Attn: Bruce S. Anderson, Ph.D., Deputy Director

Gentlemen:

Subject: The Country Course at Kahuku DEIS/8769.14

Thank you for your 10 April 1989 letter to the State Office of Environmental Quality Control and the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Drinking Water

Golf Course Activities

The Malaekahana Golf Course will involve the development of an on-site potable water well and distribution system. Golf course activities such as the application of fertilizers and pesticides, and the use and storage of other chemicals and fuels on the site will be carefully monitored and controlled to avoid the possibility of potential contamination of the underlying groundwater aquifer.

These same measures will be undertaken at the Punamano Golf Courses even though potable water supply will be derived from the Board of Water Supply system. Improvements planned in connection with the Kuilima Resort expansion will provide sufficient capacity to also provide water for domestic uses at the golf courses.

Malaekahana Golf Course Water System

The development and operation of this water system will comply with the Department's Administrative Rules, Title 11, Chapter 20, "Potable Water Systems."

Approval of New Water Source

An engineering report will be prepared for the proposed Malaekahana Golf Course Water Supply System, addressing the requirements set in Section 11-20-29 of Chapter

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX 523-5874

20. This report will be submitted for review and by the Director of Health prior to its use.

Jurisdiction of the Malaekahana Golf Course Water Supply System

The new water system planned for the Malaekahana Golf Course will be a private water system that will not be under the jurisdiction of the City and County of Honolulu Board of Water Supply.

B. Compliance With Department of Health Noise Regulations

The construction of The Country Courses at Kahuku will comply with the State Department of Health's Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu, and Chapter 42, Vehicular Noise Control for Oahu.

C. Hazardous Wastes

The potential generation of solid or liquid hazardous wastes at the golf courses, particularly the maintenance facilities for the golf courses, will be carefully monitored and controlled. The golf course maintenance supervisor will have training in the types of chemicals used, types of wastes generated, and proper chemical and waste storage. This training will include familiarization with federal regulations and procedures set forth in 40 CFR Parts 260-270.

D. Underground Storage Tanks

It has not been determined whether or not underground storage tanks for fuels and/or hazardous sustances will be included in the facilities for the golf courses. If underground storage tanks are included in the facilities, they will be designed , installed and operated in accordance with 40 CFR Parts 280 & 281.

E. Conditions Applicable to New Golf Course Development

All of the measures described in the eight conditions applicable to this new golf course development will be implemented by the developer and/or future golf course operators.

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

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton

for Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

JOHN WAIHEE
GOVERNOR OF HAWAII

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

REF: OCEA-sor

MAR 29 1989

FILE NO.: 89-452
DOC. NO.: 5386E

The Honorable Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: Draft EIS - The Country Courses at Kahuku
Koolauloa, Oahu
TMKs: 5-5-05: Por. 1, 2, 5, 6, 7;
5-7-01: Por. 21;
5-6-07: Por. 1; and
5-6-06: Por. 6

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 Aquatic Resources Division has no objection to the proposal provided that the proposed mitigating measures to control erosion and silt-laden runoff are complied with. Also, it is suggested that appropriate measures be included in the construction plans to prevent debris and petroleum products or other pollutants from entering the gulches.

Our Forestry and Wildlife Division indicates that two rare shrubs of Capparis sandwichiana var. sandwichiana (maiapilo) were found immediately adjacent to the project site. The sites with the rare shrubs need to be identified so the project will not jeopardize these two plants. These plants should be preserved.

Although the draft EIS discusses the possible effects of herbicides, pesticides and fertilizers on the Punamano golf course site itself, there is no discussion of indirect impacts of run-off containing these substances on the adjacent downslope areas. The site is directly across from the National Wildlife Refuge

including the Punahoolapa and Punamano wetlands. This possible impact on the wetland biota and any mitigating measures should be discussed in the final EIS.

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,

for WILLIAM W. PATY

cc: Alan Nii, Esq., Kuilima Resort Company
Ralph Portmore, Group 70 Ltd.

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

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

Attn: Mr. William W. Paty, Chairperson
Board of Land and Natural Resources

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 30 March 1989 memorandum to the State Office of Environmental Quality Control and your letter to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Debris, Petroleum Products and Other Pollutants

The construction plans for the golf courses will include measures to prevent debris, petroleum products and silt-laden runoff from entering the gulches on these sites. Drainage controls established prior to construction will follow City and County standards to minimize erosion of soils and control runoff. All construction activites that take place in or near the gulches on the site will be closely monitored to prevent debris and petroleum products from entering the gulch. This topic will also be addressed in the Final EIS.

B. Maiapilo Shrubs

Kenneth Nagata, consulting botanist for the project, identified two individuals of the rare maiapilo shrub (Capparis sandwichiana var. sandwichiana) immediately adjacent to the Punamano site. These plants exist on land owned by The Estate of James Campbell, and their location is shown in the DEIS Figure 22 and Appendix K. There are no plans to change the habitat of these shrubs in connection with this project. The plants are located at least 300 feet from any proposed development of the golf courses on the Punamano site.

C. Indirect Effects of Herbicides, Pesticides and Fertilizers on the National Wildlife Refuge and Punahoolapa Marsh

A thorough study of the environmental impact of fertilizer and pesticide use at the proposed Punamano golf courses was prepared by Murdoch and Green (February 1989). This report is enclosed as Appendix I in Volume II of the DEIS, and will also be included in the Final EIS.

Pesticides

The findings of this report indicate that there is only a limited potential for pesticides to be carried off-site in runoff waters. Specifically, this may happen only during heavy rainfall events that occur soon after application. Any concentrations of pesticides which do occur in the runoff are expected to be highly diluted, since the total watershed contributing the runoff into the Refuge and Punahoolapa Marsh is large relative to the area being developed.

Runoff from an area of approximately 92 acres (three sub-watersheds) flows into the Refuge. Runoff from the rest of the 1,303-acre watershed encompassing the 605-acre site flows elsewhere than the Refuge. Within the 92-acre sub-watershed area, the approximate area of the project lands is about 55 acres, and about 25 acres will be treated with fertilizers and a much smaller area (less than one acre) with pesticides. The treated area will represent approximately 27 percent of the three sub-watersheds contributing runoff to the Refuge.

Four sub-watersheds mauka of Kamehameha Highway appear to drain into Punahoolapa Marsh, covering an area of approximately 413 acres. The project site represents 172 acres (42 percent) of these sub-watersheds. Approximately 77 acres of this part of the site will be fertilized, and only about two acres will be treated with pesticides. The treated area will represent approximately 19 percent of the four sub-watersheds draining into the marsh.

According to Murdoch and Green (February 1989), movement of applied chemicals in runoff from turfed areas is not considered a major problem under these conditions of controlled runoff and relatively high dilution. Caution will be exercised in applying chemicals during the rainy season (November through February).

Pesticide applications are normally made only to greens on golf courses. Greens comprise approximately 3.0 acres of a typical 18-hole golf course, therefore, the application of pesticides is very site-specific and limited. Pesticides are normally applied only in response to outbreaks of pests, and few chemicals are applied as part of a preventative program. In terms of the toxicity, the only chemicals used in golf course maintenance in Hawaii that are highly toxic to birds are the organic phosphate insecticides, especially chloropyrifos.

Although chloropyrifos is highly toxic to birds, it is strongly adsorbed on the thatch layer of turf and moves little from the site of application. Because of the adsorption of organic phosphate insecticides on organic layers in turf and their rapid breakdown, there is little chance of their movement from grassed areas into the drainage gulches which will collect runoff on the site, and eventually transport it to the Refuge. As a futher precaution, every effort will be made in the preparation of grading and drainage

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-58[illegible]

plans for the golf courses to route runoff water circuitously through vegetated swales to maximize the removal of any organic phoshates and other chemicals which might be in the storm water prior to their transport off-site.

Additional mitigative measures are proposed which are expected to further minimize the contribution of pesticides to runoff waters entering the marsh. These measures include: minimizing application of pesticides to only pest outbreak areas; minimizing the size of areas which normally require the most frequent pesticides application, such as greens; and substitution of pesticides used which are less toxic to birds than organic phosphate types. There will be specified in the Final EIS.

Fertilizers

Murdoch and Green (February 1988) also addressed the potential for fertilizer application to affect the Punamano Pond unit of the Refuge.

The primary fertilizer elements of concern for contamination of ground and surface waters are nitrogen and phosphorus. Phosphorus is attached very tightly to soil clays and moves little, if any, from the site of application. Phosphorus, therefore, will not cause any problem with 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 nitrogen use rates 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.

To avoid loss of nitrate in runoff water from the site, a slow-release nitrogen fertilizer will be applied in which the nitrogen is in an insoluble form at application. Over time this fertilizer releases small quantities of soluble nitrogen which is then utilized by the turf. Use of slow-release nitrogen fertilizer will minimize the potential for nitrate enrichment of runoff waters leaving the site, therefore, the Punamano Pond will not be affected by excess nitrate contamination from the golf courses.

Other potential mitigative measures that will be investigated to reduce off-site transport of nitrate are similar to those proposed for controlling pesticides from entering runoff waters. These measures include minimizing the areas which require fertilizer application; careful water management to avoid over-watering; and runoff routing to enhance turfgrass uptake of nitrate.

Coordination With U.S. Fish and Wildlife Service

The applicant intends to coordinate closely with the Fish and Wildlife Service to ensure that their concerns about potential adverse effects of pesticide and fertilizer inputs to the Punamano Pond Refuge are addressed. Implementation of the proposed mitigative measures will ensure that there will be no substantive adverse impacts to the marsh.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

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

Sincerely,

GROUP 70 LIMITED

for Jeffrey H. Overton

Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

JOHN WAIHEE
GOVERNOR OF HAWAII

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

REF: OCEA-sor

APR 6 1989

FILE NO.: 89-452
DOC. NO.: 5386E

The Honorable Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: Draft EIS - The Country Courses at Kahuku
Koolauloa, Oahu
TMKs: 5-5-05: Por. 1, 2, 5, 6, 7;
5-7-01: Por. 21;
5-6-07: Por. 1; and
5-6-06: Por. 6

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

Our Department's Historic Sites Section indicates that the consulting archaeologist's report, Appendix N of Volume 2, documents a total of 26 sites in the two project areas. Of these, 13 are determined to be "no longer significant", as sufficient information has been recorded during the initial archaeological survey. Thirteen sites were evaluated as being significant: ten under criterion d (information content), two under criteria d and e (cultural significance), and one under criteria d and c (good example of site type). The recommended mitigation plan for these significant sites is for the good example of a site type to be preserved with some further data collection and interpretive development, and for the remaining twelve sites to undergo archaeological data recovery. On the basis of the methodology and expected site density in the area, we believe that the consulting archaeologist located all the sites. We concur with the evaluations of significance. However, with respect to the mitigation plans, we believe that the two sites found significant under criteria d and e should also be preserved.

The Draft EIS (Vol. I, Sect. 4.10-A-3) notes that boundary adjustments have placed 6 sites outside of the project areas. These sites have been deleted from Table 8 (page 100), but the text does not give the site numbers of the deleted sites. Table 8 indicates that 12 significant sites and 8 sites which are no longer significant are still within the project areas. This should be specified in the Section 4.10-A-4 text as well.

There is a major discrepancy in the Draft EIS text under Anticipated Impacts (section 4.10-B). According to Table 8, there are 12 significant sites in the project area after boundary adjustments, but here it says that only 6 sites will be affected by the development -- four in the "no longer significant" category and only two of the twelve significant sites. Normally, golf course development involves grading and grubbing of the entire area, and all significant sites are usually considered affected either directly or indirectly. Thus, we cannot concur with your determination of effect, without a clear statement proving that only two of the twelve significant sites will be affected.

This problem must be resolved for us to approve any mitigation plans for historic sites in your project areas. Typically, we expect a mitigation plan to cover all significant historic sites in a project area, whether they will be preserved and/or undergo archaeological data recovery. If you can demonstrate that only some of these sites will be affected, then only those sites need be covered by the plan. But in Section 4.10-C-2 of the Draft EIS under Mitigative Measures, only 2 of the 12 significant sites are scheduled for archaeological data recovery and/or preservation.

In summary, the archaeological survey's findings are acceptable, but the draft EIS text is not. We believe the Draft EIS text must be clarified considerably. It must be clear just which significant historic sites are in the project area, which will be affected, and what mitigation treatment is planned for each affected significant site. We believe that these concerns can be easily resolved. We recommend that the planners meet with our Oahu Archaeologist, Dr. Joyce Bath (548-7460) to clarify the situation and that the EIS text then be revised.

Finally, for your information, on page 93, Section 4.10-A-1, it is stated that "PHRI (1986) conducted further subsurface investigations in the Kahuku Point Archaeological Area, and uncovered human remains which yielded a calendrical age of 165 BC to AD 210." This is not accurate. The radiocarbon date of 165 to AD 210 was obtained from a charcoal sample during the 1984 investigations, and is not stratigraphically tied to the human skeletal material.

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: Alan Nii, Esq., Kuilima Resort Company
Ralph Portmore, Group 70 Ltd.

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

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

Attn: Mr. Willaim W. Paty, Chairperson
Board of Land and Natural Resources

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 6 April 1989 memorandom to the State Office of Environmental Quality Control and your letter to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Preservation of Sites Found Significant Under Criteria D and E

Two sites found to be significant under State of Hawaii criteria d and e involve Site 4082 (burial and habitation complex) on the Punamano Golf Courses site, and Site 4088 (platform/mound) located on the Malaekahana Golf Course site. These two sites will not be affected by golf course development since they are located outside the areas planned for clearing and grading activities. As these sites are located within the site boundary, mitigative measures will be described in the Final EIS. Recommendations for these sites provided by Paul H. Rosendahl, Ph.D., Inc. (PHRI) will be followed.

B. Six Archaeological Sites Identified Outside the Punamano Site

Because of boundary changes to the Punamano Golf Courses site, six archaeological sites discovered in the field investigations were subsequently identified as outside the project boundary (along the eastern boundary of the site). These sites include State Sites 4068, 4069, 4079, 4080, 4081 and 4085. This information will be included in the Final EIS in Section 4.10-A-4 .

The text of the Final EIS will also include a discussion stating that the project sites of Punamano and Malaekahana include 12 significant sites and eight sites that are no longer significant.

C. Discrepency in the DEIS Text

After reviewing your comments regarding direct and indirect effects on identified sites, we are revising the DEIS text to discuss these types of effects and the specific sites involved. Additions to the text in Section 4.10-A-3 of the Final EIS are as follows:

> "After boundary adjustments, there are 12 significant archaeological sites located within the two project sites. These sites, listed by PHRI and State site number, include: Punamano sites T-3 (4070), T-4 (4071), T-5 (4072), T-7 (4073), T-15 (4076), T-17 (4078), T-22 (4082), and T-28 (4087); and Malaekahana sites T-1 (4088), T-3 (4089), T-6 (4090) and T-12 (4093). There are also eight archaeological sites located within the two project sites that are considered not significant beyond the present study. These sites include: Punamano sites T-9 (4074), T-11 (4075), T-16 (4077), T-24 (4083), T-25 (4084), and T-27 (4086); and Malaekahana sites T-7 (4091) and T-8 (4092)."

Additions to the Final EIS text in Section 4.10-B include:

> "Current plans for the golf courses would cause some direct effects to six sites – four are non-significant sites [Punamano: T-11 (4075), T-16 (4077) and T-24 (4083); and Malaekahana: T-8 (4092)] and two are significant sites [Punamano: T-15 (4076) and Malaekahana: T-1 (4088)]. Direct effects constitute activities such as grading and excavation, which could cause partial or complete destruction of the archaeological features at a site.
>
> "Of the 14 archaeological sites on the two project sites which will not be directly affected, all could potentially be exposed to indirect effects of construction and operation. These sites include four non-significant sites [Punamano T-9 (4074), T-25 (4084), and T-27 (4086); and Malaekahana T-7 (4091)]; and ten significant sites [Punamano T-3 (4070), T-4 (4071), T-5 (4072), T-7 (4073), T-17 (4078), T-22 (4082), T-28 (4087); and Malaekahana T-1 (4089), T-6 (4090), and T-12 (4093)]. Indirect effects constitute the potential disturbance of an archaeological site by individuals whom may purposely or accidentally encounter them. There are no plans to disturb any of these 14 sites by construction or operational activities required for the golf courses and support facilities."

D. Mitigation Plans for Significant Sites

The mitigation plans for the 12 significant archaeological sites found on the project areas were stated incorrectly in the DEIS. All 12 significant sites within the project areas will be preserved and/or undergo archaeological data recovery. Only two of the 12 significant sites are expected to be affected by the construction of the project. These two sites are scheduled for archaeological data recovery and/or preservation. The other 10 sites will be left untouched on the site, since these sites are not planned to be affected by any project development plans. DLNR recommendations for specific mitigative measures, such as measures to restrict future access to significant sites, will be implemented by the developer. The developer intends to complete all necessary preservation and mitigation measures, with coordination through the archaeological resources consultant, PHRI.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

E. Statement Regarding Dating of Remains

The information provided on page 93 of the DEIS was incorrect and is being revised to reflect your comment in the Final EIS.

