

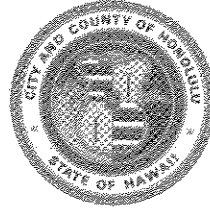
DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

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'91 MAY 16 P2:38



BENJAMIN B. LEE
CHIEF PLANNING OFFICER
ROLAND D. LIBBY, JR.
DEPUTY CHIEF PLANNING OFFICER

OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

WM 4/91-1164

May 14, 1991

Mr. Brian Choy, Acting Director
Office of Environmental Quality Control
Central Pacific Plaza
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

Acceptance Notice for the Proposed
Lualualei Golf Course, Nanakuli, Oahu--Folder No. 91/W-2
Final Environmental Impact Statement (Final EIS)

We are notifying you of our acceptance of the Final EIS for the proposed Lualualei Golf Course, as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes.

Pursuant to Section 11-200-23 (c), Chapter 200, Title 11 ("Environmental Impact Statement Rules") of the Administrative Rules, this acceptance notice should be published in the May 23, 1991 OEQC Bulletin.

We have attached our Acceptance Report of the Final EIS for the Lualualei Golf Course. Should you have any questions, please contact Bill Medeiros at 527-6089.

Sincerely,

A handwritten signature in black ink, appearing to read "Benjamin B. Lee".

BENJAMIN B. LEE
Chief Planning Officer

BBL:ft

Attachments

cc: Sanjiro Nakade
Tyrone Kusao

1991-Oahu - FEIS - Luaualei Golf

Final Environmental Impact Statement

FILE COPY

Luaualei Golf Course

Nanakuli, Oahu, Hawaii

Kabushiki Kaisha Oban

April 1991

FILE COPY

**Final Environmental
Impact Statement**

Lualualei Golf Course

Nanakuli, Oahu, Hawaii

Prepared For:
Kabushiki Kaisha Oban

Prepared By:
Hida, Okamoto & Associates

The Commerce Tower
1440 Kapiolani Boulevard, Suite 915
Honolulu, Hawaii 96814

Harvey K. Hida

Harvey K. Hida, P.E.

April 1991

Lualualei Golf Course

Final Environmental Impact Statement

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Prepared by Hida, Okamoto & Associates, October, 1989.
- B. **GROUND WATER RESOURCES,**
Prepared by John F. Mink, October 15, 1988.
- C. **ARCHAEOLOGICAL INVENTORY SURVEY,**
Prepared by Cultural Surveys Hawaii, January, 1991.
- D. **SOCIO-ECONOMIC IMPACT ASSESSMENT FOR THE PROPOSED LUALUALEI GOLF COURSE, WAIANAE DISTRICT, OAHU,**
Prepared by Community Resources, Inc., January, 1991.
- E. **TRAFFIC IMPACT ASSESSMENT REPORT FOR THE LUALUALEI GOLF COURSE,**
Prepared by Pacific Planning & Engineering, Inc., September, 1990.
- F. **ENVIRONMENTAL ASSESSMENT OF FERTILIZER, HERBICIDE AND PESTICIDE USE ON THE PROPOSED LUALUALEI GOLF COURSE,**
Prepared by Murdoch & Green, September, 1990.
- G. **TERRESTRIAL VERTEBRATE ANIMALS OF THE PROPOSED LUALUALEI GOLF COURSE,**
Prepared by Andrew J. Berger, September, 1990.

**H. BOTANICAL SURVEY, PROPOSED LUALUALEI GOLF COURSE,
LUALUALEI, NANAKULI, OAHU,**

Prepared by Char & Associates, September, 1990.

**I. NOISE STUDY FOR THE LUALUALEI GOLF COURSE PROJECT,
NANAKULI, HAWAII,**

Prepared by Y. Ebisu & Associates, Inc., November, 1990.

J. AIR QUALITY IMPACT REPORT, LUALUALEI GOLF COURSE,

Prepared by J.W. Morrow, January, 1991.

K. LUALUALEI GOLF COURSE: IMPACTS ON AGRICULTURE

Prepared By Decision Analysts Hawaii, Inc. 1991

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CHAPTER I

Introduction

Lualualei Golf Course

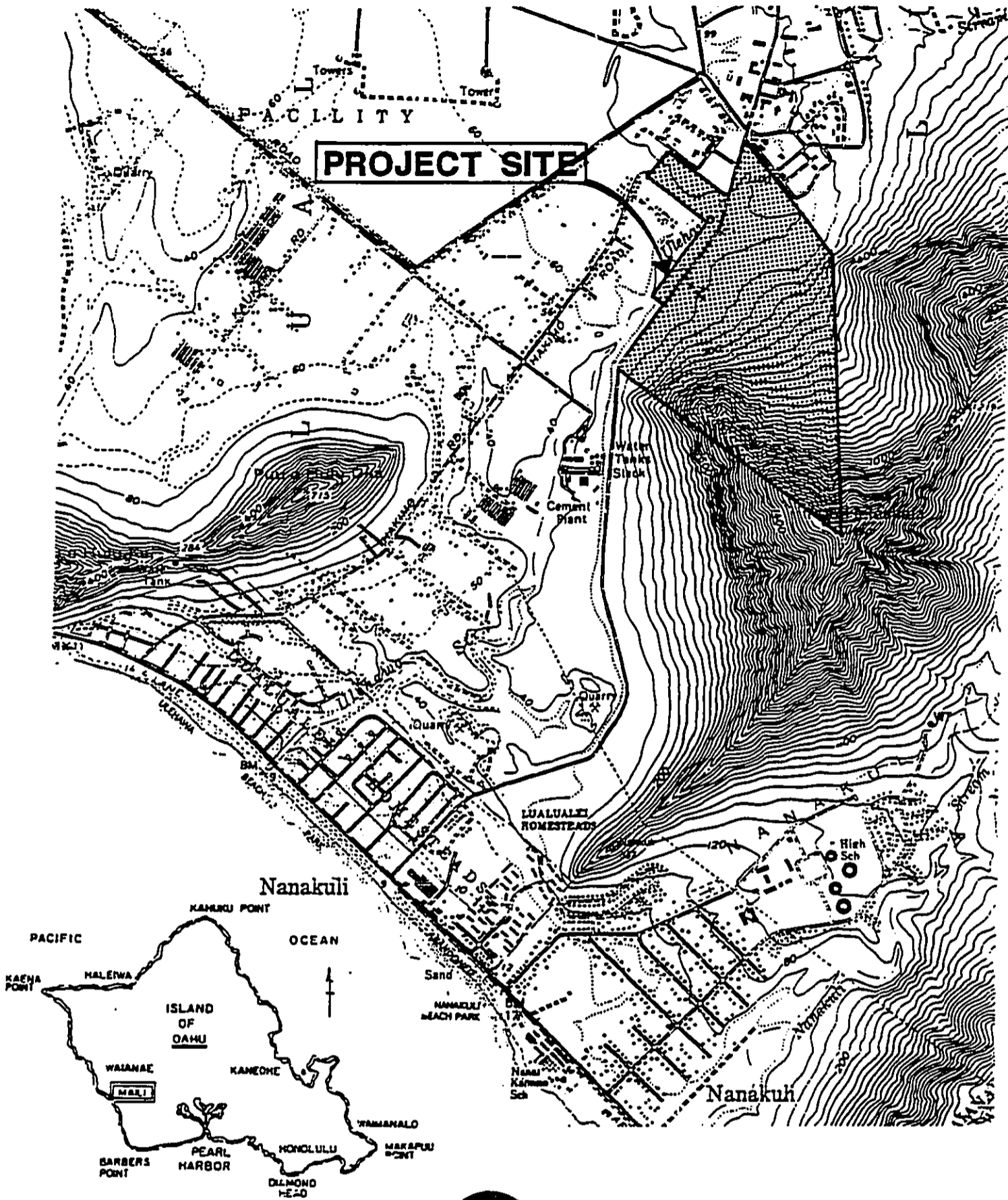
Final Environmental Impact Statement

CHAPTER I. INTRODUCTION

This Chapter presents the background information on the project site, a general description of the proposed project 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 subsequent Chapters in this report.

1.1 BACKGROUND

The applicant, Kabushiki Kaisha Oban, is planning the development of a golf course complex containing an 18-hole, regulation golf course a modest clubhouse facility and a golf driving range/nursery site. The complex would be located in Lualualei Valley, Nanakuli, Oahu, Hawaii, approximately 50 minutes driving time from Honolulu. *Figure 1* shows the regional location of these sites in relation to the Nanakuli area. The golf course complex has been named "Lualualei Golf Course".



VICINITY MAP

NO SCALE

SCALE: 1:24,000 (APPROX.)

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HIDA, OKAMOTO & ASSOCIATES, INC.

Consulting Engineers



FIGURE 1
PROJECT LOCATION

The golf course project site contains approximately 259.25 acres, located mauka of Farrington Highway and adjacent to the Naval Magazine Lualualei. This site is approximately 2.5 miles north of Nanakuli town and 7.5 miles from the Waianae community.

Elevation of the golf course site ranges from approximately 65 feet above mean sea level (msl) near Lualualei Access Road and throughout a flat plateau which comprises the vast bulk of the project site to nearly 250 feet above msl along its mauka portions which encompass some of the foothills of the Puu Haleakala ridges to the Waianae mountain range.

The site is vacant land overgrown mostly with grasses and haole koa bushes. Ulehawa Stream, a dry bed stream, crosses the level portions of the project site along path generally running parallel to the Lualualei Access Road.

The main previous use of the level portions of the site was sugar cane production which ceased in the early 1900s. Since then, the site has remain largely unused although several acres were used for a truck farming operation which closed operations voluntarily in 1988. Presently, the site is not used altogether.

Adjoining uses to the site include the Naval Magazine Lualualei along its northerly boundary; Lualualei Access Road and, across this Road, vacant lands immediately west of the site; and the foothills of Puu Haleakala Ridge along its east and southerly boundary.

The applicant has acquired complete fee ownership of the site. It is the applicant's intent to develop a golf course facility which will be open to general public use continuously and which will not be a "country club" golfing facility or offer private membership in the club for sale to individuals or business entities. In short, the facility will be a simple golf course rather than a luxury, exclusive private golf course/country club complex.

1.2 GENERAL DEVELOPMENT PROPOSAL

The Lualualei Golf Course is planned to contain 18 regulation golf holes, a modest clubhouse, a driving range/farm nursery facility. The major elements of the golf course include: a new access roadway paralleling the Lualualei Access Road and providing access to the course, potable and non-potable (course irrigation) water systems, drainage facilities with retention and detention ponds, a private wastewater collection and disposal system, and electrical, telephone and other utility services. Details of these project elements are discussed in *Chapter II*.

1.3 PURPOSE AND NEED FOR THE PROJECT

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 conditions, some Oahu golfers end up paying high green fees to play resort courses at Turtle Bay or Makaha.

In addition, existing Oahu golf facilities can only serve approximately three percent (3%) of the average daily visitor population. Overall, therefore, there is a

strong market to expand the number of golf facilities throughout Oahu, as discussed in *Chapter II*.

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. However, only one golf course has been built during this period – the private, Honolulu International Country Club in Salt Lake. The few, recently approved courses will only make a small impact on what is virtually, untapped public golf course demand.

The new course developed by this project will be a daily-fee course that will be available continuously for public play, with no private membership. Oahu golfers and, more specifically, golfers living along the Leeward Coast will benefit from the establishment of the proposed Lualualei Golf Course.

1.4 PURPOSE & CONTENT OF FINAL ENVIRONMENTAL IMPACT STATEMENT.

This Final Environmental Impact Statement (FEIS) has been prepared to identify and evaluate the existing conditions and potential impacts of the development of the Lualualei Golf Course in Lualualei Valley, Nanakuli, Hawaii, on the natural and human environment. The EIS is required as part of an application to the City and County of Honolulu Department of General Planning for a Waianae Development Plan Land Use Map amendment. This document is prepared in accordance with the provisions of Chap. 343, Hawaii Revised Statutes and Title 11, Chap. 200 of the State Health Department Administrative Rules which, together,

set forth the requirements for the preparation of environmental impact statements.

Chapter I is the Introduction which presents background on the project, the generalized development proposal, and the purpose and contents of the document. *Chapter II* contains a detailed project description, including ownership and present use of the site, the master plan, construction activities, market demand, scheduling and costs, and community benefits.

Chapter III includes a discussion of existing State and City land use and zoning designations for the project site. Changes in land use and zoning classification are also discussed in the Chapter, along with other approvals required to complete the project. *Chapter IV* includes the description of existing environmental conditions, anticipated environmental impacts and recommended mitigation measures. All environmental factors are considered in this EIS, such as soils, water quality and use, traffic, archaeological resources, noise and community services, along with other factors. Mitigative measures are recommended to minimize potential adverse impacts generated by the project.

Chapter V is a presentation of alternatives to the proposed action, including no action at all. *Chapter VI* includes a discussion of the relationship of the project to existing policies and plans for the area. *The Consulted Parties, a List of Preparers* and their resumes are included in *Chapter VII*. *Chapter VIII* includes comments received during the consultation period.

Chapter IX includes copies of technical reports prepared by consultants for the project. Specific technical reports have been prepared to evaluate the disciplines of agricultural use of the site, stormwater runoff, fertilizer and pesticide

use, botany, terrestrial vertebrates, archaeological resources, traffic, noise, air quality, water supply, wastewater collection and disposal, demographics and social impacts. Information contained in these reports has been highlighted in applicable parts of *Chapter IV*.

CHAPTER II

Project Description

CHAPTER II. PROJECT DESCRIPTION

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

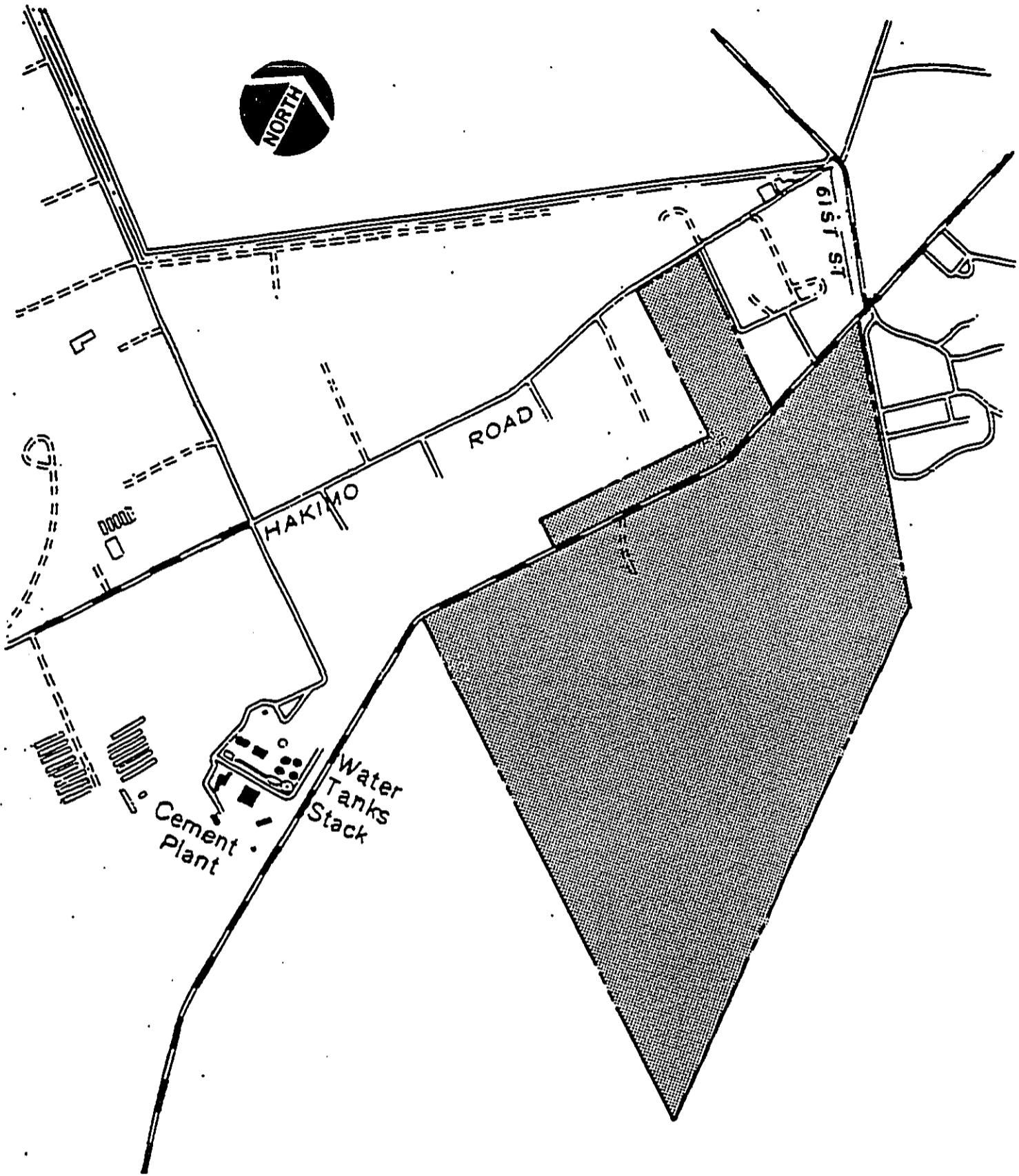
2.1 OWNERSHIP AND PRESENT USE.

The property encompassed by this project consists of vacant land briefly described in *Chapter I*, located in Lualualei Valley above the Nanakuli community in Leeward Oahu in the Waianae Judicial District.

The Tax Map Key designations for the site are: TMK 8-7-9: por. 2 (containing approximately 236.154 acres of land); 8-7-10: parcels 6 and 10 (containing 17.093 acres); and 8-7-19: por. 1 (containing 6.0 acres).

Figure 2 depicts the triangular shaped boundaries of the project site. The site consists primarily of stands of haole koa bushes and mature weed grasses growing within a fairly level plateau land mass which extends from the Lualualei Access Road in an easterly direction towards the foothills of the Puu Haleakala Ridges.

The site is located approximately 2.4 miles mauka and northeasterly of the Nanakuli coastline within U.S. Census Tract No. 96.01. It is located along the



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 Consulting Engineers
 Honolulu, Hawaii

SCALE: 1:12000 (APPROX.)



FIGURE 2
 PROJECT SITE

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northeasterly perimeter of Lualualei Valley and along the base of Puu Haleakala Ridge which partially separates the project from the more concentrated residential and rural communities in Nanakuli.

Ulehawa Stream, normally a dry bed stream, separates the proposed golf course project, along its southerly and westerly boundaries from several dispersed small farms and individual homesteads which line and concentrate along Hakimo Road. Hakimo Road runs through the center of Lualualei Valley. Among these residences, the nearest dwelling unit to the project site appears situated approximately 150-175 feet from its southwesterly boundary.

Until recently, about 15 acres of the lower portion of the project site was actively used for vegetables truck farming under a farm lease. Tomatoes, lettuce, mustard cabbage, pak choi and daikon for local consumption were grown there by an individual farmer-tenant, Ryoei Higa.

In an amicable and voluntary agreement, Mr. Higa agreed to terminate his truck farming operation on the subject site for good and valuable consideration in 1988, including a relocation of his truck farm to another site. In 1988, the protection of Mr. Higa's farming operation had been the primary reason for a withdrawal of the proposed project from active consideration by the Director of the City Department of Land Utilization under a then-pending Conditional Use Permit application.

The 15-acre portion of the site represents approximately 6% of the total land area within the project site. The remaining 244.25 acres have never been used for agricultural purposes for decades, at least since the early 1900s when sugar

cultivation on the site and much of Lualualei Valley terminated according to historical records.

This reflects the largely poor agricultural productivity of the land as manifested in its Land Study Bureau ratings: about 13.5 acres within the site are rated as having Class "B" soils, a relatively high productivity rating; while the rest of the site (approximately 245.75 acres of land) is rated as having Class "E" soils, that is, soils having the poorest agricultural productivity capacity among all soil types according to the Land Study Bureau rating scale.

Land uses of property adjoining the project site include the Naval Magazine Lualualei, open and undeveloped lands, single family residences occupying large land parcels (i.e. 1 to 5 acre parcels) that characterize the rural community and small farms in Lualualei Valley and the Puu Haleakala ridges.

2.2 PROPOSED PROJECT.

This section describes the proposed project in terms of the development elements of the project master plan and anticipated project construction activities.

2.2.1 Project Elements:

The overall project goal is the development of the proposed Lualualei Golf Course and its related support facilities and utilities as set forth in its master development plan. Each element of that master plan is described below.

A. Golf Course:

An 18-hole golf course is planned for that part of the project site situated on the mauka (easterly) side of Lualualei Access Road in a regulation course which would encompass the level plateau portions of the site and the more moderately sloping foothills of the Puu Haleakala ridges rising along the easterly perimeter of the site.

In light of the existing, mostly flat terrain of the project site, it is anticipated that the course will be a moderate level of difficulty course, similar to the better municipal golf courses on Oahu. *Figure 3* shows the proposed layout of the golf course. The fairways, tees, greens and roughs of the golf course will occupy approximately 145 acres of the total project site.

Detention and retention ponds will be constructed as water hazards on several holes, and will serve additional purposes such as aesthetic features, stormwater runoff control, irrigation water storage and fire protection supply storage.

The course will be a daily-fee course open to the public, with no private membership. The development of the course will be phased; however, golf course construction is expected to require 18-30 months. Play on the course could begin as soon as 1995, assuming all necessary governmental approvals are obtained. Actual construction and opening dates will depend largely on the timing of government approvals.

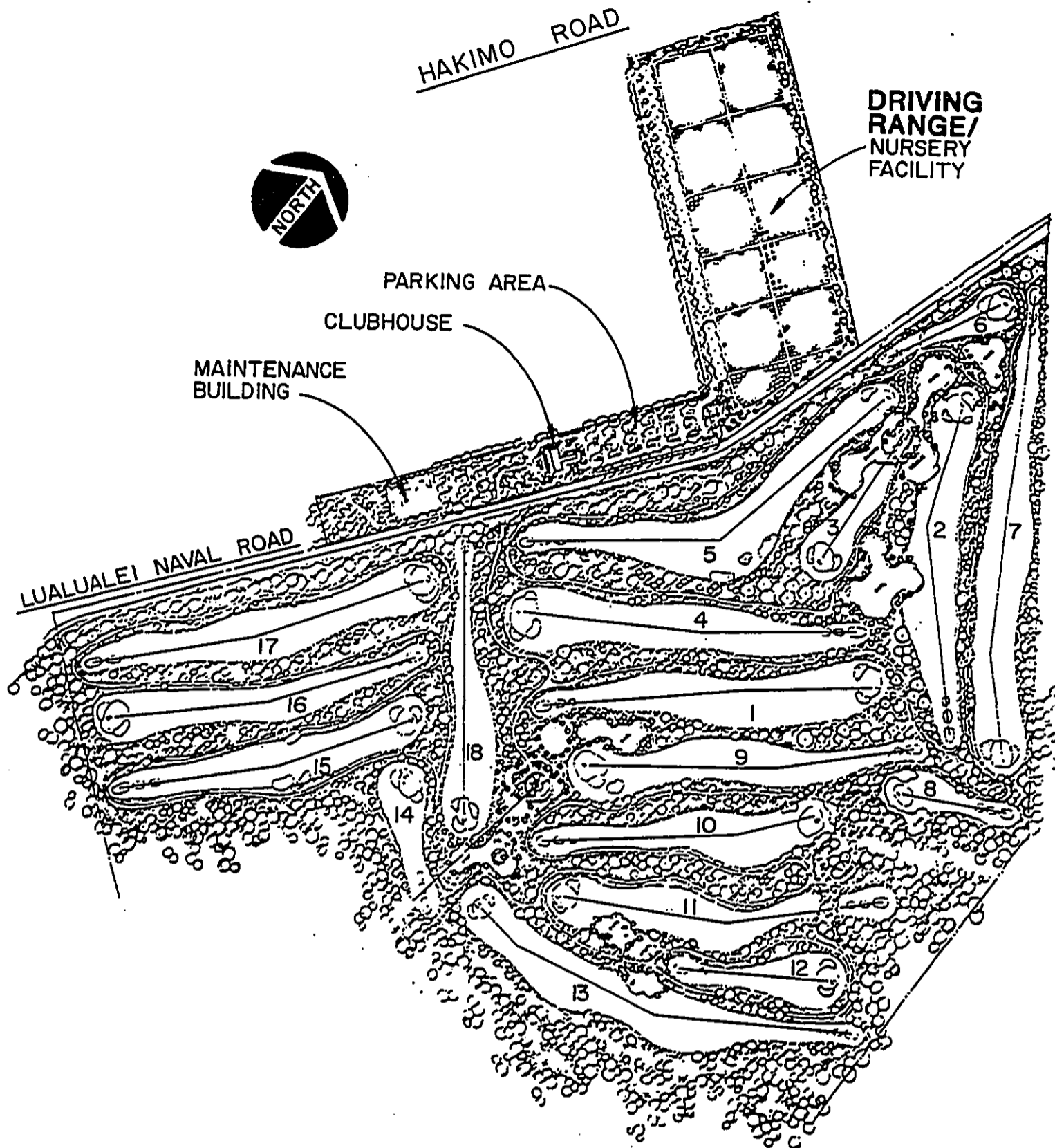


FIGURE 3
CONCEPTUAL
MASTER PLAN

HIDA, OKAMOTO & ASSOCIATES, INC.
Consulting Engineers
 Honolulu, Hawaii

B. Clubhouse:

As shown in *Figure 3*, the course clubhouse (including ancillary clubhouse structures) will be located across Lualualei Access Road. It will be linked to the golf course by a golf cart underpass to be located near the clubhouse and which will permit golfers to safely cross Lualualei Access Road. The Navy has no objection to the proposed underpass.

The clubhouse complex will include on-site parking areas, small maintenance yard and buildings, cart storage area, and other related minor structures in addition to the main clubhouse building. The main clubhouse facility is expected to contain approximately 8,000 sq. ft. of floor area and feature a modest lounge, snack bar, kitchen, locker rooms, restrooms, small pro shop, several small meeting rooms and administrative offices. The clubhouse complex will occupy approximately 27,000 sq. ft. of land.

An on-site parking area will be provided at the clubhouse and will also serve the nearby golf driving range. It will contain approximately 140 parking spaces.

Some other features that will likely surround the clubhouse include a lanai, walkways, landscaped areas and practice putting greens. In general, the clubhouse complex will be a relatively modest facility, rather than a luxury complex, and will be com-

parable in scale and features to the new Hawaii Kai Golf Course clubhouse facility.

C. Driving Range/Nursery:

As shown in *Figure 3*, a combination golf course driving range/nursery is proposed to be located on the makai side of the Lualualei Access Road and across from the golf course. This ancillary use will occupy approximately 17 acres of the project site and will serve as a significant transition/buffer zone between the golf course/clubhouse areas and the rural Lualualei Valley community.

D. Access Roadways:

Because of the Navy's reluctance to permit unrestricted public use of the Lualualei Access Road, access to the golf course will be provided by construction of a new service road paralleling the Access Road and extending from Paakea Street to the proposed clubhouse. *Figure 4* shows the proposed roadway/access plan and route for the project.

Vehicular access to the project will be primarily from Farrington Highway, Hakimo Road, Paakea Road and the aforementioned new, 2-lane and paved service road. Farrington Highway is a rural arterial highway connecting major population centers along the Waianae coast to the rest of Oahu. It is a State-owned and maintained Primary Federal Aid Highway.

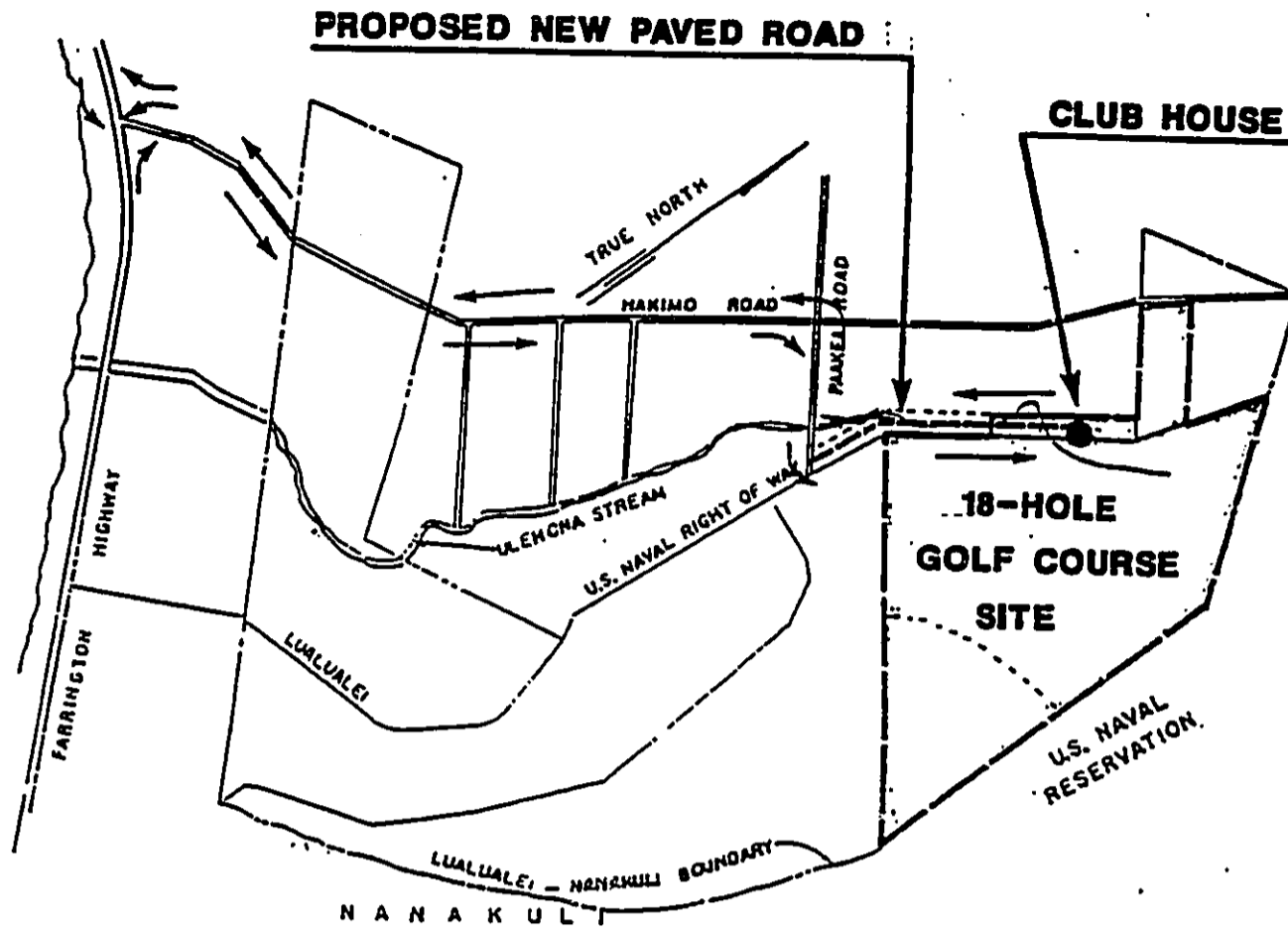
Hakimo Road is a county-maintained road with a 20-foot wide pavement designed and use for 2-way traffic. Its shoulders are unpaved and vary between 5 and 10 feet in width. About 2.1 miles of Hakimo Road is paved while the remainder is an unpaved dirt road. The proposed roadway/access plan and route for the project anticipates using portions of Hakimo Road which are already paved. Posted speed on Hakimo Road is 20 mph.

Paakea Road is also a county-maintained road with a posted 20 mph speed limit and a 20-foot wide pavement for 2-way traffic. It connects to Lualualei Access Road near the Hawaii Cement Company plant.

Lualualei Access Road is owned and maintained by the U.S. Navy. It is open to public use between Farrington Highway and the Lualualei Naval Magazine. The Navy refused an initial request for use of Lualualei Road to access onto the project site but had no objection to the construction of the proposed parallel service road to the site or to the propose golf cart underpass. The developer will be acquiring some additional land along the makai side of the Access Road which is not now owned by the developer in order to complete the construction of the proposed service road.

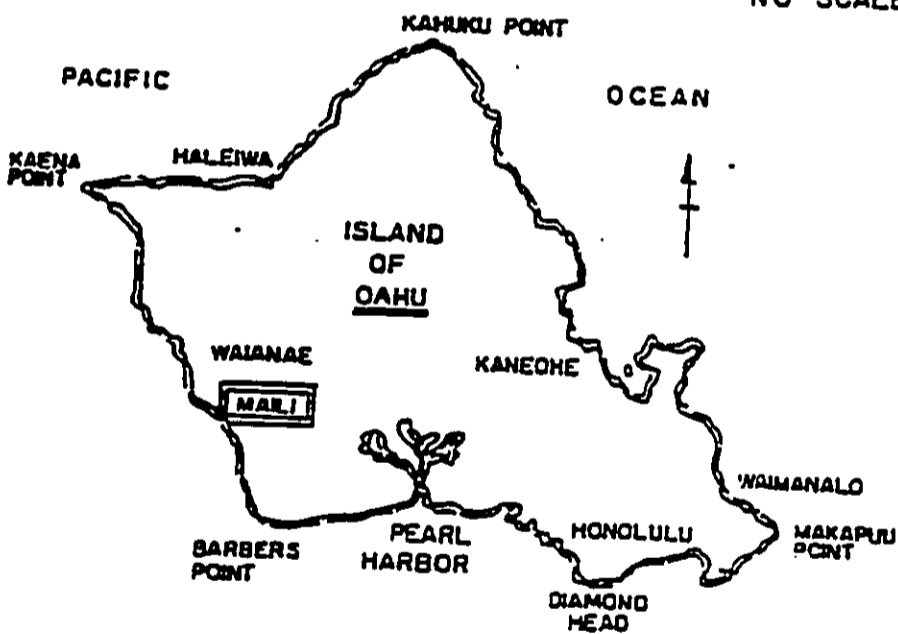
E. Wastewater Collection and Disposal.

A report entitled *Impact On Utilities and Services, Proposed Lualualei Golf Course Project* prepared by Hida, Okamoto &



LOCATION MAP

NO SCALE



VICINITY MAP

NO SCALE

HIDA OKAMOTO & ASSOCIATES, INC.
Consulting Engineers
 Honolulu, Hawaii.

FIGURE 4
ROADWAY ACCESS LAYOUT

Associates, Inc. (Oct. 1990) reviews the impacts of the proposed project on various public infrastructure facilities and utility services, including wastewater collection and disposal services to the project. Information from this report is included in this section and the complete report is included as *Appendix A*.

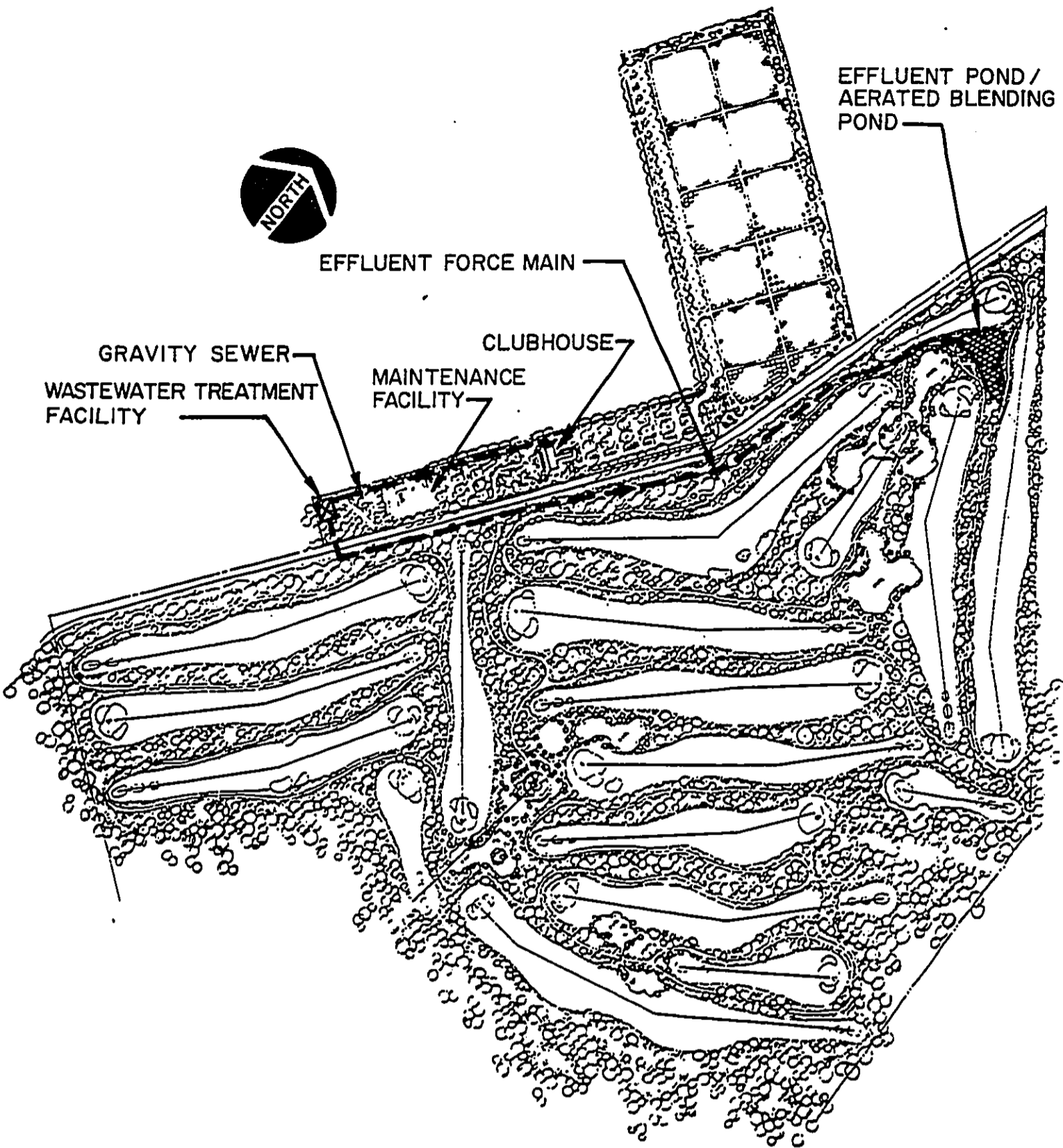
Presently, the property is not serviced by the City and County of Honolulu's wastewater collection, treatment and disposal system. The adjoining rural residential area between the project site and the junction of Waiolu Street and Hakimo Road is serviced by cesspools. Wastewater disposal by cesspools is a major issue within the Waianae Development Plan area. The City and County's Division of Wastewater Management, Department of Public Works, has no plans to service the Agricultural district within Lualualei Valley which encompasses the project site.

Wastewater will be generated from the clubhouse and golf course maintenance building. Average wastewater flow from these sources is estimated at 8,100 gpd based on calculations for overall water use and wastewater generation (Hida, Okamoto & Assoc., 1990). Wastewater generated from the proposed development is anticipated to be primarily generated from clubhouse activities and will include wastewater from meal preparations, toilet and showers and laundry area for washings. The wastewater will be typical domestic wastewater in composition.

The major components of the project's proposed private wastewater infrastructure are (1) the wastewater collection system; (2) the treatment system; and (3) the wastewater effluent disposal system. This infrastructure will serve only the Lualualei Golf Course.

Figure 5 shows the proposed wastewater collection system. It will be located on the west side of the clubhouse area. Where the topography permits, a gravity sewer will collect and convey the wastewater to the treatment facility from the clubhouse and maintenance facility.

The wastewater infrastructure system for the project will include a wastewater treatment plant (WWTP) as shown in *Figure 5*. It will be located makai (west) of the maintenance facility. The solids (sludge) removed by the treatment process will be disinfected, dewatered and applied to the golf course driving range/nursery area. It is estimated that the reclaimed wastewater will comprise about 1.4 percent of the total golf course irrigation water supply requirement and, thus, is adequate to irrigate only about 3.6 acres of the total golf course project. Any surplus sludge will be hauled to an appropriate City disposal facility (i.e. landfill, treatment plant, etc.) for disposal in compliance with State of Hawaii Health Department requirements. More details relating to the project's wastewater collection and disposal system are provided in *Chapter IV*.



(EFFLUENT DISPOSAL SYSTEM)

FIGURE 5

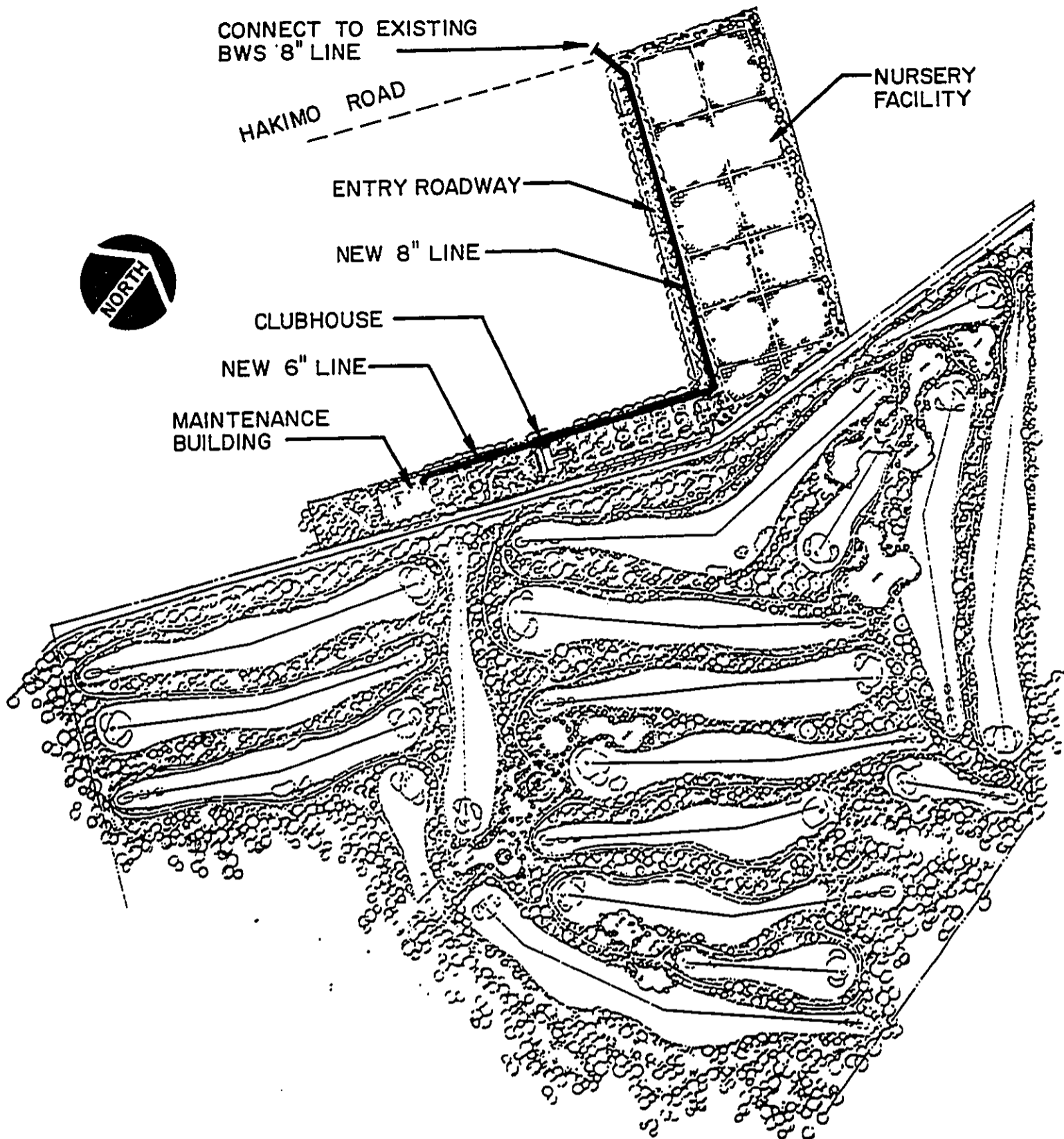
PROPOSED WASTEWATER
COLLECTION SYSTEM

F. Potable Water System:

The potable water supply plan for the project has been addressed in two reports prepared for the project: a Report on *Ground Water Resources, Maile, Waianae; Puu Haleakala to Ulehawa Stream* prepared by John F. Mink and the aforementioned Hida, Okamoto & Associates report on the project's proposed infrastructure. Information from these Reports are included in this section and the Reports are included in the Appendices.

The proposed water supply plan for the project has two separate systems: A **Potable Water System** providing domestic water supply for the clubhouse and maintenance building and a **Non-appealable/Irrigation Water System** providing water for golf course irrigation and fire protection.

The potable water system includes domestic supply for the golf course maintenance building and clubhouse. The proposed system will be connected to the existing 8-inch Board of Water Supply (BWS) water line along Hakimo Road. A new 8-inch line will be located along the new service road by the proposed driving range/nursery. A new 6-inch water line will be connected to the 8-inch line and will also serve the golf course clubhouse and maintenance facility. *Figure 6* shows this proposed system.



(POTABLE WATER SYSTEM)

FIGURE 6
PROPOSED
WATER SYSTEM

HIDA, OKAMOTO & ASSOCIATES, INC.
Consulting Engineers
 Honolulu, Hawaii

G. Non-Potable (Irrigation) Water System:

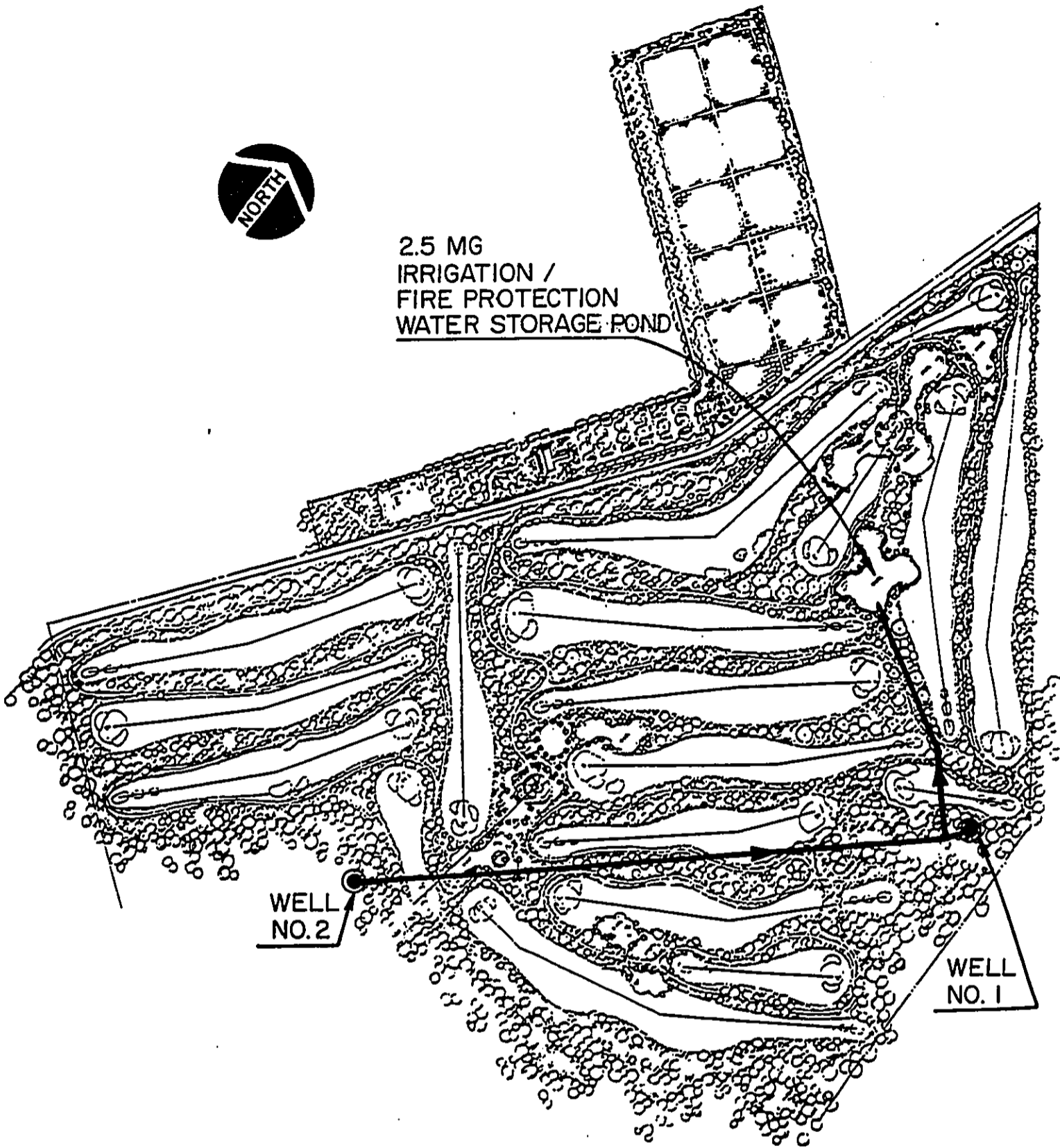
The project's non-potable water system includes irrigation for the golf course, the nursery and landscaped areas and fire protection for the clubhouse and maintenance facilities. *Figure 7* shows the project's non-potable water system.

The developer has drilled two (2) on-site wells to provide additional irrigation water to supplement treated wastewater effluent which will be applied to the course for irrigation purposes. Well No. 1 is located at the 155 feet elevation at the mauka (easterly) side of the project site in the Puu Haleakala foothills. Well No. 2 is located at the 145 feet elevation at the makai (westerly) side of the project site. *Figure 7* shows the approximate location of the wells within the site.

The wells were tested and can deliver approximately 226 gallons per minute (or 0.32 mdg) per well. A gravity line from the well sites will supply non-potable water to a 2.5 million gallon irrigation/fire protection water storage pond south and east of the proposed clubhouse site. The storage pond is also shown on *Figure 8*.



2.5 MG
IRRIGATION /
FIRE PROTECTION
WATER STORAGE POND



(NONAPPEALABLE WATER SYSTEM)

FIGURE 7
PROPOSED
WATER SYSTEM

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Honolulu, Hawaii

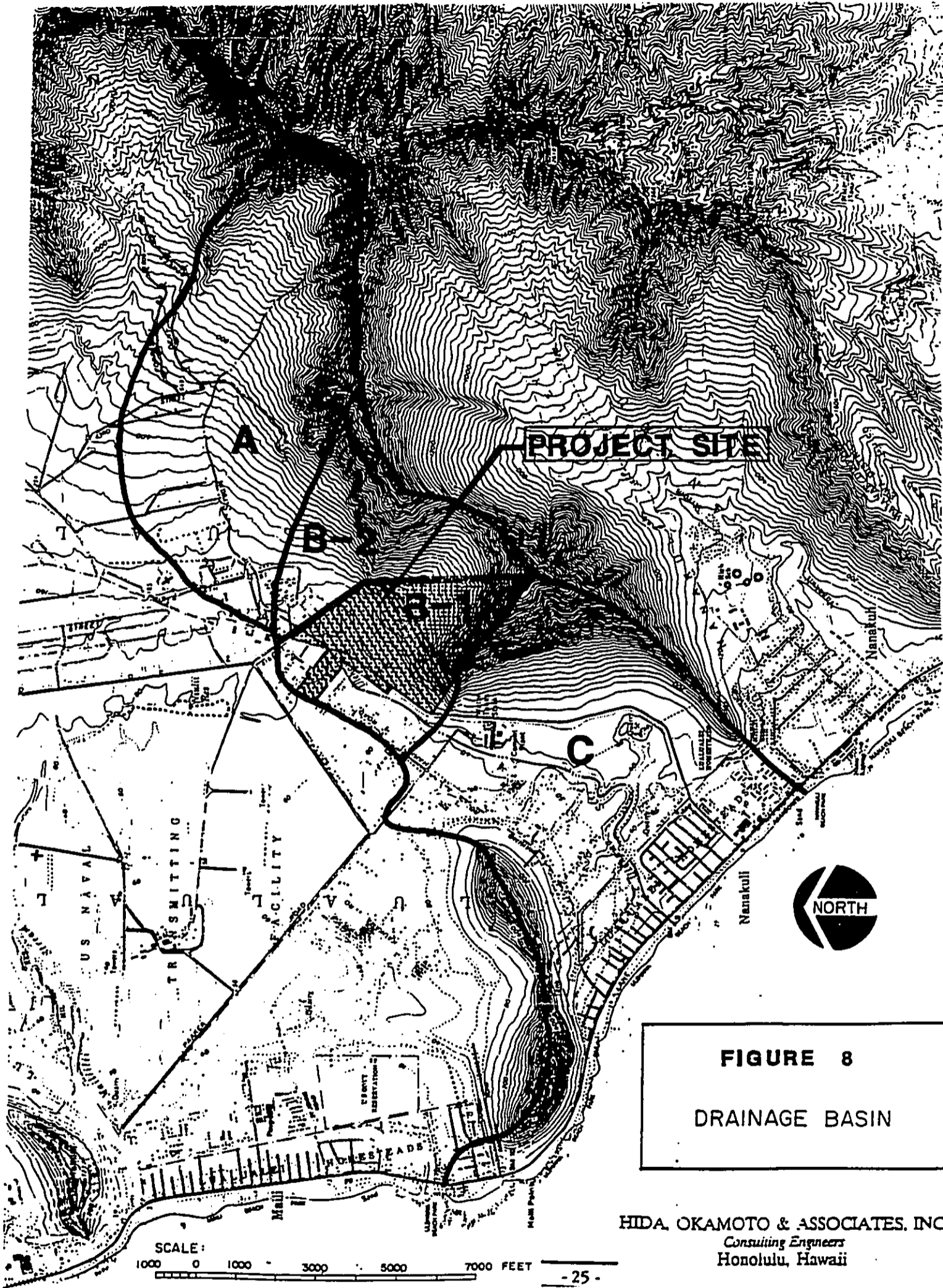


FIGURE 8
DRAINAGE BASIN

HIDA, OKAMOTO & ASSOCIATES, INC.
Consulting Engineers
 Honolulu, Hawaii

H. Drainage Facilities:

The Hida, Okamoto & Associates Report on project infrastructure also includes information on existing and proposed drainage conditions within the project site which can be found in the Appendices. More detailed information on drainage can be found in *Chapter IV* below.

Ulehawa Stream, normally a dry bed stream, is part of the Ulehawa Stream drainage basin which has an irregular shape and encompasses approximately 3,178 acres of land within Lualualei Valley. The basin contains several tributaries that discharge into Ulehawa Stream (See *Figure 8*). The entire project area is located within this drainage basin.

The proposed golf course development would change the character of approximately 140 acres of the project site and, thus, 140 acres of the Ulehawa Stream drainage basin. The medium dense vegetation cover currently found on the site would be replaced by more open, close-cropped landscaping typically associated with golf courses. The new service roadway, golf cart paths, golf course parking lot, buildings within the project, retention/detention ponds within the course and other features normally supporting a golf course would further add to the drainage basin modification resulting from the project.

Grading of the golf course 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 sediment 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. Detention basins will control any potential increase of on-site runoff so that the peak runoff rate from the developed project areas which reaches Ulehawa Stream or other off-site areas will be at most equal to that which occurs under existing undeveloped conditions.

I. Solid Waste Disposal:

Solid waste generated during project construction, such as landscaping debris, will be trucked off-site to the appropriate City sanitary landfill or H-Power facility or to private bidders in the case of recyclable materials. Solid waste generated in connection with the operation of the golf course, clubhouse and maintenance buildings which cannot be feasibility recycled will be collected by a private collection company and disposed of at the appropriate City sanitary landfill. Recyclable materials will be sold to interested vendors or included in the upcoming Island-wide City recycling program disposal system.

At full development, the activities within the project site will generate a de facto population of 200 persons who will each generate approximately 2.32 - 4 pounds of refuse daily for a total of 700 pounds of solid waste each day from the golf course.

J. Other Utilities and Services:

Electricity and telephone and all other utility conduits to the clubhouse and maintenance buildings and on-site wastewater treatment plant will be installed underground wherever feasible along the proposed service roadway and portions of the golf course through which such conduits must pass.

2.2.2 Construction Activities:

Construction activities at the golf course 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 each construction activity follows:

A. Vegetation Clearing and Grubbing:

Vegetation clearing will occur to create buildable areas for the various project elements described above in Section 2.21. Some areas on the site will be selectively cleared or retained as buffers and natural area transition zones. The impacts to vegetation from such clearing are discussed in *Chapter IV*. Cleared vegeta-

tion from the site will be trucked off-site for disposal at the appropriate City landfill or for recycling as appropriate.

B. Grading (Cut and Fill):

Site grading will be required to accommodate the construction of project design elements described above in Section 2.21. Earthwork on-site will grade the land to allow for structures and the new service roadway to be constructed. Grading will also be required to complete the golf course.

The level terrain of most of the site serves to minimize the amount of cutting and filling activity required in order to establish the course. Most, if not all, excavated materials will be retained on-site to minimize the quantity and cost of transporting materials on- and/or 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 new service roadway or the right of way of the Lualualei Access Road. Materials excavated for the trenches and foundations are expected to be reused on-site.

D. Rock Drilling and Blasting:

If necessary, rock drilling and/or blasting to remove rock to enable the construction of the golf course will be conducted,

especially along the lands comprising the Puu Haleakala foothills where soil cover begins to thin out and rock outcroppings appear more frequently. The amount of rock drilling and/or blasting required to construct the fairways, greens, tees or roughs is expected to be small since mostly cosmetic surface groundwork will be required in such foothill areas are anticipated. Actual amounts required will be determined after the completion of geological studies and the preparation of golf course construction plans.

E. Construction of Access Roadway/Buildings:

Construction of the access roadway to the project along Lualualei Access Road 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. Clubhouse and maintenance building and the wastewater treatment facility will be constructed in the areas designated in the golf course layout and discussed above.

F. Planting and Landscaping:

Extensive landscape planting will be incorporated within 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.

2.3 MARKET DEMAND.

There are 27 golf courses presently operating on Oahu that support various golfing market segments. An inventory of golf courses on Oahu as of 1988 is presented in *Table 2*. Nearly half are restricted-use courses with four private and eight military courses. Of the 15 other golf courses on Oahu, nine are daily fee course, 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 daytrip tours to the several popular daily-fee and resort courses on the Island.

There are no municipal golf course along the Leeward (Waianae) Coast. The Makaha Valley Country Club, a daily fee course, is open to the public and Leeward Coast residents. Regular tours of visitors and high green fees at the Makaha Resort and Country Club limit its accessibility to public users and local golfing residents. Leeward golfers would benefit from this project by having a close, conveniently located "public" golf course at hand which would be regularly and readily accessible to them.

In 1989, there were 29 proposed new golf courses being planned at 23 locations on Oahu. Although four courses were proposed for the Waianae area at one time or another in 1989, at the present time, only the proposed Lualualei Golf Course is moving ahead with its request for City Development Plan approval in the 1990-91 Development Plan Annual Amendment Review cycle. An application for DP Amendment approval for the project has been accepted for processing by the Department of General Planning in the 1990-91 Annual Review and this EIS is being prepared pursuant to that application.

**TABLE 1
LUALUALEI GOLF COURSE
OAHU GOLF COURSE INVENTORY - 1988**

Golf Course	Holes	Location
Resort:		
Sheraton Makaha Resort/County 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	Waipahu/Waipio
Pali Golf Course	18	Kaneohe
Daily fee:		
Bayview Golf Center (par 3)	18	Kaneohe
Hawaii Country Club	18	Kunia
Hawaii Kai Championship Course	18	Hawaii Kai
Hawaii Kai Executive Course (par 3)	18	Hawaii Kai
Makaha Valley Country Club	18	Makaha Valley
Millilani Golf Course	18	Millilani
Moanalua Golf Club *	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	Allamanu
Fort Shafter Golf Course	9	Fort Shafter
Hickam (par 3)	9	Hickam AFB

Source: Peat Marwick Main & Co. (February, 1989)

* Course open for public play Mondays-Fridays only.

The other proposed courses, Maili Kai Golf Course, Waianae Kai Golf Course and Ohikilolo Golf Course, were withdrawn from City consideration by their developers or rejected by the City for permit processing in 1989. Presently, only the proposed Lualualei Golf Course provides a bona fide opportunity to meet pent up golfing facilities along the Waianae Coast at the present time.

Regarding golf course demand on Oahu, it has been estimated by the Hawaii Real Estate Research and Education Center, University of Hawaii College of Business Administration, that in terms of Population/Golf Course ratios Honolulu is inferior to metropolitan areas of comparable size; metropolitan areas with large retirement populations; other resort areas; and other island markets servicing the visitor industry. The Center estimates that the current pent-up demand for golf courses on Oahu is 27 courses in addition to the existing courses and the distribution of the probable need is:

- 5-7 municipal courses;
- 1 private club;
- 16-18 daily fee courses;
- 3-4 resort courses; and
- 1-2 international membership courses.

(See: Hawaii Real Estate Research and Education Center, U.H. College of Business Administration, *Analyzing The Market And Environmental Impacts Of The Golf Industry In Hawaii*, February, 1990.)

Of the 27 courses listed in *Table 1*, public access is available to 15 courses as military and private courses are not generally available to everyone. Of the total 459 golf holes available on Oahu, only 261 holes are open to the public.

Oahu's municipal courses are operating near or at capacity supporting about 548,668 rounds of golf annually (1987 data) or an average 137,167 rounds of golf per course. Based on Oahu's 1987 resident population and applying the City's standard of one 18-hole golf course per 100,000 population, approximately 8 municipal courses are needed to meet existing golf course demand for municipal golf course. Oahu only has 4 existing courses; four more municipal courses are needed.

Projecting the number of needed golf courses on Oahu is most commonly based on City, State or National standards. *Table 2* summarizes the number of golf courses needed on Oahu to meet projected demand at years 1990, 2000 and 2010 using these standards. A more conservative estimate of need results when applying the City's standard (one 18-hole course/100,000 persons).

**TABLE 2
LUALUALEI GOLF COURSE
ESTIMATED GOLF COURSES NEED - 1990-2010**

Year	Standard	Required Courses	Less Existing Courses	Number of New Courses Needed
1990	City	9	4	5
	State	43*	31	12
	Federal	28**	31	surplus
2000	City	9	7	2
	State	30-37	38	surplus
	Federal	47	38	9
2010	City	10	7	3
	State	33-40	38	surplus
	Federal	51	51	13

Source: Matthew Grady, *Potential Impacts To The Island Of Oahu From Proposed Golf Courses*, August, 1989.

The estimates in *Table 2* are based on population projections for year 1990, 2000 and 2010 and do not reflect the fact that 4 private golf clubs and 9 military courses, although counted in the estimate calculations, are not available to public use. Therefore, the estimates of projected golf courses need should be adjusted upward to reflect that factor.

The project developer intends to keep the Lualualei Golf Course a "public" course in the sense that no membership to the course will be offered for sale locally, nationally or internationally. Since anticipated green fees will be comparable to fees charged at other like courses, the project will help to meet the large pent up demand for courses available on a daily basis for play by local resident golfers and the unscheduled visitor-golfers. The project is best described as a daily-fee course.

* State Recreational Functional Plan Technical Reference Document, 1980.

** National Golf Foundation, *Economic Indicators*, 1989.

2.4 DEVELOPMENT TIMETABLE.

The completion of the various project elements described above in Section 2.21 is expected to take 3-4 years after issuance of all required development permits from the City and State. The processing and approval of all required City permits for the project including this Development Plan Amendment request approval, rezoning approval, grading permit approval and building permit approval are expected to be completed in late 1992 or early 1993.

2.5 PROJECT DEVELOPMENT COSTS.

The estimated total project cost, including the cost of infrastructure improvements, engineering, administration and construction management, construction of the various project elements described above and costs associated with required community benefits, is expected to be around \$35 million.

2.6 PROJECT COMMUNITY BENEFIT PROPOSALS.

In response to revised Development Plan Amendment Guidelines for golf course projects, a number of proposed community benefits in connection with this project have been suggested by the developer in order to begin discussions with the City officials and the community towards a final set of community benefits. The developer and community recognize that the City has not yet adopted firm community benefits standards and that the benefit listed below are subject to those standards once they are adopted and, therefore, may change in the near future.

The community benefits are estimated as exceeding \$77 million during 25 years of operations and \$155 million over 50 years of operation (in 1990 dollars) as shown in *Table 3* below. Proposed community benefits identified in the project's DP amendment application include cash contributions as follows:

1. Contributions to the State Department of Hawaiian Home Lands to help the Department implement or complete current plans to develop affordable housing for Nanakuli residents; or, alternatively, Contributions to the City and community to fund additional water supply infrastructure and construction of approved improvement district projects which extend public sewer services to unsewered residential neighborhoods within the Nanakuli area.
2. Contributions to Nanakuli area public improvement projects selected by its Neighborhood Board and approved by the City or State, as applicable, from annual golf course operation profits as determined by a certified public accountant selected by the Board and hired by the developer.
3. Contributions to Nanakuli and Waianae High Schools in the form of one-time \$100,000 endowment funds for each school to be used for special educational needs of Waianae and Nanakuli public education students which are determined to be needed by such students by the Department of Education but cannot be funded by the DOE.

In addition to the above cash contributions, the developer also offers the following community benefits:

1. Provide year round access to meeting rooms and service facilities of the golf course clubhouse for special events sponsored or conducted by established community groups and organizations or groups associated with the various public schools in the community at very nominal costs only to cover clean up/maintenance costs.

2. Permit the use of the golf course and its support facilities by golf teams of the various high schools in Leeward Oahu for competitive golf matches and tournaments at no charge.
3. Allocate not less than 50% of all full-time and part-time jobs at Lualualei Golf Course to residents residing in the Nanakuli area and, secondarily, to residents residing within the Waianae DP area.

Appendix C contains a detailed report on the preliminary community benefits associated with the proposed Lualualei Golf Course as prepared by Community Resources, Inc., and submitted to the Department of General Planning.

Finally, as a pending community benefit offered to Oahu's Islandwide community, the developer offers to participation in a "shared golf course equity" arrangement with the City and County of Honolulu which provides for a City share in that portion of the proceeds from any future sale or transfer of title to the golf course by the developer which qualifies as appreciated property value measured from the first day of golf course operation.

This shared-equity arrangement would provide for a sliding scale equity ratio which allocates a larger portion of the equity value of the golf course (i.e. 75%) to the City during the earlier years of golf course operation which gradually diminishes to 50% as some future point in time and remains at that equal share level during the life of the arrangement. The specific terms of the arrangement would be set in the rezoning unilateral agreement for the golf course.

Finally, a direct community benefit to be generated from the project would be increased City real property tax revenues and revenues from construction permits, licenses and fees once the course is operational. It is estimated that City revenues from project real property taxes would be approximately

\$180,000 annually (1990 dollars) (Community Resources, Inc., 1990) and that the net increase in City revenues, after accounting for increased City costs for services as a consequence of project development and operation, would range between \$171,000 to \$177,000. (Community Resources, Inc., 1990.)

CHAPTER III

Land Use And Zoning Controls

CHAPTER III: LAND USE AND ZONING CONTROLS

This Chapter includes a description of the existing State and County land use and zoning designations for the project site and land surrounding them. Changes in land use classification, zoning and other approval required to implement the proposed action are also summarized.

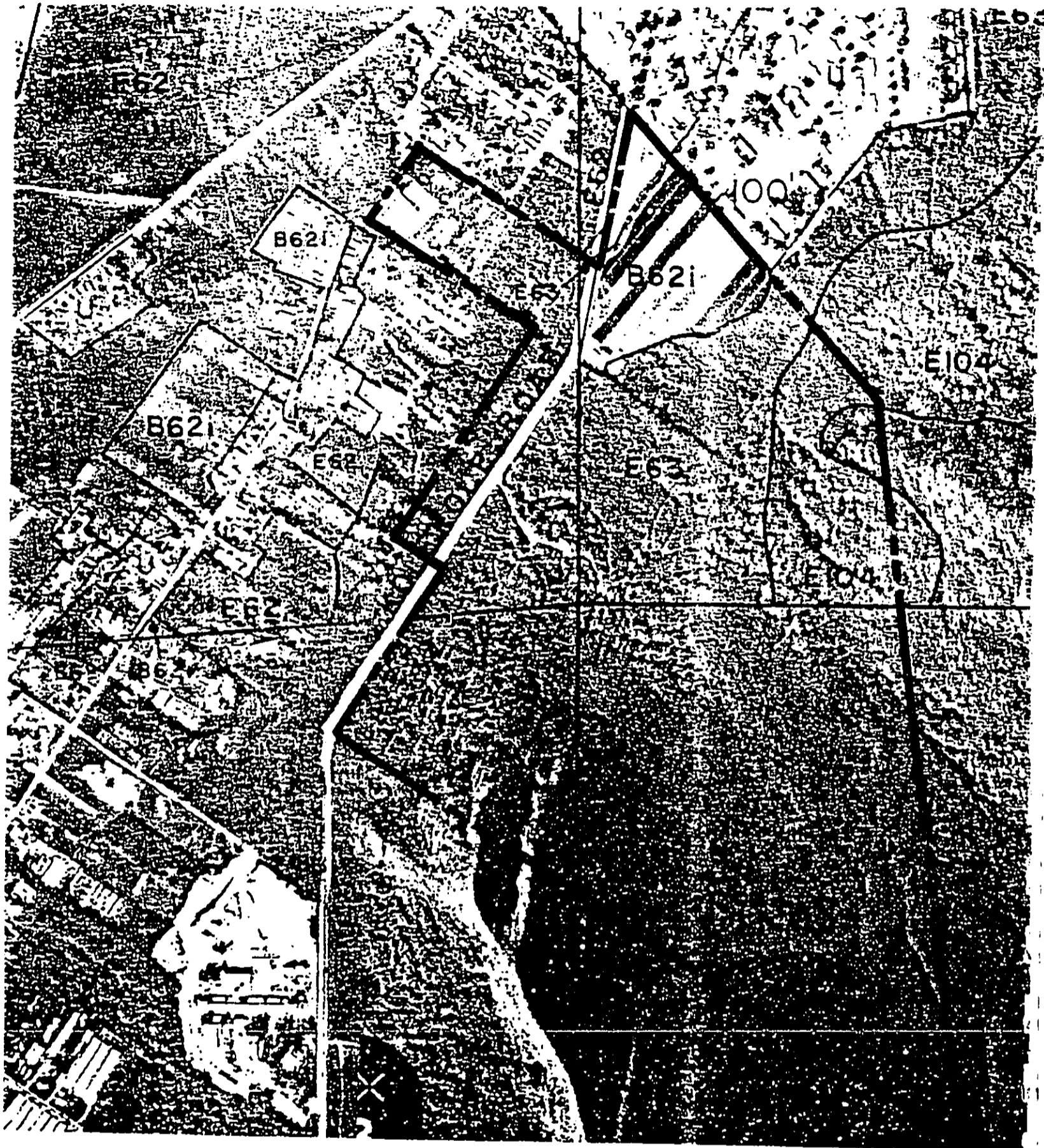
3.1 EXISTING DESIGNATIONS.

3.1.1 State Land Use:

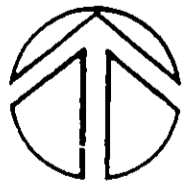
The entire project site is classified "Agriculture District" under the State Land Use Law, Chapter 205, Hawaii Revised Statutes. Under Sec. 205-4, Hawaii Revised Statutes, approval from the City Planning Commission is required in order to develop the project since most of the lands in the site are Class "E" lands under the Land Study Bureau Land Classification System.

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.

Within the subject site, the project engineer has determined that there are approximately 13.5 acres of Class "B" lands with the balance of the site being Class "E" lands. Land Study Bureau soil classifications for the subject site are shown in *Figure 9*.



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Consulting Engineers
 Honolulu, Hawaii



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FIGURE 9
 LAND STUDY BUREAU
 SOIL RATINGS

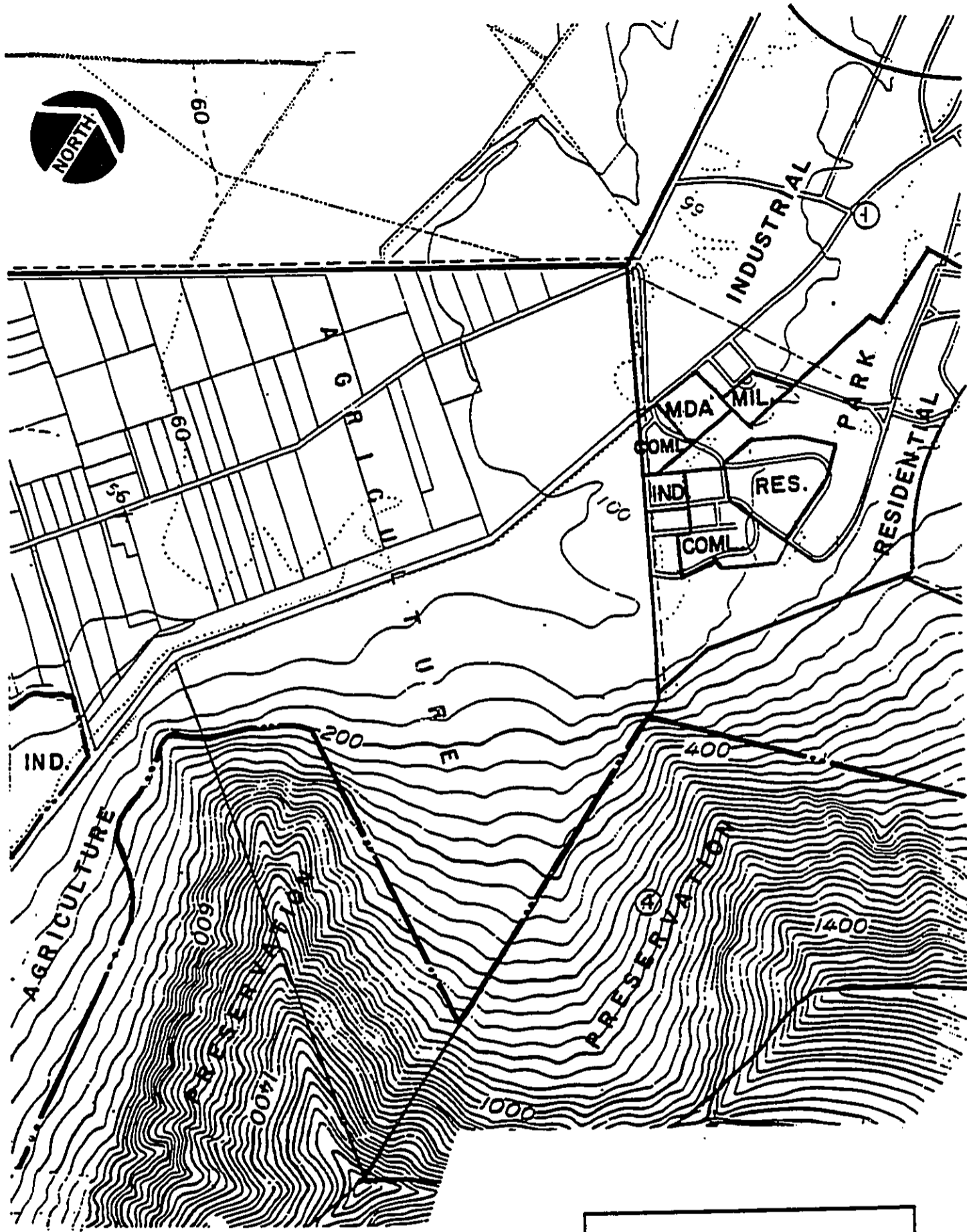
Permissible uses of Class "B" lands generally include crop cultivation, farming, wind energy facilities, aquaculture, livestock raising, and related support uses. For Class "E" lands, additional uses are possible, such as open area recreational facilities, including golf courses and golf driving ranges. Sec. 205-2, Hawaii Revised Statutes, recognizes the inclusion of substantial areas of marginal lands in the Agriculture 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 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 Waianae area is to remain as a "Rural" area, with 4.2 to 4.6 percent of the projected 2010 Oahu population. 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 Waianae Development Plan:

Figure 10 shows the existing Waianae DP Land Use Map designation of the subject site. It is designated for "Agriculture" use on the Map. The Agriculture 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. How



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 Consulting Engineers
 Honolulu, Hawaii

SCALE: 1"=2000 (APPROX.)