Thank you again for your suggestions and comments. Please feel free to call either me or Jeff Overton (532-5866) if you have any further questions or concerns.

Sincerely,

GROUP 70 LIMITED

for Jeffrey H. Overton

Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

STATE OF HAWAII

DEPARTMENT OF BUSINESS
AND ECONOMIC DEVELOPMENT

LAND USE COMMISSION

Room 104, Old Federal Building, 335 Merchant Street
Honolulu, Hawaii 96813 Telephone: 548-4611

March 28, 1989

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

Dear Mr. Portmore:

Subject: Draft EIS for the Country Courses at Kahuku

Based on our review of the proposed property, we find that the proposed golf course sites are within the State Land Use Agricultural District. Based on information contained in the Draft EIS, it is our understanding that the developers intend to seek a district boundary change for the golf course uses.

Thank you for the opportunity to provide these comments.

Sincerely,

ESTHER UEDA
Executive Officer

EU:to

MAR

89:PLNG/1071BJT

March 28, 1989

MEMORANDUM

TO: Dr. Marvin Miura, Director
Office of Environmental Quality Control

FROM: Joseph K. Conant

SUBJECT: Draft EIS for the Proposed Country Courses at Kahuku

Thank you for the opportunity to review the subject draft EIS. We have no comments to offer.

We are returning Volumes I and II of the draft EIS to you as we have no further use for the reports.

JOSEPH K. CONANT
Executive Director

Enclosures

cc: Department of General Planning
Mr. Alan Nii, Kuilima Resort
Mr. Ralph Portmore, Group 70 Ltd.

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

March 10, 1989

C-L89-0027

Dr. Marvin Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, HI. 96813

Subject: Draft EIS: The Country Courses at Kahuku, (Punamano and Malaekahana), O'ahu. TMK: 5-5-05: por. 1,2,5,6,7; 5-7-01: por. 21; 5-6-07: por. 1; 5-6-06: por. 6

Dear Dr. Miura:

Thank you for sending our office a copy of the Draft EIS, and for the opportunity to comment.

The environmental assessment (including attached reports) for this project is remarkably comprehensive and well written. We appreciate the effort that has gone into providing the public with a complete picture of the environmental impacts of the project. It will be a useful reference for our office, particularly the section on golf courses.

Topics of concern to our office include the loss of agricultural lands potentially available for small farms and diversified agriculture, the need for rural planning rather than urban development, the loss of significant archaeological sites, and the need for preservation and access to historic Hawaiian sites.

This project is yet another which will convert agricultural lands to urban commercial use and will use water that might be put to agricultural and residential uses. Such actions have an adverse impact on a substantial number of Hawaiians who would like to see our rural heritage and lifestyle maintained. The lands in the project areas are ideal for development as agricultural park subdivisions. The urbanization of O'ahu is neither inevitable nor is it the only alternative. Hawaiians rely on the State and County governments to have a plan that incorporates the needs of Hawaiians and provides for the wise use of our natural resources. Planned growth is like skilled craftsmanship, when it is well done. The proliferation of golf courses, and the unrestrained evaporation of our rural landscapes, is another story.

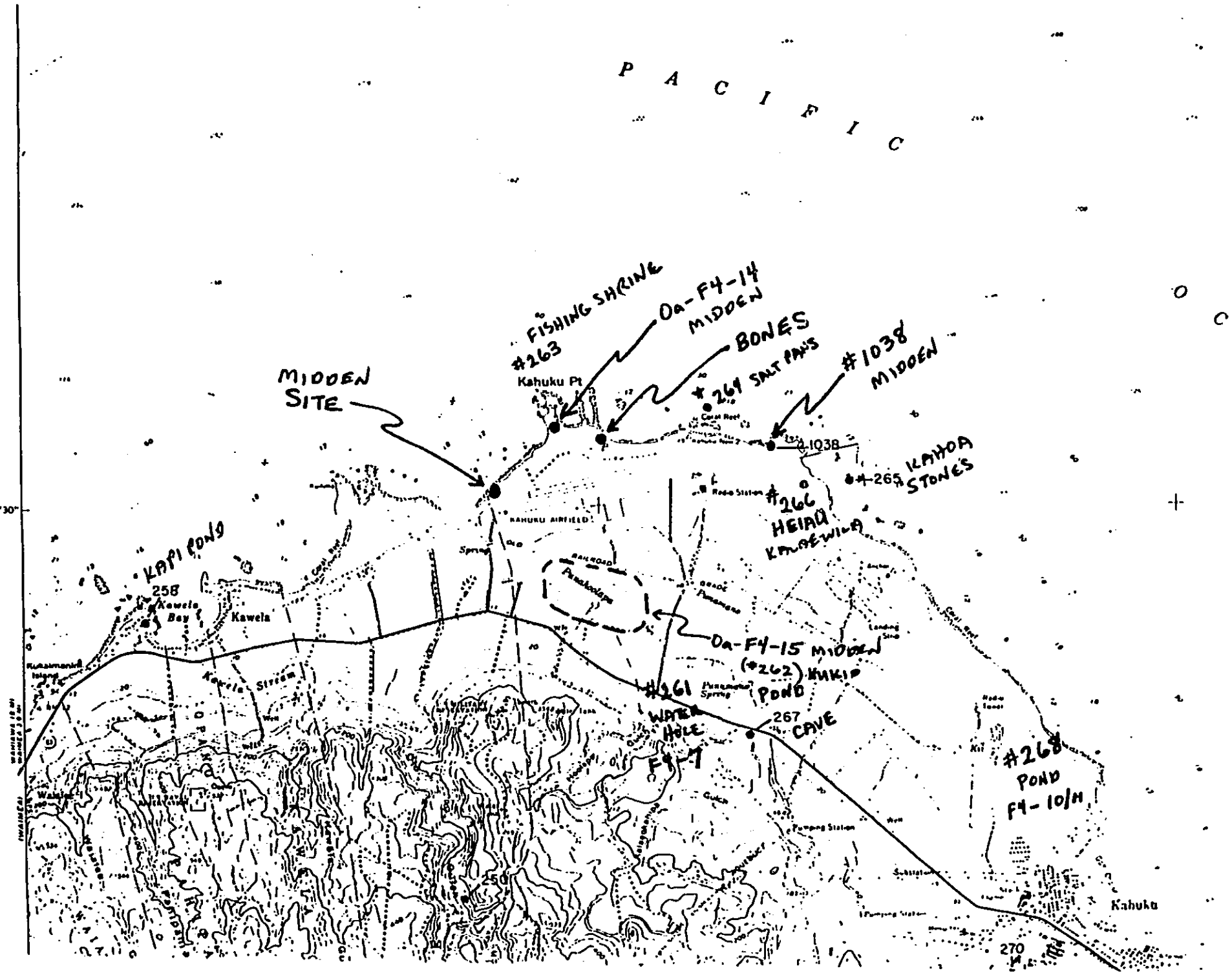
The project area lies within the district of Ko'olauloa. Within the entire district, there are only five sites on the Hawaii Register of Historic Places: Puu O Mahuka Heiau, Hanawao Heiau, Kalou Fishpond, Huilua Fishpond, and a burial cave in Ka'a'awa. Thus, it should be noted that none of the site types located during the archaeological surveys for this project are well represented in the registered sites of the District. This should be taken into account by those making recommendations and granting approvals on this project.

The Hawaii Register is central to all aspects of our preservation efforts. It is the logical end to the identification, documentation, and evaluation processes, and the beginning point for initiating protection measures. After survey by the developer's archaeological consultant, significant sites should be nominated to the Hawaii Register. This is what happened at Kawela, Moloka'i, and it could be done on O'ahu. Collectively, these nominations provide documentation of our Hawaiian heritage. They are the tangible evidence of our past. The Register should include all kinds of sites. It should reflect the diverse range of Hawaiian archaeological resources in each local community as well as throughout the State. If it is to be instrumental in protecting the remnants of Hawaiian traditions for everyone's appreciation and use, then more sites need to be nominated.

From this perspective, it is difficult to understand why only one site in the project area is characterized as an excellent example of a site type. All of the sites in the project area are under-represented in the Hawaii Register. And in terms of the Register's purpose, both the excellent and the ugly are important in measuring variability and understanding cultural patterns. As the survey for this project and others have shown, there are few surface archaeological features left in the Kahuku area, and those that remain should not be casually discarded just because other islands have more to offer. Hawaiians in Kahuku should have something to visit in their own backyard.

The assessment of rock mounds and heiau sites in Hawaiian archaeology could be improved. As Kamakau reported, Hawaiians built unu ho'ouluulu ua to bring rain. An unu was one kind of heiau that might today just look like a rock mound or a pile of rocks upon casual examination. These kinds of sites were everywhere in ancient Hawaii, yet they are not well represented in the Hawaii Register or in surveys done by Hawaii archaeologists. These facts should be addressed in the EIS.

It is important that the archaeological survey reports that accompany environmental impact statements be as complete as possible. This is because it is not reasonable to expect reviewers to understand the impact of a project on cultural resources when the archaeological sites are not fully documented in the report. There must be sufficient information to allow a reviewer to evaluate the assessments and recommendations being made. All sites should be described as fully as possible. The level of documentation necessary for a National Register nomination should be provided, as that is the minimal amount


PACIFIC
FISHING SHRINE
#263
Oa-F4-14
MIDDEN
BONES
#1038
MIDDEN
MIDDEN
SITE
Kahuku Pt
#264 SALT PANS
#1038
#265 KAHOA
STONES
#266
HEIAU
KAMAEWILA
KAHUKU AIRFIELD
KAPI POND
258
Kawela
Kawela Bay
Oa-F4-15 MIDDEN
(#262) KUKII
POND
#261
WATER
HOLE
F4-1
267
CAVE
#268
POND
F4-10/H
250
Kahuku
270

of information necessary for an outside reviewer to evaluate and appreciate the significance of a site.

The archaeological survey included with this EIS is more like a reconnaissance survey than an intensive survey, because of the limited amount of information provided on some of the sites. One example of this is the description of Site T-3 in the Punamano survey area, subsequently assigned State Site No. 4070. There is not enough information to tell that 4070 is the same as Site No. 267 in McAllister's report on the archaeology of O'ahu, the famous cave with the breasts of Nawaiuolewa. Neither is there any mention made of the hole of Kahipa and Nawaiuolewa, or of the two nearby waterholes known as Kane and Kanaloa.

Another good example where more information should have been provided is site T-1 in the Malaekahana survey, subsequently assigned State Site No. 4088. A map and photograph of the site would have helped the reviewer evaluate the site's significance by making possible a comparison with other previously recorded sites, such as burial platform site no. 2501 (in Kahuku). Based on the evidence presented in the survey report and other records on file in the Department of Land and Natural Resources, it is reasonable to assume that this is the only site of its kind in the Kahuku area, and that the site has important research and interpretive values, and should be preserved. Partial dismantling of the rock platform is not sufficient to determine its function or the activities that took place in the vicinity of the site. Excavation around and beneath the rock structure would be necessary.

It is likely there were prehistoric Hawaiian trails and irrigation ditches (auwai) in both survey areas, and these should be located and included in the survey report.

There is a possibility that subsurface burials exist in the Punamano project area similar to the ones discovered during construction of the Kahuku prawn farm and investigated by the Bishop Museum. This should be considered in the EIS.

The value of the historical appendix to the archaeological survey report is diminished by the failure to include copies of historical maps, such as the Kahuku portion of McAllister's 1917 field map and other maps on file in the DAGS Survey Division map archives. This is especially important because the survey report states that McAllister's site no. 262, Kuki'o Pond, was destroyed during construction of the Kahuku airfield during the Second World War. A review of archival maps should show that Kuki'o Pond is the same site as the Punaho'olapa Marsh area. It was not destroyed by the airfield.

There should be maps showing the relationship between the sites recorded during the survey and properties awarded to Hawaiians during the mahele. This would allow us to evaluate the probable locations of buried subsurface archaeological remains.

In our copy of the EIS the site location map for the Punamano survey area is almost unusable because the elevation contours did not reproduce well. A better map should have been used in the original.

There should be a map showing the location of the excavation trenches in the Punamano area survey.

In our copy of the archaeological report the map in Figure 8 was incorrectly identified as site 4076. It was clear from the narrative description in the report that it was a map of site 4089. Likewise, the map in Figure 10 was incorrectly identified as site 4089. It was a map of site 4076.

The number of trenches and transect corridors is left out on page 12 of the survey report.

The description of site 4076 notes the recovery of two artifacts, a basalt adz and a drilled shell ornament. The map of site 4076 indicates that four artifacts were recovered, but there is no report on the other two artifacts. There are no photographs or drawings of the artifacts.

Our staff would like a copy of any archaeological reports that may result from this project in the future, including a revised version of this survey report. Also, Our staff would like the opportunity to make a field trip to these sites. Contact our cultural resources specialist Earl Neller at 946-2642.

Sincerely,

Richard K. Paglinawan

Richard K. Paglinawan
Administrator

RKP:EN:klr

cc: DGP/City and County of Honolulu
Kuilima Resort Company
Group 70 Ltd.
DLNR/Historic Sites
U.H./Environmental Center
U.H./Anthropology Dept.

Enclosure: map of sites in the Kahuku area

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

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

ATTN: Mr. Richard K. Paglinawan
Administrator

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 10 March 1989 letter to the State Office of Environmental Quality Control concerning the Draft Environmental Impact Statement. We appreciate your comment about the effort that went into preparing the DEIS and its comprehensiveness. Your response shows a similar effort as well as an appropriate concern that we strive for an even higher level of completeness. The following responses are to your specific comments.

A. Loss of Agricultural Lands

We disagree with your characterization of this project as an "urban commercial use." It is a low intensity park use, highly compatible with the intensity of the land use and visual character of a rural or "country" area. The maintenance of golf courses is much like an agricultural operation. Golf course operators have indicated to us that they find unemployed agricultural workers to be well-qualified and suited to golf course maintenance work. A golf course is also one of the few non-agricultural uses of land which could be converted to agricultural use with little difficulty.

The fact that a fee will be charged to use the golf courses does not make it an "urban commercial" activity. All municipal golf courses charge fees, as do the National Parks on the islands of Maui and Hawaii.

We question whether the rolling terrain of the project sites is "ideal for development as agricultural subdivisions." In any event, our agricultural consultant indicates that the supply of unused agricultural land suitable for such subdivisions greatly exceed the potential demand.

The primary purpose of these golf courses is to serve the visitors who will be brought to the area by the planned growth of the Kuilima Resort. They will be important to

ensuring the viability of the Resort. The decision to plan a major resort in the area was made only after several years of consideration and with extensive local community participation and support.

B. Hawaii Register of Historic Places Representation

You note that none of the site types located during the archaeological survey of the Punamano and Malaekahana sites are well represented in the registered sites of the Koolauloa District. You conclude that this condition should lead to characterizing more than one site in the project area as an excellent example of a site type. Our consultant archaeologist indicates, however, that a site's National Register eligibility status is not currently affected by the state of a region's site type representation on the Hawaii Register of Historic Places. If you disagree with this, perhaps you should address your concern to those who establish the criteria for determining a site's eligibility.

Project proponents are not currently required to complete Hawaii Register of Historic Places nomination forms for sites considered potentially eligible for inclusion on the National Register. Data sufficient for completing such nominating forms, however, is available from the office of Paul H. Rosendahl, Ph.D., Inc. (PHRI), Consulting Archaeologist in Hilo, HI.

C. Rock Mounds and Heiaus

We concur that rock mounds and heiaus represent potentially significant sites which should not be ignored nor improperly evaluated. Most of the monds identified by the field crew and field supervisor during the present project were determined to represent bulldozer push mounds, not prehistoric Hawaiian cultural features. This determination was not arbitrary, but was based on field observations of bulldozer tracks and scaped alignments at or within the immediate vicinity of the mounds, as noted in the PHRI report enclosed as Appendix N in Volume II of the DEIS.

D. Reconnaisssance Survey vs. Intensive Survey

Your comments included a statement that the PHRI survey included in the DEIS is more like a reconnaissance survey than an intensive survey. In the front of the PHRI report (p. 1) under "Scope of Work", it is noted that "The basic purpose of an archaeological inventory survey, formerly referred to as a reconnaissance survey (emphasis added), is to identify...all sites and features of potential archaeological significance present within a specified project area. An inventory survey constitutes the initial level of archaeological investigation. It is extensive rather than intensive in scope, and is conducted basically to determine the presence or absence of archaeological resources within a specified project area. This level of survey indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains..."

The Historic Sites Section of the State Department of Land and Natural Resources has found the archaeological survey's findings to be acceptable. Again, if you disagree with what is required for an EIS-level survey, perhaps you should address your concern to those who set the requirements.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-587-4

E. Comparison with Data From McAllister (1933)

Your comments included reference to McAllister (1933), and that there was not enough information provided in the DEIS to tell whether Site 4070 is the same as Site No. 267 in McAllister (1933). With regard to Site 4070, the descriptions of the cave provided in Sites of Oahu (E. Streling and C. Summers, BPBM, Honolulu) contain three relevant clues. One of these is the locational information itself -- several observers concur that the cave is located on the northwest side of the "rocky brow of Kalaeokahipa..." Second, the descriptions reference two "stalactites" resembling the breasts of a woman which "formerly hung..." within the cave; another description also indicates that at least one of these features has been broken off. Third, one of these descriptions indicates that close to the cave is "...a small round opening into a secret cave..."