FIGURE 10

EXISTING DEVELOPMENT
 PLAN DESIGNATIONS

ever, most of the subject site is not suited for crop cultivation as indicated by the Class "E" Land Study Bureau rating of its soils. The pending DP Land Use Map Amendment application for the project seeks to redesignate the entire project site from "Agriculture" to "Park (Golf Course) Use" designation on the Map.

The Waianae DP Public Facilities Map indicates no proposed public or quasi-public improvement or use of the project site. *Figure 11* shows the existing DP Public Facilities Map designations of the project site.

3.1.4 City and County Zoning:

The existing zoning of the site is AG-2, General Agriculture District for portions of the site mauka of Lualualei Access Road and AG-1, Restricted Agriculture for makai portions of the site. See *Figure 12*. The developer owns adjoining portions of the Puu Haleakala foothills running along the southeasterly boundary of the project site which are not included in the proposed golf course land area.

Should the requested DP Land Use Map Amendment application for the project be approved, rezoning of the project site from AG-1 and AG-2, Agriculture, to P-2, Preservation District will be required in order to construct the golf course.



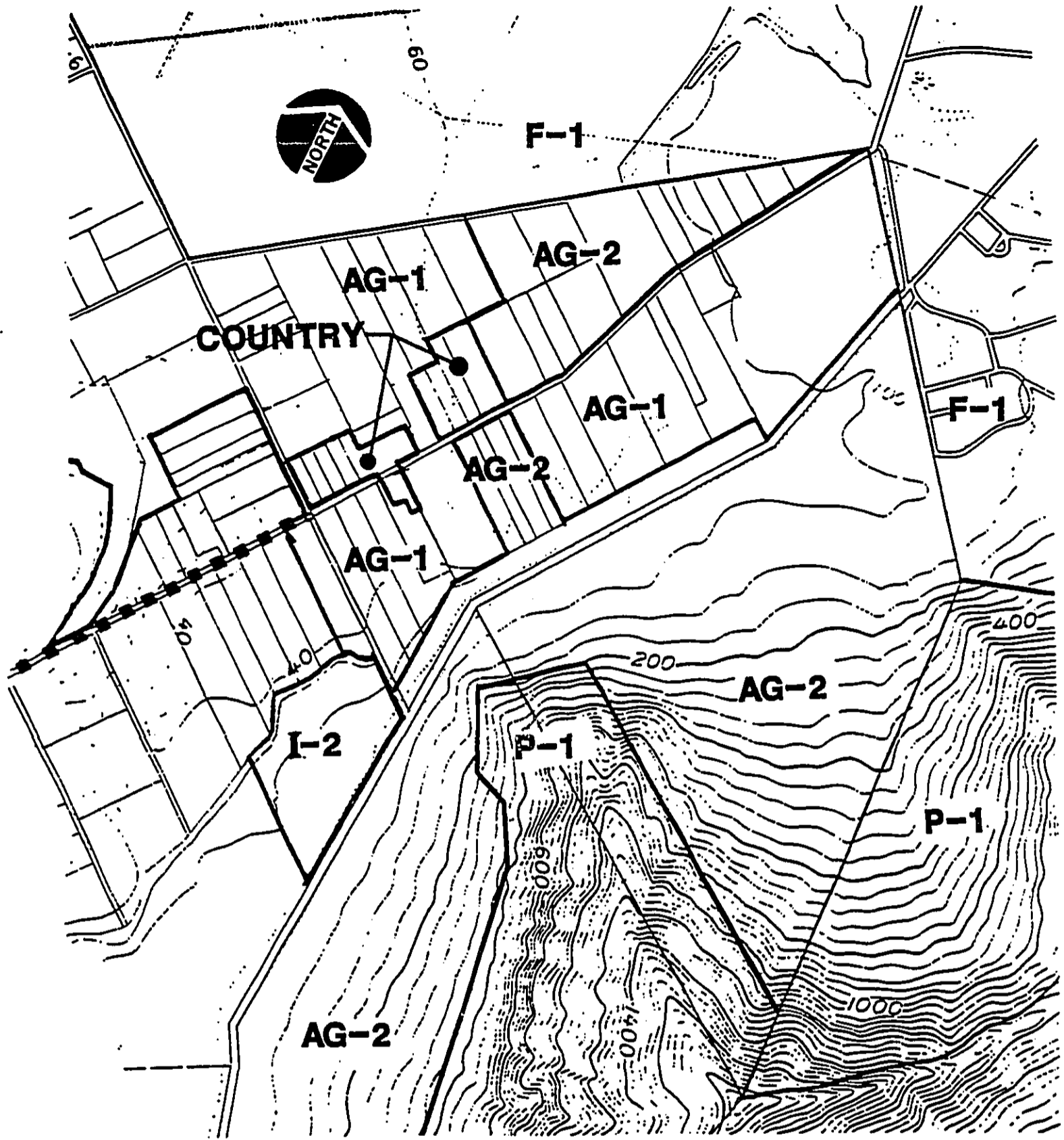
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 Consulting Engineers
 Honolulu, Hawaii

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FIGURE 11
 DEVELOPMENT PLAN
 PUBLIC FACILITIES MAP

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 Consulting Engineers
 Honolulu, Hawaii

SCALE: 1:12000 (APPROX.)

1000 0 1000 2000 FEET

- 46 -

FIGURE 12
 EXISTING ZONING MAP

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

In order to construct the project it will be necessary to obtain the following land use approvals from the City and County of Honolulu:

3.2.1 Waianae DP Land Use Map Amendment:

As noted above, a Waianae Development Plan Land Use Map Amendment changing the designation of the project site from "Agriculture" use to "Park (Golf Course)" use is required for the Lualualei Golf Course project. The developer's DP Land Use Map Amendment application has been accepted for processing in the 1990-91 Development Plan Annual Amendment Review by the Department of General Planning. The Amendment review process involves public hearings before both the Planning Commission and City Council.

3.2.2 City and County Zone Change:

As mentioned above, rezoning of the project site from AG-2, General Agriculture District, to P-2, Preservation District will be required for the project. Approval of such rezoning may occur only if the requested DP Land Use Map Amendment for the project is first approved by the City since the Honolulu City Charter requires City zoning to conform to and implement the applicable City Development Plans.

3.2.3 City Planning Commission Approval:

Under Chap. 205, Hawaii Revised Statutes, the City Planning Commission is empowered to approve proposed golf course uses on Class "B" lands under the Land Study Bureau soils classification system if such lands are classified in the State Agriculture District but are not greater than 15 acres in area. The site contains approximately 13.5 acres of Class "B" lands.

3.2.4 City "Planned Review Use" Approval:

Only if a grading permit for the project is not obtained within one (1) year after obtaining a rezoning of the site from Agriculture to P-2, Preservation for golf course development would approval of a Planned Review Use permit for the proposed course be required under Ordinance No. 90-15.

3.2.5 State Water Commission Approval:

The State Water Code requires a Well Drilling/Withdrawal Permit from the State Water Commission before the developer may be allowed to drill groundwater wells within the project site for irrigation/fire protection water supplies.

3.2.6 State Health Department Approval:

Wastewater Treatment and Disposal System approval from the State Department of Health is required in order to construct the project's proposed private wastewater collection, treatment and disposal system.

3.2.7 Other Approvals:

City building and grading permits will be required in order to proceed with project construction as described in *Chapter II*. These are ministerial permits which are issued by the City Building and Public Works Department upon compliance with applicable code requirements as a matter of course.

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CHAPTER IV

**Description Of Environmental
Setting; Anticipated Impacts And
Mitigative Measures**

CHAPTER IV: DESCRIPTION OF ENVIRONMENTAL SETTING; ANTICIPATED IMPACTS AND MITIGATIVE MEASURES.

This Chapter presents background information on the existing human and natural environment appertaining to the project site. 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 are also identified and recommended in this Chapter to minimize the potential impacts of project construction and operation.

Technical consultant reports have been prepared to supplement the impact assessment and provided the bases for this Chapter. Findings from these reports are included herein, and the report texts are enclosed as Appendices.

4.1 CLIMATE.

4.1.1 Existing Conditions:

Lualualei Valley is relatively arid. Mean annual rainfall is approximately 20 to 30 inches and varies from about 3.5 inches in December and January to about 0.4 inches in June and July (Giambelluca et al., 1986). Mean pan evaporation is approximately 70 to 80 inches annually and varies from over 8 inches in July and August to about 4 inches in December and January (Ekern and Chang, 1985). There is an evaporation deficit of approximately 50 inches annually and there are no months

when rainfall equals pan evaporation. Thus, with careful golf course irrigation, recharge of groundwater would be minimal.

Average temperatures within the area surrounding the project site varies from 70.3 degrees (January) to 76.7 degrees (October). Prevailing tradewinds come from a northeast direction at an average 10 mph (January) to 13.6 mph (July). Cloud cover varies from 51% in the summer to 63 % in Spring. Sunshine percentages range from 59% (winter) to 75% (summer).

4.1.2 Anticipated Impacts and Mitigative Measures:

Buildings at the proposed golf course project and course construction will be designed for the relatively dry climate of the Lualualei Valley area and Waianae Coast. The project will have no effect on climatic conditions and no mitigation measures are required.

4.2 TOPOGRAPHY.

4.2.1 Existing Conditions:

Generally, the project site slopes in a southwesterly direction towards the Lualualei Access Road. Approximately one-third of the site, situated below the 200-foot elevation above sea level, is relatively flat sloping at a 12% rate from Lualualei Access Road upward to the foothills of Puu Haleakala ridge.

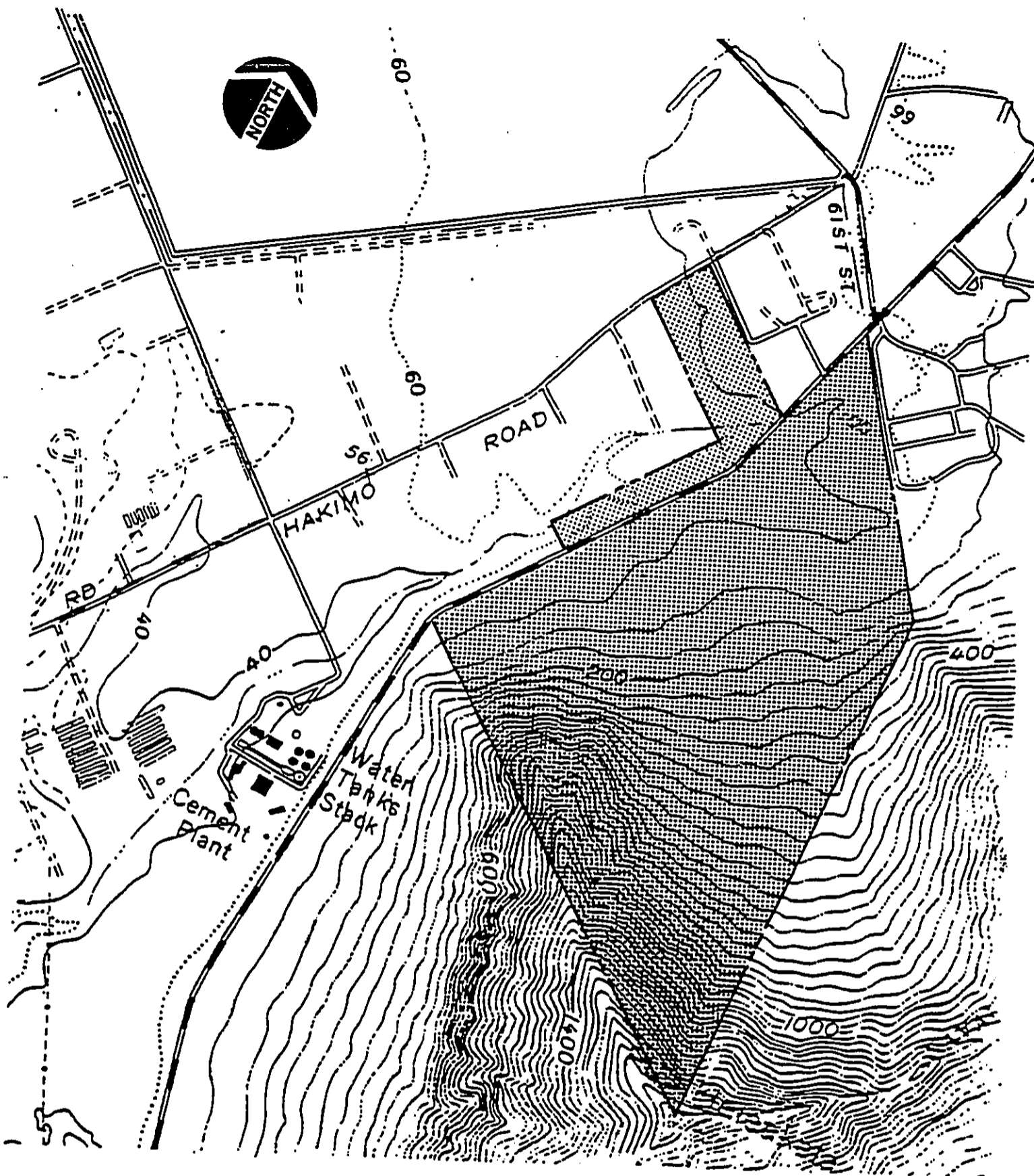
Above the 200-foot elevation level, the site takes on a more abrupt slope upward towards the back of the proposed golf course. It is estimated that the slope within this "second tier" of the project site is within the 10-30% range.

The rest of the site running along the foothills of Puu Haleakala ridge and the rear portions of the proposed course slopes radically upward towards the peak of the ridge. However, no golf course construction will occur on this portion of the site as it will be left in its current, undeveloped state. *Figure 13* shows the topography of the project site.

4.2.2 Anticipated Impacts and Mitigative Measures:

The development of the golf course and support facilities will require significant disturbance of the natural vegetation and grades although grading will be minimized in order to allow the course to follow the natural terrain as much as possible. Approximately 154 acres of the site will be cleared and graded for construction. Material from grading will be retained on the project site as much as possible.

Blasting and/or rock drilling should be required only to a minor degree, if at all, to construct improvements on the golf course. The need for occasional drilling or, if necessary, blasting may occur along the rear portions of the golf course where rock outcroppings begin to appear more frequently indicating the relatively thin soil layers along the base of the foothills to the Puu Haleakala ridge. Drilling and blasting will be kept to a minimum.



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 Consulting Engineers
 Honolulu, Hawaii

SCALE: 1:12000 (APPROX.)



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FIGURE 13
 TOPOGRAPHY

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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 to modify the topography of the site. The grading plans for the site are reviewed and approved by the City Public Works Department in this manner.

4.3 SOILS.

4.3.1 Existing Conditions:

A. Soil Suitability Conditions.

Soil types or classifications for the project site are based on soil surveys by the USDA Soil Conservation Service (SCS) (1972). According to that Survey, the project site contains mostly Lualualei extremely stony clay, 3 to 35 percent slopes (LPE) with some Lualualei clay, 2 to 6 percent slope (LuB) within portions of the site directly abutting the Lualualei Access Road and covering the flatter portions of the site.

LPE soils occur on talus slopes on Oahu. The slope range is 3 to 35 percent, but in most places the soil is moderately sloping to steep. The soil is similar to LuB soils except that there are many stones on the surface and in the profile. It is impractical to cultivate this soil unless the stones are removed. Runoff is medium to rapid, and the erosion hazard is moderate to severe.

Most of the project site (about 90%) consists of LPE extremely stony clay. The high stone content of the soil makes it very difficult to cultivate, thus it has a Capability Classification of VIIc, indicating severe limitations due to stoniness and undesirable texture.

LuB soils are characterized by slow runoff with a slight erosion hazard. This soil is used for sugarcane, truck crops, pasture, urban development and military installations. LuB soils make up the remainder of the project site. It occurs along Ulehawa Stream and the Lualualei Access Road in the low elevation areas. This soil has a Capability Classification of IIIc if irrigated, and VIc if non-irrigated.

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.

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

The soils within the project site are mostly Class "E" lands under the Land Study Bureau soils rating system. As mentioned in Sec-

tion 3.11, above, golf courses are permitted on Class "E" lands without need for any State Land Use Commission approval as this outright policy is set by State statute.

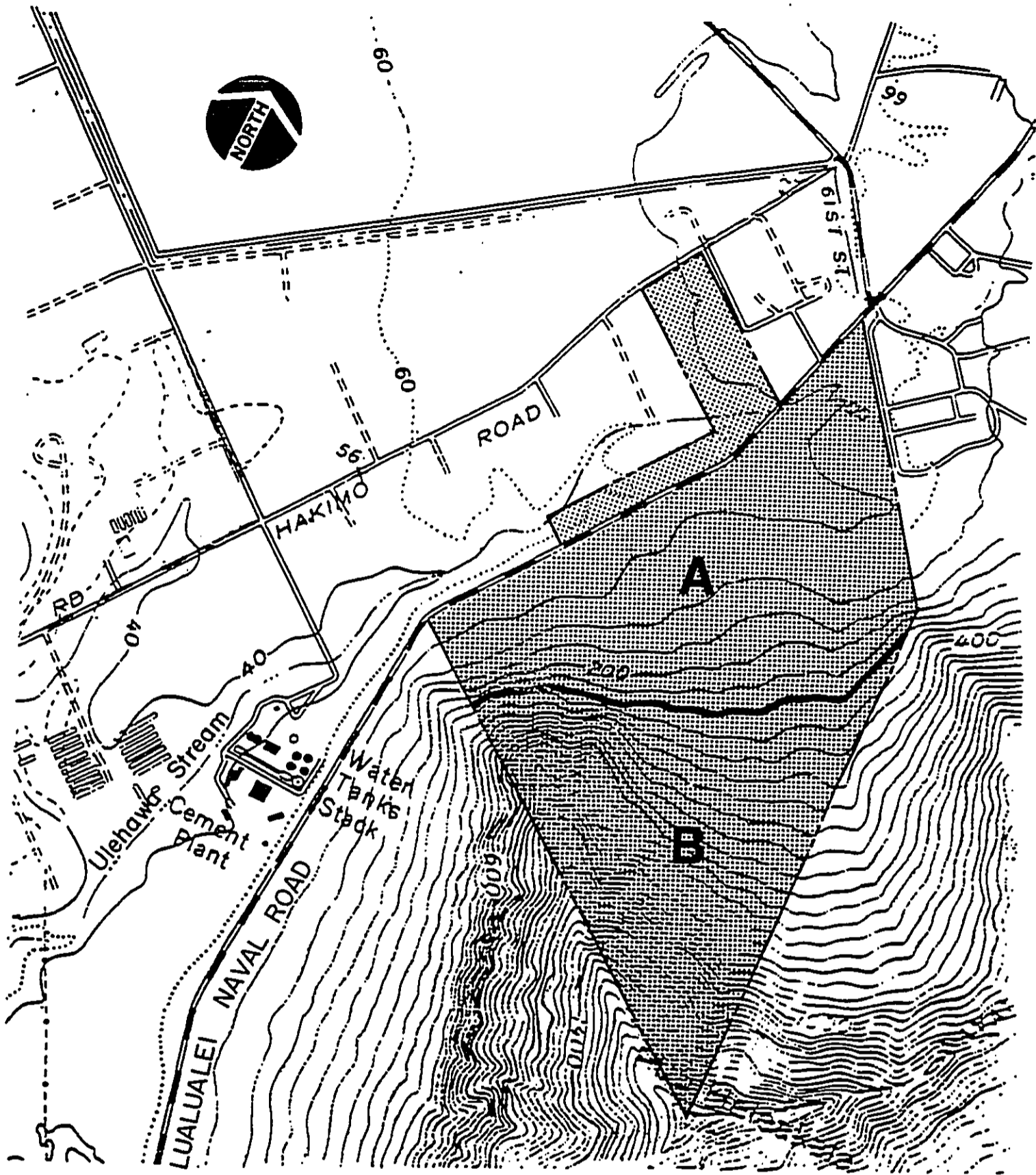
About 13.5 acres within the project site contains Class "B" lands under the LSB rating system. The developer will seek City Planning Commission approval to establish the golf course on these lands when and after City approval of the developer's Development Plan Amendment request and follow up rezoning request has been obtained.

B. Soil Erosion Considerations.

I. Site Characteristics:

The project site is divided into two subareas for the purpose of calculating soil erosion potential (See *Figure 14*). These subareas represent sites within the project area that vary in soil erosion potential characteristics such as terrain and/or drainage network.

Subpart A, part of the Ulehawa Stream drainage basin, is directly abutting the Lualualei Access Road and covers the flatter portion of the project site. The subarea occupies approximately 140 acres and is bounded to the north, south and west by the project boundaries and to the east by a 250-foot contour line.



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FIGURE 14
 SOIL EROSION
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The entire area of subarea A will be graded for golf course development. The subarea is fringed by the Lualualei Access Road on the west, the Puu Haleakala ridge on the south, Lualualei Naval Magazine Depot complex on the north. Ulehawa Stream runs through a northern portion of subarea A.

Subarea B is located south of subarea A and is bounded on the south and east by the Puu Haleakala ridge, and on the north by the 250-foot contour line. Approximately 96 acres are located in this subarea. The subarea is currently a medium-dense and rocky outcropping becoming numerous with slopes ranging from 25 to 60 percent. Golf course development is not planned for portions of this subarea above the 250 foot elevation.

2. Soil Erosion Potential.

For the entire project area, the estimated soil erosion potential after development of the Lualualei Golf Course is 4,105 tons per year. For each of subareas, the current soil erosion potential are estimated as follows:

**TABLE 3
LUALUALEI GOLF COURSE
EXISTING SOIL EROSION POTENTIAL**

Subarea	Acres	Tons/Acre/Year	Tons/Year
A	140	3.3	462
B	96	37.9	3,643

Source: Hida, Okamoto & Associates, 1990

These calculations apply the U.S. Department of Agriculture, Soil Conservation Service's Universal Soil Loss Equation (USLE) formula to existing soil conditions within the project site. A report prepared by Hida, Okamoto & Assoc. on soil characteristics and erosion potential within the project site is contained in *Appendix A* and describes the formula and its application to the project site in greater detail.

4.3.2 Impacts and Mitigation Measures:

A. Soil Suitability:

1. Short-term Impacts.

Since most of the project site has been unused for decades and, more recently, a small truck farming operation within a 15-acre portion of the site was closed down voluntarily by the farmer/lessee in 1988, construction of the proposed golf course will not have any adverse short-term impact on any existing agricultural land use. No active agricultural use or cultivation within the project will be displaced by such construction. Accordingly, no mitiga-

tion measures pertaining to agricultural use of the project site is proposed by the developer.

2. Long-term Impacts.

The long-term impacts of the project on agriculture, in general, and agricultural use potential within the site in particular is determined to be non-existent or, at best, insignificant. The predominant Class "E" rating of the soils within the project site renders its potential extremely poor for farming and crop cultivation. The small size of the area within the site containing Class "B" lands (15 acres) renders crop production and cultivation on such lands economically infeasible, especially in light of the costs to be incurred in developing the on-site water supply for such crops. Accordingly, no mitigation measures pertaining to the long-term use of the site for agricultural purposes is proposed by the developer.

B. Soil Erosion Potential:

1. Long-term Impacts.

Based on the USLE, soil erosion potential in the project site should decrease after development of the golf course. The erosion potential of subarea A is estimated to decrease by 0.9 tons/acre/ year (120 tons/year), or 21 percent. Thus, sediment transport to the Ulehawa Stream should decrease after golf course development. Accord-

ingly, no mitigation measures are proposed as regards this long-term issue.

2. Short-term Impacts and Mitigation Measures.

Construction of the golf course will involve land disturbing activities that result in soil erosion. These activities include removal of existing vegetation (clearing and grubbing) and leveling, removing and replacing soil. Short-term impacts due to construction are estimated to last one year.

The USLE can be used to estimate soil erosion potential based on these short-term construction impacts. For purposes of calculation, it is assumed that the areas will be exposed for a period of one year (January through December) progressing from subarea A to B.

The aggregate result of applying the USLE formula to existing soil conditions within the site to determine the short-term impacts on soil erosion from golf course construction is as follows: In the short term, 27,166 tons of soil erosion are calculated for a one-year period. Of this amount, approximately 10 percent (2,720 tons) will impact Ulehawa Stream.

Mitigation measures can be implemented to reduce short-term soil erosion. Accordingly, grading will generally be limited to not more than 15 consecutive acres at a time and installation of a sedimentation basin at least 12,000 sq.

ft. in area at the onset of grading will reduce estimated soil erosion potential for the site by 89 percent to 50.8 tons. Thus, the estimated impact on the Ulehawa Stream is reduced by 2.9 tons/acre/year (406 tons).

Additional control measures will be taken to lessen construction impacts even further. These are listed as such below:

1. Minimize time of construction to the extent possible.
2. Retain existing ground cover until the latest date before construction.
3. Early construction of drainage control features (i.e. detention/retention basins).
4. Use of temporary area sprinklers and spraying in non-active construction areas when ground cover is removed.
5. Station water truck on site during construction period to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).
6. Use temporary berms and cutoff ditches, where needed, for control of erosion.
7. Thorough watering of graded areas after construction activity has ceased for the day and on weekends.

8. Sod or plant all cut and fill slopes immediately after grading work has been completed.

4.4 AGRICULTURE.

The following section includes a discussion of previous agricultural use of the project site and its potential for further agricultural use. Impacts of the proposed project only on potential agricultural use of the project site are evaluated herein since the site is not currently used for any agricultural use.

4.4.1 Existing Conditions.

Soils analyses for agricultural purposes by the U.H. Land Study Bureau have identified soils on the project site as suitable for agriculture in 13.5 acres of the site which were used for truck farming for several years until 1988. Based on this analyses, which classified only five percent (5%) of the 259-acre project site as containing Class "B" (or "prime" or "good") agricultural lands, ninety five percent (95%) of the project site contains Class "E" lands; that is, lands which are only "marginally" suitable for agricultural use according to the LSB soils rating system.

For almost 50 years, most of the lands in the project site have remained fallow and unused lands. In the early 1900s, sugar cane was grown on the project site and along much of the Waianae Coast by the Waianae Sugar Company which ceased operations in about 1946. No other crops have been grown on the project site since that time except for the aforementioned small truck farming cultivation.

The potential for crop cultivation on this site is severely limited by the poor soil conditions within most of the site. Class "E" soils have the lowest or poorest agricultural productivity capacity among all soil types according to the LSB soils rating system. This condition was further aggravated by decades of sugarcane production and the consequence severe loss of topsoil that resulted from the standard farming practices for sugar which prevailed in the first of half of this century.

While livestock grazing presents a possible use option for the subject site, its viability is very questionable due to the prevailing dry weather year round at the site and the prohibitive cost of providing the needed amounts of water for grazing purposes in relation to the marginal economic returns from such activity.

Although approximately 13.5 acres of the site, located within the lower and level portions of the site, contains Class "B" or prime agricultural lands, its has not been actively used for any agricultural purpose since 1988. The potential for future agricultural use of the site by any large, corporate agricultural producer (i.e. sugar companies; diversified farming operations) is severely limited by the small size of this prime agricultural area; the generally dry weather conditions prevailing year round at the site which limits the choice of crops that may be grown within the site; the prohibitive cost of providing irrigation water in relations to the small size of the area and, thus, the small crop production capability at the site; the great distance of the site from crop processing and shipping centers on Oahu relative to other sites in Central and Windward Oahu; and, of course, the availability of better and larger diversified farming sites con-

taining superior soils for agricultural purposes and located within Central and Windward Oahu.

4.4.2 Impacts and Mitigation Measures:

Because the site is not used for any agricultural pursuit at the present time, the proposed Lualualei Golf Course will have no impact at all on any existing agricultural uses within or near the project site. Inasmuch as 96% of the site contains soils which have the lowest or poorest agricultural productivity capacity among all soil types according to the U.H. Land Study Bureau soils rating system, the proposed use will have no foreseeable impact on any future agricultural use potential within the project site. Accordingly, no mitigation measures as regards existing and future agricultural use potential of the project site is proposed by the developer for no agricultural impacts will be generated by the project.

4.4.3 Diversified Agriculture Impacts

In response to comments on the project's Environmental Impact Statement Preparation Notice, further research was conducted for this EIS report on the project's impact on diversified agriculture. The results of that research are contained in the attached *Appendix K* entitled *Lualualei Golf Course: Impacts on Agriculture* prepared by Decision Analysis, Hawaii, Inc. and are summarized as follows:

Agronomic Conditions

It is estimated that less than 20 percent of the property has good soils and level land suitable for agriculture. However, commercial farming on these good soils would be limited in that relatively expensive irrigation water would preclude those low-value crops that require considerable water. Furthermore, except for about 15 acres, the land would have to be cleared of rocks and bushes before it could be farmed.

Recent Agricultural Use of Property

Until 1988, about 15 acres of the lower portion of the project site were used for a truck farm under a farmer-tenant lease to Mr. Ryoei Higa. In an amicable and voluntary agreement, Mr. Higa agreed to relocate his operation to another site in exchange for consideration. In effect, the adverse impact of the proposed golf course on this small truck-farm operation has already been mitigated.

Impact on Existing Agriculture Activities

The proposed development would not affect existing plantation-agriculture or diversified agriculture activities on the property since none currently exist, nor would the development interfere with nearby agricultural activities in Lualualei Valley. Furthermore, the groundwater source for golf course irrigation would not affect existing agricultural activities within Lualualei Valley as no farm relies on this water source.

The proposed golf course may increase the values of the few agricultural parcels which abut or have prominent views of the golf course, but it is unlikely that agricultural lease rents, taxes, and the current agricultural use of lands would be affected.

Potential Crops

Given the agronomic conditions of the property and the relatively high cost of land, water and labor on Oahu, the most promising crops for the property would include mustard cabbage, daikon, eggplant, flowers and nursery products, semi-head lettuce, and green onions. These are the commercial crops which are grown profitably in significant quantities in the Waianae District. For most of these crops, however, production is declining on Oahu as a result of a shift to the Neighbor Islands where land and labor is generally less expensive.

Availability of Land for Diversified Agriculture

Even though the proposed project would result in the loss of a small amount of "prime" agricultural land, this loss would not adversely affect the growth of diversified agriculture. There are four reasons for this assessment: (1) a vast amount of agricultural land and water in the State has been freed from sugar and pineapple production due to past plantation closings and reductions in operations—over 120,000 acres since 1968, including announced reduction plans—and most of this land has favorable soil ratings and remains available for diversified-agriculture activities; (2) it is very probable that additional sugarcane acreage and water will be freed, given the existence of unprofitable sugar operations;

(3) some, if not most, of the sugar companies would make their lands available for profitable replacement crops to the extent that such crops exist; and, in contrast, (4) land requirements to accommodate the growth of diversified agriculture are surprisingly modest compared to the available supply.

In addition, the greater the success of diversified agriculture, the greater the amount of land which will be released from sugar for diversified agriculture.

In summary, the factor limiting the growth of diversified agriculture is not the land supply—far more land has been and continues to be freed from plantation agriculture than can be absorbed by diversified agriculture and urban development. Rather the limiting factors to the growth of diversified agriculture are (1) the market demand for those crops that can be grown profitably in Hawaii, and (2) for the case of small-scale (but not large-scale) farmers, subdivision requirements which limit their access to agricultural land. The proposed Lualualei Golf Course would involve far too little land to affect the growth of diversified agriculture.

Potential Conversion to Agricultural Use

A golf course is not an irretrievable commitment of resources; if future economic conditions warrant, the golf course could be converted to agricultural use. Although such a conversion is possible, it is regarded as highly improbable.

Positive Impacts on Diversified Agriculture

To an undetermined extent, the Lualualei Golf Course would stimulate the growth of diversified agriculture by increasing the demand for plants and trees from nursery operations. Also the golf course would provide about 20 grounds-maintenance jobs involved with the cultivation of grasses and plants, applying fertilizers and chemicals, maintaining irrigation systems, etc. In terms of function, these jobs are similar to certain jobs in the agriculture industry, and require similar skills and training.

Consistency with State and County Plans

The proposed Lualualei Golf Course (1) would not adversely affect any plantation agriculture activities; (2) would not adversely affect any existing diversified-agriculture activities; (3) would not limit the growth of diversified agriculture since, in other parts of the State, far more agricultural land has been released from plantation agriculture than has been absorbed by other activities; and (4) would contribute to the economy, including the addition of a number of agriculture-type jobs. However, the proposed golf course has displaced a small 15-acre truck farm, but this displacement has already been mitigated through an amicable and voluntary agreement which involved relocation in exchange for consideration.

In view of these findings, the project would not conflict with the major thrust of the Hawaii State Plan, the State Agriculture Functional Plan, and the General Plan of the City and County of Honolulu. This thrust in all

three plans calls for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture. To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured. The thrust of these plans is not to preserve prime agricultural lands simply for the sake of preserving them—preservation is to occur only if a potential need for these agricultural lands exists.

However, less than 20 percent of the project would conflict with the lower-level State agricultural guidelines which call for Agricultural Lands of Importance to be protected from development.

4.5 GROUNDWATER.

This section discusses the existing aquifers located below and very near the project site, the potential for deriving water from them, the anticipated impacts that could result from drawing such groundwater and the effects of fertilizers/pesticides use on the proposed golf course on groundwater. Mitigative measures are also identified in order to minimize effects of proposed withdrawals and fertilizers/pesticides use on groundwater.

The information contained in this section is based on a 1988 study of groundwater sources within the site and immediate surrounding area conducted by John F. Mink entitled *Groundwater Resources, Maile, Waianae, Puu Haleakala To Ulehawa Stream*, October, 1988, and Murdoch & Green, *Environmental Assessment Of Fertilizer, Herbicide And Pesticides Use – Lualualei Golf Course*, September, 1990, which are contained in the Appendices.

4.5.1 Existing Conditions:

Maile is in the driest part of the Island of Oahu, receiving no more than an average of 25 inches of rain per year. Two thirds of the total annual rainfall occurs between November and April from rainstorms.

Two separate aquifers occur in the property; one consisting of limestone in the valley and the other composed of basalt underlying the valley fill and talus slopes. These aquifers are independent of each other.

The limestone stratum extends throughout Lualualei Valley below the approximately 100 feet elevation contour, while the basalt constitutes the basement of the entire Waianae district and is exposed as slopes and ridges above the level valley floor. The source of groundwater in the limestone is recharged from rainfall and from mountain runoff reaching the valley; the source in the basalt is rainfall on talus slopes and ridges exposed to bedrock.

A. Limestone Aquifer

Groundwater in the limestone aquifer occurs as a lens of brackish water floating on sea water. It is not suitable for drinking and in most places it is unusable for irrigating all but salt-tolerant plants. This aquifer is located in the level portion of the project site along Lualualei Access Road.

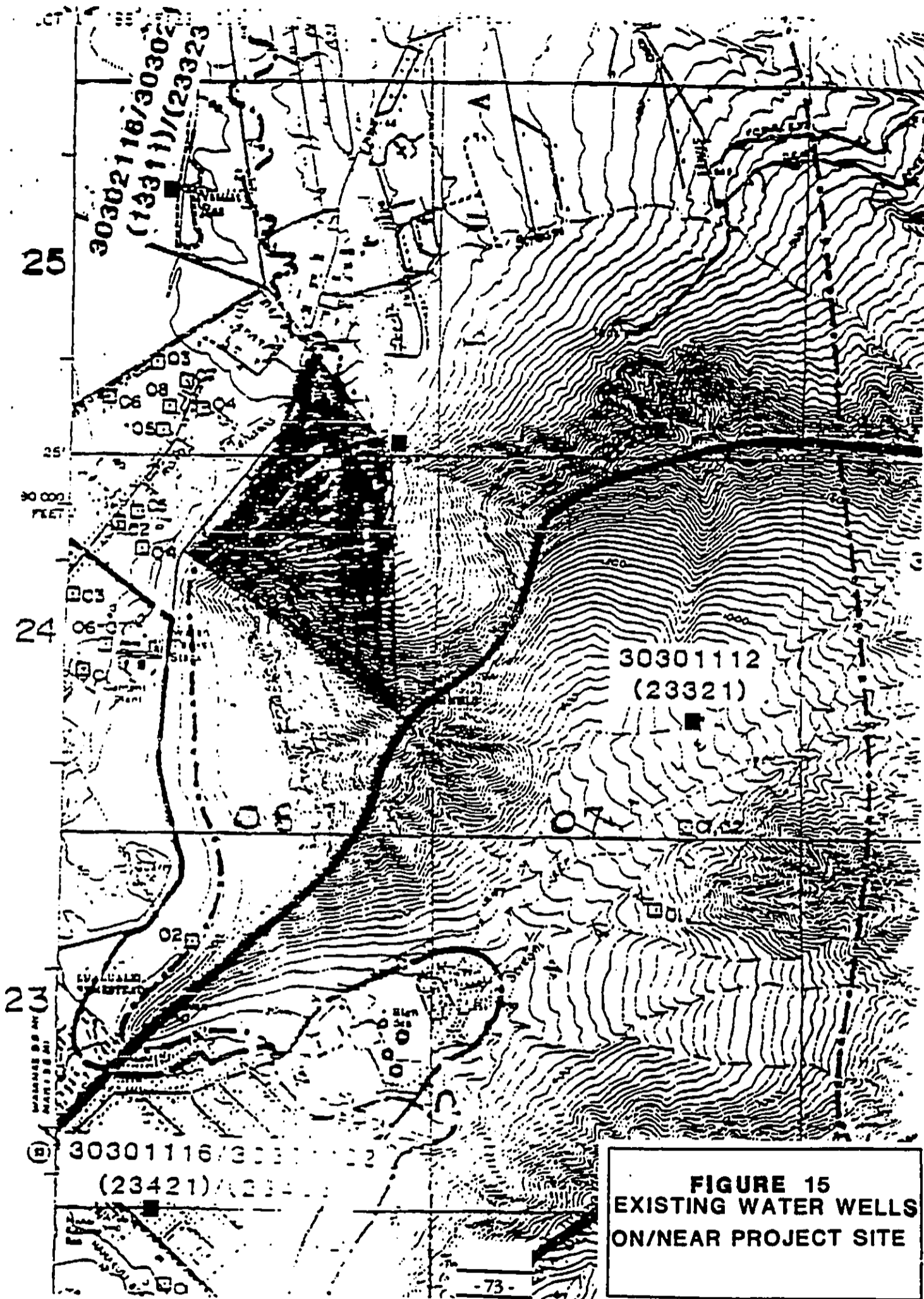
The salinity of this groundwater is too high for optimal crop irrigation, as a result local farmers have shifted over the years to

water from the Board of Water Supply although some limestone aquifer wells may still be in use in Lualualei Valley.

Head (the elevation of the water table above sea level) in this aquifer is approximately two (2) feet near the project's boundary line, suggesting a depth below sea level of moderately brackish water of about 50 feet. Normally, the diameter of a well is six (6) inches, and a small pump, usually having a capacity of 50 - 125 gpm, is employed. For these conditions the salinity of the pumped water averages about 1200 mg/l chloride, but a few wells yield water with as low as 700 mg/l and others produce water at the 2000 mg/l level. Higher pumping rates would cause higher salinity.

The sustainable draft of the limestone aquifer between Puu Hulu, a basaltic ridge a half a mile west of the property, and Ulehawa Stream is about 300,000 gallons/day. Capturing this quantity while maintaining salinity between 1000 and 2000 mg/l chloride would require a minimum of five wells, each equipped with a 50 gpm pump.

A typical well could be less than 100 feet deep and have a six (6) inch diameter casing. *Figure 15* shows the location of wells in the limestone aquifer within about a half a mile of the project site.



**FIGURE 15
EXISTING WATER WELLS
ON/NEAR PROJECT SITE**



B. Basalt Aquifer

The basalt aquifer underlying the property lies in the rift zone in which dikes have a southerly strike. An exploitable aquifer consisting of basalt compartments between dikes is known to exist because at one time an infiltration gallery (shaft) was located within a few hundred feet of the project site's boundary and yielded reasonably low salinity water at small rates for both domestic and agricultural uses.

The gallery (shaft) was constructed in 1939. Its location is shown on *Figure 16*. The initial groundwater head was 12 feet and initial chloride was 146 mg/l. In 1939 an average of 76 gpm of 300 mg/l chloride water was pumped; between 1941 and 1944, an average of 150 gpm was delivered to the Waianac Plantation. Later, the gallery (shaft) was used by the Mikilua Farmers Association for irrigation, but in 1962 it was closed down.

For a period (1974-1976) heads and chlorides were monitored but water was not pumped from the shaft. The head ranged from 11.4 to 11.9 feet and chloride from 280 to 285 mg/l.

The shaft is located just off the property line, but the aquifer it exploited underlies the golf course portion of the project site.

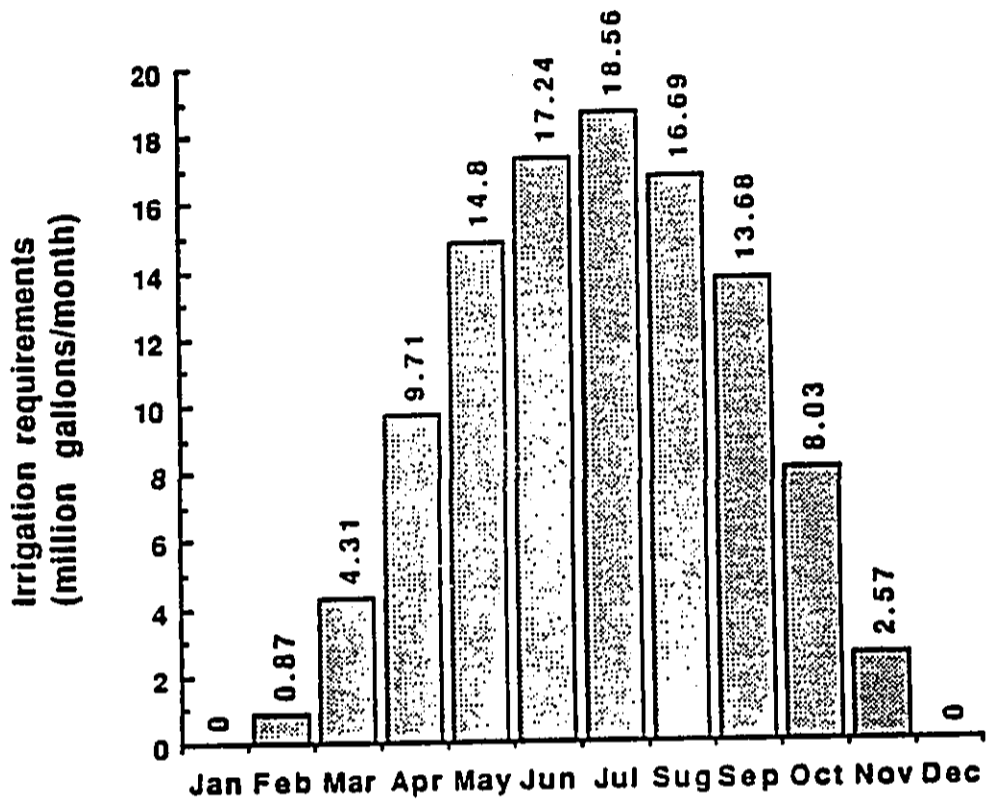


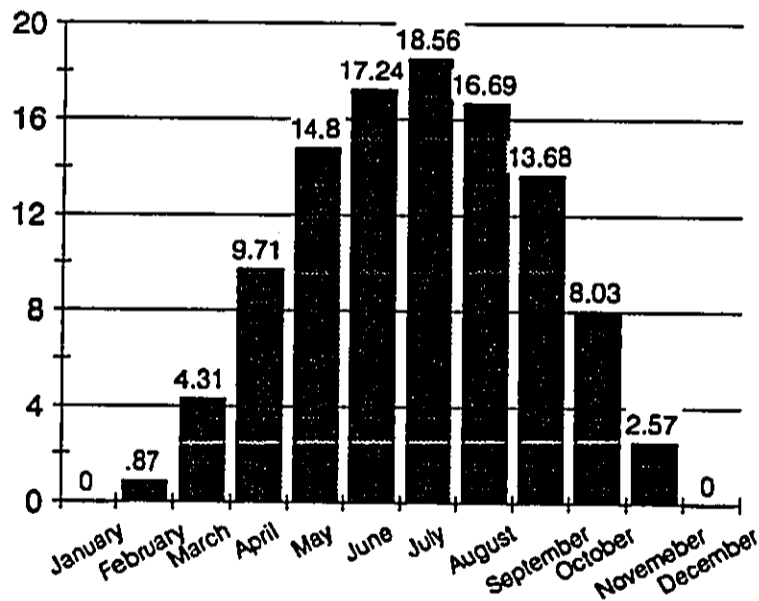
FIGURE 16
 MEAN MONTHLY IRRIGATION
 REQUIREMENT FOR
 LUALUALEI GOLF COURSE

With proper development practice, several hundred gallons per minute of brackish water having 500 to 1000 mg/l chloride could be obtained from wells within the project site.

4.5.2 Impacts and Mitigation Measures:

The total annual irrigation requirement for the Lualualei Golf Course averages approximately 106 million gallons. (Murdoch & Green, 1990.) This figure is based on a golf course irrigation schedule which calculates irrigation volumes from pan evaporation rates (Ekern and Chang, 1985) and rainfall (Giambelluca et al., 1986) data. *Figure 17* shows the mean monthly irrigation requirement for the Lualualei Golf Course.

Figure 17
Mean Monthly Irrigation Requirement for
Lualualei Golf Course
(Measured in Million Gallons per Month)



It is not expected that ground water withdrawal from the basalt or limestone aquifer for golf course construction or operation will adversely affect any neighboring properties since none is known to be tapping either sources to meet their potable or irrigation water needs.

A. Basalt Aquifer.

Presently, the basalt aquifer groundwater source is an untapped water source located directly below portions of the proposed golf course. Use of this groundwater source for golf course irrigation and certain maintenance purposes will not affect any existing agricultural or domestic uses or activities within Lualualei Valley as no such uses or activities rely on this water source for water supply. Therefore, no mitigation measures with respect to groundwater withdrawal by the project from the underlying basalt aquifer is proposed by the developer.

The developer has drilled two (2) wells which will tap this groundwater source to provide water for golf course and landscaping irrigation needs and for fire protection purposes. The location of these wells are shown in *Figure 8*, page 25. Well No. 1 is located at the 155 feet ground elevation and towards the mauka (northeasterly) boundary of the proposed project. Well No. 2 is located at the 145 feet ground elevation and towards the makai (southwesterly) boundary of the site.

B. Limestone Aquifer.

The developer will also tap groundwater from the limestone aquifer only as a secondary irrigation/fire protection water source which complements the supply of groundwater for these purposes drawn from the basalt aquifer. This practice will enable a lower level of brackish water withdrawal from the aquifer and, therefore, a lower salt content within the drawn water so as to permit such water to be used for general golf course and landscaping irrigation purposes within the project. It will also mitigate the effects of limestone aquifer water withdrawal by the project on other possible users of this groundwater source in Lualualei Valley. At this time, the developer is unaware of any such other users as farmers in the Maile/Lualualei Valley have tapped into the Board of Water Supply water system.

Finally, it will assure a lower water withdrawal volume by the project which will be far below the 300,000 mgd sustainable draft of this aquifer.

C. Fertilizer, Herbicide & Pesticides Use.

A report by Dr. Charles Murdoch and Dr. Richard Green entitled *Environmental Assessment Of Fertilizer, Herbicide & Pesticide Use – Lualualei Golf Course*, September, 1990, was prepared for the project and is contained in the Appendices. The report analyzed the potential effects of golf course maintenance with

fertilizers and pesticides on the basalt and limestone aquifers in question. The report concluded:

An analysis of the types and amounts of fertilizers and pesticides likely to be used on a golf course suggests that only nitrate from fertilizers might move through the soil profile in sufficient quantity to be measurable in groundwater of the limestone aquifer; this water is already of poor quality due to its high salinity. The deeper basaltic aquifer would not receive much recharge from the developed area and thus would not be affected. The pesticides expected to be used are even less likely to impact on groundwater quality than nitrate. A comparison of the Attenuation Factors for the various pesticides indicates that the pesticides used in largest quantity are not expected to move to groundwater as a result of either high sorption on the soil or rapid degradation in the soil. Others which are potential leachers are not used in sufficient quantity to constitute a problem. The low permeability of the Lualualei soil when it is moist is another factor which will limit chemical leaching.

Mitigation measures addressing the potential for leaching of nitrates and other chemicals into the groundwater aquifers are as follows: Containment of applied chemicals in the soil profile and within the boundaries of the development will be enhanced by careful management of both chemicals and water in accordance with the best prevailing management practices in golf course maintenance and upkeep. Both leaching and runoff will be reduced by applying water only when it is required for suitable plant growth. Irrigation based on a water balance method will be employed. Use of a slow-release nitrogen fertilizer in the

winter months will reduce leaching and losses of nitrates. Finally, groundwater will be periodically monitored for the presence of pesticides and nitrates in accordance with applicable State Health Department requirements.

No mitigation measures are proposed with respect to the potential of leaching of reclaimed wastewater effluent for irrigation into the basalt aquifer since these reclaimed waters will be applied to the golf course driving range/nursery area which is located below the 120 foot ground elevation outside of the State's "Underground Injection Control" (UIC) line and away from the Basalt aquifer.

4.6 SURFACE WATER.

This section discusses the existing surface water conditions at the project site; potential impacts of the proposed project on such conditions, including technical consultant reports addressing stormwater runoff and fertilizer and pesticide effects on water quality; and mitigation measures to minimize drainage and water quality impacts. The information contained in this section is based on two consultant studies: Hida, Okamoto & Associates, *Impacts On Utilities And Services, Proposed Lualualei Golf Course Project*, October, 1990, and Murdoch and Green, *Environmental Assessment Of Fertilizers, Herbicide And Pesticides Use - Lualualei Golf Course*, September, 1990. These reports are contained in Appendices.

4.6.1 Existing Conditions:

The Ulehawa Stream drainage basin, which includes the project site and the normally dry bed Ulehawa Stream, is irregular in slope and encompasses approximately 3,178 acres of land and several tributaries which discharge into Ulehawa Stream. *Figure 8*, on page 25, shows the Ulehawa Stream drainage basin. The Ulehawa Stream watershed stretches from seal level at Ulehawa Beach Park to a maximum elevation of 3,098 feet at Palikea, a distance of over 4.5 miles.

The Ulehawa Stream drainage basin was divided into 3 subwatershed areas to determine the peak discharge using the Storm Drainage Standards of the City Department of Public Works (May, 1988). (See *Figure 8*). The peak discharge was estimated for the existing conditions as follows:

**TABLE 4
LUALUALEI GOLF COURSE
PEAK DISCHARGE ESTIMATES - ULEHAWA DRAINAGE BASIN**

Tributary Area	Area (Acres)	Peak Runoff (cfs)
A	1,084	2,800
B	606	1,800
C	1,488	3,500
Totals:	3,178	8,100

Source: Hida, Okamoto & Associates, October, 1990.

The Flood Insurance Rate Map (FIRM) indicates that the entire project site is situated within Flood Area Zone D (areas in which flood hazards

are undetermined). There are currently no drainage improvements within the project site.

As noted in section 4.31 above, the project site contains Lualualei Soils which typically has two horizons, the surface A horizon and the underlying parent material or C horizon. In areas with nearly level topography the A horizon may be about 2 feet deep, but on the talus slopes the surface soil is expected to be thinner.

This soil cracks widely upon drying, but has a high shrink-swell potential so that the cracks close when the soil is thoroughly wetted. This shrink-swell characteristic has a great impact on the infiltration of water and permeability of the soil. When the soil is dry, water infiltration into the surface soil can be rapid; but once the cracks close in the wetted soil, the infiltration of water is greatly reduced. Consequently, runoff is medium to rapid on the steeper slopes.

4.6.2 Impacts and Mitigation Measures:

A. Drainage and Runoff.

The proposed golf course will change the character of approximately 140 acres of the project site. The medium dense vegetation cover currently found on the site would be replaced by a more open, close-cropped landscaping typically associated with golf courses. Roadways, parking lots, buildings, ponds and other features normally supporting a golf course would further add to the modification of the project.

As a result of the proposed golf course improvements, peak runoff generated on-site is expected to increase. Estimated peak discharge in the 3 subwatershed areas shown in *Figure 8*, page 25, is as follows:

**TABLE 5
LUALUALEI GOLF COURSE
PEAK DISCHARGE WITH PROPOSED PROJECT ULEHAWA STREAM
DRAINAGE BASIN**

Tributary Area	Area (Acres)	Peak Runoff (cfs)
A	1,084	2,800
B	606	2,008
C	1,488	3,554
Totals:	3,178	8,362

Source: Hida, Okamoto & Associates, October, 1990.

Drainage patterns are expected to remain similar to existing conditions, although diversion of some on-site runoff to the golf course ponds will occur. It is anticipated that the natural slopes and vegetation of the areas unaffected by golf course construction would be maintained.

Project development may result in a potential increase in the off-site discharge of peak runoff generated on-site. The downstream discharge of the on-site runoff has the potential to increase approximately 3.2 percent. However, runoff entering Ulehawa Stream can remain near existing levels when mitigating measures are employed. These measures will include routing runoff to ponds within the course layout.

Ponds within the course will serve as detention basins and will dampen the peak runoff generate on-site. By using these detention ponds to capture and store on-site runoff, the discharge of peak storm runoff from the project is not expected to increase from existing conditions. The increase in on-site peak runoff resulting from golf course development represents 3.1 percent of the total peak runoff from the drainage basin.

A positive impact of the proposed development is the probable reduction of erosion and sediment transport to Ulehawa Stream. Bare areas currently found on the site would be planted, with the project as a whole having better control and maintenance of its landscaping.

B. Fertilizer/Pesticides Effects on Surface Waters.

Runoff-producing storms are not expected to occur most of the year. During the winter months (November through February) runoff is more likely. Thus, special care in management of chemicals and irrigation will be exercised during this period.

Some runoff from the golf course during high-rainfall periods may contribute to stream flow in Ulehawa Stream. During the winter months, this stream carries runoff from Lualualei Valley to the ocean. However, fertilizer nitrates or pesticides in runoff from the golf course into the Stream are not expected to be detectable in the coastal waters in Nanakuli where it enters the ocean. The golf course will be located about 2 miles from the

coastline, providing a relatively large distance for mixing and dilution of golf course runoff with other runoff waters from Lualualei Valley. The several detention ponds within the course layout will further mitigate any negative impact of chemicals in runoff waters.

C. Ulehawa Stream

Ulehawa Stream, an intermittent and normally dry-bed stream, will not be altered in any manner in order to accommodate the proposed project. Instead, it will be incorporated in the current natural state in the design and layout of the proposed golf course driving range/nursery. Should unforeseen circumstance require any alteration of the stream in order to accommodate the project, the State Division of Water Resource Management (DLNR) will be contracted to determine any applicable State permit requirements and any such requirement will be complied with.

4.7 VEGETATION.

A detailed botanical survey of the project site was conducted by Char & Associates and is entitled *Botanical Survey, Proposed Lualualei Golf Course, Lualualei, Nanakuli, O'ahu*, September, 1990. It is contained in the Appendices and the information discussed below are taken from that survey.

4.7.1 Existing Conditions:

Kiawe forest, which vary from open woodland to closed-canopy stands, forms the dominant vegetation type within the project site. Buffel grass is the most common ground cover associated with this forest type. At about the 100-foot elevation contour, the composition of the forest changes with the trees more open, 30 to 50% cover, and Guinea grass and green panic grass becoming co-dominant with buffel grass at this elevation level.

At about the 200 to 250 feet elevation and higher, rocky outcroppings become numerous and koa-haole shrubs become more commonplace. On about 15 acres of the flatter, level portion of the site adjacent to the Lualualei Naval Magazine Depot, an open field once cultivated for vegetable crops in the mid-1980s exists. This abandoned field supports a weedy assortment of species commonly associated with agricultural lands.

A total of 61 species of plants are found on the project site of which a majority (54 species or 88% of all species) are introduced species while 7 species (12%) are native species. Of the native species, 6 species are indigenous; that is, they occur in the Hawaiian Islands and elsewhere, and 1 is endemic or occurring only in the Hawaiian Islands. All of the native species of plants can be found throughout the Hawaiian Islands in areas with similar environmental conditions.

None of the 61 species are designated as threatened or endangered by the Federal government (U.S. Fish and Wildlife Service, 1989) or State

government. The proposed golf course will not have a significant impact on the botanical resources within the Lualualei area.

4.7.2 Impacts and Mitigation Measures:

Since the plant species within the site are common throughout the Hawaiian Islands and elsewhere, no special mitigation measures are proposed by the developer with respect to project impacts on existing vegetation within the site. It is expected that grassing and landscaping of areas cleared of vegetation in order to construct the golf course will be undertaken immediately after golf course grading work is completed to avoid soil erosion. Also, a fire contingency plan will be formulated prior to project construction.

4.8 WILDLIFE.

A report by Andrew Berger entitled *Terrestrial Vertebrate Animals of the Proposed Lualualei Golf Course*, August, 1990, was prepared for the project and is contained in the Appendices. The information below is taken from that report.

4.8.1 Existing Conditions:

The survey conducted by Andrew Berger for the project reports the following findings: Of the four species of frogs that have been introduced into the Islands, only the Giant Neotropical Toad (*Bufo marinus*) was observed on one occasion at the project site.

Several types of birds were observed at or near the project site. These include the following introduced species: Spotted or Lacenecked Dove (*Streptopelia chinensis*), which is common to the project site and surrounding area; Barred Dove or Zebra Dove (*Geopelia striata*), which is common along can haul roads and anywhere there are weed seeds; Red-vented Bulbul (*Pycnonotus cafer*); Japanese White-eye (*Zosterops j. japonicus*), which is very common in all habitats in the lowlands of Oahu; Common Indian Myna (*Acridotheres tristis*), common throughout Oahu's lowlands; Ricebird or Nutmeg Mannikin (*Lonchura punctulata*), common throughout the region; House Sparrow (*Passer domesticus*); Red-crested Cardinal (*Paroaria coronata*), which occurs throughout the region; House Finch (*Carpodacus mexicanus frontalis*), common throughout the region; and Feral pigeons (*Columba livia*)

The only indigenous bird specie noted in Berger's report as "the only winter resident that would occupy the project region" is the Lesser Golden Plover (*Pluvialis dominica fulva*).

Berger's report on endemic Hawaiian birds notes that there is no suitable native forest habitat for any of the Hawaiian forest birds anywhere near the project site; that there is no suitable habitat for any of the endangered Hawaiian waterbirds on or anywhere near the project site; and that the Pucio or Hawaii owl (*Asio flammeus sandwichensis*) was not observed in his field studies of animal species within or near the project site. Berger concludes that the site is not suitable for this owl.

It is assumed that all of the following mammal species occur in the project site because of their common occurrence throughout the Island:

Roof Rat (*Rattus rattus*); Polynesian Rat (*Rattus exulans*); Norway Rat (*Rattus norvegicus*); the small Indian mongoose (*Herpestus auropunctatus*) which was observed on the site; Feral Cats (*Felix catus*); and Feral Dogs (*Canis familiaris*).

The Berger field study makes the following conclusions: None of the introduced species of birds identified in his report is an endangered species. A change in land use could provide more habitats for some of the introduced species.

The project will have no effect on any seabird the black-crowned night heron because there is no habitat at or near the project for this heron, and wintering ducks or shorebirds. There are no suitable wetland habitat for any of the endangered Hawaiian waterbirds at or near the project site. The Pueo or Hawaiian Owl was never seen at or near the site nor is there any published record indicating its presence at or near the site.

Finally, Berger concludes that "the construction of a golf course in the project region would have no adverse effect on any endemic ecosystem or on any native plant or animal".

4.8.2 Impacts and Mitigation Measures:

Since the project will not have any adverse effect on any endemic ecosystem or on any plant or animal species in the area, no mitigation measures is proposed by the developer with respect to the project's impacts of wildlife within and near the project site.

4.9 ARCHAEOLOGICAL/HISTORIC RESOURCES.

An archaeological survey of the project site was conducted in November, 1990 by Cultural Surveys Hawaii and the findings and conclusions of that survey are contained in *An Archaeological Inventory Survey For The Proposed Lualualei Golf Course, Lualualei, Waianae, Oahu*, January, 1991 which is contained in the Appendices. Information in this section is based on that report.

4.9.1 Existing Conditions:

A total of eight (8) archaeological sites were identified in the project site. Only two of these site (50-80-08-4366 and -4367) are interpreted as being attributable to traditional Hawaiian activity, with one site (50-80-08-4366) probably representing prehistoric, recurrent habitation at the foothills of Puu Haleakala. This is primarily evidenced by the presence of a probable hearth feature within the site complex.

Site 50-80-08-4367, a remnant wall section running adjacent to an intermittent stream bed, suggests an agricultural usage possible constructed to retain or divert water. Given the weathered condition of the structure, this site may be prehistoric.

The six remaining sites identified within the project area are attributable to historic land usage. Five sites (50-80-08-4364, 4370, -4372 and -4373) are associated with cattle ranching and include cattle walls, a historic house lot and various other ranching infrastructure. One site (50-80-08-4365) represents a military shelter evidenced by the presence of bullets and C-ration cans.

Seven of the eight sites in the project area are evaluated as no longer significant because of lack of cultural or scientific interest beyond their plotted distribution. Site 50-80-08-4366 is likely to yield information important in prehistory or history. This site lies outside the proposed golf course layout and, therefore, will not be disturbed by project construction and operation. The following Table summarizes the sites within the project area and their significance:

**TABLE 6
LUALUALEI GOLF COURSE
ARCHAEOLOGICAL SITES SUMMARY AND SIGNIFICANCE**

CSH#	STATE SITE #	SITE TYPE/ FUNCTION	SIGNIFICANCE	RECOMMENDATION
1	50-80-08-4364	Wall/Ranching	NSL	None
2	50-80-08-4365	Shelter/Military	NSL	None
3	50-80-08-4366	Struc. Complex/Hab.	D	Preserve
4	50-80-08-4367	Wall remnant/Agric.	NSL	None
5	50-80-08-4370	House lot/Ranching	NSL	None
6	50-80-08-4371	Wells/Ranching	NSL	None
7	50-80-08-4372	Foundation/Ranching	NSL	None
8	50-80-08-4373	Incinerator/Ranch.-Mil.	NSL	None

NSL: No longer significant

D: Site may be likely to yield information important in prehistory or history.

Source: Cultural Surveys Hawaii, *An Archaeological Inventory Survey for the Proposed Lualualei Golf Course, Lualualei, Waianae, Oahu*, January, 1991.

4.9.2 Impacts/Mitigation Measures.

Since Site 50-80-08-4366 is located outside the proposed golf course layout and will not be impacted or disturbed by the project, no mitigation measures with respect to the project's archaeological resources impacts are proposed herein. The applicant commits to working closely with the

State Historic Preservation Office toward the preservation of this site if deemed appropriate by the State.

Development of the golf course will impact the remaining seven sites within the project area; however, they are considered no longer significant. Therefore, no mitigation measure is proposed with respect to project impacts on these other sites. Should any unknown and significant archaeological or historic resources be uncovered during project construction, work will cease immediately and all procedures of the State Historic Preservation office will be instituted and complied with in order to protect and preserve such resource beyond resuming construction.

4.10 ROADWAYS AND TRAFFIC.

This section includes a presentation of the existing roadways and traffic conditions at the project site and in the immediate surrounding community. Potential impacts of the project on future traffic conditions are assessed and mitigation measures to minimize its effects on traffic and transportation are described.

A detailed report entitled *Traffic Impact Assessment Report For The Lualualei Golf Course*, September, 1990, by Pacific Planning and Engineering, Inc. was prepared for the project and is contained in the Appendices. The information below is taken from that report.

4.10.1 Existing Conditions:

A. Roadway Facilities:

Vehicular access to the project will be primarily from Farrington Highway, Hakimo and Paakea Roads, and a new, two-lane paved service road to be constructed parallel to the Lualualei Access Road between Paakea Road and the proposed golf course clubhouse. *Figure 4*, above, shows the proposed vehicular access route to the project.

Farrington Highway is a rural arterial highway connecting major population centers along the Waianae Coast (Makaha, Maile, Nanakuli). It is the only roadway for through traffic along the Coast. It is a State-maintained Primary Federal Aid Highway with a 80-foot right-of-way and a 60-foot wide pavement near its intersection with Hakimo Road. That intersection is signalized. There are four 11-foot wide lanes with 2 lanes serving traffic in both directions and 8-foot wide paved shoulders on both sides of the Highway. The posted speed limit is 25 - 35 mph.

Hakimo Road is a County-maintained road with 20-foot wide pavement designed for 2-way traffic. The shoulders are unpaved and vary between 5 and 10 feet. Approximately 2.1 miles of Hakimo Road is paved while the remainder is unpaved. The posted speed limit is 20 mph.

Paakea Road is also a County-maintained road with posted speed limits of 20 mph. It has 20-foot wide pavement designed for 2-way traffic. It connects to Lualualei Access Road near the Hawaiian Cement Company plant in Nanakuli.

Lualualei Access Road is owned and maintained by the U.S. Navy. A portion of the Road from Farrington Highway to the Lualualei Naval Magazine Depot is opened to the public, subject to temporary closures during emergencies.

While the Navy had no objections to the proposed golf course, it denied a formal request for use of the Road to provide access to the project. Instead, it recommended access to the project from Hakimo Road with a golf cart underpass and limited grade crossing of Lualualei Access Road for maintenance vehicles.

B. Traffic Conditions:

Based on traffic count data obtained from the State Department of Transportation, peak traffic periods generally occur between 5:30 to 7:30 am and 3:00 to 5:00 pm daily. Manual counts during these peak periods at the intersection of Farrington Highway and Hakimo Road. The results, shown in *Figure 17*, indicate that the intersection currently operates well during these peak hours will little delays or congestion.

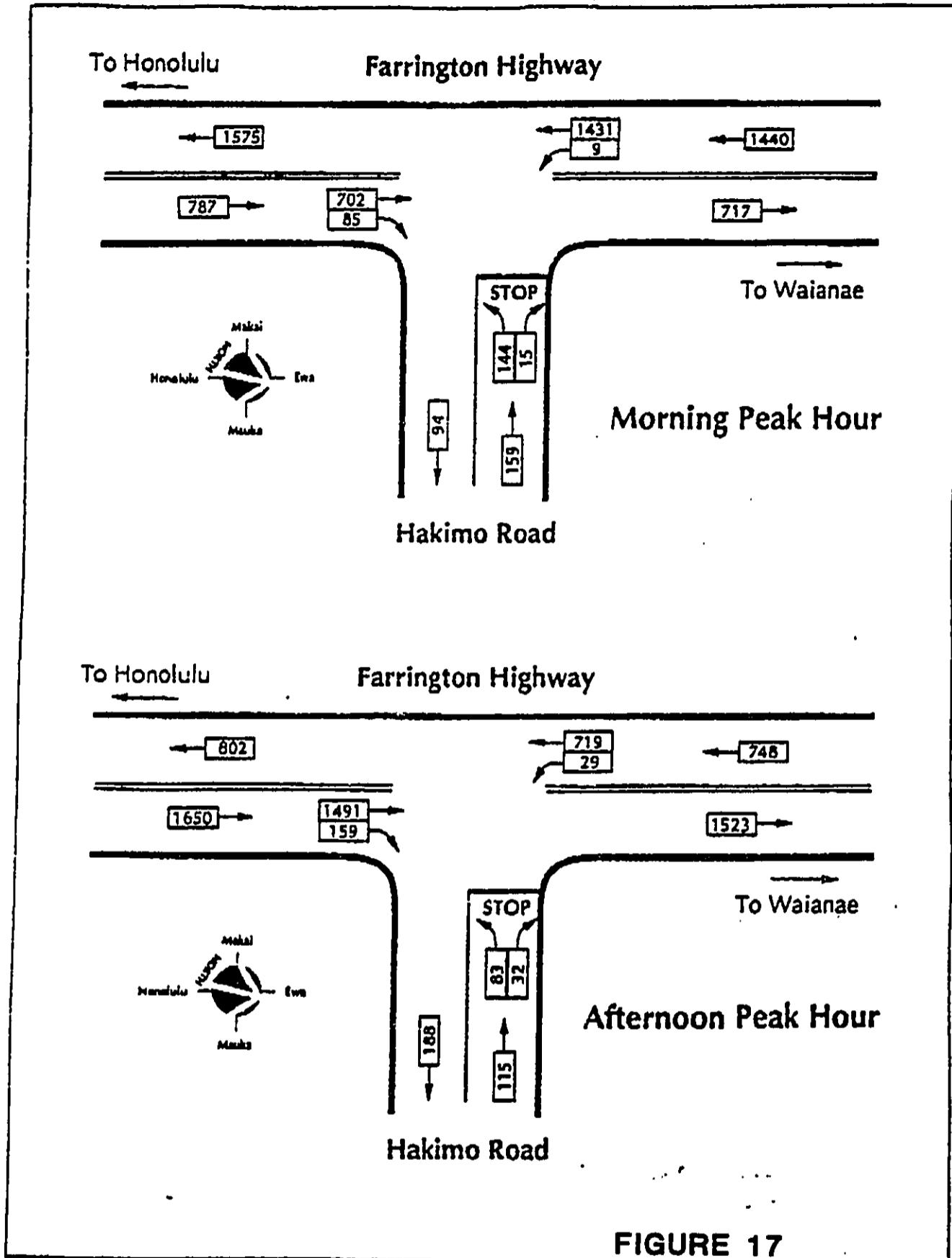


FIGURE 17
PEAK HOUR TRAFFIC VOLUME

4.10.2 Impacts and Mitigation Measures:

Impacts on traffic resulting from the proposed Lualualei Golf Course were measured in terms of Level-of-Service (LOS) at the intersection of Farrington Highway and Hakimo Road. *Table 7* shows the results of that measurement:

**TABLE 7
LUALUALEI GOLF COURSE
SIGNALIZED INTERSECTION LOS DURING PEAK HOURS
(Farrington Highway with Hakimo Road)**

Turning Movement	1990		1996		1996	
	Existing		With Project		Without Project	
	am	pm	am	pm	am	pm
Farrington Highway:						
Northbound (Waianae)	A	B	A	C	A	C
Southbound (Honolulu)	B	A	B	B	C	B
Hakimo Road:						
Westbound (Makai)	B	B	D	C	D	D

Source: Pacific Planning & Engineering, Inc., 1990.

Notes: LOS "A": Very low delays, i.e. less than 5.0 sec./vehicle.
 LOS "B": Delay range of 5.1 - 15.0 sec./vehicle.
 LOS "C": Delay range of 15.1 - 25.0 sec./vehicle.
 LOS "D": Delay range of 25.1 - 40.0 sec./vehicle.

The measurement was conducted in accordance with the latest *Highway Capacity Manual* (Special Report 209, 1985) and was done during weekday morning and afternoon peak hours.

The traffic study indicates that the proposed project is not expected to create any adverse impact to existing traffic along Farrington Highway, Hakimo and Paakea Roads, when the project is completed and opened

for public use in 1996. The golf course is not likely to attract other traffic to the project site due to its remoteness and lack of other recreational attractions and, therefore, traffic into and out of the project site is expected to be composed primarily of golfers and employees.

The study also indicated that project-generated traffic will have minimal impact on existing traffic flow due to intermittent arrivals and departures of golfers. Golfers usually arrive at a course based on individual "starting times" and thus traffic generated by the project is spread throughout most of the day. Therefore, project-generated traffic will have minimal impact on normal morning and afternoon peak hour traffic flows.

Although not indicated by the study results, the developer plans to widen Hakimo Road at its intersection with Farrington Highway in order to provide separate left-turn and right-turn lanes at the existing intersection and improve the right-turn movements into and out of Hakimo Road.

Although the intersection of Maililili Road and Farrington Highway was not analyzed as part of the project's EIS effort due to the very small amount of project-related traffic that would pass through this intersection, the EIS traffic study prepared by Pacific Planning and Engineering, Inc., is being expanded to include an such an analysis in response to a suggestion by the State Department of Transportation.

Altogether, the project is estimated to generate 10 trips entering and 100 trips exiting during the afternoon peak hour. It is expected that 90% of these trips will be to/from the Honolulu direction and the remaining 10% to/from the Waianae direction. Therefore, it is estimated that only 11

project-related trips will pass through the intersection of Maililili Road and Farrington Highway, Compared to the Farrington Highway volumes (2500 vehicles in both direction at DOT Sta. 14-H, 1989), this is an insignificant number (0.4% of 2500).

4.11 NOISE.

Existing noise conditions and the potential future noise conditions at the project site and its surrounding areas were reviewed and analyzed by Y. Ebisu & Associates in its study for the project entitled *Noise Study For The Lualualei Golf Course Project, Nanakuli, Hawaii*, November, 1990, which is contained in the Appendices. The information below is taken from that study.

4.11.1 Existing Conditions:

Existing background ambient noise levels in the project environs are controlled by traffic on Lualualei Access Road, local traffic on Hakimo Road, birds, dogs, wind and foliage.

At residences in the vicinity of the project site and which are somewhat removed from Lualualei Access Road, existing average background ambient noise levels range from 45 to 55 Ldn, which is in the "Minimal Exposure, Unconditionally Acceptable" noise exposure category. Existing noise levels in the further removed residential areas west of the proposed golf course are low. During quiet periods between local traffic, background ambient noise levels along the roadway are dominated by the sound of dogs, birds, wind and distant traffic.

Existing traffic noise levels along Lualualei Access Road and Hakimo Road are moderate (approximately 61 to 62 Ldn) at 50 feet setback distance from the roadway center line. Maximum noise level (Lmax) associated with heavy truck and bus traffic on the two roadways are in the order of 78 to 85 dB at this setback distance. Minimum background ambient noise levels of approximately 35 to 50 dB occur between periods of traffic flow.

4.11.2 Impacts and Mitigation Measures:

A. Future Traffic Noise Environment.

Moderate project plus non-project traffic noise increases of 1.0 dB are predicted to occur by CY 1996 along Hakimo Road which is expected to serve as the primary access roadway to the project. The increase in traffic noise along this roadway which would be attributable to traffic generated by the project is 0.5 dB, only a minimal increase in noise. Such an increase should not be perceptible and is generally not considered significant. Therefore, traffic noise impacts associated with the project are not considered to be significant.

Along Farrington Highway where traffic volumes, speeds and noise levels are significantly higher, the added noise contributions from project-generated traffic should be even less significant when compared to non-project traffic noise contributions. Project traffic noise impacts along the Highway are not antici-

pated because of the dominating influence of non-project traffic noise over project-generated traffic noise.

B. Other Potential Noise Impacts.

Clubhouse: Adverse noise impacts from activities at the planned clubhouse are not anticipated due to the normally available option of total closure and air conditioning of the facility's dining and social function areas. Additionally, a relatively large buffer distance of approximately 200 to 300 feet is planned between the facility and its nearest noise-sensitive neighboring uses.

Sound attenuation treatment of the clubhouse facility and its mechanical equipment (air conditioning equipment, exhaust fans, etc.) will be incorporated into its construction to mitigate adverse noise impacts of clubhouse activities on neighboring residences.

Driving Range: The potential for adverse noise impacts from the proposed golf driving range component of the project is expected to be low due to the large distances (exceeding 300 feet) between the practice tees and residences in the area. The loudest noise expected from the driving range should come from the tractor to be used to retrieve golf balls within the driving range.

Measured noise levels from tractors used on golf courses range from 66 to 74 dB from 50 feet distances. These tractors will

probably be audible during quiet periods, but these noise events are expected to be intermittent and are similar to other farm equipment used within and agricultural district.

Properly muffled and maintained tractor equipment within the entire golf course will be used. Additionally, evening and night time curfews on operating such equipment will be exercised to further minimize any adverse noise impacts on neighboring properties.

Construction Noise: Audible construction noise will probably be unavoidable during project construction. Short-term noise impacts associated with project construction will occur. Because of the relatively high noise levels associated with project construction activities, mitigation of construction noise to inaudible levels will not be practical in all cases.

Properly muffled and maintained construction equipment will be required on the job site. The incorporation of State Health Department construction noise limits and curfews will also be applied to project construction.

4.12 AIR QUALITY.

A report by J.W. Morrow entitled *Air Quality Impact Report, Lualualei Golf Course*, January, 1991 reviewed the potential air quality impacts of the proposed

project and is contained in the Appendices. The information in this section is based on that report.

4.12.1 Existing Conditions:

While there is no air monitoring station in the project area, air quality is believed to be in compliance with State and Federal standards due to the rural, lightly developed nature of the area. The nearest major stationary source, a cement plant within a mile, is downwind of the site under normal trade winds and, thus, would impact the project site air quality only during southerly (kona) wind conditions.

Similarly, the large power plant located some five miles away at Kahe Point is also downwind during trade wind conditions. Mobile source activity along Lualualei Access Road is so low that such activity has minimal air quality impact. The State Health Department's nearest air monitoring station, located eight miles away at Barber's Point indicates compliance with State and Federal standards despite being located adjacent to Campbell Industrial Park.

Air sampling conducted for the project found carbon monoxide (CO) levels in the 1-4 milligrams per cubic meter (mg/m³) range at the Farrington Highway/Hakimo Road intersection during the morning and afternoon peak traffic hours under light-to-moderate wind conditions. This was lower than computer predicted CO levels due to the absence of "worst case" conditions during the field sampling.

On an annual basis, wind conditions in the area are dominated by brisk trade winds; however, there is a marked seasonal difference in the velocity and persistence of such winds. Trade winds tend to decline in the fall and winter months (light and variable) which can contribute to higher pollutant concentrations. Near coastal areas also experience land-sea breeze regimes with onshore winds during the day and offshore winds at night.

4.12.2 Impacts and Mitigation Measures:

A. Short-term Air Quality Impacts.

There will be 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 earth moving activities within the project. A rough estimate of uncontrolled fugitive dust emissions from construction activity has been provided by the U.S. Environmental Protection Agency (1987) and establishes a benchmark 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 project site may approximate the EPA's benchmark due to the relatively dry weather prevailing at the site. 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 as engine exhaust fumes. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment emissions, 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 from nearby roadways.

Mitigation Measure: During project construction, 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 along the planned roadway route

to the project can obstruct the normal flow of traffic to an extent that overall vehicular emissions of carbon monoxide are increased. This will be mitigated by moving heavy construction equipment during periods of low traffic volume whenever possible.

B. 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 risks of using these chemicals are to the applicator rather than to individuals at possible receptor sites down wind. Individuals down wind should encounter airborne concentrations of these chemical substances only in a greatly diluted form, if at all. Nevertheless, precautions will be taken in applying such chemicals as described in mitigating measures below.

There could be minor long-term indirect impacts on air quality along the project's roadway route due to project-related traffic. These are expected to be minimal due to the intermittent arrival of golfer to the course responding to staggered starting times and to the small daily work force needed to operate and maintain the golf course complex.

No specific mitigative measures are proposed to reduce vehicle-generated carbon monoxide levels at the Farrington Highway/Hakimo Road intersection or at any other portions of the

planned roadway route to the site due to the insignificant increase in traffic at these areas arising from users of the golf course. Moreover, worst-case projected levels of emissions at these areas will be well within the State of Hawaii and Federal Ambient Air Quality Standards because of the low current traffic volumes along the route and insignificant increases to such volumes which would be attributable to the project.

C. Pesticides Impact on Air Quality.

Pesticide use associated with golf course maintenance also has a potential for air quality impact if the pesticides are improperly applied under strong wind conditions. Estimated concentrations of typical herbicides, insecticides, and fungicides uses on golf courses indicated concentrations well below standards and effects levels.

Mitigation Measures: The primary mitigation measure will be to insure that applicators strictly follow label instructions. Alternatively, other non-chemical means of pest control will be sought out and implemented occasionally.

Certain precautions will be employed by pesticide applicators on the course in order to prevent significant down wind drift when spraying: Coarse rather than a fine spray will be used and application under low wind speed conditions when the wind direction will not contribute to drift towards the clubhouse area will be done.

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.

4.13 SOCIAL AND ECONOMIC CHARACTERISTICS.

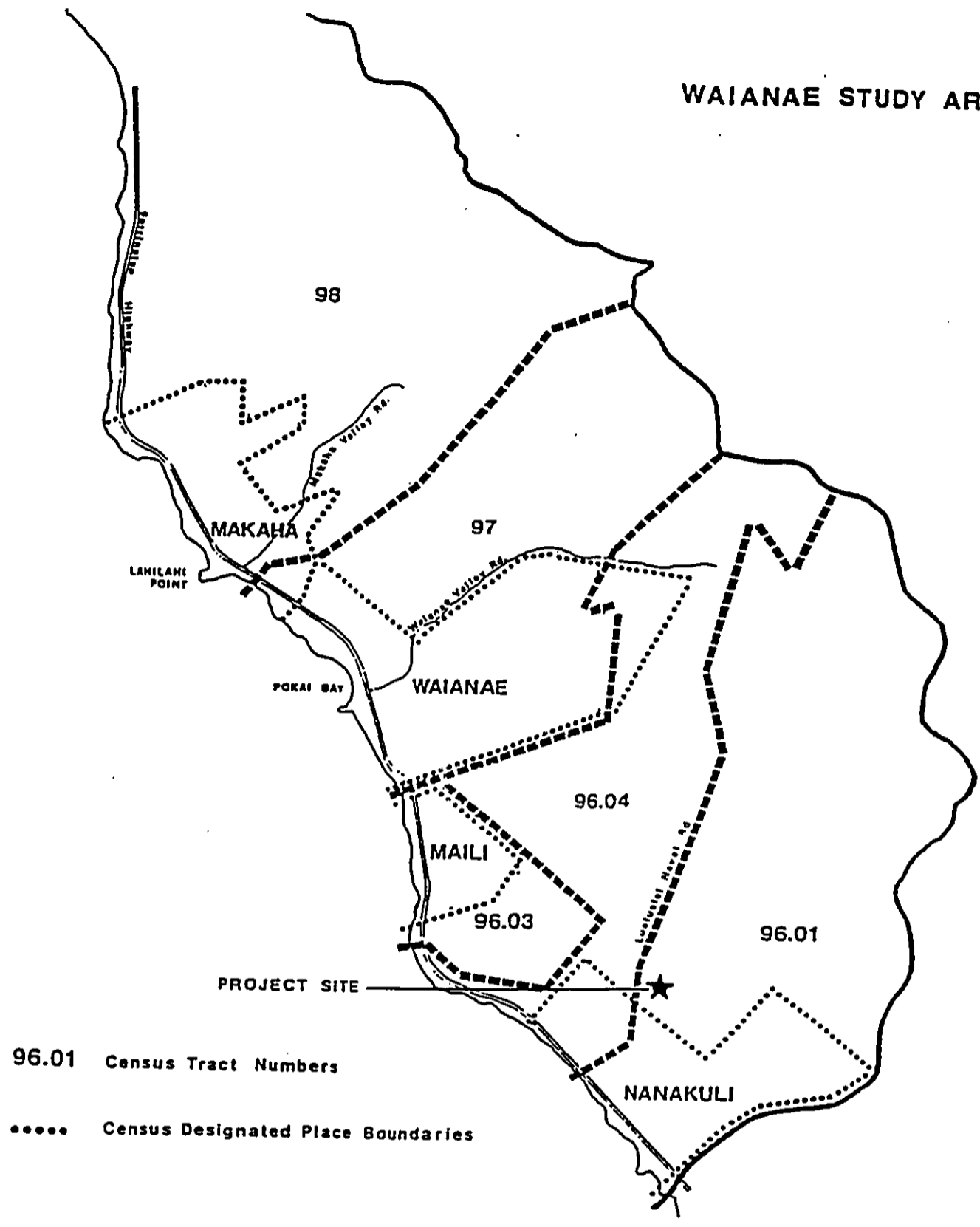
A study of this topic area for the project entitle *Socio-Economic Impact Assessment for the Proposed Lualualei Golf Course, Waianae District, Oahu*, January, 1991 by Community Resources, Inc., was prepared and is contained in the Appendices. The information in this section is based on that report.

4.13.1 Existing Conditions:

A. Population/Employment.

The project site is situated in Census Tract 96.01 (Sec. *Figure 18*) although part of the site extends into Tract 96.04. Road access to and from the site leads seaward to the Lualualei Homestead area which is usually viewed as closely related to the town of Maili. Most of the population in Census Tract 96.01 consist of residents of the town of Nanakuli which is physically separated from the project site by a steep ridge identified as Puu Haleakala Ridge.

WAIANAE STUDY AREA



96.01 Census Tract Numbers
..... Census Designated Place Boundaries

FIGURE 18

AREA CENSUS TRACT MAP

The project site is located in the Waianae Development Plan area. Waianae's population was 35,800 in 1989 (State Dept. of Business & Economic Development, 1990), a population increase of only 13.6 % over 1980.

Waianae's population was proportionately much more Native Hawaiian and less Oriental; far younger on average (with 40 percent of the population under 18); and less educated on average based on detailed census characteristics of 1980. Waianae's poverty rate for families in 1980 was nearly three times the islandwide rate. Incomes were significantly lower.

There are a relatively small number of jobs in the Waianae area. *Figure 19* shows a total of 4,036 jobs in the Waianae area in 1980. This number is equal to only 40 percent of the resident Waianae civilian labor force in that year. In contrast, the number of civilian jobs islandwide in 1980 was equal to 91 percent of the available civilian labor force.

**Figure 19
Employment (Existing Condition)**

Table 1: Oahu and Study Area Civilian Jobs by Industry, 1980

Industry Category	Jobs in Waianae DP Area	% of Total	Jobs in Ewa*	% of Total	Jobs on Oahu	% of Total
Agriculture, Forestry & Fisheries	212	5.3			4,845	1.5
Mining	0	0		0	131	0.4
Construction	273	6.8		0	19,064	6.2
Manufacturing	162	4.0		0	24,246	7.8
Transportation, Communications, & Other Public Facilities	210	5.2		0	27,695	8.9
Wholesale	81	2.0		0	12,955	4.2
Retail	820	20.3		0	64,497	20.9
Finance, Insurance & Real Estate	208	5.2		0	25,147	8.1
Business & Repair Services	84	2.1		0	14,489	4.7
Personal Services	161	4.0		0	19,803	6.4
Entertainment & Recreation Services	141	3.5		0	5,622	1.8
Professional & Related Services	1,155	28.6		0	56,166	18.2
Public Administration	529	13.1		0	33,781	10.9
TOTALS (CIVILIAN JOBS)	4,036	100%	5,650	100%	308,441	100%
Armed Forces	220	N/A	3,965	N/A	48,251	N/A

* Ewa DP area equated with Census Tracts 82 to 86.02 for present purposes.

Source: Urban Transportation Planning Package (printouts of special analyses from 1980 U.S. Census, available from the Hawaii State Department of Transportation).

Relatively little new economic development is slated for the Waianae area. Direct job activities (i.e. those which bring dollars into the region) in the Waianae Development Plan area are limited to a small number of tourism-related jobs in Makaha, diversified agriculture farm operations and military activities at Lualualei Naval Magazine Depot.

B. Forces For Change Without the Project.

The three major ongoing projects in the study area that will have the most impact are all located in Ewa:

- The Ko Olina Resort. Plans call for hotels, condominiums, commercial facilities and golf courses. Operations will provide more than 8,000 direct jobs after the completion of the construction phase in 15 years.
- Kapolei. The State envisions Kapolei as Oahu's second city. Besides extensive residential sections, plans include a business district and commercial areas.
- Campbell Industrial Park. Presently, more than 150 firms provide jobs for 3,100 persons. Expansion of the Park is expected to generate 200 extra jobs annually for the next five years.

Major developments in Waianae are few and are basically centered in Makaha Valley. The most significant plans include an expansion of the Makaha Valley Country Club, the expansion of the Sheraton Makaha and the creation of a Pacific Basin Conference Center.

4.13.2 Impacts and Mitigation Measures:

Construction of the course, which will take approximately 24 months, will generate direct, indirect and induced employment at around 170 persons/year. Following construction, course and nursery operations are expected to provide 70 direct jobs. Direct, indirect and induced employment attributable to visitor spending is expected to amount to 45 jobs. (These jobs, at the project and off-site, constitute the Statewide employment impacts attributable to project operations.)

During construction, the total gross income generated by the project amounts to nearly \$5 million. During operations, direct, indirect and induced jobs supported by visitor spending will generate total incomes of approximately \$1 million annually.

Total State revenue from the construction phase is estimated at around \$1.1 million. The annual State revenue from the operational phase is estimated to be about \$312,000. With annual State expenditures (services to the project) estimated at about \$18,000 - \$42,000, the net annual increase in State revenues would be \$271,000 - \$294,000. Over a 25 year period, the net increase in revenues would range from \$6.8 - \$7.4 million.

Total County revenue from project construction will amount to an estimated \$10,000. The county revenue from the operations phase is estimated to be about \$180,000 annually. Annual County expenditures from between \$4,000 and \$9,000 would create a net annual increase of \$171,000 - \$177,000. Over a 25-year period, the net increase in revenues would range from \$4.3 - \$4.4 million.

No part of the project site has been occupied for over a year, therefore, resident or housing displacement is not an issue. The last tenant to occupy the site was a farmer who leased only 15 acres. The remaining acres has been unused for years.

The temporary, daily golfer population at the course during peak use periods is expected to reach 200 persons.

Recreational project impacts include: (i) allocation of an average of 60% of all golf rounds to residents; (ii) establishment of resident golf rates substantially lower than visitor rates; and (iii) development of a junior golf program.

Potential project impacts on the surrounding community include: (i) employment conveniently near homes; and (ii) community benefits as discussed in *Chapter III*, above.

The project is not expected to affect property tax assessments in the region in the near term since there are no definite plans for improvements which would affect nearby properties and, thus, assessments. Long-term property tax impacts are very unlikely as well due to the

nearby agricultural zoning and land uses (military, small farms, preservation uses).

The project is not expected to stimulate further urban development within the surrounding areas to any significant extent due to lack of infrastructure to support such development; City policy direction limiting the area to "rural" developments; and proximity of the area to the Navy's Lualualei Magazine Depot.

When the project was first proposed in 1988, community opposition arose mainly because the project would have displaced the lone tenant farmer referenced above. Interviews of residents conducted in 1990 suggest that community sentiment is not currently antagonistic to the project for the following reasons: (i) the tenant settled the lease dispute with the developer; (ii) there are no plans for resort development on the project site; only the proposed 18-hole golf course and modest clubhouse; and (iii) the proposed development will provide jobs for local residents near their homes.

Interviews identified the following potential impacts with respect to the project: (i) anticipated potential property tax increases for adjacent properties; (ii) increased traffic; (iii) possible change in existing lifestyles; (iv) anticipated overburdening of water and sewage systems; (v) interest in nearby job opportunities; and (vi) anti-Japanese sentiments.

Golf course development has been hotly debated on Oahu since 1988. Many residents are concerned that golf courses could affect surrounding property values and, hence, property taxes; disturb the character of rural

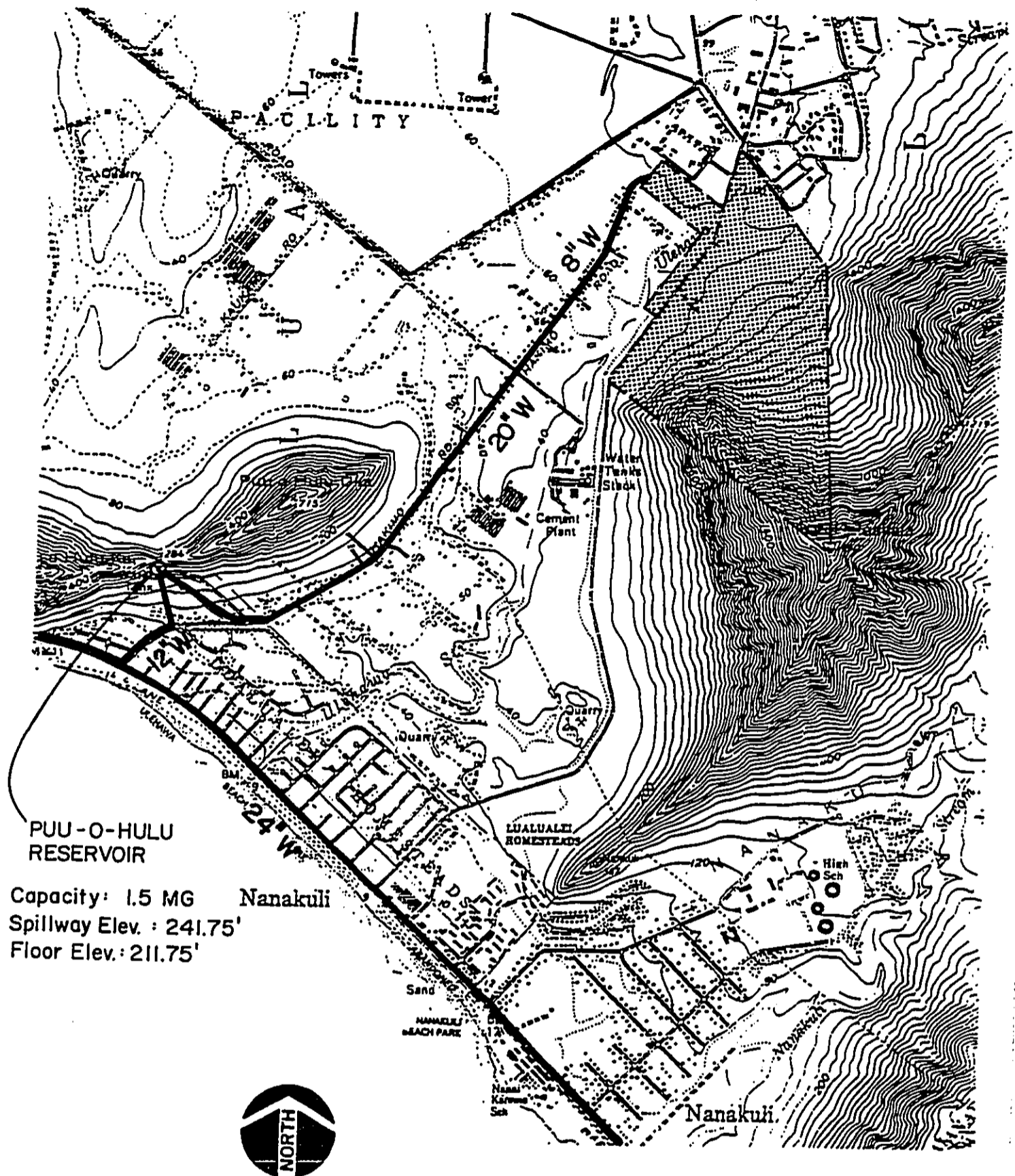
communities; and affect the supply of affordable housing. However, these general islandwide concerns have little or no application to the proposed Lualualei Golf Course project for reasons identified in this report.

4.14 INFRASTRUCTURE.

4.14.1 Water Supply:

A. Existing Conditions:

The Board of Water Supply's Puu-O-Hulu system services the properties along Hakimo Road. The water storage facility located closest to the project site is Puu-O-Hulu Reservoir, with a 1.5 MG capacity and spillway elevation at 241.75 feet. The reservoir services through a 20-inch transmission line and 8-inch distribution main along Hakimo Road. See *Figure 20*.



PUU-O-HULU
 RESERVOIR
 Capacity: 1.5 MG Nanakuli
 Spillway Elev. : 241.75'
 Floor Elev. : 211.75'



FIGURE 20

**EXISTING WATER SYSTEM
(BWS SYSTEM)**

SCALE: 1 : 24,000 (APPROX.)
 1000 0 1000 2000 3000 4000 5000 FEET
 HIDA, OKAMOTO & ASSOCIATES, INC.
 Consulting Engineers

B. Project Water Demand:

The projected water demand for the proposed golf course is based on BWS Water System Standards (1985). A domestic water demand of 9,900 gallons/day, based on typical domestic requirements for the maintenance building and clubhouse, is estimated for the project and is broken down accordingly:

**TABLE 8
LUALUALEI GOLF COURSE
BREAKDOWN OF ESTIMATED
DOMESTIC WATER DEMAND**

Activity	GPD
50-seat Restaurant	2,000
250 golfers (peak day)	2,500
30 employees (peak day)	600
150 showers (peak day)	3,750
2 washing machines	1,000
Total:	9,850

A water demand of 0.6 MGD is estimated for golf course irrigation of approximately 100 acres. Irrigated areas include greens, tees, fairways and roughs, clubhouse landscaping, and plant nursery. A typical golf course irrigation rate of 1.5 inches per week is assumed. Non-potable water from three on-site wells will supplement rainfall to meet the irrigation requirement.

A projected water demand for fire protection is 2,000 gallons per minute (gpm) over a 2-hour duration for the clubhouse and maintenance. This demand is based on the Water System Stan-

dards' fire flow rate for schools, small shopping centers, neighborhood businesses and hotels.

C. Proposed Water Supply System:

The proposed water supply plan will contain 2 systems: (1) a potable water system for the domestic water supply for the clubhouse and maintenance building; and (2) a non-potable water system for golf course irrigation and fire protection. The latter system was described above in *Chapter III*.

The potable water system will be connected to the existing 8-inch BWS water line along Hakimo Road. A new 8-inch line will be located along an entry road by the nursery facility. A new 6-inch water line will be connected to the 8-inch line and service the golf course clubhouse and maintenance building (See *Figure 6*, above).

D. Impacts and Mitigation Measures:

Positive impacts resulting from the proposed water system are anticipated and include (1) using non-potable water sources for irrigation of golf course and landscaping; and (2) upgraded fire protection for the vicinity.

Possible negative impacts from the system include (1) increased demands on the BWS source and distribution system due to approximately 9,900 gpd demand from the clubhouse and

maintenance building; and (2) decreases in groundwater quality due to pumping of irrigation water from the two wells on-site. In the event that significant changes in ground water quality occurs during monitoring of the wells, other source alternatives will be considered.

4.14.2 Wastewater Facilities:

A. Existing Conditions:

Presently, the property is not served by the City and County's wastewater collection and disposal system. Residential areas between the project site and the junction of Waiolu Street and Hakimo Road are serviced by cesspools. Wastewater disposal by cesspools is a major issue within the Waianae Development Plan area. The City has no plans to serve the Agricultural District with public sewers.

B. Project Wastewater Facilities Demand:

Wastewater flow from the project is expected to be generated primarily from clubhouse activities (i.e. meal preparation, toilets and showers and laundry area washings). The average daily wastewater generated from such activities is estimated at 1,800 GPD and will be typical of domestic wastewater in composition.

C. Proposed Wastewater System:

The major components of the proposed project wastewater collection and disposal system are (1) the wastewater collection system; (2) the treatment system; and (3) the wastewater effluent disposal system. The system will serve only the golf course complex.

The proposed collection system is shown in *Figure 5*, page 20. It will be located on the west side of the clubhouse area. A gravity sewer will collect and convey the wastewater to the system's treatment facility.

The proposed wastewater treatment plant will be located makai of the maintenance facility. The solids (sludge) removed by the treatment process will be disinfected, dewatered and applied to the golf course and landscaping as soil conditioner. Any surplus sludge will be hauled to an approved City Sanitary landfill for final disposal in compliance with State Health Department rules.

The treated effluent will be chlorinated and conveyed to an aerated blending pond which will be used to mix effluent with non-potable irrigation water. The pond will be lined to prevent direct infiltration of irrigation water. Approximately 1.4 percent of the estimated golf course irrigation water requirement can be supplied by the treated effluent from the project.

D. Impacts and Mitigation Measures:

Irrigation of the golf course with treated effluent will reduce the demand for irrigation water from non-potable sources.

With proper operation, objectionable odors will not be generated from the treatment plant. Pumps and blowers normally associated with treatment plants will be enclosed within a control building to reduce the impact of operating noises.

Placement of the treatment plant below ground level and landscaping the perimeter fence area will reduce the visual impact on users of the golf course and the general public passing on Lualualei Access Road.

4.14.3 Solid Waste Disposal Facilities.

A. Existing Conditions:

Because the project site is vacant and unused land, it is not serviced by the City refuse collection program or any comparable private refuse collection service.

B. Proposed Solid Waste Services:

It is anticipated that at full development the activities within the project will generate a de facto population of 200 persons who will each generate approximately 2.32 to 4 pounds of refuse

each day for a total of 700 pounds of solid waste each day. Solid waste will be collected by a private collection company and disposed at public or private landfills.

C. **Impacts and Mitigation Measures:**

The proposed activities within the project site will place additional demand on County waste disposal facilities. It is expected that State and County revenues derived from the complete golf course facilities will be sufficient to finance the developer's fair share of the cost of major capital improvements such as solid waste disposal facilities, and to provide the same level of per-unit services.

The County has future plans to construct a solid waste transfer station. Solid waste collected at this station will be hauled either to a sanitary landfill site for disposal or to the H-Power plant.

4.15 PUBLIC FACILITIES AND SERVICES.

4.15.1 Schools.

A. Existing Conditions:

The nearest public school to the project site is Nanakuli High School located along makai Farrington Highway in the Nanakuli area.

B. Impacts and Mitigation Measures:

The proposed project is not expected to add additional students to the current public schools enrollment in the immediate Nanakuli area. Nevertheless, the developer has offered, as part of the project's Development Plan Community Benefits Proposals, the following benefits specifically targeted for students residing in the Nanakuli-Waianae district and attending its public schools:

1. Contributions to Nanakuli and Waianae High Schools in the form of \$100,000 endowment funds for each school to be used for special education needs of Waianae and Nanakuli public education students which are determined to be needed by such students by the State Department of Education but cannot be funded by the DOE.

2. Provide year round access to meeting rooms and service facilities of the golf course clubhouse for special events sponsored or conducted by organizations or groups associated with the various public schools in the community at very nominal costs only to cover clean up/maintenance costs.

3. Permit the use of the golf course and its support facilities by golf teams of the various high schools in Leeward Oahu for competitive golf matches and tournaments at no charge.

No mitigation measures are considered necessary since there will be no impact on local schools.

4.15.2 Police/Fire Protection:

A. Existing Conditions:

Personnel from the Waianae Police Substation will provide police protection services to the project site and uses of the course. The current manpower at this Substation consists of 8 regular duty officers for each shift. Under normal conditions where personnel are available, response time is 15 minutes to the general area containing the project site.

Personnel from the Nanakuli Fire Station will provide fire protection services to the golf course. The Nanakuli Fire Station,

located approximately 3.4 miles from the project site, is closest to the site; the backup fire unit to that Station is located at the Waianae Fire Station located about 8 miles away. From the Nanakuli Station, fire trucks are expected to be able to access the project site in about 12 minutes.

B. Impacts and Mitigation Measures:

The developer 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 and operation. Besides private security measures, additional private manpower would be required of sponsors of special events at the course and they would coordinate with local police officials. Tax revenues generated by the project should more than cover the costs of police protection services to be provided to the course through regular beat inspections.

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

The clubhouse and maintenance building 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 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.

4.15.3 Health Care Facilities.

A. Existing Conditions:

The nearest health care facility is the Waianae Coast Comprehensive Health Center located at 86-260 Farrington Highway, approximately 11 miles from the project site. Ambulance services to the site would come from the Waianae Fire Station where ambulance services are available round the clock. The nearest hospital to the site is the new St. Francis Hospital in Ewa which can be reached from the project site within about 20 minutes.

B. Impacts and Mitigation Measures:

Visitors and workers at the golf course can be expected to place only a slight demand on the operations of the Waianae Coast Comprehensive Health Center medical facilities and an even slighter demand on St. Francis hospital. Since no residents will

be living on the site, the project's impact on these facilities will be slight. Therefore, no mitigation measures are proposed.

4.15.4 Recreational Facilities.

A. Existing Conditions:

There are several City and County recreational facilities located in the general area of the project site. Private commercial recreational activities are also located in the area. The beaches and ocean are major recreational attractions along the Waianae Coast as several beach parks are located along Farrington Highway. These include Mailili Beach, Maili Beach Park Maipalaoa Beach, Puuhulu Beach, Ulehawa Beach Park, Nanaikapono Beach, Kalaniana'ole Beach, Nanakuli Beach Park, Zablan Beach, Piliokahe Beach, Manner's Beach, Hawaiian Electric Beach Park and Kahe Point Beach Park.

B. Impacts and Mitigation Measures:

Development of the project will create a new recreational facility for golfing within the area. The course will be a daily-fee course available to the public which will have a beneficial effect on golf course availability to local residents/golfers.

No mitigative measures are proposed because no adverse effects on area recreational facilities arising from the project are expected. Overall, the project will have a positive effect on the

availability of recreational opportunities within the immediate community and along the Waianae Coast.

4.16 UNAVOIDABLE ADVERSE IMPACTS.

4.16.1 Unavoidable Short-Term Adverse Impacts:

- Soils will be temporarily disturbed by grading, excavation and mounding activities during project construction.
- 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.
- Vegetation will be removed from 154 acres to allow for golf course and infrastructure construction.
- Wildlife utilizing the site and immediate adjacent areas may be displaced by construction activities temporarily; construction activities will discourage wildlife from feeding at or migrating through the site.
- Operation of construction equipment and vehicles may temporarily impede traffic in the area.
- Negligible releases of air contaminants will occur from construction equipment. Emissions of fugitive dust may occur during dry periods as a result of construction activities.
- The visual character of the area will be affected by construction activities and by the presence and operation of construction equipment.

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

4.16.2 Unavoidable Adverse Long-Term Impacts:

- Modification of current topography to accommodate portions of the project.
- Approximately 13.5 acres of "prime" agricultural lands will be converted to golf course use from their current non-use.
- Up to 0.6 mgd of groundwater will be used to irrigate the golf course; approximately 9,900 gpd of potable water from the Board of Water Supply's Waianae Water System will be used.
- Small contributions of nitrogen compounds will enter groundwater from treated wastewater effluent irrigation and occasional fertilization of the course.
- Stormwater runoff from the project site could contain some minor quantities of fertilizer nitrates and pesticides.
- Seven archaeological sites considered "no longer significant" by the State will be affected by project development.
- Vehicles using Farrington Highway, Hakimo Road, Paakea Road and Lualualei Access Road to reach or leave the golf course will have a minor effect on traffic flow.
- Some additional noise will be generated by golf course traffic causing a very slight increase in noise levels along local roadways used to approach/leave the course.
- Air quality at area roadways will receive a minor addition of traffic-related emissions.

- There will be an additional 700 pounds/day of refuse generated by the project which must be accommodated by public solid waste management facilities.

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

4.17 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 259.5 acres of land required for project development. Money, construction materials, manpower and energy will all be expended to complete construction and operate the facility. The impact of utilizing these resources should, however, be weighed against the economic benefits to the residents of the region, the City and the State, and the consequences resulting from not proceeding with the project.

The lands involved in the project will not be available for agricultural use as long as the golf course exists; however, the golf course will be a landscaped area which, thus, would be compatible with agricultural and rural uses in the region. Future agricultural use of the project site would be questionable in light of the long-standing undeveloped and unused character of the site and the doubtful feasibility of agricultural use of the site.

There will be a permanent commitment of private funds and resources to plan, design, construct and operate the golf course facility. 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 and off-site improvements constructed and operated by the developer, there will be an increase usage of certain public facilities (BWS water system, local roadways, etc.) and greater load on City facilities for solid waste disposal.

The commitment of resources required to accomplish the project includes labor and materials, which are mostly non-renewable 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.

4.18 SUMMARY OF UNRESOLVED ISSUES.

At this stage of project development, a significant unresolved issue concerns the specific negotiated community benefits which will ultimately be provided as part of the project given the pending City decision on golf course community benefit standards which do not exist at the present time.

As presented in other sections of this EIS, issues arising from project implementation can generally be mitigated by measures identified in the various appended project studies.

Finally, in its comments on the draft EIS for the project, the Office of State Planning noted the presence of two Navy communication transmitter towers

located approximately 1/2 to 3/4 miles west of the project site and suggested that the Final EIS review the impact of these transmitters on the project and mitigation measures. According to Dr. Bruce Anderson of the State Health Department, scientific studies are "inconclusive and contradictory" about the potential health effects of so-called non-ionizing radiation, which includes electromagnetic fields from broadcast antennas, power lines, television sets, computer terminals and household appliances. (See. Hon. Adv. Nov. 28, 1990.)

Additional research and study of the impact, if any, of the project on the existing Navy very-low-frequency (VLF) and low-frequency (LF) communication transmitters within Lualualei Valley must be undertaken. While it is expected that there will be no impact or only insignificant impact on these transmitters because of the low intensive character of the proposed golf course, such study will be conducted by the developer in order to provide definitive findings on this matter for interested public and private agencies, organizations and individuals. Upon study completion, its findings and conclusions will be disclosed accordingly. Presently, however, this matter continues to be an unresolved issue with respect to the project's environmental impacts.

CHAPTER V

Alternatives

CHAPTER V: ALTERNATIVES.

Alternatives for the project site have been considered which would utilize the land in question for either agriculture or its current vacant use. Only these two alternatives were considered since they reflect plausible options for the site given its current use and historical use.

5.1 NO-ACTION ALTERNATIVE.

The no-action alternative would involve no change to the existing project site for the foreseeable future. The vacant, unused status of the site would continue. The frequency of hillside fires within the Nanakuli-Waianae coast suggest that this alternative is not preferable since it would not reduce the proven risk of such fires within the project site in the future. In 1990, a large portion of the site was burnt as a result of such a fire.

Access to the site would be restricted under this alternative. The restricted access would be necessary for safety and liability reasons in light of the current proliferation of kiawe forests and dense mature grasses within the site.

The current topography, soils conditions, intermittent surface water flow, groundwater resources, runoff, vegetation and wildlife within the site would not change. Other factors that would not be affected under this alternative would include archaeological resources, traffic, noise, air quality, population, employment, government expenditures, infrastructure and public services.

Under this alternative no new local jobs would be generated and personal income and recreational opportunities resulting from the project would not arise. The generation of property taxes from the site would remain at current levels. The owner would be forced to continue paying taxes without gaining any offsetting income from the site.

As compared with the proposed project, this alternative would create less environmental effects. Social and economic benefits, as well as recreational benefits, would not be generated under this alternative.

5.2 AGRICULTURE ALTERNATIVE.

Under the "agriculture alternative", the project site could be productively cultivated only within the 13.5 acres of Class "B" lands as identified under the U.H. Land Study Bureau soils rating system. All other lands within the site would have to remain vacant and unused because of their Class "E" soils rating which indicate that such lands are only marginally or poorly suited to crop cultivation.

The irrigation water requirements for the productive 13.5 acres within the site would have to be obtained from the basalt aquifer groundwater since brackish water from the shallower limestone aquifer would contain too much salt for most marketable crops. The prohibitive cost of developing and tapping the basalt aquifer to irrigate a mere 13.5 acres of land would probably render any crop cultivation far more costly than the possible revenues it might be able to generate on the diversified agriculture market.

Existing limited market potentials for crops that would be ecologically adapted to the site's overall harsh soil conditions and dry climate would also constrain the viability of any agricultural use of the project site.

Because of the small area of productive soils within the site, the agriculture use alternative would probably result in little soil erosion as compared with the development of the project site. Fertilizer and pesticide use within the site would be confined to the 13.5-acre parcel; thus, the potential for airborne drift of sprayed chemicals and leaching of chemical into groundwater resources would be confined to a substantially smaller area although more concentrated applications of farm fertilizers and pesticides within that area would probably occur.

Drainage conditions would not be significantly affected by this alternative since only 13.5 acres of the Ulehawa Stream drainage basin would be affected by soil cultivation practices, if any, under this alternative.

Agriculture use of the 13.5 acres would probably require some heavy equipment operation during planting and harvesting if the type of crop grown on the 15-acre site requires such equipment in order to be planted or harvested. Such equipment would generate significant noise during daytime periods.

Fugitive dust, crop burning smoke (possibly) heavy equipment exhaust fumes would be created by operations required for agriculture use of the 13.5-acre parcel. On the other hand, there would be fewer workers and resident vehicles added to the local roadways and little related exhaust emissions as a result of agricultural development.

Agricultural use of the project site would not increase the area's population base or provide significant job opportunities within the community. In contrast, the proposed project would create 75 direct, on-site jobs and many other secondary jobs and related economic transactions.

Few, if any, governmental expenditures and revenues would be involved under this alternative because no community services would be required. In contrast, the project would involve greater governmental expenditures than this alternative; however, it would also generate much greater revenues and provide a tax surplus.

Less property taxes would be paid under this alternative than under the proposed project. Little domestic wastewater and solid waste would be generated under this alternative and it would have less impact, if any, on public infrastructure.

CHAPTER VI

Relationship To Existing Policies & Plans For The Affected Area

CHAPTER VI: RELATIONSHIP TO EXISTING POLICIES & PLANS FOR THE AFFECTED AREA.

This Chapter includes a discussion of the relationship of the project to the objectives and policies of the Hawaii State Plan, the City's General Plan and the City's Waianae 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, Chap. 226, Hawaii Revised Statutes, and applicable priority guidelines and functional plan policies.

6.1.1 Objectives and Policies:

Sec. 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.

Sec. 6(b): Applicable Policies:

- (2) Promote Hawaii as an attractive market for environmentally 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 70 full-time jobs upon completion which is anticipated to be in 1995. Waianae historically has had one of the higher unemployment rates on Oahu. Thus, the jobs expected to be generated from the construction and operation of the project and the secondary employment effects of golf course construction and operation should contribute significantly towards reducing the current shortage of jobs along the Waianae Coast. Golf course jobs will be less vulnerable to fluctuations in the visitor industry market and, thus, more stable.

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 Lualualei Valley, and will benefit the local population and Hawaii's people.

The aloha spirit is indigenous to the area and the natural beauty of the site can be seen both as a resource and asset of the project, to be protected and enhanced by the developer.

Sec. 11(a): Objectives for the physical environment - land-based resources.

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

Sec. 11(b): Applicable policies:

- (1) Exercise an overall conservation ethic in the use of Hawaii's natural resources.
- (9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.

Discussion: In light of the limited potential of the project site for any viable agricultural use, housing or other more intensive uses, the proposed project represents a conservative and prudent use of the land in question which essentially retains future use options for the subject site. The project does not irretrievably commits the site to a single use (i.e. commitment of the site for urban develop would physically foreclose future land use options for the site for many years to come).

And the proposed use would assure compatibility between recreational (golfing) activities within the site and rural/small farming activities in the surrounding areas. The golf course will blend into the open character of the Puu Haleakala Ridge and foothills and the sparsely developed, "country" atmosphere which pervades Lualualei Valley.

Sec. 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.

Sec. 13(b): Applicable Policies:

- (2) Promote the proper management of Hawaii's land and water resources.

Discussion: The land and water resources of the project site will be properly managed. Nearly all the land will be reserved in undisturbed and recreational open space. The project will not stress the potable water resource capabilities of the Board of Water Supply as it will depend on on-site groundwater aquifers for the bulk of the project's irrigation water needs.

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 may 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 and air quality. Noise and air quality levels at the project will be well within governmental standards.

Economic Priority Guidelines:

Sec. 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 will use water drawn from on-site wells for irrigation of the golf course and other landscaping purposes.

Land Resources Priority Guidelines:

Sec. 104(b)(2): Make available marginal or non-essential for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

Discussion: As previously noted, the site contains land which are marginal or poor for agricultural use and non-essential for agricultural use. The proposed recreational use of the site is of very low intensity and appropriate to the rural character of the area.

Sec. 104(b)(6): Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces.

Discussion: The developer will build the necessary infrastructure such as the new service road to the project, improvements at the intersection of Farrington Highway and Hakimo Road, on-site roadways, potable and irrigation water supply systems, a wastewater collection, treatment and disposal system, and drainage and erosion control systems for the project.

Sec. 104(b)(13): Protect and enhance Hawaii's open spaces.

Discussion: Most of the total 259 acres within the project site will be landscaped open space with only a small percentage of the such acreage being outdoor recreational land use (clubhouse).

6.2 STATE FUNCTIONAL PLANS.

The State Functional Plans translate the broad goals and objectives of the Hawaii State Plan into detailed courses of action. The relationship of certain provisions in these Plans with the proposed project are discussed 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 agriculture 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 soil surveys and classification systems provide evidence that the lands within the project site are marginally or poorly suited for agricultural use. The absence of any agricultural activity on most of the site for decades support this conclusion. Implementation of the proposed project would fulfill objectives and policies for the economy in general as described above and in conformance with this implementing action.

State Recreational Functional Plan

The purpose of the project is to provide recreational facilities – golf course and driving range. Its facilities will be open to the public.

State Health Functional Plan.

This Functional Plan focuses on public health programs under the State Health Department's jurisdiction. Several DOH programs apply to the project, including the review of private wastewater treatment systems, discharges to the air or

groundwater, 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 DOH in these functional areas.

State Historic Preservation District Plan.

Almost all of the policies and implementing actions in this Functional Plan are directed at State agencies, especially the Department of Land and Natural Resources. An archaeological survey of the project site has been conducted and the findings will be processed in accordance with this Functional Plan.

6.3 CITY AND COUNTY GENERAL PLAN.

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

6.3.1 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 project will generate two types of employment opportunities, those in construction and those in operation. An estimated 70 on-site operational jobs will be created by the project. There will be

another 45 indirect and induced jobs generated by the project. Construction jobs should result in 170 positions during project construction. Employment in both categories will contribute to the overall economy through additional income and resulting taxes and spending.

Objective C: To maintain the viability of agriculture on Oahu.

Objective C, Policy 5: Maintain agricultural land along the Waianae coast for truck farming, flower gardening, aquaculture, livestock production, and other types of diversified agriculture.

Discussion: The proposed project 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 one of the few non-agricultural uses of land which could be converted to agricultural use with little difficulty.

6.3.2 Transportation and Utilities.

Objective B, Policy 5: Provide safe, efficient, and environmentally sensitive waste-collection and waste-disposal services.

Discussion: The developer will draw water from the Board of Water Supply's transmission/distribution system to meet the project's limited potable water needs. This need can be met without adversely affecting supply to other users in the Lualualei BWS service area.

A private wastewater collection, treatment and disposal system, designed and operate in accordance with the State DOH and City Public Works Department requirements and rules, will service the proposed project. Treated effluent from the project will be applied to the course for irrigation if permitted by and in accordance with applicable State DOH rules and regulations.

6.3.3 Physical Development & Urban Design.

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 Waianae-Nanakuli area has a rural setting. The project will be a development of similar rural style and will maintain 259 acres of landscaped open space. The project will be designed to complement the country environment, and natural surroundings.

6.3.4 Culture and Recreation.

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 local, islandwide, statewide residents and visitors.

6.4 WAIANAE DEVELOPMENT PLAN

6.4.1 Common Provisions:

Sec. 32-1.5 (1)(A)(vii):

Discussion: This Common Provision establishes a standard of one 18-hole golf course/100,000 persons where possible. The project has the potential to help meet Oahu's need for 2-4 additional municipal golf courses by the year 2010 and 13 more private courses by year 2010.

Sec. 32-1.4(8):

This Common Provision defines "rural areas" accordingly:

Rural areas are characterized by a preponderance of open and agricultural lands with limited development clustered in small, low density residential areas which have a strong sense of community and a country-like environment.

...

The location and character of new development in rural areas shall be consistent with the above-described characteristics of such areas and be guided by the following principles and controls:

- (A) The visual attractiveness that distinguishes rural from urban and country from city shall be maintained.

...

- (E) Appropriately located sites shall be provided for community-based economic activities which utilize locally available raw materials and the skills of crafts people living in the area.

Discussion: The project will maintain and enhance the open space character of Lualualei Valley and, especially, the foothills of Puu Haleakala Ridge. In so doing, it will help to maintain the existing attractiveness of the area.

The project is expected to provide permanent jobs for up to 75 persons most of whom will be living in the community. Indirect jobs for local residents will also be generated by the project.

Sec. 10. Social Impact of Development:

This policy requires that, in evaluating any proposed development, its demographic, economic, housing, public service and environmental effects be considered.

Discussion: The proposed development is not expected to generate any significant population increase within the Lualualei Valley area. The influx of jobs due to the project is not expected to alter existing community characteristics as the project will be designed in accordance with prevailing community values.

The project will generate short-term employment during construction and long-term employment in the operation and support of golf course

facilities. Secondary jobs arising from these primary jobs also will be generated.

The proposed project will have no impact on housing supply or demand in the area as no housing units are proposed as part of the project and employees will either already live in the community or commute to work.

The project's effects on community and public services is expected to be minimal.

As already discussed, the project will substantially preserve the natural environment, open space and aesthetic qualities of its immediate environs.

6.4.2 Special Provisions:

Sec. 32-9.1:

Discussion: Under this provision, it is the expressed intent of the Waianac Development Plan that the development pattern in the area generally remain linear along Farrington Highway and that the area's overall agricultural and open space setting be retained.

The project, located along and below the Puu Haleakala foothills and a substantial distance from the scattered small farms and rural neighborhoods within the central portions of Lualualei Valley, conforms to and implements this policy priority for Waianac. The project provides for

continuation of the existing open space pattern dominating the character of Lualualei Valley and is located far enough from existing small farms and homesteads in the Valley so as not to pose a threat to their continued existence due to incompatibilities or property tax impacts.

CHAPTER VII

Consulted Parties And Participants In The DEIS Preparation Process

CHAPTER VII CONSULTED PARTIES AND PARTICIPANTS IN THE DEIS PREPARATION PROCESS

7.1 Consulted Parties

The Environmental Impact Statement Preparation Notice (EISPN) for the proposed Lualualei Golf Course was published in the OEQC Bulletin of December 23, 1990. The EISPN together with the Environmental Assessment report were delivered or mailed directly to the agencies and organizations listed below. The list contains parties believed to have an interest in the project.

Federal

Navy

U.S. Army Corps of Engineers

State

Department of Agriculture

Department of Health

Department of Land and Natural Resources

DLNR State Historic Preservation Officer

Department of Transportation

Office of State Planning

U.H. Environmental Center

City and County of Honolulu

Board of Water Supply

Department of Land Utilization

Department of General Planning

Department of Parks and Recreation

Department of Transportation Services

Fire Department

Police Department

Department of Public Works

Non-Government Agencies

Hawaiian Electric Company

Waianae Neighborhood Board

7.2 Participants in the DEIS Preparation Process

NAME	POSITION	HIGHEST POSITION	AREA OF EXPERTISE
Andrew J. Berger	Retired Professor	Ph-D Zoology	Terrestrial Vertebrates
Winona Char	President Char & Assoc.	M.S. Botany	Botany
Yoichi Ebisu	President Y. Ebisu & Associates	M.S. Electrical Engineering	Acoustical Consulting
Richard Green	Principal Murdoch & Green	Ph-D Soil Physics	Fertilizer & Pesticide
Hallett Hammat	Owner Cultural Surveys Hawaii	Ph-D Anthropoly	Archaeology
Harvey Hida	President Hida, Okamoto & Associates, Inc.	B.S. Civil Engineering	Civil/Environmental Engineering
John T. Kirkpatrick	Senior Research Assoc. Community Resources, Inc.	Ph-D Anthropoly	Socio/Economic
Tyrone T. Kusao	President Tyrone T. Kusao, Inc.	M.S. City & Regional Planning	Planning & Zoning Consultant
John Mink	Mink & Yuen, Inc	M.S. Geology	Hydrologist/Geologist
James Morrow	Environmental Management Consultant J. W. Morrow	M.S. Science	Air Quality
Patrick A. Ribellia	Attorney-at-Law	J.D. Law	Urban Planning & Zoning Law
Jonathan Shimada	President Pacific Planning & Engineering	Ph.D. Philosophy & Civil Engineering	Traffic Engineer

CHAPTER VIII

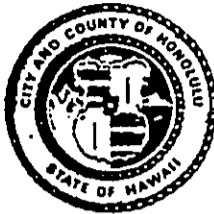
Comments During The Consultation Period

CHAPTER VIII. COMMENTS DURING THE CONSULTATION PERIOD

The following pages contain (1) a copy of DGP's determination letter requiring a EIS, (2) the project notice in the OEQC Bulletin of December 23, 1990, (3) a copy of the Environmental Assessment Report, and (4) comments received and follow-up responses.

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813



FRANK F. FASI
MAYOR

BENJAMIN B LEE
CHIEF PLANNING OFFICER

ROLAND D. LIBBY, JR.
DEPUTY CHIEF PLANNING OFFICER

WM

December 3, 1990

Honorable Bruce Anderson, Acting Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Mr. Anderson:

Chapter 343, HRS
Environmental Impact Statement (EIS) Preparation
Notice for Amendment Application from Agriculture to
Park (Golf Course) at Waianae, Oahu
Tax Map Keys 8-7-9: Por. 2, 8-7-10: 6, 10 and
8-7-19: Por. 1, Folder No. 91/W-2

The Department of General Planning has determined that the subject applicant action requires an EIS pursuant to Chapter 343, HRS, because the proposal, which involves an application for a Development Plan amendment, may have a significant impact on the environment. This letter, together with the enclosed EIS Preparation Notice should be published in the OEQC Bulletin under the "Register of Chapter 343, HRS Documents."

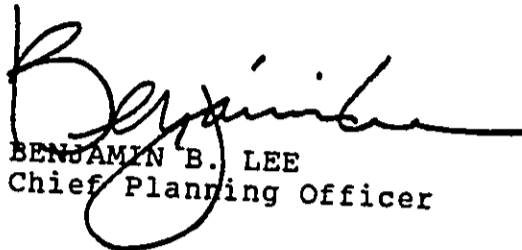
The contact person for this EIS will be:

Mr. Tyrone T. Kusao
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Honorable Bruce Anderson, Acting Director
Office of Environmental Quality Control
December 3, 1990
Page 2

If there are any questions, please contact Bill Medeiros
at 527-6089.

Sincerely,



BENJAMIN B. LEE
Chief Planning Officer

BBL:lh

Encl.

cc: Sanjiro Nakade
✓ Tyrone Kusao

DOCUMENT FOR PUBLICATION IN THE OEQC BULLETIN

DATE: Dec. 4, 1990 SUBMITTED BY: City Dept. of General Planning

THE DOCUMENT IS A (CHECK ALL THAT APPLY): BE SURE TO ATTACH 4 COPIES

CHAPTER 205A DOCUMENT	<input type="checkbox"/>	NEGATIVE DECLARATION	<input type="checkbox"/>
CHAPTER 343 DOCUMENT	<input type="checkbox"/>	EIS PREPARATION NOTICE	<input checked="" type="checkbox"/>
NEPA DOCUMENT	<input type="checkbox"/>	DRAFT EIS	<input type="checkbox"/>
		FINAL EIS	<input type="checkbox"/>
		ACCEPTANCE NOTICE	<input type="checkbox"/>
		FONSI	<input type="checkbox"/>

IS THE DOCUMENT A SUPPLEMENTAL EIS? YES NO

TITLE OF PROPOSED ACTION OR PROJECT: Proposed Lualualei Golf Course Project

LOCATION: ISLAND Oahu DISTRICT Nanakuli District
ATTACH PROJECT LOCATION MAP(S)

TYPE OF ACTION (CHECK ONE): APPLICANT AGENCY

* NAME OF PROPOSING APPLICANT Kabushiki Kaisha Oban
NAME OF CONTACT: c/o Mr. Harvey Hida
ADDRESS: 1440 Kapiolani Blvd., Suite 915, Hon. 96814
CITY: _____ STATE: _____ ZIP CODE: _____
PHONE: (808) 942-0066 or (_____) _____

* NAME OF PREPARER OR CONSULTANT: Hida Okamoto and Associates
NAME OF CONTACT: c/o Tyrone T. Kusao, Inc.
ADDRESS: 1188 Bishop St., Suite 2507
CITY: Honolulu STATE: Hawaii ZIP CODE: 96813
PHONE: (808) 538-6652 or (_____) _____

* ACCEPTING AUTHORITY: Dept. of General Planning, City & County of Honolulu
650 S. King Street, 8th Floor, Hon. 96813
Attention: Mr. William Medeiros

ESTIMATED PROJECT COST:	DOCUMENT PREPARATION COST:
FEDERAL FUNDS \$ _____	NEG DEC/EA \$ _____
STATE FUNDS \$ _____	DRAFT EIS \$ _____
COUNTY FUNDS \$ _____	FINAL EIS \$ _____
PRIVATE FUNDS \$ _____	SUP DRAFT EIS \$ _____
TOTAL \$ _____	SUP FINAL EIS \$ _____
	TOTAL \$ _____

EA TRIGGER (CHECK ALL THAT APPLY):

- USE OF STATE OR COUNTY LANDS OR FUNDS
- USE OF CONSERVATION DISTRICT LANDS
- USE OF SHORELINE SETBACK AREA
- USE OF HISTORIC SITE OR DISTRICT
- USE OF LANDS IN THE WAIKIKI SPECIAL DISTRICT

* All comments to be sent to Accepting Authority with copies to Applicant and Consultant.

OEQC FORM 89-01 (2/89)
PAGE 1 OF 2

- USE REQUIRING AN AMENDMENT TO A COUNTY GENERAL PLAN
- USE REQUIRING THE RECLASSIFICATION OF CONSERVATION LANDS
- CONSTRUCTION OR MODIFICATION OF HELICOPTER FACILITIES
- OTHER _____

BRIEF DESCRIPTION OF THE PROPOSED ACTION OR PROJECT WHICH WILL BE PUBLISHED IN THE OEQC BULLETIN (LIMIT OF 500 WORDS OR LESS): The proposed 18-hole, regulation golf course includes the construction of 18 golf holes (including fairways) along the Lualualei Navy Road in Nanakuli, Oahu, Hawaii; a clubhouse and ancillary/accessory structures for golf course maintenance; on-site parking areas; maintenance yard and building; cart storage area, and other related minor structures. The clubhouse and appurtenant structures and on-site parking areas will be located on the makai side of the Navy Road and will be linked to the course by a proposed underpass which would cross the Road. Located on the makai side of the Navy Road and next to the clubhouse will be a proposed driving range/farm nursery facility. The driving range will be constructed after completion of the golf course construction.

The golf course will contain 18 golf fairways and greens, several man-made lakes, a restaurant/bar and landscaping throughout the course and along its perimeter. The lakes will hold golf course irrigation water. The attached exhibit shows the proposed golf course layout/site plan.

(CONTINUE ON ANOTHER SHEET IF NECESSARY)

TAX MAP KEY(S): 8-7-9: por. 2 _____
8-7-10: parcel 6 _____
8-7-19: por. 1 _____

TOTAL ACREAGE: approximately 259.25 acres.

FOR OEQC USE ONLY

DATE OF SUBMISSION:
 DATE OF PUBLICATION:
 LAST DAY FOR CONSULTED
 PARTY REQUEST:
 COMMENT PERIOD ENDS:
 ACCEPTANCE DATE:
 PUBLICATION DATE OF
 ACCEPTANCE:

OEQC # _____
 PLANNER: _____

OEQC FORM 89-01 (2/89)
 PAGE 2 OF 2

OEQC BULLETIN



JOHN WAIHEE
GOVERNOR

OFFICE OF ENVIRONMENTAL QUALITY CONTROL

DIRECTOR

VOLUME VII

DECEMBER 23, 1990

NO. 24

REGISTER OF CHAPTER 343, HRS DOCUMENTS

The OEQC Bulletin is a semi-monthly publication. The publication dates of the bulletin are the eighth and twenty-third of each month. Applicants should deliver an appropriate number of Draft and Final EISs to the accepting authority before submitting copies to OEQC for distribution and publication. Environmental Assessments should be submitted to the accepting authority directly. Based on the assessment, the accepting authority will submit to OEQC a determination of a Negative Declaration or a Preparation Notice for publication in the bulletin. Draft and Final Environmental Impact Statements must be received by the fifth and twentieth days of the month for publication in the respective issue. Negative Declarations and Preparation Notices must be received at least five working days prior to the publication date. All documents submitted for publication in the OEQC Bulletin should be delivered to the Office of Environmental Quality Control, 465 South King Street, Room 104, Honolulu, Hawaii 96813. To ensure proper processing of documents, please attach OEQC Bulletin Publication Form with all submittals. These forms can be obtained by calling OEQC at 548-6915.

EIS PREPARATION NOTICES

The following actions have been determined to have significant impacts upon the environment. Environmental Impact Statements will be prepared for these projects. A 30-day consultation period commences with the initial publication of these projects in the bulletin (see deadline dates). The purpose of soliciting comments during the consultation period is to establish the scope and the depth of coverage that the Draft EIS should have.

LUALUALEI GOLF COURSE

Location: Nanakuli, Oahu
TMK: 8-7-09:02
8-7-10:06
8-7-19:01

Please send your comments to:

Accepting Authority: Department of General Planning
Attn: William Medeiros
650 South King Street,
8th Floor
Honolulu, Hawaii 96813

with a copy to:

Applicant: Kabushiki Kaisha Oban
c/o Harvey Hida
1440 Kapiolani Boulevard,
Suite 915
Honolulu, Hawaii 96814

and a copy to:

Consultant: Hida Okamoto and Associates
c/o Tyrone Kusao, Inc.
1188 Bishop Street,
Suite 2507
Honolulu, Hawaii 96813

and a copy to OEQC.

Deadline: January 22, 1991

The applicant is proposing the development of an 18-hole, regulation golf course along the Lualualei Navy Road in Nanakuli. Also proposed is the construction of a clubhouse and ancillary/accessory structures for golf course maintenance; on-site parking areas; maintenance yard and building; cart storage areas, and other related minor structures. The clubhouse and appurtenant structures and on-site parking areas will be located on the makai side of the Navy Road and will be linked to the course by a proposed underpass which would cross the road. Located on the makai side of the Navy Road and next to the clubhouse will be a proposed driving range/farm nursery facility. The driving range will be constructed after completion of the golf course.

TYRONE T. KUSSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS: (808) 531-4552
FAX: (808) 531-4552

September 4, 1990

Mr. Benjamin B. Lee
Chief Planning Officer
Department of General Planning
City and County of Honolulu
630 S. King Street, 8th Floor
Honolulu, Hawaii 96813

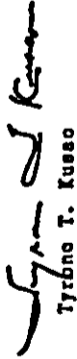
Dear Mr. Lee:

Subject: Waianae Development Plan Land Use Map
Amendment Application For Proposed Lualualei
Golf Course, TMK 8-7-9: Por. 2, 8-7-10:6,
8-7-19: Por. 1, Nanakuli, Hawaii

On behalf of the applicant, Sanjiro Nakade, I am submitting two copies of the Development Plan amendment application and environmental assessment report for the subject project. This document addresses those items which are required for golf course applications pursuant to your agency's guidelines. We respectfully request that this application be processed during the 1991 Annual Amendment Review period.

Your assistance in processing the enclosed application is sincerely appreciated. Should there be questions or you require more information, please contact me.

Very truly yours,


Tyrone T. Kusso

cc: Mr. Sanjiro Nakade

WAIANA'E
DEVELOPMENT PLAN AMENDMENT APPLICATION REPORT
and
ENVIRONMENTAL ASSESSMENT

PROPOSED LUALUALEI GOLF COURSE PROJECT

TMK: 8-7-9: por. 2; 8-7-10:6 & 10; 8-7-19: por.1

Lualualei, Nanakuli, Oahu, State of Hawaii

Sanjiro Nakade
The Commerce Tower
Suite 915
1440 Kapiolani Blvd.
Honolulu, Hawaii 96814
Applicant

Tyrone T. Kusso, Inc.
1188 Bishop Street
Suite 2507
Honolulu, Hawaii 96813
Agent

SEPTEMBER, 1990

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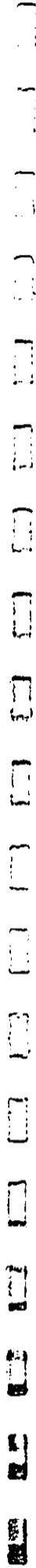
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PREFACE

This proposed Development Plan Amendment Application/ Environmental Assessment Report is prepared pursuant to the new Guidelines for proposed new golf courses seeking City Development Plan approval which have recently been issued by the City Department of General Planning. The contents of this report address (1) standard Development Plan informational requirements which have been applicable to DP Amendment proposals for several years; (2) Environmental Assessment requirements set forth in those standard requirements; and (3) the aforementioned new DP Amendment guidelines applicable to golf course proposals.

LUALUALEI GOLF COURSE PROPOSAL
DP Amendment Report & Environment Assessment
August, 1990

INTRODUCTION.

This report provides the required information to be submitted to the City Department of General Planning pursuant to its recent, 1990 Guidelines for preparing Development Plan Amendment requests for the establishment of new golf courses for submittal to, and consideration during the 1990-91 Development Plan Annual Amendment Review. The report is based on requirements set forth in Department of General Planning Guidelines for Development Plan Amendments for Golf Course Development, 1990 and DGP staff suggestions and advice obtained during an August meeting.

The new DGP Guidelines require a DP amendment request for a new golf course to submit information on the following areas:

1. Information responding to standard DP Amendment reporting requirements contained in the DGP standard application form for DP amendments;
2. Information in response to criteria set forth in the DGP new guidelines applicable to golf course proposals; and

3. Information on applicant proposal(s) for community benefits commensurate with the impact and magnitude of the proposed golf course development. Such information is presented in this report.

Under separate cover and report form, an Environmental Assessment of the proposed golf course's possible environmental impacts is presented pursuant to the new DGP guidelines which requires henceforth that each new golf course DP amendment proposal address its social, economic, and environmental quality and other physical and infrastructure impacts. The applicant is committed to the timely preparation and submittal of a full-blown Environmental Impact Statement for the proposed Luualalei Golf Course pursuant to this new DGP Guideline requirement. The accompanying Environmental Assessment identifies some of the foreseeable impacts of the project and describes the subject matter to be addressed in the project EIS.

2. BACKGROUND INFORMATION.

2.1 Essential Information.

2.11 Applicant/Landowner:
 Sanjiro Nakade
 The Commerce Tower
 Suite 915
 1440 Kapiolani Blvd.
 Honolulu, Hawaii 96814

2.12 Request:
 Amendments to the Waianae Development Plan Land Use Map (City Ord. No. 83-11, Part II, as amended) from "Agriculture" to "Park/Golf Course" Use to facilitate the development of an 18-hole championship golf course open to the public in Luualalei Valley, Nanakuli, Oahu, State of Hawaii.

2.13 Acreage

The proposed golf course would encompass several abutting parcels of land containing approximately 259.25 acres of vacant land in Luualalei Valley, Nanakuli, situated just makai of the Luualalei Naval Ammunition Depot.



2.14 Location:

Exhibit "A" shows the location of the proposed golf course project. The site is located approximately 1.5 miles mauka and northeasterly of the Manakuli coastline within U.S. Census Tract No. 96.01. It is located along the northeasterly perimeter of Lualualei Valley and along the base of Puu Haleakala ridge which partially separates the project from the more concentrated residential and rural communities in Manakuli.

Ulehawa Stream, normally a drybed stream, separates the proposed golf course project, along its southerly and westerly boundaries from several dispersed small farms and individual homesteads which line and concentrate along Hakimo Road. Hakimo Road runs through the center of Lualualei Valley. Among these residences, the nearest dwelling unit to the project site appears situated approximately 150-175 feet from its southwesterly boundary.

2.15 Tax Map Key:

The project site is identified as TMK 8-7-9; por. 2 (236.154 ac.); 8-7-10; parcels 6 & 10 (17.093 ac.); and 8-7-19; por. 1 (6.0 ac.)

2.16 Existing Use:

The project site is comprised of vacant, unused lands. Except for a 15-acre parcel which had been leased to a tenant farmer, Ryoel Higa, for vegetables cultivation, the bulk of the project site has been vacant and unused for many years. The Higa leasehold ended voluntarily in 1988. Currently, the site is undeveloped and contains several dilapidated and abandoned structures (i.e. 2 quonset huts, collapsed storage sheds, an old wooden water tank).

2.17 State Land Use Boundary:

The site is classified "Agriculture District" under the State Land Use Law, Ch. 205, Hawaii Revised Statutes.

2.18 Development Plan Designations:

The project site is designated for "Agriculture" use on the Waianae DP Land Use Map. That portion of applicant's ownership which contains approximately 15 acres of land that forms part of the foothills to the Puu Haleakala Ridge is designated for "Preservation" Use. The Waianae DP Public Facilities Map indicates no proposed public or quasi-public improvement or use of the project site. Exhibits "B" and "C" shows the existing DP Land Use and Public Facilities Map designations of the subject site.

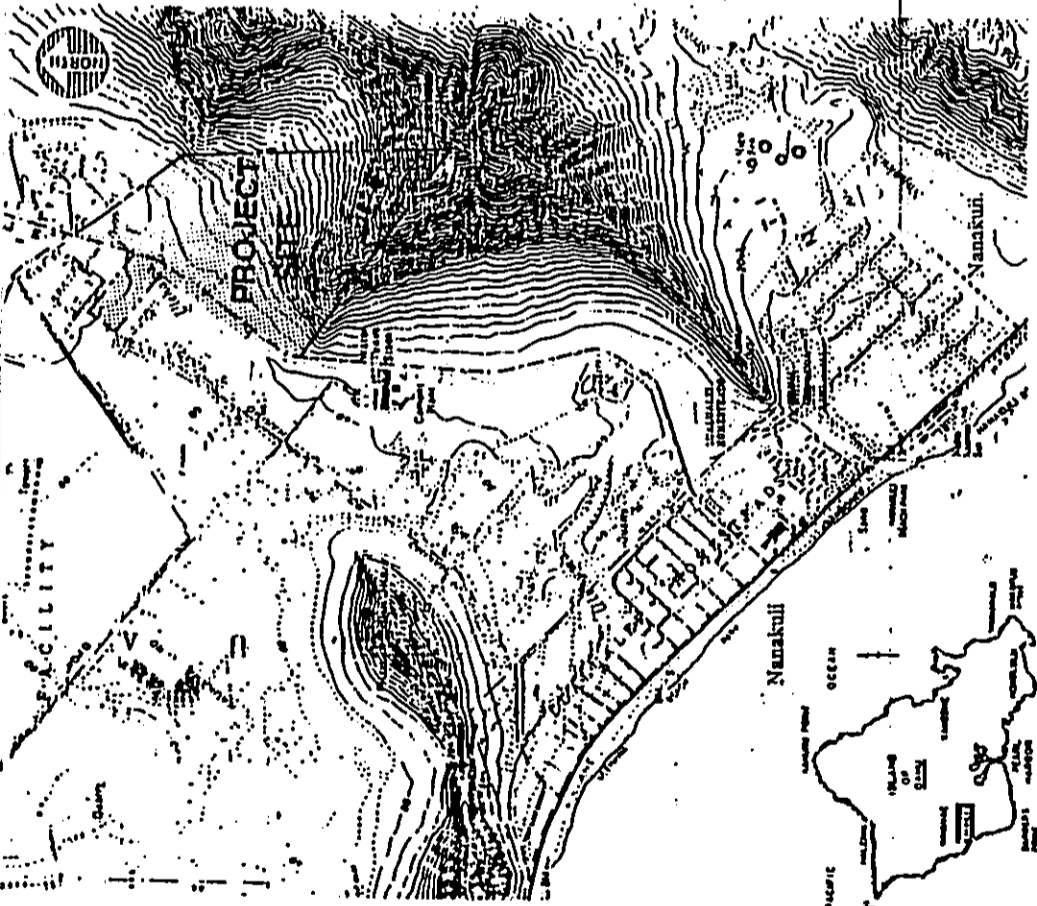


EXHIBIT 'A'
PROJECT LOCATION

VICINITY MAP
AS SCALE

SCALE: 1:24,000 (APPROX.)