Collectively, the evidence does suggest that our Site T-3 (4070), located on the north to northwest brow of the cliff face, may perhaps represent McAllister's Site 267, but the same possibility exists for a number of other caves also recorded along the cliff face. The problem of identification is compounded by the lack of specificity in the original site description provided by McAllister. In any case, this possiblity had certainly been considered prior to conducting fieldwork, which accounts for the lengthy discussion of this site in the PHRI report's Appendix A. In response to your comments, the possibility that Punamano Site 440770 may represent McAllister's Site 267 will be more clearly stated in the final version of the PHRI report enclosed in the Final EIS Appendix N.

Your comments also mentioned that the DEIS makes no mention of the hole of Kahipa and Nawaiuolewa, or of the two nearby waterholes known as Kane and Kanaloa. Pages A2 and A3 of the original report do mention these features.

F. Malaekahana Site T-1 (4088)

Your comment regarding State Site No. 2501, a burial platform, includes recommendations for excavation around and beneath the rock structure. The level of excavation proposed for Malaekahana's Site T-1 (same as 2501) consists of trenching through the feature in two directions. This will, in fact, result in excavation "...around and beneath the rock structure..."

G. Prehistoric Hawaiian Trails and Irrigation Ditches

We agree that it is likely that there were prehistoric Hawaiian trails and irrigation ditches in both survey areas. PHRI accounts for the absence of such features as being due to the extensive past disturbances to which both project sites have been subjected over the past 80 or more years.

H. Subsurface Burials in the Punamano Area

PHRI concurs that subsurface burials may exist in the Punamano project area. In reflection of this, the report concludes with the provisional statement that "potentially significant unidentified culturaal remains might be encountered in the course of future development. In such a situation, archaeological consultation should be sought immediately."

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-587[illegible]

I. Failure to Include Historical Maps

With regard to the comments on the historical appendix to the PHRI Report, McAllister's 1917 map was not copied and included in the report as the information contained therein has been included in the "Sites of Oahu" volume. We did examine an earlier map (Loebstein's 1910 map, Registry #1560), and while some pond locations are identified, these were not labeled. McAllister's 262 site is described as Kukio Pond, and as being located within 300 feet of the shoreline. This site was relocated during archaeological excavation in 1985 (PHRI Project No. 215, discussed in the Archaeological Background Section of the PHRI report). Further, the Punahoolapa Pond is also described in "Sites of Oahu" as a separaate listing, but is not mentioned by McAllister. This pond is clearly located a substantially greater distance from the shoreline than Kukio Pond, and was recently assigned a separate State site number (50-OA-2912). We cannot reconcile the available evidence with your comment that "A review of archival maps should show that Kukio Pond is the same site as the Punahoolapa Marsh area was destroyed by the airfield." The available evidence clearly indicates that Kukio Pond was destroyed, that Kukio Pond is not the same as Punahoolapa Pond, and that neither is located within the Punamano project site.

J. Maps Showing the Relationship Between PHRI Sites and Properties Awarded to Hawaiians During the Mahele

PHRI's examination of the Land Court Award (LCA) records did result in locating a single LCA within the Punamano project area; however, there was no accompanying ownership information, The PHRI Final Report, to be included in the Final EIS, will include information on the LCA.

K. Map Corrections

The site location map for the Punamano site will be corrected in the Final PHRI Report in Volume II of the Final EIS. A map showing the location of excavation trenches will be included in the Final EIS. The mix-up of Figures 8 and 10 will be corrected in the Final EIS. The number of trenches and transect corridors will be included in the Final EIS.

L. Recovered Artifacts From Site 4076

Four artifacts were observed on the surface of Site 4076, two of which were collected. The site map of the PHRI Report revised to show which of the four identified artifacts were collected, and the text will be corrected to indicate that four artifacts were actually observed. A copy of the revised report will be sent to you shortly.

M. Field Trip

You mention the desire to make a field trip to the sites identified in the DEIS. For this matter to proceed, please contact Alan Nii, Esq. of Kuilima Resort Company at 524-7622.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

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

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton

for Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

(P)1168.9

MAR 1 1989

Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dr. Marvin Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Gentlemen:

Subject: The Country Courses at Kahuku
Draft Environmental Impact Statement

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

Very truly yours,

T. Tominaga

TEUANE TOMINAGA
State Public Works Engineer

LO:jnt
cc: Mr. Alan Nii, Kuilima Resort Company
Mr. Ralph Portmore, Group 70 Ltd.

3949 DIAM

1989

Engineering Office

City & County of Honolulu
Dept. of General Planning
650 S. King Street
Honolulu, Hawaii 96813

Dr. Marvin T. Miura
OEQC
465 S. King Street, Room 104
Honolulu, Hawaii 96813

Gentlemen:

The Country Courses at Kahuku
Koolauloa, Oahu
TMK: 5-5-05:Por 1, 2, 5, 6, 7,
TMK: 5-7-01:Por 21, TMK: 5-6-07:Por 1,
TMK: 5-6-06:Por 6

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

Enclosures

cc: Ala Nii, Esq., Kuilima Resort Company
Group 70 Ltd., Ralph Portmore, AICP

JOHN WAIHEE
GOVERNOR
ROGER A. ULVELING
DIRECTOR
BARBARA KIM STANTON
DEPUTY DIRECTOR
LESLIE S. MATSUBARA
DEPUTY DIRECTOR

DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813

February 27, 1989

City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Sir:

Subject: The Country Courses at Kahuku, Koolauloa, Oahu,
TMK: 5-5-05: Por. 1, 2, 5, 6, 7;
5-7-01: Por. 21;
5-6-07: Por. 1;
5-6-06: Por. 6

Thank you for the opportunity to review the Draft EIS. We have no comments to offer at this time.

Sincerely,

MAURICE H. KAYA
Energy Program Administrator

MHK/hk

cc: Mr. Alan Nii, Esq.
Group 70 Ltd.

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

89/EC-5(ASK)

April 10, 1989

MEMORANDUM

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: JOHN P. WHALEN, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)
THE COUNTRY COURSES AT KAHUKU
KOOLAULOA DISTRICT, OAHU, HAWAII

We have reviewed the subject document and offer the following questions and comments:

Groundwater

Do you intend to install underground fuel storage tanks? If so, the EIS should discuss the potential risks these tanks may pose to groundwater.

Will surface water carry fertilizers and pesticides off site? If so, what impacts might this have?

A monitoring program may be required to evaluate the impact of pesticides and fertilizers on groundwater.

The EIS should evaluate the impact of proposed withdrawals from groundwater sources.

Infrastructure

Drainage plans should be coordinated with the City Department of Public Works.

Agriculture

The feasibility of other agricultural uses for the subject property should be discussed.

The primary and secondary impacts of golf course development on adjoining agricultural lands should be discussed.

Thank you for the opportunity to comment on this project. If you have any questions, please contact Ardis Shaw-Kim of our staff at 523-4077.

JOHN P. WHALEN
Director of Land Utilization

JPW:ik
0318N/12

cc: Dr. Marvin Miura, OEQC
Mr. Alan Nii, Kuilima Resort Company
Mr. Ralph Portmore, Group 70✓

GROUP 70
LIMITED

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Robert K.L. Wong, AIA
Sheryl B. Seaman, AIA, ASID
Hitoshi Hida, AIA
Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

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

Attn: Mr. John P. Whalen, Director

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 10 April 1989 memorandum to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Underground Storage Tanks

It has not been determined whether or not underground storage tanks for fuels and/or hazardous sustances will be included in the facilities for the golf courses. If underground storage tanks are included in the facilities, they will be designed , installed and operated in accordance with 40 CFR Parts 280 & 281. These regulations have been promulgated to minimize potential risks to groundwater posed by underground storage tanks.

B. Fertilizers and Pesticides in Groundwater

All of the measures described in the eight conditions applicable to this new golf course development, as imposed by the State of Hawaii Department of Health (April 7, 1989), will be implemented by the developer and/or future golf course operators. These measures include the establishment of a groundwater monitoring program to periodically measure for chemicals in groundwater. Fertilizer and pesticide components will be tested for in this program.

C. Impact of Proposed Groundwater Withdrawls

As discussed in the DEIS, potable water supply for the Punamano Golf Courses will come from groundwater withdrawn from the Waialee Dike Aquifer. This aquifer has been estimated by the Department of Land and Natural Resources to have a surplus capacity in excess of 7.0 million gallons per day (mgd). Proposed usage of this aquifer

by the Punamano Golf Courses is estimated at 60,000 to 75,000 gallons per day, which would represent a one percent reduction in surplus capacity.

Irrigation water use at the Punamano Golf Courses is projected to be 1.4 mgd, as reported by Murdoch and Green (February 1989) in Appendix I of the DEIS. This water will be drawn from the Koolauloa Basal Aquifer, and is expected to be slightly brackish at this location. Groundwater in the portion of this aquifer underlying the golf course site is not considered suitable for potable water development, and is not planned to be a future source for potable water. According to Mink (April 1989), the withdrawl of 1.4 mgd of irrigation water from this aquifer is not expected to adversely affect its capacity to produce irrigation water for the area's agriculture and golf course uses.

Potable water development for the Malaekahana Golf Course will be drawn from another portion of the Koolauloa Basal Aquifer which has good potential for deriving potable water. The maximum potable water demand projected for the Malaekahana facilities is estimated at 40,000 gpd, based on Board of Water Supply water use rates. Irrigation water will also be derived from an on-site well, with an average rate of 0.35 mgd. According to Mink (April 1989), water derived from this aquifer for the golf course will not adversely affect other nearby wells. Additionally, a percentage of the irrigation water will percolate back into the basal aquifer.

D. Surface Runoff of Fertilizers and Pesticides

A thorough study of the environmental impact of fertilizer and pesticide use at the proposed Punamano golf courses was prepared by Murdoch and Green (February 1989). This report is enclosed as Appendix I in Volume II of the DEIS, and will also be included in the Final EIS.

Pesticides

The findings of this report indicate that there is only a limited potential for pesticides to be carried off-site in runoff waters. Specifically, this may happen only during heavy rainfall events that occur soon after application. Any concentrations of pesticides which do occur in the runoff are expected to be highly diluted, since the total watershed contributing the runoff into the Refuge is large relative to the area being developed.

Runoff from an area of approximately 92 acres (three sub-watersheds) flows into the Refuge. Runoff from the rest of the 1,303-acre watershed encompassing the 605-acre site flows elsewhere than the Refuge. Within the 92-acre sub-watershed area, the approximate area of the project lands is about 55 acres, and about 25 acres will be treated with fertilizers and a much smaller area (less than one acre) with pesticides. The treated area will represent approximately 27 percent of the sub-watershed. While movement of applied chemicals in runoff from turfed areas is not considered a major problem under these conditions, caution will be exercised in applying chemicals during the rainy season (November through February).

Pesticide applications are normally made only to greens on golf courses. Greens comprise approximately 3.0 acres of a typical 18-hole golf course, therefore, the application of pesticides is very site-specific and limited. Pesticides are normally applied only in response to outbreaks of pests, and few chemicals are applied as part of

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

a preventative program. In terms of the toxicity, the only chemicals used in golf course maintenance in Hawaii that are highly toxic to birds are the organic phosphate insecticides, especially chloropyrifos.

Although chloropyrifos is highly toxic to birds, it is strongly adsorbed on the thatch layer of turf and moves little from the site of application. Because of the adsorption of organic phosphate insecticides on organic layers in turf and their rapid breakdown, there is little chance of their movement from grassed areas into the drainage gulches which will collect runoff on the site, and eventually transport it to the Refuge. As a futher precaution, every effort will be made in the preparation of grading and drainage plans for the golf courses to route runoff water circuitously through vegetated swales to maximize the removal of any organic phoshates and other chemicals which might be in the storm water prior to their transport off-site.

Additional mitigative measures are proposed which are expected to further minimize the contribution of pesticides to runoff waters entering the marsh. These measures include: minimizing application of pesticides to only pest outbreak areas; minimizing the size of areas which normally require the most frequent pesticides application, such as greens; and substitution of pesticides used which are less toxic to birds than organic phosphate types. There will be specified in the Final EIS.

Fertilizers

Murdoch and Green (February 1988) also addressed the potential for fertilizer application to affect the Punamano Pond unit of the Refuge.

The primary fertilizer elements of concern for contamination of ground and surface waters are nitrogen and phosphorus. Phosphorus is attached very tightly to soil clays and moves little, if any, from the site of application. Phosphorus, therefore, will not cause any problem with 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 nitrogen use rates 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.

To avoid loss of nitrate in runoff water from the site, a slow-release nitrogen fertilizer will be applied in which the nitrogen is in an insoluble form at application. Over time this fertilizer releases small quantities of soluble nitrogen which is then utilized by the turf. Use of slow-release nitrogen fertilizer will minimize the potential for nitrate enrichment of runoff waters leaving the site, therefore, the Punamano Pond will not be affected by excess nitrate contamination from the golf courses.

Other potential mitigative measures that will be investigated to reduce off-site transport of nitrate are similar to those proposed for controlling pesticides from entering runoff waters. These measures include minimizing the areas which require fertilizer application; careful water management to avoid over-watering; and runoff routing to enhance turfgrass uptake of nitrate.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

Coordination With U.S. Fish and Wildlife Service

The applicant intends to coordinate closely with the Fish and Wildlife Service to ensure that their concerns about potential adverse effects of pesticide and fertilizer inputs to the Punamano Pond Refuge are addressed. Implementation of the proposed mitigative measures will ensure that there will be no substantive adverse impacts to the marsh.

E. Drainage Infrastructure

The plans to control stormwater runoff during and after construction of the golf courses will be coordinated and reviewed by the City and County Department of Public Works, and the State Department of Transportation where KamehamehaHighway is involved.

F. Agricultural Feasibility

The report by Decision Analysts Hawaii, Inc. (February 1989), enclosed as Appendix H of the DEIS, addressed previous attempts to utilize the site for different types of agricultural uses since the departure of sugarcane from the land. The Malaekahana site has been utilized for grazing purposes during the past years. Because of slopes, soil types, water requirements and agricultural market factors, neither site has been successfully developed for diversified agricultural use. The report in the DEIS cites that these factors would continue to limit the potential success of agriculture on these lands.

G. Primary and Secondary Impacts of the Project on Adjoining Agricultural Lands

The development of the golf courses is not expected to reduce the potential for agricultural use of nearby agricultural lands such as the aquaculture and diversified agriculture operations occuring in the area.

The recently enacted moratorium on the issuance of golf course permits is in response to 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 specific reasons for the moratorium.

The concerns behind the bill are addressed individually below to get a better perspective on the issues.

Long Term Impact On Agricultural Land

Golf course demand for agricultural 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 to use 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.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-587[illegible]

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, Ph.D. (1) 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. (2) and Michael Sklarz, Ph.D. of Locations Inc. (3) 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.

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.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

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 Kuilima Resort Company sees the golf courses as a community project and will work to make the project an integrated and positive part of the Koolauloa community. A close and continuing relationship between the golf courses developer/operator and the community can address the concerns covered by this subject.

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 Country Courses at Kahuku 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 will be negotiated. Specific conditions will be incorporated as requirements of the various permits.

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 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.

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

Sincerely,

GROUP 70 LIMITED

for Jeffrey H. Overton

Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-58[illegible]

References

(1) Scott, Frank S. (February 1989)
Feasibility and Need for Agriculture at the Waikane Golf Course Project
Honolulu, HI

(2) Community Resources, Inc. (October 1988)
Socio-Economic Impact Assessment for Proposed Waikane Golf Course
Honolulu, HI

(3) Sklarz, Michael (November 1988)
Projected of Real Estate Price Impacts of the Lihi Lani Recreational Community, Pupukea, Oahu, Locations, Inc., Honolulu, HI

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

DONALD A. CLEGG
CHIEF PLANNING OFFICER

GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

WM/DGP 2/89-674

March 28, 1989

Mr. Alan Nii, Esq.
Kuilima Resort Company
Pauahi Tower, Suite 2000
1001 Bishop Street
Honolulu, Hawaii 96813

MAR

Dear Mr. Nii:

Draft Environmental Impact Statement (DEIS) for the
Proposed "Country Courses" in Kahuku, Koolauloa, Oahu

The Department of General Planning has reviewed the above referenced DEIS and offers the following comments.

Conformity to General Plan

Given the fact that this project, if successful, will irrevocably commit a large portion of agricultural land to non-agricultural uses, it is apparent that the proposed golf course development may be inconsistent with General Plan policies related to the protection and efficient use of agricultural lands. However, as it is anticipated that this project will provide additional employment (both direct and indirect) and enhance recreational opportunities in the Koolauloa and North Shore Development Plan areas, there may be overriding public good that could outweigh the irretrievable loss of these agricultural lands. To the extent that the proposed project may be shown to involve a significant contribution to the general welfare of the residents of Koolauloa and the public at large, then the loss of these agricultural lands may be appropriate.