0 1000 2000 3000 4000 FEET

HEDA, OCEANICO & ASSOCIATES, INC.
CONSULTING ENGINEERS
HONOLULU, HAWAII

-7-

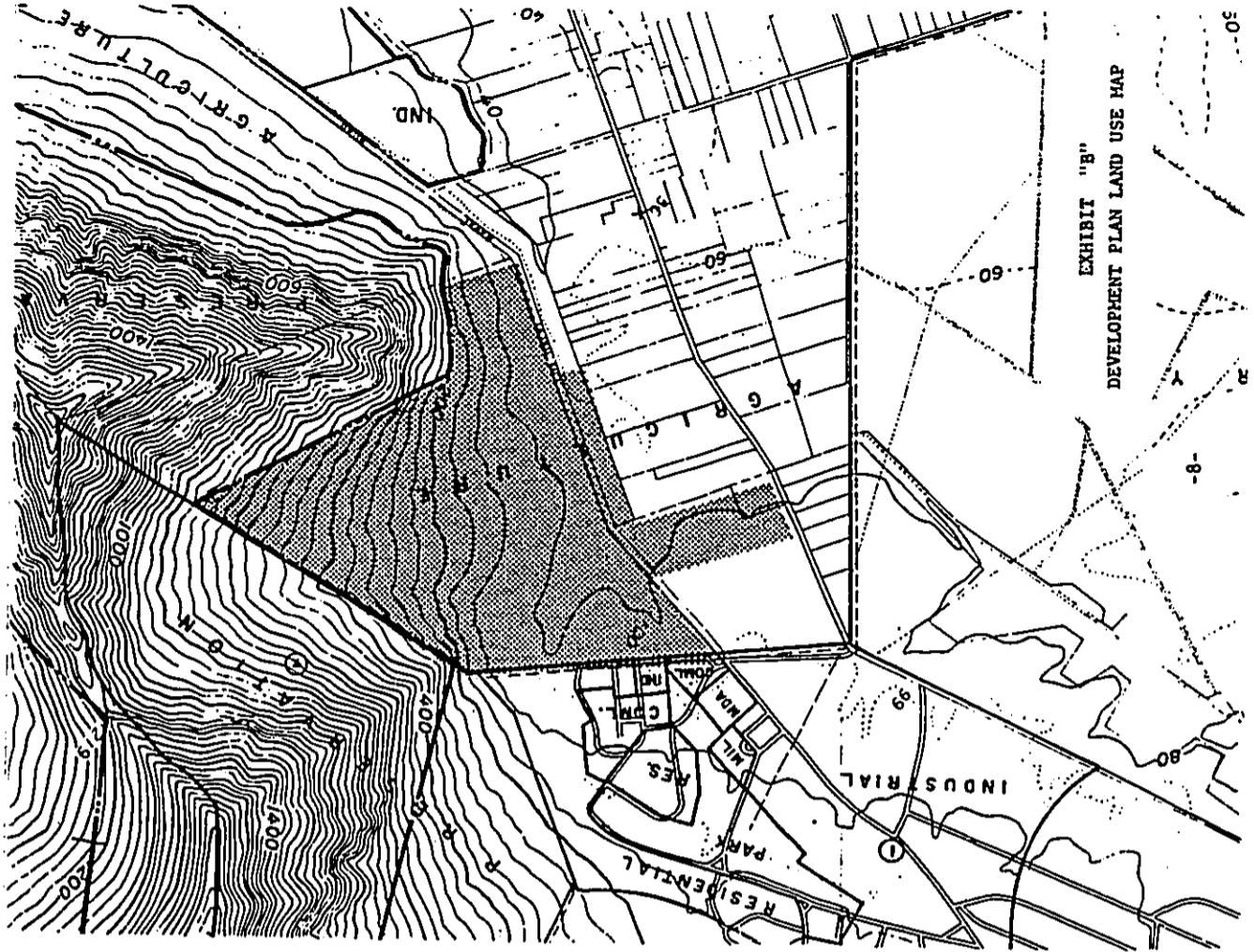
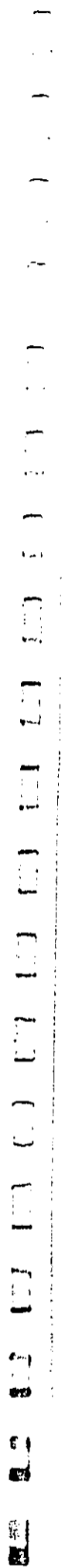
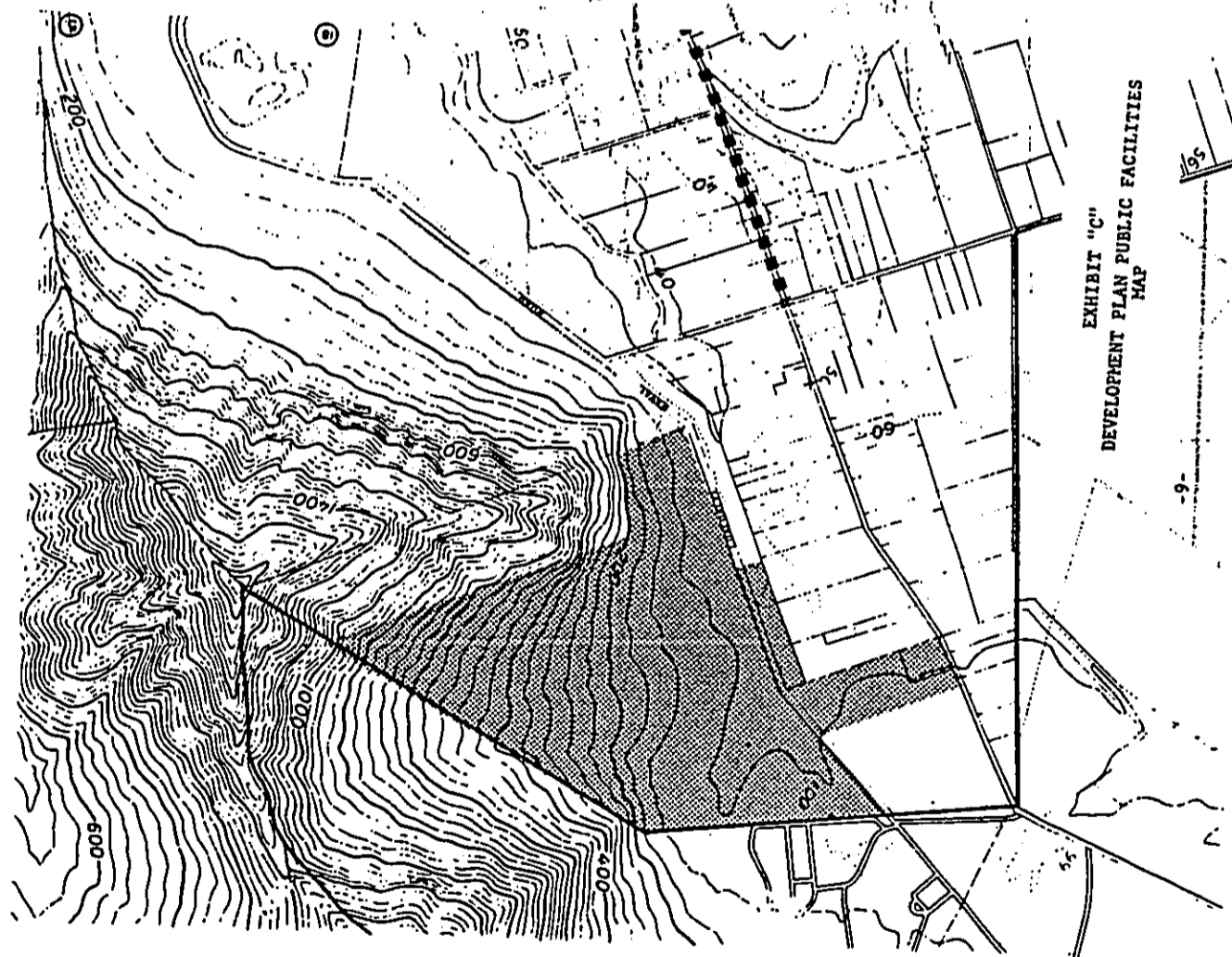


EXHIBIT 'B'
DEVELOPMENT PLAN LAND USE MAP





2.19 Existing Zoning

Corresponding to the existing DP Land Use Map designations of the project site, the existing zoning of the site is AG-2, General Agriculture District for the bulk of the vacant, flat portions of the site and P-1, Preservation for that part of the site which are foothills to Puu Haleakala ridge. (See Exhibit "D".) Note: The subject property for this application is entirely within the AG-2 District.

2.2 Property Description.

2.21 Property Boundary.

The subject property is bounded along its southerly (makai) and westerly boundary by the Lualualei Naval Road which leads to the Lualualei Naval Ammunition Depot complex. The northerly (mauka) and northeasterly boundary of the site runs along the edge of that complex. To the east, the project is bounded by privately-owned and State lands comprising Puu Haleakala ridge. Exhibit "A" also shows the boundary of the project site.

2.21 Natural Features:

Topography/slope:

Generally, the project site slopes in a southwesterly direction towards the Lualualei Naval Road. Approximately

1/3 of the site, situated below the 200 foot above sea level elevation, is relatively flat, sloping at a 12% rate from Lualualei Road upward to the foothills of Puu Haleakala ridge.

Above the 200-foot elevation level, the site takes on a more abrupt slope upward toward the back of the subject site. It is estimated that the slope within this "second tier" of the subject site is within the 10-30% range. The rest of the site along the foothills of Puu Haleakala ridge and the rear portions of the project site slope radically upward towards the peak of the ridge; however, no golf course construction will occur on this portion of the site as it will be left in its current, undeveloped state. Exhibit "A" shows the topography of the project site.

Vegetation:

The lower, flatter portion of the site directly abutting the Lualualei Naval Road contains mostly a weedy mixture of grasses and koa haole shrubs. About 15 acres within this flat area were cultivated for vegetables crops until early 1988. Today, a few of the crop plants and much of the irrigation system is still evident.

Kiawe forest and wild grasses dominate the rest of the project site along the Puu Haleakala ridge foothills. Above the 250-foot elevation level, rocky outcroppings become numerous and vegetation cover decreases. Recently, much of the Kiawe forests within the site was burned due to an unknown cause and many of the trees and ground cover have died.

Soils:

According to the U.S. Soil Conservation Service's Soil Survey (1972), the project site contains most Lualualei extremely stony clay, 3 to 35 percent slopes (LPE) with some Lualualei clay, 2 to 6 percent slopes (LUB) with portions of the site directly abutting the Lualualei Naval Road and covering the flatter portions of the parcel:

LPE soils occur on talus slopes on Oahu. The slope range is 3 to 35 percent, but in most places the soil is moderately sloping to steep. The soil is similar to LuB soils, except that there are many stones on the surface and in the profile. It is impractical to cultivate this soil unless the stones are removed. Runoff is medium to rapid, and the erosion hazard is moderate to severe.

LuB soils are characterized by slow runoff with a slight erosion hazard. This soil is used for sugarcane, truck crops, pasture, urban development and military installations.

2.23 Existing Use: Elaboration:

Until recently, about 15 acres of the lower portion of the project site was actively used for vegetables truck farming under a farm lease. Tomatoes, lettuce, mustard cabbage, pak choi and daikon for local consumption were grown there by an individual farmer-tenant; Ryohei Higa.

In an amicable and voluntary agreement, Mr. Higa agreed to terminate his truck farming operation on the subject site for good and valuable consideration in 1988, including a relocation of his truck farm to another site. In 1988, the protection of Mr. Higa's farming operation had been the primary reason for a withdrawal of the proposed project from active consideration by the Director of the Department of Land Utilization under a then-pending Conditional Use Permit application.

The 15-acre portion of the site represents approximately 6% of the total land area within the project site. The remaining

221 acres have never been used for agricultural purposes for decades. This reflects the largely poor agricultural productivity of the land as manifested in its Land Study Bureau ratings: about 50 acres within the site is rated as "B" soils, or relatively high productivity rating; while the rest of the site (approximately 221 acres) is rated as "E" soils, that is, soils having the lowest or poorest agricultural productivity capacity among all soil types according to the Land Study Bureau rating scale.

2.24 Project Layout

Exhibit "E" shows the schematic layout of the proposed project. Project plans call for the construction of the 18 golf holes on the mauka (easterly) side of Lualualei Naval Road in a championship course which would encompass the flat lands and more moderately sloping foothills to Puu Haleakala Ridge. A clubhouse and ancillary/accessory structures for golf course maintenance are proposed for construction on the makai (westerly) side of Lualualei Naval Road directly across the course. Such accessory facilities include on-site parking areas, maintenance yard and building, cart storage area, and other related minor structures. The clubhouse and appurtenant structures would be linked to the course by a proposed

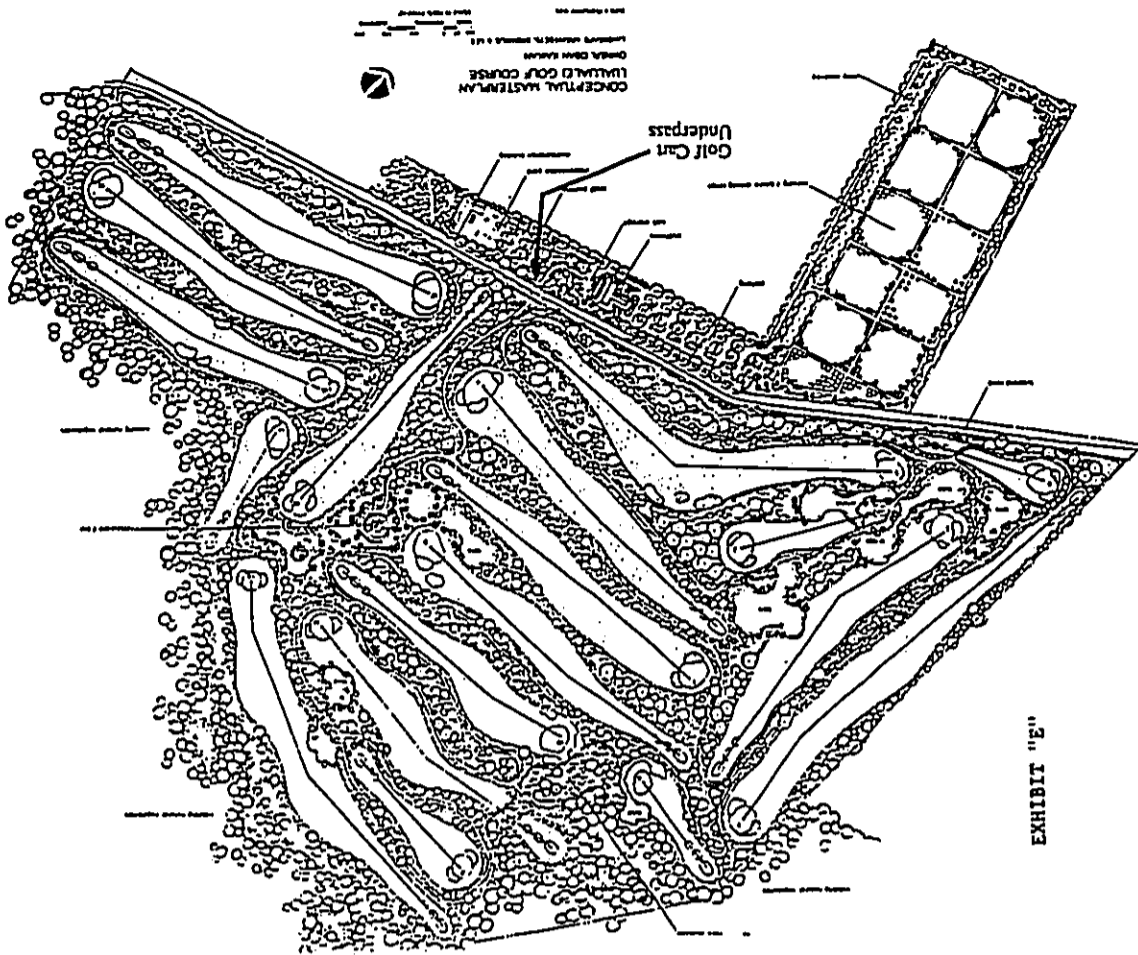


Figure 2: Site Plan

underpass which would cross under Luahualaei Naval Road pursuant to the request of the U.S. Navy.

Also located on the makai site of the Naval Road would be a driving range/farm nursery facility. Construction of the driving range would occur well after the proposed course has been constructed and in operation as a second phase of project development.

The golf course area will contain the 18 golf fairways and greens, several man-made lakes, a restaurant/bar near the starter's station and golf course landscaping throughout the area. The lakes will hold water for golf course irrigation requirements as well as serve as catch basins for any surface drainage runoff.

3. DEVELOPMENT PROPOSAL.

3.1 Proposed Use of Property (Master Plan).

Exhibit "E" shows the existing project master plan and the previous section discussed the proposed elements and uses contained in that plan.

Operationally, the proposed golf course will be open to public use. It will not offer memberships for sale to foreign nationals or local residents as the course is intended to be a privately-owned "public" course. Green fees will be charged to all users at rates which are comparable to those charged by such courses as the Milliani, Hawaii Kai and Makaha East golf courses.

It is the applicant's intent to keep the course available for use by, and highly accessible to local golfers and golf organizations to the maximum extent possible. The course will be a for-profit establishment; however, proceeds are expected to come primarily from generated green fees and on-site sales of golf-related goods and services.

3.2 Development Timetable/Estimated Cost.

Upon issuance of all required permits from the State and City and County of Honolulu, it is expected that completion of the project, including the construction of the driving range/farm nursery, will take 3-4 years. The estimated total project cost, including costs associated with required community benefits, is expected to be around \$30 million.

4. NEED FOR PROPOSED DEVELOPMENT.

4.1 Public Need.

Assessments of Oahu's golf course need appear to vary among interested and credible sources. On the "demand" side of the ledger, it has been estimated by the Hawaii Real Estate Research and Education Center, U.H. College of Business Administration, that in terms of Population/Golf Course ratios Honolulu is inferior to metropolitan areas of comparable size; metropolitan areas with large retirement populations; other resort areas; and other island markets servicing the visitor industry. The Center estimates that the current pent-up demand of golf courses on Oahu is 27 courses in addition to the existing courses and the distribution of the probable need is:

- * 5-7 municipal courses;
- * 1 private club;
- * 16 - 18 daily fee courses;
- * 3 -4 resort courses; and
- * 1 - 2 international membership courses.

See. Hawaii Real Estate Research and Education Center, U.H. College of Business Administration, Analyzing The Market and Environmental Impacts of the Golf Industry in Hawaii, February, 1990.

Oahu has 28 existing courses comprised of 9 military courses, 8 daily fee courses, 4 private courses, 4 municipal courses and 3 resort courses. Public access is available to 15 of the 28 courses as military and private courses are not available to everyone. Of the total 459 golf holes available on Oahu, only 261 holes are open to the public.

Municipal courses are operating near or at capacity supporting about 548,668 rounds annually (1987) or an average 137,167 rounds per course. Based on Oahu's 1987 resident population and applying the City's standard of one 18-hole course/100,000 persons, approximately 8 municipal courses are needed to meet demand; Oahu only has 4 existing courses. Four more are needed.



Three new courses are under construction: West Loch (municipal), Ko Olina #1 (resort) and Minami (private). Permits for another 7 courses have been approved as follows:

Course	Type
Ewa Golf Course	Daily fee
Kahuku Golf Course Expansion	Municipal
Kapolei Golf Course	Municipal
Puuloa Golf Course *	Not Available
Royal Hawaiian Golf Course**	Daily fee/Private
Kuilima Resort Second Course	Resort
Waikole Golf Course	Daily fee

Notes: * Only 9 holes approved to date.
 ** 2 courses planned.

Source: Peat Harwick, Market Assessment for the Proposed Country Courses at Kahuku, February, 1989.

Projecting the number of needed golf courses on Oahu is most commonly based on City, State or National (i.e. National Golf Foundation) standards. The following table summarizes the number of golf courses needed at various points in time between the years 1990 and 2010 using these standards. It is noted that a more conservative estimate of need results when applying the City's and State's standards.

Year	Population*	Required Golf Courses Based on Standards	
		Standard	Less Existing Number Needed
1990	928,000	City 9	4
		State 43**	12
		Nat'l 28-34***	31
2000	1,012,500	City 9	7
		State 30-37	38
		Nat'l 47	38
2010	1,094,700	City 10	7
		State 33-40	38
		Nat'l 51	38
			2
			8-1
			(surp)
			9
			3
			5-2
			(surp)
			13

Notes: * State DBED Population Projections (Series K-K), 1988
 ** State Recreation Plan Technical Reference, 1980
 ** National Golf Foundation, Economic Indicators, 1989
 "(surp)" means surplus courses.

Source: Matthew Grady, Potential Impacts to the Island of Oahu from Proposed Golf Courses, August, 1989.

These projections are conservative because de facto population estimates are used in relation to all of the golf courses on Oahu. In fact, the 4 private clubs and 9 military courses should be subtracted from the existing number of courses because they are not available to the public and population estimates should then be adjusted to exclude military and private club members. The needed number of courses would probably increase after such estimate adjustments.

4.2 Intended Market.

As stated above, the applicant and project owner intends to keep the Lualualei Golf Course a "public" course in the sense that no membership to the Course will be sold locally, nationally or internationally. Since anticipated green fees for users of the facility will be comparable to fees charged at other like courses (i.e. Milliani, Hawaii Kai, Makaha East Golf Courses), the project will help to meet the large demand for courses available on a daily basis for play by local resident golfers and the unscheduled visitor-golfers. The project is best described as a "daily fee" course.

4.3 Intended vs. Proposed Use.

The existing State and City regulatory land use designations of the project site limits its current use options to Agricultural use. Soils data indicate that the land is mostly unsuitable for cultivation as approximately 221 acres of the total 236 acres are classified as "E" lands; that is, lands having the poorest productivity capacity among all land classifications made by the Land Study Bureau. While livestock grazing may be a possible agricultural use option for the site, its viability is questionable due to the prevailing dry weather year round at the site and prohibitive

cost of providing the needed amounts of water for grazing purposes in relation to the marginal economic returns from such activity.

It is further noted that, unlike other golf course proposals on Oahu, the proposed Lualualei Golf Course does not require the displacement of active agricultural uses. The project site is entirely vacant and undeveloped. Portions within the site which were once under farm cultivation are now fallow land.

On the other hand, the proposed golf course use of the site can address an existing community need: more golf courses which would be available for, and primarily intended for regular use by local residents (and the occasional visitor-golfer) at reasonable and comparable green fee rates. Unlike many of the other recent golf course proposals which are either linked to a developing resort, private, or semi-private membership clubs, the proposed Lualualei Golf Course will be developed primarily for use by local golfers and local golf organizations at affordable rates.

Moreover, the proposal represents a land use which will be compatible with the dominant rural/small farms character of the surrounding community and, therefore, will not encourage their displacement or relocation. As a for-profit operation, the proposed golf course will also increase State and City tax revenues by generating additional excise taxes and real property taxes which are not now forthcoming from the site. Users of the course are also expected to increase the amount of outside spending at local retail and service establishments due to their closer proximity to project site.

5. FEDERAL, STATE AND CITY PLANS & PROGRAMS.

5.1 State Plans & Programs:

5.11 Hawaii State Plan:

Sec. 226-6(a)(1)(1)

(Provide) [i]ncreased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.

Comment:

Waianae has historically experienced high unemployment. Underemployment continues to be higher in the district than in more urban areas on Oahu. Recent community surveys also

reveal that Waianae residents see the lack of nearby jobs as a severe community problem.

The proposed Luaualei Golf Course will employ up to 75 full- and part-time employees at project completion in accordance with its master plan. In addition, golf courses normally generate indirect jobs within the surrounding communities as local retail and service establishments adjust their markets and work force to the demand for goods and services generated by the golf course operation and its users.

Sec. 226-7(2)(b)(12):

Facilitate the transaction of agriculture lands in economically non-feasible agricultural production to economically viable agricultural uses.

Comment:

The proposed course provides an economically viable use of land within the project site which is otherwise unproductive lands unsuitable for viable agricultural pursuits. The project site is vacant, largely designated as low productivity and, for the most part, has never been used for agricultural purposes for decades even though it is zoned as such.

Sec. 226-11(2)(b)(3):

Take into account the physical attributes of areas when planning and designing activities and facilities.

Sec. 226-11(2)(b)(9):

Promote increased accessibility and prudent use of inland and shoreline areas of public recreational, educational and scientific purposes.

Comment:

The proposed course will replace an otherwise drab and dry land area covered by weeds, shrubs, common kiawe trees and rocky outcroppings along its higher elevations with well-maintained grassy fairways, man-made lakes and ponds, landscaping and a variety of trees. It will improve the visual and aesthetic quality of the site when viewed from nearby areas.

The course will also open up areas which are now inaccessible to the public due to the lack of known public accessways and trails through the site and the lack of significant or aesthetic areas or items of interest within the site.

5.12 State Functional Plans:

The State Recreational and Agricultural Function Plans are relevant to the proposed project. In the Recreational Plan the following policy statements appear relevant:

Land Use and Planning, A(2) Policy:

Ensure that intended uses for the site respect community values and are compatible with the area's physical resources and recreational potential.

Comment:

Development of the project will involve the use ground water sources located within the project site; therefore, it will not detract of water supplies for other uses within the Nanakuli community; especially those uses which must rely solely on limited potable water from the Board of Water Supply water system. Neither will the project intrude upon or displace existing rural and small farm uses in the surrounding areas since it will be located on vacant land in an isolated corner of Lualualei Valley and a significant distance away from the mainstream small farming and rural housing which dominate the land use pattern along Hakimo Road and the central portions of the Valley.



Recreation Facilities & Programs, C(1) Policy

Maintain an adequate supply of recreation facilities and programs which fulfill the needs of all recreation groups.

Comments:

As discussed in some detail above, the proposed golf course will meet a increasing recreation need on Oahu for courses which are regularly available primarily for local resident use at comparable green fee rates. The prohibitive costs of constructing municipal golf courses make the development of private sector courses such as the proposed project even more important and a realistic means of addressing pent-up demand for "local" courses on Oahu which cannot be met by government due to limited financial resources.

The State Agriculture Functional Plan "[e]ncourages productive agricultural use of the most suitable agricultural lands". The subject site is not suitable for agricultural use for reasons which are explained above. Therefore, the proposed use of the site, even though it is zoned for agricultural purposes, would not be inconsistent with this Functional Plan policy.

5.13 State Land Use Law

Act 298 (1985) amended Chapter 205, Hawaii Revised Statutes, by adding the following languages to Ch. 205:

Agricultural districts shall include activities or uses characterized by . . . ; open area recreational facilities, including golf courses and golf driving ranges, provided that they are not located within agricultural district lands with soil classified by the Land Study Bureau's Detailed Land Classification as Overall (Master) Productivity Rating A or B.

The proposed project will located on land which has an "g" productivity rating by the Land Study Bureau covering almost 80% of its land area. The amendment to the Land Use Law appears to be specifically directed to situations similar to that which is at hand with respect to the proposed Luualalei Golf Course project and the subject site.

5.2 City Plans and Programs.

5.21 City General Plan:

The General Plan is Oahu's statement of long range social, economic, environmental and design objectives for the general welfare and prosperity of the people of Oahu. Several GP policies appear applicable to the project:

Objective B, Policy 4, Natural Environment:

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

Comment:

The proposed project will provide golfing opportunities for local residents which are not available on a regular basis at most municipal, private and resort courses. As noted above, the primary focus of the course is to provide for golf play by local residents on a daily, as-come basis. Such opportunities are diminishing on Oahu due to the increasingly heavy demand for tee times at the municipal and private courses generated by local and visitor golfers.

Objective D. Policy 8. Physical Development:

Preserve and maintain beneficial open space in urban areas.

Comment:

The foothills of Puu Haleakala ridge are undeveloped lands which are visible from much of Luaualei valley. The proposed golf course, if developed on the subject site, will help to maintain the existing panoramic open space view presented by those foothills. Moreover, the golf course's developed irrigation system will enable better and more effective protection against the periodic brush fires experienced in these foothills.

Objective D. Policy 10. Culture and Recreation:

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

Comment:

The applicant will finance the planning, design and construction of the proposed golf course and related facilities and the attendant community benefits assessments alone. No public funds will be required to develop and operate the project or to provide the necessary supporting infrastructure and improvements therefor. The facility will be open for public play continuously once it is completed and in operation.

5.22 Waianae Development Plan:

Common Provisions:

Section 32-1.5 (1)(A)(vii) of the Waianae DP Common Provisions establishes a standard of one 18-hole golf course/100,000 persons where possible. As discussed above, the proposed project has the potential to help meet Oahu's need for 2-4 additional municipal golf courses by the year 2010 and 13 more private courses by 2010.



Section 32-1.4(8) of the Common Provisions define "rural areas" accordingly:

Rural areas are characterized by a preponderance of open and agricultural lands with limited development clustered in small, low density residential areas which have a strong sense of community and a country-like environment.

The location and character of new development in rural areas shall be consistent with the above-described characteristics of such areas and be guided by the following principles and controls:

- (A) The visual attractiveness that distinguishes rural from urban and country from city shall be maintained.
- (E) Appropriately located sites shall be provided for community-based economic activities which utilize locally available raw materials and the skills of craftspeople living in the area.

Comment:

The proposed golf course will maintain and enhance the open space character of Lualualei Valley and, especially, the foothills of Puu Haleakala ridge. In so doing, it will help to maintain the existing attractiveness of the area.

As stated above, the project is expected to provide permanent jobs for up to 75 persons most of whom will be living in the community. Indirect jobs for local residents will also be generated by the project.

Special Provisions:

It is the expressed intent of the Waianae DP that the development pattern generally remain linear along Farrington Highway and that the area's overall agricultural and open space setting be retained. Sec. 32-9.1, Waianae DP Special Provisions. As discussed above, the proposed golf course, located along and below the Puu Haleakala foothills and a substantial distance from the scattered small farms and rural neighborhoods within the central portions of Lualualei Valley, conforms to and implement this land use policy priority for Waianae. In essence, the project provides for continuation of the existing open space pattern dominating the character of Lualualei Valley and is located far enough from existing small farms in the Valley so as not to pose a threat to their continued existence due to incompatibilities or property tax impacts.

DP Land Use Map.

This DP Amendment application seeks a redesignation of the subject site from Agriculture Use to Park/Golf Course Use on the Waianae DP Land Use Map. No corresponding amendment to the DP Public Facilities map are proposed as no public improvement is planned for location within any portion of the project site.

6. PROJECT IMPACTS - ENVIRONMENTAL ASSESSMENT.

An Environmental Assessment Report on the proposed Lualualei Golf Course Project is presented below for consideration by the Department of General Planning along with its review of this DP Amendment Application. The EA addresses the project's impacts in the following topic areas: demographic impacts; economic impacts; housing impacts; public services; environmental impacts; hazards; and alternative uses considered pursuant to DP Amendment Report requirements set forth in the DGP's application outline.

It is noted at the onset of this section that the applicant is preparing an Environmental Impact Statement on the proposed Lualualei Golf Course project pursuant to the recently revised DGP Guidelines on proposed DP Amendments for golf courses. The ensuing Environmental Assessment information; therefore, is presented to identify the various impact topic areas being reviewed for the EIS and corresponding possible impacts mitigation measures which may be undertaken during project development.

6.1 Demographic Impacts.

6.11 Resident Population:

The Mailli Census Designated Place in 1980 had a population of 5,711 people, the smallest of the four Waianae communities. The project site is located in this CDP area (Census Tract 96.03). The Department of General Planning estimated that the area's population was 6,020 people in 1985, indicating relatively slow population growth in the community in recent years.

Since the project does not include the development of any housing units on the project site or elsewhere within the surrounding community, it is not expected to generate any direct population increase within the Manakuli/Mailli community. It is anticipated, however, that most of the project full- and part-time employees will come from the existing population within these communities. Therefore, the project will not have any impact on the Waianae DP area resident population.



6.12 Visitor Population:

The proposed golf course is not part of any proposed resort project; nor is it connected to any existing or proposed resort project within the Waianae DP area or elsewhere on Oahu. Therefore, the project is not expected to increase the number of de facto visitor population in the immediate community or larger Waianae DP area.

Because the demand for golf course facilities continues to increase among Oahu's visitors, it is anticipated that some occasional patrons of the proposed course will be visitors from the mainland or international visitors. These occasional visitors are expected to be small in numbers since a regular scheduling of golfing tours from Oahu's resorts to the Lualualei course will not be a policy or business practice of the project's operation. As stated above, the project will be open continuously to local golfers use on a daily basis.

Based on these consideration, the impacts of the project on Oahu's visitor population, if any, is expected to be insignificant. In any event, the following mitigation measures could be undertaken to eliminate, if not minimize the impacts of visitors' use of the proposed golf course:

- * Limit the number of rounds each week or month which will be allocated to visitors.
- * Reserve a large percentage of golf rounds each week/month for residents.
- * Demand advanced bookings before play time from visitors.
- * Allow no bookings of groups larger than four players except where such groups are local residents or organizations.
- * Charge higher fees for golf rounds by visitors.

The project's EIS will fully examine the potential impacts of visitor use of the project site in terms of estimated volume and frequency of such use and resulting community impacts.

6.13 Neighborhood Character/Culture:

It has long been a perception among Waianae residents that establishment of golf courses within their community will impact the existing lifestyles and community composition in unfavorable ways. The project's EIS will fully explore this topic area in terms of actual as well as perceived impacts of the golf course on the surrounding communities. Some preliminary considerations on this matter, however, is set forth below.

The project's impact on Waianae's (and the surrounding community's) social life is expected to be insignificant given the project relatively distant location from centers of resident/population activities in the Nanakuli/Mailli area. If anything, it is anticipated that a positive impact will occur as the golf course facilities are opened up to use for social and community events of local residents and organizations. In this regard, a proposed community benefit offered by the applicant will provide relatively easy access to the use of the facilities by such groups. Should that occur, the golf course could well evolve into a hub of community life in the Nanakuli/Mailli area.

The applicant appreciates that Waianae residents have objected to prior golf course developments, including an earlier proposal involving the subject site, on two primary grounds: (1) a course would remove agricultural land from production, depriving farmers of a chance to make a living; and (2) it would bring visitors (and other outsiders) into the community thereby somehow changing the district. As described above, however, the proposed project will not impact the community in these ways.

In fact, part of the proposed project calls for the establishment of a farming nursery/golf driving range within a 15.14-acre parcel (THK: 8-7-10; parcel 6) located on the makai side of Luualalei Naval Road and comprising the part of the project site located closest to the small farms and rural neighborhoods in the central Luualalei Valley along Hakimo Road. This mixed use concept will provide for a compatible transitional land use between those farms and neighborhoods and activities occurring within the proposed golf course facilities.

The project's EIS will examine in depth the proposed golf course's impacts on prevailing cultural values and community characteristics within the Nanakuli/Mailli area and suggest mitigating actions to address any such negative impacts.

6.14 Displacement:

Since the project site contains vacant, undeveloped land, the project will not cause the displacement of any residents, agricultural operation or current recreational use from the land in question. Inasmuch as the project is a recreational land use, it is not expected to cause the displacement of



small farms and rural homesteads located in Lualualei Valley. Such farms and homesteads are already located a considerable distance from the project site and downwind from the site when the prevailing tradewinds are active.

6.15 Other Social Impacts:

Socio-economic impacts of the project mainly have to do with (1) impacts on the daily lives of neighboring residents and workers at the site; and (2) project impacts on community attitudes and self-understandings. The EIS will examine a number of factors which fall under this broad topic area because the Nanakuli/Mailli community appears to be a very "rooted" community. That is, about 70% of its residents have lived in the same home for five or more years. Therefore, the project's impacts of lifestyles and community perceptions and values need to be explored in the EIS.

6.2 Economic Impacts.

6.21 Economic Growth:

Analyses of a golf course's economic impacts can occur at two levels: macro-economic (regional or islandwide) impacts or micro-economic (localized, community) impacts. The impacts of the proposed Lualualei Golf Course from both perspectives will be examined in the EIS.

From a regional or islandwide perspective, the economic impact of the proposed golf course, if any, is expected to be very minimal. The course will provide a recreational service to its users and will compete with all other comparable golf courses on the island for customers. As such, it does not contribute directly to increasing the Islandwide or Leeward Oahu economic base. Alone, the golf course is not expected to contribute significantly to Oahu's economic well-being.

On the other hand, the localized economic impacts of the proposed project could be appreciable and significant in terms of economic multiplier effects within the community's existing economic fabric. The shops and businesses of

merchants and service sector entrepreneurs within the Nanakuli/Mailli community may directly benefit from the project due to their convenient accessibility to users of the golf course.

It has been estimated that a typical 18-hole golf course can serve approximately 300 persons/day. Shops and businesses in the Nanakuli/Mailli area will have a "captive market" with respect to such golf course users for goods and services which are not available within the golf course itself. Even local farmers may likely benefit from the demand for produce and meats generated from the course's restaurant and convenience shops as well as from food requirements of special business and community events held at the clubhouse. The same would apply to local shops dealing with goods, landscaping and services required to maintain and operate the golf course. Such "positive" benefits of the project will be examined in the EIS.

6.22 Employment

Typically, a golf course project can be expected to generate employment in two phases: its construction and operation phases. In a recent study of recent golf course projects

on Oahu, the following benchmark figures in each category of jobs were reported:

The construction phase entails a time frame of 16 months employing up to 65 full time jobs on-site. Off-site personnel is estimated to be approximately 25 percent of the total on-site jobs, calculated to be another 16 employees. Secondary support jobs is estimated to be 80 percent of the combined on-site and off-site jobs, totalling another 64 jobs. The grand total is estimated to be approximately 129 positions. This employment figure, placed in perspective, generates jobs for a limited time period, a year and two months.

The operation phase of the project generates long-term jobs requiring various skilled positions. The employment figure differs depending upon the type of course. . . . A private daily fee course would employ more people, ranging from 57 to 71 positions. The reason for the increase in available positions in the private daily fee course are the needed employees for the pro shop, administration and food and beverage service.

Matthew Grady, Potential Impacts to the Island of Oahu from the Proposed Golf Courses, August, 1989, pp II-36-37.

The proposed project is expected to generate such typical employment impacts within the Nanakuli/Mailli community. In fact, a community benefit offered by the applicant commits, in principle to hire not less than 50% of the golf course employees from residents living in the Nanakuli area.

The project's employment impacts are especially beneficial to the surrounding community. Waianae has historically



experienced high unemployment and many of its employed residents must commute 30- to 60-minutes to and from work each day as most residents work outside the community by necessity. The EIS will examine the quantifiable employment impacts of the proposed project in detail.

6.23 Government Revenues:

On this topic area, the critical issues concern the proposed project's impact on public revenues and property taxes. The positive impacts of the project on public revenues is fairly obvious and can be seen from the ensuing description of such benefits contained in the above-cited Matthew Grady study:

Increased property taxes for the subject site has positive benefits for the community. According to Richard Nathaniel (City Finance Department Appraiser), golf course use is the 'highest and best use' of agriculturally zoned land. The assessed value for just the golf course separate from the structures is in the neighborhood of \$650,000 per hole or a property tax of \$101,250 per year for an 18-hole course. The assessed value for the clubhouse and infrastructure improvements would be \$8,500,000 and \$6,500,000 respectively. The additional property tax gained from these improvements would be \$141,750 providing a combined annual property tax of \$243,000. This type of impact contributes significantly to the tax base of the community.

Ibid., p. II-38.

While these figures may not precisely apply to the project site, they provide a general idea of the potential property tax revenues which could be generated from the project.

State excise tax proceeds will also be generated from sales made by the course for rounds of golf, by its restaurant (food and beverage sales), and by sales of goods, services and supplies to the course from its vendors. The EIS will attempt to estimate the amount of annual property tax, excise tax and licenses revenues which would be generated by the project.

The project impacts on real property tax assessments and resulting property taxes on adjacent properties will also be analyzed in detail in the EIS. The issues to be examined are the following questions: Will land values adjacent to the proposed project increase so significantly that maintaining them in agricultural/rural use becomes uneconomical? Will this pressure be so overwhelming that property owners will be unable to pass up the opportunity to sell their land for substantial profits?

According to the DCP, these questions are unanswerable:

Today, these questions are unanswerable because there is no data to substantiate what many planners believe is the case. Three private market studies were unable to determine whether a potential golf course would increase land value of adjoining residential or agricultural land, beyond that which occurs 'naturally' in a dynamic real estate market. (MARKET STUDY OF LIHI-LANI

RECREATIONAL COMMUNITY, Mike Skariz, Locations, Inc., 1989; MARKET STUDY FOR WAIKANE GOLF COURSE, Mike Skariz, Locations, Inc., 1989; SOCIO-ECONOMIC IMPACT ASSESSMENT FOR PROPOSED WAIKANE VALLEY GOLF COURSE, Community Resources, Inc., 1988) It is difficult to evaluate the impact because the phenomenon is relatively recent.

DGP, Golf Course Development on Oahu, July, 1989, p.8.

Real property taxes are determined by two variables: property tax rates and real property assessments. Tax rates, which are set by the City Council, are currently fixed at \$9/\$1,000 assessed land value for agricultural lands. It is within the means of the City to control tax increases on adjacent lands by manipulating property tax rates on an annual basis as may be required.

In contrast, the law requires that property assessments be based on prevailing "market value" of property in the surrounding community as established by comparable real property sales or conveyances within the community. In 1987, the project site was purchased by the applicant at \$3.5 million (or for an average value per acre of \$14,820). It has been estimated that the average adjusted sale price/for per acre developed golf courses on Oahu in recent years was \$68,435 (DGP, *Ibid.*, p. 8). Upon completion of the proposed Lualualei

Golf Course, therefore, a considerable immediate increase in assessed value of the land within the site can be expected.

The EIS will examine whether such an increase will directly cause increases in assessed values of adjoining properties or merely contribute as one of several factors to any such increase in assessed value. In so doing, the EIS will respond to the DGP new guideline for golf course DP amendments which advises applicants to "provide a forecast of the impact of the project on the value of land in the area and indicate the impact on future real property taxes". It also advises an applicant to "propose a plan which would compensate for any negative impact".

It is the applicant's preliminary view that development of the course should not have a substantial impact on the assessed values of adjacent properties for the following reasons: First, the project is quite a distance from the nearest small farm and rural neighborhood and, generally, is separated from them by Lualualei Naval Road.

Second, Most of the surrounding lands are zoned for Agriculture Use. This provides an inherent limitation on the

"market value" of such lands notwithstanding the development of the golf course since the Agricultural zoning district imposes severe use limitations which bears directly on its marketability and market value.

Third. The relatively isolated location of the site in relation to existing homesteads and small farms in Lualualei Valley precludes associating any spin-off open space or aesthetic value arising from such properties being close to the golf course. In other words, such properties are unable to capture the property value benefits of being close to the golf course and the open space amenities it offers.

6.24 Location vis Intended Market:

Users of the propose course are expected to come primarily from the Leeward Oahu area, although the pent-up demand for accessible golf courses among most local golfers suggest that a considerable number of golfer coming from as far as the Honolulu District. The applicant's policy and practice of keeping the course available to local golfers is expected to encourage golfers from more distant parts of Oahu to frequent the proposed course. Travel time to the course will be shortened by the H-1 Freeway. The applicant's policy of

charging comparable green fees to other like golf courses on Oahu will further encourage Oahu golfers to use the proposed course.

The EIS will examine the recreational "reach" of the proposed project in detail given the above-described factors and other factors such as pent-up golf course demand on the part of local golfers, availability of like courses in other parts of Oahu, etc.

6.3 Housing Impacts.

6.31 Increase Supply:

By itself, the project is not expected to generate a need for additional housing (i.e. employee housing) within the Nanakuli/Mailli community or elsewhere since most of its employees are expected to be existing residents from that community. Since the project is a stand-alone course, the development of housing units is not part of its master development plan. (See Exhibit "E".) It follows that the project does not propose the actual development of affordable homes within the project site as part of its master plan.

6.4 Public Services.

6.41 Access and Transportation:

Exhibit "F" shows the proposed roadway/access plan and route for the project which is described as follows:

Vehicular access to the project will be primarily from Farrington Highway, Hakimo Road, Paakea Road, and a new, 2-lane paved roadway to be constructed parallel to Luualalei Naval Road from Paakea Road to the proposed golf course clubhouse. Farrington Highway is a rural arterial highway connecting major population centers along the Waianae coast to the rest of Oahu. It is a State maintained Primary Federal Aid Highway.

Hakimo Road is a County maintained road with 20-foot wide pavement designed for 2-way traffic. Its shoulders are unpaved and vary between 5 and 10 feet in width. About 2.1 miles of Hakimo Road is paved while the remainder is an unpaved dirt road. Posted speed on Hakimo Road is 20 mph.

Therefore, the project will have no direct impact on housing supply on Oahu.

6.32 Affordable Housing:

The applicant recognizes the need for affordable housing in the Nanakuli/Haoli community even though its proposed golf course will not add to or aggravate that need or deny the City or private sector from undertaking affordable housing projects in other nearby parts of the community. Accordingly, the applicant will offer an alternative community benefit which calls for exploration of financial contribution to housing unit construction within the community by the State Department of Hawaiian Home Lands which is a major supplier of affordable housing along the Waianae coast and the Nanakuli/Haoli area. The specific amount of this contribution will be determined after coordination and consultation with the Chief Planning Officer and the DPHL. This community benefit offer responds to the DGP guideline which advises applicants to "provide affordable housing" by contributing land, units or cash.

Paekea Road is also a County maintained road with a posted 20 mph speed limit and a 20-foot wide pavement for 2-way traffic. It connects to Luualalei Naval Road near the Hawaiian Cement Company plant.

Luualalei Naval Road is owned and maintained by the U.S. Navy. It is open to public use between Farrington Highway and the Luualalei Naval Ammunition Depot. The Navy denied the applicant's initial request for use of Luualalei Road to access onto the project site but does not object to the construction of a golf course/clubhouse access road paralleling Luualalei Naval Road or to the construction of the proposed course.

Access from the clubhouse to the golf course will be via a golf cart underpass crossing Luualalei Naval Road near the proposed clubhouse. The Navy does not object to the proposed underpass. The applicant will acquire the needed right-of-way and construct a 2-way paved roadway between Paekea Road and the proposed clubhouse to provide access to the course.

Preliminary traffic studies indicate that the project is not expected to adversely impact existing traffic along Farrington Highway and Hakimo and Paekea Roads upon its completion and

operation. The course is not likely to attract non-golfers traffic to the site on a regular or daily basis due to its remoteness and single-use character. Only traffic from golfers and employees and, to a lesser extent, groups using the facility for infrequent special events is expected to be generated by the project.

Preliminary studies also indicate that the project generated traffic will have minimal impact on existing traffic flow as well as peak hour traffic in the community due to intermittent arrival and departure of golfers spread out throughout the day.

Although preliminary studies indicate no major roadway improvements are needed, widening of Hakimo Road at its intersection with Farrington Highway is desirable to provide separate left- and right-turn lanes at that intersection.

All necessary roadway improvements in order to develop the project will be funded by the applicant.

6.42 Water Supply:

A water study and explorations for the project was recently conducted by Mr. John Mink. This section summarizes their results.

Two aquifers occur in the project site; one consisting of limestone in the lower, flat portion of the site and the other composed of basalt underlying the valley fill and talus slopes as they occur within the site. Groundwater in the limestone aquifer occurs as a lens of brackish water floating on salt water. The water is not suitable for drinking purposes and in most places it is unusable for irrigating all but salt-tolerant plants without pre-treatment.

The limestone aquifer is located near Luualalei Naval Road and extends throughout a large portion of Luualalei Valley. The sustainable draft from this aquifer at a point near the project site is on the order of 300,000 gallons/day. Without pre-treatment, the groundwater may be too brackish for ordinary irrigation of grasses. A well to this groundwater source exists within approximately 1/2 mile from the project site.

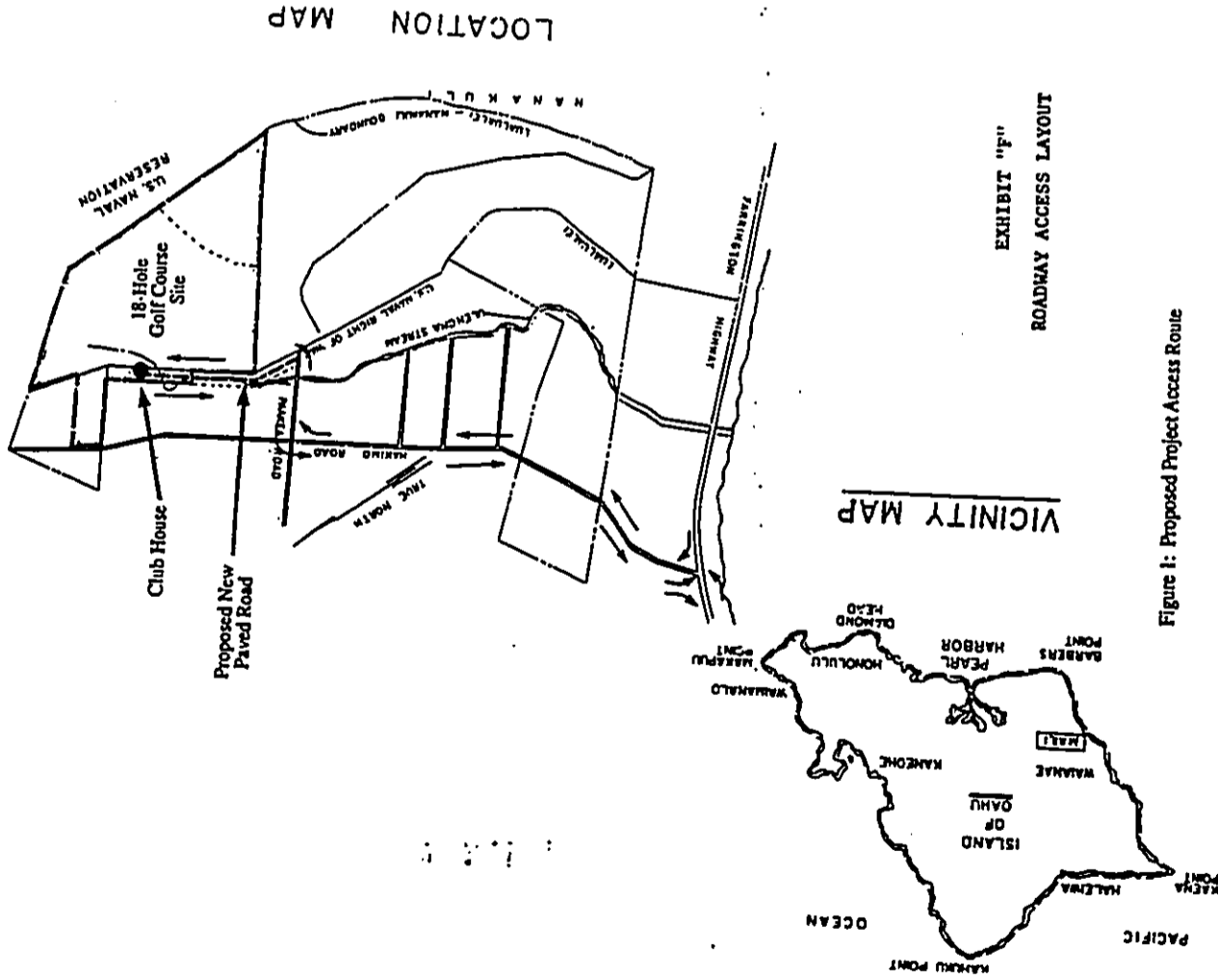


Figure 1: Proposed Project Access Route

The basalt aquifer underlying the property lies in the rift zone in which dikes have a southerly strike. An exploitable aquifer consisting of basalt compartments between dikes is known to exist because at one time a well tunnel was located within a few hundred feet of the property line and yielded reasonably low salinity water at small rates for both domestic and agricultural use. The tunnel was abandoned many years ago.

In 1939, an average of 76 gallons/minute of useable water was pumped from this aquifer; between 1941 and 1944 an average of .150 gpm was delivered from the aquifer to the Waianae Sugar Plantation.

A tunnel to the aquifer is located just off the project's property line but the exploitable aquifer, itself, underlies the entire project site. Several hundred useable gallons per minute can be tapped from this aquifer for the project for golf course irrigation.

In sum, all the necessary water for the project can be obtained from within the project site based on the findings of the Mink study and exploration. The costs of tapping these groundwater resources will be absorbed by the applicant.

Approval of such on-site wells will be required from the State Water Commission.

6.43 Wastewater Disposal:

Wastewater generated from the clubhouse and other facilities will be connected to a private sewer collection and disposal system located within the project site. All sewer system improvements necessary to make these connections will be funded by the applicant.

6.44 Drainage:

As shown in Exhibit "E", the design of the course includes the placement of several man-made lakes which will serve as catchment basins for any surface water runoff as well as holding ponds for reserve irrigation water. It is expected that there will be little runoff due to rain since the entire Waianae coast, generally has the least amount of rain (i.e. around 20 inches/year average) among all places on Oahu.

Some risk of soil erosion due to surface water runoff will arise during golf course construction. It is anticipated that approximately 250,000 cubic yards of cut and fill material will be moved around within the site to achieve the desired golf course layout.

A potential concern with respect to surface water drainage within the project site involves the prevention of pesticides and fertilizers leaching into the groundwater supply. To address this concern, the applicant will prepare and implement a groundwater monitoring plan and system in accordance with State Health Department guidelines and employ a well-qualified, certified Golf Course Superintendent who will be responsible for sound and safe management practices with regard to fertilizer and pesticide application within the proposed golf course.

6.45 Schools/Parks:

The proposed project is not expected to add additional students to current public school enrollments in the community or create additional need for, or burdens on existing parks within the community. The project is a recreational land use which will not increase the area's population and, thus, will have no impact on area schools and parks.

6.46 Police/Fire Protection:

Personnel from the Waianae Police Substation will provide police protection services to the project site and users of the course. Personnel from the Manakuli Fire Station will provide fire protection services to the golf course.

6.47 Utilities:

Electricity, telephone and other utility services to the project site will be purchased from the Hawaiian Electric Company, Hawaii Telephone Company and other utility companies as may be required by golf course operations.

6.5 Environmental Impacts.

6.51 Noise:

Existing ambient noise levels in the project environs come from traffic on Lualualei Road, local traffic, birds, dogs, the wind and foliage. At residences in the vicinity of the project site and which are setback considerably from Lualualei Naval Road, existing average background ambient noise levels range from 45 to 55 Ldn, which is in the "Minimal Exposure, Unconditionally Acceptable" noise exposure category. Along Lualualei Naval Road, at approximately 50 feet setback distance from its centerline, existing traffic noise levels are approximately 61 Ldn, which is in the "Moderate Exposure, Acceptable" noise exposure category.

Potential noise impacts of the project include increased traffic noise along the access road, noise from mechanical

equipment and activities at the proposed clubhouse, and noise from short term construction activities. Anticipated noise levels from off-site and on-site motor vehicles range from 70 to 85 dBA at the 50-foot setback distance. Anticipated noise levels from golf course maintenance vehicles range from 70 to 80 dBA at the 50-foot setback distance.

Construction noise levels along the property's boundary will vary depending on the phase and location of the on-site construction activities. The expected range of noise levels during construction is 45 to 95 dBA along the project boundaries.

Available means of mitigating noise impacts from the clubhouse are total closure and air conditioning, as well as the use of sound attenuating walls and silencing equipment. Mitigation of noise from motor vehicles is possible through the use of administrative and speed controls, and/or sound attenuation walls. Mitigation of short term construction noise impacts is possible through implementation of State Health Department noise permit and curfew procedures.

6.52 Air Quality:

The project site, itself, lacks any man-made air pollution sources other than occasional motor vehicle activity. Air quality within the site is believed to be quite good and in compliance with federal and state ambient air quality standards.

The main air quality impact of a golf course project is its ability to generate motor vehicle activity on the streets and highways which serve the area. The project will also create additional electrical power demand which will require added burning of fossil fuels at the nearby Kahe Power plant.

Operation of the golf course will involve pesticides spraying which may drift at times. There will be short term construction impacts as the site is developed. This will involve fugitive dust, vehicles, generators, etc. There will also be off-site impacts due to production of concrete and asphalt for the site.

The following mitigation measures correspond to the above-cited potential air quality impacts:

Motor vehicle activity:

- * Use of vans or buses to bring golfers.

Electrical Generation:

- * Energy efficient building design.
- * Use of solar water heating.
- * Use of heat pumps.
- * Minimize air conditioning.

Pesticide use at Course:

- * Integrated pest control measures.
- * Minimize pesticides use.
- * Use of non-chemical or non-toxic/non-persistent chemical pest controls.

Construction Impacts:

- * Frequent watering of exposed soils.
- * Immediate landscaping.
- * Compliance with dust control regulations.

6.53 Historic and Archaeological Resources:

No historic or traditional Hawaiian sites are known to exist within the project site; however, it is expected that some are present. According to John Papa I'i two trails from Ewa to Maianae came over the mountains into Lualualei Valley. The southernmost of these, through Pohakea Pass, may have proceeded along Ulehava Stream within the project area to the Nanakuli coast.

Recent archaeological studies in Nanakuli Valley by Pak and Cordy and specifically in Lualualei Valley by Alan Haun show a significant number of traditional Hawaii sites. The largest concentration of these are clustered around Ulehava and Maillili Streams, in land at the south end of the Valley, mauka of the project area. This latter area is similar in features to the land within the project site. Therefore, although no sites have been established within the project area, their existence is possible. In the development of the project, the discovery of any possible evidence of site or archaeological remains within the project site will be reported to the State Historic Preservation Officer and work suspended pending his review and determination.

At the present time, there are no sites within the project area which are registered in the State Historic Places Register. A survey of the site will be conducted as part of the EIS report.

6.54 Vegetation:

Two vegetation types are recognized on the site. On the lower, level portions, adjacent to Lualualei Naval Road and the Lualualei Naval Ammunition Depot, vegetation consists of a

weedy mixture of grasses and herbaceous species with scattered, small koa haole shrubs. Until recently, this portion of the site was under farm cultivation.

Weedy species which are locally common in this area are bristly foxtail (Setaria verticillata), Guinea grass (Panicum maximum), lion's ear (Leonotis nepetifolia), false mallow (Malvastrum coromandelianum), red pua-lele (Emilia foerbergii), and sowthistle (Sonchus oleraceus).

Kiawe forests occur on the remainder of the property. Where there is soil, as on most of the level to moderately steep foothills within the site, the kiawe (Prosopis pallida) are from 15 to 25 feet tall. Buffel grass (Cenchrus ciliaris) is the dominant grass where the site is level. At about the 100-foot elevation, Guinea grass and green panic grass (Panicum maximum var. trichoglume) becomes co-dominant. Above the 250-foot elevation vegetation decreases, rock outcroppings become numerous and kiawe trees are shorter.

The project area contains only introduced plants and animals; there are no unique flora or fauna within the subject site.

6.55 Other Environmental Factors:

The project site is not within a flood plane; does not contain wetland; is not located within the coastal zone; and is not within an airport clear zone.

Since it is located next to the Lualualei Naval Amunition Depot, the EIS will review the possibility of project location within any blast zone emanating from the Depot. This research may prove difficult in light of possible National security concerns.

6.6 Alternatives Considered.

The applicant considered two alternatives with respect to proposed uses of the project site:

6.61 No Action:

This alternative implies leaving the site in its unused and unproductive state, even for agricultural use purposes. It implies leaving the site in a state which prevents its use for positive social, recreational, open space, employment, governmental revenues and local business impacts and community benefits as described in this report. Based on these

considerations, the applicant rejected this alternative as non-beneficial to the community's and the applicant's interests.

6.62 Proposed Project:

For reasons provided throughout this DP report and environmental assessment, the applicant considered and selected the proposed Lualualei Golf Course project as a reasonable and productive use of the subject site which will contribute greatly to the betterment and well-being of the surrounding community.

No other alternatives were considered by the applicant.

7. NEW DP AMENDMENT GUIDELINES FOR GOLF COURSES.
Revised DGP DP Amendment Guidelines for proposed golf courses require an applicant to address a number of issues as regards a proposed golf course's social, economic, environmental quality and other physical and infrastructure impacts on the community. These specialized guidelines focus on particularized golf course impacts so as to enable the DGP to determine "community benefits" to be provided by the project's proponent which would be "commensurate with the impact and magnitude of the proposed development".

The Departmental "guidelines" provide a tangible indication of the possible type and extent of community benefits which may be required of an applicant given the scope and magnitude of its golf course's impact on the surrounding community. The guidelines calls for a "commensurate" nexus between project impacts and required community benefits will be sought by the Chief Planning Officer. Community benefits to be required of a proposed golf course proponent ultimately are to be determined by the Chief Planning Officer and enforced at the zoning stage.

7.1 Applicant's Community Benefits Proposal:

In light of the project's generally positive impacts on the surrounding community as preliminarily described in the Environmental Assessment to the Project (See Section 6, above), the applicant believes that the financial magnitude and scope of community benefits to be expected of its project should be kept at reasonable levels. Several factors underlay this contention:

First, the project will not displace existing agricultural uses and the site is physically not suited for agricultural use.

Second. All infrastructure improvements required in order to establish the proposed golf course will be funded solely by the applicant; no public funds will be required.

Third. The project will have its own water supply from on-site wells, pending State Water Commission approval of such wells. Thus, the project will not burden the community's supply of potable water provided by the Board of Water Supply except to meet the marginal potable water needs of the project's clubhouse and ancillary uses.

Fourth. The project will provide direct and indirect jobs in the community for local residents. The need for nearby jobs has been a major and perennial community problem along the Waianae coast.

Fifth. The project will provide a major, improved open space system and, thereby, maintain the panoramic open space and views of the foothills of Puu Haleakala ridge.

Sixth. The project will not invite an onslaught of visitor golfers to the community and, thus, will avoid or minimize community lifestyle and cost-of-living disruptions that usually attend a rush of visitor to new communities. As noted above, the project will not sell local, national or international membership. Instead, the project's main purpose is to provide a golf course facility open to the public on a daily basis. As such, it will lack the lucrative revenue-generating source that comes when private memberships in golf courses are sold. Such revenues are vital to a golf course project being able to afford stiff community benefit requirements.

Seventh. Effective mitigation measures will be undertaken to address potential environmental problems associated with

golf course irrigation, course maintenance and fertilization, impacts on possible archaeological resources within the site, additional traffic generated from the course and other similar problems identified in the Environmental Assessment.

These factors have a direct bearing on any effort to identify community benefits to be provided by the applicant which are "commensurate" with the project's "impact and magnitude".

In principle, the applicant recognizes, understands and acknowledges its obligation to provide project-related community benefits pursuant to the DGP Guidelines. Therefore, the following community benefit action proposals are offered without proposing or assigning any specific monetary value or consideration to each of the proposals at this time. It is expected that such specific value or consideration shall be determined through applicant-DGP-community consultation and coordination during the DP Amendment review process, taking into consideration the factors discussed immediately above.

Community Benefit #1:

The applicant commits, in principle, to explore contributing a meaningful amount of financial assistance to the State Department of Hawaiian Home Lands to enable completion of several planned or under-construction DHHL housing projects within the Manakuli community.

This proposed benefit addresses the DGP guideline which requires a golf course proponent to provide land, unit or cash to the development of affordable housing.

Community Benefit #2:

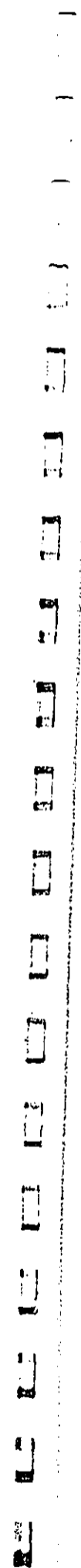
The applicant commits, in principle, to assigning a reasonable portion of the profits from golf course's annual income to the Manakuli community to be used for public projects and improvements to the community as may be determined by its Neighborhood Board and approved by the City or State. A certified public accountant selected by the Board and retained by the applicant shall determine the course's annual profits and amount thereof to be assigned to the community.

This commitment address the DGP guideline which advises applicants to provide community facilities such as child care, fire, police, community center and recreational facilities.

Community Benefit #3:

The applicant commits, in principle, to provide year round access to meeting rooms and service facilities of the golf course clubhouse for special events sponsored or conducted by established community groups and organizations or groups associated with the various public schools in the community at cost, given reasonable advanced notice of such upcoming events and availability of such facilities.

This commitment addresses the DGP guideline which advises an applicant to provide land for use as public parks to the City



with a minimum of 10% of the total land area of the proposed golf course. The applicant proposes, as an alternative, an in-kind contribution to the community in the form of relatively unrestricted year round access to the course's clubhouse and other facilities for bona fide community social and recreational events conducted by legitimate community groups and organizations. Only a minimal charge to cover clean up costs after such events would be imposed. This alternative conforms to the spirit and intent of the DGP guideline in question.

Community Benefit #4:

The applicant commits, in principle, to permit the use of the golf course and its support facilities by golf teams of the various high schools in Leeward Oahu for competitive golf matches and tournaments between/among such schools at no charge upon reasonable advanced notice of such upcoming matches and tournaments.

A DGP guideline advises an applicant to reserve a minimum of 30% of the tee times for Oahu residents and/or provide public play at municipal rates. As noted above, all tee times at the proposed course will be open to Oahu's residents; therefore, the applicant operational plans pertaining to tee times for local golfers at the course substantially exceeds this DGP requirement. The proposed commitment opens up the proposed course to even greater local use.

Community Benefit #5:

As an alternative to the Community Benefit #1 proposal, the applicant commits, in principle, to provide reasonable funding assistance to the City and community funding additional water supply infrastructure and construction of approved improvement district projects which extend public sewer services to unsewered residential neighborhoods within the Manakuli area.

A DGP guideline advises applicants to contribute to wastewater improvements in the form of wastewater treatment plants or sewer upgrades or an equivalent cash payment to the City Public Works Department. This commitment is proposed as an alternative to proposed Community Benefit #1 should implementation of that proposal be problematic.

The commitment proposes a one-time, reasonable funding contribution towards the implementation of additional Board of Water Supply transmission lines and/or construction of planned public sewer projects which are part of an approved City improvement district benefitting the Manakuli community in response to that DGP guideline.

The commitment also responds to a DGP guideline which advises applicants develop water facilities by developing new water wells or reservoirs yielding 0.5 mgd to the Board of Water Supply or making an equivalent cash payment to the Board.

Since the Water Board's master plans for the Waianae coast calls for the development of extensive water transmission lines in Leeward Oahu to bring potable water to residential neighborhoods, this commitment proposes some financial assistance to the Board for such lines. In so doing, it meets the spirit and intent of the DGP guideline.

Community Benefit #6:

The applicant commits, in principle, to allocate not less than 50% of all full- and part-time jobs at the proposed Lualualei Golf Course to residents residing in the Nanakuli area and, secondarily, to residents residing within the Waianae DP area.

Although this community benefit does not respond to any specific DGP guideline, it is offered to bring about the complete integration of the proposed golf course within the social and community fabric of the Nanakuli and Waianae communities and to foster civic and community pride in the golf course as one of the community's physical assets

7.2 Other Community Benefits Requirements.

Other DGP guidelines advise applicants to undertake certain planning, design or construction actions with respect to the development of their golf courses which will assure that

certain environmental consequences (i.e. depletion of water recharge aquifers, destruction of views and vistas, leaching of fertilizers and pesticides into ground water sources, etc.) are avoided. The Environmental Assessment addresses these guidelines and should be referred to by the reader.

8. SUMMARY SHEET.

Appendix I contains the completed Summary Sheet for the requested DP Amendment.

9. NOTIFICATION OF AFFECTED PARTIES.

Appendix II contains a list of the affected/interested parties who have been contacted and notified about the requested DP Amendment.

10. PROJECT EVALUATIVE CRITERIA FORM.

Appendix III contains as completed Project Evaluative Criteria form for the proposed Lualualei Golf Course pursuant to the new DGP guidelines for golf course Development Plan amendment proposals.

CERTIFICATION

Ordinance 84-111 states: "No application for Development Plan Land Use Map amendment shall be accepted for processing unless the applicant notifies, by mail, all owners, lessees, sub-lessees and residents of the affected property and each of the abutting parcels."

I hereby certify that I have complied with the notification requirements of Ordinance 84-111.


Byron T. Kusao
Agent

DGP REF. NO.:
MAP REF. NO.:
MAP AREA:
AREA:
TRK:
Waianae DP Land Use Map
Waianae
259.25 acres
8-7-9; por. 2; 8-7-10;
6 & 10; 8-7-19; por. 1.

(DP AREA)
DEVELOPMENT PLAN LAND USE AMENDMENTS
BEING CONSIDERED

Amendment/Project Information

Amendment Request: Redesignation of 259.25 acres from Agriculture to Park/Golf Course on Waianae DP Land Use Map.
Location: Lualualei Valley next to Lualualei Naval Ammunition Depot, Nanakuli, Oahu, Hawaii.
Address(es) of Subject Area--Where Applicable:

Owner/Developer: Sanjiro Nakade

Requested By: Sanjiro Nakade

Basis for Request: To provide golf course which meets only local public demand :
golf course facilities; no membership to be sold.

Type of Project:
18-hole golf course to meet recreational needs of local golfers.
Impact on Provision of Housing:
None. Project does not involve residential lands.

Existing Conditions:
None. Project does not involve residential lands.

Land Use: Vacant, unused.

Structures: None

Number: None

Type: None

Height: None

ALISH: Classified "E" by Land Study Bureau

Soil Features: Lualualei silty clay.

Zoning: AG-2, Agriculture.

DP Special Provisions: Designated.

State Land Use: Agriculture District

DP Public Facilities Map: No public project

Possible Constraints: None for golf course development.

List of Parties Notified

T. C. Dumarcan Trust P. O. Box 2297 Waianae, Hawaii 96792	Alfredo/Angela Agorilla 91-1715 Hakimo Road Waianae, Hawaii 96792
Wun Sung Wong 2215 Aulii Street Honolulu, Hawaii 96817	Philip/Paciencia Nazareth 94-352 Waietu Street Milliani, Hawaii 96789
Myra Gambinini P. O. Box 2528 Waianae, Hawaii 96792	Nakata Makato 87-979 Hakimo Road Waianae, Hawaii 96792
Allan Tavares 97-1129 Hakimo Road Waianae, Hawaii 96792	Minoru/Mertin S. Saki 94-998 Waipahu Street Waipahu, Hawaii 96797
Harry L./Marcia A. Momoa 87-1121 A Hakimo Road Waianae, Hawaii 96792	George/Edna Oshiro 87-961 Hakimo Road Waianae, Hawaii 96792
Walter/Nancy Smith 1244 Haloa Drive Honolulu, Hawaii 96818	Kiwankichi/Sharon Oshiro 87-951 Hakimo Road Waianae, Hawaii 96792
James/Toshiko Tome 87-1073 Hakimo Road Waianae, Hawaii 96792	Henry Nakahodo 1604 Ala Aolani Street Honolulu, Hawaii 96819
Joseph/Estrella Cabansag 84-740 Kili Drive Waianae, Hawaii 96792	Toshio/Grace Honda 86-310 C Kuwale Road Waianae, Hawaii 96792
Sidiaren Tedorico/Venia 87-1051 Hakimo Road Waianae, Hawaii 96792	Lone Star Hawaii 220 South King Street, Suite 1700 Honolulu, Hawaii 96813

APPENDIX II
LIST OF AFFECTED PARTIES NOTIFIED

Elsine L. Chang Trust
P. O. Box 6472
Santa Barbara, California 93160

Elsine Balisacan
P. O. Box 2350
Waianae, Hawaii 96792

Boyington J. Park
P. O. Box 582
Waipahu, Hawaii 96797

Jerrold W. Booth
P. O. Box 21F
Waianae, Hawaii 96792

Elizabeth M. Stack
P. O. Box 497
Honolulu, Hawaii 96809

Mr. Albert Silva, Chairman *
Waianae Coast Neighborhood Board #24
83-503 Farrington Highway
Waianae, Hawaii 96792

The Honorable John DeSoto *
District Councilman
Honolulu City Council
Honolulu Hale
530 S. King Street, 2nd Floor
Honolulu, Hawaii 96813

*Complete report forwarded.

APPENDIX III

DEPARTMENT OF GENERAL PLANNING
AUGUST 3, 1990

PROPOSED GOLF COURSE PROJECT: EVALUATIVE CRITERIA

Proposed Golf Course: Lualualei Golf Course
DP Area: Waianae No. of Acres: 259.25
Developer: Sanihiro Makade
Tax Map Key: 8-7-9; POR, 2; 8-7-10; 6 & 10; 8-7-19; POR, 1.

I. APPROVALS NEEDED AND PROCESSING STATUS

Zoning:	Designation Needed P-2	Preservation	Date Application Submitted
Dev. Plan:	Designation Needed Park/Golf Course		Date Application Submitted 9/1/90
SLUC:	Classification Needed Special Use Permit		Date Application Submitted NA
Other:			
Comments:			

II. GENERAL CHARACTERISTICS

New Golf Course Expansion No. of Holes 18
Ownership: Private Public
Operation: Private Membership Semi-private Public
Type of Course: Stand Alone Integrated
Existing DP Designation Agriculture Use
Existing Zoning AG-2, Restricted Agriculture.
Existing State Land Use District Agriculture

III. REVIEW CRITERIA

A. LAND USE IMPLICATIONS

1. Golf course is: (select one category or subcategory only) Not Applicable.
- (a) integral part of resort complex YES NO
- (b) integral part of planned development with YES NO
- (i) 60% or more of the housing units are affordable to families at or below 120% of median income YES NO
- (ii) 30% of the housing is affordable to families at or below 120% of median income and 30% is affordable to families between 120%-140% of median income YES NO
- (iii) 30% of the housing is affordable to families between 120%-150% of median income YES NO
- (iv) market priced housing YES NO
- (c) integral part of resort and housing planned development YES NO
2. Golf course functions:
- (a) as buffer between potentially incompatible uses (e.g., blast zones, industrial from housing, shoreline buffer, agricultural uses from urban, especially residential, etc.) YES NO
- (b) to use land on which environmental hazards preclude more intensive uses (e.g., flood areas, blast zones, AICUZ over 60, steep slopes, etc.) YES NO
- (c) other - specify: YES NO

B. LAND USE APPROVALS RECEIVED/IMPACT ON AGRICULTURAL USE

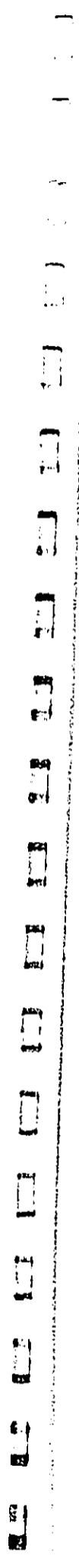
1. Portion(s) of proposed golf course sites are: YES NO
- (a) in State Urban District or Conservation District YES NO
- (b) designated Parks/Golf Course on DP YES NO
- (c) zoned Resort or P-2 YES NO

APPLIES ONLY IF IN STATE AGRICULTURE DISTRICT

2. Proposed golf course is not located on Land Study Bureau A or B soils. YES NO
3. Proposed golf course site is located on land: (select one category only)
- (a) which is not currently in use for agricultural production YES NO
- (b) which has not been used for agricultural production within the last 5 years YES NO

C. ENVIRONMENTAL IMPACT

1. Proposed golf course does not impact sensitive areas or is not in proximity to:
- marshes YES NO
- water quality, AA or AAA YES NO
2. Subsurface water type available is:
- (a) basal water (aquifer) YES NO
- (b) caprock water YES NO
- (i) fresh YES NO
- (ii) brackish YES NO
- (c) dike water YES NO
- (d) other limestone aquifer YES NO
3. Golf course is located below the No-Pass Line. YES NO



4. Developer has established a groundwater monitoring plan and system. YES NO

5. Irrigated areas will be no closer than 500 feet from potable water wells and reservoirs. YES NO

6. Irrigated areas will be no closer than 100 feet from any private residence. YES NO

7. There are holding/mixing ponds in the design. YES NO

8. Electric, not gas. Golf carts will be used. YES NO

9. Management programs have been developed in applying fertilizer or pesticides and
 (a) provide for the employment of a well qualified Golf Course Superintendent and/or other Professional Staff YES NO
 (b) provide monitoring and reporting of types and applications YES NO

10. Recharge Area: Golf course is located in area characterized by less than 50" average annual rainfall or above caprock YES NO

11. Less than 50% of the project site will be completely cleared and grubbed. YES NO

12. Alterations to the topography:
 (a) % slope of existing topography 5 - 20%
 (b) amount of cut and fill that will take place:
 Cut 250,000 cy
 Fill 250,000 cy
 (c) result of alterations to topography will be:
 (i) significant i.e.,
 (ii) moderate i.e.,
 (iii) slight i.e.,

D. INFRASTRUCTURE

1. To irrigate the golf course: (select one category only) YES NO

(a) nearly all potable water is used

(b) approximately a 50-50 mix of potable and non-potable water sources are used

(c) nearly all non-potable water is used

2. Net water usage is less than 100,000 gallons per day of potable water. YES NO

3. Sewage effluent is used for irrigation. (Applicant to build on-site SFP) YES NO

4. No new wells are needed to support golf course 2 wells now on site. YES NO

5. Golf course (exploratory wells only) public or centralized sewage system. YES NO

6. There is adequate existing road access to course. YES NO

E. COMMUNITY BENEFIT

1. The availability of public play and green fees at the golf course will be:
 (a) 100% public play at non-subsidized golf course prices
 (b) 50% public play with green fees at municipal golf course prices
 (c) 30% public play at municipal golf course prices

2. The cash value of community benefits is approximately the following amount:

- | | YES | NO |
|----------------------------|-------------------------------------|--------------------------|
| (a) \$100 million | <input type="checkbox"/> | <input type="checkbox"/> |
| (b) \$75 million | <input type="checkbox"/> | <input type="checkbox"/> |
| (c) \$50 million | <input type="checkbox"/> | <input type="checkbox"/> |
| (d) \$25 million | <input type="checkbox"/> | <input type="checkbox"/> |
| (e) Less than \$25 million | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

(Note: Community benefits include off-site improvements to service the community, park dedication beyond requirements, cash contribution in lieu of providing affordable housing, other direct cash contributions, etc.)

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

1/91-193

1638-A Mikahala Way
Honolulu, HI 96816

January 19, 1990

Mr Medeiros:


I will not have an opportunity to send these comments to Kaushiki Kaisha Oban, Hida Okamoto and Associates or OEQC, but these are my comments regarding the Lualualei golf course.

I would like the following issues addressed in the EIS:

1. How will the golf course affect nearby land prices? How will this then affect the supply of affordable housing? Will the golf course encourage urbanization of the area? What will be the economic, social, and environmental impact of such urbanization?
2. What will be the impact of pesticides on the water table and on the ocean from leaching?
3. Where will the water be coming from? What is the impact of using our limited water supply on golf courses rather than saving it for future affordable housing?
4. How much traffic will be generated by this project and can the roads handle it without improvement?

I look forward to seeing how the EIS treats these issues.

Sincerely,


David Kimo Frankel

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU

630 SOUTH KING STREET
HONOLULU, HAWAII 96813



FRANKEL P&S
1/19/90

BENJAMIN LEE
CHIEF PLANNING OFFICER
HONOLULU LIBRARY JN
DEPUTY CHIEF PLANNING OFFICER

WM 1/91-193

February 6, 1991

Mr. David Kimo Frankel
1638-A Mikahala Way
Honolulu, Hawaii 96816

Dear Mr. Frankel:

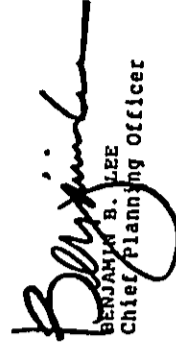
Comments in Response to the Environmental Impact Statement Preparation Notice for the Proposed Lualualei Golf Course, Waianae, Oahu--91/W-2

Thank you for your comments on the subject golf course contained in your letter dated January 19, 1990. By copy of this letter, we are forwarding your letter to the applicant for his direct response to you and are also sending copies of both letters to the Office of Environmental Quality Control.

We appreciate your input and will review the subsequent Environmental Impact Statement with your concerns in mind. Should you have any questions or further comments, please contact Bill Medeiros at 527-6089.

BBL:ft

cc: Tyrone Kusao
OEQC (w/attachment)


BENJAMIN B. LEE
Chief Planning Officer

RECEIVED

1991 FEB 24 PM 3:44

MIDA, OKAMOTO & ASSOCIATES, INC.
CONSULTING ENGINEERS

HARVEY K. HIDA, P.E.
*LANT. OKAMOTO, P.E.

January 28, 1991

Mr. David K. Frankel
1638-A Mikanaha Way
Honolulu, Hawaii 96816


Dear Mr. Frankel:

Subject: Lualualei Golf Course EIS

Your letter dated January 19, 1991 addressed to Mr. William Medeiros of the Department of General Planning was referred to my office. Please be advised that we will be addressing these issues in the project EIS document.

We appreciate your taking the time to provide us with your suggestions.

Very truly yours,


for Harvey K. Hida

HKH:afk

cc: Mr. William Medeiros

The Commerce Tower • 1440 Kapiolani Blvd. • Suite 915 • Honolulu, Hawaii 96814
Phone (808) 942-0066 • Fax (808) 947-7546

BOARD OF WATER SUPPLY

1100 BERETANIA STREET
HONOLULU, HAWAII 96813



January 30, 1991

FRANK F. FASI, Mayor
DONNA B. GOIK, Chairman
SISTER M. DAVID, AN CHICK, O.S.F.
VON CHAMBERLAIN
SAM CALLI JO
EDWARD Y. HIRATA
MILITRO O. WATSON, JR.
MURIEL H. TAMURA
KAZU HAYASHIDA
Manager and Chief Engineer

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Your Letter of January 22, 1991 Regarding Preparation of the Draft Environmental Impact Statement (DEIS) for the Proposed Luualalei Golf Course, TMK: 8-7-09: Por. 2; 8-7-10: 6 and 10; 8-7-19: Por. 1, Hakimo Road

Thank you for giving us the opportunity to review and comment on the proposed Luualalei golf course development as a consulted party in preparing the DEIS.

The development of the brackish water wells for irrigation should be coordinated with the State Department of Land and Natural Resources and the State Department of Health.

We will provide potable water only for the clubhouse facilities provided our existing water system in that area is adequate to accommodate the clubhouse.

We may have other comments regarding the proposed golf course when more detailed information is submitted for our review and approval.

If you have any questions, please contact Bert Kujoka at 527-5235.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

HARVEY K. HIDA, P.E.
ALAN I. OKAMOTO, P.E.

February 1, 1991

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 S. Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

Subject: Proposed Luualalei Golf Course EIS

This is to acknowledge receipt of your letter dated January 30, 1991 in response to our EISP material.

We will be coordinating with both the State Department of Land and Natural Resources and the State Department of Health in developing the brackish water wells for golf course irrigation. Further, we understand that potable water is for clubhouse use only.

The Office of Environmental Quality Control will be sending you a copy of the Draft EIS for your review in the near future.

We certainly appreciate your review of the forwarded material and comments thereon.

Very truly yours,

for Harvey K. Hida

HKH:afk

RECEIVED BY: [unclear]

The Commerce Tower • 1440 Kapiolani Blvd. • Suite 915 • Honolulu, Hawaii 96814
Phone (808) 942-0066 • Fax (808) 947-7546

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

100 SOUTH KING STREET, FIFTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE: 535-2100
FACSIMILE: 535-2100



THE COMMERCIAL ENGINEERS, INC.
CONSULTING ENGINEERS

HARVEY K. HIDA, P.E.
CITY ENGINEER

JOSEPH M. MAGALDI, JR.
DIRECTOR

TE-359
PL91.1.024

January 29, 1991

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
Suite 2507
1188 Bishop Street
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Lualualei Golf Course
Environmental Impact Statement
TRK: 8-7-09: For. 21, 8-7-10: 6, 10, 8-7-19 For. 1

This is in response to your letter of January 22, 1991 requesting our review and comments on the subject project.

Our concerns are as follows:

1. A traffic assessment should be prepared to address the need for separate turning lanes at the Makino/Faakea Roads intersection.
2. A schematic plan of the Makino Road/Farrington Highway intersection should be provided to our department and the State Department of Transportation.
3. The proposed ownership of the new access road parallel to Lualualei Naval Road should be specified.
4. A minimum pavement width of 20 feet for two-way traffic should be provided on all access roads from the proposed project to Farrington Highway.
5. The neighborhood board should be informed of the planned golf course development.

Should you have any questions, please contact Lance Watanabe of my staff at 523-4199.

Sincerely,

JOSEPH M. MAGALDI, JR.
Director

February 1, 1991

Mr. Joseph Magaldi, Jr.
Director
Department of Transportation Services
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Magaldi:

Subject: Proposed Lualualei Golf Course EIS

This is to acknowledge receipt of your letter dated January 29, 1991 in response to our EISPN material. Please be advised that items 1-4 of your comments will be referred to both our traffic and civil engineers for appropriate follow-up actions. For your information, we have sent the EISPN material to the Waianae Neighborhood Board Chairman.

Your attention to our request is sincerely appreciated and we look forward to working with your agency on this project.

Very truly yours,

Harvey K. Hida
for Harvey K. Hida

HRH:azk

The Commerce Tower • 1440 Kapiolani Blvd. • Suite 915 • Honolulu, Hawaii 96814
Phone (808) 942-0066 • Fax (808) 947-7546



William A. Bonnet
Manager
Environmental Department

Mr. Tyrone T. Kusao
1188 Bishop Street
Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Lualualei Golf Course

In response to your letter of January 22, 1991 and as discussed with your office on January 28, Hawaiian Electric has made a preliminary review of the proposed project and determined that we need not be a consulted party during the environmental review process. There is no indication of proposed relocation of HECO facilities, hence we would need only to continue discussion during the design phase of this project in preparation for electrical service.

Sincerely,

An HEI Company

-203-

January 28, 1991

MIDA, OKAMOTO & ASSOCIATES, INC.
CONSULTING ENGINEERS

HARVEY K. MIDA, P.E.
ALAN I. OKAMOTO, P.E.

January 31, 1991

Mr. William A. Bonnet
Manager, Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 2750
Honolulu, Hawaii 96840-0001

Dear Mr. Bonnet:

Subject: Lualualei Golf Course EIS

This is to acknowledge receipt of your letter dated January 28, 1991 in response to our EISPN material. We appreciate your taking the time to review the forwarded material and your responses thereon.

Very truly yours,

for Harvey K. Mida

HKH:afk

-204-

The Commerce Tower • 1440 Kapiolani Blvd. • Suite 915 • Honolulu, Hawaii 96813
Phone (808) 942-0066 • Fax (808) 942-0067

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813



OFFICE
1100

HIDA, OKAMOTO & ASSOCIATES, INC.
CONSULTING ENGINEERS

HARVEY K. HIDA, P.E.
ALANT. OKAMOTO, P.E.

WALTER M. OZAWA
DIRECTOR
ALVIN R. C. FUJII
DEPUTY DIRECTOR

January 31, 1991

January 29, 1991

Tyrone T. Kusao, Inc.
1188 Bishop Street
Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Proposed Lualualei Golf Course Project Development Plan
Amendment Application and Environmental Assessment
Tax Map Key: 8-7-09: por. 2;
8-7-10: 6 and 10;
8-7-19: por. 1

We have no comments on the subject project.

Sincerely,

WALTER M. OZAWA, Director

WMO:s1

cc: Department of General Planning

-205-

Mr. Walter H. Ozawa
Director
Department of Parks and Recreation
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Ozawa:

Subject: Proposed Lualualei Golf Course EIS
This is to acknowledge receipt of your letter dated
January 29, 1991 in response to our EISP material. Your
attention to our request is sincerely appreciated.

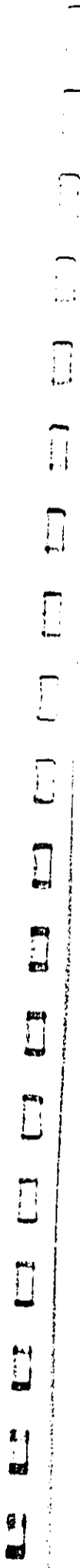
Very truly yours,

for Harvey K. Hida

HKH:afk

-206-

The Commerce Tower • 1440 Kapiolani Blvd. • Suite 815 • Honolulu, Hawaii 96814
Phone (808) 942-0066 • Fax (808) 942-7548



DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

810 SOUTH KING STREET
HONOLULU, HAWAII 96813 • PHONE 525-4123



REF: 525-4123

DONALD A. CLEGG
DIRECTOR

LORETTA R. CHEE
DEPUTY DIRECTOR

LU 01/91-0479 (AC)

January 31, 1991

Mr. Tyrone T. Kusao
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Environmental Assessment (EA)
for the Proposed Luualualei Golf Course Project
Manakuli, Oahu

Tax Map Key: 8-7-9; POR. 2, 8-7-10; 6, 8-7-19; POR. 1

We have reviewed the EA and offer the following comments:

1. The Draft Environmental Impact Statement (DEIS) should include a discussion of any anticipated impacts to the aquifer which may occur as a result of surface water drainage into the man-made lakes. Will lining of the lakes be considered as a possible mitigation alternative?
2. The DEIS should contain information supporting the assertion that adjacent water wells will not be adversely affected by tapping the basalt aquifer for golf course irrigation.
3. The containment of surface water runoff should be elaborated upon.

Thank you for the opportunity to comment on the Environmental Assessment.

Very truly yours,

Donald A. Clegg
DONALD A. CLEGG
Director of Land Utilization

DAC:lg

HARVEY K. HIDA, PE
CONSULTING ENGINEERS

HARVEY K. HIDA, PE
1411 OKAMOTO PE

February 1, 1991

Mr. Donald A. Clegg
Director
Department of Land Utilization
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Proposed Luualualei Golf Course
(Your File No: LU 01/91-0479 (AC))

Thank you for your letter of January 31, 1991 in response to our EISP material. We will be addressing your concerns in the DEIS. If we are unable to address your concerns adequately in the DEIS, we will certainly do so in the final document.

Your assistance in providing us with your comments is greatly appreciated.

Very truly yours,

Harvey K. Hida
for Harvey K. Hida

HKH:afk

The Commerce Tower • 1440 Kapiolani Blvd. • Suite 915 • Honolulu, Hawaii 96814
Phone (808) 942-0066 • Fax (808) 947-7546

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
840 SOUTH KING STREET
HONOLULU, HAWAII 96813



FRANKY PAST
MAIL ROOM

SAM CALLEJO
DIRECTOR AND CHIEF ENGINEER
C. MICHAEL STREET
HONOLULU, HAWAII 96813
In reply refer to:
ENV 91-26(449)

January 30, 1991

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Biehopp Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Malanae Development Amendment Application Report
and Environmental Assessment (EA)
Proposed Luualalei Golf Course Project
TRK: 8-7-9; Pot. 2; 8-7-10; 6 and 10; 8-7-19; Pot. 1

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

1. There are no municipal sewers in the area.
2. Approval from the State Department of Health is required for private sewer collection, treatment and disposal system.
3. If pumping is required, a private pumping service will have to be hired since the City does not provide pumping service.
4. A drainage report should be submitted to our Drainage Section, Division of Engineering, for review and approval.

Very truly yours,

C. Michael Callejo
SAM CALLEJO
Director and Chief Engineer

HARVEY K. MIDA, P.E.
ALBERT OKAMOTO, P.E.

February 1, 1991

Mr. Sam Callejo
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
1188 Biehopp Street, 11th Floor
Honolulu, Hawaii 96813

Dear Mr. Callejo:

Subject: Proposed Luualalei Golf Course EIS

This is to acknowledge and thank you for your letter of January 30, 1991 in response to our EISPM material. We appreciate your response and will comply with all the requirements mentioned in your letter.

Your assistance in reviewing the submitted material and your response thereon is sincerely appreciated.

Very truly yours,

Harvey K. Mida
for Harvey K. Mida

MERIAL

The Commercial Trust Co. of Hawaii
1140 Alakoa Blvd., Suite 1111, Honolulu, Hawaii 96813
Phone (808) 442-0000 • Telex (808) 217-1948

JOHN WAINHEB
GOVERNOR



YUKIO HIRAYAMA
CHAIRPERSON, BOARD OF AGRICULTURE
ILUMA A. PIIAMAI
DEPUTY TO THE CHAIRPERSON
FAX: 548-6100

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96823-2159

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

January 29, 1991

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, HI 96813

Dear Mr. Kusao:

Subject: Environmental Assessment/Proposed Waianae
Development Plan Land Use Map Amendment
(Agriculture to Park) for Luualualei Golf Course
Sanjiro Nakada
THK: 8-7-09: por. 2
8-7-10: 6, 10
8-7-19: por. 1 Nanakuli, Oahu
Area: 259.25 acres

The Department of Agriculture has reviewed the subject
environmental assessment (EA) and offers the following comments.
The references to the three soils studies should be corrected as
follows:

- The Soil Conservation Service (SCS) Soil Survey indicates
that Luualualei series soils (clay and extremely stony clay)
comprise about two-thirds of the subject property. The
portion of the property up towards and including Puu
Heleakala is comprised of rock land which has extremely
limited agricultural potential. The Luualualei soils
adjacent to the Kolekole/Hakimo roads (LUA, LUB) have fair
productivity if irrigated. Luualualei extremely stony clay
(LPE) has very limited productivity potential unless the
stones are removed. Such was the case with the former
Ryoai Higa farm.

- About 45 acres of the property is classified "prime"
according to the Agricultural Lands of Importance to the
State of Hawaii (ALISH) system. These "prime" lands appear
to be the same as the areas identified by the SCS as LUA,



Mr. Tyrone T. Kusao, Inc.
January 29, 1991
Page -2-

LUB, and the former Ryoai Higa farm. The remainder of the
property is not classified according to the ALISH system.

The property has Land Study Bureau Overall Productivity
Ratings and Land Types of B621, E62, E102, E104, and
E114. The B621 rating is found in the same area as the
former Ryoai Higa farm. The E62 rating is the same as
B621, but without irrigation. Likewise, the E63-rated
lands (which include those soils identified as LPE by the
SCS) would have been rated "B" if these lands were
irrigated at the time of study.

The conclusion we reach from the above is that while the subject
property is presently vacant, a portion of it has potential for
productive agricultural use as is or if rocks are removed. The
former Ryoai Higa farm is an example of the realization of the
latter potential. Furthermore, the fact that agricultural lands
lie fallow does not mean that these lands have no agricultural
value.

Impact Upon Surrounding Uses

The EA states in its preliminary view "...that development of
the course should not have a substantial impact on the assessed
values of adjacent properties for the following reasons: First,
the project is quite a distance from the nearest small farm and
rural neighborhood and, generally, is separated from them by
Luualualei Naval Road" (emphasis added) (EA, page 46).

According to our information, there are few other areas on Oahu
that have an equivalent aggregation of intensive diversified
farming activities such as found in the subject area. As of
1982, there were vegetable/melon farms, hog, and poultry
operations immediately to the west of the project site, along
Hakimo Road. Further east along Hakimo Road, there were flower
farms and other hog and poultry operations. In order to
ascertain this distance, we suggest that the Draft EIS contain a
map indicating at a minimum, the locations and types of farms in
the vicinity of the project.

According to the EA, the Draft EIS will "propose a plan which
would compensate for any negative impacts" (EA, page 48). If
there are to be negative impacts upon agricultural activities in
the region, we suggest that among the possible forms of
compensation to be considered should be those that are
beneficial to agriculture.

Mr. Tyrone T. Kusao, Inc.
January 29, 1991
Page -3-

We look forward to reviewing the Draft EIS when it is available.
Thank you for the opportunity to comment.

Sincerely,

Yukio Kitagawa
YUKIO KITAGAWA
Chairperson, Board of Agriculture

c: Office of Environmental Quality Control
Office of State Planning (attention: Land Use Division)
Department of General Planning, City and County of Honolulu



CONSULTING ENGINEERS

HARVEY K. HIDA, P.E.
ALANT OKAMOTO, P.E.

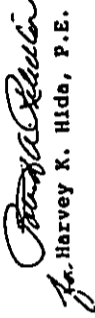
Chairperson Yukio Kitagawa
February 1, 1991
Page 2.

Your information concerning soil classifications within the site raises facts (i.e. the effects of irrigation on Class E62 lands) that are not readily available in the existing reports and studies. They indicate a critical need for additional research on the subject of soil suitability by a certified agriculturalist. Our information indicates that most of the land within the project site are classified "E" under the Land Study Bureau rating system. However, we will retain such an agriculturalist to conduct the needed detailed studies of soils within the subject site.

Because of our tight EIS processing schedule, the findings of an agriculturalist may not be ready in time for inclusion within the draft EIS. However, they will certainly be ready for inclusion in the final EIS. Please be advised accordingly.

Thank you for your helpful and informative comments on the EA. Rest assured that we will address them in the draft EIS, if processing time permits, and most assuredly in the final EIS.

Sincerely,


Harvey K. Hida, P.E.

February 1, 1991

Mr. Yukio Kitagawa
Chairperson
Board of Agriculture
State of Hawaii
1428 S. King Street
Honolulu, Hawaii 96812

Dear Chairperson Kitagawa:

Subject: Environmental Assessment/Proposed Waianae
Development Plan Land Use Map Amendment
(Agriculture to Park) for Luualaei Golf Course.

Thank you for your January 29 comments on the above-captioned Environmental Assessment (EA). They were most informative and helpful.

As addressed in the draft EIS, the matter of potential agricultural use of the project site represents the best information available to us at the present time and without the benefit of input and research from an agricultural specialist. We relied heavily, in both the EA and draft EIS, on existing information sources and reports regarding the suitability of the site for agricultural use as well as field survey information.

While there are intermittent small farms along Hakimo Road, existing farming activities occur closer to Hakimo Road and closer to the farm residences which generally front that roadway. The Navy restricts direct access to/from the Luualaei Navy Road from adjoining properties. Thus, small farms and related small farming activities have gravitated, locationally, closer to Hakimo Road which is quite a distance from the bulk of the proposed golf course. Nevertheless, we will obtain the suggested information concerning locations and types of farms in the vicinity of the project for inclusion in the draft or final EIS.

The Commerce Tower • 1440 Kapiolani Blvd. • Suite 915 • Honolulu, Hawaii 96814
Phone (808) 942-0066 • Fax (808) 947-7548

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1433 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813



FRANK F. PASI
Mayor

MICHAEL S. NAKAMURA
Chief
MICHAEL M. KAWAHAU
Deputy Chief

OUR REFERENCE DY-LK

February 4, 1991

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Environmental Impact Statement (EIS) for Proposed
Lualualei Golf Course

After reviewing the material for the above project, we find that the development will not significantly impact the services of the Waianae police personnel.

The proposed improvements to the roadways to accommodate the projected increase in vehicular traffic appear to be sufficient so as not to adversely affect traffic.

We appreciate the opportunity to comment.

Sincerely,
MICHAEL S. NAKAMURA
Chief of Police
By *Michael S. Nakamura*
CHESTER E. HUGHES
Assistant Chief of Police
Support Services Bureau

TYRONET. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-8828
RES (808) 385-1338
FAX (808) 521-4282

March 6, 1991

Mr. Michael S. Nakamura
Chief of Police
Police Department
City & County of Honolulu
1455 S. Beretania Street
Honolulu, Hawaii 96814

Dear Police Chief Nakamura:

Subject: Environmental Impact Statement (EIS) for
Proposed Lualualei Golf Course.

This acknowledges our receipt of your February 4 letter commenting that the above-captioned project will not significantly impact the services of the Waianae police personnel and that proposed roadway improvements for the project to accommodate the projected increase in vehicular traffic appear to be sufficient so as not to adversely affect traffic.

We truly appreciate your prompt review of the Draft EIS.

Sincerely,
Tyrone T. Kusao
Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.

7-0000-0100
01/01/01



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 411
HONOLULU, HAWAII 96813

REF:OCEA:JN

File No.: 91/298/299
Doc. No.: 9716E

Feb 5 1990

Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

We are currently reviewing the Environmental Assessments recently submitted to us for both the Ewa Marina Phase II and the Luualalei Golf Course projects. We understand that the draft Environmental Impact Statement for these projects will be available shortly. Please include us as a consulted party in the EIS process for both projects. We would appreciate receiving five copies of each draft EIS in order to expedite our review.

Very truly yours,

William W. Paty
William W. Paty

cc: OEOC

WILLIAM W. PATY, CHAIRPERSON
Board of Land and Natural Resources

MEMBERS
ELIOT W. JAMES
MAMAKU TAGAMOHU
RUSSELL W. FURUKAWA
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CONSTRUCTION AND
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PROGRAM
STATE AND LAND DEVELOPMENT

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Planning and Zoning Consultant

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HONOLULU, HAWAII 96813
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FAX: (808) 535-1338
FAX: (808) 531-4882

February 23, 1991

The Honorable William W. Paty
Chairperson
Board of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

Environmental Impact Statement Preparation Notice (EISPN)
Luualalei Golf Course.

This will acknowledge your February 5, 1991 letter regarding the above EISPN. The Department of Land and Natural Resources was included as a consulted party in the EIS process as you requested.

Any future comments you may have will be appreciated and will be incorporated into the Final EIS.

Thank you for your interest and if you should have any questions, please feel free to contact me.

Very truly yours,

Tyrone T. Kusao
Tyrone T. Kusao

cc: Department of General Planning
City and County of Honolulu



STATE OF HAWAII
DEPARTMENT OF HEALTH

P. O. BOX 319
HONOLULU, HAWAII 96813

February 11, 1991

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

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

In reply, please refer to:
EHD/SOWB

Mr. Tyrone T. Kusao
Page 2
February 11, 1991

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED
LUALUALEI GOLF COURSE
LUALUALEI, HAWAII, OAHU
TRK: 8-7-09; POR. 2; 8-7-10; 6 AND 10; 8-7-19; POR. 1

Thank you for the opportunity to review and comment on the subject project. We have examined the Development Plan Amendment Application and Environmental Assessment report and have the following comments to offer:

Drinking Water

- 1) According to the report, the project's potable water requirements will be supplied by the Board of Water Supply. It goes to state that on-site wells will be developed for golf course irrigation. Thus, the Department's Administrative Rules, Title 11, Chapter 20, "Potable Water Systems," will not be applicable. In the event that the proposed use were to change, the Safe Drinking Water Branch must be informed.
- 2) The proposed development is situated above the Department's Underground Injection Control (UIC) line. Land areas located above the UIC line are generally considered to contain underground sources of drinking water. The report confirms the existence of an aquifer, underlying the entire project site, with reasonably low salinity water previously used for domestic and agricultural purposes. These areas should therefore be protected against all sources of groundwater contamination.
- 3) It is essential that any proposed wells in the project area be designed and constructed to prevent the possibility of groundwater contamination. For example, each well should have a concrete pad and full grouting to prevent seepage or floodwaters from migrating down the well shaft.

- 4) The standard golf course conditions (attached) apply to this project.
- 5) The potable and non-potable water systems must be carefully designed and operated to prevent cross-connections and backflow conditions. The two systems must be clearly labeled and physically separated by air gaps or reduced pressure principle backflow preventers to avoid contaminating the potable water supply.

Wastewater Branch

- 1) The subject project areas are located in the proposed critical wastewater disposal area as determined by the Oahu Wastewater Advisory Committee. No cesspools will be allowed in the subject area. The area is also above the Department's UIC line and within the "Pass" Zone as determined by the Board of Water Supply.
- 2) After consultation with the City and County Wastewater Management Division, it has been determined that the area is currently not serviced by a sewer line. However, the area is adjacent to residential areas that are to be serviced by the City.
- 3) At this time, the details of the wastewater treatment and disposal are incomplete. The reports suggest that a private sewer system will be developed and treatment and disposal will be handled on-site. The Department is not in favor of this alternative. We highly recommend that wastewater be collected and transported to the municipal wastewater system.
- 4) We do reserve the right to review all detailed wastewater plans for conformance to applicable rules prior to the actual time of construction.

Very truly yours,

John C. Lewin
JOHN C. LEWIN, M.D.
Director of Health

Enclosure



STATE OF HAWAII
DEPARTMENT OF HEALTH

April, 1990 (Version 3)

EIGHT (8) CONDITIONS APPLICABLE TO THIS NEW GOLF COURSE DEVELOPMENT

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 monitoring system tailored to fit site conditions and circumstances. The system shall include, and not be limited to, the use of monitoring wells, lysimeters and vadose zone monitoring technologies. If monitoring wells are used, the monitoring wells shall generally extend 10 to 15 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. Baseline groundwater/vadose zone water data shall be established as described in this paragraph. Once the monitoring system 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 establish the baseline groundwater/vadose zone water quality and report the findings to the State Department of Health. Testing of the analyses of the groundwater shall be done by a certified laboratory.
3. If the data from the monitoring system 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.

-2-

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 helminths or worms).
 - b. **General Recommendations**
 - 1) Irrigated areas should be no closer than 500 feet from potable water wells and reservoirs.
 - 2) Irrigated areas should be no closer than 200 feet from any private residence.
 - 3) Application rates should be controlled to minimize ponding. Excess irrigation tailwater in the reclaimed wastewater irrigation area shall be contained and properly disposed. An assessment should be made of the acceptable time and rate of application based on factors such as type of vegetation, soil, topography, climate and seasonal variations.
 - 4) Effluent holding/mixing ponds shall be designed to prevent the infiltration of the wastewater into the subsurface. The holding/mixing ponds shall be made impervious.
 - 5) Irrigation shall be scheduled such that the public is not in the vicinity and the soil is sufficiently dry to accept the irrigation water.
 - 6) Permanent fencing or barriers shall be erected around polishing or holding ponds to prevent public entry or stray feral and tame animals from gaining access to the ponds.

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

- 6. Releases from underground storage tanks (USTs) used to store petroleum products for fueling golf carts, maintenance vehicles, and emergency power generators pose potential risks to groundwater.

Should the owner/developer/operator plan to install USTs that contain petroleum or other regulated substances, the owner/developer/operator must comply with the federal UST technical and financial responsibility requirements set forth in Title 40 of the Code of Federal Regulations Part 280. These federal rules require, among other things, owners and operators of USTs to meet specific requirements in the detection, release response and corrective action. Also, the owner/developer/operator must comply with all State UST rules and regulations pursuant to Chapter 342-L, "Underground Storage Tanks" of the Hawaii Revised Statutes.

In consideration of the above-mentioned remarks, the Department of Health recommends that the owner/developer/operator implement facility plan alternatives that exclude the installation and operation of UST systems (e.g., the preferential use of electric golf carts, use of above-ground storage of fuel oil for emergency power generators, etc.), or, if USTs are utilized, that secondary containment be considered.
- 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 543-8304. We ask you cooperation in the protection of Hawaii's valuable groundwater resource.

TYRONET, KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2202
HONOLULU, HAWAII 96813
BUS (808) 539-8652
RES (808) 385-1338
FAX (808) 531-4282

March 5, 1991

Dr. John C. Lewin, M.D.
Director
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Lewin:

Subject: Environmental Impact Statement Preparation
Notice for the Proposed Luahale Golf Course,
Manakuli, Hawaii, THK: 8-7-09: por. 2, 8-7-10;
parcels 6 and 10; and 8-7-19: por. 1.

This acknowledges our receipt of your February 11 letter commenting on the above-captioned EIS preparation notice and responds to your comments in the order in which they are listed in your letter. The substantive content of the following responses reflect input from the project engineers.

Re: Drinking Water

1. At this time, there are no plans to convert the on-site wells for potable water use. In the event that the proposed water use is changed, the Safe Drinking Water Branch of the State Health Department will be informed and there will be compliance with the Health Department's Administrative Rules, Title 11, Chap. 20, "Potable Water Systems".
2. Your concerns regarding the protection of underground water sources within the project site are duly noted and are addressed in the Draft EIS. The project architects and engineers have been informed of your concerns and will also incorporate safeguards against ground water contamination within the site.
3. Proposed wells for the project will be designed and constructed in a manner which incorporates structural and design safeguards which help to prevent the possibility of groundwater contamination.
4. The development and operation of the proposed golf course will comply with the standard golf course conditions which were attached to your letter. Incidentally, these conditions are normally applied during the rezoning process for golf courses which still lay ahead for this project.

Dr. John Lewin, M.D.
March 5, 1991
Page 2.

5. Your concern about cross-connections and preventing backflow conditions in the potable and non-potable water systems for the project will be addressed during the project's engineering and construction phases. Proper labelling and system separation will be designed into the system.

Wastewater:


1. All applicable regulations regarding the Board of Water Supply (BWS) "no pass" line and the State's Underground Injection Control (UIC) line will be complied with during the engineering, construction and operation phases of the project.
2. The project site is unsewered property. The closest existing residential area to the project site which is expected to be provided with public sewers in the foreseeable future is located approximately 9,000 feet away (more than 1.5 miles away) from the project site.
3. We understand that, generally, your Department disfavors the use of private sewer systems and on-site treatment and disposal of wastewater. However, our proposed on-site private sewage collection, treatment and disposal system is designed to provide approximately 2 percent (2%) of the total golf course irrigation supply through the reuse of treated effluent as generally encouraged by existing State and City policies. Effluent storage and irrigation ponds within the project will be separated; storage ponds will be lined with impervious materials to prevent percolation and seepage into the ground. The technical details, preliminary engineering study and construction of the proposed wastewater collection, treatment and disposal system will be submitted to the DOH for review and approval prior to construction as required by law. Your suggestion that wastewater generated from the project be collected and transported to the municipal wastewater system was also addressed by the City Public Works Department which informed us that the City does not provide such pumping service. This alternative will be reviewed carefully; however, it could prove to be very costly and would not allow the reuse of safely treated effluent for golf course irrigation pursuant to existing public policies.

Dr. John Lewin, M.D.
March 5, 1991
Page 3.

In accordance with your request, DOH has been consulted in the preparation of the draft EIS for the project and the draft and/or final EISs for the project will address all DOH concerns raised in your February 11 and any subsequent DOH comments on the project.

Thank you, again, for reviewing our project and offering very helpful comments thereon.

Sincerely,



Tylene T. Kusao
Consultant

copy: Hida Okamoto & Associates.





**DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM**

ENERGY DIVISION, 335 MERCHANT ST., 8th FLOOR, HONOLULU, HAWAII 96813 PHONE: (808) 541-2000 FAX: (808) 524-5213

JOHN WAIKAI
COMMISSIONER
MURRAY F. JONES
BARBARA K. HARRISON
DEPUTY DIRECTOR
DEPUTY DIRECTOR

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

2702
1188 898-HCP STREET, SUITE 200
HONOLULU, HAWAII 96813
BUS: (808) 526-8859
FIS: (808) 526-1338
FAX: (808) 527-4892

February 13, 1991

March 5, 1991

Mr. William Medeiros
City and County of Honolulu
Department of General Planning
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Medeiros:

Subject: Proposed Lualualei Golf Course Project
Manakuli, Oahu
TMK: 8-7-9: por 2; 8-7-10: parcel 6
8-7-19: por. 1

We wish to inform you that we have no comments to offer on the subject environmental impact statement preparation notice.

Thank you for the opportunity to review the document.

Sincerely,

Maurice H. Kaya
Maurice H. Kaya
Energy Program Administrator

MHK/hkals25

cc: Office of Environmental Quality Control
Kabushiki Kaisha Oban
Hida Okamoto and Associates

Mr. Maurice H. Kaya
Energy Program Administrator
Department of Business, Economic
Development & Tourism
State of Hawaii
335 Merchant Street, Rm. 110
Honolulu, Hawaii 96813

Dear Mr. Kaya:

Subject: Proposed Lualualei Golf Course Project,
Manakuli, Oahu, Hawaii; TMK 8-7-9: por. 2,
8-7-10: parcel 6 and 8-7-19: por. 1.

Thank you for your February 13 letter informing us that you have no comments to offer on the environmental impact statement preparation notice for the above-captioned project. We appreciate your review of the notice and your written response thereto.

Sincerely,

Tyrone T. Kusao
Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.



DEPARTMENT OF THE NAVY
 COMMANDER
 NAVAL BASE PEARL HARBOR
 BOX 110
 PEARL HARBOR, HAWAII 96860-0110

Mr. Tyrone T. Kusao
 Tyrone T. Kusao, Inc.
 1188 Bishop Street, Suite 2507
 Honolulu, HI 96813

Dear Mr. Kusao:

ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED LUALUALEI GOLF COURSE

As requested by your letter of January 22, 1991, we have reviewed the Development Plan Amendment Application and Environmental Assessment report on the proposed project and offer the following comments to assist you in the preparation of the EIS.

The proposed Lualualei Golf Course may impact two Navy activities located adjacent to the project. These activities are Naval Magazine Lualualei (NAV MAG LLL) which is a major ordnance storage facility and Naval Computer and Telecommunications Area Master Station Eastern Pacific (NCTAMS EASTPAC) which operates the radio transmitter facility located to the northwest of the proposed project. The EIS should address the following areas of concern:

Safety. It appears there may be a hazard from errant golf balls to users of Lualualei Access Road and to personnel and buildings on NAV MAG LLL property. Golf ball hazards on the Lualualei Access Road would primarily affect Navy operations, as the road is used for access to the Navy facilities and transport of materials and ordnance. Mitigation measures such as realigning the layout of holes, installing fencing and protective netting may improve this situation. Your consideration of these suggestions would be appreciated.

Security. Golf course improvements up to the boundary (fence) of NAV MAG LLL may degrade the physical security of the station. Bushes and trees along the fence not only provide concealment for intruders but could provide easier access to scale the fence. A clear zone of approximately twenty feet in width along the fence that could be maintained as part of the golf course would accommodate our concerns.

Traffic on Lualualei Access Road. The statement in the Development Plan Amendment Application and Environmental Assessment report that the Lualualei Access Road is open to public use from Farrington Highway to the Lualualei Naval Ammunition Depot is not true today due to the low-intensity land uses in the vicinity and the corresponding low level of non-military traffic. The roadway is owned by the Navy. In the road's present condition, use by the public must be prohibited to maintain safe ordnance hauling operations.

Subj: ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR PROPOSED LUALUALEI GOLF COURSE

In consonance with this policy, the Navy denied use of the road for golf course patrons. However, if the road is improved and made acceptable to the City and County of Honolulu by the developer, the Navy would consider dedicating the road to the City, thereby allowing public use.

The developer proposes to construct a new access road parallel to Lualualei Access Road from Paakea Road to the golf course club house. Since Paakea Road may connect with the Naval road, it appears that the Naval road could be used between Farrington Highway and Paakea Road despite the Navy's denial of golf course patrons' use of Lualualei Access Road. Although use of the Naval road is not proposed for access to the golf course, some patrons may park along the road and walk to the golf course or drive in if possible. The Navy will not permit parking along the Lualualei Access Road and will be obliged to take appropriate enforcement actions. Because the Navy must deny general use of the Lualualei Access Road in its present condition, the EIS should present plans to prevent use of the Naval Road by golf course patrons.

Water use and impact on sources. Like any increased development, the proposed project will be drawing on limited water resources. The EIS should address in greater detail how withdrawal of ground water for golf course irrigation would limit the water available for other possible uses and whether the quality of the water available to neighboring properties would be degraded as a result of construction and operation of the golf course.

Navy titles. References in the documents to the "Naval Ammunition Depot, Lualualei" should be corrected to "Naval Magazine Lualualei" and references to the "Lualualei Naval Road" should be corrected to the "Lualualei Access Road."

Thank you for the opportunity to comment on the subject environmental impact statement preparation. Should you have any questions, the Navy point of contact is Mr. Bill Liu, telephone 471-3324.

Sincerely,

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

Copy to:
 Department of General Planning
 C&C Honolulu (B. Lee)

TYRONE T. KUSAD, INC.
Planning and Zoning Consultant

2202
1188 BISHOP STREET, SUITE 2202
HONOLULU, HAWAII 96813
BUS 808 538-8808
RES 808 355-1338
FAX 808 521-4282

March 5, 1991

Commander
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860

Mr. W. K. Liu
Asst. Base Civil Engineer
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020

Gentlemen:

Subject: Environmental Impact Statement (EIS)
for Proposed Luahalei Golf Course.

This acknowledges our receipt of your letter dated February 15, 1991 which responds to the above-captioned EIS Preparation Notice. We appreciate your prompt response to the Notice and the very helpful comments and suggestions therein. We respectfully respond to your comments accordingly:

Safety

The project's final EIS will address this matter and identify mitigation measures to avoid the hazard to personnel and property within the Naval Magazine LLL which could be caused by potential errant golf balls coming over from the golf course. For your information, golf course architects generally accept a 150-foot setback area between a golf course and adjacent properties. Construction of the course will adhere to this accepted practice even though it is not required by law.

Security

A clear zone, approximately twenty (20) feet wide along the fence of the Naval Magazine LLL, will be provided and incorporated as part of the golf course.

Traffic On Luahalei Access Road:

In response to your comments, the following information submitted by the project's traffic impact consultants is presented:

Naval Base Pearl Harbor Commander
March 5, 1991
Page 2.

1. Field surveys by the consultants last month revealed several direct access on the part of private farm lots onto Luahalei Naval (Access) Road near the Luahalei Naval Ammunition Depot main gate; a new gravel road located mauka of the proposed golf course clubhouse site and approximately 100 yards makai of the Depot's main gate which provides direct access to the Road to various farm lots; other paved and unpaved driveways from the Road to private residences and commercial establishments along the Road; and direct access to the Road from the Hawaiian Cement Company concrete batching plant apparently under a letter of agreement with the Navy Department.
2. Peakea Road, a City and County roadway, is not connected to the Luahalei Naval Road and there are no plans by the City or the project applicant to construct such a connection.
3. The proposed parallel access road leading from Peakea Road to the golf course site will have no direct access onto the Luahalei Naval Road. You are correct that a golf cart underpass across the Naval Road, as recommended by the Navy Department (Ref. letter Ser 2412, Dec. 31, 1989), will be constructed.
4. Golf course patrons will be unable to park along the Naval Road because there is an existing hogwire and barbed wire fence along the length of the Road. Also, the project applicant will provide physical barriers to discourage pedestrians from entering the golf course site and prevent vehicles from accessing from the Naval Road.
5. The draft EIS addresses vehicular access to the proposed golf course from Hakimo Road as recommended by the Navy Department in its December 31, 1989 letter. There are no plans to use the Naval Road to access onto the golf course facilities.

Water Use and Impact on Sources:

The draft EIS notes that most farm residences within the general vicinity of the project site are connected to the Board of Water Supply water system for domestic water use. The underground water sources nearer to such residences are contained in a limestone aquifer as a lens of brackish water floating on sea water and are generally unsuitable for domestic or irrigation purposes.

A basalt aquifer underlying the property and foothills of the Puu Haleakala Ridge are not readily accessible to most of these farm residences. Therefore, construction of the golf course and

Naval Base Pearl Harbor Commander
March 5, 1991
Page 3.

will not impact the existing or future domestic and irrigation water availability to such farm properties.

This entire subject matter will be more thoroughly treated in the final EIS.

Navy Titles

The final EIS will contain the correct Navy titles as noted in your letter.

Thank you for thoroughly reviewing the project's EIS documents and providing some very helpful comments thereon. The Navy is a consulted party on the draft EIS and we will give its valuable comments and suggestions very careful review and attention.

Sincerely,



Tyfone T. Kusao
Consultant

copy: Hida Okamoto & Associates.





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

REPLY TO:
ATTENTION OF:

February 26, 1991

Planning Division

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Thank you for the opportunity to review the Development Plan Amendment Application and Environmental Assessment for the proposed Lualualei Golf Course, Manakuli, Oahu. The following comments are offered:

- a. A Department of the Army permit would be required for the placement of fill material into waters of the United States, including streams and wetlands. For more information on permit requirements, please contact Operations Division at 438-9258 and refer to file number P091-075.
- b. According to the Flood Insurance Rate Map, the project site is in Zone D (areas in which flood hazards are undetermined).

Sincerely,

C. Cheung
Kisuk Cheung
Director of Engineering

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

202
1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-8032
RES (808) 363-1338
FAX (808) 531-4282

March 5, 1991

Mr. Kisuk Cheung
Director of Engineering
U.S. Army Engineering District, Honolulu
Department of the Army
Building 230
Fort Shafter, Hawaii 96858-5440

Attn: Planning Division.

Dear Mr. Cheung:

Subject: Proposed Lualualei Golf Course Environmental Impact Statement Preparation Notice.

Thank you for your February 26 letter offering comments on the above-captioned document. We respond to your comments accordingly:

According to the project engineer, the development of the proposed project, including the golf course; clubhouse with dining facilities, meeting and function rooms; maintenance facilities; and driving range/nursery facility will not be placed within any waters of the United States, including streams and wetlands. Therefore, no Department of the Army permit is required in order to construct the project.

The Draft Environmental Impact Statement on the project notes that the project site is in Zone D (areas in which flood hazards are undetermined) according to the Flood Insurance Rate Map.

We appreciate your help comments on this project.

Sincerely,

Tyrone T. Kusao
Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.

CHAPTER IX

Comments During The Preparation Of The Final EIS

**CHAPTER IX. COMMENTS DURING THE PREPARATION OF THE
FINAL EIS**

Sixty (60) copies of the Draft Environmental Impact Statement for the LUALUALEI GOLF COURSE were received by the Office of Environmental Quality Control on February 4, 1991. Notice of the DEIS was published in the February 8, 1991 OEQC Bulletin and sixty copies of the report were distributed to interested public agencies, organizations and individuals. The original plus one (1) copy of the DEIS were delivered to the accepting agency, the Department of General Planning, City and County of Honolulu. A total of 21 comments were received in response to the Draft EIS. All comments were responded to with both comments and responses reprinted on the following pages.

Agencies and organizations submitting comments to the *Draft Lualualei Golf Course EIS* are as follows:

City and County of Honolulu

Building Department

Fire Department

Dept. of Land Utilization

Dept. of Parks and Recreation

Police Department

Dept. of Public Works

State of Hawaii

Dept. of Accounting and General Services

Dept. of Defense

Office of Environmental Quality Control

Dept. of Health

Dept. of Land and Natural Resources 3/1/91

Dept. of Land and Natural Resources 3/15/91

Dept. of Land and Natural Resources 3/21/91

Office of State Planning

Dept. of Transportation

University of Hawaii 2/14/91

University of Hawaii 3/25/91

Federal Government

United States Dept. of Agriculture

Dept. of the Army

Dept. of the Navy

PRIVATE

Hawaiian Electric

HIDA, OKAMOTO & ASSOCIATES, INC.
CONSULTING ENGINEERS

HARVEY K. HIDA, P.E.
ALAN T. OKAMOTO, P.E.

February 4, 1991

'91 FEB -4 P4.01

Dr. Bruce S. Anderson
Acting Director
Office of Environmental Quality Control
465 S. King Street
Kekuanaoa Building, Room 104
Honolulu, Hawaii 96813

Office of
QUALITY

Dear Dr. Anderson:


Subject: Lualualei Golf Course Draft Environmental
Impact Statement, Nanakuli, Oahu, Hawaii
TMK 8-7-9: por. 2, TMK 8-7-10: parcels 6 and 10
and TMK 8-7-19: por. 1.

Enclosed herein are 60 copies of the subject Draft EIS for
publication in your February 8, 1991 Bulletin and
distribution by your agency.

Please be advised that we have also forwarded the original
draft document plus 1 copy to the City Department of General
Planning, the accepting authority.

Your assistance in processing this Draft EIS is greatly
appreciated and should there be questions please contact
Tyrone T. Kusao at 538-6652 or myself.

Very truly yours,


Harvey K. Hida

cc: Department of General Planning
Yoshio Maeda
Tyrone T. Kusao

OEQC BULLETIN



JOHN WAIHEE
GOVERNOR

OFFICE OF ENVIRONMENTAL QUALITY CONTROL

DIRECTOR

VOLUME VII

FEBRUARY 8, 1991

NO. 3

REGISTER OF CHAPTER 343, HRS DOCUMENTS

The OEQC Bulletin is a semi-monthly publication. The publication dates of the bulletin are the eighth and twenty-third of each month. Applicants should deliver an appropriate number of Draft and Final EISs to the accepting authority before submitting copies to OEQC for distribution and publication. Environmental Assessments should be submitted to the accepting authority directly. Based on the assessment, the accepting authority will submit to OEQC a determination of a Negative Declaration or a Preparation Notice for publication in the bulletin. Draft and Final Environmental Impact Statements must be received by the fifth and twentieth days of the month for publication in the respective issue. Negative Declarations and Preparation Notices must be received at least five working days prior to the publication date. All documents submitted for publication in the OEQC Bulletin should be delivered to the Office of Environmental Quality Control, 465 South King Street, Room 104, Honolulu, Hawaii 96813. To ensure proper processing of documents, please attach OEQC Bulletin Publication Form with all submittals. These forms can be obtained by calling OEQC at 548-6915.

LUALUALEI GOLF COURSE

Location: Nanakuli, Oahu
TMK: 8-7-09:02
8-7-10:06
8-7-19:01

Please send your comments to:

Accepting Authority: Department of General Planning
Attn: William Medeiros
650 South King Street,
8th Floor
Honolulu, Hawaii 96813

with a copy to:

Applicant: Kabushiki Kaisha Oban
c/o Harvey Hida
1440 Kapiolani Boulevard,
Suite 915
Honolulu, Hawaii 96814

and a copy to:

Consultant: Hida Okamoto and Associates
c/o Tyrone Kusao, Inc.
1188 Bishop Street,
Suite 2507
Honolulu, Hawaii 96813

and a copy to OEQC.

Deadline: March 25, 1991

The applicant, Kabushiki Kaisha Oban, is planning the development of a golf course complex containing an 18-hole, regulation golf course, a clubhouse facility and a golf

driving range/nursery site. The complex would be located in Lualualei Valley. The major elements of the golf course include: a new access roadway paralleling the Lualualei Navy Road and providing access to the course, potable and non-potable (course irrigation) water systems, drainage facilities with retention and detention ponds, a private wastewater collection and disposal system, and electrical, telephone and other utility services.

The golf course project site contains approximately 259.25 acres, located mauka of Farrington Highway and adjacent to the Lualualei Naval Ammunition Depot. Elevation of the golf course site ranges from approximately 65 feet above mean sea level (msl) near Lualualei Navy Road and throughout a flat plateau which comprises the vast bulk of the project site to nearly 250 feet above msl along its mauka portions which encompass some of the foothills of the Puu Haleakala ridges to the Waianae mountain range.

The site is vacant land overgrown mostly with grasses and haole koa bushes. Ulehawa Stream, a dry bed stream, crosses the level portions of the project site along path generally running parallel to the Lualualei Navy Road.

Lualualei Golf Course ❖ Environmental Impact Statement
DISTRIBUTION LIST

() E.A. (x) EIS
 () APPLICANT ACTION (x) APPLICANT ACTION
 () AGENCY ACTION () AGENCY ACTION

TITLE: PROPOSED LUALUALEI GOLF COURSE PROJECT

LOCATION: Nanakuli District, Oahu

PROPOSING AGENCY/APPLICANT: Kabushiki Kaisha Oban

ACCEPTING AUTHORITY/APPROVING AGENCY: City & County of Honolulu
Dept of General Planning

PUBLICATION DATE: 02/08/91 DEADLINE FOR COMMENTS: 03/25/91

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(a)*Copy desired only if project involves agency's responsibility

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Lualualei Golf Course - Environmental Impact Statement

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Kauai Community College Library		
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American Lung Association	1	
Hawaiian Electric Company	1	
Office of Hawaiian Affairs	1	
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U.H. Hamilton Library, Hawaiian Collection	1	
Legislative Reference Bureau	1	

(b)** Copy desired only if project is in respective county

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Waimea Library		

HIDA, OKAMOTO & ASSOCIATES, INC.
CONSULTING ENGINEERS

HARVEY K. HIDA, P.E.
ALAN T. OKAMOTO, P.E.

February 4, 1991

Mr. Benjamin B. Lee
Chief Planning Officer
City and County of Honolulu
650 S. King Street, 8th Floor
Honolulu, Hawaii 96813

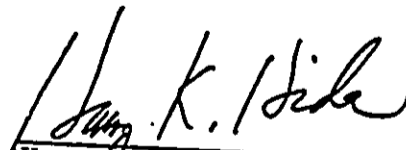
Dear Mr. Lee:

Subject: Lualualei Golf Course Draft Environmental
Impact Statement, Nanakuli, Oahu, Hawaii
TMK 8-7-9: por. 2, TMK 8-7-10: parcels 6 & 10
and TMK 8-7-19: Por. 1.

In compliance with Section 11-200-20 of the EIS Rules and
your agency's requirement, enclosed herein are one (1)
original and one (1) copy of the subject Draft EIS. Please
be advised that we have submitted sixty (60) copies of this
document to the State Office of Environmental Quality
Control today for publication in their February 8, 1991
bulletin.

Your assistance in this matter is sincerely appreciated and
should there be questions, please contact Tyrone T. Kusao at
538-6652 or myself.

Very truly yours,



Harvey K. Hida, President

cc: Office of Environmental Quality Control

Yoshio Maeda

Tyrone T. Kusao

1188 BRENCH STREET, SUITE 200
HONOLULU, HAWAII 96813
BUS (808) 538-8832
RES (808) 305-1300
FAX (808) 531-4282

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

February 19, 1991

PB 91-130

February 13, 1991

MEMO TO: BENJAMIN LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING
ATTN: WILLIAM MEDEIROS
FROM: HERBERT K. MURAOKA
DIRECTOR AND BUILDING SUPERINTENDENT
SUBJECT: PROPOSED LUALUALEI GOLF COURSE PROJECT

We have reviewed the Environmental Impact Statement (EIS) for the subject project and have no comments to offer.

James Harada
JH-HERBERT K. MURAOKA
Director and Building Superintendent

JH:jo
cc: J. Harada
Kabushiki Kaisha Oban
Hida Okamoto and Associates
Office of Environmental Quality Control

Mr. Herbert K. Muraoka
Director and Building Superintendent
Building Department
City and County of Honolulu
650 S. King Street, 2nd Floor
Honolulu, Hawaii 96813

Dear Mr. Muraoka:

Subject: Proposed Lualualei Golf Course Project Draft EIS
Thank you for your memorandum dated February 13, 1991 to the Department of General Planning, City and County of Honolulu, concerning the above-referenced report.

Your memorandum will be reproduced in the Final EIS together with this response.

Very truly yours,

Tyrone T. Kusao
Tyrone T. Kusao

TTK:afk
cc: Kabushiki Kaisha Oban
James Harada
Hida Okamoto and Associates
Office of Environmental Quality Control
Department of General Planning

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
1435 SOUTH BERTANNA STREET, ROOM 302
HONOLULU, HAWAII 96814



FRANK P. PARR
MAYOR

LIONEL E. CAMARA
FIRE CHIEF
DONALD S. H. CHANG
DEPUTY FIRE CHIEF

February 22, 1991

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1186 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

SUBJECT: Environmental Impact Statement for
Proposed Luahalei Golf Course

We have reviewed the subject material provided and foresee no adverse impact in Fire Department facilities or services.

Access for fire apparatus, water supply and building construction shall be in conformance to existing codes and standards.

Should you have any questions, please contact Battalion Chief Attilio Leonard of our Administrative Services Bureau at 943-3838.

AKL:ny

Very truly yours,

DONALD S. H. CHANG
Acting Fire Chief

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
1435 SOUTH BERTANNA STREET, ROOM 302
HONOLULU, HAWAII 96814



FRANK P. PARR
MAYOR

February 26, 1991

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

ATTN: WILLIAM J. MEDEIROS

FROM: DONALD S. H. CHANG, ACTING FIRE CHIEF

SUBJECT: PROPOSED LUALUALEI GOLF COURSE PROJECT
THK: 8-7-9; POR 2; 8-7-10; PARCEL 6; 8-7-19; POR 1

We have reviewed the subject material provided and have no additional comments.

Should you have any questions, please contact Battalion Chief Attilio Leonard of our Administrative Services Bureau at 943-3838.

AKL:ny

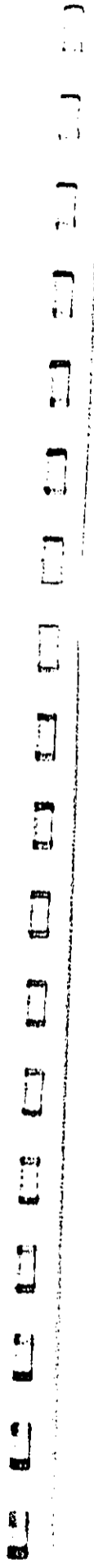
DONALD S. H. CHANG
Acting Fire Chief

cc: Harry Hida (Kabushiki Kaisha Oba)
Hida Okamoto and Associates
Office of Environmental Quality Control

LIONEL E. CAMARA
FIRE CHIEF
DONALD S. H. CHANG
DEPUTY FIRE CHIEF

Luahalei Golf Course

Environmental Impact Statement



TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

2202
1188 BIRCH STREET, SUITE 200
HONOLULU, HAWAII 96813
BUS: (808) 538-8833
RES: (808) 383-1338
FAX: (808) 521-4232

March 6, 1991

Mr. Donald S.M. Chang
Acting Fire Chief
Honolulu Fire Department
City & County of Honolulu
1455 S. Beretania Street, Rm. 305
Honolulu, Hawaii 96814


Dear Chief Chang:

Subject: Environmental Impact Statement (EIS)
for Proposed Lualualei Golf Course.

This acknowledges our receipt of your February 22 letter commenting on the above-captioned draft EIS that your Department foresees no adverse impact in Fire Department facilities or services and advising us that access for fire apparatus, water supply and building construction must conform to existing codes and standards.

We truly appreciate your comments and hereby inform you that the development and operation of the project will comply with all such codes and standards referenced in your letter.

Sincerely,



Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

400 SOUTH KING STREET
HONOLULU, HAWAII 96813 • PHONE 833-4122



DONALD A. CLEGG
DIRECTOR

LORETTA K. CHIZ
DEPUTY DIRECTOR

LU1/91-0479 (AC)

March 18, 1991

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Draft Environmental Impact Statement (DEIS) for the
Proposed Luualaei Golf Course Project, Manakuli, Oahu
Tax Map Key: 8-7-9; P.O.L. 21.8-7-10; 6; 8-7-19; P.O.L. 1

We have reviewed the DEIS and note that it contains adequate
information and responses to our earlier comments regarding the
environmental assessment. We have no additional comments to
offer at this time.

Thank you for the opportunity to comment on the DEIS.

Very truly yours,

Donald A. Clegg

DONALD A. CLEGG
Director of Land Utilization

DAC:fm
LKUSAO.fam

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813

TEL (808) 833-8883
FAX (808) 833-4200

March 21, 1991

Mr. Donald A. Clegg
Director
Department of Land Utilization
City and County of Honolulu
650 S. King Street, 7th Flr.
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (DEIS)
for the Proposed Luualaei Golf Course Project.

This acknowledges our receipt of your March 18 letter on
the above-captioned DEIS which informs us that you have reviewed
the DEIS and found that it contains adequate information and
responses to your Department's earlier comments regarding the
project's environmental assessment and that you have no additional
comments to offer at this time.

Thank you for promptly reviewing the DEIS and providing
comments thereon.

Very truly yours,

Tyrone T. Kusao

TYRONE T. KUSAO

cc: OEQC
Department of General Planning
Hida Okamoto & Associates.

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU

840 SOUTH KING STREET
HONOLULU HAWAII 96813



March 11, 1991

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

ATTENTION: WILLIAM MEDEIROS

FROM: WALTER H. OZAWA, DIRECTOR

SUBJECT: PROPOSED LUALUALEI GOLF COURSE PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
TAX MAP KEY: 8-7-09: POR. 2; 8-7-10: 6; 8-7-19: POR. 1

The Department of Parks and Recreation has no comments concerning the DEIS for the proposed Lualualei golf course project.

MMO:s1

Walter H. Ozawa
WALTER H. OZAWA, Director

RECEIVED

MAR 13 AM 8:16

GENERAL PLANNING
CITY AND COUNTY OF HONOLULU

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

2202
1188 BISHOP STREET, SUITE 2202
HONOLULU, HAWAII 96813
BUS: (808) 538-8833
RES: (808) 538-1338
FAX: (808) 531-4238

March 21, 1991

Mr. Walter M. Ozawa
Director
Department of Parks & Recreation
City and County of Honolulu
650 S. King Street, 10th Fl.
Honolulu, Hawaii 96813

Dear Mr. Ozawa:

Subject: Proposed Lualualei Golf Course Project
Draft Environmental Impact Statement (DEIS).

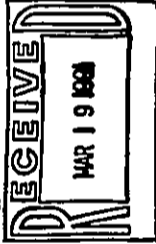
This acknowledges our receipt of your March 11 memorandum to the City's Chief Planning Officer (CPO) which states that your Department has no comments concerning the above-captioned DEIS. Thank you for reviewing the DEIS and informing the CPO accordingly.

Very truly yours,

Tyrone T. Kusao
TYRONE T. KUSAO

cc: OEQC
Hida Okamoto & Assoc.
Dept. of General Planning

RECEIVED



WALTER OZAWA
DIRECTOR
ALVIN K. AU
OFFICE MANAGER

RECEIVED

RECEIVED

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1035 SOUTH BERKELEY STREET
HONOLULU, HAWAII 96813



MICHAEL S. NAKAMURA
CHIEF

HAROLD M. MARJANO
DEPUTY CHIEF

KN-1K

March 13, 1991

TO: BENJAMIN E. LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

ATTENTION: MR. WILLIAM MEDEIROS
DEPARTMENT OF GENERAL PLANNING

FROM: MICHAEL S. NAKAMURA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: PROPOSED LUALUALEI GOLF COURSE PROJECT

After reviewing the materials for the above project, we find that the proposed golf course will not significantly impact police services provided for the area.

We would, however, like to point out a minor error in section 4.15.2, Police/Fire Protection. The current manpower at the Waianae Substation consists of 8 (not 6) regular duty officers for each shift.

Thank you for the opportunity to comment.

MICHAEL S. NAKAMURA
Chief of Police

Chester E. Hughes
CHESTER E. HUGHES
Assistant Chief of Police
Support Services Bureau

cc: Kabushiki Kaisha Oban
Hida Okamoto and Associates
OEQC

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

2202
1168 BISHOP STREET, SUITE 2202
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BUS: (808) 535-0808
FAX: (808) 535-1338
FAX: (808) 535-4882

Luualuei Golf Course ❖

Environmental Impact Statement

March 19, 1991

Mr. Michael S. Nakamura
Chief of Police
Police Department
City and County of Honolulu
1455 S. Beretania Street
Honolulu, Hawaii 96814

Dear Chief Nakamura:

Subject: Proposed Luualuei Golf Course Project
Draft Environmental Impact Statement (EIS).

This acknowledges our receipt of your March 13 written comments on the above-captioned EIS. Please be informed that we will correct the minor error in sec. 4.15.2, Police/Fire Protection, pointed out in your comments in the Final EIS on the project. We also note your comment that the project will not significantly impact police services provided for the area.

Thank you for your prompt comments on the DEIS.

Very truly yours,

Tyrone T. Kusao

TYRONE T. KUSAO

cc: Hida Okamoto & Associates.
OEQC.
City Department of General Planning.

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

690 SOUTH KING STREET
HONOLULU, HAWAII 96813



SAM CALLEJO
DIRECTOR AND CHIEF ENGINEER

C. MICHAEL BREWSTER
DEPUTY DIRECTOR

In reply refer to:
ENV 91-46(448)

February 26, 1991

MEMORANDUM

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: SAM CALLEJO, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
PROPOSED LUALUALEI GOLF COURSE PROJECT
TRK: 8-7-9; POR. 2; 8-7-10; 16; 8-7-19; POR. 1

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

1. Due to the effluent disposal and sludge application proposals, coordination with the Board of Water Supply and the State Department of Health is required.
2. The Division of Refuse Collection and Disposal should be contacted with regard to the disposal of sludge at the landfill.
3. With regard to the Drainage Report of Appendix A, please submit the following:
 - a. Calculation for estimated peak discharge for each of the tributary areas.
 - b. A plan to indicate existing and proposed drainage patterns and proposed drainage improvements.
 - c. A map to indicate the location of detention basins.

cc: Kabushiki Kaisha Oban
Jilda Okamoto and Associates
O&C

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

March 6, 1991

Mr. Sam Callejo
Director and Chief Engineer
Department of Public Works
City & County of Honolulu
650 S. King Street, 11th Fl.
Honolulu, Hawaii 96813

Dear Mr. Callejo:

Subject: Draft EIS for Proposed Lualualei Golf Course Project; TRK 8-7-9; por. 1; 9-7-10; 16; and 8-7-19; por. 1.

This acknowledges receipt of a copy of your February 26 memorandum commenting on the above-captioned DEIS. Thank you for your comments. We wish to respond to them accordingly:

1. The detailed design and approvals for the effluent disposal and sludge application for the project will be coordinated with the City Board of Water Supply and State Health Department pursuant to your recommendation.
 2. An application for a private sewage treatment plant sludge disposal system permit for the project will be timely submitted with your Division of Refuse Collection and Disposal.
 3. A detailed drainage report will be submitted to the Drainage Section, Division of Engineering, of your Department for review and approval prior to filing an application for a project grading permit.
- As you know, the project is only at the planning and zoning approval stages. Detailed drainage plans and engineering documentation will be completed at the design development stage and will be submitted to your Department at that latter stage. Right now, detailed information of detention basins is still being developed and are not available at this early stage of the planning process. However, such information, in a completed form, will be submitted to your Department for review prior to application for a project grading permit.

Sam Callejo
SAM CALLEJO
Director and Chief Engineer

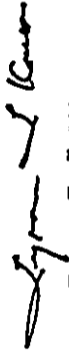
2202
1188 BISHOP STREET, SUITE 2202
HONOLULU, HAWAII 96813
BUS. FOR: 538-8853
RES. FOR: 385-1338
FAX FOR: 521-4282

Lualualei Golf Course ❖ Environmental Impact Statement

Mr. Sam Callejo
March 6, 1991
Page 2.

Thank you, again, for reviewing the DEIS and providing some very helpful comments for our review and action. They will be considered carefully in the preparation of the final EIS.

Sincerely,



Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.

12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

2202
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BUS (808) 538-0532
FIS (808) 585-1338
FAX (808) 581-4592

(P)1131.1

February 19, 1991

FEB 12 1991

City and County of Honolulu
Department of General Planning
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Attention: Mr. William Medeiros

Gentlemen::

Subject: Proposed Lualualei Golf Course Project
Draft EIS

Thank you for the opportunity to review the subject document. We have no comments to offer.

Should there be any questions, please contact Mr. Ralph Yukumoto of the Planning Branch at 548-7192.

Very truly yours,

T. Tomimaga
TEUANE TOMINAGA
State Public Works Engineer

RY:jk

cc: Kabushiki Kaisha Oban
Hida, Okamoto and Associates
Office of Environmental Quality Control

Mr. Teuane Tomimaga
State Public Works Engineer
Public Works Division
State Department of Accounting
and General Services
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Tomimaga:

Subject: Proposed Lualualei Golf Course Project Draft EIS
Thank you for your letter dated February 12, 1991 to the Department of General Planning, City and County of Honolulu, concerning the above-referenced report.

Your letter will be reproduced in the Final EIS together with this response.

Very truly yours,

Tyfone T. Kusao
Tyfone T. Kusao

TTK:afk

cc: Kabushiki Kaisha Oban
Office of Environmental Quality Control
Department of General Planning
Hida, Okamoto and Associates

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2202
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BUS: (808) 538-9832
FAX: (808) 538-1338
FAX: (808) 538-4292

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ASSISTANT SECRETARY
381 MANUPOLO DRIVE, SUITE 400
HONOLULU, HAWAII 96813

February 19, 1991

Lt. Col. Jerry M. Matsuda
Contracting & Engineering Officer
Hawaii Air National Guard
Department of Defense
State of Hawaii
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Dear Lt. Col. Matsuda:

Subject: Proposed Luualalei Golf Course Project Draft EIS

Thank you for your letter dated February 11, 1991 to the Department of General Planning, City and County of Honolulu, concerning the above-referenced report.

Your letter will be reproduced in the Final EIS together with this response.

Very truly yours,

Tyrone T. Kusao

TTK:afk

cc: Kabushiki Kaisha Oban
Hida Okamoto and Associates
Office of Environmental Quality Control
Department of General Planning

February 11, 1991

Engineering Office

Mr. William Medeiros
City & County of Honolulu
Dept of General Planning
650 S. King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Medeiros:

Proposed Luualalei Golf Course Project

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

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

Sincerely,

SIGNED:

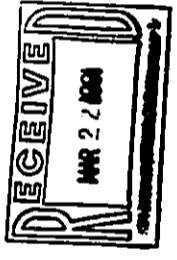
Jerry H. Matsuda
Lieutenant Colonel
Hawaii Air National Guard
Contracting & Engineering Officer

cc: Mr. Harvey Hida,
Kabushiki Kaisha Oban
Mr. Tyrone T. Kusao, Inc.
Hida Okamoto and Associates
Office of Environmental
Quality Control

2202
1188 BISHOP STREET, SUITE 2102
HONOLULU, HAWAII 96813
BUS. HOUR: 830-0530
FEB. HOUR: 300-1300
FAX HOUR: 001-400-2

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

BRIAN J. CHOY
Acting Director



STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
228 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
March 18, 1991

Department of General Planning
Attn: Mr. William Medeiros
650 South King Street, 8th Floor
Honolulu, Hawaii 96813
Dear Mr. Medeiros:

SUBJECT: Lualualei Golf Course
Draft Environmental Impact Statement

Thank you for the opportunity to review this document. We have one comment for your consideration. Page 52, Topography Anticipated Impacts and Mitigative Measures, notes that there is the possibility of "blasting and/or rock drilling." Before any blasting occurs, it should be cleared through the appropriate staff at Naval Magazine Lualualei.

Sincerely,
Brian J. Choy
Brian J. J. Choy

cc: Kabushiki Kaisha Oban
Hida, Okamoto, & Associates

March 22, 1991

Mr. Brian J. Choy
Acting Director
Office of Environmental Quality Control
State of Hawaii
220 S. King Street, 4th Flr.
Honolulu, Hawaii 96813

Dear Mr. Choy:

Subject: Lualualei Golf Course Project
Draft Environmental Impact Statement (DEIS).

This acknowledges our receipt of your March 18 comment on the above-captioned DEIS. Only one comment was offered.

You recommended that, before any blasting of rocky areas within the site during project construction occurs, it should be cleared with the appropriate staff at Naval Magazine Lualualei. Please know that we will seek such clearance if and when it is determined during project construction that blasting is necessary in order to construct the golf course.

Thank you for reviewing and commenting on the DEIS.

Sincerely,
Tyrone T. Kusao
TYRONE T. KUSAO

cc: Dept. of General Planning
Hida Okamoto & Associates.

JOHN HALLER
DIRECTOR OF HEALTH

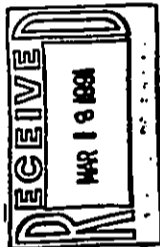


STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3278
HONOLULU, HAWAII 96811

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

In reply, please refer to
EHO/EDWS

March 11, 1991



Mr. Benjamin B. Lee
Chief Planning Officer
Department of General Planning
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813
Attn: William Medeiros

Dear Mr. Lee:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
LUALABAI GOLF COURSE
LUALABAI, WAIMANUKU, OAHU
TRK: 8-7-09; POR. 2; 8-7-10; 6 AND 10; 8-7-19; POR. 1

Thank you for the opportunity to review and comment on the subject project. We have examined the Draft Environmental Impact Statement (DEIS) and have the following comments to offer:

Drinking Water

- 1) According to the DEIS, the project's potable water requirements will be supplied by the Board of Water Supply. It goes to state that on-site wells will be developed for golf course irrigation. Thus, the Department's Administrative Rules, Title 11, Chapter 20, "Potable Water Systems," will not be applicable. In the event that the proposed use were to change, the Safe Drinking Water Branch must be informed.
- 2) The proposed development is situated above the Department's Underground Injection Control (UIC) line. Land areas located above the UIC line are generally considered to contain underground sources of drinking water. The report confirms the existence of an aquifer, underlying the entire project site, with reasonably low salinity water previously used for domestic and agricultural purposes. These areas should therefore be protected against all sources of groundwater contamination.

Benjamin B. Lee
Page 2
March 11, 1991

- 3) It is essential that any proposed wells in the project area be designed and constructed to prevent the possibility of groundwater contamination. For example, each well should have a concrete pad and full grouting to prevent seepage or floodwaters from migrating down the well shaft.
- 4) The standard conditions for all golf course developments should apply to this project. A copy of the eight (8) conditions (version 3) is enclosed.
- 5) The potable and non-potable water systems must be carefully designed and operated to prevent cross-connections and backflow conditions. The two systems must be clearly labeled and physically separated by air gaps or reduced pressure principle backflow preventers to avoid contaminating the potable water supply.

Wastewater Branch

A review and evaluation of the subject DEIS, focused on wastewater collection, the treatment system and effluent reuse or disposal. The salient point of the review states that the majority of the site is located within the 10-pass zone and therefore the reuse of reclaimed water must be thoroughly evaluated to prevent the contamination of the fresh underground water.

The suitability of a specific area proposed for the application of reclaimed water should be verified with field data before final approval is granted.

On page 17 of the subject DEIS:

"The treated wastewater effluent will be chlorinated and conveyed to an aerated blending pond. The pond will be used for mixing effluent with non-potable irrigation water from brackish ground water. The pond will be lined to prevent direct infiltration of irrigation water. Approximately 1.4 percent of the estimated golf course irrigation water requirement can be supplied by the treated effluent."

The hydrogeologic evidence presented on pages 67 through 71 states that the expected chloride level in the limestone aquifer for the estimated withdrawal of 100,000 gallons per day is 1000 to 2000 mg/L. And with proper development, it is stated that the basalt aquifer could produce 700 gpm with chloride concentrations of 500 to 1000 mg/L.

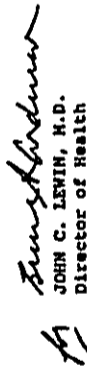
The intermediate and long-term impact of the total dissolved solids (TDS) loading on either aquifer due to irrigation practices are not addressed. The importance of this type of analysis during the planning stage may give some assurance that the proposed water reclamation process is viable. For example, an irrigation and monitoring program is required by the Department of

Benjamin B. Lee
Page 3
March 11, 1991

Health for the use of water reclamation. If the monitoring program detects a significant increase in the level of TDS or any other appropriate water quality parameters in the aquifer, mitigation measures will be required. These measures to reduce TDS are likely to be extremely costly. If appropriate corrective action is not taken, an alternate method of effluent disposal will be required. In summary, from the analysis presented in this DEIS, the likelihood of the proposed irrigation is to significantly increase the TDS of the aquifer.

Secondly, as part of the wastewater effluent disposal system (Section 11-62-25 b 1(b)), the irrigation plan shall provide methods and controls to be used in the irrigation system such that no runoff or ponding will occur. It is recommended that a water balance during the wettest period recorded be used for the sizing of the ponds. Discharge from the ponds, ponding of effluent and runoff from the ponds leaving the property will be considered an unlawful effluent discharge without an NPDES permit. The presentation on page 4 of Appendix A reminds the Department that discharge violations are likely.