Conformity to the Development Plan

The lands associated with the development of the proposed golf course complex are designated for Agricultural use on the Development Plan (DP) Land Use Map for Koolauloa. The developer has submitted an application for an amendment to the

DP Land Use Map in order to change the designation for these lands from Agriculture to Park and Recreation (Golf Course). However, the Department of General Planning has opted to defer processing of all amendments for golf course developments proposed within areas presently designated for agricultural uses. It is the intent of the department to defer processing of such amendments until the 1990 DP Annual Amendment Review in order to provide sufficient time to resolve economic and land use issues related to the development of private golf courses on agricultural land.

Golf Course Moratorium

The City Council has enacted a one-year moratorium on the development of golf courses on agriculturally zoned land. While the moratorium is primarily aimed at permit processing, especially Conditional Use Permits (Type 1) within AG-2 General Agricultural Districts, the ordinance specifically identifies the need to "evaluate and establish special policies for private golf courses." These special policies, once established, may well affect all private golf course development and perhaps other levels of the land use planning process (beyond merely the Conditional Use Permit process) as well. To this end, the processing of a Development Plan amendment for a project such as the Country Courses may well be affected by these policies, once enacted.

Effect on Current Agricultural Uses

It has been noted in the DEIS that the proposed project will have substantial effect on the cattle grazing operations of Gunstock Ranch. The DEIS estimates that Gunstock Ranch may have to reduce the size of its herd by half unless other suitable grazing lands may be found in order to make up acreage lost due to the development. It is unclear from the DEIS whether such a reduction in the size of the herd would affect the ranch's economy of scale, thereby diminishing Gunstock's ability to continue as a viable ranching operation. The DEIS does note that other agricultural lands are available in the Kahuku area. However, the suitability of these lands as a replacement for Gunstock's current acreage would depend on (along with various other factors) the proximity of these lands to the remaining Gunstock lands, the topography and the quality of the grazing, the availability of water, and the ability of the ranch operators to negotiate a lease at or near current lease rent levels. It is also unclear from the DEIS whether the developer intends to assist Gunstock Ranch in locating suitable lands or in negotiating a favorable lease agreement should such lands be found.

Rare and Endangered Plantlife

The DEIS indicates that there are two specimens of maiapilo (capparis sandwichiana) adjacent to the boundaries of the proposed development. While it is understood that the two specimens lie outside of the project boundaries, there is always the possibility of incidental damage to plant life adjacent to areas of groundwork. It is suggested that the developer and the landowner of the area in question, Campbell Estate, establish a program to protect and, if possible, propogate these specimens in accordance with the recommendations of the applicant's botanical survey (Appendix K of the DEIS).

Market Analysis

The marketing study, and its conclusions, is based on a complete and on-schedule buildout of all five hotel developments (each with a projected stabilized occupancy rate of 80%) within the Kuilima Resort area. As Kuilima Resort guests from both the hotels and condominiums are estimated to represent approximately 60% of the total market for the proposed golf courses, delays in the development of the hotel and condominium sites within the Kuilima Resort area could adversely affect the marketability of the golf course complex. Lower resort occupancy rates could similarly affect the viability of the total project. Historically, the total buildout of major resort areas have usually encountered some form of delays in scheduled completion whether it be from an unfavorable financial climate (as was the case several years ago), an unanticipated major archaeological find (as is the case currently with the Ritz-Carlton at Kapalua), a shift in the tourism market or various other factors.

If, for any reason, the entire Kuilima Resort development does not proceed according to schedule, the result could be a substantial overcommitment of resources (both natural and financial) to golf course development. The golf courses would remain underutilized until such time as total build out could be achieved and occupancy brought up to a stable 80% rate. It may be more prudent to allow golf course development to lag behind the market expansion created by the development of the resort, thereby keeping market demand high. Should the market stagnate, whether by delays in resort development or an inability to achieve projected occupancy rates, further golf course development could be suspended and agricultural acreages saved from unnecessary development.

For this reason, it is suggested that the developer examine the alternative of having the land use approval process for the golf course developments phased in such a way as to meet the projected demands of Kuilima Resort projects already underway, but without unduly committing the total agricultural acreages. As the final phase of the Kuilima resort development begins to come on line, and if market demand has met or exceeded expectations, then the remainder of the acreages may be committed to meet the needs of the final expansion of Kuilima Resort.

Unresolved Issues

There are certain unresolved issues identified in the DEIS which may have substantial impact on the community. While it is accepted that resolution of these issues may be best accomplished during the review and approval process, some of these issues may deserve more than cursory mention during the course of the EIS.

Certainly with respect to the issue of possible development pressures on surrounding lands arising out of the ultimate completion of the proposed golf course complex, there may be substantial secondary and cumulative impacts on the character and lifestyle in the Kahuku and Laie communities involved in the development of the golf courses. Therefore, while the proposed project may not involve an urban development in a technical sense, there remains the possibility that resultant pressures for urbanization may lead to the need for complementary development at higher than rural densities, thus changing the rural environment of the area over the long term.

Similarly, while these lands are proposed for Park designation on the DP Land Use Map, the project, by virtue of its affiliation with and development by the Kuilima Resort Company, would constitute a de facto increase in the size of the Kuilima Resort and the extension of the resort beyond the Kawela Bay/Kahuku Point area. This extension of the de facto "resort" area mauka of the highway, and especially south of Kahuku in the Malaekahana area, may set the stage for the development of other appurtenant or accessory land uses which may change long range development patterns for the Kahuku area. In this respect, the proposed development of the Country Courses may need to be assessed with respect to certain cumulative and secondary impacts which may result from the expansion of the resort area beyond the limits identified within the Development Plan Special Provisions. Such an assessment would be especially crucial for the Malaekahana site, as this area is more remote from the resort and there has been no precedent set for development south of Kahuku town.

Conclusion

The department concludes that the Final Environmental Impact Statement (FEIS) should address those issues related to the commitment of agricultural lands for private golf course development and the possible phasing of land use approvals to prevent overcommitment of agricultural resources. The FEIS should also address the cumulative environmental and social effects of this development in terms of increased pressures for urbanization in the Kahuku area and the de facto expansion of the Kuilima Resort. The developer should establish a plan, along with Campbell Estate, to protect and propogate endangered plantlife located adjacent to the project boundary.

Should you have any questions please contact Bill Medeiros at 527-6089.

Sincerely,

Donald Clegg

DONALD A. CLEGG
Chief Planning Officer

DAC:js

cc: OEQC
√Ralph Portmore
James Campbell Estate

GROUP 70
LIMITED

Francis S. Oda, AIA, AICP
Norman G.Y. Hong, AIA
Robert K.L. Wong, AIA
Sheryl B. Seaman, AIA, ASID
Hitoshi Hida, AIA
Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Attn: Mr. Donald A. Clegg, Chief Planning Officer

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 28 March 1989 letter to Kuilima Resort Company concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Conformity to General Plan

As you note, the proposed golf course project may not appear to be consistent with the General Plan Economic Activity Objective C, Policies 5 and 6, relating to maintaining land for diversified agriculture on the North Shore and encouraging more intensive use of productive agricultural land. However, the following two points regarding the application of these policies to this proposed golf courses project should be considered.

First, the study on agricultural impacts prepared by Decision Analysts Hawaii, Inc. (February 1989), included as Appendix H of the DEIS, examined recent attempts to conduct different types of agriculture on these sites. A variety of different crops have been attempted on the Punamano site with little success. Site conditions and market problems were cited as reasons for the failure of crops on this site. The agricultural consultant report noted that the agricultural suitability of the land as reported by LSB and LESA may be overstated, due to current conditions on the site.

The other point concerns the real impact of loss of agricultural lands to residents of Koolauloa. Neither site currently provides employment to residents of the area. The small grazing operations at Malaekahana are run by individuals from Kaneohe. The agricultural feasibilty of the two sites is limited because the market conditions. The relatively poor competitive positions of producers in Kahuku for the traditional truck crops feasible for the area place such operators at a disadvantage. The situation is reflected in the fact that much of the land has remained fallow for a long time.

B. Conformity to the Development Plan

Subsequent to your 28 March 1989 letter, the Department of General Planning has decided to continue processing the application for a Development Plan Amendment from Agriculture to Park (Golf Course). We realize that economic and land use issues relating to golf course development are, however, still major concerns of the City and County of Honolulu. The processing of the Development Plan Amendment will be an interim step in the approval of the golf courses project, with a change of zone to be requested later. We expect that there will be conditions set on the development of this project based on the findings of this and subsequent review processes. The issues and concerns associated with golf courses will be discussed further in the Final EIS, as indicated in the following section of this letter.

C. Golf Course Moratorium

The recently enacted moratorium on the issuance of golf course permits is in response to 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 specific reasons for the moratorium.

The concerns behind the bill are addressed individually below to get a better perspective on the issues.

Long Term Impact On Agricultural Land

Golf course demand for agricultural 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 to use 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, Ph.D. (1) 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. (2) and Michael Sklarz, Ph.D. of Locations Inc. (3) 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

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-587-4

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.

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.

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 Kuilima Resort Company sees the golf courses as a community project and will work to make the project an integrated and positive part of the Koolauloa community. A close and continuing relationship between the golf courses developer/operator and the community can address the concerns covered by this subject.

Public Play at Affordable Rates

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

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 Country Courses at Kahuku 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 will be negotiated. Specific conditions will be incorporated as requirements of the various permits.

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 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.

D. *Effect on Current Agricultural Uses*

The Gunstock Ranch will be affected by the development of the Malaekahana Golf Course, with some reduction of the cattle herd. The actual size of the cattle herd varies, and it has been difficult to determine the actual grazing acreage needs of the ranch. With the golf course, the ranch may be forced to seek additional grazing lands in the area. The Estate of James Campbell is willing to discuss the potential grazing use of other lands of the Estate in the area. The lands adjacent to the Gunstock Ranch, however, are all leased and would not be available for expansion of the ranch. The applicant will assist the Ranch owner in lease negotiations with the estate to find alternative sites if this is needed.

E. Rare and Endangered Plantlife

Kenneth Nagata, consulting botanist for the project, identified two individuals of the rare maiapilo shrub (Capparis sandwichiana var. sandwichiana) immediately adjacent to the Punamano site. These plants exist on land owned by The Estate of James Campbell, and their location is shown in the DEIS Figure 22 and Appendix K. There are no plans to change the habitat of these shrubs. The plants are located at least 300 feet from the proposed golf courses on the Punamano site. The development of the golf courses is expected to have no impact on these plants.

F. Market Analysis

Demand for golf facilities at The Country Courses at Kahuku is related to the anticipated development schedule for hotels, condominiums and other facilities at Kuilima Resort, as provided by the Kuilima Resort Company. The development schedule is included in the DEIS Appendix G - Exhibit IV-B.

If hotel and condominium development falls short of the governmentally-approved and anticipated levels, there would be fewer persons staying at the resort and thus the demand for golf would be expected to be less than projected. The analysis conducted for The Country Courses at Kahuku includes a sensitivity analysis for hotel and condominium occupancies at the resort. Lower occupancies would impact utilization of the courses in a manner similar to having fewer units in that either situation would

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-58[illegible]

support less population at the Resort. This analysis, shown in Exhibit IV-F of Appendix G, shows that the effect of a 10 to 15 percent reduction in overall occupancies would delay the achievement of target rates of utilization at the Country Courses by about three years. A slower or less ultimate development of visitor and residential units at the Resort could be anticipated to have comparable effects on market performance of the Country Courses. In the meantime, the commuity could benefit because of the greater availability of starting times and competitive fees.

The actual build-out of The Country Courses at Kahuku will follow a phased program that is keyed to projected short-term golf facilities demand created by the Resort and Oahu-wide. Your comment regarding phasing of the completion of the latter of the four golf courses based on the market demand follows the intention of the Kuilima Resort Company. The golf courses, like the entire resort expansion, have been introduced as an ultimate long-range plan for resort facilities. Just like a hotel, no golf course will be constructed until the demand for that facility can be economically justified. There will be no commitment of agricultural land until the actual construction of the golf courses is underway, and agriculture could continue on these lands until that point. The potential phasing of development approvals for the different golf courses is more appropriate and could better be accomplished at the zoning approval level, rather than at the Development Plan Amendment stage.

G. Unresolved Issues

Change in Rural Character of the Area Over the Long Term

The question of the long-term effects of the Kuilima Resort Expansion and its associated facilities on the character of the Koolauloa and North Shore area has been considered for the past five or more years. Previously cited studies have shown that golf courses per se do not create significant development pressures. Future housing needs for employees of the Kuilima Resort who migrate to the area will be a much more likely source of these pressures. Enforcement of the limits on growth of the area, as established by the City and County General Plan, can keep the area from growth which drastically changes the rural character.

Urban growth of the area will most likely be controlled by the City and County through its Development Plan amendment and zoning approval processes.

"De Facto" Increase in the Size of the Kuilima Resort

We do not believe there is a need to be concerned over the development of the Punamano and Malaekahana Golf Courses extending the range of the Resort beyond the Kawela Bay/Kahuku Point area. None of the golf course facilities are planned to include any resort amenities. At Malaekahana, the golf course would be as much a community recreational facility as the park areas nearby. As exemplified by the Hawaii Country Club golf course in Kunia, golf courses do not automatically "set the stage for the development of other appurtenant or accessory land uses". In any event, the City and County is in a strong position to control what happens in the surrounding area.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

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

Sincerely,

GROUP 70 LIMITED

for Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

References

(1) Scott, Frank S. (February 1989)
Feasibility and Need for Agriculture at the Waikane Golf Course Project
Honolulu, HI

(2) Community Resources, Inc. (October 1988)
Socio-Economic Impact Assessment for Proposed Waikane Golf Course
Honolulu, HI

(3) Sklarz, Michael (November 1988)
Projected of Real Estate Price Impacts of the Lihi Lani Recreational Community, Pupukea, Oahu, Locations, Inc., Honolulu, HI

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-58[illegible]4

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 5TH FLOOR
HONOLULU, HAWAII 96813
PHONE: 523-4427

FRANK F. FASI
MAYOR

MIKE N. SCARFONE
DIRECTOR

HIRAM K. KAMAKA
DEPUTY DIRECTOR

April 3, 1989

Mr. Donald Clegg, Chief Planning Officer
City and County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dr. Marvin Miura, Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Mr. Clegg and Dr. Miura:

Subject: Draft Environmental Impact Statement
The County Courses at Kahuku
Punamano and Malaekahana
Koolauloa District, Oahu, Hawaii

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement for The Country Courses at Kahuku.

In the event that the developer selects the Mixed-Use Alternative, we request that ten (10) percent of all residential units be set aside for low- and moderate-income households, or an acceptable in-kind substitute be provided. Please be advised that all developments requesting rezoning actions would be subject to some kind of requirement under a Bill for a Community Benefit Assessment Ordinance currently before the City Council which could affect this project. The Department will inform the developer of any requirements should the Community Benefit Assessment bill be enacted.

Thank you for the opportunity to provide these comments.

Sincerely,

for MICHAEL N. SCARFONE
Director

cc: Kuilima Resort Company
Group 70 Ltd.

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

City and County of Honolulu
Department of Housing and Community Development
650 South King Street
Honolulu, Hawaii 96813

Attn: Mr. Michael N. Scarfone, Director

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 3 April 1989 memorandum to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

We have evaluated your comment regarding the possibility of selecting the Mixed-Use Alternative to the proposed golf courses project. At present, it is highly unlikely that the developer would proceed with such an alternative project. The intent of the project is to construct four golf courses that would be open to the public. No residential development is planned for the two sites. If residential development is considered for these sites at some future point, affordable housing requirements of the City and County would be complied with.

Since a rezoning action is proposed for this project, the proposed Community Benefit Assessment Ordinance would affect this project. The rezoning is from Agricultural District to Park District. It is intended that the newly-constructed facilities avaliable to the public for golfing on these sites will provide community benefits. If the ordinance is passed, discussions will be held with the Department of Housing and Community Development to examine your requirements.

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

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton
for Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

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

March 23, 1989

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE COUNTRY COURSES AT KAHUKU, PUNAMANO AND MALAEKAHANA, KOOLAULOA, OAHU, TMK: 5-5-05: Por. 1,2,5,6,7; 5-7-01: Por. 21; 5-6-07: Por. 1; 5-6-06: Por. 6

We have completed our review of the above referenced EIS and would like to provide the following comments.

We do not anticipate a substantial increase in calls for police service and the need for additional police resources as a result of this project.

In addition to the mitigative measures mentioned in the draft EIS, we suggest that the following measures be considered to improve the traffic flow on Kamehameha Highway:

(1) Provide acceleration and deceleration lanes at the access roadways to each of the golf courses.

(2) Create left-turn storage lanes at the entrances to the golf courses.

The clubhouse and other related facilities should be designed with security in mind; parking areas should be well lit at night and accessible to police patrols.

Thank you for the opportunity to comment on this matter.

DOUGLAS G. GIBB
Chief of Police

By
JOSEPH AVEIRO
Assistant Chief of Police
Support Services Bureau

cc: Office of Environmental Quality Control
Kuilima Resort Company
Group 70, Ltd.