Very truly yours,


JOHN C. LEWIN, M.D.
Director of Health

- cc: 1. Kabushiki Kaisha Oban
c/o Harvey Hida
1440 Kapiolani Blvd., Suite 915
Honolulu, HI 96814
2. Hida Okamoto and Associates
c/o Tyrone T. Kusso, Inc.
1188 Bishop Street, Suite 2507
Honolulu, HI 96813
3. Environmental Planning Office

2202
1188 BERKAMP STREET, SUITE 202
HONOLULU, HAWAII 96813
DLR 808 538-8852
FEB 808 595-1308
FAX 808 531-4282

TYRONET T. KUSAO, INC.
Planning and Zoning Consultant

March 21, 1991

Dr. John Lewin, M.D.
Director
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Lewin:

Subject: Draft Environmental Impact State (DEIS)
for the Proposed Luaualei Golf Course.

This letter acknowledges our receipt of, and contains
our responses to your written comments on the above-captioned DEIS
date March 11, 1991. We greatly appreciate your helpful and prompt
comments on the DEIS.

Drinking Water.

Your comments regarding this subject matter are the same
comments offered with respect to the project EIS Preparation
Notice. The following responses, therefore, repeat our responses
to those earlier comments:

1. At this time, there are no plans to convert the on-site wells
for potable water use. If the proposed water use is changed,
the Safe Drinking Water Branch of the State Health Department
(DOH) will be informed and there will be compliance with the
DOH's Administrative Rules, Title 11, Chap. 20, "Potable Water
Systems".
2. Our water and pesticide consultants' reports indicate that a
basalt aquifer within the project site generally exist at
the 120 foot elevation area (See Appendix F, page 4 of the
DEIS quoting John Mink's 1988 water resources study for the
area). In contrast, the proposed private wastewater treatment
facility will be located on the makai side of Luaualei Navy
Road and near the proposed golf course clubhouse. Our
information indicates that the clubhouse/treatment facility
will be located well below the 120 foot elevation and below
the DOH's Underground Injection Control (UIC) line.

Dr. John Lewin
March 21, 1991
Page 2.

Moreover, as discussed below, only about 3.6 acres of the
total 259.52-acre project site would be irrigated by reclaimed
effluent from the on-site wastewater collection and treatment
facility because such reclaimed water would comprise only 1.4%
of the total golf course irrigation water supply.

Therefore, no threat to groundwater contamination would arise
from the proposed use of reclaimed and treated wastewater
within the project for irrigation. It is likely that such
water would be used to help irrigate the entire proposed
15+-acre golf course driving range/nursery which also will be
located makai of Luaualei Naval Road and well below the 120
feet elevation.

3. Proposed wells for the project will be designed and
constructed in a manner which incorporates structural and
design safeguards which help to prevent the possibility of
any groundwater contamination.

4. The development and operation of the golf course will comply
with the eight (8) standard golf course conditions which are
attached to your March 11 letter and which are
customarily included as conditions to City zoning approval for
any proposed new golf course.

5. Your concern about cross-connections and preventing backflow
conditions in the potable and non-potable water systems for
the project will be addressed during the project's engineering
and construction phases. Proper labelling and system
separation will be designed into the system.

Wastewater.

The following remarks respond to your comments pertaining to
the project's wastewater collection, treatment and reuse of
reclaimed and treated wastewater for golf course irrigation
purposes:

1. Our DEIS indicates that treated wastewater effluent must
comply with all applicable DOH standards as set forth in
the DOH's eight (8) conditions applicable to new golf courses,
and will supply about 1.4 percent of the estimated golf course
irrigation water. This translates to irrigation of
approximately 3.6 acres of the total 259.25-acre golf course
project site, which comprise a relatively small portion of the
project site.

Dr. John Lewin
March 21, 1991
Page 3.

2. As stated above, the proposed application area for such reclaimed water will be the entire proposed golf course driving range/nursery site which will contain about 15+ acres of low lying lands located below the DOH's UCI line and the BMS No-Pass line. This water reuse plan will enable the project to avoid loading dissolved solids on the basalt aquifer.

It also allows application of reclaimed wastewater over the entire 15+ acre driving range/nursery area to further assure no such loading on the limestone aquifer within the Lualalei Valley floor. The limestone within the latter aquifer is about 100 feet thick and is underlain by clays and calcareous materials containing salty water (See, Appendix F, page 4. of the DEIS). These are additional barriers to any loading of dissolved solids on the limestone aquifer within the project site.

3. As noted above, reclaimed wastewater within the project site will be used to help irrigate the entire driving range/nursery area. No retention ponds for such wastewater is proposed as part of the project because the daily irrigation need of this area is expected to readily use the relatively small daily volume of treated wastewater generated within the project.

Thank you for your kind attention to these remarks.

Very truly yours,



TYRONE T. KUSAO

cc: OEDC
Dept. of General Planning.
Hida Okamoto and Associates.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 611
HONOLULU, HAWAII 96809

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

MEMBERS
WALTER W. ANGE
MAMAKU TADOKORO
Dan T. Kuchi
ADMINISTRATIVE DEVELOPMENT
PROGRAM
AGRICULTURE
COMMERCE AND INDUSTRY
CONSERVATION AND RECREATION
CIVIL DEFENSE
ENERGY AND NATURAL RESOURCES
ENVIRONMENTAL AFFAIRS
GENERAL INVESTIGATIONS
HUMAN RESOURCES
LAND MANAGEMENT
PLANNING
STATE POLICE
STATE AND LAND DEVELOPMENT

REF:OCEA:JN

MAR 1 1991

File No.: 91-298
Doc. No.: 9894E

Tyrone T. Kusao, Inc.
1188 Bishop Street
Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Environmental Impact Statement (EIS) for Proposed
Luahualei Golf Course, Waianae, Oahu
TMK: 8-7-9; Fr. 2; 8-7-10; 6, 10 & 8-7-19; Por. 1,
Folder No. 91/W-2

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

Our Department's Historic Preservation Division comments that the
Environmental Assessment correctly summarizes current knowledge of
historic sites on the project parcel and states that an inventory
survey will be conducted for the EIS. This office is currently
reviewing a draft of the archaeological inventory survey and we
expect that these comments will be incorporated in the final report
for the EIS.

Thank you for your cooperation in this matter. Please feel free to
call me or Roy Schaefer at our Office of Conservation and
Environmental Affairs, at 548-7837, if you have questions.

Very truly yours,
William W. Paty
William W. Paty

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

2202
1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS. HOURS: 9:00-5:00
RES. HOURS: 9:00-1:00
FAX HOURS: 8:00-4:00

March 6, 1991

Mr. William Paty, Chairman
Board of Land & Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Dear Chairman Paty:

Subject: Environmental Impact Statement (EIS) for
Proposed Luahualei Golf Course, Waianae, Oahu,
TMK: 8-7-9; por. 2; 8-7-10; parcels 6 & 10; and
8-7-19; por. 1 (Folder No. 91/W-2).

This acknowledges our receipt of your March 1 letter
commenting on the draft EIS for the above-captioned golf course
project and noting that the draft correctly summarizes current
knowledge of historic sites on the project site. We truly
appreciate your review and comments and respectfully respond
thereto as follows.

As stated in the draft EIS, an archaeological inventory
of the survey for the proposed golf course project was conducted by
Cultural Surveys Hawaii in January, 1991. The survey results are
reprinted in full in the appendix to the draft EIS and will also be
included in the final EIS.

We look forward to receiving the comments from your
office after it has completed its review of our archaeological
inventory survey. Because time is of the essence and our EIS
processing schedule requires publication of the final EIS in the
April 8 OEQC Bulletin, we respectfully request receipt of those
comments by March 24, 1991 so that they can be incorporated into
the final EIS.

Thank you, again, for your comments on the draft EIS.

Sincerely,
Tyrone T. Kusao
Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.

JONI WAIKANE
Secretary of State



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 511
HONOLULU, HAWAII 96809

WILLIAM W. MITT, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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KATHY W. JAMES
MARTIN T. FALCONER
DAN I. KOCHI
ASSOCIATIVE STATEMENT
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NATURAL RESOURCES
CONSERVATION AND
DEVELOPMENT
CONSERVATION AND
DEVELOPMENT
POLICY AND PLANNING
NATURAL RESOURCES
LAND MANAGEMENT
WATER AND LAND DEVELOPMENT

REF:OCEA:JN

MAR 15 1991

File No.: 91-318
Doc. No.: 9914E

The Honorable Benjamin Lee
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813
Attn: Mr. William Medeiros

Dear Mr. Lee:

Subject: Draft Environmental Impact Statement (EIS) -
Luahualei Golf Course Project Manakuli, Oahu, Hawaii
TRK: 8-7-9; por. 2; 8-7-10; parcel 16; 8-7-19; por. 1

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 Division of Forestry and Wildlife comments that they recommend that a fire contingency plan be made prior to any construction on the site. The Draft EIS thoroughly addresses our botanical concerns and we have no further comments to add, except that we wish to review the Final EIS.

Our Land Management Division has no objections. However, we recommend that the City require the Applicant to allow for public play at, or near current Municipal golf course rates.

The Division of Aquatic Resources indicates that the proposed project is not expected to impact aquatic resources adversely due to the remote location from the ocean and the lack of perennial streams. Although the draft EIS does state that the potential for groundwater chemical contamination is low; we suggest that the applicant monitor the groundwater periodically for the presence of pesticides and nitrates.

Honorable Benjamin Lee

-2-

Doc. No.: 9914E

The Historic Preservation Division comments that this Draft EIS correctly summarizes the results of archaeological inventory survey on the project parcel. Our Historic Preservation Division office has commented on a draft report of the archaeological inventory survey, and these comments apply to the Draft EIS as well. To summarize, we concur that 7 of the sites found on the project parcel are "no longer significant" and that one site, 50-80-08-4366, is significant for its information content. We have insufficient information to concur with the assessment that the project will have "no effect" on this site, since the construction of the golf course may provide increased access to the site with chances of resulting damage. Once an agreement is reached on the impact assessment the next step in the historic preservation review process will either be an assessment of "no effect," at which point the process will end, or development and execution of a plan to mitigate any adverse effects to the site. The Division expects that these concerns will be reflected in the Final EIS.

Thank you for your cooperation in this matter. Please feel free to call me or Roy Schaefer at our Office of Conservation and Environmental Affairs, at 548-7837, if you have questions.

Very truly yours,

William W. Mitt

cc: Kabushiki Kaisha Oban
Hida Okamoto and Associates
OEQC

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 200
HONOLULU, HAWAII 96813
BUS (808) 538-0032
RES (808) 365-1338
FAX (808) 531-4282

March 18, 1991

Mr. William W. Paty
Chairman
Board of Land & Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96804

Dear Chairman Paty:

Subject: Draft Environmental Impact Statement (DEIS) -
Lualualei Golf Course Project, Manakuli, Oahu,
Hawaii, TMS 8-7-9: por. 2; 8-7-10: parcel 16;
and 8-7-19: por. 1.

Thank you for your prompt review and comments on the
above-captioned DEIS. We truly appreciate your very helpful
comments on the project which will be reflected, as appropriate,
within the Final EIS.

In response to your Division of Forestry and Wildlife
comment, a fire contingency plan for the project will be prepared
and circulated among pertinent agencies prior to any construction
within the site.

We note that your Land Management Division has no
objection to the project. Please be advised that we will be
implementing its recommendation that the public be allowed to play
on the golf course at comparable golf course rates.

We note the comment from your Division of Aquatic
Resources that the proposed project is not expected to impact
aquatic resources adversely. Please be advised that the applicant
will closely monitor the groundwater within the site for the
presence of pesticides and nitrates as required by the State Health
Department Golf Course Monitoring Rules and Regulations. This will
be reflected in the Final EIS.

We note your Historic Preservation Division's comment
that the DEIS correctly summarizes the results of archaeological
survey previously conducted within the project site and its
concordance that seven (7) of the sites found within the project
parcel are "no longer significant" and that one site, 50-80-08-
4366, is significant only for its information content.

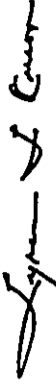
Chairman William W. Paty
March 18, 1991
Page 2.

Special note is taken of your comment that project
construction may provide increased access to the site and, thus,
may uncover historic or archaeological resources as yet
undiscovered at this point. We agree that a better perspective
will be obtained as regards the project's impact on such unknown
resources within the site when construction gets under way.

Our Final EIS will note that, by necessity, the process
of historic preservation review within the project site will be
ongoing through project construction to assure that the project
will have "no effect" on historical or archaeological resources
which may possibly exist within the site. The Final EIS will note
that, should significant resources actually be discovered within
the site during project construction, all applicable procedures of
the Historic Preservation Division of your Department will be
followed in the managing and protecting such resources.

Thank you for your very kind attention to these remarks.

Very truly yours,


TYRONE T. KUSAO

cc: Hida Okamoto & Associates.
OECC.
City Dept. of General Planning.



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. BOX 431
HONOLULU, HAWAII 96813

WILLIAM W. PATY, CHIEF OF BUREAU
Chief of Land and Natural Resources

MEMBER

ELI W. JAMES
MAYOR

Dan T. Kouchi

AGRICULTURE DEVELOPMENT

ADULT EDUCATION

ENVIRONMENTAL AFFAIRS

CONSERVATION

CONTRACTS

FORESTRY AND WILDLIFE

RECREATION

LAND MANAGEMENT

PLANNING

WATER AND LAND DEVELOPMENT

REF:OCEA:JH

MAR 21 1981

File No.: 91-318

Doc. No.: 9914E

Honorable Benjamin Lee -2- Doc. No.: 9914E

Also, section 3.2.5., "State Water Commission Approval", should discuss requirements for approval of a stream channel alteration permit, if channel alterations are proposed.

Thank you for your cooperation in this matter. Please feel free to call me or Roy Schaefer at our Office of Conservation and Environmental Affairs, at 548-7837, if you have questions.

Very truly yours,

Willibald W. Paty

cc: Kabushiki Kaisha Oban
Hida Okamoto and Associates
OEQC

The Honorable Benjamin Lee
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813
Attn: Mr. William Medeiros

Dear Mr. Lee:

Subject: Draft Environmental Impact Statement (EIS) --
Lualualei Golf Course Project Manakuli, Oahu, Hawaii
TRK: 8-7-9; por. 2; 8-7-10; parcel 16; 8-7-19; por. 1

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 Division of Water Resource Management notes that Ulehewa stream, an intermittent stream, crosses a portion of the project site. This stream is described as a normally dry-bed stream (pg. 9). Figure 3, Conceptual Master Plan, on page 12, shows a "Driving Range/Nursery Facility" constructed over the Ulehewa Stream channel, although there is no discussion of alterations to the channel in the project description on page 25. The EIS should describe stream channel alterations if any are proposed. Channel alterations include bridges or stream crossings, as well as fill that will eliminate a stream. Under the State Water Code, a stream channel alteration permit is usually required for all channel alterations. The Department's Division of Water Resource Management should be contacted to discuss stream channel alteration permit requirements and to determine if a permit is required in this instance.

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BOKOP STREET, SUITE 2202
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BUS (808) 538-0853
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March 25, 1991

Mr. William W. Paty
Chairman
Board of Land & Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

Subject: Draft Environmental Impact Statement (DEIS) -
Lualualei Golf Course Project, Nanakuli, Oahu,
Hawaii.

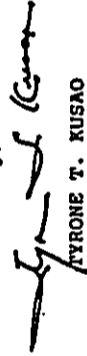
This acknowledges our receipt of your March 21 communication on the above-captioned DEIS. Thank you for reviewing the DEIS and providing comments with respect to Ulehava Stream which crosses a portion of the proposed golf course driving range/nursery area.

Please be informed that no alteration of Ulehava Stream in order to accommodate the construction of the driving range/nursery area is anticipated. Instead, the subject portion of Ulehava Stream -- in its current natural state -- is expected to be incorporated into the layout of the driving range/nursery area.

No significant structures (i.e. bridges, stream crossing paths, etc.) are expected to be constructed within the proposed driving range/nursery area. Should such construction or any stream alteration become necessary in order to accommodate the project, your Department's Division of Water Resources Management will be contacted to discuss the matter and to determine if a stream alteration permit would be required under the State Water Code.

Your comments on the DEIS are greatly appreciated.

Sincerely,



TYRONE T. KUSAO

cc: Department of General Planning
OEQC.



OFFICE OF STATE PLANNING

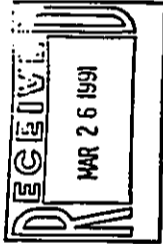
OFFICE OF THE GOVERNOR
STATE CAPITAL, HONOLULU, HAWAII 96813 TELEPHONE (808) 548-1000

DATE PRINTED: 03/26/1991

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

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1188 BISHOP STREET, SUITE 2202
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FAX: (808) 527-4200

March 22, 1991



March 26, 1991

The Honorable Benjamin B. Lee
Chief Planning Officer
Department of General Planning
City & County of Honolulu
650 S. King Street, 8th Floor
Honolulu, Hawaii 96813

Mr. Harold S. Masumoto
Director
Office of State Planning
State of Hawaii
State Capitol, 4th Flr.
Honolulu, Hawaii 96813

Attention: Mr. William Medeiros

Dear Mr. Masumoto:

Dear Mr. Medeiros:

SUBJECT: Request for Comments on Draft Environmental Impact Statement (EIS) for Proposed Luaualei Golf Course

Subject: Draft Environmental Impact Statement (DEIS), Proposed Luaualei Golf Course Project.

We have reviewed the Draft Environmental Impact Statement which is being prepared in support of an application for an amendment to the Waianae Development Plan and offer the following comments.

This acknowledges our receipt of your March 22 comments on the above-captioned DEIS. Thank you for reviewing the DEIS and providing comments thereon. We respectfully respond to your comments accordingly.

We note that the EIS states that approximately 13.5 acres of the site is rated as B and 245.5 acres as E by the Land Study Bureau Detailed Land Classification. However, our review of the LSB maps indicates that the majority of the E rated land is E63 which would have had a B631 rating if irrigation had been available at the time the classification was done. Therefore, we do not believe a generalized statement that these soils have the lowest or poorest agricultural productivity capacity should be made.

Our comment on page 56 of the DEIS that the project site contains approximately 13.5 acres of "B" rated lands by the Land Study Bureau Detailed Land Classification System responds to Sec. 205-6, Hawaii Revised Statutes, which states in pertinent part:

[S]pecial permits for land the area of which is greater than fifteen acres shall be subject to approval by the land use commission. (Emphasis added.)

This provision does not expressly require consideration of land rating under irrigated conditions. In checking this matter with the State Land Use Commission, we were informed that our understanding conforms with the Commission's reading and application of the statute.

We suggest that the EIS should address the presence of Navy very-low-frequency (VLF) and low-frequency communication transmitters in the area. Potential impacts should be assessed and mitigative measures should be proposed if necessary.

Thank you for the opportunity to comment. If you should have any questions please contact the Land Use Division at 548-2066.

Sincerely,

Harold S. Masumoto
Harold S. Masumoto
Director

cc: Kabushiki Kaisha Oban
Hida, Okamoto and Associates
OEXC

We did not consider the rating of the soil if irrigated, because we read and understood Sec. 205-6, Hawaii Revised Statutes, to mean the classification of the land in its current condition. Please be informed, however, that we will do whatever is required in order to obtain the needed State Special Permit for the project.

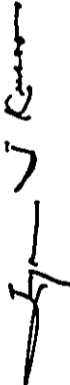
Mr. Harold Masumoto
March 26, 1991
Page 2.

Please be advised that we will retain a consultant to study the impacts of the project on the Navy's very-low-frequency (VLF) and low-frequency (LF) communication transmitters in the area in response to your comments. We have received extensive comments from the Navy and comments from other Federal, State and City agencies on the DEIS. However, your comments are the first to speak to this topic.

The study may not be completed in time for the printing and publication of the Final EIS on the project. Accordingly, we will identify the topic as an "unresolved issues" in the Final EIS. It is our firm intent, however, to conduct the study and disclose its results to all interested public and private agencies and members of the general public. Since the project involves a non-intensive land use, we believe that the impacts, if any, of the project on the transmitters will be insignificant.

Thank you for your kind attention to these remarks.

Sincerely,



TYRONE T. KUSAO

cc: Department of General Planning.
OEQC.
Hida Okamoto & Associates.



JOHN WAHNEE
COMMISSIONER



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5007

February 12, 1991

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Draft Environmental Impact Statement
for Proposed Luualalei Golf Course

Thank you for your letter of January 22, 1991 requesting our
comments on the proposed project.

We have the following comments:

1. The traffic assessment should be expanded to include the
intersection analyses for Hakimo Road with Farrington Highway
and for Maillili Road with Farrington Highway.
2. We agree that widening of the Hakimo Road approach to
Farrington Highway to provide for left- and right-turn lanes
is desirable. This improvement should be implemented by the
applicant.
3. Plans for all construction work within the State highways
right-of-way should be submitted for our review and approval.
4. The applicant shall bear the cost of all required roadway
improvements on our highway facilities.

Very truly yours,

Edward Y. Hirata
Director of Transportation

EDWARD Y. HIRATA
DIRECTOR

DEPUTY DIRECTORS
DAN T. KOCH (PRIMARY)
RONALD N. HIRANO
JEANNE K. SCHULTZ
CALVIN N. TSUDA

IN REPLY REFER TO:

HMV-PS
2-5492

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
2202
SUB (808) 538-0032
FEB (808) 303-1338
FAX (808) 531-4282

March 6, 1991

Mr. Edward Y. Hirata
Director
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Hirata:

Subject: Draft Environmental Impact Statement (EIS)
for Proposed Luualalei Golf Course.

This acknowledges our receipt of your February 12 letter
commenting on the above-captioned draft EIS. We truly appreciate
your helpful comments and wish to respond to them accordingly:

For the final EIS we will ask our traffic consultants to
analyze project traffic impacts on the intersections of Hakimo
Road/Farrington Highway and Maillili Road/Farrington Highway
pursuant to your request.

All other concerns noted in your letter will be complied
with by the applicant.

Sincerely,

Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.
cc: Dept. of General Planning



University of Hawaii at Manoa

Environmental Health and Safety Office
2525 Maile Way, Bldg. 2
Honolulu, Hawaii 96822
Telephone (808) 948-0000

TYRONE T. KUSAO, INC.
Planning and Zoning Consultants

1188 BISHOP STREET, SUITE 2507
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FAX (808) 331-4592

February 21, 1991

February 14, 1991

Tyrone T. Kusao
1188 Bishop Street, Suite 2507
Honolulu, HI 96813

Mr. Roy Takekawa, CIH, MPH
Director
Environmental Health and Safety Office
University of Hawaii at Manoa
2525 Maile Way, Bldg. 2
Honolulu, Hawaii 96822

Dear Mr. Takekawa:

Subject: Proposed Lualualei Golf Course EIS

Thank you for your letter of February 14, 1991 in which you state that you do not wish to be a consulted party on the above project.

Very truly yours,

Tyrone T. Kusao

Sincerely,

Roy Takekawa, CIH, MPH
Director

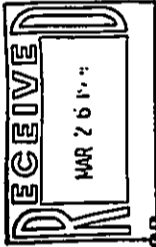
Subject: EIS for proposed Lualualei Golf Course
EIS for Proposed Ewa Marina Phase II Project Involving
Mixed Uses and Golf Course

I do not wish to be a consulted party for these projects. Thank you for the opportunity to comment.

TTK:afk

cc: Department of General Planning

AN EQUAL OPPORTUNITY EMPLOYER



University of Hawaii at Manoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 956-7361

March 25, 1991
RE:0576

Mr. William Medeiros
Department of General Planning
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Medeiros:

Draft Environmental Impact Statement (EIS)
Lualualei Golf Course
Nanakuli, Oahu

The above referenced project proposes development of a golf course complex on 259.25 acres in Lualualei Valley which will include an 18-hole, regulation golf course, a clubhouse facility, and a golf driving range/nursery site. Construction elements include potable and non-potable (course irrigation) water systems, drainage facilities incorporating retention and detention ponds, a private wastewater collection and disposal system, a new access roadway which parallels the Lualualei Navy Road, and electrical, telephone, and other utilities.

Our review was prepared with the assistance of Blon Griffin, Anthropology; Yu-Si Fok, Water Resources Research Center; Jon Matsuoaka, School of Social Work; and Alex Buttaro of the Environmental Center.

Wastewater Collection and Disposal System

This document fails to specify wastewater treatment system characteristics. Presently, the Department of Health (DOH) Administrative Rules, Chapter 62, lists treatment requirements for wastewater systems including specifications for effluent irrigation systems. The EIS should provide sufficient information to assure that relevant design criteria are met.

Water Supply

Our reviewers note that permission is needed from the Board of Water Supply (BWS) in order connect with the BWS system. Affirmation of such approval must be included in the Draft EIS pursuant to the EIS Rules, Section 11-200-17(h) which requires the Draft EIS to

AN EQUAL OPPORTUNITY EMPLOYER

Mr. William Medeiros
March 25, 1991
Page 2

"...contain a list of necessary approvals, required for the action, from governmental agencies, boards, or commissions or other similar groups having jurisdiction."

The supply of "several hundred gallons per minute of brackish water having 500 to 1000 mg/l chloride" from the basalt aquifer underlying the project site is inferred from John Mink's report (Appendix B, page 6; and Section 4.5.1.B, page 72). However, Mink qualifies this assertion by stating that "exploratory boring would be needed first, then a plan of development outlined." Until completion of the exploratory development, this source of irrigation water must remain hypothetical.

Irrigation requirements (Figure 16) are derived on the basis of an assumed efficiency of water application of 90 percent (Appendix F, page 6). Our reviewers suggest that 60 percent is a more realistic efficiency figure for overhead irrigation systems. Consequently, quoted irrigation requirements are probably underestimated by roughly 30 percent. Since peak demand during summer appears to be close to the hypothetical capacity of the aquifer, it seems likely that pumpage requirements may exceed the suggested sustainable yield.

Social and Economic Impacts

Interviews are referenced in the Social and Economic Characteristics section (4.13.2, page 107). Given the controversy surrounding this project, our reviewers felt that a more rigorous survey methodology utilizing a standardized survey instrument with statistical analysis of responses would have been preferable to the "loosely structured" interviews.

Serious concerns of area residents described in Section 4.13.2 (pages 107-108) (e.g., increased property taxes and possible changes in lifestyle and in the character of the rural community) are dismissed with the statement that these concerns have "little or no application to the proposed Lualualei Golf Course project for reasons identified in this report" (page 108). Our reviewers were unable to locate substantial reasons explicitly stated that might provide ample support to the conclusion that the local residents' concerns would have "little or no application" to this development. Other regional concerns, such as increased traffic, overburdening of water and sewage systems, and anti-Japanese sentiments, are identified, but mitigation measures to address these concerns are not specifically articulated.

The statement, "The aloha spirit is indigenous to the area" (Section 6.1.1 page 130), infers that all outsiders and foreigners are welcome by the local community. Although the consultant's report cites a strong sense of community "ohana," it also cites negative attitudes towards Japanese developers. The "aloha spirit" is therefore a misleading description of the community sentiment towards outsiders.

Mr. William Medeiros
March 25, 1991
Page 3

Section 4.8.5 of the consultant's report mentions "Commitments to hire Malanae Coast residents, fund job training programs, and to support the local community and the community groups" (page 4-31). Have specific commitments been made, and are there plans to ensure they are implemented. Our reviewers suggest that an appropriate percentage of the 35 full and part-time jobs guaranteed to Nanakuli or Malanae Coast residents (Section 2.6, page 38) should include administrative and managerial positions.

The consultant's report states that residents interviewed "find it quite possible that the project will be acceptable to the surrounding community if the developer works closely with community groups and offers jobs to local residents" (Appendix D, page 4-32). Our reviewers are concerned that if some of the community "outreach" efforts and "commitments" made by the developer that constitute "working closely," fail to materialize favorably for community groups and local residents, negative reactions may arise, thereby fostering disharmony between the community and the proposed development.

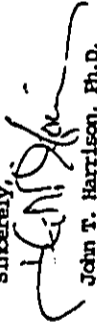
In accordance with EIS Rules Section 11-200-15(j), which requires "...a discussion of the extent to which the proposed action forecloses future options, [and] narrows the range of beneficial uses of the environment," we would like to see a description of how this development will affect the overall quality of life and future development options of the local community. What are the implications of transforming agricultural land to golf courses and of the resulting immigration of new residents. It would seem that Nanakuli, one of the most impoverished areas on Oahu, would benefit to a far greater extent from the development of low-cost housing.

Accuracy: Figure 14

The document states in Section 4.3.1.B.1 (page 58), that golf course development is not planned for subarea B, yet the representation of the golf course layout in figures 3, 5, 6, and 7 suggests that fairways 12 and 13 (figure 3, page 12) are in subarea B.

We hope you will find our comments useful, and we thank you for the opportunity to comment on this document.

Sincerely,



John T. Harrison, Ph.D.
Environmental Center

cc: Mr. Harvey Hida, Kabushiki Kaisha Oba
Mr. Tyrone T. Kusao Inc., Hida Okamoto and Associates ✓
OECC

Roger Fujioka, HRRC
Yu-Si Fok
Jon Matsuoka
Bion Griffin
Alex Buttaro

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

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FAX: (808) 538-1308
FAX: (808) 521-4292

March 26, 1991

Dr. John T. Harrison, Ph.D.
Environmental Center
University of Hawaii at Manoa
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Dr. Harrison:

Subject: Draft Environmental Impact Statement (DEIS)
Luaualei Golf Course, Nanakuli, Hawaii.

This acknowledges our receipt of your March 25 letter commenting on various aspects of the above-captioned DEIS. Thank you for reviewing the DEIS and providing input thereto. We wish to respond to your comments accordingly:

Wastewater Collection and Disposal System:

Appendix "A" to the DEIS describes the basic components of the proposed project wastewater system and Exhibit G thereto illustrates the proposed effluent disposal system. The information in Appendix "A" includes descriptions of (1) the existing wastewater system; (2) projected wastewater flows; (3) proposed wastewater infrastructures; (4) the collection system; (5) the wastewater treatment plant; and (6) the effluent system.

Based on other comments to the DEIS, the proposed system will be modified to apply reclaimed wastewater only to portions of the proposed golf course driving range/nursery area in order to completely avoid irrigation over the basalt aquifer located under the higher elevation areas within the golf course site.

To obtain DOH approval of the proposed system, the developer must design and operate the proposed system in compliance with wastewater treatment requirements contained in Title 11, Chap. 62, Department of Health (DOH) Administrative Rules. Your well-taken concern about such compliance is duly noted. We respectfully respond that DOH review procedures for wastewater system permit applications assure that your concern will be addressed.

Dr. John T. Harrison
March 26, 1991
Page 2.

Water Supply.

It is correct that Board of Water Supply (BWS) permission to connect certain project facilities to the BWS system is required. In part, Sec. 11-200-17(h), EIS Rules, requires that the EIS "... also contain a list of necessary approvals, required for the action, from governmental agencies, boards, or commissions or other similar groups having jurisdiction". Nothing in Sec. 11-200-17(h) says that the EIS must contain an "affirmation" of such approvals as suggested in your comments. Therefore, the DEIS satisfies this aspect of Sec. 11-200-17(h).

We place great credence and have full confidence in the findings of our water consultant on this project, Mr. John Hink, a respected expert in this field in the community. Therefore, we respectfully disagree with your opinion that his finding of an adequate source of irrigation water beneath portions of the project site is only "hypothetical". In fact, his report notes a historical usage of this groundwater source as evidenced by existing well shafts to this source which have been unused for several years. (See pp. 5-6 of Appendix B).

Social and Economic Impacts:

The following remarks address specific comments offered by the Environmental Center:

Community Survey:

The individual interviews conducted during the project's social impact assessment were done to gather qualitative information on a number of general topics, going into far greater detail within interviews than is possible with a standardized survey instrument. Thus, the interviews turned up expected and unexpected issues and concerns and yielded useful suggestions about possible project mitigations which a standardized survey would not be able to produce.

Resident Concerns:

The issue of possible property tax increases was analyzed in Appendix "D", Sec. 4.8.3. Potential changes to lifestyles are discussed in Appendix "D", Sections 4.8.1 and 4.8.5. The issues of traffic, water availability and sewage system use are also noted in Appendix "D" and Sections 4.10 and 4.14 of the DEIS based on information contained in Appendix "A". The presence of anti-Japanese sentiments in the community was noted as one of several contextual factors that could affect community view of the proposed development.

Dr. John T. Harrison
March 26, 1991
Page 3.

Aloha Spirit:

The statement regarding "aloha spirit" at page 130 of the DEIS acknowledges the importance of a Hawaii State Plan policy on the topic and the developer's intent to honor that resources and other important subjective cultural resources within the community in the development and operation of the proposed golf course.

Developer's Commitments to the Community:

Specific developer commitments concerning local employment and job training have been made and are contained within the project's DEIS (See, page 38) and its Environmental Assessment Report as part of its "Community Impact Benefits" Package being required as part of the project's City Development Plan Amendment Application.

At pages 105-108, a summary of the positive project impacts on the quality of life and future of the local community is presented. A detailed description of these impacts are contained in Appendix D to the report at pages 4-1 through 4-30. A review of these materials will show that the DEIS addresses your inquiry as to how the project affects the local community's quality of life and future.

At pages 63-65 of the DEIS, the topic of Agriculture is discussed. The Final EIS will contain an expanded discussion of this topic and address the project's impact on diversified agriculture. An additional Appendix K, prepared by Decision Analysts Hawaii, Inc., will review in substantial detail the feasibility of agriculture use of the project site and the implications of transforming the project site from its current unused state to golf course use.

This new supporting study as well as the DEIS report that the project will not encourage "immigration of new residents". There are no housing components involved in the project; therefore, the project is not expected to result in an influx of any new residents to the community.

At pages 188 of the DEIS, the developer's commitment to encourage the development of affordable housing is stated. In sum, the developer commits to contributing "... financial assistance to the State Department of Hawaiian Home Lands to enable the completion of several planned or under-construction DHHL housing projects within the Nanakuli community". This commitment, if approved by the city, will be enforced within a zoning unilateral agreement for the project.

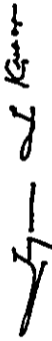
Dr. John T. Harrison
March 26, 1991
Page 4.

Figure 14. Page 571

Your comment about Subarea B is duly noted and correct. We will correct the Final EIS to state that the lower portions of Subarea B which do not contain severe slopes and are not dominated by rock outcroppings may be developed with portions of the golf course. It is probable that lands within Subarea B which are below the 250 feet elevation will be used for golf course fairways, etc.

Thank you for providing some helpful comments on the DEIS. They are truly appreciated.

Sincerely,



TYRONE T. KUSAO

cc: Department of General Planning.
OECC.
Hida Okamoto & Associates.



UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P. O. BOX 50004
HONOLULU, HAWAII
96850

February 18, 1991

Mr. William Medeiros
Department of General Planning
City & County of Honolulu
650 S. King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Medeiros:

Subject: Draft Environmental Impact Statement (DEIS) - Proposed
Lualualei Golf Course Project - Hanalei, Oahu, HI

We have reviewed the above-mentioned document and have no comments to offer
at this time; however, we would appreciate the opportunity to review the
final EIS.

Sincerely,

 Acting

WARREN M. LEE
State Conservationist

cc: Kabushiki Kaisha Oban, c/o Mr. Harvey Hida, 1440 Kapiolani Boulevard,
Suite 915, Honolulu, Hawaii 96814
Hida Okamoto and Associates, c/o Tyrone T. Kusao, Inc., 1188 Bishop Street,
Suite 2507, Honolulu, Hawaii 96813

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

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HONOLULU, HAWAII 96813

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FAX (808) 531-4292

February 21, 1991

Mr. Warren M. Lee
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
P.O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Lee:

Subject: Proposed Lualualei Golf Course Project Draft EIS

Thank you for your letter dated February 18, 1991 to the
Department of General Planning, City and County of Honolulu,
concerning the above-referenced report.

Your letter will be reproduced in the Final EIS together
with this response.

Very truly yours,



Tyrone T. Kusao

TTK:afk

cc: Kabushiki Kaisha Oban
c/o Harvey Hida
Department of General Planning



DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96828-5440

February 26, 1991

REPLY TO:
ATTENTION OF:
Planning Division

Mr. Roland D. Libby, Jr.
Deputy Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Libby:

We have reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Luualalei Golf Course, Nanakuli, Oahu, Hawaii. The following comments are offered:

- a. A Department of the Army permit would be required for the placement of fill material into waters of the United States, including streams and wetlands. For more information on permit requirements, please contact Operations Division at 438-9258 and refer to file number P091-075.
- b. According to the Flood Insurance Rate Map, the project site is in Zone D (areas in which flood hazards are undetermined).

Sincerely,

Kisuik Cheung
Director of Engineering

Copies Furnished:

Kabushiki Kaisha Oban
c/o Mr. Harvey Hida
1440 Kapiolani Blvd., Suite 915
Honolulu, Hawaii 96814

-2-

Copy Furnished (Continuation):

Aida Okamoto and Associates
c/o Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

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HONOLULU, HAWAII 96813
BUS (808) 538-6232
RES (808) 385-1335
FAX (808) 581-4552

March 6, 1991

Mr. Kisuk Cheung
Director of Engineering
U.S. Army Engineering District, Honolulu
Department of the Army
Building 230
Fort Shafter, Hawaii 96858-5440

Attn: Planning Division

Dear Mr. Cheung:


Subject: Draft Environmental Impact Statement (DEIS)
for Proposed Luualaei Golf Course Project.

Thank you for your February 26 letter commenting on the above-captioned DEIS. Your comments are very helpful and greatly appreciated. We respectfully respond to them accordingly:

According to the project engineer, the development of the proposed project, including the golf course, clubhouse with dining facilities, meeting and function rooms; maintenance facilities; and driving range/nursery facility will not be placed within any water of the United States, including streams and wetlands. Therefore, no Department of the Army permit is required in order to construct the project.

The DEIS notes that the project site is in zone D (areas in which flood hazards are undetermined) according to the Flood Insurance Rate Map.

Sincerely,


Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.



DEPARTMENT OF THE NAVY
 COMMANDER
 NAVAL BASE PEARL HARBOR
 BOX 110
 PEARL HARBOR, HAWAII 96320

11000
 Ser 00F(2321)/528
 0 MAR 1991

IN REPLY REFER TO

Mr. William Medeiros
 City and County of Honolulu
 Department of General Planning
 650 South King Street, 8th Floor
 Honolulu, HI 96813

Dear Mr. Medeiros:

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) FOR
 PROPOSED LUALUALEI GOLF COURSE

Our review of the subject DEIS forwarded by the State of Hawaii Office of Environmental Quality Control found that the document does not address all of the Navy's concerns on the proposed project. The proposed Lualualei Golf Course may impact two Navy activities located adjacent to the project. These activities are Naval Magazine Lualualei (NAV MAG LLL) which is a major ordnance storage facility and Naval Computer and Telecommunications Area Master Station, Eastern Pacific (NCTAMS EASTPAC) which operates the radio transmitter facility located to the northwest of the proposed project.

The EIS should address the following areas of concern:

Safety. It appears there may be a hazard from errant golf balls to users of Lualualei Access Road and to personnel and buildings on NAVMAG LLL property. Golf ball hazards on the Lualualei Access Road would primarily affect Navy operations, as the road is used for access to the Navy facilities and transport of materials and ordnance. Mitigation measures such as realigning the layout of holes, installing fencing and protective netting may improve this situation. Consideration of these suggestions would be appreciated.

Security. Golf course improvements up to the boundary (fence) of NAVMAG LLL may degrade the physical security of the station. Bushes and trees along the fence not only provide concealment for intruders but could provide easier access to scale the fence. A clear zone of approximately twenty feet in width along the fence that could be maintained as part of the golf course would accommodate our concerns.

Traffic on Lualualei Access Road. The statement in the DEIS that the Lualualei Access Road is open to the public from Farrington Highway to the Lualualei Ammunition Depot is not correct. Due to the existing low-intensity land uses in the vicinity, the corresponding level of non-military traffic is low. Therefore, the Navy does not usually restrict entry onto the road by the general public. However, the roadway is owned by the United States and is under Navy cognizance. In the past, the Navy has declined requests for permanent access rights over the road, including a request by the

Subj: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) FOR PROPOSED
 LUALUALEI GOLF COURSE

developer of the proposed golf course. At present, the Navy retains the right to control the amount of traffic on this narrow, two-lane road so that safe ordnance hauling operations are insured. However, if the road is improved and made acceptable to the Navy and the City and County of Honolulu by the golf course developer and/or other property owners along the road, the Navy would consider dedicating the road to the City, thereby allowing unrestricted public use.

The developer proposes to construct a new access road parallel to Lualualei Access Road from Paakea Road to the golf course club house. Since Paakea Road connects with the Naval road, it appears that the Naval road could be used between Farrington Highway and Paakea Road despite the Navy's denial of golf course patrons' use of Lualualei Access Road. Although use of the Naval road is not proposed for access to the golf course, some patrons may park along the road and walk to the golf course or drive in if possible. The Navy will not permit parking along the Lualualei Access Road and will be obliged to take appropriate enforcement actions. Because the Navy must deny general use of the Lualualei Access Road in its present condition, the EIS should present plans to prevent use of the Naval Road by golf course patrons.

Water use and impact on sources. Like any increased development, the proposed project will be drawing on limited water resources. The EIS should address in greater detail how withdrawal of ground water for golf course irrigation would limit the water available for other possible uses and whether the quality of the water available to neighboring properties would be degraded as a result of construction and operation of the golf course.

Navy titles. References in the documents to the "Naval Ammunition Depot, Lualualei" should be corrected to "Naval Magazine Lualualei" and references to the "Lualualei Naval Road" should be corrected to the "Lualualei Access Road."

Should you have any questions, the Navy point of contact is Mr. Bill Liu, telephone 471-3324.

Sincerely,

W. K. LU
 Auxiliary Base Civil Engineer
 By direction of
 the Commander

Copy to:
 Kabushiki Kaisha Oban
 c/o Mr. Harvey Hida

Hida Okamoto and Associates
 c/o Tyrone T. Kusao, Inc.

State of Hawaii Office of Environmental
 Quality Control

TYRONET, KUSAD, INC.
Planning and Zoning Consultant

2202
1188 BUSHOP STREET, SUITE 2202
HONOLULU, HAWAII 96813
TEL: (808) 538-8822
FAX: (808) 538-1338
FAX: (808) 531-4292

March 14, 1991

Commander
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860

Mr. W.K. Liu
Asst. Base Civil Engineer
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020
Gentlemen:

Subject: Draft Environmental Impact Statement
(DEIS) for Proposed Luahalei Golf Course.

This acknowledges our receipt of your letter dated March 8, 1991, which responds to the above-captioned DEIS. We appreciate your helpful comments and suggestions therein which repeat those contained in the Navy's February 15 comments on the project's Environmental Impact Statement Preparation Notice (EISPN).

Apparently, you did not receive our March 6 written responses to your February 15 EISPN comments before you prepared and sent your March 8 letter addressing the DEIS. The ensuing comments repeats our earlier responses to your EISPN comments.

Safety:

The project's final EIS will address this matter and identify mitigation measures to avoid the hazard to personnel and property within the Naval Magazine LLL which could be caused by potential errant golf balls coming over from the golf course. For your information, golf course architects generally accept a 150-foot setback area between a golf course and adjacent properties. Construction of the course will adhere to this accepted practice even though it is not required by law.

Security:

A clear zone, approximately twenty (20) feet wide along the fence of the Naval Magazine LLL, will be provided and incorporated as part of the golf course.

Naval Base Pearl Harbor Commander
March 14, 1991
Page 2.

Traffic On Luahalei Access Road:

In response to your comments, the following information submitted by the project's traffic impact consultants is presented:

1. Field surveys by the consultants last month revealed several direct access on the part of private farm lots onto Luahalei Naval (Access) Road near the Luahalei Naval Ammunition Depot main gate; a new gravel road located mauka of the proposed golf course clubhouse site and approximately 100 yards makai of the Depot's main gate which provides direct access to the Road to various farm lots; other paved and unpaved driveways from the Road to private residences and commercial establishments along the Road; and direct access to the Road from the Hawaiian Cement Company concrete batching plant apparently under a letter of agreement with the Navy Department.
2. Paakea Road, a City and County roadway, is not connected to the Luahalei Naval Road and there are no plans by the City or the project applicant to construct such a connection.
3. The proposed parallel access road leading from Paakea Road to the golf course site will have no direct access onto the Luahalei Naval Road. You are correct that a golf cart underpass across the Naval Road, as recommended by the Navy Department (Ref. letter Ser 2412, Dec. 31, 1989), will be constructed.
4. Golf course patrons will be unable to park along the Naval Road because there is an existing hogwire and barbwire fence along the length of the Road. Also, the project applicant will provide physical barriers to discourage pedestrians from entering the golf course site and prevent vehicles from accessing from the Naval Road.
5. The draft EIS addresses vehicular access to the proposed golf course from Hakimo Road as recommended by the Navy Department in its December 31, 1989 letter. There are no plans to use the Naval Road to access onto the golf course facilities.

Naval Base Pearl Harbor Commander
March 14, 1991
Page 3.

Water Use and Impact on Sources:

The draft EIS notes that most farm residences within the general vicinity of the project site are connected to the Board of Water supply water system for domestic water use. The underground water sources nearer to such residences are contained in a limestone aquifer as a lens of brackish water floating on sea water and are generally unsuitable for domestic or irrigation purposes.

A basalt aquifer underlying the property and foothills of the Puu Haleakala Ridge are not readily accessible to most of these farm residences. Therefore, construction of the golf course and will not impact the existing or future domestic and irrigation water availability to such farm properties.

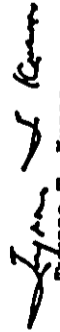
This entire subject matter will be more thoroughly treated in the final EIS.

Navy Titles:

The final EIS will contain the correct Navy titles as noted in your letter.

Thank you for thoroughly reviewing the project's EIS documents and providing some very helpful comments thereon. The Navy is a consulted party on the draft EIS and we will give its valuable comments and suggestions very careful review and attention.

Sincerely,


Tykone T. Kusao
Consultant

copy: Hida Okamoto & Associates.
William Medeiros, DGP
OEQC



William A. Bonnet
Manager
Environmental Department

Hawaiian Electric Company, Inc. - PO Box 2750 - Honolulu, HI 96840-0001

ERV 2-1
JA/G

February 26, 1991

Mr. William Medeiros
City & County of Honolulu
Department of General Planning
650 S King St., 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Medeiros

Subject: Draft Environmental Impact Statement (DEIS) for
Luualualei Golf Course, Nanakuli, Oahu, Hawaii

We have reviewed the subject DEIS and have no comments on the proposed project at this time. HECO shall reserve comment pertaining to the protection of existing power lines bordering the project area until construction plans are finalized.

Sincerely,

CC: Mr. Harvey Hida
Kabushiki Kaisha Oban
Tyrone T. Kusao
Hida Okamoto and Associates

An HEI Company

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

2202
1188 BISHOP STREET, SUITE 2000
HONOLULU, HAWAII 96813
BUS PHONE 538-8652
FIS PHONE 383-1308
FAX PHONE 531-4292

March 6, 1991

Mr. William A Bonnet
Manager
Environmental Department
Hawaii Electric Co., Inc.
P.O. Box 2750
Honolulu, Hawaii 96840

Dear Mr. Bonnet:

Subject: Draft EIS for Luualualei Golf Course
Project, Nanakuli, Oahu, Hawaii.

This acknowledges our receipt of a copy of your February 26 letter commenting on the above-captioned DEIS and noting that your company have no comments on the proposed project at this time and reserves comment pertaining to the protection of existing power lines bordering the project area until construction plans are finalized.

Please be informed that project construction will be coordinated with HECO to assure that your concern is accommodated.

Thank you for reviewing the DEIS and providing helpful comments thereon.

Sincerely,

Tyrone T. Kusao
Consultant

copy: Hida Okamoto & Associates.

APPENDICES

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APPENDIX A

Impact On Utilities And Services Report— Lualualei Golf Course Project

Prepared by Hida, Okamoto & Associates, October, 1989

PROPOSED LUALUALEI GOLF COURSE PROJECT

Lualualei, Nanakuli, Oahu, Hawaii

Tax Map Key: 8-7-9: por. 02

IMPACT ON UTILITIES AND SERVICES

Prepared for

Tyrone T. Kusao, Inc.

By:

HIDA, OKAMOTO & ASSOCIATES, INC.
Consulting Engineers

The Commerce Tower, Suite 915
1440 Kapiolani Boulevard
Honolulu, Hawaii 96814

October 1990

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1. INTRODUCTION

The proposed Lualualei Golf Course would encompass a parcel of land containing approximately 236.15 acres of vacant land in Lualualei Valley, Nanakuli, situated just makai of the Lualualei Naval Ammunition Depot and lies approximately 9000 feet into Lualualei Naval Road from Farrington Highway. It is bounded along its southerly (makai) and westerly boundary by the Lualualei Naval Road. The northerly (mauka) and northeasterly boundary of the site runs along the edge of Lualualei Naval Ammunition Depot complex. To the east, the project is bounded by privately-owned and State lands comprising Puu Haleakala ridge. (See Figure A).

2. PROJECT BACKGROUND

2.1 **Proposed Project**

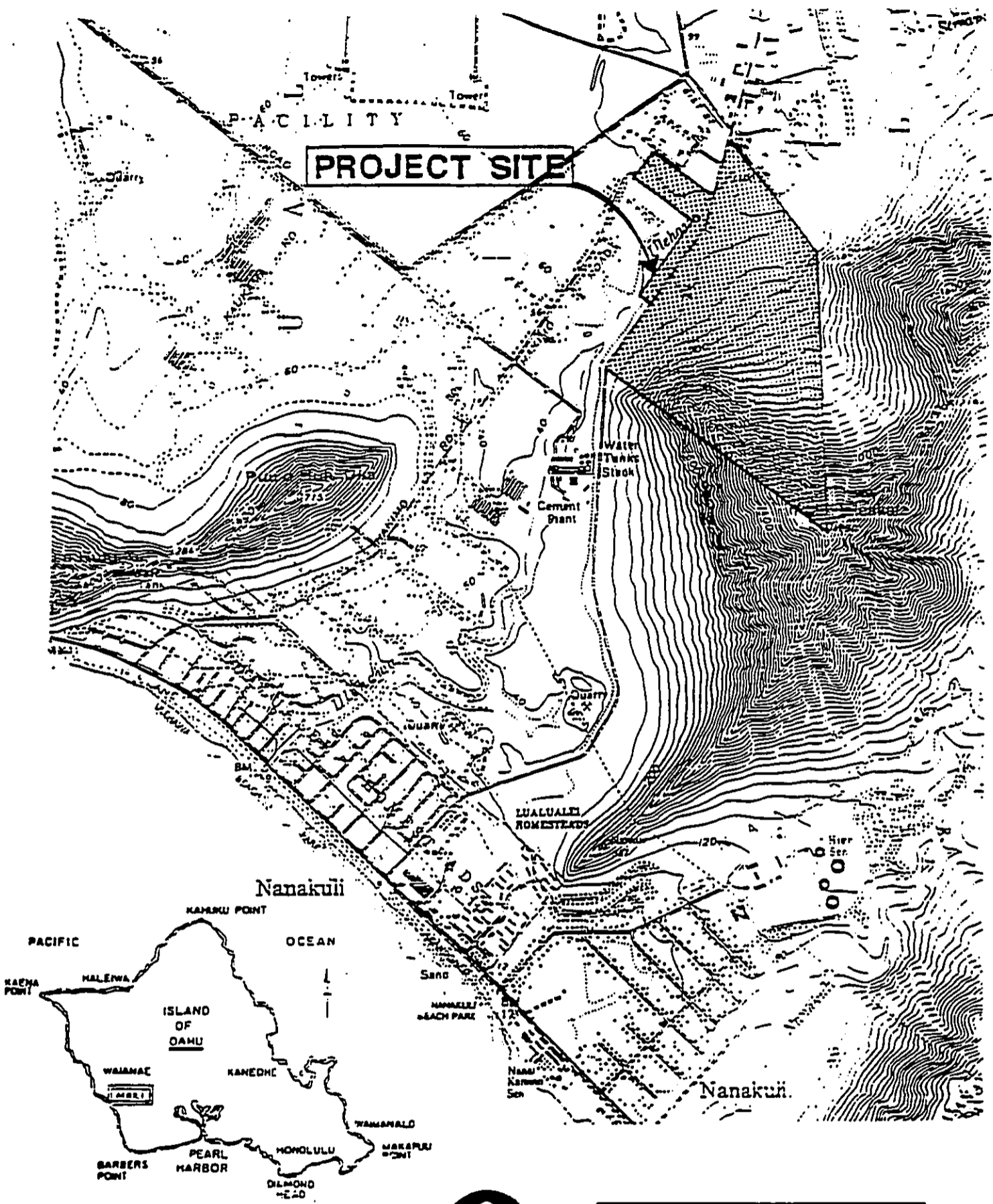
The proposed Lualualei Golf Course will consist of an 18-hole golf course on the mauka side of Lualualei Naval Road, a driving range, maintenance building and a clubhouse. The proposed golf course contains several small ponds and landscaping features to function as irrigation/fire protection water storage and/or storm runoff abatement facilities.

A clubhouse and ancillary/accessory structures for golf course maintenance are proposed for construction on the makai (westerly) side of Lualualei Naval Road directly across the course. Such accessory facilities include on-site parking areas, maintenance yard and building, cart storage area, and other related minor structures. The clubhouse and appurtenant structures would be linked to the course by a proposed underpass which would cross under Lualualei Naval Road.

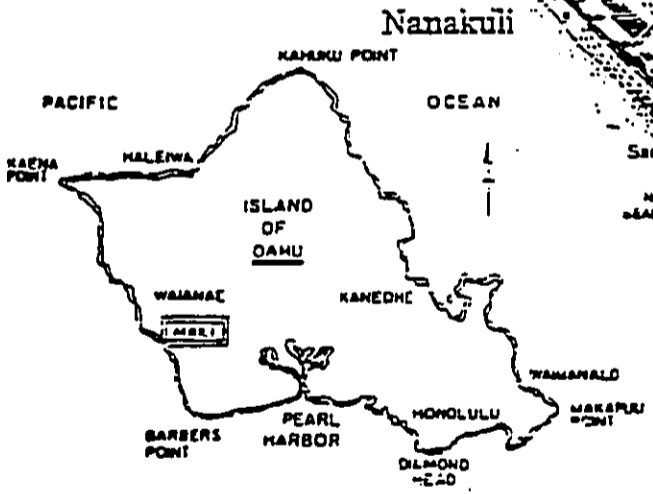
2.2 **Topographic Features**

Generally, the project site slopes in a southwesterly direction towards the Lualualei Naval Road. Approximately 1/3 of the site, situated below the 200 foot above sea level elevation, is relatively flat, sloping at a 12% rate from Lualualei Road upward to the foothills of Puu Haleakala ridge.

Above the 200-foot elevation level, the site takes on a more abrupt slope upward toward the back of the subject site. It is estimated that the slope within this "second tier" of the subject site is within the 10-30% range. The rest of the site along the foothills of Puu Haleakala ridge and the rear portions of the project site slope radically upward towards the peak of the ridge; however, no golf course construction will occur on this portion of the site as it will be left in its current, undeveloped state. Figure A shows the topography of the project site.



PROJECT SITE



VICINITY MAP

NO SCALE

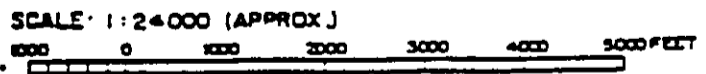


FIGURE A
PROJECT LOCATION

HIDA, OKAMOTO & ASSOCIATES, INC.
Consulting Engineers
Honolulu, Hawaii

3. DRAINAGE REPORT

3.1 Ulehawa Stream drainage basin, normally a drybed stream, is irregular in slope and encompasses approximately 3,178 acres and contains several tributaries that discharge into Ulehawa Stream (See Figure B). The entire project site is located within the drainage basin. The Ulehawa Stream water shed stretches from sea level at Ulehawa Beach Park to a maximum elevation of 3,098 feet at Palikea, a distance of over 4.5 miles.

3.2 **Runoff**

Ulehawa Stream drainage basin was divided into 3 subwater shed areas in an effort to determine the peak discharge using the Storm Drainage Standards, Department of Public Works, City and County of Honolulu (May 1988). The peak discharge was estimated for the existing site conditions as follows:

Tributary Area	Area (Acres)	Peak Runoff (cfs)
A	1,084	2,800
B	606	1,800
C	1,488	3,500
Total	3,178	8,100

3.3 **Flood Hazard**

The Flood Insurance Rate Map (FIRM) indicates that the entire project site situated within Flood Area Zone D (areas in which flood hazards are undetermined). There are currently no drainage improvements within the project site.

3.4 **Modifications After Development**

The proposed golf course development would change the character of approximately 140 acres of the project site. The medium dense vegetative cover currently found on the site would be replaced by a more open, close-cropped landscaping typically associated with golf course developments. Roadways, parking lots, buildings, ponds and other features normally supporting a golf course would further add to the modification of the project.

As a result of the proposed improvements, peak runoff generated on-site is expected to increase. Estimated peak discharge is as follows:

Tributary Area	Area (Acres)	Peak Runoff (cfs)
A	1,084	2,800
B	606	2,008
C	1,488	3,554
Total	3,178	8,362

Drainage patterns are expected to remain similar to existing conditions, although diversion of some on-site runoff to the golf course ponds is proposed. It is anticipated that the natural slopes and vegetation of the areas unaffected by golf course construction would be maintained.

3.5 Impact and Mitigation Measures

Development of the proposed golf course may result in a potential increase in the off-site discharge of peak runoff generated on-site. Within mitigation, the downstream discharge of the on-site runoff has the potential to increase approximately 3.2 percent. However, runoff entering Ulehawa Stream can remain near levels experienced for existing conditions when mitigating measures are employed. These measures include routing runoff to ponds within the golf course layout.

It is intended that the ponds serve as detention basins, dampening the peak runoff generated on-site. 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 from existing conditions.

The impacts of the increased on-site peak 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 3.1 percent of the total peak runoff from the drainage basin.

A positive impact of the proposed development is the probable reduction of erosion and sediment transport to Ulehawa Beach. Bare areas currently found would be planted, with the project site as a whole having better control and maintenance of its landscaping.

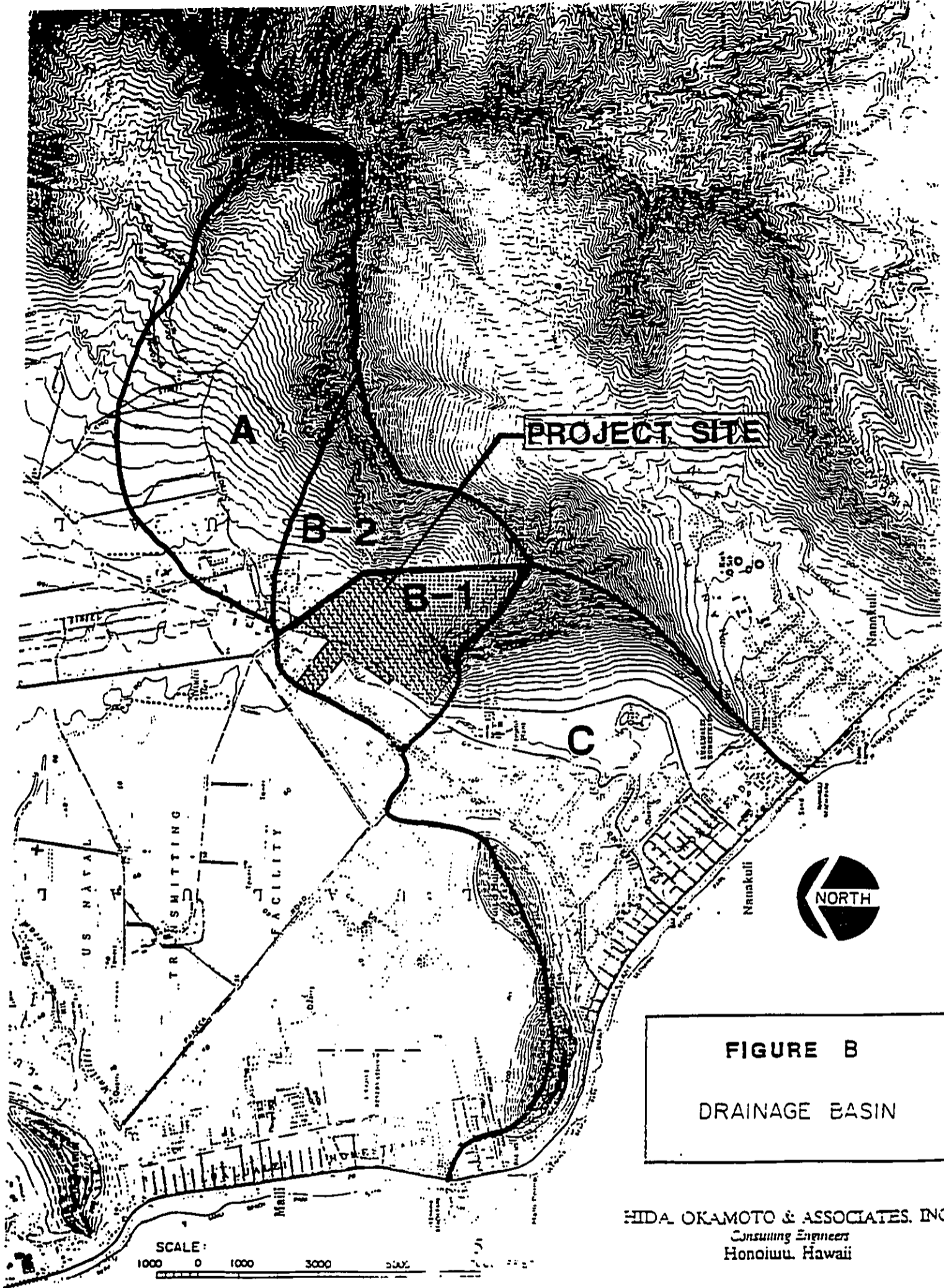


FIGURE B
DRAINAGE BASIN

HIDA OKAMOTO & ASSOCIATES, INC.
 Consulting Engineers
 Honolulu, Hawaii

4. SOIL EROSION

4.1 Site Characteristics

The project site is divided into two subareas for the purpose of calculating soil erosion potential (See Figure C). These subareas represent sites within the project area that vary in soil erosion potential characteristics such as terrain and/or drainage network.

Subarea A, part of the Ulehawa Stream drainage basin, is directly abutting the Lualualei Naval Road and covering the flatter portion of the project site. The subarea occupies approximately 140 acres and is bounded north, south and west by the project limits and the east by a 250 foot contour line. The entire area of subarea A will be graded for golf course development. The subarea is characterized by the Lualualei Naval Road on the west, ridge line of Puu Haleakala on the south, Lualualei Naval Ammunition Depot complex on the north. Ulehawa Stream runs through a northern portion of subarea A.

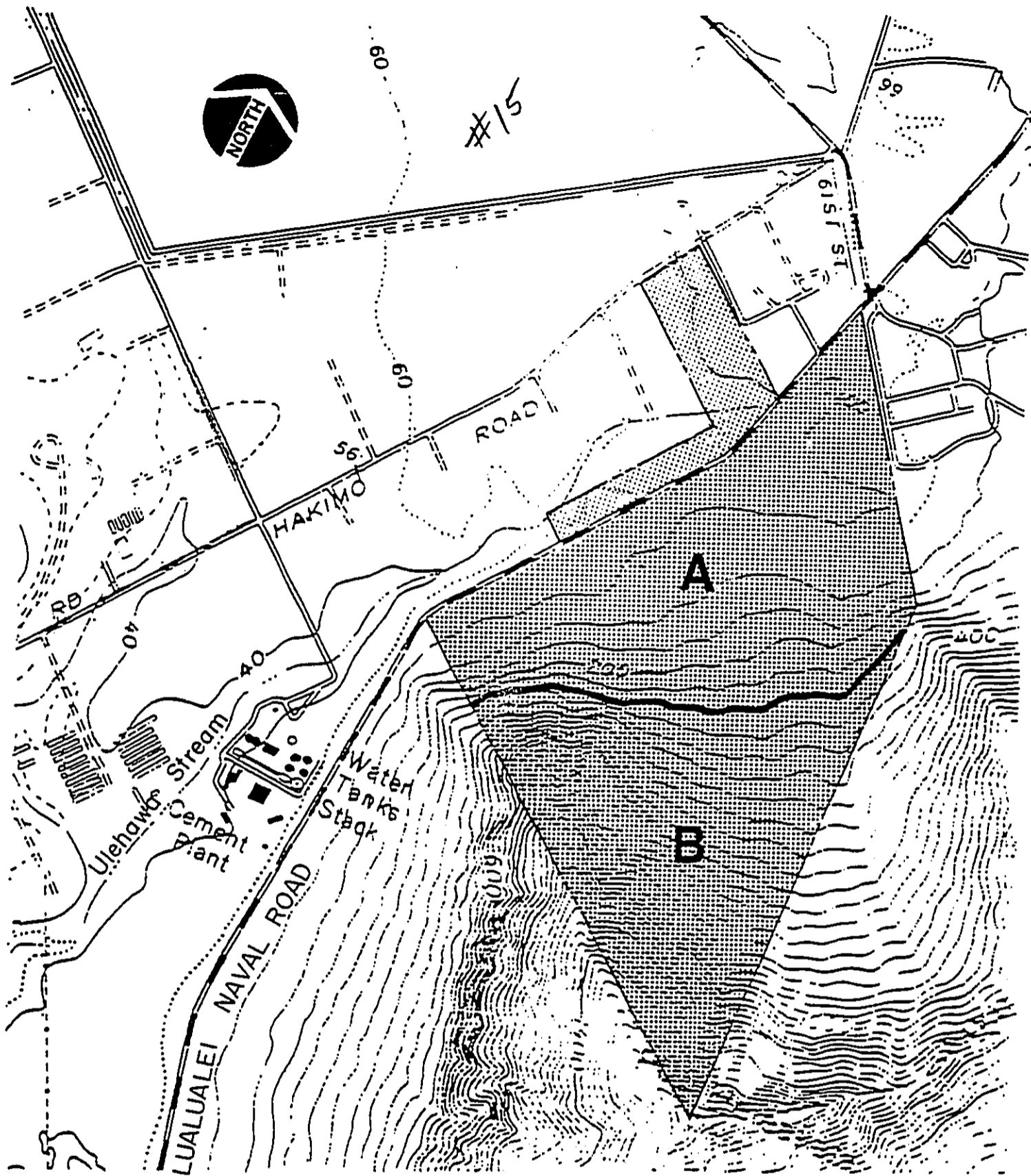
Subarea B, is located south of subarea A and is bounded on south and east by ridge line, and north by a 250 foot contour line. Approximately 96 acres are located in this subarea. The subarea is currently a medium-dense and rocky outcropping becoming numerous with slopes ranging from 25 to 60 percent. *Golf course development is not planned for this subarea.*

4.2 Calculation of Soil Erosion Potential

The U.S. Department of Agriculture, Soil Conservation Service, uses the Universal Soil Loss Equation (USLE) to estimate long-term average annual soil losses from sheet and rill erosion. It is used to estimate erosion on forest land, farm fields, construction/development sites, and other areas. Soil losses can be estimated for present conditions or for a future condition. The soil loss equation is --

where: A = RKLSCP
 A = soil loss (tons per acre per year)
 R = rainfall factor
 K = soil erodability factor
 L = slope length factor
 S = slope gradient factor
 C = cover and management factor
 P = erosion control practice factor

Based on the U.S. Soil Conservation Service (SCS) Erosion and Sediment Control Guide for Hawaii, the rainfall factor (R) is 220. A soil readability factor (K) was selected for each subarea after evaluating the U.S. Department of Agricultural Soil Survey and the City and County of Honolulu Soil Erosion Standards and Guidelines. The K values for the site are based on a weighted average of all K values for soil types in each subarea.



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SCALE: 1:12000 (APPROX.)



FIGURE C
 SOIL EROSION
 POTENTIAL

The cover and management factor (C) is also based on a weighted average for C values within each subarea and will be recalculated accordingly after development of the golf course. Both R and K factors will remain the same for the site before and after the proposed golf course is constructed.

The slope length factor (L) and slope gradient factor (S) are combined into a LS factor for calculations. This factor also remains constant before and after development. However, each subarea will have different factors to reflect the differences in topography.

4.3 Existing Soil Erosion Potential

The existing soil erosion potential for the site can be estimated by the USLE using the following parameters:

USLE Parameters	SUBAREA	
	A	B
R	200	220
K	0.20	0.28
LS	6.3	56
C	0.015	0.011
P	1	1

The existing soil erosion potential for each subarea is listed below.

Existing Soil Erosion Potential

Subarea	Acres	Tons/Acre/Yr	Tons/Yr
A	140	4.2	582
B	96	37.9	3,643

Thus, for the entire project, the existing erosion potential is 4,229 tons/year.

4.4 Soil Erosion Potential After Development

The long-term change in soil erosion potential can be estimated by the USLE for the new land use at the site. Appropriate USLE factors for the site after golf course development are --

USLE Parameters	SUBAREA	
	A	B
R	220	220
K	0.20	0.28
LS	6.3	56
C	0.012	0.011
P	1	1

The C factor for subareas have decreased to account for golf course development.

Existing Soil Erosion Potential

Subarea	Acres	Tons/Acre/Yr	Tons/Yr
A	140	3.3	462
B	96	37.9	3,643

Thus, for the entire project, the estimated soil erosion potential after development of the golf course is 4,105 tons/year.

4.5 Impacts and Mitigation Measures

4.5.1 Long-Term Impacts

Based on the USLE, soil erosion potential at the project site should decrease after development of the golf course. The erosion potential of subarea A is estimated to decrease by 0.9 tons/acre/year (120 tons/year), or 21 percent. Thus, sediment transport to the Ulehawa Stream should decrease after development.

4.5.2 Short-Term Impacts and Mitigation Measures

Construction of the golf course will involve land disturbing activities that result in soil erosion. These land disturbing activities include removal of existing vegetation (clearing and grubbing) and leveling, removing, and replacing soil. Short-term impacts due to construction are estimated to last one year.

The USLE can be used to estimate soil erosion potential based on these short-term construction impacts. For purposes of calculation, it is assumed that the areas will be exposed for a period of one year (January through December) progressing from subarea A to B. The rainfall factor, R, is revised to represent the fraction of annual rainfall falling within the grading period for each subarea. The CP factor is 0.7 for bare soil without mitigation measures.

Thus, in the short term, 27,166 tons of soil erosion are calculated for a one-year period. Of this amount, approximately 10 percent (2,720 tons) will impact the Ulehawa Stream.

Mitigation measures can be implemented to reduce short-term soil erosion. For example, limiting grading to not more than 15 consecutive acres at a time and installation of a sedimentation basin at least 12,000 square feet in size at the onset of grading will reduce estimated soil erosion potential for the site by 89 percent to 50.8 tons. Thus, the estimated impact on the Ulehawa Stream is reduced by 2.9 tons/acres/year (406 tons).

Additional control measures could be taken to lessen construction impacts even further. These are --

1. Minimize time of construction.
2. Retain existing ground cover until latest date before construction.
3. Early construction of drainage control features.
4. Use of temporary area sprinklers in nonactive construction areas when ground cover is removed.
5. Station water truck on site during construction period to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).
6. Use temporary berms and cutoff ditches, where needed, for control of erosion.
7. Thorough watering of graded areas after construction activity has ceased for the day and on weekends.
8. Sod or plant all cut and fill slopes immediately after grading work has been completed.

5. WATER SUPPLY REPORT

5.1 Existing Water Supply System

The property is vacant and covered with a weedy mixture of grasses and koa haole shrubs. About 50 acres within the lower flat area were cultivated for vegetable crops until early 1988. Currently, the property is not cultivated and there are no existing residences.

The Board of Water Supply's (BWS) Puu-O-Hulu system services the properties along Hakimo Road. The storage facility located closest to the project site is Puu-O-Hulu Reservoir, with a 1.5 MG capacity and spillway elevation at 241.75 feet. The reservoir services through a 20-inch transmission line and 8-inch distribution main along Hakimo Road (See Figure D).

5.2 Project Water Demand

The projected water demand for the golf course site is based on the BWS Water System Standard (1985).