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

City and County of Honolulu
Police Department
1455 South Beretania Street
Honolulu, Hawaii 96814

Attn: Mr. Douglas G. Gibb, Chief of Police

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 10 April 1989 memorandum to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Improvements to Kamehameha Highway

The mitigative measures described in the DEIS were recommended by the traffic consultant for the project, Pacific Planning and Engineering, Inc. (PPE). Their study of the project is included as Appendix O in the DEIS. According to the PPE study, the Punamano and Malaekahana Golf Courses will not require widening of the highway to provide acceleration/deceleration lanes or exclusive left-turn storage lanes at any of the three project entrances. This was based on an evaluation of the project at its projected completion in 1997.

Beyond 1997, PPE recommended that an assessment of traffic flow conditions should be conducted periodically to determine if additional improvements to the highway are warranted.

B. Security of Facilities

The clubhouse and other related facilities will be designed with security in mind. Parking areas surrounding the clubhouses will be lighted to provide adequate security. Private security forces will be employed to provide security around the two sites. There will be few nighttime activities at these sites, therefore, few vehicles will be entering or exiting the golf courses after dark. The private security force will make the site accessible to police patrols as needed.

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

Sincerely,

GROUP 70 LIMITED

for Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

SAM CALLEJO
DIRECTOR AND CHIEF ENGINEER

In reply refer to:
ENV 89-38(449)

March 17, 1989

MEMORANDUM

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: SAM CALLEJO, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
THE COUNTRY COURSES AT KAHUKU
TMK: 5-5-05: POR. OF 1, 2, 5, 6, 7;
5-6-06: POR. OF 6; 5-6-07: POR. OF 1;
5-7-01: POR. OF 21

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

1. We have no comments on the proposed treatment and disposal of wastewater generated from the golf courses.

2. Before the approval of the grading plans, a more quantitative drainage report should be submitted to the Drainage Section, Division of Engineering, for review and approval.

Sam Callejo

SAM CALLEJO
Director and Chief Engineer

cc: OEQC
Kuilima Resort Co.
Group 70 Ltd.

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

City and County of Honolulu
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

Attn: Sam Callejo, P. E., Director and Chief Engineer

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 17 March 1989 memorandum to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

Detailed grading plans have not been prepared at this time. Grading plans will be prepared in conjunction with design of the golf courses and support facilities. Once grading plans are complete, a quantitative drainage report will be prepared and submitted to the Drainage Section, Division of Engineering, for review and approval.

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

Sincerely,

GROUP 70 LIMITED

Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

PB 89-173

March 2, 1989

Dr. Marvin Miura
Office of Environmental Quality Control
465 S. King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: The Country Courses at Kahuku

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

Thank you for giving us the opportunity to comment on this project.

Very truly yours,

HERBERT K. MURAOKA
Director and Building Superintendent

RM:jo
cc: Alan Nii, Kuilima Resort Co.
Group 70, Ltd.
J. Harada

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 S. BERETANIA STREET, ROOM 305
HONOLULU, HAWAII 96814

FRANK F. FASI
MAYOR

FRANK K. KAHOOHANOHANO
FIRE CHIEF

LIONEL E. CAMARA
DEPUTY FIRE CHIEF

March 1, 1989

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

DR. MARVIN MIURA
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

FROM: FRANK K. KAHOOHANOHANO, FIRE CHIEF

SUBJECT: THE COUNTRY COURSES AT KAHUKU, KOOLAULOA, OAHU
TMK: 5-5-05:por 1,2,5,6,7; 5-7-01:por 21;
5-6-07:por 1; 5-6-06:por 6

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.

Should you have any questions, please contact Battalion Chief Kenneth Word of our Administrative Services Bureau at 943-3838.

Frank K. Kahoohanohano
FRANK K. KAHOOHANOHANO
Fire Chief

HA:ny

(EIS draft returned to OEQC)

cc: Alan Nii, Esq.
Group 70, Limited

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

City and County of Honolulu
Fire Department
1455 South Beretania Street, Room 305
Honolulu, Hawaii 96814

Attn: Mr. Frank K. Kahoohanohano, Fire Chief

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 1 March 1989 memorandum to the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

Access for emergency vehicles at the new golf courses is planned to conform to fire codes and standards. The new construction at the golf courses is also planned to conform to building codes and standards. Details of the construction design will be reviewed by the City and County to obtain applicable permits for construction.

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

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton for

Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

University of Hawaii at Manoa

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

April 10, 1989
RE:0525

Mr. Donald Clegg
Department of General Planning
650 King Street
Honolulu, Hawaii 96813

Dr. Marvin Miura
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Sirs:

Draft Environmental Impact Statement
Kahuku Country Courses
Koolauloa, Oahu

The proposed Country Courses at Kahuku are golf course complexes planned for 833 acres at two sites near Kahuku in the Koolauloa District of Oahu. Kuilima Resort Company plans three 18-hole golf courses, three golf clubhouses, and two golf driving ranges at the 605 acre Punamano site; and one 18 hole golf course, a clubhouse and a golf driving range at the 228 acre Malaekahana site. Construction of the project will include: roadways, wastewater collection, treatment and disposal facilities; potable water and irrigation water supply and distribution systems; and other utilities installations.

This review was prepared with the assistance of Bion Griffin, Anthropology; Paul Ekern and Edwin Murabayashi, Water Resource Research Center; James Hollyer, Agricultural and Resource Economics; and Carolyn D. Cook, Environmental Center.

In general, we find this document well prepared and comprehensive. However, we suggest that the following items need further consideration.

Water Related Problems

Our reviewers have identified four water related areas of inadequacy: (1) quantity required for irrigation, (2) evaporation conditions, (3) degree of salinity, and (4) runoff and sedimentation traps.

1. Irrigation requirements: On pages 33-35, irrigation water requirements for the Punamano and Malaekahana golf course should take peak summer demands and pan evaporation data from page 3, Appendix I into consideration. Reviewers estimate these demands to be 3.53 MGD rather than the 1.40 MGD total calculated for both locations (page 35). Also, page 6 of Appendix I states that 40,000 gallons for greens and 1,000,000 gallons for fairways will be required for the two 18 hole golf courses at Punamano. However, the basis for these calculations is not clear.

2. Evapotranspiration: Another factor related to sprinkling systems is that with the average wind velocity in the Kahuku area being generally greater than anywhere else on Oahu (Daniels & Oshiro, 1980), higher evaporation rate are to be expected. This is not accounted for in calculating water needs.

3. Salinity of Irrigation Water: The document (pages 27-29) states that wastewater will be collected, treated, and mixed with brackish water for irrigation. What is the expected salt level of this mixture? If the collection lines (assumed to carry fresh water in the document) actually lie in brackish water zones, brackish water will infiltrate, and the resulting influent to the treatment plant could be highly saline. Use of treated effluent in sprinkler irrigation may result in salt damage to foliage.

4. Runoff and Sedimentation: What is the expected life of the detention and sedimentation basins (pages 35, 70-75, Appendix E page 9) that will collect runoff and trap sediment? How will these be handled when they are full? The last paragraph on page 78 states, "Under extreme storm conditions, phosphorous [sic] may not reach the soil." This sentence does not make sense. Something essential has been lost in editing the consultant's report. In particular, it is unclear what effect extreme storm conditions would have on delivery of phosphorus to the soil.

The following sentences are also unclear: "Phosphorous [sic] is not expected to cause significant contamination of runoff water that drains from each site. This is because runoff will be controlled by detention basins, and released slowly to the drainage areas." What criteria define "significant" contamination? Strictly speaking, the runoff becomes "contaminated" with phosphorus the instant the two are admixed. Therefore, by the time the runoff reaches the detention basins, the water already is "contaminated".

Wind Hazard

The potential wind hazard for the Kahuku site is understated (page 53). Accurate data on this subject may be found in the Wind Energy Resource Atlas, vol. 11, ONL-3195 WERA-11. Maps for Oahu (pages 48-49) indicate very high wind energy. Also, Noguchi (1979) maps surface wind flow patterns on Oahu. Prevailing conditions in Kahuku will not be conducive to golf courses or driving ranges unless shelterbelt protection is provided.

Soils

The soils information in Appendix I, page 2, would be helpful in the main body of the text. There are no soils maps in either the main text or the appendix to relate the listed soils to their location. Such maps would be very helpful and should be included.

Golf Course Demand and Potential Use

The demand for golf courses was predicated on growth in housing/resort rooms in Kahuku (Appendix R), i.e., demand for the full operation of courses is expected to develop as the resort areas expand. This projection is not discussed in the Executive Summary or elsewhere in Volume I. What will happen to the demand for golf courses if more housing is not built?

In the estimation of golf demand from Waikiki customers, attention is not given to travel time, which is over one hour each way. Will these people really want to travel so far to play golf, or will they prefer to utilize closer courses?

The impact of Kahuku municipal course expansion is not fully explored in this report. Will this attract some of the Country Courses' expected local customers, reducing "local" justification for the project? Other competitive sources such as courses on Maui exist, but are not considered in the report's demand estimations.

Traffic Assesment

The document lacks adequate discussion of traffic impacts caused by the hundreds of new golf course and resort employees. In addition, what road modifications are needed to accommodate projected residential housing developments for Kahuku and Kuilima? It is not clear whether the road expansion with the left hand turn lanes (page 106) will be one of the first tasks completed or one of the last.

Employment

Where will employees for the Country Courses at Kahuku come from? We presently have one of the lowest unemployment rates in the nation. If an adequate number of employees is found, where will they live?

The multiplier used for the estimation of off-site jobs (Appendix R, pages 52-53) needs to be carefully reviewed, since new off-site jobs are not necessarily going to be created. For instance, employees who are not working at full capacity may be given additional responsibilities rather than hiring new people to do the jobs.

Corrections

On page 39 in Volume I and in Appendix G, "Ford Island" golf course was closed prior to 1988.

Volume I, page 89, paragraph 6, has an error of repetition in it.

We hope that the comments provided by our reviewers will be helpful in preparation of the Final EIS. Thank you for the opportunity to review this Draft EIS, and we look forward to receiving your response to our comments.

Yours truly,

John Harrison
Environmental Coordinator

cc: Kuilima Resort Co.
Group 70 Ltd.
L. Stephen Lau
Bion Griffin
Paul Ekern
Edwin Murabayashi
James R. Hollyer
Carolyn D. Cook

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

27 April 1989

University of Hawaii at Manoa
Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, HI 96822

Attn: Mr. John Harrison, Environmental Coordinator

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 10 April 1989 letter to the State Office of Environmental Quality Control and the City and County Department of General Planning concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

A. Water Related Problems

Irrigation Requirements

The consulting horticulturist for the project, Charles Murdoch, Ph.D., prepared estimates of the irrigation water requirements for the golf courses planned at Punamano and Malaekahana. The statement in his report regarding irrigation rates was incorrect, and should have been 1.4 million gallons (mg) per application for the three golf courses. The Malaekahana Golf Course, according to his report, will require 0.52 mg per application. The total irrigation water requirement for the four golf courses is projected at 1.92 mg per application, utilizing available data on climate, soil types, and turf grass requirements. Turfgrasses will need to be watered every day to about once a week, depending on the type of soil and the water use rate.

Evapotranspiration

Wind speed was accounted for in Dr. Murdoch's calculation of irrigation water demand. Because the layout of the golf courses is planned to utilize lowlands and valleys between ridges for much of the courses, actual wind speeds may be lower than average wind velocity records indicate for the sites.

Salinity of Irrigation Water

Plans for irrigation water use at the golf courses are as follows:

- Punamano: irrigation water via new on-site wells (1.4 mgd average)
- Malaekahana: irrigation water via new on-site well (390,000 gpd average)

The Punamano Golf Courses will be irrigated by groundwater derived from on-site wells. This groundwater is expected to be slightly brackish, however, is expected to be low enough to be acceptable for irrigation of golf course turf and landscape plantings. There will be no influent of brackish water to a wastewater treatment facility at this site.

At the Malekahana site, irrigation water will be composed of secondary-treated wastewater effluent diluted with groundwater derived from on-site wells (10 percent treated effluent mixed with 90 percent groundwater). Groundwater from on-site wells will also be used for domestic purposes. The groundwater to be derived on the site is expected to be of low salinity (under 200 ppt chloride), according to John Mink, a consulting hydrogeologist who has prepared studies for the project. The expected salt level of treated effluent will be nearly the same as the groundwater derived on-site. Therefore, the expected salt content of water utilized to irrigate the Malaekahana Golf Course will be within tolerance levels for turf grass and landscape plantings.

The State Water Commission is the regulatory authority for this proposed water use, and the applicant must satisfy their concerns before the well is allowed to operate.

Runoff and Sedimentation

The detention and sedimentation basins at the golf courses are expected to remain as permanent features of the project. These facilities will be maintained by the golf course maintenance staff, including periodic sediment removal and clearing of debris. Sediment removed from the basins will be applied elsewhere on the golf course as topsoil.

As you note, the DEIS states that even under extreme storm conditions, recently applied phosphorus may not reach the soil. The concern here is the potential for phosphorus to be carried off-site in runoff water. The position of Dr. Murdoch and Richard Green, Ph.D. is that phosphorus will generally be bound in soils on the site, and little will be carried off-site in runoff. The collection of silt in runoff within detention/sedimentation basins on the golf courses will hold most soil particles bound with phosphorus. The quantity of phosphorus-containing soil particles which will be mixed with runoff water and carried off-site is expected to be minor.

B. Wind Hazard

The golf courses will be designed by a qualified golf course architect with experience in the design and layout of golf courses in Hawaii. Wind factors are a concern at many existing golf course locations on Oahu and elsewhere in Hawaii. Landscape plantings will likely be considered which will reduce the effects of high winds over certain portions of the courses. The current layout for the golf courses utilizes natural

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-587-

topographic variations to place the course into depressed areas and valleys where wind forces will be less.

C. Soils

There are soils maps for both the Punamano and Malaekahana sites included in the DEIS as Figures 16 and 17. These maps show the distribution of various soil types on the two sites as mapped by the U. S. Department of Agriculture Soil Conservation Service (1972).

D. Golf Course Demand and Potential Use

A market study for the project was prepared by Peat Marwick Main and Co. (Februaury 1989), which was included as Appendix G in the DEIS. It will also be included in the Final EIS.

Relationship to Resort Development

Demand for golf facilities at The Country Courses at Kahuku is related to the anticipated development schedule for hotels, condominiums and other facilities at Kuilima Resort, as provided by the Kuilima Resort Company. The development schedule is included in the DEIS Appendix G - Exhibit IV-B.

If hotel and condominium development falls short of the governmentally-approved and anticipated levels, there would be fewer persons staying at the resort and thus the demand for golf would be expected to be less than projected. The analysis conducted for The Country Courses at Kahuku includes a sensitivity analysis for hotel and condominium occupancies at the resort. Lower occupancies would impact utilization of the courses in a manner similar to having fewer units in that either situation would support less population at the Resort. This analysis, shown in Exhibit IV-F of Appendix G, shows that the effect of a 10 to 15 percent reduction in overall occupancies would delay the achievement of target rates of utilization at the Country Courses by about three years. A slower or less ultimate development of visitor and residential units at the Resort could be anticipated to have comparable effects on market performance of the Country Courses. In the meantime, the commuity could benefit because of the greater availability of starting times and competitive fees.

Travel Time From Waikiki

Surveys of selected Oahu hotel representatives and selected golf tour operators, as shown in DEIS Appendix G - Exhibits III-B and III-C, indicated that guests are willing to play on courses that are further from the Waikiki area, especially if starting times are available. For instance, guests frequently request to golf at the Kuilima and Makaha resort golf courses. The non-availability of starting times at the Ala Wai Country Club and the Waialae Country Club golf courses, which are closer to Waikiki, generally precludes play at these courses.

The golf tour operators indicated that the most common factors in selecting courses are convenience in terms of starting time availability, course characterisitics, and travel time and proximity. According to tour operators, the favorite courses include those at Mililani, Kuilima, Hawaii Kai and Pearl Country Club. From Waikiki, two of these

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-587-4

courses are within one-half hour driving time, two are about 45 minutes driving time, and two take about one hour driving time. Based upon these travel times and the fact that these courses are some of the most frequently requested, travel time to the proposed Country Courses was not found to be a limiting factor in determining demand for play.

Impact of Competitive Courses

The proposed Kahuku municipal golf course expansion from nine holes to 18 holes is not expected to materially affect the demand for golf at the proposed Country Courses. Three of the golf courses at this project are proposed to be of a quality that would not directly compete with municipal courses. A fourth course could compete with municipal courses, but is planned to provide higher quality play. Additionally, the Country Courses are not anticipated to be competitive with Kahuku in terms of fees. Fees at the Kahuku Municipal Course are significantly lower than at any other course on Oahu. The Kahuku course is expected to continue to attract the price-sensitive golfer rather than the golfer desiring a high quality of play.