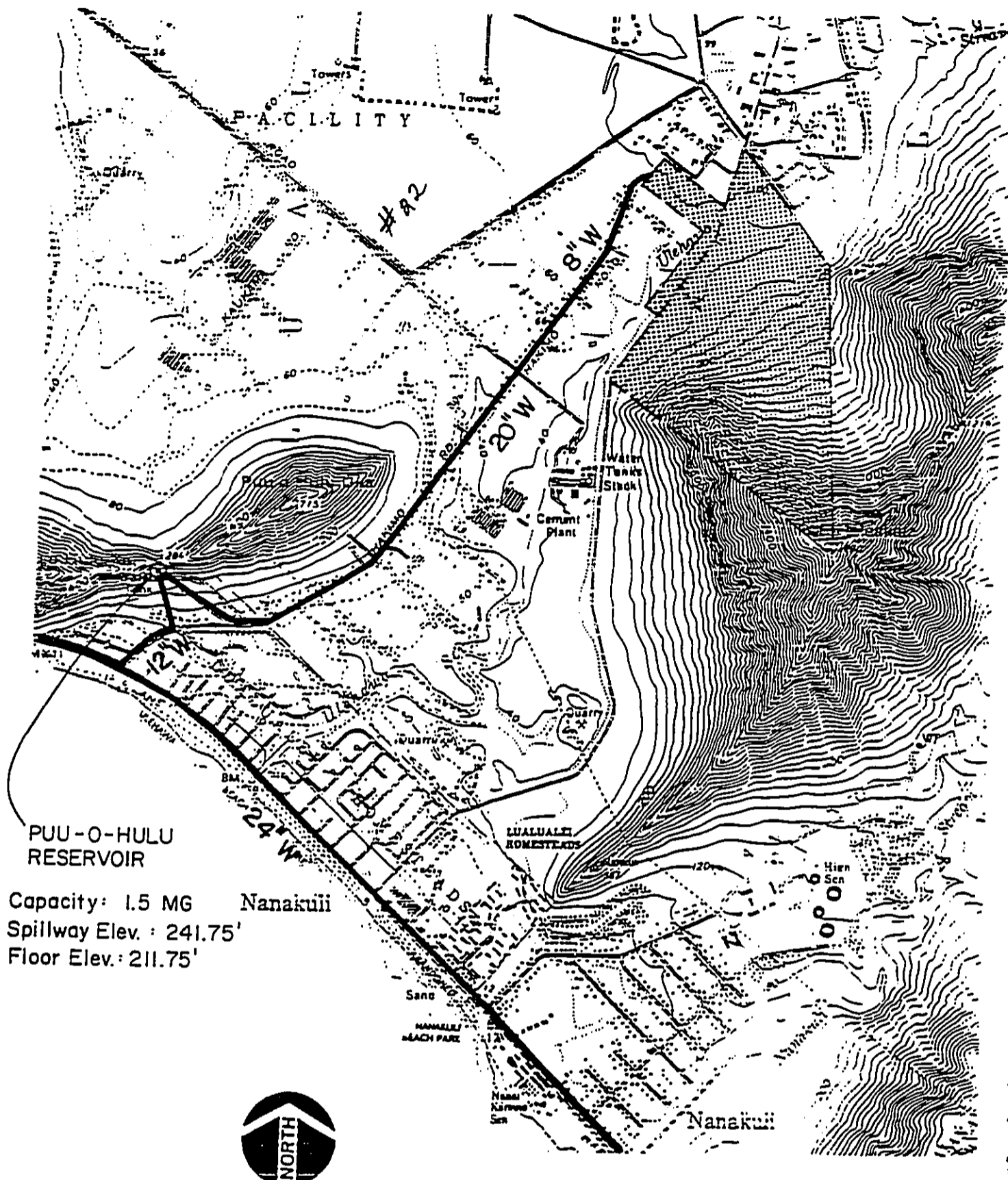
A domestic water demand of 9,900 gallons per day (gpd) is estimated, based on typical domestic requirements for the maintenance building and clubhouse.

Specifically, domestic water demand is based on the following projections:

			<u>GPD</u>
50-seat restaurant	@ 40 gpd/seat	=	2,000
250 golfers (peak day)	@ 10 gpd/person	=	2,500
30 employees (peak day)	@ 20 gpd/person	=	600
150 showers (peak day)	@ 25 gal/shower	=	3,750
2 washing machines	@ 500 gpd/machine	=	<u>1,000</u>
			9,850
		Say	9,900

A water demand of 0.6 MGD is estimated for golf course irrigation of approximately 100 acres. Irrigated areas include greens, tees, fairways, and roughs; clubhouse landscaping; and plant nursery. A typical golf course irrigation rate of 1.5 inches per week is assumed. Nonpotable water from three on-site wells will supplement rainfall to meet the irrigation requirement.

The projected water demand for fire protection is 2,000 gallons per minute (gpm) over a two-hour duration for the clubhouse and maintenance building. This demand is based on the Water System Standards' fire flow rate for schools, small shopping centers, neighborhood businesses and hotels.



PUU-O-HULU RESERVOIR
 Capacity: 1.5 MG
 Spillway Elev.: 241.75'
 Floor Elev.: 211.75'



SCALE 1:24,000 (APPROX.)
 1000 0 1000 2000 3000 4000 5000 FEET

HIDA, OKAMOTO & ASSOCIATES, INC.
 Consulting Engineers
 Honolulu, Hawaii

FIGURE D
EXISTING WATER SYSTEM
(BWS SYSTEM)

5.3 Proposed Development

The proposed water supply plan is separated into two distinct systems outlined below:

- 1) Potable Water System - Includes domestic supply for the clubhouse and maintenance building.
- 2) Non-appealable Water System - Irrigation of golf course and fire protection.

5.4 Potable Water System

The potable water system includes domestic supply for the golf course maintenance facility and clubhouse. The proposed potable water system will be connected to the existing 8-inch BWS water line along Hakimo Road. A new 8-inch line will be located along entry road by nursery facility. A new 6-inch water line will be connected to the 8-inch line and service the golf course clubhouse and maintenance facilities (See Figure E).

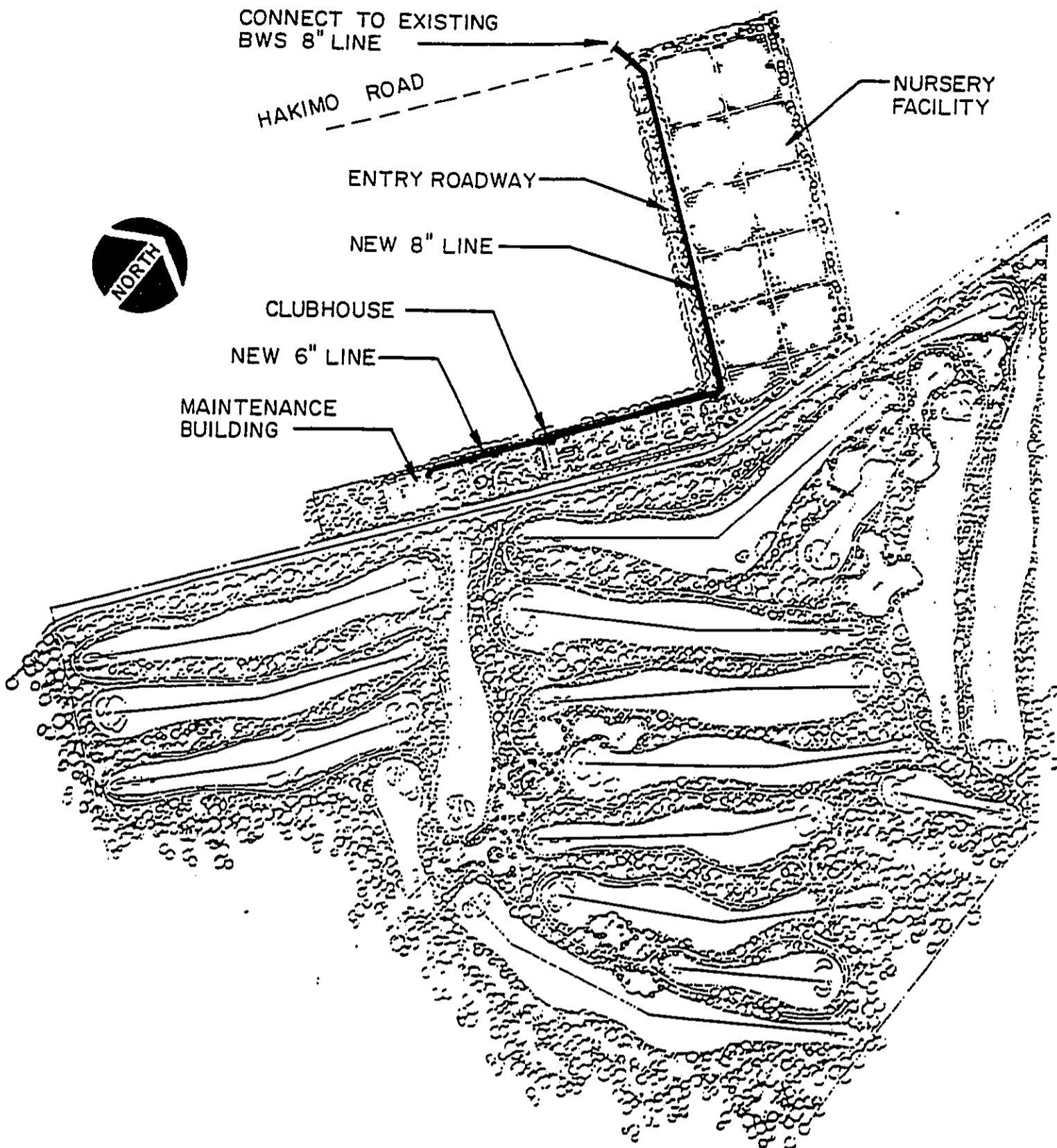
5.5 Non-appealable/Irrigation Water System

The non-appealable water system includes irrigation for the golf course, nursery and landscaped area, and fire protection for clubhouse and maintenance facilities (See Figure F). The developer has drilled two (2) on-site wells to provide additional irrigation water to supplement treated sewage effluent. The Well No. 1 located 155 elevation at the mauka side of the site, Well No. 2 located 145 foot elevation at the makai side of the site. The wells were tested to deliver 225 gpm (0.32 MGD) per well. A gravity line from the well sites will supply non-potable water to an 2.5 MG irrigation/fire protection water storage pond south east of the clubhouse site.

5.6 Potential Impact and Mitigation Measures

Positive impacts resulting from the proposed water system include: (1) using non-potable sources for irrigation of golf course and landscaping; (2) Upgraded fire protection for the vicinity.

Possible negative impacts resulting from the proposed water system include: (1) Increased demands on the BWS source and distribution system due to approximately 9,900 gallons per day from the use of the golf course clubhouse; (2) Decreases in ground water quality due to pumping of irrigation water from the two wells. In the event that significant changes in ground water quality occur during monitoring of the wells, other source alternatives will be considered.

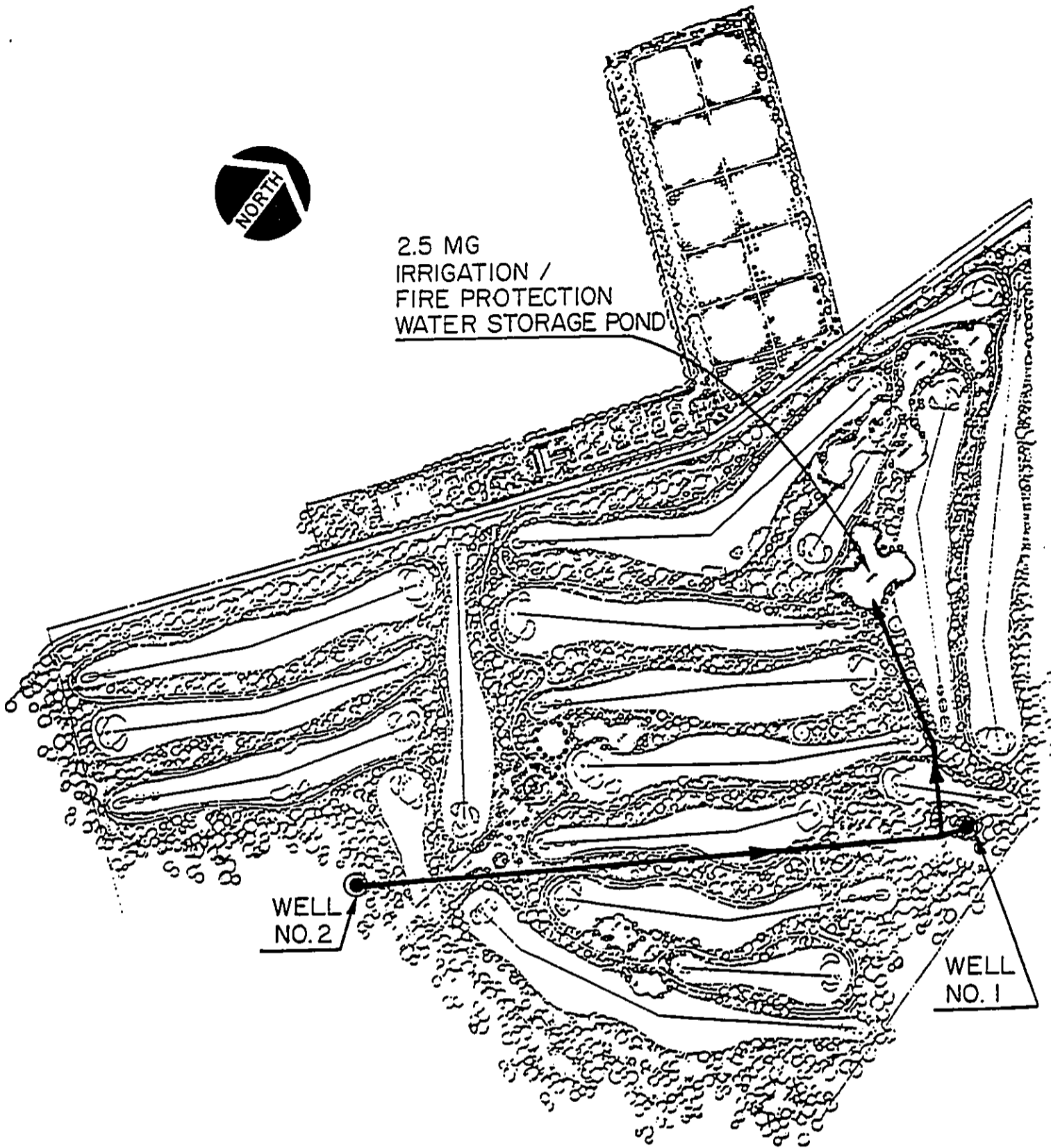


(POTABLE WATER SYSTEM)

FIGURE E
PROPOSED
WATER SYSTEM



2.5 MG
IRRIGATION /
FIRE PROTECTION
WATER STORAGE POND



(NONAPPEALABLE WATER SYSTEM)

FIGURE F
PROPOSED
WATER SYSTEM

6. WASTEWATER STUDY REPORT

6.1 Existing Wastewater System

Presently, the property is not serviced by the City and County of Honolulu's wastewater collection, treatment and disposal system. The adjoining residential area between the project site and the junction of Waiolu Street and Hakimo Road is serviced by cesspools. Wastewater disposal by cesspools is a major issue within the Waianae Development Plan area. The City and County, Division of Wastewater Management has no plans to service the Agriculture District.

6.2 Projected Wastewater Flows

The wastewater flows from the proposed development is anticipated to be primarily generated from the clubhouse activities. The clubhouse activities will include meal preparation, toilets & showers, and laundry area for washing towels.

The average daily wastewater generated by the golf clubhouse is estimated to be 8,100 GPD and will be typical of domestic wastewater in composition.

6.3 Proposed Wastewater Infrastructures

The major components of the proposed wastewater infrastructure are: (1) the wastewater collection system; (2) the treatment system; and (3) the wastewater effluent disposal system. The proposed wastewater infrastructure will serve only the Lualualei Golf Course.

6.4 Collection System

The proposed wastewater collection system is shown in Figure G. The collection system is located on the west side of the clubhouse area. A gravity sewer will collect and convey the wastewater to the treatment facility from the clubhouse and maintenance facility.

6.5 Wastewater Treatment Plant (WWTP):

The proposed WWTP is shown in Figure G, located makai of the maintenance facility. The solids (sludge) removed by the treatment process will be disinfected, dewatered and applied to the golf course and landscape areas as a soil conditioner. Any surplus sludge will be hauled to an approved City Sanitary landfill for final disposal in compliance with State of Hawaii Health Department requirements.

6.6 Effluent Disposal

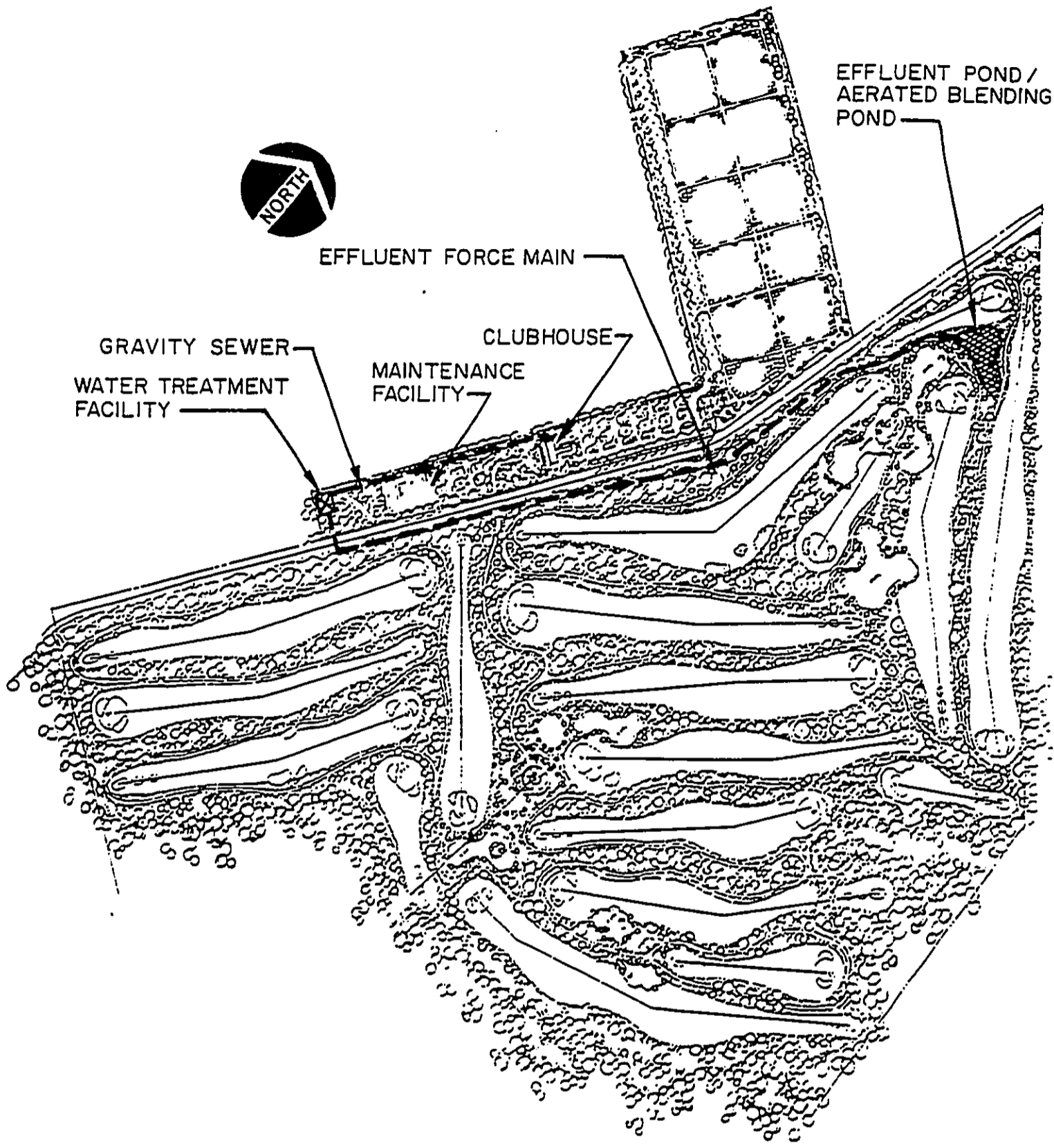
The treated wastewater effluent will be chlorinated and conveyed to an aerated blending pond. The pond will be used for mixing effluent with non-potable irrigation water from brackish ground water. The pond will be lined to prevent direct infiltration of irrigation water. Approximately 1.4 percent of the estimated golf course irrigation water requirement can be supplied by the treated effluent.

6.7 Impact and Mitigation Measures

Irrigation of the golf course with treated effluent will reduce the demand for irrigation water from non-potable sources.

With proper operation, objectionable odors will not be generated from the WWTP. Pumps and blowers normally associated with WWTP will be enclosed within a control building to reduce the impact of operating noises.

Placement of the WWTP below ground level and landscaping the perimeter fence area will reduce the visual impact on users of the golf course and the general public passing on Lualualei Naval Road.



(EFFLUENT DISPOSAL SYSTEM)

FIGURE G
**PROPOSED WASTEWATER
 COLLECTION SYSTEM**

7. ELECTRIC AND TELEPHONE SERVICES

7.1 Existing Conditions

Power and telephone service to the site is currently supplied by the overhead lines along Luualalei Naval Road. Power to this primary line is supplied by the Mikiloa Substation feeder No. 3 which has available capacity to serve the subject expansion.

7.2 Proposed Action

Electrical and telephone infrastructure has adequate capacity to be upgraded to serve the development. The assumed average daily power requirement is estimated to be approximately 300 KVA.

7.3 Impact and Mitigating Measures

The developer will work closely with HECO in order to find an appropriate on-site location for a substation as well as to ensure that timely service can be provided.

No other mitigating measures are necessary since the electric company has indicated that adequate service can be provided.

The electrical system within the development will be built to County standards. Utility lines will be underground to mitigate any visual impacts.

The developer will maintain contact with Hawaiian Telephone Company to assure necessary service levels.

8. SOLID WASTE

8.1 Existing Conditions

Because the project site is currently vacant, it is not collected by the refuse collection companies.

8.2 Proposed Action

It is anticipated that at full development the activities within the project site will generate a de facto population of 200, who will each generate approximately 2.32 to 4 pounds of refuse each day, for a total of 700 pounds of solid waste each day. Solid waste will be collected by private collection companies and disposed at public or private landfills.

8.3 Impact and Mitigating Measures

The proposed activities within the project site will place additional demand on County waste disposal facilities. It is expected that State and County revenues derived from the completed golf course facilities will be sufficient to finance the developer's fair share of the cost for major capital improvements such as solid waste disposal facilities, and to provide the same level of per-unit services. The County has future plans to construct a solid waste transfer station. Solid waste collected at this transfer station will be hauled either to a sanitary landfill site for disposal or to a proposed refuse-to-energy plant.

APPENDIX B

Ground Water Resources

Prepared by John F. Mink, October 15, 1988

**Groundwater Resources
Maile, Waianae****Puu Heleakala to Ulehawa Stream
TMK 8-7-09:2****October 15, 1988
John F. Mink**

The property in question has a roughly triangular shape with an apex at Puu Heleakala and its base along Luualalei Road (see attached USGS map, scale 1:24,000). The lower boundary lies between elevation 70 to 80 feet while the peak of Heleakala is just under 2000 feet above sea level. Below elevation 200 feet the surface slope is moderate, about 12 percent, but above it rises steeply. At the northern angle of the triangle a small farm is operated, but otherwise the parcel is unused. The total property area is about 306 acres, of which nearly 70 acres along the ridge striking northwest from Heleakala to the road is classified as Preservation.

Within the property are three land form types. The relatively level area below an elevation of approximately 90 feet is part of valley fill and is underlain by an upper stratum of limestone and lower strata of clays. The basement volcanic rock rises above the valley at elevation 100 feet but is covered by talus and other landslide debris to a much higher elevation. In the upper part of the mountain the volcanic rock crops out as steep slopes and palis.

The basaltic formation exposed in the region belongs to the lower member of the Waianae volcanic series. It is a typical primitive basalt consisting of thin lava flows and

rubby layers. The area, however, is in the rift zone striking southward from the original center of the Waianae volcano at the head of Lualualei Valley and consequently includes dikes as well as layered rocks. The lavas are highly permeable and easily transmit groundwater, while narrow dikes form impermeable vertical boundaries to groundwater flow. These conditions are characteristic of Hawaiian rift zones.

In the valley portion of the property a stratum of limestone about 100 feet thick starts below surface soil and alluvium 5 to 10 feet in depth. The limestone, like the basalt, is very permeable and was used at one time as a source of brackish water for irrigation by small farmers. Beneath the limestone the valley fill consists of clays and calcareous sediments containing salty water. The basalt is at least several hundred feet below the top of the limestone layer.

The talus slope above the valley floor is not an aquifer as are the basalt and limestone but is effective in infiltrating rain water. Talus consists of debris ranging from clay to boulders, much of it weathered into relatively soft material.

Groundwater Occurrence and Development

Maile is in the driest part of Oahu, receiving no more than an average of 25 inches of rain per year. Two thirds of the total falls between November and April from storms. Infiltration below the soil layer takes place only in this

period.

Uiahawa Stream near the western boundary of the property is non-perennial. Flow accompanies the infrequent winter storms but dissipates quickly. The storms can be intense, causing local flooding along Uiahawa and sheet flow elsewhere, but by and large the talus buffers the effects of concentrated rainfall. Most of the drainage area is covered by talus.

Two separate aquifers occur in the property, one consisting of limestone in the valley and the other composed of basalt underlying the valley fill and talus slopes. These aquifers are independent of each other. The limestone stratum extends throughout Lualualei Valley below the approximately 100 foot elevation contour, while the basalt constitutes the basement of the entire Waianae district and is exposed as slopes and ridges above the level valley floor. The source of groundwater in the limestone is recharge from rainfall and from mountain runoff reaching the valley; the source in the basalt is rainfall on talus slopes and ridges of exposed bedrock.

Limestone Aquifer

Groundwater in the limestone occurs as a lens of brackish water floating on sea water. Nowhere is the water fresh enough to drink, and in most places it is unusable for irrigating all but salt-tolerant plants. The aquifer is located in the level portion of the property along Lualualei

Road.

For many years brackish groundwater was extracted from the limestone to irrigate crops and maintain piggeries near Ulehawa Stream. The salinity of the water is too high for optimal irrigation, and as a result farmers eventually shifted from local wells to the Board of Water Supply system. Some wells may still be in use.

The typical Maile farmer well is driven from an elevation of about 60 feet to less than 25 feet below sea level. Head (elevation of the water table above sea level) in the aquifer is approximately 2 feet near the property line, suggesting a depth below sea level of moderately brackish water of about 50 feet. Normally the diameter of a well is 6 inches, and a small pump, usually having a capacity of 50 to 125 gpm, is employed. For these conditions the salinity of the pumped water averages about 1200 mg/l chloride, but a few wells yield water with as low as 700 mg/l and others produce water at the 2000 mg/l level. Higher pumping rates would cause higher salinities.

The sustainable draft of the limestone aquifer between Puu Hulu, a basaltic ridge half a mile west of the property, and Ulehawa is on the order of 300,000 gallons per day. Capturing this quantity while maintaining salinity between 1000 and 1200 mg/l chloride would require a minimum of five wells, each equipped with a 50 gpm pump. A typical well would be less than 100 feet deep and have a 6 inches diameter casing. The groundwater might be too brackish for ordinary

irrigation of grasses; the upper limit of tolerance for most hardy grasses is about 1000 mg/l chloride.

The map at the end of this memorandum shows the location of wells in the limestone aquifer within about half a mile of the property. The location of each well is plotted on the map as a square with a two digit number. The complete number assigned to a well consists of the latitude-longitude one minute square plus the two digit locator. For example, 2408-03 means that the well is in a square defined by latitude 24 minutes and longitude 08 minutes and its site is identified by 03.

Basalt Aquifer

The basalt aquifer underlying the property lies in the rift zone in which dikes have a southerly strike. An exploitable aquifer consisting of basalt compartments between dikes is known to exist because at one time an infiltration gallery was located within a few hundred feet of the property line and yielded reasonably low salinity water at small rates for both domestic and agricultural uses. The gallery was abandoned many years ago. Its location on the map is 2508-01,02.

The gallery, called Shaft 2 in old reports but now numbered as 2508-02, was constructed in 1939. A shaft led from the ground elevation of 170 feet at the nose of a basalt bluff to a sump having its invert 5 feet below sea level. From the sump, tunnels (galleries) totalling 917 feet in

length were excavated. The initial groundwater head was 12 feet and initial chloride was 146 mg/l.

Pumped at a rate of 285 gpm, the chloride rose to 375 mg/l and the tunnel was dewatered. Lower rates, however, were successful. In 1937 an average of 76 gpm of 300 mg/l chloride water was pumped; between 1941 and 1944 an average of 150 gpm was delivered to the Waianae Plantation. Later the station was used by the Mikilua Farmers Association for irrigation, but in 1962 it was closed down. For a period (1974-1976) heads and chlorides were monitored but water was not pumped. The head ranged from 11.4 to 11.9 feet, and chloride from 280 to 285 mg/l. The water is abnormally warm, about 83 F, suggesting a residual heat source persists in the rift zone.

Shaft 2 is just off the property line, but the aquifer it exploited underlies the entire parcel. With proper development practice, several hundred gallons per minute of brackish water having 500 to 1000 mg/l chloride could be obtained from wells within the property boundaries. An exploratory boring would be needed first, then a plan of development outlined. The boring should be designed for conversion to a production well.

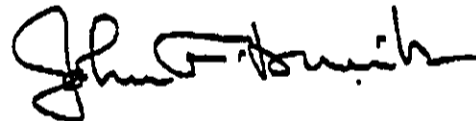
Exploiting the capability of the basalt aquifer to provide water for a golf course or agriculture is justified on the basis of experience at Shaft 2. The exploratory well would have to be 250 to 300 feet deep and 8 inches in diameter. Total cost for drilling, casing and testing should be about \$100,000. The limestone aquifer might also be

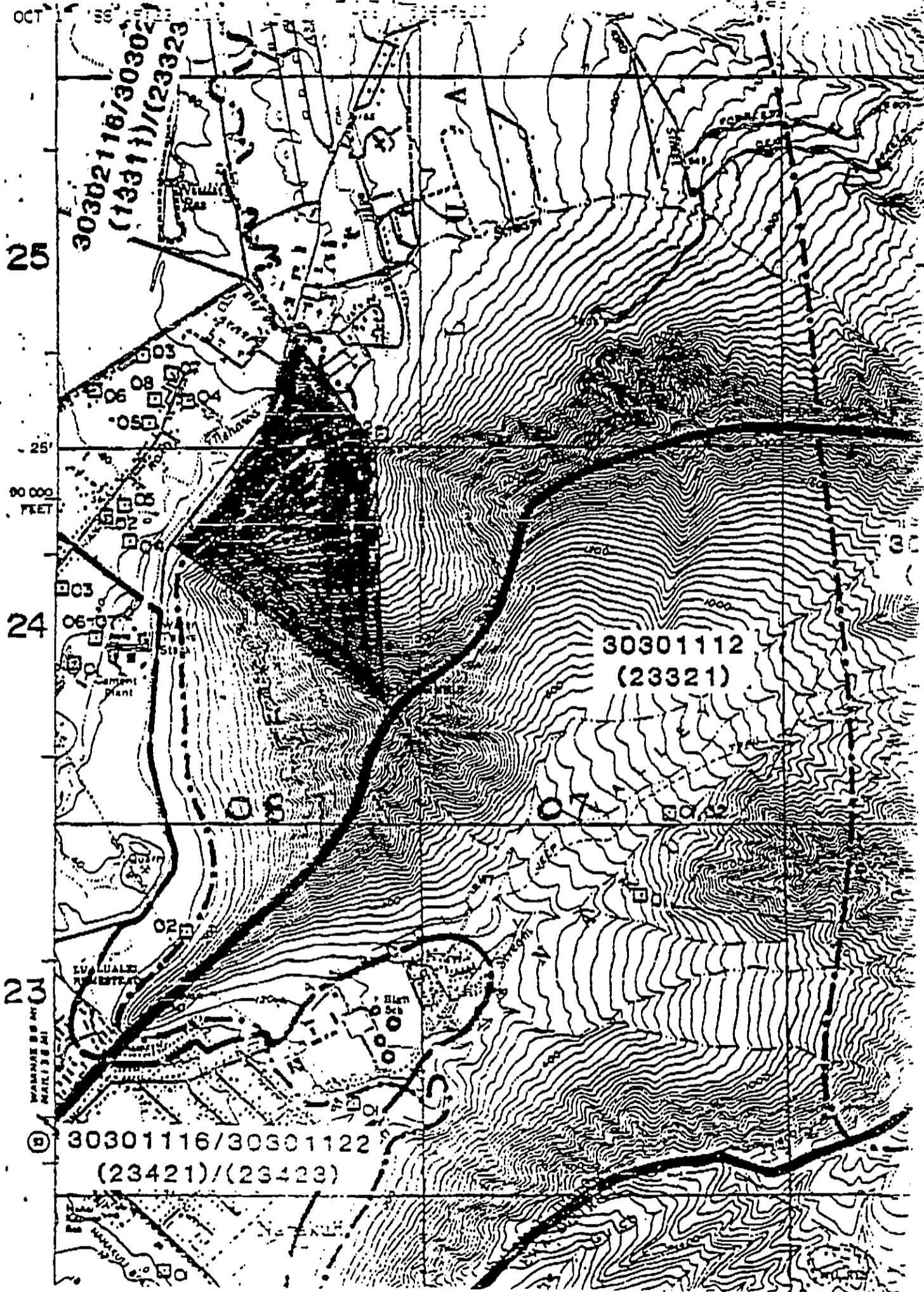
explored, but the quality of its water will be inferior to that taken from the basalt.

Conclusions

The property embraces two exploitable aquifers, each of which can yield several hundred gallons per minute. The limestone is more brackish than the basalt aquifer but is cheaper and easier to develop. The basalt will yield water that may be suitable for irrigation without treatment to reduce salinity. For either aquifer an exploratory well will be required before a plan of groundwater development could be implemented.

If exploitation of the groundwater resources in the property is accepted as reasonable, I suggest the basalt aquifer be tested first. It may not be necessary to use the limestone water if a sufficient supply is obtainable from the basalt.





APPENDIX C

Archaeological Inventory Survey

Prepared by Cultural Surveys Hawaii, January, 1991

**An Archaeological Inventory Survey
for the Proposed Lualualei Golf Course
Lualualei, Wai'anae, O'ahu**

DRAFT

By

Hallett H. Hammatt, Ph.D.

Jennifer J. Robins, B.A.

Mark Stride

**Prepared for
Hida, Okamoto and Associates**

by

Cultural Surveys Hawaii

January 1991

Abstract

Cultural Surveys Hawaii was requested by Hida, Okamoto and Associates to undertake an archaeological inventory survey for the approximately 170-acre proposed Lualualei Golf Course Development Project (TMK 8-7-9:portion 2; 8-7-10 parcels 6 and 10; and 8-7-19, portion 1) located in the ahupua'a of Lualualei, Island of O'ahu.

The survey and limited testing were conducted during four field days in the month of November 1990. As a result of the fieldwork eight sites were located within the project area including two traditional Hawaiian sites and six historic sites related to ranching and military activities. The historic sites include a cattle wall, a furnace, wells, a house lot, and cement foundation structure. The two traditional Hawaiian sites include one habitation complex and one wall remnant.

Limited subsurface testing for cultural deposits was conducted at the habitation complex - site 50-80-08-4366 - within a suspected hearth feature; no midden or artifacts were recovered. According to the Lualualei Golf Course development plan, site 50-80-08-4366 lies outside of the impact area and thus should be spared any disturbance. However, in the event that the impact zone is extended into the site area, we would recommend that it be preserved since it represents the only unequivocal, traditional Hawaiian habitation site in the project area.

Of the remaining seven sites identified within the project area, none are considered significant for future research.

Acknowledgments

We wish to thank Mr. Harvey Hida of Hida, Okamoto and Associates for supplying the general information and maps for this project. Recognition and thanks is given to Messrs. Chris Bailey, Don Hugo, and Aron Suzuki who, along with the authors comprised the field crew. We would also like to thank Ms. Carol Kawachi of the State Historic Preservation Office for supplying information necessary for this report, Dr. Vicki Creed of Windword Processing for typing this report, and Mr. Dennis Tom for drafting the site maps. We especially thank Mr. Rodney Chiogioji and Mr. David Shideler for editing this report.

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Table 1 **Site Summary and Significance** 30

I. Introduction

At the request of Hida, Okamoto and Associates, Cultural Surveys Hawaii conducted an archaeological inventory survey of the proposed Lualualei Golf Course (170 acres) in the ahupua'a of Lualualei, Island of O'ahu (TMK 8-7-9:portion 2; 8-7-10 parcels 6 and 10; and 8-7-19: portion 1)(Figures 1-5).

The objective of this survey was to locate, inventory and evaluate the significance of the cultural resources in the project area and provide recommendations for treatment of these resources.

Fieldwork was conducted over a period of four days during the month of November 1990, by a crew of four persons. Limited subsurface testing was conducted at site 50-80-08-4366 to determine if cultural deposits are present.

The project area is located along the northeastern perimeter of Lualualei Valley and along the base of Pu'u Heleakala Ridge which partially separates Lualualei Valley from Nanakuli Valley.

As a result of the survey, eight sites were identified within the project area (Figure 6). Two of these sites (50-80-08-4366 and -4367) are interpreted as traditional Hawaiian sites, while the remaining six are clearly attributable to historic activities related to ranching and military presence.

A. Scope and Methods

This project consisted of reconnaissance, description and mapping of archaeological sites within the project area.

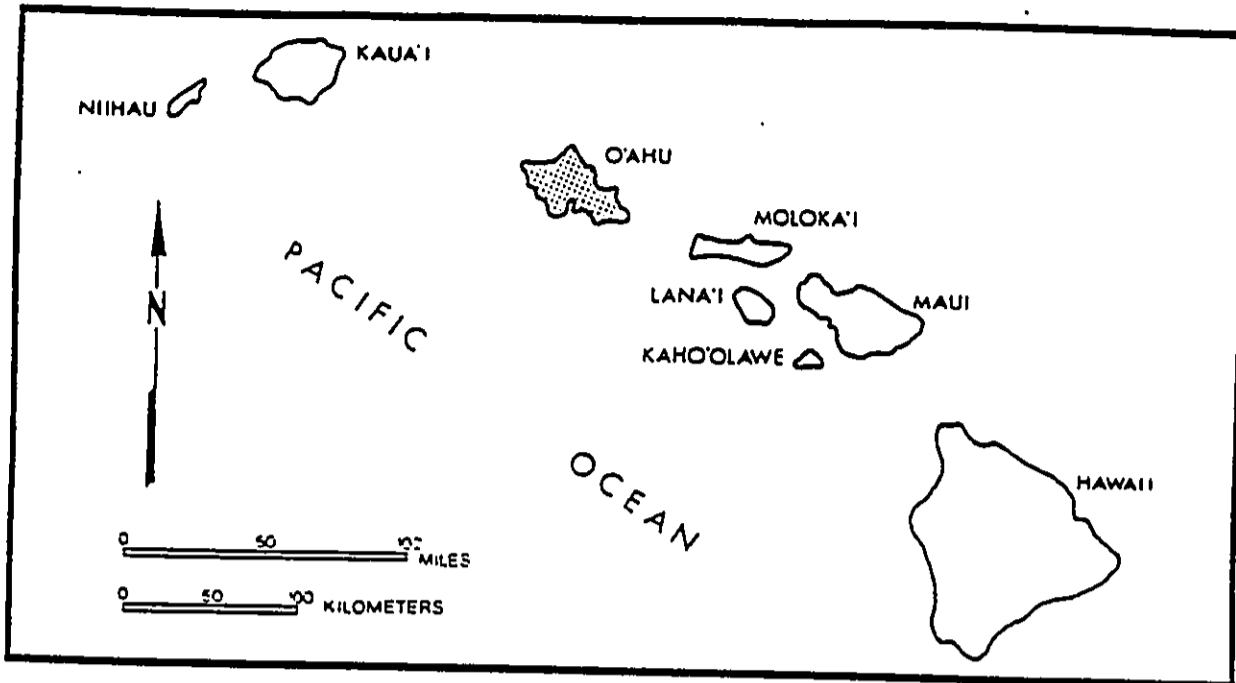


Fig.1. State of Hawaii

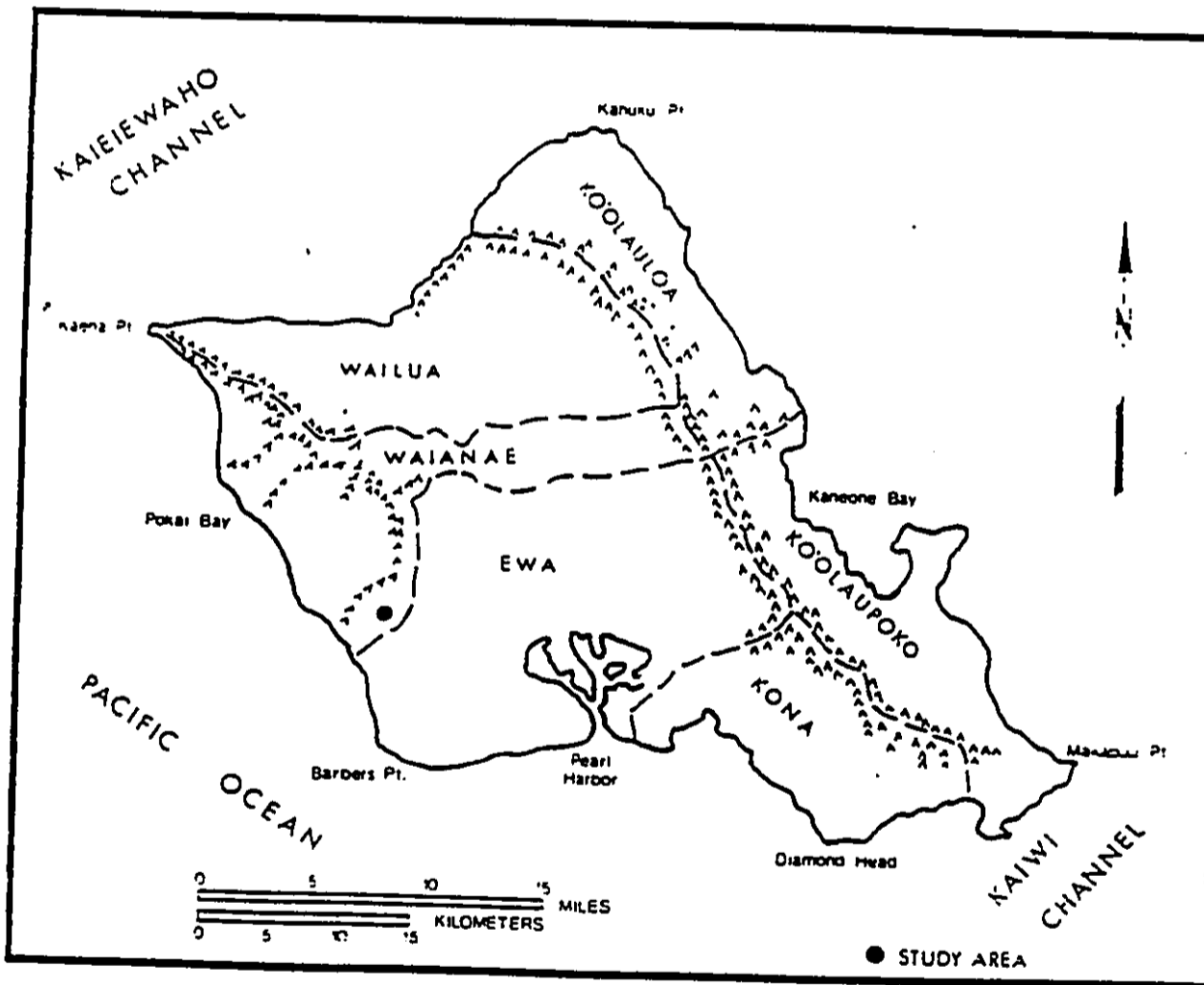


Fig.2. General Location Map, Oahu Island.

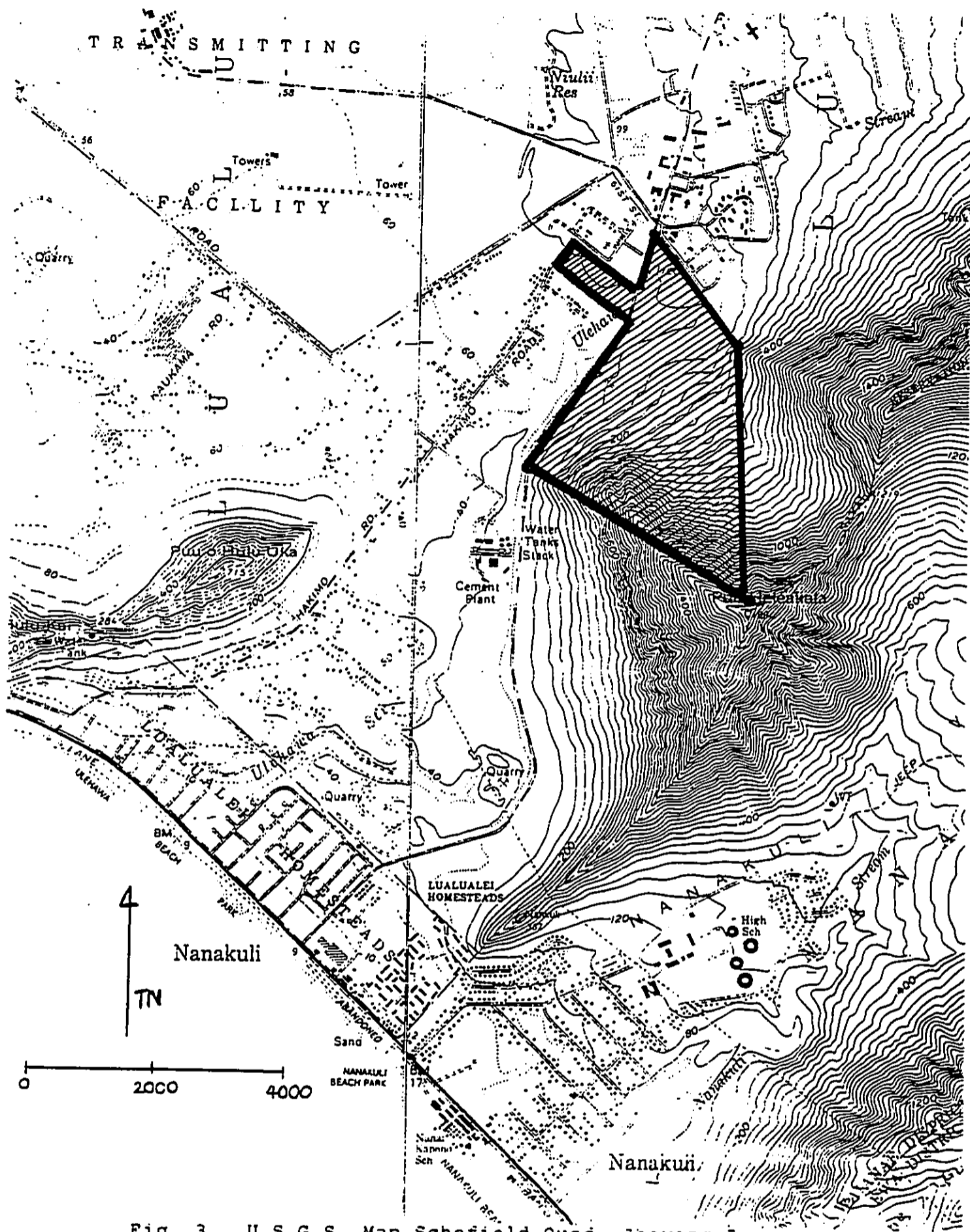


Fig. 3 U.S.G.S. Map Schofield Quad, Showing Project Area (Shaded)

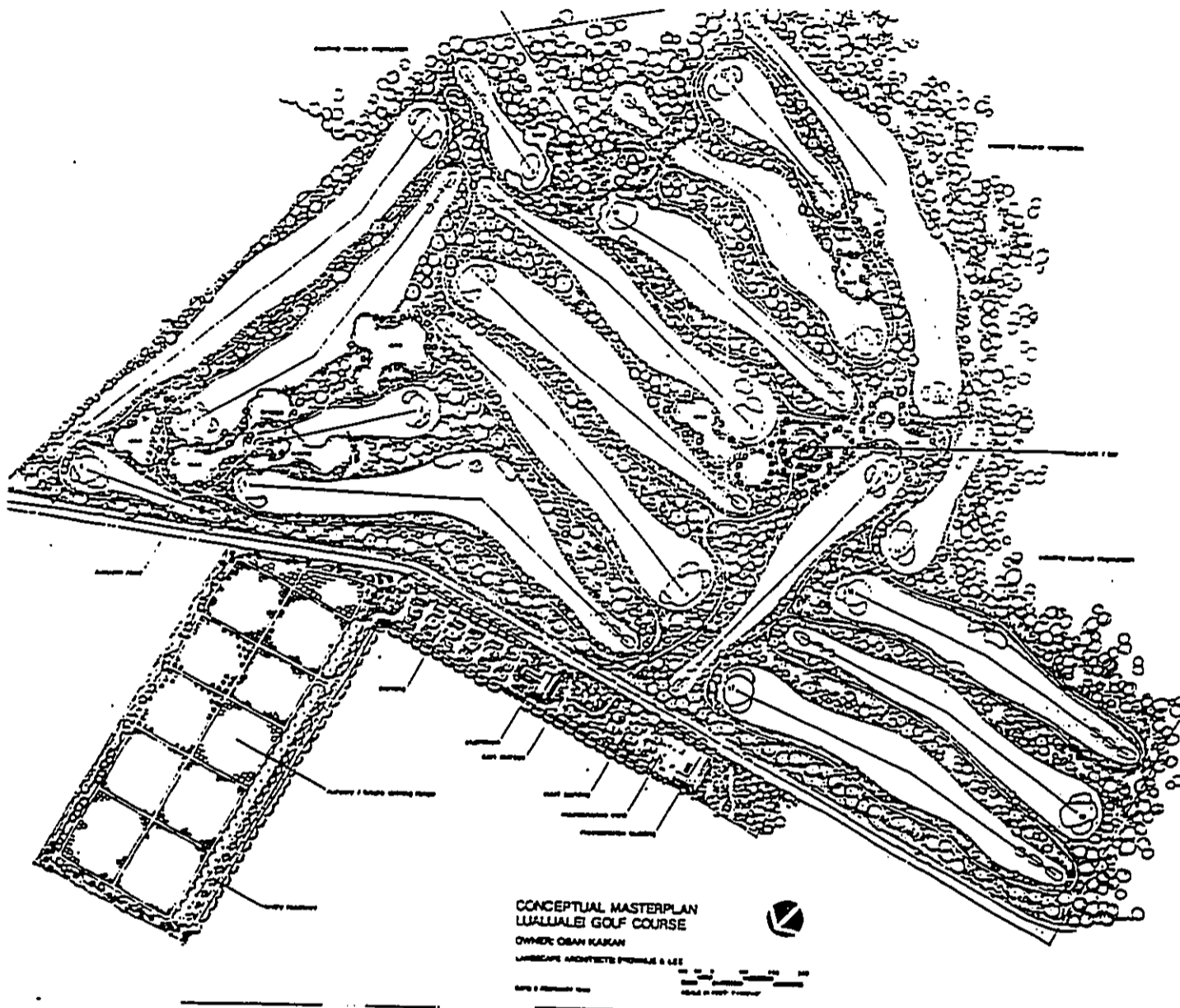


Fig. 4 Proposed Lualualei Golf Course

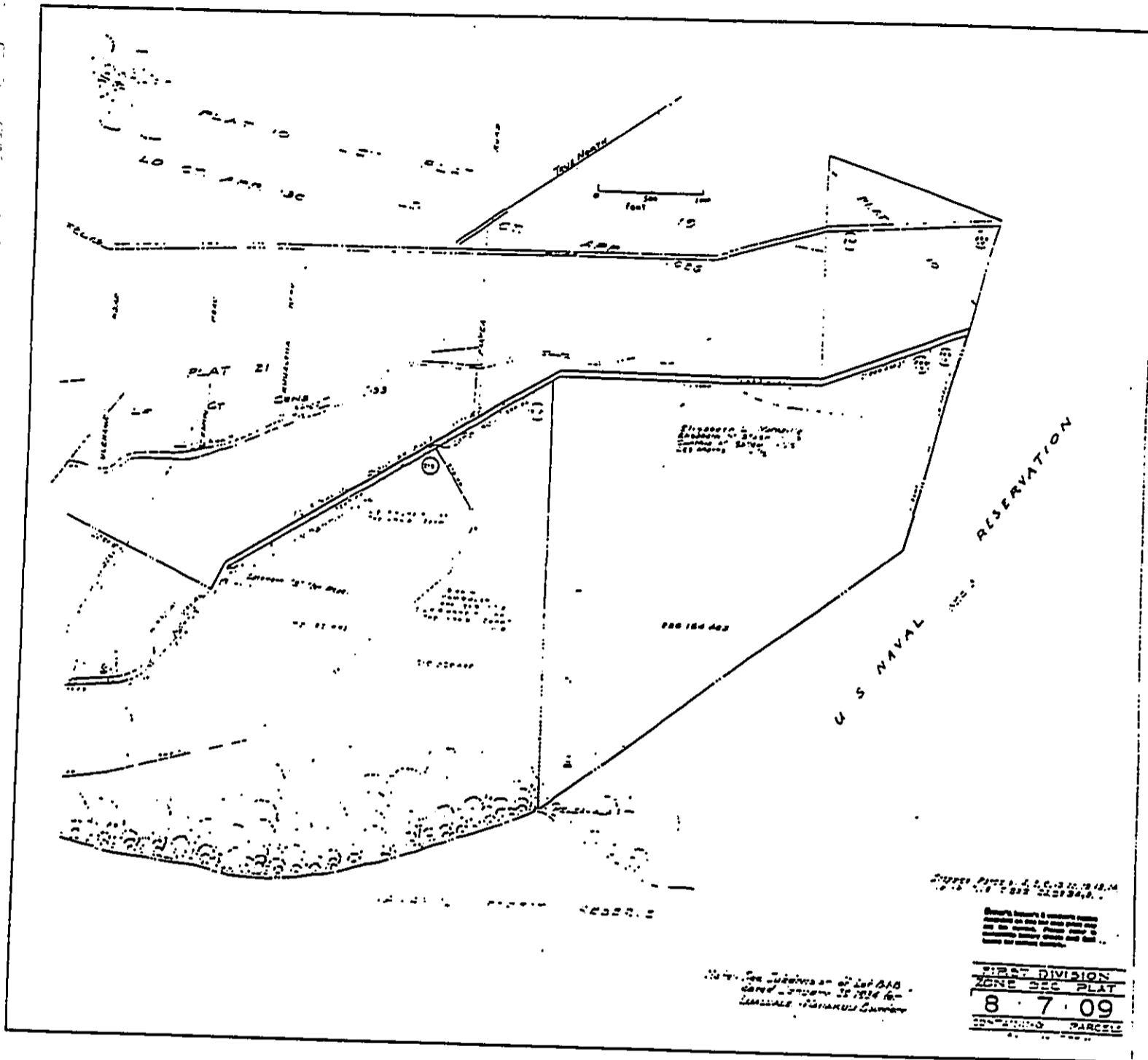


Figure 5 Tax Map of Project Area

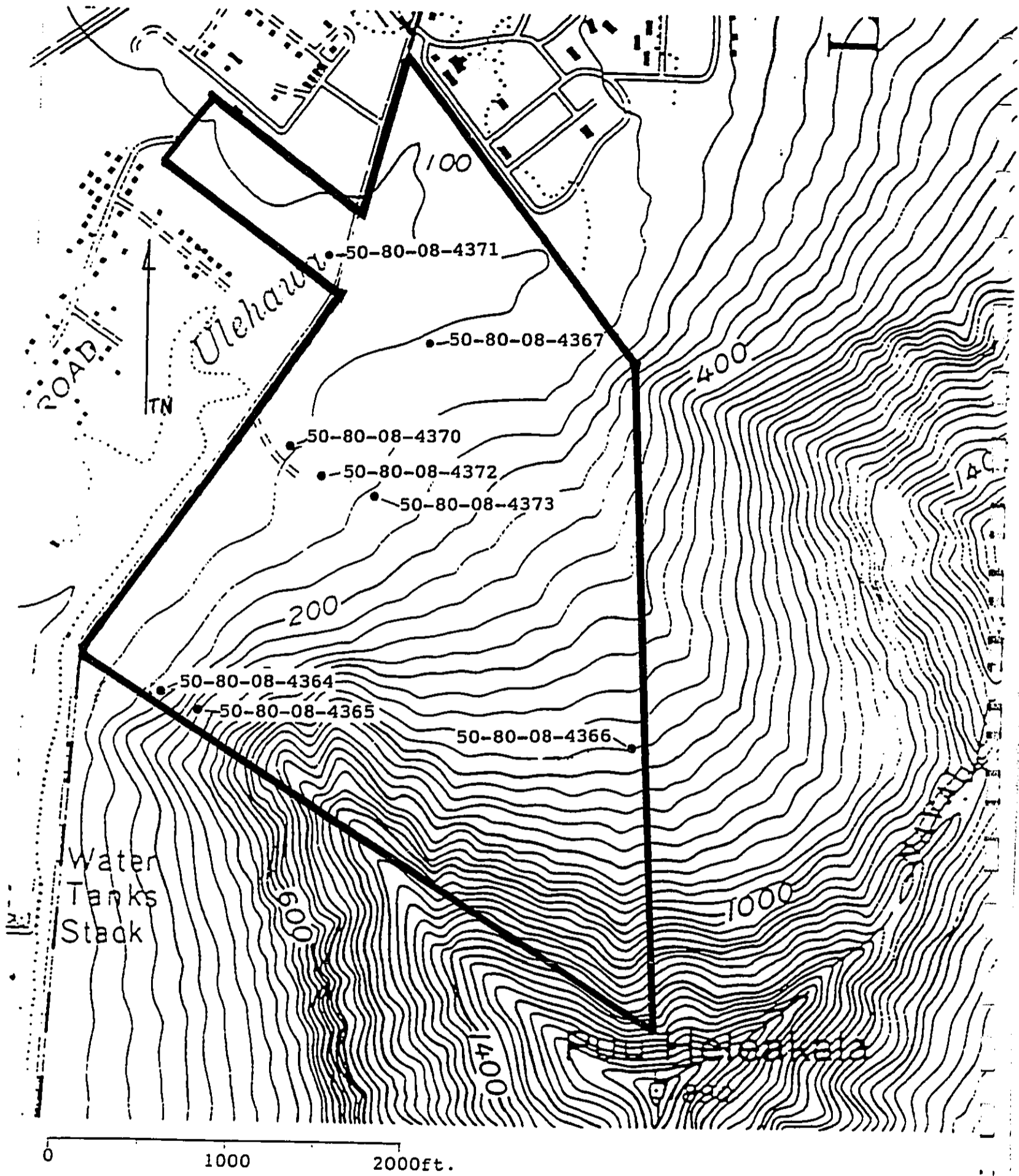


Figure 6 Project Area Showing Site Locations

Access to the property was gained from Lualualei U.S. Naval Road on the northwest boundary. Three gates along this road were used to enter the project area. A crew of three-four archaeologists, spaced at intervals of 50 ft.-100 ft. depending on the vegetation and visibility, systematically surveyed the property by pedestrian sweeps (usually west to east). The steep slope and cliffs along Pu'u Heleakala rendered the ground survey impossible above the 400 ft. to 600 ft. elevation.

All sites were recorded by formal category and given temporary site numbers. Fieldwork at each site included triangulating and mapping its location onto a project map; interpreting the site's nature, extent, and probable function; and searching for the presence of surface artifacts. Specific sites were mapped - using a compass and tape - and photographed. All sites were flagged with heavy yellow construction tape. Edges of sweeps were marked with pink or red flagging tape.

Following the fieldwork all sites were given State Site numbers. Two sites that were originally given temporary site numbers were later determined to be noncultural. Consequently, gaps exist in the temporary site number list.

B. Project Area Description

The project area comprises vacant, unused lands. It is undeveloped and contains several remnant and abandoned historic structures.

The project area extends in a northeasterly direction from

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

Access to the property was gained from Lualualei U.S. Naval Road on the northwest boundary. Three gates along this road were used to enter the project area. A crew of three-four archaeologists, spaced at intervals of 50 ft.-100 ft. depending on the vegetation and visibility, systematically surveyed the property by pedestrian sweeps (usually west to east). The steep slope and cliffs along Pu'u Heleakala rendered the ground survey impossible above the 400 ft. to 600 ft. elevation.

All sites were recorded by formal category and given temporary site numbers. Fieldwork at each site included triangulating and mapping its location onto a project map; interpreting the site's nature, extent, and probable function; and searching for the presence of surface artifacts. Specific sites were mapped - using a compass and tape - and photographed. All sites were flagged with heavy yellow construction tape. Edges of sweeps were marked with pink or red flagging tape.

Following the fieldwork all sites were given State Site numbers. Two sites that were originally given temporary site numbers were later determined to be noncultural. Consequently, gaps exist in the temporary site number list.

B. Project Area Description

The project area comprises vacant, unused lands. It is undeveloped and contains several remnant and abandoned historic structures.

The project area extends in a northeasterly direction from

Lualualei Naval Road to the foothills of Pu'u Heleakala. Below the 200-foot elevation level the terrain is fairly level with gradual slope. Above the 200-foot elevation level the terrain slopes steeply uphill toward Pu'u Heleakala Ridge which is at approximately the 1880-foot elevation level (no golf course construction will occur beyond the 400-ft. elevation).

The lower, flatter portion of the project area adjacent to the Lualualei Naval Road consists mostly of weedy grasses and koa haole shrubs. Approximately 15 acres located in the north portion of the project area were cultivated for vegetable crops until early 1988; much of the irrigation system is still evident. Kiawe trees and wild grasses dominate the remaining portion of the project area along the foothills of Pu'u Heleakala. Above the 250-foot elevation level, steep outcroppings dominate and the vegetation is low shrubs and grasses. A number of Wiliwili trees were present in the project area most especially along the foothills of Pu'u Heleakala.

The major soil types in the project area consist mostly of Lualualei extremely stony clay 3 to 35 percent slopes (LPE) with some Lualualei clay 2 to 6 percent slopes (LuB) covering the flatter portions of the project area adjacent to the Lualualei Naval Road (Foote et al. 1972).

II. Cultural Setting

A. Prehistory and Early History

Numerous Hawaiian legends, in addition to archaeological evidence, reveal the Wai'anae coast and mauka interior to be an important center of Hawaiian prehistory and early history.

The present study area is located in the ahupua'a of Lualualei which extends from the leeward ridge of the Wai'anae Range to the coast between Nanakuli Valley to the south and Wai'anae Valley to the north.

Traditional accounts of Lualualei focus on the mythological cycle of the demi-god Maui. Samuel Kamakau cites Ulehawa Stream at the coast of Lualualei as the birthplace of the Polynesian demi-god Maui and his brothers: it was here that Maui learned the secret of making fire for mankind and perfected his fishing skills. Other famous accounts of Maui at Ulehawa Stream refer to: the cave in which Hina (moon goddess, mother of Maui) made her tapa; the fishhook, Manai-a-ka-lani (with which Maui attempted to unite the Hawaiian Islands); the snare for catching the sun (which Maui used to advantage on Haleakala); and the place where Maui's adzes were made (Kamakau, 1961).

John Papa I'i describes three trails crossing over the mountains into Lualualei Valley and running along the coastline from 'Ewa. These trails are certainly of some antiquity with the southern-most trail through Pohakea Pass possibly once traversing a portion of the present study area along Ulehawa Stream.

During prehistory the arid coastal regions of Nanakuli and

Lualualei Valley likely supported a sparse population which was limited to isolated, perhaps temporary, habitations focusing on fishing; this scene was undoubtedly similar to George Vancouver's description of the Wai'anae coast observed at the time of contact. Here, Vancouver reported seeing "one barren, rocky waste, nearly destitute of verdure, cultivation or inhabitants" with only a "few stragglng fishing huts" scattered along the coastline (in McGrath et al., 1973:17). Amidst the sparsely inhabited expanse he observed at the leeward coast, Vancouver encountered a village along the beach at Wai'anae, where he was offered a number of hogs and a wide variety of vegetables (Handy and Handy, 1972:468). Wai'anae - the wettest valley on the leeward side of O'ahu - was the largest settlement on the coast. Roger C. Green suggests it was one of the first Hawaiian settlements in the Wai'anae District (Green, 1980:72).

A story told by Mary Kawena Pukui about how Nanakuli Valley got its name clearly reveals the early Hawaiians' struggle and the unique character formed by adapting to the more unfavorable environments of the leeward coast:

'...Because of the great scarcity of water and vegetable food, they [the Nanakuli people] were ashamed to greet passing strangers. They remained out of sight as much as possible. Sometimes they met people before they were able to hide, so they just looked at strangers with expressionless faces and acted as though they were stone deaf and did not hear the greeting. This was so that the strangers would not ask for water which they did not have in that locality...So the place they lived was called Nana, or look, and kuli, deaf--that is, Deaf mutes who just look' (in Sterling and Summers, 1978:61-62)

Although these and various other historic accounts describe the coastal regions of Nanakuli and Lualualei as relatively uninhabited because of their limited subsistence resources, archaeological evidence suggests that late prehistoric and early historic land usage occurred inland of the coastline.

Subsequent to western contact in the area (after ca. 1790), the landscape of Lualualei Valley and the surrounding slopes of the Wai'anae Mountains were adversely impacted by the removal of the sandalwood forest and by the introduction of domesticated animals and new vegetation species.

In the early 1800s when Wai'anae first became involved in the sandalwood trade, King Kamehameha the Great ordered the people of the leeward district to cut sandalwood to pay for the ship "Columbia" which he purchased at the price of "twice the full of the vessel" (in Hammatt et al., 1985:24). In addition to obliterating the sandalwood forest, the intensive sandalwood trade adversely impacted the traditional Hawaiian culture. Kamakau writes that because so many commoners were ordered to participate in the harvesting of sandalwood "famine was experienced from Hawaii to Kauai" forcing the people to "eat herbs and fern roots because there was no food to be had" (in McGrath et al. 1973:18). As a result of an accelerated oppression of the people following the death of Kamehameha in 1819 - when control of the rich sandalwood trade was placed in the hands of local chiefs - the people of Wai'anae pulled out the sandalwood saplings to avoid future harvesting (Ibid.).

Domesticated animals including goats, sheep, and cattle were brought to the Hawaiian Islands by Vancouver in the early 1790s and allowed to graze freely about the land for some time after. It is unclear when the domesticated animals were first brought to O'ahu; however, L.A. Henke reports the existence of a longhorn cattle ranch in Wai'anae by at least 1840 (Frierson, 1972:10). During this same period, perhaps as early as 1790, exotic vegetation species were introduced to the area. These typically included vegetation best suited to a terrain disturbed by the dwindling sandalwood forest and erosional effects of animal grazing. The following dates of specific vegetation introduced to Hawai'i are given by R. Smith and outlined by Frierson (1972:10-11):

- 1) "early," c. 1790
Prickly pear cactus, Opuntia tuna
Haole koa, leucaena glauca
Guava, Psidium quajava
- 2) 1835-1840
Burmuda [sic] grass Cynodon dactylon
Wire grass, Eleusine indica
- 3) Lantana, Lantana camara

The kiawe tree was also introduced during this period, either in 1828 or 1837 (Ibid.:11).

Following the western encroachment into the Wai'anae Coast, a swift decline in population occurred due to disease and a "tendency to move to the city where there was more excitement" (McGrath et al., 1973:25). In 1835, a missionary census listed 1,654 residents on the Wai'anae Coast. This was a small fraction

of the 4000-6000 inhabitants estimated to have lived in Wai'anae in 1778 by state statistician Robert Schmitt (Ibid.). The population of the Wai'anae Coast was decimated by a small pox epidemic in late 1853. In 1855, the Wai'anae tax collector recorded 183 taxpayers on the leeward coast, which is thought to represent a total population of about 800 people. This catastrophic depopulation facilitated the passing of large tracts of land into the hands of few landholders and led to the decline of the traditional Hawaiian economy that once supported the region.

B. Mid to Late 19th Century

During the Great Mahele in the mid 1800s, the ahupua'a(s) of Wai'anae, Lualualei, and Nanakuli became crown lands and were intended to be personal property of the king and his heirs providing sufficient revenue to support the king and his family (Haun and Kelly, 1984:35). In Lualualei six lands claims were awarded to at least eight families in Puhawa'i located at the northern end of the valley. According to information provided by the claimants in the Register of the Land Commissioners to Quiet Land Titles, these families were cultivating "a total of at least 163 lo'i or taro pondfields, in addition to dryland crops on the kula and wauke in the small valleys" (Ibid.:32).

Between 1850 and 1880, ranching was the leading industry of the Wai'anae Coast. During this time and prior to 1886 (year of King Kamehameha IV's death) large tracts of crown lands in the Wai'anae District were sold with fee simple titles or placed

under long-term leases to various entrepreneurs and families such as Samuel Andrews in Makua Valley; the Dowsetts in Nanakuli, Lualualei, Mikilua, and later in Wai'anae; and the Holt clan in Makaha.

In 1878, Hermann A. Widemann - a retired Supreme Court Justice - began Wai'anae Plantation, the first sugar plantation on O'ahu. Roger Green reports that "between 1878 and 1884 the economy and community of Wai'anae underwent a major change, in which the former Hawaiian landscape virtually disappeared" (Green, 1980:12). With the hiring of 20 local Hawaiians, 15 haole technicians and almost 60 Chinese laborers, Widemann essentially created a town at Wai'anae to support the cultivation and processing of sugarcane. This included the building of 24 new houses and a manager's residence along with a sugar mill and various extensive irrigation systems. In 1884, the Hawaiian Directory reported Wai'anae to be the largest settlement on the island outside of Honolulu. By 1890 the Wai'anae Sugar Plantation had over 600 acres in sugar cultivation, 12 miles of railroad and 350 laborers; the 1890 census reported 903 residents in the Wai'anae District.

On George Bower's trip around O'ahu in 1880, he described Lualualei Valley as "occupied as a grazing farm" by Dowsett and Galbraith who leased "sixteen thousand acres from the Crown" (in Haun and Kelly, 1984:32).

Following the overthrow of the Hawaiian monarchy in 1893, crown lands along with government lands became recognized as

public domain and subsequently became available for homesteading.

C. 20th Century

At the turn of this century the ahupua'a of Lualualei was divided into numerous homestead lots. The largest homestead lot (including the present study area) totaled 2,629 acres and was sold to H.M. von Holt in 1903 for ranching cattle (Haun and Kelly, 1984:37-38). The majority of the present study area continued to be used for cattle ranching and was probably once included in the extensive McCandless Cattle Ranch covering a large portion of Lualualei Valley. By 1929 over 8,184 acres of the McCandless Cattle Ranch land, "the area which now constitutes the Lualualei branch" (in Haun and Kelly, 1984:41) had been purchased by the U.S. Military.

Although most of the present study area continued to be utilized for cattle ranching up into modern times, the northeast portion of the lot was used by the military, as is evidenced by the presence of a few quonset huts and associated military debris.

D. Modern Land Use

During more recent times the project area has been vacant and unused with the exception of roughly 15 acres along the northern portion which was leased to tenant farmers - Mr. and Mrs. Ryoei Higa - for vegetable cultivation. After initial protest, an amicable agreement was reached between the owner and

tenants, and the Higas stopped farming and terminated the lease
in 1988.

III. Previous Archaeological Work

No archaeological research has been conducted within the project area prior to this present study.

The earliest attempt to record archaeological sites in the nearby regions of Lualualei and Nankuli was in the 1930s by J. Gilbert McAllister. Sites located closest to the present study area include Nioiula Heiau, Ilihune Heiau and a large rock referred to as "Maui" (McAllister, 1933:110).

Nioiula Heiau (State Site no. 50-80-08-1179) is located on Halona Ridge near Pohakea Pass. The site is described as a paved and walled heiau with the northern portion almost completely destroyed after many of its stones were removed to build a cattle pen for the McCandless Ranch. The site is said to have been of ancient antiquity, once belonging to the chief Kakuihewa. In addition, McAllister suggests it to be the "heiau on which was placed the body of the boxer killed by Kewalo" (Ibid.).

Ilihune Heiau (State Site no. ?) is located on the Nanakuli side of the western ridge of Pu'u Heleakala and was originally described by Thomas G. Thrum as "a small walled heiau of Pookana-ka class; used about 1860 by Frank Manini as a cattle pen, for which natives prophesied his poverty and death" (in McAllister, 1933:110). McAllister only approximated the location of this site as no surface structure or structures remained.

The large rock, referred to as "Maui," is located on the coast near Ulehawa Stream. Oral tradition denotes this rock as the place where the demi-god Maui "reposed and sunned himself"

after first arriving in the Hawaiian Islands from the south (McAllister, 1933:110).

A recent archaeological reconnaissance survey specifically conducted in Lualualei Valley by Alan Haun (1985) recorded the presence of a significant number of traditional Hawaiian sites. The project included surveying of approximately 3,130 acres of Lualualei Valley. A total of 376 indigenous (Hawaiian) "features" were recorded, including a wide range of site types from cliff overhang shelters, caves, and habitation platforms to field terraces and mounds, in addition to religious and lithic technology sites; possible burials were also noted. Nine radiocarbon dates obtained from the survey indicate an interior settlement pattern by the 1400s when, according to Haun, "mid-level elevation sites were occupied." Haun further suggests that the majority of the remaining "features" were occupied by the mid-1600s, probably permanently until the 1800s (Ibid.:13). It is important to note that these results and interpretations of the Lualualei fieldwork are preliminary and currently under review by the State Historic Preservation Office.

IV. Survey Results

Each of the eight sites located within the project area is described below.

State Site # 50-80-08-4364 CSH Site: 1
Site Type: Wall
Function: Cattle wall
Probable Age: Historic
Condition: Fair
Dimensions: 141 m. (462 ft.) long
Description: Site 50-80-08-4364 is located on the lower portion of the ridgeline oriented northwest/southeast along the west boundary of the project area. This site is a wall constructed of large and small boulders with some cobbles; it measures .6 m. - 1 m. (2 ft. - 3.5 ft.) high, 3-5 courses, and 30 cm. - 45 cm. (.9 ft. - 1.3 ft.) wide. The wall is constructed along a sloping ridgeline and utilizes bedrock cliffs in areas where the wall would not be necessary. The mauka end of the wall has a hook-shaped configuration and terminates where the terrain is too steep at approximately the 200-foot elevation level.

State Site # 50-80-08-4365 CSH Site: 2
Site Type: Wall
Function: Military shelter
Probable Age: Historic
Condition: Fair
Dimensions: 2.5 m. (8.2 ft.) long

Description: This site is located 42 m. (137.7 ft.) upslope of Site 50-80-08-4364 at approximately the 300-foot elevation level. The site comprises a short wall section constructed of piled small boulders; the wall averages 25 cm. (.8 ft.) high and 60 cm. (1.9 ft.) wide. It is situated along a knoll at the edge of a bedrock cliff providing a clear view of Lualualei Valley to the NE and NW. A small pile of bullet shells and military C-ration cans were visible at the site.

State Site # 50-80-08-4366

CSH Site: 3

Site Type: Structural Complex

Function: Habitation

Probable Age: Prehistoric

Condition: Fair

Dimensions: 12 m. (39.3 ft.) N/S by 8 m. (26 ft.) EW

Description: Site 50-80-08-4366 (Fig. 7) is located in the southeast portion of the project area at approximately the 550-foot elevation level on the west side of an intermittent stream bed. The site comprises at least three features including a terrace with an attached enclosure and adjacent modified outcrop.