It is recognized that many potentially competitive courses are located on the outer islands, however, Oahu continues to have the advantage of attracting the largest share of visitors to the State. Oahu does not currently have the facilities to offer a resort experience comparable to those offered on the neighbor islands. In this respect, the continued development of the Kuilima Resort is considered critical to enabling Oahu to compete more directly with the neighbor islands.

E. Traffic Assessment

The potential traffic impacts of the Country Courses were evaluated in a study by Pacific Planning and Engineering, Inc. (February 1989), which was included in the DEIS as Appendix O.

Traffic impacts of the Country Courses, as reported in the DEIS, include the projected vehicles associated with golf course employees and Kuilima Resort employees through 1997. The projected residential housing through 1997 at Kuilima Resort is also accounted for in this study. Future development of the region is accounted for by a growth factor that is applied in the traffic projections.

The entrances to the Punamano and Malaekahana golf courses will have exclusive left and right turn lanes for exiting traffic, as stated in the DEIS. This improvement will be installed at the inception of the project.

F. Employment

The Country Courses will employ people in a variety of different jobs, as indicated in the DEIS. In some cases, these can be part-time jobs.

Oahu does have one of the lowest unemployment rates in the nation, but unemployment and underemployment have been serious concerns for people in the Koolauloa/North Shore area. Some of the employees at the project will probably be area residents who now work far from their homes. Some will be young people from the area who are now in school. It is likely that some area residents will want to work part-time at the

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-587[illegible]

Country Courses to supplement their income. Still, some jobs will probably be filled by residents of other areas of Oahu. Employees in some specialized positions could come from the mainland United States, although local hiring will be encouraged.

The project's employment impact will be small in relation to the impact of the expansion of the Kuilima Resort. The Country Courses wil benefit from the expansion, as job training programs will be developed to help area residents qualify for jobs at the Country Courses as well as at the Resort.

The Kuilima Resort is bound (by a conditional agreement set with the approvals for the Resort expansion) to spend at least $500,000 on a major resident-oriented job training program. A non-profit organization, Resort Training, Inc., will administer the funds. This organization is now being formed. The Director of the Hawaii State Department of Labor and Industrial relations will be a member of its Board.

The Hawaii State Department of Labor and Industrial Relations is now conducting a study of the labor supply in the Koolauloa/North Shore region. The study should be available later this year.

The multiplier used to estimate indirect and induced jobs was developed by the State Department of Business and Economic Development on the basis of extensive analysis of Hawaii's economy. It provides an estimate of the jobs created when workers at a new project spend their incomes, and when that project buys goods from other concerns. In effect, it measures the indirect economic impact of the project in the State of Hawaii. The "indirect and induced jobs" estimated can be located anywhere in the State of Hawaii.

G. Corrections

Thank you for pointing out the two noted errors in the DEIS. They will be corrected in the Final EIS.

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

Sincerely,

GROUP 70 LIMITED

Jeffrey H. Overton

for Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

Architects • Planners • Interior Designers • 924 Bethel Street • Honolulu, HI 96813 • Phone (808) 523-5866 • FAX: 523-5874

ZIONS SECURITIES CORPORATION
55-510 KAMEHAMEHA HWY. • LAIE, OAHU, HAWAII 96762
(808) 293-9201 FAX # 293-5722

March 8, 1989

Group 70
924 Bethel St
Honolulu, Hi 96813

RE: Country Courses at Kahuku
#8769-14

Dear Ralph:

Thank you for the draft EIS report for the Country Courses at Kahuku.

At the present time Zions Securities Corporation, its lessees and its community is using the egg farm access road as access to enter and exit various properties in Laie.

Your maps on page 19 and 23 of volume #1 of the EIS report shows how this same road will access the golf course area. Our greatest concern is that this access road to the golf course be continued to be available for access by our Laie community, our tenants and lessees. We could develop our adjacent properties by connecting our road to the golf course.

Much of our mauka properties can only be developed by the use of this access road. We therefore would like a committment from "Country Courses at Kahuku" that their road will be build to city standards and that we will be allowed to connect to that road.

Very truly yours,

ZIONS SECURITIES CORPORATION

Marvin H. Stone, MANAGER

MHS:vm

28 April 1989

GROUP 70
LIMITED

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

Roy H. Nihei, AIA
Linda M. Aniya
Derrick T. Seiki
Ralph E. Portmore, AICP
Edward T. Green
Paul P. Chorney, AIA
Stephen H. Yuen, AIA
Susano P. Pabo
Dean H. Kitamura, AIA
Norma J. Scott
June Fukushima-Lee, ASID
Anne Theiss
Stephen E. Callo, CPA
Bradford A. Wellstead, AIA
Walter R. Bell, AIA, CCS

Zions Securities Corporation
55-510 Kamehameha Highway
Laie, Hawaii 96762

Attn: Mr. Marvin Stone, Manager

Gentlemen:

Subject: The Country Courses at Kahuku DEIS/8769.14

Thank you for your 8 March 1989 letter concerning the Draft Environmental Impact Statement. The following responses are to your specific comments.

The egg farm access road used as access to enter and exit mauka lands is currently planned to serve as the access to Kamehameha Highway for the Malaekahana Golf Course. Design plans for the golf course and roadway system, including the subject access road, have not been prepared. Therefore, specific details about the entrance and roadway alignment and construction standards to be followed are not available. The developer, Kuilima Resort Company, is willing to discuss your concerns regarding future access to mauka lands by Zion Securities Corporation, its lessees and the community.

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

Sincerely,

GROUP 70 LIMITED

Ralph E. Portmore, AICP
Vice President, Planning

cc: Alan K. Nii, Esq.

FINAL ENVIRONMENTAL IMPACT STATEMENT

LIST OF PREPARERS

7.3 LIST OF PREPARERS

This Environmental Assessment has been prepared by the planners and environmental analysts at GROUP 70 Limited Architects/Planners/Interior Designers, 924 Bethel Street, Honolulu, Hawaii 96813, Telephone (808) 523-5866. The GROUP 70 Limited staff involved in the preparation of this document included:

Francis S. Oda, AIA, AICP	Chairman of Group 70
Ralph Portmore, AICP	Project Manager
Jeffrey H. Overton	Planner/Environmental Analyst
Edith Masaki	Graphics
Kathy Hida	Graphics
Karen Koja	Production

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:

Ann M. Bouslog, Ph.D. Jana Hattan	Peat Marwick Main & Co.	Market Demand
Charles L. Murdoch, Ph.D. Richard Green, Ph.D.	Murdoch & Green	Fertilizer/Pesticides
John F. Mink, Ph.D.	Consultant	Groundwater
Andrew Berger, Ph.D.	Consultant	Terrestrial Vertebrates
Alan Haun, Ph.D.	Paul H. Rosendahl, Ph.D., Inc.	Archaeology
Kenneth Nagata	Consultant	Botany
Ronald Darby, P.E.	Darby & Assoicates, Inc.	Noise
Barry D. Neal	Root & Neal	Air Quality
Jonathan Shimada, P.E. Howard Abe, P.E.	Pacific Planning & Engineering, Inc.	Traffic
Bruce S. Plasch, Ph.D.	Decision Anaylsts Hawaii, Inc.	Agriculture/Fiscal
John M. Knox, Ph.D. John Kirkpatrick, Ph.D.	Community Resources, Inc.	Demographics and Displacement
Kay Muranaka, P.E. Kenneth Ishizaki, P.E.	Engineering Concepts, Inc.	Engineering/Infrastructure

RESUMES OF ALL PREPRARES ARE ATTACHED BELOW

RESUMES

GROUP 70

FRANCIS S. ODA, AICP, AIA
Chairman

EDUCATION

B.A. Architecture - 1964, Cornell University, Ithaca, New York
Graduate Studies - University of Hawaii, Pacific Urban Regional Planning Program

PROFESSIONAL REGISTRATIONS AND ASSOCIATIONS

American Institute of Certified Planners
Architect, State of Hawaii
Architect, State of California
Hawaii Chapter, American Planning Association
Hawaii Society, American Institute of Architects, President (1982)

PROFESSIONAL EXPERIENCE

Mr. Oda has nearly twenty years of professional experience as an architect and planner in Hawaii, and elsewhere in the United States, Australia, Saipan and Japan. Mr. Oda is Chairman of Group 70 Limited, and is Principal-in-Charge for many of the firm's major planning and architecture projects. Mr. Oda has been a Principal with Group 70 Limited since 1973.

Mr. Oda's work in planning has included the development of master plans for several major resorts, residential communities, science research facilities and a university. Mr. Oda's architectural projects include the design of several resort hotels, office buildings, churches, military base facilities, residential developments, educational facilities and town centers. Mr. Oda has recieved numerous awards from various professional associations for his work.

Several representative planning and EIS projects directed by Mr. Oda include:

- Kapolei City Design Plan and Implementation Guide -- Ewa, Oahu
- Kuilima Resort Expansion Master Plan/EIS -- Kahuku, Oahu
- Kaanapali Resort Master Plan -- Kaanapali, Maui
- Kona Village Resort Master Plan -- North Kona, Hawaii
- University of Hawaii Long Range Development Plan -- Manoa Campus, Oahu
- Mid-Elevation Facilities Master Plan/EIS -- Hale Pohaku, Hawaii
- Mauna Kea Science Reserve Complex Master Plan/EIS -- Hale Pohaku, Hawaii
- California Institute of Technology 10.4 m Telescope EIS -- Mauna Kea, Hawaii
- Aloha Tower Plaza EIS -- Honolulu, Oahu

Prior to his work at Group 70 Limited, Mr. Oda was the University Architect for the University of Hawaii, Honolulu, Hawaii (1971-73). Mr. Oda was a Partner with the architectural firm of Carson/Oda in El Paso, Texas during 1970-74. From 1970-72, Mr. Oda was also a Partner with the architectural firm of Quinn and Oda in Berkeley, California.

GROUP 70

RALPH E. PORTMORE, AICP
Vice President, Planning

EDUCATION

M.S. Urban Planning - 1968, Columbia University, New York, N.Y.
B.S. Civil Engineering - 1963, Rutgers University, New Brunswick, N.J.

PROFESSIONAL REGISTRATIONS AND ASSOCIATIONS

American Institute of Certified Planners
Hawaii Chapter, American Planning Association
President 1988-89, Vice President/ President Elect 1987-88, Public Issues Chair 1985-87
Health and Community Services Council of Hawaii
Strategic Plan Cmte. Chair 1988-89, First Vice President, Program Cmte. Chair 1985-86

PROFESSIONAL EXPERIENCE

Mr. Portmore has over twenty years of diverse professional experience in urban and regional planning with public agencies and as a planning consultant. Mr. Portmore manages Group 70 Limited's Planning Department as Chief Planner and Project Manager, responsible for the overall progress of physical and master planning and environmental assessment /EIS projects.

At Group 70 Limited, Mr. Portmore has managed several major planning assignments involving the preparation of master plans, environmental assessments/EIS documentation, and various government permit applications. Representative current projects include:

- Kapolei City Urban Design Plan and Implementation Guide -- Ewa, Oahu
- Signal Puako New Community Master Plan -- South Kohala, Hawaii
- Ward Ave. Mixed-Use Complex Master Plan -- Hawaiian Electric Co., Honolulu
- Laie Community Master Plan -- Laie, Oahu
- Lihi-lani Recreational Community -- Pupukea, Oahu
- The Country Courses at Kahuku -- Kahuku, Oahu
- Waikane Golf Course -- Waikane, Oahu
- Farms of Kapua Diversified Agriculture -- South Kona, Hawaii

Mr. Portmore has also been involved with several other significant planning projects at Group 70 Limited, such as the: Ikekai (Queen's Beach) Resort in Hawaii Kai, Oahu: Golf Course 5 and 6 Cluster Development, Hawaii Kai, Oahu; and the Kuilima Resort Expansion, Kahuku, Oahu.

Previously, Mr. Portmore spent a total of twelve years in progressively responsible planning positions with the City and County of Honolulu. He was Deputy Chief Planning Officer with the Department of General Planning (1981-85), where he was responsible for overall management of the Department's planning operations. During 1976-81, he served as a Legislative Analyst with the Honolulu City Council. From 1973-76, Mr. Portmore was Senior Planner/Branch Chief with the Department of General Planning. Mr. Portmore began his career as an associate planner (1968-73) with the consulting firm of Frederick P. Clark Associates, Rye, N.Y.

GROUP 70

JEFFREY H. OVERTON
Planner/Environmental Analyst

EDUCATION

M.S. Environmental Sciences, 1983 - State University of New York, Stony Brook, N.Y.
B.S. Zoology, 1979 - Duke University, Durham, N.C.

PROFESSIONAL REGISTRATIONS AND ASSOCIATIONS

Hawaii Chapter, Americal Planning Association
Urban Land Institute

PROFESSIONAL EXPERIENCE

Mr. Overton has seven years of professional experience in the environmental analysis of private and municipal development projects. During this period he has prepared over 35 environmental assessments and EIS documents for projects involving public infrastructure expansion and various private site developments. Mr. Overton has also participated in the preparation of several community and area-wide master plans.

At Group 70 Limited, Mr. Overton is a Project Manager responsible for the preparation of enviromental assessments and EIS documents and permit applications associated with private and municipal development projects. He coordinates the activites of technical consultants participating in these projects, as well as community advisory group activities and governmental approval processes. Several representative projects include:

- University of Hawaii, Long Range Development Plan, Plan Review Use, Manoa Campus – Honolulu, Oahu
- Lihi-lani Recreational Community -- Pupukea, Oahu
- The Country Courses at Kahuku – Kahuku, Oahu
- Hawea Point Residence -- Kapalua, Maui
- Kawela Bay Desilting Project -- Kahuku, Oahu
- Pikoiloa Cemetery Expansion – Kaneohe, Oahu

Previously, Mr. Overton was a Senior Environmental Planner with a major Long Island, N.Y. engineering consulting firm (1984-88), where he managed the preparation of environmental assessments, EIS, permit applications and master plans. His project experience includes the expansion of major highway, solid waste and drainage facilities for municipal clients, as well as several private residential, recreational and corporate site developments. Project locations included New York, New Jersey and Connecticut.

Mr. Overton was a Marine Extension Agent for the New York Sea Grant Extension Program (1983-84), where he conducted educational programming in southeastern New York coastal communities. Mr. Overton also was an environmental planning intern with the Long Island Regional Planning Board (1979-80).

GROUP 70

GEORGE I. ATTA
Senior Planner

EDUCATION

M.A. City and Regional Planning - 1981, Harvard University, Cambridge, MA.
Professional Diploma - 1973, University of Hawaii, Manoa, HI.
B.A. Liberal Arts - 1972, University of Hawaii, Manoa, HI.

PROFESSIONAL REGISTRATION AND ASSOCIATIONS

Hawaii Chapter, American Planning Association

PROFESSIONAL EXPERIENCE

Mr. Atta has nine years of professional experience in urban and regional planning experience with public agencies and as a planning consultant. Mr. Atta is a Senior Planner with Group 70 Limited, involved with the technical progress and management of planning and environmental assessment projects.

At Group 70 Limited, Mr. Atta has been Senior Planner for several major planning assignments involving the preparation of urban design plans, environmental assessment/EIS documents, and various government permit applications. Mr. Atta has experience in coordinating community advisory groups and public meetings. He is also experienced in the management of projects, involving scheduling, budget control and consultant coordination.

Representative current projects include:

- Kuilima Resort Expansion - Kahuku, Oahu
- Waikane Golf Course EIS - Waikane, Oahu
- University of Hawaii, Hawaiian Studies Bldg. - Manoa Campus, Oahu
- Lanai City Urban Design Plan - Lanai
- Kapolei City Urban Design Plan - Ewa, Oahu

Previously, Mr. Atta was a Legislative Analyst with the Office of Counsel Services for the City and County of Honolulu (1984-88). He worked under the council member who chaired the Planning and Zoning Committee. During 1982-84, Mr. Atta was a Planner with the Department of General Planning of the City and County of Honolulu. In these two positions, Mr. Atta was involved in the regulatory review and analysis of development projects planned on Oahu for more than six years.

Mr. Atta worked as a Planner for the Research Corporation of the University of Hawaii (1981-82). He began his professional career as a planner with H. Mogi Planning and Research Inc., Honolulu, HI. during 1979-80. Mr. Atta is also fluent in Japanese.

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.

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. Soon (ed.) Soil Nutrient availability. Van Nostrand Reinhold Co. N.Y. pp 326-331.

Murdoch, C. L., H. Tashiro, J. Tavares, and W. C. Mitchell. 1984. Turfgrass feeding injury and host preference of lepidopterous insect pests of the major warm season turfgrasses in Hawaii. Proc. 2nd Fert. and Ornamentals Short Course. Coop. Ext. Ser., Univ. Haw. pp 172-181.

Haung, Ruey-Shyang, R. S. Yost, R. L. Fox, M. Habte, and C. L. Murdoch. 1983. Effects of three mycorrhizal isolates on Leucaena leucocephalon 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.

Murdoch, C. L., E. Okizaki, and D. Shigeta. 1983. Plant analysis of turfgrass samples from golf putting greens in Hawaii. Res. Ext. Ser. 025. Coll. Trop. Ag. and Human Resources, Univ. Haw. 7 pp.

Tashiro, H., C. L. Murdoch, and W. C. Mitchell. 1983. Development of a survey technique for larvae of the grass webworm and other lepidopterous species in turfgrasses. Environ. Entomol. 12:1428-1432.

Murdoch, C. L., and R. K. Nishimoto. 1982. Diclofop for goosegrass control in bermudagrass putting greens HortScience 17:914-915.

Murdoch, C. L., R. K. Nishimoto, W. C. Mitchell, A. M. Alvarez, W. J. Apt, A. P. Martinez, and W. T. Watanabe. 1981. U. H. Recommendations for turfgrass. Coop. Ext. Serv. Coll. Trop. Ag. and Human Resources, Univ. Haw. HITAHR Brief 001. 4 pp.

Murdoch, C. L., and R. K. Nishimoto. 1980. Weed control in golf course bunkers with glyphosate. Calif. Turfgrass Culture. 30:4-6.

Murdoch, C. L., and W. D. McCall. 1979. Turfgrass fertilization in Hawaii. Coop. Ext. Serv., Coll. Trop. Ag. and Human Resources., Univ. Haw. Circular 495. 16 pp.

Murdoch, C. L., R. K. Nishimoto, W. C. Mitchell, A. M. Alvarez, W. J. Apt, A. P. Martinez, and W. T. Watanabe. 1979. U. H. recommendations for turfgrasses. Coll. Trop. Ag. and Human Resources, Univ. Haw. Unnumbered Publication. 4 pp.

Murdoch, C. L., and W. C. Mitchell. 1978. Application frequency of various insecticides for grass webworm control in bermudagrass turf. J. Econ. Entomol. 71:337-338.

Murdoch, C. L., H. Tashiro, and M. B. Harrison. 1978. Plant parasitic nematodes associated with golf putting green turf in New York. Plant Dis. Reptr. 62:85-87.

Murdoch, C. L., W. J. Apt, and H. Tashiro. 1977. Effects of nematicides on root-knot nematodes associated with golf putting green turf in Hawaii. Plant Dis. Reptr. 61:978-981.

Tashiro, H., C. L. Murdoch, and W. J. Apt. 1977 Nematodes associated with golf putting greens in Hawaii. Plant Dis. Reptr. 61:919-922.

Tashiro, H., C. L. Murdoch, R. W. Straub, and P. J. Vittum. 1976. Evaluation of insecticides on Hyperoides sp., a pest of annual bluegrass. J. Econ. Entomol. 70:729-733.

Boonduag, A., Y. Kanehiro, and C. L. Murdoch. 1976. Effects of slowly available nitrogen sources and rates on growth, nitrogen uptake, and nitrogen recovery of 'Suntruf' bermudagrass. HortScience 11:379-381.

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.

Murdoch, C. L., and W. C. Mitchell. 1976. Effectiveness of organo-phosphate insecticides in controlling Rhodesgrass scale in 'Sunturf' bermudagrass in Hawaii. HortScience 11:209-210.

Murdoch, C. L., and H. Tashiro. 1976. Host preference of the grass webworm, Herpetogramma licarsisalis, to warm season turfgrasses. J. Econ. Entomol. 5:1068-1070.

Van Dam, J., and C. L. Murdoch. 1976. Turfgrass management on the island of Oahu. Depti. Paper 41, Hort. Dept., Univ. Haw. 9 pp.

BIOGRAPHICAL RESUME

for

RICHARD E. GREEN, Professor of Soil Science
Department of Agronomy and Soil Science
University of Hawaii
1910 East-West Road
Honolulu, HI. 96822
(808) 948-8419

PERSONAL INFORMATION:

Date of birth: March 23, 1931
Place of birth: Seward, Nebraska
Social Security No.: 523-42-7715
Married (Mary E. Mahoney), four children (ages 23-29)
Home address: 834 A 12th Ave., Honolulu, 96816
Home phone: (808) 737-8749

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)

3/87

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.

3. Green, R.E. 1965. Head cabbage yield and leaf calcium as influenced by liming a Latosolic Reddish Prairie soil. Hawaii Agr. Expt. Sta. Tech. Prog. Rept. No. 145, 12 pp.

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.

19. Green, R.E. and V.K. Yamane. 1970. Precision in pesticide adsorption measurements. Soil Sci. Soc. Amer. Proc. 34:353-354.

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-photoneutron 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.

23. Green, R.E. and J.C. Corey. 1971. Pesticide adsorption measurement by flow equilibration and subsequent displacement. Soil Sci. Soc. Amer. Proc. 35:561-565.

24. Goswami, K.P. and R.E. Green. 1971. Microbial degradation of the herbicide atrazine and its 2-hydroxy analog in submerged soils. Environ. Sci. and Tech. 5:426-429.

25. Goswami, K.P. and R.E. Green. 1971. A simple automatic soil percolator. Soil Biol. Biochem. 3:389-391.

26. Green, R.E. and R.H.F. Young. 1971. Herbicide and fertilizer movement in Hawaii sugarcane soils in relation to subsurface water quality. Hawaiian Sugar Technologists, 1970 Reports:88-96.

27. Yamane, V.K. and R.E. Green. 1972. Adsorption of ametryne and atrazine on Oxisol, montmorillonite, and charcoal in relation to pH and solubility effects. Soil Sci. Soc. Amer. Proc. 36:58-64.

28. Green, R.E., P.S.C. Rao, and J.C. Corey. 1972. Solute transport in aggregated soils: tracer zone shapes in relation to pore-velocity distribution and adsorption. Proceedings Joint Symposium on Fundamentals of Transport Phenomena in Porous Media, Guelph, Ontario, Vol. 2, 732-752.

29. Balasubramanian, V., Y. Kanehiro, P.S.C. Rao, and R.E. Green. 1973. Field Study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: 1. Nitrate. J. Environ. Quality 2:359-362.

30. Whitney, A.S., R.E. Green and O.R. Younge. 1973. Effects of gibberellic acid and sublethal levels of four herbicides on the cool-season regrowth of two tropical grasses. Agron. J. 65(3):473-476.

31. Goswami, K.P. and R.E. Green. 1973. Simultaneous extraction of hydroxyatrazine, atrazine and ametryne from some Hawaiian soils. Soil Sci. Soc. Amer. Proc. 37:702-706.

32. Goswami, Kishore P. and Richard E. Green. 1974. Ametryne metabolite in transpired/guttated water from sugarcane shoot. J. Agr. Food Chem. 22(2):340-341.

33. Green, R.E. 1974. Pesticide-Clay-Water Interactions. In W.D. Guenzi (ed.) Pesticides in soil and water. Soil Science Society of America, Madison, Wisconsin.

34. Rao, P.S.C., R.E. Green, V. Balasubramanian, and Y. Kanehiro. 1974. Field study of Solute Movement in a Highly Aggregated Oxisol with Intermittent Flooding: 2. Picloram. J. Environ. Quality 3:197-202.

35. Goswami, Kishore P. and Richard E. Green. 1975. Microbial degradation of ametryn in Hawaiian Torrox and Hydrandept surface soils. Soil Sci. Soc. Amer. Proc. 29:669-673.

36. Balasubramanian, V., Ahuja, L.R., Y. Kanehiro, and R.E. Green. 1976. Movement of water and nitrate in an unsaturated aggregated soil during nonsteady infiltration - A simplified solution for solute flow. Soil Sci. 122:245-255.

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.

38 Green, R.E., K.P. Goswami, H. Mukhtar, and H.Y. Young. 1977 Herbicides from cropped watersheds in stream and estuarine sediments. J. Environ. Qual. 6:145-150.

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.

40. Fischer, Charles, Richard E. Green and Nathan C. Burbank, Jr. 1977. Refractory organic compounds in treated effluent and their removal by soil, Mililani, Oahu, Hawaii. Univ. of Hawaii Water Resources Research Center Technical Report 115.

41. Green, Richard E. and Haruyoshi Ikawa. 1979. Report of a workshop on Teaching Introductory Soil Science, including some special considerations of Soils of the Tropics. HAES Misc. Publ. 169. 98 pp.

42. Davidson, J.M., P.S.C. Rao, R.E. Green and H.M. Selim. 1980. Evaluation of conceptual process models for solute behavior in soil-water systems. In Agrochemicals in Soils, Ed. A. Banin and V. Kafkafi. pp. 241-251. Pergamon Press, New York.

43. Green, R.E., J.M. Davidson and J.W. Biggar. 1980. An assessment of methods for determining adsorption-desorption of organic chemicals. In Agrochemicals in Soils, Ed. A. Banin and V. Kafkafi. pp. 73-82. Pergamon Press, New York.

44. Chong, S.K. and R.E. Green. 1980. Application of field-measured sorptivity for simplified infiltration prediction. In Proceedings of the Hydrologic Transport Modeling Symposium, pp. 88-96. ASAE Publication 4-80. Amer. Soc. Agric. Engineers, St. Joseph, Mich.

45. Ahuja, L.R., R.E. Green, S.K. Chong and D.R. Nielsen. 1980. A simplified functions approach for determining soil hydraulic conductivities and water characteristics in situ. Water Resour. Res. 16:947-953.

46. Elder, V.A., A.S. Whitney, B.L. Koch, R.K. Nishimoto, and R.E. Green. 1981. Dissipation of phytotoxic diuron residues in Hawaii pineapple soils. HITAHR Research Series 006. University of Hawaii.

47. Green, R.E. and C. Guernsey. 1981. Soil water relations and physical properties of soils of the Kula area, Maui. HAES Research Bulletin 173.

48. Chong, S.K., R.E. Green and L.R. Ahuja. 1981. Simple in situ determination of hydraulic conductivity by power function descriptions of drainage. Water Resour. Res. 17:1109-1114.

49. Khan, M.A., R.E. Green and P. Cheng. 1981. A numerical simulation model to describe nitrogen movement in the soil with intermittent irrigation. HITAHR Research Series 010, University of Hawaii. 132 p.

50. Green, R.E. 1981. Placement of nitrogen fertilizers. Proceedings of 14th Hawaii Fertilizer Conference, April 27-28, 1981. HITAHR Research Extension Series 005, pp. 89-104.

51. Chong, S.K., R.E. Green and L.R. Ahuja. 1982. Determination of sorptivity based on in-situ soil water redistribution measurements. Soil Sci. Soc. Amer. J. 46:228-230.

52. Chong, S.K., R.E. Green and L.R. Ahuja. 1982. Infiltration prediction based on estimation of Green-Ampt wetting front pressure head from measurements of soil water redistribution. Soil Sci. Soc. Amer. J. 46:235-239.

53. Chong, S.K., M.A. Khan and R.E. Green. 1982. Portable hand-operated soil core sampler. Soil Sci. Soc. Amer. J. 46:433-434.

54. Green, R.E., L.R. Ahuja, S.K. Chong and L.S. Lau. 1982. Water conduction in Hawaii oxic soils. Tech. Rept. No. 143, Water Resources Research Center, Univ. Hawaii, 122 pp.

55. Bresler, E. and R.E. Green. 1983. Soil parameters and sampling scheme for characterizing soil hydraulic properties of a watershed. Tech. Rept. No. 148, Water Resources Research Center, Univ. Hawaii, 42 pp.

56. Liu, C.C.K., R.E. Green, C.-C. Lee and M.K. Williams. 1983. Modeling analysis of pesticide (DBCP) transport in soils of Kunia area in central Oahu, Hawaii. Phase I Project Completion Report, Pesticide Hazard Assessment Project, University of Hawaii, 51 pp.

57. Chong, S.-K. and R.E. Green. 1983. Sorptivity measurement and its application. pp. 82-91. In Advances in infiltration. Proceedings of a National Conference on Advances in infiltration, Dec. 12-13, 1983, Chicago,Ill., ASAE Pub. 11-83. Amer. Soc. Agric. Eng., St. Joseph, Michigan.

58. Green, R.E. 1984. Forecasting pesticide mobility in soils: dispersion and adsorption considerations. In Proceedings of a joint USA-USSR Symposium, Prediction of Pesticide Behavior in the Environment, Yerevan, USSR, Oct. 1981, EPA-600/9-84-026, pp. 42-71.

59. Ahuja, L.R., J.W. Naney, R.E. Green and D.R. Nielsen. 1984. Macroporosity to characterize spatial variability of hydraulic conductivity and effects of land management. Soil Sci. Soc. Am. J. 48:699-702.

60. Pringle, M.W., C.C.K. Liu, and R.E. Green. 1984. DBCP volatilization from soil and water: A laboratory study with two hawaiian soils. Water Resources Res. Center Tech. Rept. No. 157, Univ. Hawaii, 96 pp.

61. Green, R.E. 1985. Methods of estimating pesticide sorption coefficients for soils and sediments. Proceedings of Natural Resources Modeling Symposium, Pingree Park, Colarado, Oct. 17-21, 1983, ARS-30, pp. 184-187.

62. Green, R.E., L.R. Ahuja and S.K. Chong. 1986. Unsaturated hydraulic conductivity, soil water diffusivity and sorptivity: Field methods. Chapter 30. In A. Klute (ed.), Methods of Soil Analysis, Part 1, Agronomy Monograph No. 9, 2nd Edition, pp. 771-798. Amer. Soc. Agronomy, Madison, Wisconsin.

63. Lee, C.-C., R.E. Green and W.J. Apt. 1986. Transformation and adsorption of fenamiphos, 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. Tamrakar. 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. Tamrakar, 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. Karickhoff. 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.League 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.

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.

"Kleidervögel" (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.

University of Hawaii at Manoa

Department of Zoology
Edmondson Hall • 2538 The Mall
Honolulu, Hawaii 96822

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.

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 PHRI, Dr. Rosendahl personally oversees all archaeological work conducted by PHRI. 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 PHRI, 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 PHRI 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 collegue 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. UNIHI-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, Aiport 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.

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 Plannning and Economic Development, 1980.

* Tourism Research Priorities in Hawaiii 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.

CIVIL ENGINEER

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

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

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 WWTP 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)
- Waialae-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
- Makena 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 wastewaters and wastes.
- Development of a conceptual design for a new hazardous and industrial waste treatment complex at Pearl Harbor.

Projects:

<u>Wastewater Systems</u>

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)

SANITARY ENGINEER

Water Systems and Studies
- Guam Water Conservation and Shoreline Investigation
- Maui Water System Improvements (Maui, Hawaii)
- Mililani Town Well No. 6 (Oahu, Hawaii)
- Honokahua 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)
- Honokahua 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)

BRUCE STEVEN PLASCH
1655 Kamole Street
Honolulu, HI 96821
Office: (808) 373-9364
Fax: (808) 373-9590

August 1988

AREAS OF EXPERTISE

Economic Analysis: Economic development, input-output and other economic models, economic impacts, and evaluation of complex resource allocation problems.

Financial Analysis: Evaluation, feasibility, planning, comparative costs, funding sources, and financial impacts.

Market Analysis: Market potential, prices, marketing and price strategies.

Demographic Analysis: Population and housing forecasts and impacts.

Analytical Techniques: Systems analysis, mathematical modeling of complex relationships, decision analysis under uncertainty, analysis of multivariable/dynamic/probabilistic systems, statistical analysis, simulation, and linear programming and other optimization techniques.

Strategic/Policy Planning: Strategic plan development and implementation, project and research team management, and preparation of planning reports, position papers, and analyses.

Selected Fields of Specialty: Economic development (tourism, agriculture, energy, etc.), feasibility analysis, land and housing economics, valuations, and impact analysis (economic, financial, and demographics).

This strong multidisciplinary foundation enables successful analysis of complex problems and decisions.

EDUCATION

Ph.D. 1971: Stanford University, Engineering-Economic Systems
M.S. 1966: Stanford University, Engineering-Economic Systems
B.S. 1965: University of California, Santa Barbara, Electrical Engineering, unofficial liberal arts minor.

PROFESSIONAL EXPERIENCE

1980- President, Decision Analysts Hawaii, Inc.
1971 - 1980 Economic/Financial Consultant
1970 - 1973 Assistant Prof., University of Hawaii, Information Sciences
- 1970 Various part-time and summer jobs.

ACADEMIC HONORS

Various honors and honor societies; fellowships from the National Science Foundation, Ford Foundation, and Wheeler Foundation; various elected offices.

AFFILIATIONS

Hawaii Economic Association (1978 –).
International Agricultural Development Service of Washington, D.C. (Rockefeller Foundation affiliate), registered consultant (1981 –).
Chamber of Commerce, Land & Water Use Planning Committee (1983 –).
American Bar Association, registered expert witness (1983 –).
American Planning Association, Public Issues Committee (1984 –).
American Arbitration Assoc., Commercial Panel of Arbitrators (1984 –).
White House Conference on Small Business, resource person (1986).
Mayor's Committee on Food Prices (1984).
Oahu Metropolitan Planning Organization, Forecast Committee (1982).
Governor's Steering Committee on Carrying Capacity Studies (1975).

SELECTED PROJECTS

Economic Development and Growth Plans

Cable communications franchise terms to promote economic development: Office of Commerce and Consumer Affairs, 1988.

Urbanization versus agricultural preservation, Ewa and Central Oahu: American Planning Association, 1985/1986.

Economic development strategy for Molokai: DPED, 1984/1985.

Development plan for the Honolulu Symphony: The Honolulu Symphony, 1983/1984.

Economic development issues, policies, and priorities: DPED, 1977.

Carrying capacity studies (contributor), Oahu: DPED, 1975.

State of Hawaii growth policies plan: DPED, 1974.

Assessment and Outlook of Economic Activities

Economic development strategy for Molokai: Department of Planning and Economic Development (DPED), 1984/1985.

Tourism outlook, characteristics, and implications: Loui, Singer, Ankersmit, Soon, Inc. for the Polynesian Cultural Center, 1984.

Hawaii's economic activities: DPED, 1972, 1977, and 1983.

Probability of attracting specific industries: DPED, 1967.

Economic, Population, and Housing Outlook and Projections

Economic and population outlook, State of Hawaii: DPED, 1972, 1977, and 1983.

Economy and population outlook (expert witness), Oahu: Ashford & Wriston for Bishop Estate, 1981 - 1986.

Employment outlook (contributor), Ewa and Central Oahu: Community Resources, Inc. for Castle & Cooke, 1985.

Resource Management

Waimanu estuarine sanctuary management plan: DPED, 1984.

Impact mitigation of energy activities: DPED, 1981/1982.

Land and Housing Economics

Construction cycles (expert witness): Kiefer, Oshima, Chun & Webb, 1988.

Selection of sites suitable for aquaculture: William A. Brewer & Associates, for the Department of Land and Natural Resources, 1988.

Demand for commercial and industrial land at Ewa Gentry (expert witness): Gentry, 1988.

Impact of geothermal plant on land values, Island of Hawaii: Thermal Power, 1987.

Appreciation trends for Waikiki land (expert witness): Ukishima and Matsubara, 1987.

Historic property values, Aina Haina (expert witness): Ukishima and Matsubara, 1987.

Anticipated land rent for outleasing activities, Oahu and Kauai: US Navy, 1987.

Land-use policies to support affordable housing, West Hawaii: County of Hawaii, 1986.

Housing information system, Hawaii County: Alexander Grant & Co. for Hawaii County, 1983.

Land rents and user fees for the Hawaii Ocean Science and Technology Park; and the Natural Energy Laboratory: DPED, 1985.

Outlook for land appreciation (expert witness), Oahu: Ashford & Wriston for Bishop Estate, 1985; and Ashford & Wriston for Kalama Land Co., 1985.

Alternative approaches to lease rents: Ashford & Wriston for Bishop Estate, 1984.

Concentration of land ownership, Oahu: Rush, Moore, Craven, Kim & Stricklin for Bishop Estate, 1983.

Factors determining high housing prices (expert witness), Oahu: Ashford & Wriston for Bishop Estate, 1982.

Consideration for telescopes on Mauna Kea (advisor), Hawaii: UH Institute for Astronomy, 1974 - 1987.

Infrastructure Financing

Infrastructure to support rapid growth, West Hawaii: County of Hawaii, 1986.

Infrastructure for non-conforming subdivisions: County of Hawaii, 1986.

Wastewater-treatment systems: Department of Health, 1977/1978.

Infrastructure to support astronomy (advisor): UH Institute for Astronomy, 1974 - 1987.

Economic/Financial Feasibility

Economic feasibility of geothermal power and the Hawaii deep-water cable: DPED and Hawaiian Electric Company, 1987.

Geothermal power (expert witness): Mid-Pacific Geothermal, Inc., 1986.

A luxury resort, West Hawaii: 1986.

Recovery of water and nutrients from wastewater: Oceanic Institute for Campbell Estate, 1982.

Expansion of the Stanford-Palo Alto Hospital: Department of Enginering-Economic Systems, Stanford University, 1968.

Steel plant alterations: Jones & Laughlin Steel Co., Pennsylvania, 1966.

Valuations, Land

Value of sugar lands and leases (expert witness), Kauai: Ukishima and Matsubara, 1987.

Value of a land option (expert witness): Ukishima and Matsubara, 1987.

Value of homes relative to assessed values (expert witness): Ukishima and Matsubara, 1987.

Leased-fee methodology (expert witness): Ashford & Wriston for Bishop Estate, 1981 - 1986; and for Kalama Land Co., 1985.

Value of real property (expert witness), Maui: Herbert R. Takahashi, 1985.

Valuations, Other

Value of lost earnings (expert witness):

Greeley, Walker & Kowen, 1988.
John Francis Perkin, 1988 (2 cases).
Yuklin Aluli, 1988.
Stubenberg, Shinn & Durrett, 1988.
Rush, Moore, Craven, Kim & Stricklin, 1985.
Robert Ling Sung Nip, 1983, 1985 and 1987.

Foley, Maehara, Judge, Choi, Nip & Okamura, 1985.

Herbert R. Takahashi, 1984.

John A. Chanin, 1983 and 1984.

Value of contributions, Galleria Plaza: William E. Wanket, Inc., 1987.

Value of sugar operations (expert witness), Kauai: Ukishima and Matsubara, 1987.

Allocation of appreciation (expert witness): Ukishima and Matsubara, 1987.

Value of lost insurance benefits (expert witness): Stubenberg, Shinn & Durrett, 1987.

Value of a professional degree (expert witness): Ukishima and Matsubara, 1987.

Value of contract terms (expert witness): Foley, Maehara, Judge, Choi, Nip & Okamura, 1985.

Value of investments having uncertain cash flows (Ph.D. thesis research): Dept. of Engineering-Economic Systems, Stanford University: 1968 - 1971.

Agriculture/Aquaculture Assessments and Impacts

Assessment of Hawaii's sugar industry: Department of Business and Economic Development (DBED), 1988.

Impact of Ewa Gentry (expert witness): Gentry Companies, 1988.

Impacts of golf courses (Kauai Lagoons, Mokuleia, and Ohikiloa): Belt-Collins & Associates, 1988.

Impacts of Signal Puako housing development (expert witness): Signal Puako Corporation, 1987/1988.

Impact of Kapolei Village (expert witness): State of Hawaii, 1988.

Impact of West Loch estates (expert witness): City & County of Honolulu, 1988.

Impact of Kunia golf course: William E. Wanket, Inc., 1987.

Impact of industrial development: William E. Wanket, Inc., for Campbell Estate, 1987.

Agriculture and aquaculture potentials for US Navy lands, Oahu and Kauai: KRP Information Services for the US Navy, 1987.

Manu'a economic development and environmental management plan (advisor): Templet Resources, Inc. for American Samoa, 1986.

Impacts of Village Park Expansion (expert witness): Waitec Development, 1985/1986.

Agricultural and aquaculture potential at Queens Beach (expert witness): Robinson & Cole for the City & County of Honolulu, 1985/1986.

Impacts of Mokuleia housing development: Northwestern Mutual Life Insurance Co., 1986.

Economic development strategy for Molokai: DPED, 1984/1985.

The outlook for sugar, pineapple, and diversified agriculture: DPED, '1977 and 1983.

Proposal for an agricultural development strategy, American-flag Pacific Islands: Pacific Basin Development Council, 1983/1984.

Agriculture and aquaculture potential, Guam: US Army Corps of Engineers, 1983.

Potential aquaculture activities using wastewater: Oceanic Institute for Campbell Estate, 1982.

Impacts of Kaanapali expansion and employee housing: Amfac, Inc., 1982.

Agricultural development strategy, American-affiliated Pacific islands: College of Tropical Agriculture, University of Hawaii, 1980/1981.

Problems and outlook of Hawaii's sugar industry, urbanization pressures on Oahu Sugar Company, and potential for diversified agriculture: DPED, 1980.

Economic, Population and Housing Impacts

Geothermal development: MCM Planning for DBED, 1988.

Pacific Games: Hawaii International Sports Foundation, 1988.

Resort developments, West Hawaii: County of Hawaii, 1986.

Manganese crust mining and processing: US Department of the Interior and DPED, 1985.

Hawaii Ocean Science and Technology Park, Hawaii (expert witness): DPED, 1985.

Resort multipliers: Amfac, 1984.

State Water Quality Management Plan: Department of Health, 1977/1978.

Fiscal Impacts (Impacts on State and County Finances)

Ewa Gentry development (expert witness): Ewa Gentry, 1988.

Signal Puako housing development, Hawaii (expert witness): Signal Puako Corporation, 1987/1988.

Long-term care for the aged, State of Hawaii: Office of the Governor: 1988.

City & County Transportation Center and City Hall annex office complex: Parsons Hawaii, Inc. for the City & County of Honolulu, 1988.

Waiawa Ridge housing development (expert witness): Gentry Pacific, Ltd., 1986/7.

Kapolei Town Center (expert witness): Campbell Estate, 1987.

Village Park Expansion (expert witness): Waitec Development, 1985/1986.

Kuilima Resort (expert witness): Kuilima Development Company, 1985.

Social Assessments and Impacts

Needs assessment for native Hawaiian entrepreneurs, resource consultant: SMS Research and Marketing, Inc. for Alu Like, Inc., 1988.

Social impacts of expanding Kaanapali Resort and development of employee housing: Group 70 and Helber, Hastert, Van Horn and Kimura Planners, for Amfac Resorts, 1982.

Socio-economic information system: City & County of Honolulu, 1982.

Socio-economic profile, Waianae: Dames and Moore, 1982.

Energy conversion factors: DPED, 1981/1982.

Economic, social, and environmental indicators: DPED, 1974.

Programming of calculations: General Motors Defense Research Corporation, Calif., 1965.

Teaching Activities (graduate level)

Economics; regional and urban planning methods; decision analysis under uncertainty; statistics; regression analysis; and systems analysis and optimization: Information Sciences Program, University of Hawaii, 1970 - 1973.

SELECTED PUBLICATIONS AND REPORTS

Cable Communications Franchises: Background and Recommendations," State of Hawaii, Department of Commerce and Consumer Affairs, June 1988.

"Kauai Lagoons' Proposed Third Golf Course: Impact on Agriculture," Belt-Collins & Associates, Hemmeter, April 1988.

"Pacific Games: Economic Impacts," for Hawaii International Sports Foundation, March 1988.

Undersea Cable to Transmit Geothermal-Generated Electrical Energy from the Island of Hawaii to Oahu and Maui: Economic Feasibility, for DPED, February 1988.

"Cost of Long-Term Care for the Aged," for State of Hawaii, Office of the Governor, February 1988.

"Proposed Kunia Golf Course: Impact on Agriculture," for William E. Wanket, Inc., February 1988.

"Kapolei Town Center and Related Developments: Impact on State and County Finances, by Project," for The Estate of James Campbell, January 1988.

"Proposed Kapolei Village: Impact on Agriculture," for R.M. Towill Corporation and State of Hawaii, January 1988.

"Kapolei Town Center and Related Developments: Impact on State and County Finances," for The Estate of James Campbell, November 1987.

"Signal Puako Residential Community: Impact on State and County Finances," for Signal Puako Corporation, November 1987.

"Proposed West Loch Estates: Impact on Agriculture," for City and County of Honolulu, September 1987.

"Outleasing Recommendations for Hawaii Lands Controlled by the US Navy," for the US Navy under a subcontract to KRP Information Services, 1987.

"Infrastructure Financing for West Hawaii, Executive Summary," for the County of Hawaii, January 1987.

West Hawaii Housing: Actions to Improve Affordability and Requirements for Employee Housing, for the County of Hawaii, December 1986.

"West Hawaii: Cumulative Impacts of Planned and Proposed Resort Developments," for the County of Hawaii, November 10, 1986.

"Infrastructure Financing for Non-Conforming Subdivisions," for the County of Hawaii, October 25, 1986.

"Proposed Waiawa Planned Community: Impact on State and County Finances," for The Gentry Companies, August 1986.

Proposed Mokuleia Development: Impact on Agriculture and Aquaculture, for the Mokuleia Development Corporation, May 1986.

Natural Energy Laboratory of Hawaii: Master Plan (co-author), for the Natural Energy Laboratory of Hawaii, DPED, 19186.

"King George V Resort: Preliminary Financial Analysis," for the King George V Resort, 1986.

"Proposed Village Park Expansion: Public Benefits and Costs," for Waitec Development, Inc., February 1986.

"Proposed Village Park Expansion: Impact on State and County Finances," for Waitec Development, Inc., February 1986.

Proposed Village Park Expansion: Impact on Agriculture and Aquaculture, for Waitec Development, Inc., February 1986.

"Agriculture Preservation Versus Urban Development in the Ewa/Central-Oahu Area: Recommendations of the Hawaii Chapter of the American Planning Association (principal author), January 1986.

"Manganese Crust Mining and Processing: Economic and Demographic Impacts" (co-author), for the US Department of the Interior and DPED, 1985.

"Hawaii Ocean Science and Technology Park: Finances," for the High Technology Development Corporation, July 1985.

"Potential Socio-Economic Impacts and Mitigating Measures of Expanding the Natural Energy Laboratory of Hawaii and Developing the Hawaii Ocean Science & Technology Park" (principal author), for the High Technology Development Corporation, July 1985.

"Impact on State Finances of Expanding the Kuilima Resort," for the Kuilima Development Corporation, 1985.

An Economic Development Strategy and Implementation Program for Moloka'i (principal author), for DPED, June 1985.

"The Market Outlook for the Polynesian Cultural Center," for the Polynesian Cultural Center, August 1984.

Waimanu National Estuarine Sanctuary Management Plan, State of Hawaii (principal author), for DPED, June 19814.

"Economic and Population Multipliers for Resort, Residential, Condominium, and Industrial Development in Hawaii," for Amfac Property Development Corporation, February 1984.

The Honolulu Symphony: Long Range Plan, for the Honolulu Symphony Society, January 1984.

Hawaii's Primary Economic Activities: Relative Importance, Trends, Problems, Potentials, and Outlook (principal author), for DPED, August 1983.

Impact of the Proposed Kaanapali and Wainee Developments on the Profitability of Pioneer Mill Company, Ltd., for Amfac Properties, 1983.

"Social Aspects and Impacts of Proposed Mauka Expansion of Kaanapali Beach Resort and Development of Employee Housing at Wainee," for Amfac Properties, 1982.

Agriculture, Municipal, and Industrial Water Demand and Benefit Parameters on Guam, for the Army Corp of Engineers, August 1983.

Hawaii Land Reform Act: Critique of Legislative Findings and Declaration of Necessity, for Ashford and Wriston, May 1983.

A Proposed Social Impact Management System for the City & County of Honolulu, (co-author), for the City and County of Honolulu, Department of Land Utilization, 1983.

Economic Feasibility of Reclaiming Water and Nutrients from Domestic Wastewater on Oahu, for Campbell Estate/Oceanic Institute, 1983.

Cumulative and Unaddressed Impacts Associated with Energy Development in Southwestern Oahu, for DPED, 1982.

Proposed Ocean Thermal Energy Conversion Plant at Kahe Point: anticipated Impacts and Mitigating Measures, for DPED, 1982.

"Public Input Issues Raised by the Kahe Power Plant Outfall," for DPED, November 1981.

Hawaii Energy Data Management System (co-author), for DPED, November 1981.

"Energy Conversion Rates," for DPED, 1982.

"An Evaluation of Environmental Impact Assessment Requirements for Exploratory Geothermal Drilling in Hawaii," for DPED, October 1981.

Strategy Outline for Accelerated Agricultural Development Applicable to American-Affiliated Islands in the Pacific, for the University of Hawaii, College of Tropical Agriculture and Human Resources, 1981.

"Methods for Calculating the Fair-Market Value of the Owner's Interest in Leased Land," for Ashford & Wriston, May 7, 1981.

Hawaii's Sugar Industry: Problems, Outlook, and Urban Growth Issues, for DPED, April 1981.

"State of Hawaii Coastal Energy Impact Program Strategy, 1980 to 1985," for DPED, October 1980.

Coastal Energy Impacts in Hawaii: Existing and Planned Facilities and General Impact Assessments, DPED, November 1979.

Water Quality Management Plan (co-author), for the Hawaii Department of Health (DOH), 1978.

Financial and Economic Analysis and Final Recommendations for the Hawaii 208 Water Quality Program, Technical Report No. 4, for DOH, November 1, 1978.

"Economy Issue Paper," State Plan Issue Paper No. 1, for DPED, 1977.

The Hawaii State Plan, The Economy: Analysis of Economic Growth in the State of Hawaii:1960 to 1990, A Technical Study, for DPED, 1977.

The Hawaii State Plan, Population: Analysis of Population Growth in the State of Hawaii: 1960 to 1990, A Technical Study, for DPED, 1977.

State of Hawaii Growth Policies Plan: 1974 - 1984 (principal author), for DPED, 1974.

"Island Indicators," *Economic Growth and the Quality of Life,* American Society for Public Administration, Honolulu Chapter, 1974.

State Economic Model, for DPED, 1973.

Alternatives for Oahu's Population and Employment Growth, for DPED, January 1973.

Competitive Economic Theory Under Uncertainty with Costly Information, doctoral dissertation for Stanford University, 1970.

"Adaptive Pattern Classification: An Application of Statistical Decision Theory," *Proceedings of the Second Hawaii International Conference on System Sciences,* 1969.