The terrace is bi-level and is constructed of stacked boulders and cobbles. The uppermost level of the terrace exhibits the most formal construction; it is separated from the lower terrace by a raised boulder alignment 60 cm. (1.9 ft.) high. The upper terrace measures 8 m. (26.2 ft.) long E/W and retains a level area of small boulders and cobbles approximately 2 m. (6.5 ft.)

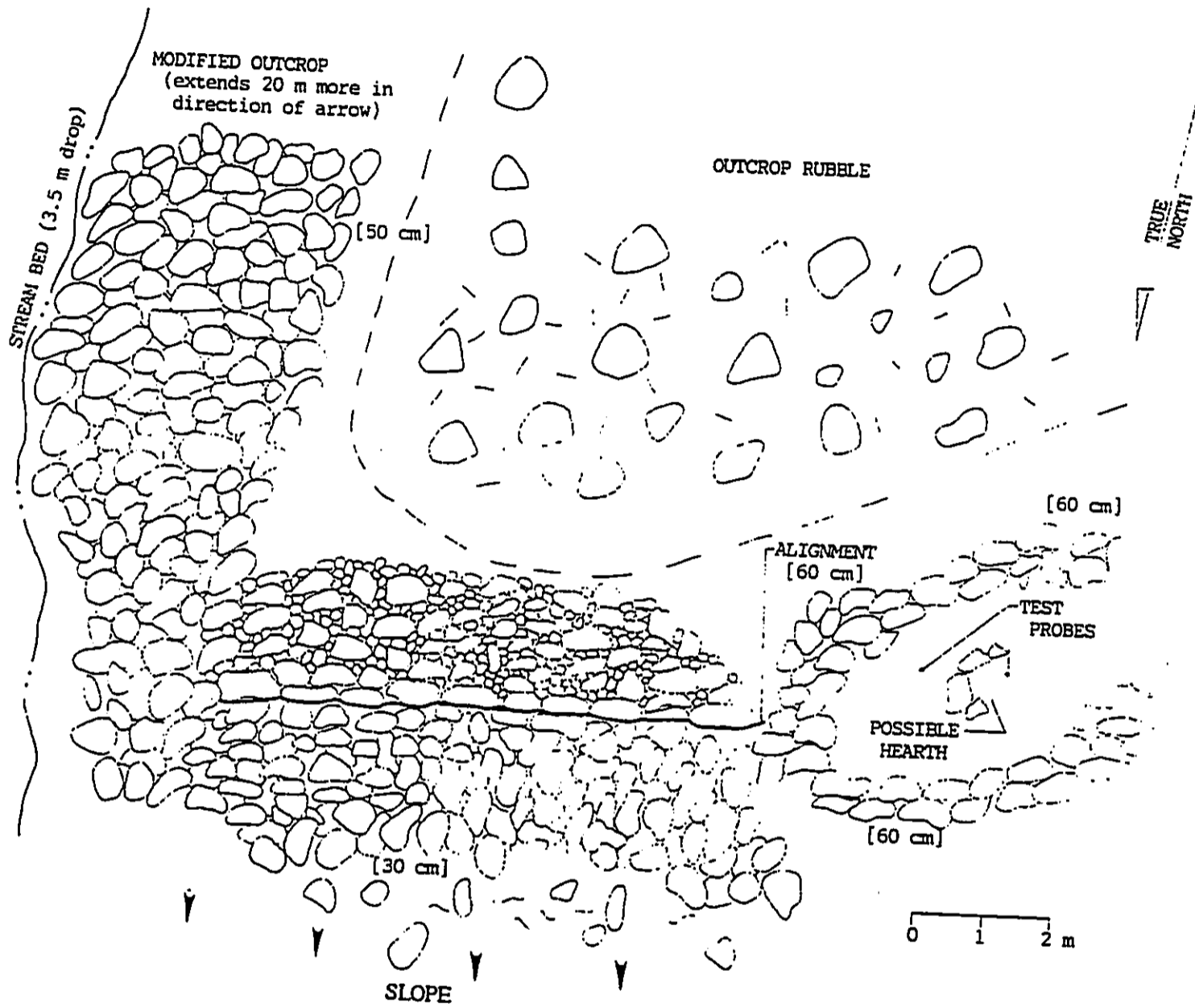


Fig. 7 Site 50-80-08-4366; Plan View

wide N/S. The lower terrace is less formal and somewhat collapsed.

A roughly oval-shaped enclosure abuts the terrace to the west; it is constructed of small and large boulders. It measures 6 m. (19.6 ft.) E/W by 4 m. (13.1 ft.) N/S (exterior) and 2 m. (6.5 ft.) E/W by 1.2 m. (3.9 ft.) N/S (interior). The walls of the enclosure average 60 cm. (1.9 ft.) high and 50 cm. (1.5 ft.) wide. A probable hearth feature - evidenced by a semi-circular configuration of four cobbles - is located at the center of the enclosure.

Directly east of the terrace is a naturally mounded wall of outcrop with minor modifications; this formation extends to the south roughly 30 m. (98.4 ft.) running adjacent to the stream bed and adjoins a sloped bed of outcrop rubble situated west and south of the general site area. Modifications along the naturally mounded wall as well as among the extensive outcrop rubble, include rough facings and circular depressions.

Two test probes were conducted within the suspected hearth feature of the enclosure. A very dark brown soil - which may represent burning episodes - was encountered; no artifacts or midden were observed.

State Site # 50-80-08-4367

CSH Site: 4

Site Type: Wall segment

Function: Possible shelter remnant

Probable Age: Prehistoric

Condition: Poor

Dimensions: 4.5 m. (14.7 ft.) long

Description: Site 50-80-08-4367 is located on fairly level terrain in the northern portion of the project area at approximately the 100-ft. elevation level. The site consists of a short wall segment 4.5 m. (14.8 ft.) long constructed of water-rounded boulders. It stands 60 cm. - 90 cm. (1.9 ft. - 3 ft.) high, 3-4 courses, and one boulder wide; it is situated on the west side of a small, shallow, dry stream bed. The area surrounding this site has been disturbed by heavy erosion or possible bulldozing. Adjacent to this site is a barbed wire fence extending NW/SE. No midden or artifacts were observed at this site.

State Site # 50-80-08-4370

CSH Site: 7

Site Type: Historic house lot

Function: House lot

Probable Age: Historic

Condition: Poor

Description: This site consists of historic features including a garden area, possible cesspool, and other miscellaneous modern debris. Directly to the east of this site is Ulehawa Stream; a dirt road lies immediately to the west. Evidence of a house, including wood, a refrigerator, bottles and jars, are present in this area. Fence posts are still standing near the dirt road. Lualualei Naval Road is located just to the north of this site.

Some minor modifications are evident along the southwest side of the stream bed where some small boulders have been piled in an alignment. There is no evidence of any prehistoric activity in this area. This site is located on level terrain in the west central portion of the project area at approximately the 100-foot elevation level.

State Site # 50-80-08-54371

CSH Site: 8

Site Type: Historic wells

Function: Well site

Probable Age: Historic

Condition: Poor

Dimensions: See Description

Description: This site is the only site located on the portion of the project area NW of Lualualei Naval Road. It consists of two probable well features. Both features consist of a circular depression with a low wall bounding the depression. The depressions average 1 m. (3.2 ft.) deep and 4 m. (13.1 ft.) in diameter. Wood and metal fragments are present within the depressions; these may have represented a well cover at one time.

Feature A is located at the north end of a dry stream bed. A low L-shaped wall was constructed on the NE bank. The low wall is constructed of piled small boulders and cobbles and measures 5 m. (15 ft.) N/S by 4 m. (13 ft.) E/W.

Feature B (Figure 8) is located directly to the NE of Feature A at the SW end of a dry stream bed. Some piling of cobbles

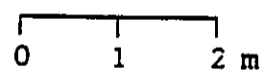
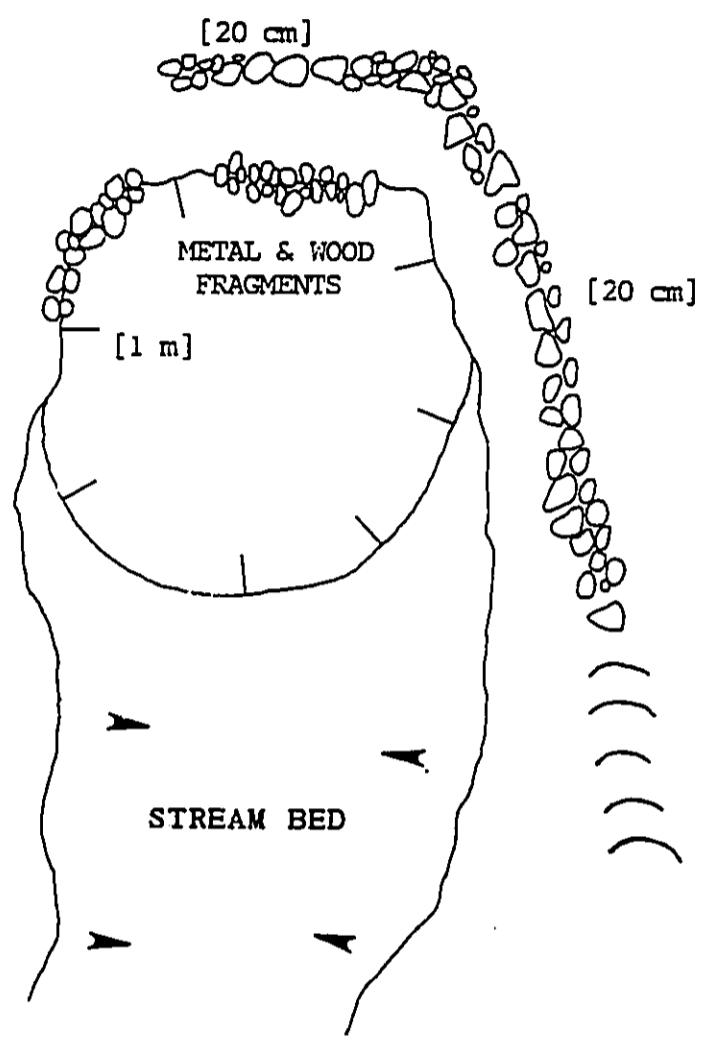


Fig. 8 Site 50-80-08-4371 Feature B; Plan View

are evident on the west and south portion of the depression. The associated L-shaped wall is constructed of small boulders and cobbles; it measures 3 m. (9.3 ft.) N/S by 6 m. (19.6 ft.) E/W. The wall stands only 20 cm. (less than 1 ft.) high and 1-2 courses.

These historic wells are located on level terrain surrounded by kiawe trees and low, thick grass.

State Site # 50-80-08-4372 CSH Site: 9
Site Type: Concrete retaining wall
Function: Building foundation or water tank foundation
Probable Age: Historic
Condition: Poor
Dimensions: 35 m. (115.8 ft.) long
Description: This historic structure is located in the west central portion of the project area at approximately the 100-foot elevation on fairly level terrain. The concrete structure has rebar and metal retaining plates protruding from it. The wall retains a level area measuring 35 m. by 40 m. (114.8 ft. by 131.2 ft.) with gravel, buried metal and wood evident. This structure probably served as a building foundation or as a foundation for water tanks.

State Site # 50-80-08-4373 CSH Site: 10
Site Type: Metal Tank
Function: Incinerator

Probable Age: Historic

Condition: Fair

Dimensions: 5.4 m. (17.7 ft.)

Description: This site is located in the west central portion of the project area. The historic incinerator is 5.4 m (17.7 ft.) high and 2.1 m. (6.8 ft.) in diameter and is cylinder-shaped. Two openings exist at the base and at the top of the structure (a metal staircase allows access to this top opening). The interior floor of the structure - visible through the lower opening - contains a circular metal plate covered primarily with burned bullet casings and miscellaneous metal debris. Bullet casings were also observed along the ground surface outside of the incinerator.

Summary and Recommendations

A total of 8 archaeological sites was identified in the Lualualei Golf Course project area.

Only two of these sites (50-80-08-4366 and -4367) are interpreted as being attributable to traditional Hawaiian activity, with one site (50-80-08-4366) probably representing prehistoric, recurrent habitation at the foothills of Pu'u Heleakala. This is primarily evidenced by the presence of a probable hearth feature within the site complex. Site 50-80-08-4367 - a remnant wall section running adjacent to an intermittent stream bed - suggests an agricultural usage possibly constructed to retain or divert water. Given the weathered condition of the structure this site may be prehistoric.

The six remaining sites identified within the project area are attributable to historic land usage. Five sites (50-80-08-4364, -4370, -4371, -4372, and -4373) are associated with cattle ranching and include cattle walls, a historic house lot and various other ranching infrastructure. One site (50-80-08-4365) represents a military shelter evidenced by the presence of bullets and C-ration cans. In addition to this site, three quonset huts are present in the project area. These structures, however, are considered to have been built within the last 50 years and have not been included in the present study.

Seven sites of the the site inventory are evaluated as no longer significant because of lack of cultural or scientific interest beyond their plotted distribution.

Site 50-80-08-4366 is likely to yield information important in prehistory or history. According to the Lualualei Golf Course development plan this site lies outside of the impact area and thus should be spared any disturbance. However, in the event that the impact zone is extended into the site area, we recommend that it be preserved given that it represents the only traditional Hawaiian habitation site present in the project area.

A summary of site significance and recommended action is presented in Table 1.

Table 1: Site Summary and Significance

<u>CSH#</u>	<u>State Site #</u>	<u>Site Type/Function</u>	<u>Sig.</u>	<u>Recommend.</u>
1	50-80-08-4364	Wall/Ranching	NLS	None
2	50-80-08-4365	Shelter/Military	NLS	None
3	50-80-08-4366	Struc. Complex/Hab.	D	Preserve
4	50-80-08-4367	Wall remnant/Agric.	NLS	None
7	50-80-08-4370	House lot/Ranching	NLS	None
8	50-80-08-4371	Wells/Ranching	NLS	None
9	50-80-08-4372	Foundation/Ranching	NLS	None
10	50-80-08-4373	Incinerator/Ranch.-Mil.	NLS	None

CODES FOR CRITERIA FOR SITE SIGNIFICANCE

- NS Not Significant
- NLS No Longer Significant
- A Site reflects major trends or events in the history of the state or nation.
- B Site is associated with the lives of persons significant in our past.
- C Site is an excellent example of a site type.
- D Site may be likely to yield information important in prehistory or history.
- E Site has cultural significance; probable religious structures (shrines, heiau) and/or burials present.

Summary of Site Distribution

The few traditional Hawaiian sites identified during the present study suggest that most of the project area was sparsely inhabited during prehistory and early history. This would be due primarily to the lack of fresh water resources in the vicinity. Archaeological site patterning in the Lualualei Valley has revealed that Hawaiian populations were typically present within the wetter upland valleys where wetland agriculture proved to be productive. Although surface run-off and intermittent drainages present in the project area would allow some potential for seasonal agriculture, the attraction for settling in the wetter upland valleys would surely have been greater.

The absence of sites within the project area along Ulehawa Stream, however, may not necessarily indicate the lack of Hawaiian usage of the area, as the lower regions of the project area have been extensively altered by ranching, military and modern farming activity.

V. References Cited

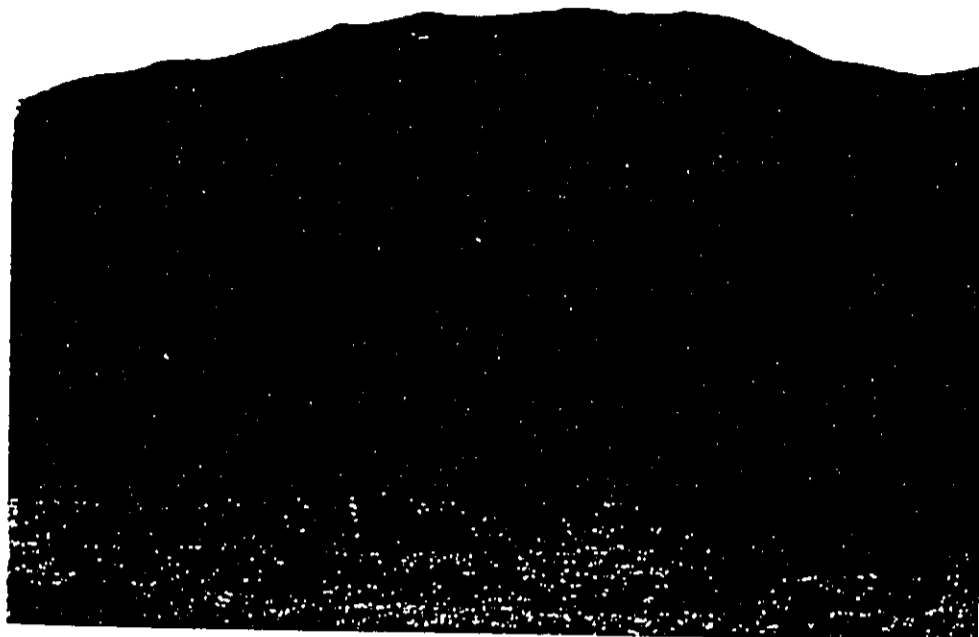
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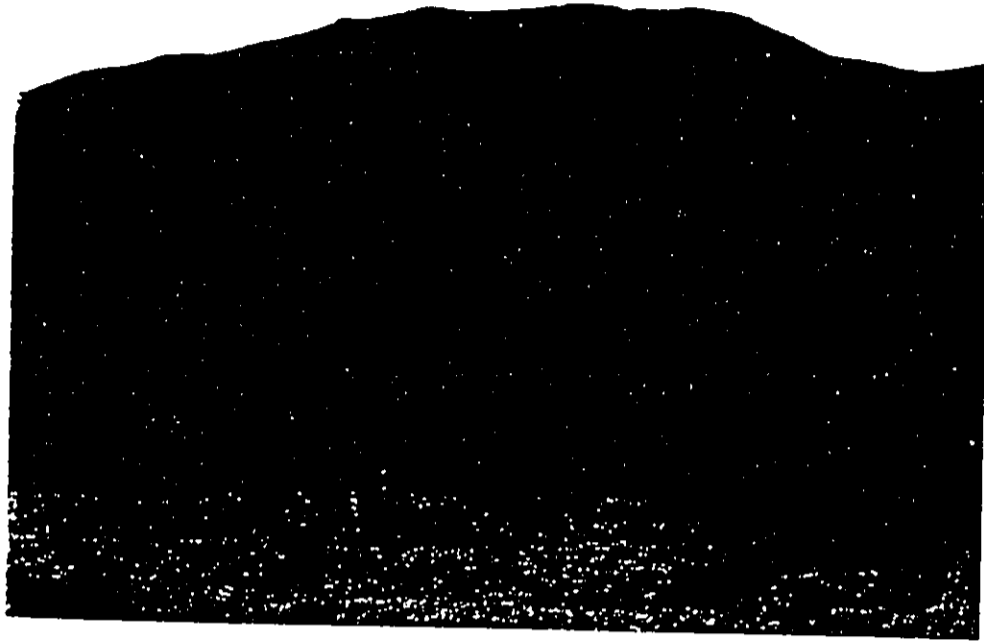


Project Area: View South With Pu'u Heleakala in Background



Project Area: View West

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Project Area: View South With Pu'i Heleskala in Background



Project Area: View Northeast

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Site 60-60-09-4344: Wall, View Northwest



Site 60-60-09-4344: Wall, View Southwest

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Site 50-20-08-4365: Military Shelter



Site 50-20-08-4366: Terrace

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Site 50-30-08-4270; Historic House Lot, Grill



Site 50-30-08-4270; Historic House Lot, Showing Debris and Cesspool

RECEIVED AS FOLLOWS



Site 50-50-08-4372; Concrete Retaining Wall



Site 50-50-08-4373; Metal Incinerator

APPENDIX D

Socio-Economic Impact Assessment For The Proposed Lualualei Golf Course, Waianae District, Oahu

Prepared by Community Resources, Inc., January, 1991

**SOCIO-ECONOMIC IMPACT ASSESSMENT
FOR THE PROPOSED LUALUALEI GOLF COURSE,
WAIANAE DISTRICT, OAHU**

January 1991

Prepared for:

Hida, Okamoto & Associates, Inc.

Prepared by;

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1.0 INTRODUCTION

1.1 THE PROPOSED PROJECT

Kabushiki Kaisha Oban plans to develop its property in Lualualei Valley just makai of the Lualualei Naval Magazine. The property includes about 259.25 acres, of which about 14.6 acres would be devoted to a nursery and the remaining acreage to a golf course.

The company proposes to develop an 18-hole golf course, a clubhouse, ancillary/accessory structures to the golf course and a tree nursery on the property. Construction of the golf course and infrastructure, including the nursery, is expected to take three to four years.

Figure 1 shows the project's conceptual masterplan.

The golf course will be open to the public and offer reduced (kamaaina) rates to local residents. It will allot at least 60 percent of the tee times for residents, and it will offer no private memberships.

1.2 SCOPE OF THIS REPORT

The following sections provide information on:

- . Existing socio-economic conditions, including historic and geographic factors affecting the region;
- . Forces for change in the region apart from the project;
- . Socio-economic and fiscal impacts that may be anticipated in connection with the project and possible mitigations of such impacts;

2.0 EXISTING AND ANTICIPATED CONDITIONS

2.1 DEFINITION OF STUDY AREA

The proposed Lualualei golf course is located on Lualualei Naval Road, on Oahu's Waianae Coast. "Waianae" as a geographical term may refer to any of three administrative units with essentially identical boundaries--the State of Hawaii's Waianae Judicial District, the U.S. Census Bureau's Waianae Division, or the City and County of Honolulu's Waianae Development Plan (DP) Area. Also, the City and County Waianae Coast Neighborhood Board Area covers much the same area.

The property is largely in U.S. Census Tract 96.01, although part of the property extends into Tract 96.04. Road access to the project site leads seaward to the Lualualei Homestead area, which is usually viewed as closely related to the town of Maili. Hence Census Tract information can be somewhat misleading, since most of the population in Census Tract 96.01 consists of residents of the town of Nanakuli, which is separated from the project site by a steep ridge, Puu Haleakala.

Figure 2 shows the Waianae DP Area in relation to the island's other seven DP areas, while Figure 3 shows the project site in relation to the four census tracts and the four Census Designated Places (CDP's) within the overall Waianae area.

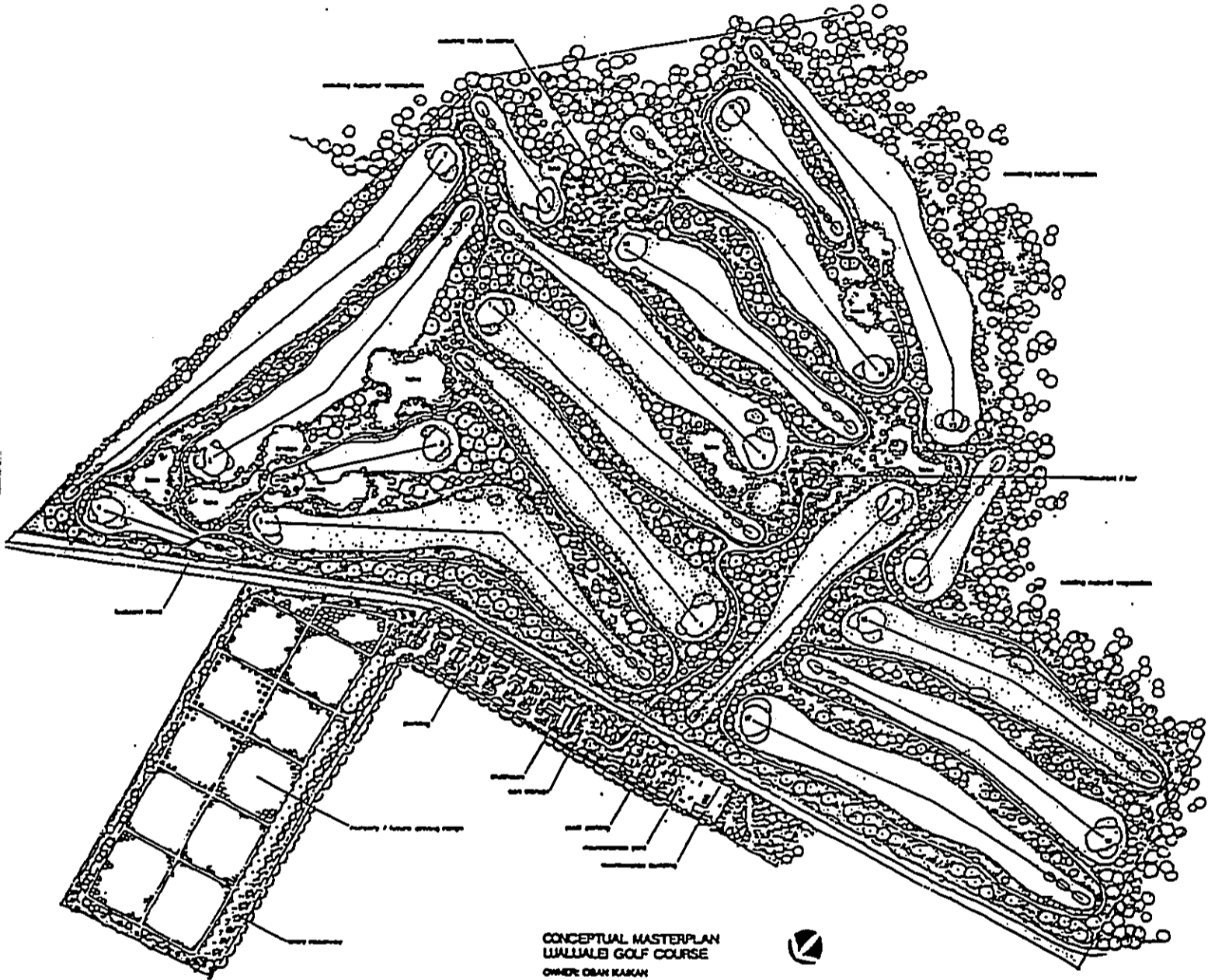
Socio-economic impacts of the project mainly have to do with (a) impacts on the daily lives of neighbors of the project and workers at the project site, and (b) impacts of the project on community attitudes and self-understandings.

For this impact assessment, the overall Waianae DP area will be considered the primary study area. However, the Ewa DP area will also be included as a secondary study area. This is because the western part of Ewa, closest to the Waianae boundary, is currently regarded as the most likely site of substantial population and employment growth for West Oahu as a whole over the next several decades. Thus, for purposes of cumulative impact assessment, changes in Waianae must be considered in light of expected changes in Ewa as well.

2.2 HISTORIC AND GEOGRAPHIC FACTORS AFFECTING THE COMMUNITY

Waianae: Geographically, Waianae is isolated from the rest of Oahu by mountains and the highway system. It is bounded on the east by the Waianae Mountains, over which there is no access to Central Oahu (except by a military road normally closed to the public). The only overland access to the Waianae area is by the Farrington Highway, which terminates a few miles before Kaena Point, Waianae's northern boundary. As a result, the Waianae

FIGURE 1



CONCEPTUAL MASTERPLAN
UJALLALE GOLF COURSE
OWNER: OBAH KAKAH
LANDSCAPE ARCHITECTS: BROWNLEE & LEE

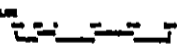


FIGURE 2
DEVELOPMENT PLAN AREAS

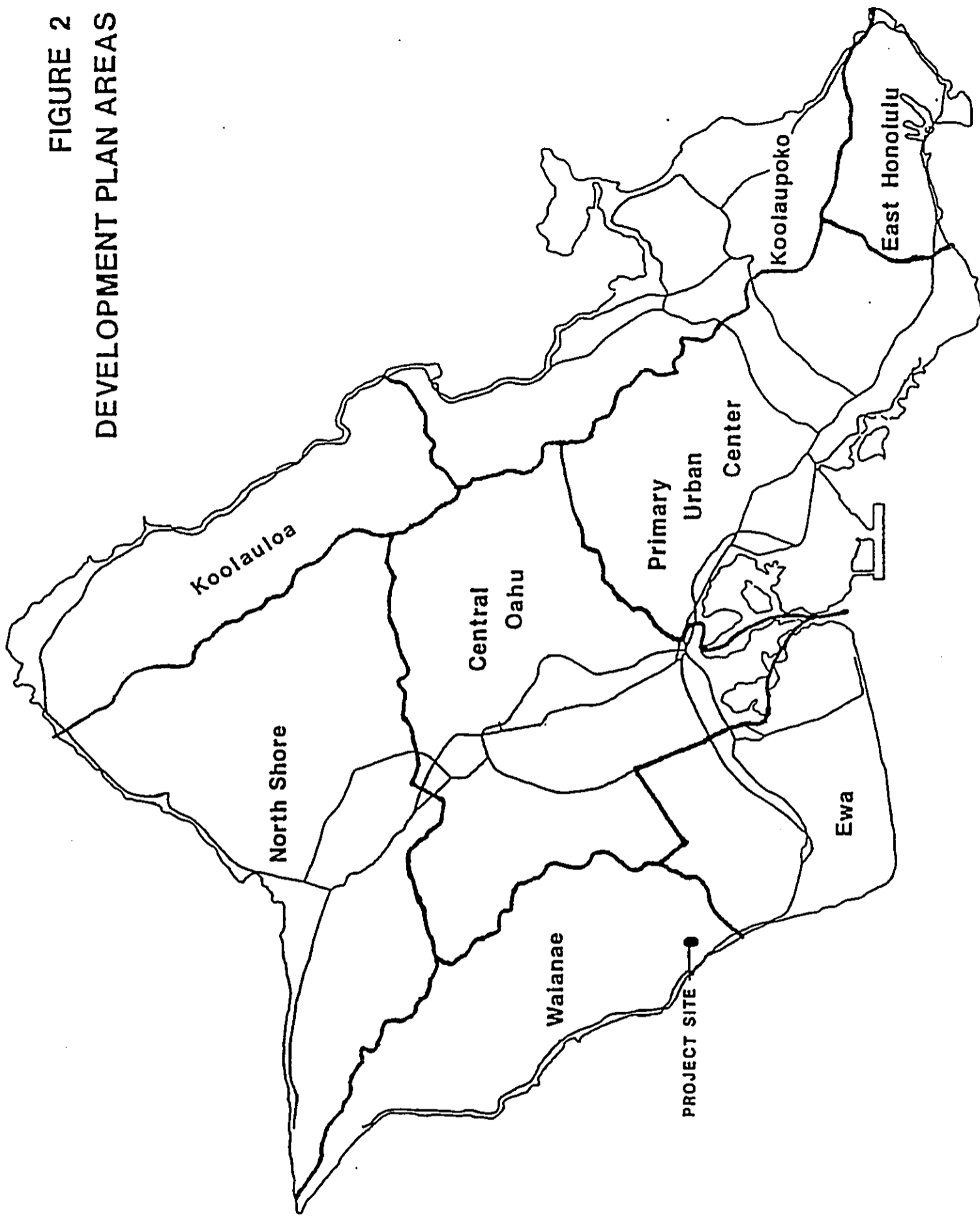
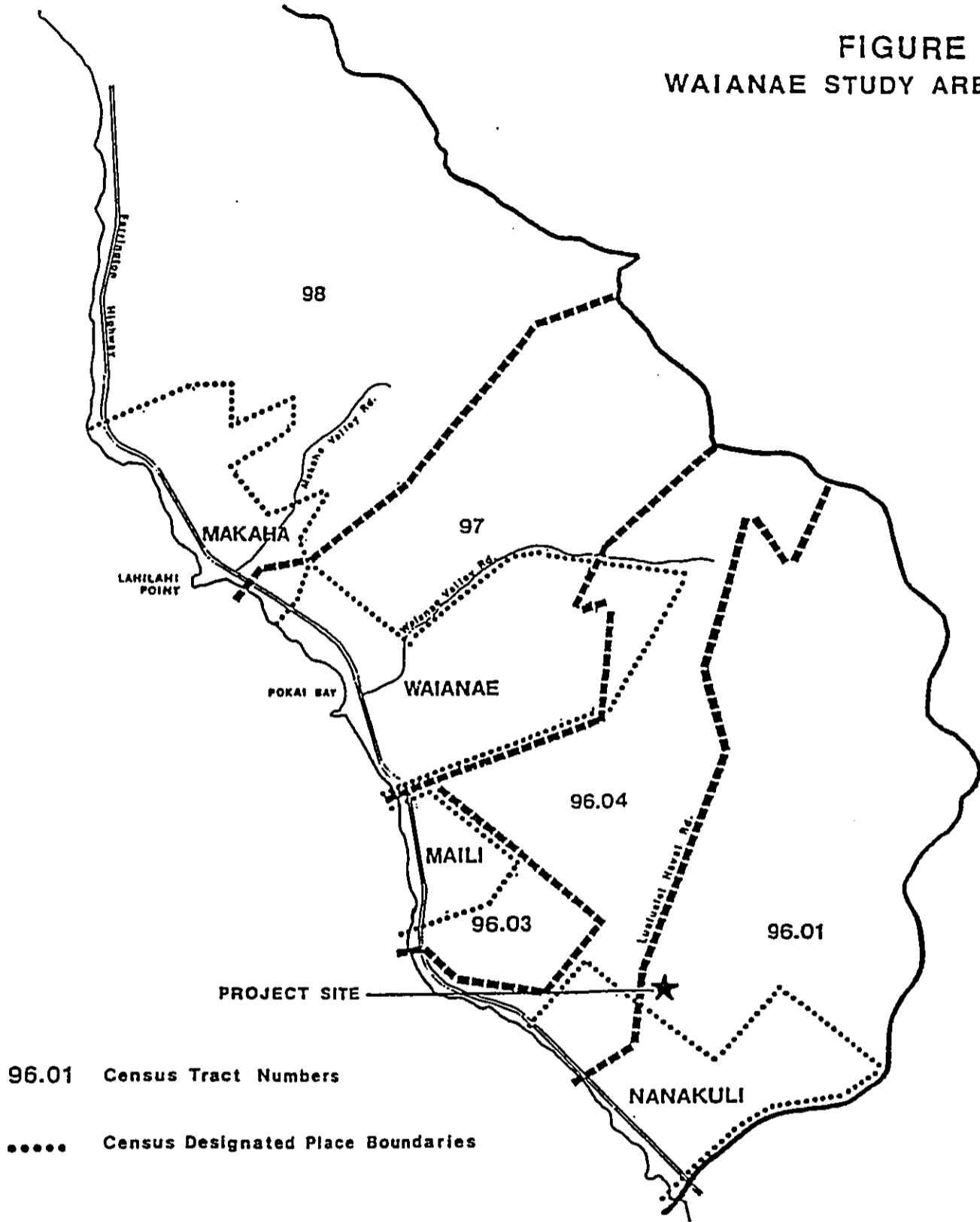


FIGURE 3
WAIANAE STUDY AREA



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

area has an "end-of-the-road" geographical relationship to Ewa and Honolulu.

The Waianae area is further distinguished geographically by a series of ridges extending from the mountains to the sea and dividing the coast into a number of pockets or valleys. Each valley has developed a separate identity, with recognized urban communities primarily located off the highway along the coast. Traveling roughly south to north, these communities include Nanakuli (1980 population of 8,185), Maili (population 5,025, at the base of Lualualei Valley), Waianae Town (7,941), and Makaha (6,552). The last valley, Makua, is essentially undeveloped except for cattle ranching and military target practice operations.

Historically, Waianae in the mid-nineteenth century was a dry and dusty area occupied by only a few cattle ranchers and their workers. In 1879, Judge Herman A. Widemann began the Waianae Sugar Company. Within five years, this venture had rapidly transformed the almost uninhabited district into the largest settlement on Oahu after Honolulu (Krauss et al., 1973). For more than half a century, sugar dominated Waianae's social and economic life.

However, the Waianae Sugar Company was one of Hawaii's first post-war sugar casualties and ceased operations in 1946. Capital Investment Company then acquired 9,150 acres of the former Waianae Valley sugar lands and sold them as houselots or small farms--beginning a second wave of population growth in Waianae, but one which lacked a nearby job base. Starting in the 1960's, Capital Investment did create some tourism jobs through its development of a small resort complex in Makaha Valley.

Over the years, another major developer has been the State Department of Hawaiian Home Lands (DHHL). Much of the land in Nanakuli and several large parcels in Waianae and Lualualei are owned by DHHL. According to the Hawaii State Department of Hawaiian Home Lands, as of June 30, 1990, a total of 1,471 residential and 63 agricultural homestead lots on the Waianae Coast had been awarded to native Hawaiians (personal communication, October 24, 1990). The DHHL developments have been largely responsible for the heavy concentration of ethnic Hawaiians in Waianae's overall population.

In recent years, the Waianae area's population has grown much more rapidly than its economic activities. Until recently, several military installations, the largest of which is the U.S. Navy's Naval Magazine at Lualualei, above Maili, and a proliferation of small truck farms and animal operations were the principal economic operations. Consequently, Waianae today remains among the less economically prosperous areas on Oahu.

Maili and Lualualei: In early Hawaiian times, Maili was the area located between the hills of Puu o Hulu and Puu Mailiili, a double-domed hill of many small pebbles. As the Waianae

community prospered from the development of sugar, the Lualualei area (which then included the settlements of Maili and Nanakuli) remained sparsely settled because of the scarcity of water.

Throughout the years, the hardship involved in making a living off the land in Maili limited its desirability for community development. By the 1890s, this lack of development made the area suitable for cattle ranching. Lincoln McCandless owned and ranched 4,000 acres of the Lualualei plains.

In 1912, the federal government began opening homestead lands in Lualualei. However, this attracted only a limited number of people. The lack of improved roads, a water system, and other amenities becoming available in other communities would remain as major drawbacks for living in the area. Even today, Maili has fewer community amenities (e.g., high schools, commercial areas) than Nanakuli or Waianae town.

In the early 1930s, the governor of the Territory of Hawaii issued two executive orders that turned over 1,356 acres in Lualualei to the Navy for ammunition storage and a transmitting station (Kobayashi, 1988). In 1986, the Department of Hawaiian Home Lands filed a suit challenging the transfer of these lands to the Navy. The suit was based on the fact that the property originally was part of the Hawaiian Home Lands designated by Congress in 1921. A federal judge has ruled against DHHL, but citizens have recently renewed the claim that federal lands in Lualualei should be returned to Hawaiian hands.

The Naval Magazine is located immediately adjacent to the project site. It covers an area of 7,499 acres (personal communication, Priscilla McCall, Personnel Director, Lualualei Naval Magazine, December 21, 1990). The base has become the primary ammunition depot for the military on Oahu. Besides the actual Magazine, there are a number of tenant commands that share the site, the most important of which is the Lualualei Naval Radio Transmitter Facility. Together the on-base commands provide employment for almost 500 civilian and military personnel.

The project site itself consists of a long and relatively narrow brush-covered plane that is backdropped by steep mountain ridges. Besides the ridges to the south and west, the site is bordered by the naval base to the east and Lualualei Naval Road to the north. A small number of horses currently graze on-site amongst the shrubs.

Nearby non-military parcels in Lualualei are zoned for agriculture, like the project site. Some small-scale nursery activities are evident on properties in the area, but little intensive agricultural development is currently visible.

The Kaiser Cement plant (now owned by Hawaiian Cement), which lies about half a mile makai of the site, is the only prominent non-military development in Lualualei. However,

operations there are now low-key, and the plant has only a skeleton staff. Cement production is scheduled to end within a year, but no definite alternative plans for the facility have yet been proposed by the management.

Besides Hawaiian Cement and the Navy, the only other major land owner is Kyowa Buildings, Limited. Its land is on the project site's western boundary, partly separated by a ridge. The company has a large parcel of agricultural land that straddles both sides of the Lualualei Naval Road. There are no apparent developments or structures presently on the Kyowa site.

Ewa: The lower portions of the Ewa Development Plan Area are a coral plain, while the upper portions--which rise to meet the foothills of the Waianae Mountains--contain some of Oahu's best agricultural lands.

Most of Ewa's past economic activity and settlements have been in the southern and eastern portions, centered on sugar and military activities. The easternmost part of Ewa includes U.S. Naval operations and the Iroquois Point housing along Pearl Harbor's West Loch, and the Barbers Point Naval Air Station is located on Ewa's southern shores.

The economic activity that has consumed the most land in Ewa has been sugarcane cultivation. Several operations were consolidated in 1970 under operations of a single plantation, the Oahu Sugar Co., now one of two remaining Oahu plantations. The Amfac-owned plantation had 18,000 acres under cultivation in Ewa and Central Oahu in 1981. The acreage has shrunk by about a third since then. Almost all of Oahu Sugar's lands are obtained by leases due to expire in the mid-1990's.

In recent years, Ewa's population and economic growth has begun to shift to the area's northwestern portion, nearer Waianae. The hillside community of Makakilo, developed by Finance Realty, has been grown steadily since 1962. It was Ewa's second-largest town (after Ewa Beach) in the 1980 Census.

Along the coast, the Estate of James Campbell (Ewa's largest non-governmental landowner) opened the Campbell Industrial Park in 1958, and the towers and stacks of oil refineries and other industrial facilities there are visible from much of Ewa and southern Waianae. A total of 2,400 acres are approved for industrial use there, of which approximately 1,200 acres have thus far been developed (personal communication, Fay Yamamoto, Employee Relations Director, Campbell Estate, November 6, 1990).

North of Campbell Industrial Park, the Barbers Point Harbor has been built by the U.S. Army Corps of Engineers as a second civilian harbor for Oahu. Further to the north, basic infrastructure work has been completed, and work has begun on some buildings for the 640-acre Ko Olina Resort, formerly known as West Beach.

2.3 EMPLOYMENT AND ECONOMIC BASE

Until recently, Waianae and Ewa have had a limited economic base and relatively high unemployment, compared to the rest of Oahu. With the development of Kapolei and the Ko Olina resort, jobs in Ewa near Waianae will greatly increase in number. Relatively little new economic development is slated for Waianae itself. The current situation is one of transition.

Table 1 shows the number of jobs located within the Waianae DP, Ewa DP, and on Oahu as a whole in 1980. The numbers in the table are from the Hawaii State Department of Transportation's (1982) Urban Transportation Planning Package (UTPP), which provides data on the number of jobs located in an area, rather than the number of employed persons living in an area.

Waianae DP Area: There are a relatively small number of jobs in the Waianae area. Data shown in Table 1 indicate a total of 4,036 jobs in 1980. This number is equal to only 40 percent of the resident Waianae civilian labor force in that year. By contrast, the number of civilian jobs islandwide in 1980 was equal to 91 percent of available civilian labor force.

The type of jobs most prominent in the area were in the category of "Professional and Related Services." This likely reflects a large number of teachers, social service professionals, and other government or private-sector service

Table 1: Oahu and Study Area Civilian Jobs by Industry, 1980

<u>Industry Category</u>	<u>Jobs in Waianae DP Area</u>	<u>% of Total</u>	<u>Jobs on Oahu</u>	<u>% of Total</u>
Agriculture, Forestry & Fisheries	212	5.3	4,845	1.5
Mining	0	0	131	0.4
Construction	273	6.8	19,064	6.2
Manufacturing	162	4.0	24,246	7.8
Transportation, Communications, & Other Public Facilities	210	5.2	27,695	8.9
Wholesale	81	2.0	12,955	4.2
Retail	820	20.3	64,497	20.9
Finance, Insurance & Real Estate	208	5.2	25,147	8.1
Business & Repair Services	34	2.1	14,489	4.7
Personal Services	161	4.0	19,803	6.4
Entertainment & Recreation Services	141	3.5	5,622	1.8
Professional & Related Services	1,155	28.6	56,166	18.2
Public Administration	529	13.1	33,781	10.9
TOTALS (CIVILIAN JOBS)	4,036	100%	308,441	100%
Armed Forces	220	N/A	48,251	N/A

Source: Urban Transportation Planning Package (printouts of special analyses from 1980 U.S. Census, available from the Hawaii State Department of Transportation).

workers. "Retail" jobs also comprised a significant amount of jobs, with more than 20 percent of the area's total.

Direct job activities (i.e., those which bring dollars in the region) in the Waianae DP area are limited to a small number of tourism-related jobs in Makaha, diversified agricultural farm operations, and military activities at Lualualei.

Ewa DP Area: UTPP data indicate a total of 10,689 jobs in the Ewa census tracts as of 1980. Of this total, 8,127 (76 percent) were civilian jobs. The remaining 2,562 jobs were military.

Major civilian employers in Ewa include the collective activities at the Campbell Industrial Park. At present, there are approximately 160 to 170 industries employing 3,100 individuals at the park (personal communication, Walter Yoshimitsu, Administrator of Industrial Properties, Campbell Estate, November 4, 1990). Another major employer is Oahu Sugar Company, which currently employs about 450 workers (personal communication, Fay Yamamoto, Employee Relations Director, November 4, 1990). The predominant job types in Ewa are in the "Manufacturing," "Professional and Related Services," "Public Administration" and "Retail" categories.

2.4 POPULATION LEVELS AND SOCIO-ECONOMIC CHARACTERISTICS

Tables 2 through 5 provide selected 1970 and 1980 U.S. Census data for the City and County of Honolulu, the Waianae DP Area (equivalent to the Census Bureau's "Waianae Division"), and the various census tracts comprising the Ewa DP Area.

Also, Tables 6 through 9 provide comparable data for the four major town areas in Waianae--Nanakuli, Maili, Waianae Town, and Makaha. The information in these tables refers to Census Designated Places, and does not include upvalley areas and some of the Waianae shoreline. The project site, located upland in Lualualei valley, is included in the Waianae DP area (and hence in Tables 2 through 5) but not in any of the Census Designated Places.

Waianae DP Area: Waianae's population increased from 24,077 in 1970 to 31,487 in 1980. More recent population estimates are conflicting but indicate slow growth since 1980. The estimated 1989 mid-year population was 35,800 (Hawaii State Department of Business and Economic Development, 1990), an increase of 13.6 percent over 1980.

The detailed Census characteristics of 1980 indicate that, compared to the County as a whole, Waianae's population was proportionately much more Native Hawaiian and less Oriental; far younger on average (with 40 percent of the population under 18); and less educated on average (Table 2).

Waianae's poverty rate for families in 1980 was nearly three times the islandwide rate. Incomes were significantly lower. Households usually consisted of families, but these families were more likely than those elsewhere on the island to be headed by single females (as shown in Table 3).

Table 2: Population and Demographic Characteristics: City and County of Honolulu and Various Parts of Study Area, 1970 and 1980

	CITY AND COUNTY OF HONOLULU		WAIANAHA D.P. AREA		EWA D.P. AREA*** (C.T. 83-86.02)	
	1970	1980	1970	1980	1970	1980
TOTAL POPULATION	630,528	762,565	24,077	31,487	24,087	36,234
ETHNICITY						
Caucasian	41.2	34.4	34.9	22.8	60.4	44.5
Japanese	26.8	24.9	9.0	6.9	N/A	8.8
Chinese	7.7	6.9	3.4	1.7	N/A	2.0
Filipino	10.4	12.6	15.3	15.5	N/A	24.8
Hawaiian	8.5	10.5	26.0	40.0	N/A	12.4
Other	5.5	10.4	11.4	13.1	N/A	7.5
AGE						
Less than 5 yr.	9.3	7.9	12.5	11.8	13.3	10.7
5 - 17 yr.	26.2	20.2	35.2	29.0	31.1	27.8
18 - 64 yr.	59.5	64.6	48.7	54.1	53.1	59.3
65 or more yr.	5.0	7.3	3.6	5.1	2.5	3.0
Median age	24.6 yr	28.1 yr	19.2 yr	22.8 yr	N/A	N/A
PLACE OF BIRTH*						
Hawaii	HC	55.1	HC	76.5	HC	49.6
Other U.S.**	HC	30.1	HC	15.9	HC	36.0
Foreign country	HC	14.8	HC	7.6	HC	14.5
RESIDENCE_5_YRS._PREVIOUS* (people_aged_5+)						
Same house	42.5	48.2	47.0	53.2	31.0	44.0
Same island	NC	25.5	NC	33.6	NC	23.6
Different island	HC	1.3	HC	1.3	NC	0.8
Different state	HC	18.4	HC	18.4	HC	26.1
Different country	HC	6.6	HC	6.6	HC	6.1
EDUCATION* (people_aged_25+)						
0-8 years only	20.8	14.4	32.5	19.8	21.0	13.6
High school only	37.5	46.0	30.9	60.9	59.7	56.0
Some post high school	26.2	18.3	31.2	12.4	10.7	17.8
College, 4+ yr.	15.5	21.7	5.4	6.9	8.6	12.6

Notes: * Figures based on 15% sample; hence, numbers represent estimate.
 ** Including persons born in U.S. territories, and persons born abroad or at sea to American parent/s.
 *** In this and immediately following tables, the small Central Oahu town of Kunia (1980 pop. 829) is counted with Ewa rather than Central Oahu because it falls in one of the Ewa census tracts.
 "HC" = 1970 categories or bases "Not Comparable" to 1980 (1970 Census kept a "non-response" category, while 1980 Census allocated non-responses to other categories shown).

Sources: U.S. Bureau of the Census, 1973, 1981a, 1981b.

Table 3: Family Characteristics and Income Levels: City and County of Honolulu and Various Parts of Study Area, 1970 and 1980

	CITY AND COUNTY OF HONOLULU		MAIANA D.P. AREA		EWA D.P. AREA (C.T. 83-86.02)	
	1970	1980	1970	1980	1970	1980
POPULATION IN FAMILIES	N/A	653,118	N/A	29,599	N/A	34,071
as percentage of total population	N/A	85.6%	N/A	94.0%	N/A	94.0%
NUMBER OF FAMILIES	138,277	178,516	4,583	6,797	5,229	8,329
	%	%	%	%	%	%
HEAD						
Husband/wife	86.7	82.8	84.9	75.8	89.5	87.9
Male only	3.6	4.5	4.3	5.2	2.4	3.3
Female only	9.8	12.7	10.7	19.0	8.1	8.9
WITH OWN CHILDREN UNDER 18						
Female head	63.4	54.9	71.2	67.3	75.1	70.8
Female head	6.2	7.5	18.4	13.5	6.8	7.1
BELOW POVERTY LEVEL						
	7.2	7.5	16.4	21.4	8.7	7.2
MEDIAN FAMILY INCOME						
	\$12,035	\$23,554	\$8,000	to \$16,326	\$10,109	\$21,000
					\$8,999	
NON-FAMILY HOUSEHOLDS	N/A	53,298	N/A	1,224	N/A	806
percentage below poverty level	N/A	15.7%	N/A	23.4%	N/A	17.5%

Notes: All figures (except "Population in Families" and "Non-Family Households") based on 15% sample; hence, numbers represent estimates.
 "N/A" = "Not Available."

Sources: U.S. Bureau of the Census, 1970, 1981a, 1981b; State of Hawaii, 1973.

Table 4: Housing Stock and Characteristics: City and County of Honolulu and Various Parts of Study Area, 1970 and 1980

	CITY AND COUNTY OF HONOLULU		MAIANA E D.P. AREA		EWA D.P. AREA (C.T. 83-86.02)	
	1970	1980	1970	1980	1970	1980
TOTAL YEAR-ROUND HOUSING_UNITS	174,107	250,864	5,633	9,528	5,723	9,465
vacant (total)	5.4%	8.2%	7.9%	16.4%	4.2%	3.4%
vacant for sale	0.6%	0.5%	0.2%	1.0%	0.5%	1.0%
vacant for rent	2.5%	3.6%	4.0%	2.9%	1.9%	0.6%
held for occas'l use	N/A	0.9%	N/A	1.2%	N/A	0.4%
other	N/A	3.2%	N/A	11.3%	N/A	1.4%
TOTAL YEAR-ROUND OCCUPIED_UNITS	164,763	230,214	5,185	7,972	5,484	9,139
TENURE						
owner-occupied	45.0%	49.9%	40.6%	51.3%	32.7%	50.2%
renter-occupied	55.0%	50.1%	59.4%	48.7%	67.3%	49.8%
SELECTED CONDITIONS						
lacking some or all plumbing	3.5%	1.5%	8.6%	1.3%	3.0%	0.6%
1.51 or more persons/room	6.9%	7.4%	19.2%	13.7%	6.9%	8.5%
PERSONS_PER_HOUSEHOLD	3.60	3.15	4.52	3.93	4.39	3.96
MEDIAN_CASH_RENT (renter-occupied)	\$130	\$279	\$80 to \$99	\$264	\$89 to \$158	\$230 to \$372
as % of median family income	12.9%	14.2%	N/A	19.4%	10.6% - 18.8%	13.1% - 21.3%
MEDIAN_VALUE* (owner-occupied)	\$38,400	\$130,400	\$20,000 to \$24,999	\$77,400	\$29,100 to \$32,000	\$96,000 to \$120,400
MEDIAN_MONTHLY_MORTGAGE* (owner-occupied)**	N/A	\$494	N/A	\$355	N/A	N/A
as % of median family income	N/A	25.2%	N/A	26.2%	N/A	N/A

Notes: * For 1980, median values are for non-condominium housing units.
 ** Figures based on 15% sample; hence, numbers represent estimates.
 "N/A" = "Not Available."

Sources: U.S. Bureau of the Census, 1973, 1981a, 1981b.

Table 5: Labor Force Size and Characteristics: City and County of Honolulu and Various Parts of Study Area, 1970 and 1980

	CITY AND COUNTY OF HONOLULU		MAIHAHA D.P. AREA		EWA D.P. AREA (C.T. 83-86.02)	
	1970	1980	1970	1980	1970	1980
POTENTIAL LABOR FORCE (aged 16+)	427,601	574,903	13,654	20,062	14,110	23,862
not in labor force	33.0%	30.8%	42.2%	45.9%	38.3%	31.9%
armed forces	11.5%	10.1%	8.2%	4.2%	25.5%	18.5%
civil. labor force	55.5%	59.1%	49.6%	49.9%	36.3%	49.5%

CIVILIAN LABOR FORCE	237,338	339,863	6,780	10,008	5,115	11,821
unemployed	3.0%	4.6%	6.5%	7.7%	4.3%	8.0%
TOTAL EMPLOYED	230,252	324,113	6,338	9,236	4,893	10,873

OCCUPATION						
service manager./profes. technical, sales & adminis.	15.0%	17.6%	26.8%	19.7%	14.0%	19.3%
farm/fish/forest	NC	24.7%	NC	14.3%	NC	14.2%
precision, craft, repair	NC	33.7%	NC	29.7%	NC	31.0%
operators, fabri-	NC	1.8%	NC	2.4%	NC	3.9%
cators, laborers	NC	11.3%	NC	16.6%	NC	15.5%
	NC	10.9%	NC	17.3%	NC	16.3%

INDUSTRY (selected)						
agric., forest, fish, mining	2.1%	1.7%	N/A	2.0%	N/A	6.1%
construction	9.5%	6.6%	16.6%	9.8%	6.6%	7.5%
manufacturing	10.3%	7.7%	20.6%	12.4%	18.8%	12.0%
retail trade	18.0%	20.5%	13.9%	21.5%	15.7%	20.1%
financial, insur., real estate	5.6%	8.1%	2.1%	5.9%	2.4%	5.2%
personal, entertain. & recreat. services	7.6%	8.1%	N/A	8.7%	N/A	5.9%
health, educ. & professional	18.1%	18.5%	12.0%	12.4%	11.0%	12.7%
public adminis.	12.6%	10.9%	15.7%	11.4%	16.0%	13.4%

COMUTE_TO_WORK 45 minutes or more mean travel (min.)	N/A	11.9%	N/A	40.6%	N/A	22.6%
	N/A	22.6 m	N/A	32.8 m	N/A	25.8 m

Notes: All figures based on 15% sample; hence, numbers represent estimates. "N/A" = "Not Available" in published form. "NC" = 1970 categories or bases "Not Comparable" to 1980 Census.

Sources: U.S. Bureau of the Census, 1973, 1981a, 1981b.

Table 6: Population and Demographic Characteristics: Manakuli, Maili, Waianae, and Makaha, 1970 and 1980

	MANAKULI		MAILI		WAIANAE		MAKAHA	
	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980
TOTAL POPULATION	6,506	8,185	4,397	5,026	3,302	7,941	4,644	6,582
ETHNICITY								
Caucasian	23.8	15.3	40.9	27.6	36.8	20.4	41.6	31.5
Japanese	3.3	2.4	7.4	5.9	18.6	10.4	6.6	5.2
Chinese	4.1	1.0	4.7	1.6	1.0	1.8	3.0	2.0
Filipino	13.7	13.8	14.0	19.6	16.7	15.4	18.4	15.5
Hawaiian	39.7	56.2	26.6	34.1	13.0	38.9	23.3	28.6
Other	15.5	11.3	6.4	11.2	13.9	13.1	6.7	17.2
AGE								
Less than 5 yr.	13.7	10.7	14.5	11.8	10.1	12.0	11.8	15.0
5 - 17 yr.	38.7	31.6	34.5	30.4	33.4	30.8	44.8	21.9
18 - 64 yr.	44.8	53.7	48.1	53.4	51.1	52.3	39.9	56.4
65 or more yr.	2.8	4.0	2.9	4.4	5.4	4.9	3.5	6.7
Median age	16.0 yr	21.4 yr	18.0 yr	22.4 yr	21.0 yr	22.0 yr	18.0 yr	24.3 yr
PLACE OF BIRTH*								
Hawaii	NC	84.5	NC	82.1	NC	77.6	NC	62.9
Other U.S.**	NC	9.7	NC	10.3	NC	14.0	NC	28.9
Foreign country	NC	5.8	NC	7.6	NC	8.4	NC	8.2
RESIDENCE 5 YRS. PREVIOUS* (people aged 5+)								
Same house	45.8	53.6	51.6	70.4	55.0	50.2	42.5	38.7
Same island	NC	36.0	NC	19.5	NC	41.9	NC	37.5
Different island	NC	1.1	NC	3.2	NC	0.2	NC	2.2
Different state	NC	8.2	NC	6.5	NC	7.1	NC	19.5
Different country	NC	1.1	NC	0.4	NC	0.6	NC	2.1
EDUCATION* (people aged 25+)								
0-8 years only	35.7	16.6	23.6	17.3	27.1	21.2	32.9	16.7
Hi school only	32.8	70.4	48.6	67.0	53.9	57.0	43.3	56.8
Some post high school	28.3	10.0	23.5	10.2	10.4	13.9	15.3	15.8
College, 4+ yr.	3.2	3.0	4.3	5.5	8.6	7.9	8.5	10.7

Notes: * Figures based on 15% sample; hence, numbers represent estimate.

** Including persons born in U.S. territories, and persons born abroad or at sea to American parent/s.

"NC" = 1970 categories or bases "Not Comparable" to 1980 (1970 Census kept a "non-response" category, while 1980 Census allocated non-responses to other categories shown).

Sources: U.S. Bureau of the Census, 1973, 1981a, 1981b.

Table 7: Family Characteristics and Income Levels: Hanakuli, Haili, Waianae, and Makaha, 1970 and 1980

	HANAKULI		HAILI		WAIANAE		MAKAHA	
	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980
POPULATION IN FAMILIES	N/A	7,792	N/A	4,697	N/A	7,537	N/A	5,855
as percentage of total population	N/A	95.2%	N/A	93.5%	N/A	94.9%	N/A	88.9%
NUMBER OF FAMILIES	1,119	1,584	899	1,104	700	1,711	932	1,572
HEAD								
Husband/wife	82.9	73.8	85.4	74.5	86.3	79.5	83.0	72.9
Male only	4.9	7.5	3.8	6.8	4.4	3.3	4.4	5.7
Female only	12.2	18.7	10.8	19.2	9.3	17.2	12.6	21.4
WITH OWN CHILDREN UNDER 18								
Female head	N/A	70.6	N/A	68.1	N/A	72.0	N/A	60.9
Male head	N/A	13.3	N/A	13.6	N/A	12.0	N/A	16.2
BELOW POVERTY LEVEL	15.6	20.8	17.6	22.5	44.2	16.7	15.8	22.8
MEDIAN FAMILY INCOME	\$9,733	\$16,689	\$9,253	\$15,801	\$9,700	\$19,466	\$8,895	\$14,767
NON-FAMILY HOUSEHOLDS	N/A	248	N/A	216	N/A	311	N/A	485
percentage below poverty level	N/A	24.6%	N/A	20.8%	N/A	21.5%	N/A	14.2%

Notes: All figures (except "Population in Families" and "Non-family Households") based on 15% sample; hence, numbers represent estimates.

"N/A" = "Not Available."

Sources: U.S. Bureau of the Census, 1973, 1981a, 1981b.

Table 8: Housing Stock and Characteristics: Hanakuli, Haili, Waianae, and Hahaione, 1970 and 1980

	HANAKULI		HAILI		WAIANAE		HAAHAAIONE	
	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980
TOTAL YEAR-ROUND HOUSING UNITS	1,296	1,896	1,043	1,390	908	2,075	1,288	3,199
vacant (total)	4.1%	3.6%	N/A	9.6%	N/A	6.4%	N/A	37.2%
vacant for sale	N/A	0.2%	N/A	1.4%	N/A	1.2%	N/A	1.5%
vacant for rent	N/A	2.0%	N/A	2.8%	N/A	2.9%	N/A	3.8%
held for occas'l use	N/A	0.3%	N/A	4.6%	N/A	0.6%	N/A	1.0%
other	N/A	1.1%	N/A	1.2%	N/A	1.7%	N/A	30.9%
TOTAL YEAR-ROUND OCCUPIED UNITS	1,243	1,828	997	1,264	843	1,943	1,072	2,010
OWNER-occupied	47.0%	65.9%	41.0%	53.1%	46.6%	60.9%	29.9%	57.7%
renter-occupied	53.0%	34.1%	59.0%	46.9%	53.4%	39.1%	70.1%	42.3%
SELECTED CONDITIONS lacking some or all plumbing 1.51 or more persons/room	14.7%	1.4%	3.2%	0.5%	9.8%	1.6%	3.9%	1.0%
PERSONS_PER_HOUSEHOLD	5.20	4.47	4.40	3.98	3.89	4.08	4.31	3.25
MEDIAN CASH_RENT (renter-occupied)	\$85	\$268	\$97	\$239	\$115	\$259	\$110	\$282
as % of median family income	24.3%	20.9%	12.6%	18.2%	14.2%	15.9%	14.8%	22.9%
MEDIAN VALUE* (owner-occupied)	\$17,100	\$61,300	\$23,500	\$80,300	\$28,800	\$85,100	\$38,600	\$96,000
MEDIAN_MONTHLY_MORTGAGE* (owner-occupied)**	N/A	\$287	N/A	\$437	N/A	\$400	N/A	\$432
as % of median family income	N/A	1.7%	N/A	33.2%	N/A	24.7%	N/A	35.1%

Notes: * For 1980, median values are for non-condominium housing units.
 ** Figures based on 15% sample; hence, numbers represent estimates.
 "N/A" = "Not Available."

Sources: U.S. Bureau of the Census, 1973, 1981a, 1981b.

Table 9: Labor Force Size and Characteristics: Manakuli, Maili, Waianae, and Makaha, 1970 and 1980

	MANAKULI		MAILI		WAIANAE		MAKAHA	
	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980	CENSUS DESIGNATED PLACE 1970	CENSUS DESIGNATED PLACE 1980
POTENTIAL LABOR FORCE (aged 16+)	3,318	5,190	2,454	3,107	2,055	4,949	2,631	4,358
not in labor force	42.9%	49.7%	41.2%	50.0%	39.9%	39.0%	49.5%	44.4%
armed forces	3.8%	4.6%	4.0%	2.3%	7.0%	2.4%	4.2%	4.7%
civil. labor force	53.3%	45.7%	54.8%	47.7%	53.1%	58.6%	46.3%	50.9%
CIVILIAN LABOR FORCE	1,770	2,371	1,346	1,482	1,091	2,902	1,218	2,217
unemployed	8.6%	8.3%	5.9%	6.4%	5.5%	9.3%	2.6%	5.2%
TOTAL EMPLOYED CIVIL. LABOR FORCE	1,617	2,174	1,267	1,387	1,031	2,632	1,150	2,101
OCCUPATION								
service manager./profes. technical, sales & adminis.	NC	18.7%	NC	17.5%	NC	23.9%	NC	18.6%
farm/fish/forest	NC	12.4%	NC	14.7%	NC	12.9%	NC	15.6%
precision, craft, repair operators, fabri-	NC	22.0%	NC	19.8%	NC	23.6%	NC	24.0%
cators, laborers	NC	4.0%	NC	4.0%	NC	6.2%	NC	4.7%
	NC	18.9%	NC	15.5%	NC	14.1%	NC	19.9%
	NC	24.0%	NC	28.5%	NC	19.3%	NC	17.2%
INDUSTRY (selected)								
agric., forest, fish, mining	N/A	2.3%	N/A	1.5%	N/A	5.1%	N/A	2.9%
construction	N/A	17.4%	N/A	11.2%	N/A	8.6%	N/A	16.5%
manufacturing	N/A	8.6%	N/A	14.7%	N/A	7.3%	N/A	12.2%
retail trade	N/A	16.2%	N/A	17.7%	N/A	19.9%	N/A	18.8%
financial, insur., real estate	N/A	2.3%	N/A	4.4%	N/A	2.8%	N/A	6.2%
personal, entertain & recreat. services	N/A	8.2%	N/A	3.9%	N/A	6.7%	N/A	5.0%
health, educ, & professional	N/A	13.1%	N/A	14.9%	N/A	12.9%	N/A	14.6%
public adminis.	N/A	16.4%	N/A	14.4%	N/A	19.6%	N/A	10.4%
COMMUTE TO WORK 45 minutes or more	N/A	40.6%	N/A	29.8%	N/A	44.9%	N/A	42.6%
mean travel (min.)	N/A	33.8 m	N/A	29.7 m	N/A	33.7 m	N/A	33.8 m

Notes: All figures based on 15% sample; hence, numbers represent estimates.

"N/A" = "Not Available" in published form. "NC" = 1970 categories or bases "Not Comparable" to 1980 Census.

Sources: U.S. Bureau of the Census, 1973, 1981a, 1981b.

Both housing costs and housing values were relatively low. Average household sizes were high, with a consequent high rate of crowding (Table 4). Workers residing in Waianae tended to have a "blue-collar" profile, and a high percentage had to commute more than 45 minutes to work. Waianae's labor force participation rate was lower than the islandwide rate--particularly for females--and unemployment was much higher--particularly for males (Table 5 contains sex-specific information from original Census sources).

According to recent estimates from the Hawaii State Department of Labor and Industrial Relations, unemployment in Waianae and Ewa was markedly lower than in the early 1980s, as shown in Table 10.

Lualualei and Maili: The Maili CDP in 1980 had a population of 5,026, the smallest of the four Waianae Coast communities. Census Tract 96.03, containing the Maili CDP and surrounding areas below Paakea Road, had a 1980 population of 5,711. The City and County of Honolulu's Department of General Planning estimates a 1985 population of 6,020 for this census tract, indicating little recent growth in the Maili area.

The 1980 detailed Census characteristics (Tables 6 to 9) suggest Maili's population generally resembled that of the overall Waianae area. However, Maili appeared to be a very "rooted" community, for 70 percent of its residents had been in the same house five years previously.

Maili's people in 1980 on average were less affluent than residents in other Waianae communities (with neighboring Waianae Town relatively better off in terms of incomes). Rents were cheaper in Maili, but mortgage payments were high. Maili's resident labor force had proportionately more skilled craftsmen than other Waianae CDP's, and fewer Maili workers commuted long distances to work.

Ewa DP Area: Ewa's population increased by 50 percent from 1970 (24,087) to 1980 (36,234). However, City and County planners estimate the 1989 population for the Ewa DP as 39,595, representing little growth since 1980 (City and County of Honolulu, Department of General Planning, 1990).

Since the mid-1980s, however, Ewa has experienced a boost in the rate of population growth, brought on principally by the West Loch, and Kapolei projects. The West Loch proposal calls for the development 1,500 housing units by the end of 1991 (City and County of Honolulu, Department of Housing and Community Development, 1987). The Kapolei proposal calls for 5,000 housing units by 1995 (R.M. Towill Corporation, 1988).

TABLE 10: UNEMPLOYMENT AND WORKFORCE ESTIMATES, 1989, 1990

	<u>1989 Annual Average</u>		<u>April 1990</u>	
	<u>Civilian Labor Force</u>	<u>Percent Unemployed</u>	<u>Civilian Labor Force</u>	<u>Percent Unemployed</u>
Waianae D. P. Area	11,150	4.0%	11,400	3.9%
Ewa D. P. Area	13,150	3.4%	13,500	3.3%
Total Study Area	24,300	3.7%	24,900	3.6%
City and County of Honolulu	385,450	2.5%	395,200	2.2%

SOURCE: Personal communication, Manuel Fragante, Research Statistician, Research and Statistics Office, Hawaii State Department of Labor and Industrial Relations, August 16, 1990.

Ewa's 1980 population characteristics showed the influence of its dominant economic activities--that is, the military and sugar plantation activities. Ethnically, the population was predominantly Caucasian and, secondarily, Filipino. Ewa residents were younger on average than most Oahu residents and much more mobile. Incomes were lower on average, and household sizes were higher. Workers living in Ewa tended to be blue-collar and commuted farther than most Oahu residents (although not as far as Waianae workers).

Unemployment was higher in Ewa during 1980 than it was islandwide or even in Waianae. The State DLIR estimates average 1989 unemployment in these census tracts as about 3.3 percent--lower than in Waianae, but higher than the islandwide average (Table 10). (The local estimates are based in part on extrapolation from 1980 data, so the change in the relative level of unemployment in Ewa reflects significant economic development.)

2.5 LIFESTYLE

The Waianae area is one of Hawaii's most frequently studied rural areas. While residents are diverse in nature, the concept of a special "Waianae lifestyle" (especially in connection with native Hawaiians) is frequently encountered and has been the topic of lengthy anthropological studies (e.g., Howard, 1974). Thus, any summary runs the risk of omitting things that some people would consider vital. The following list represents one attempt to describe the lifestyle of Waianae:

- (1) As previously noted, employment is scarce in the Waianae area, and many workers must make 30- to 60-minute commutes or have no job. Thus, for many, an important "lifestyle" dimension involves either commuting or unemployment.
- (2) Waianae Coast residents value agricultural activities and/or rural surroundings, and community groups have consistently fought to protect these characteristics in government land use plans. Waianae is Oahu's major producer of many agricultural products. Some agriculturalists--for example, pig farmers--are making their "last stand" in Waianae after being forced out of other parts of the island by residential development. (However, by the U.S. Census Bureau's rather strict definitions of "farm residence," only 85 Waianae residents lived on farms in 1980.)
- (3) At a broader level, Waianae residents value the outdoors in general. Asked to name the "nicest things" about the Waianae Coast in a recent survey (Willinger and Sine, 1982), residents' mention of the area's beautiful outdoor characteristics was second only to their appreciation of the social environment.

- (4) A slow and relaxed pace of life is considered one of the most important parts of "country" living in Waianae, according to many residents and community leaders.
- (5) Social problems and personal stress, however, are also an undesired but widespread part of life in Waianae. As discussed further in the next section, unemployment, crime, and youth/family problems represent major concerns to Waianae Coast residents. Unemployment rates of 20 percent or more in Waianae were documented in the 1980 U.S. Census. Welfare caseloads are among the highest on the island. And both anthropological studies (Gallimore and Howard, 1968) and mental health needs assessment surveys (White, 1982a; Willinger and Sine, 1982) have found large minorities of area residents exhibiting some sign of personal stress.
- (6) Life in Waianae often features fierce community controversies particularly in response to proposals for development or change. Community meetings on the Waianae Coast are frequently marked by strong feelings and strong positions. In a history of the Waianae Coast, Krauss (1973) notes that conflict between progress and tradition has characterized the area for more than 150 years--perhaps more than in any other part of Oahu.
- (7) Values about personal and social relationships which may initially seem contradictory are frequently encountered in Waianae. For example, many people call for consensus and a sense of 'ohana, but still fight for their rights to independent opinions. And in one of the recent mental health surveys (Willinger and Sine, 1982), the most popular responses to the question on the "nicest thing" about the Waianae Coast were "people are friendly/Ohana/neighborliness," but also "quiet neighborhood" (26 percent) or "people leave you alone/no one bothers us/privacy" (10 percent). The idea that people can be very friendly but still quiet and non-intrusive is not actually a contradiction at all, but basic to rural lifestyle.
- (8) Threaded throughout the "Waianae lifestyle" is the heritage of native Hawaiian culture. The Waianae Coast has one of the highest concentrations of ethnic Hawaiians in the State of Hawaii. Many Waianae residents who do not meet standard definitions of "Hawaiian" blood or ethnicity nevertheless consider themselves "culturally Hawaiian" (White, 1982b).

The implications of the Hawaiian culture and heritage are so complex that it is difficult to do them justice in the space available. They would certainly include:

- . For many, a subjective sense of historic injustice and deprivation, along with such objective indicators as being the State's ethnic group with the highest imprisonment rate, highest male suicide rate, and lowest life expectancy (Native Hawaiians Study Commission, 1983);
- . Modern versions of ancient cultural beliefs regarding family ties, the physical universe, and the supernatural (Pukui, Haertig, and Lee, 1972); and
- . Great sensitivity toward any possible shame or personal embarrassment in social situations, especially where educational failings might be involved (Howard, 1974; Gallimore, Boggs, and Jordan, 1974; Kamehameha Schools/Bernice Pauahi Bishop Estate, 1983).

Although results were not available for particular areas such as Waianae, a statewide survey of approximately 1,410 Native Hawaiians (Office of Hawaiian Affairs, 1986) found that the most frequent definition of "Hawaiian lifestyle" involved traditional respect for elders (40 percent), followed by being easy-going and generous (21.5 percent); living off the land and sea (17.7 percent); and practicing Hawaiian language, culture, food, religion (12 percent). In response to another question on most important aspects of Hawaiian "Culture," the most frequent answers were music (30 percent) and the Hawaiian language (20 percent).

The future of the "Waianae lifestyle" is open to great debate and question. Some economists believe that increasing population and land prices will likely lead to the "gradual erosion of agriculture and the rural lifestyle still present in the [Waianae] area as parcel by parcel is upzoned and subdivided (Miklius et. al., 1976). And survey results discussed in the next section indicate many residents would be willing to trade much of the "Waianae lifestyle" for more jobs.

Residents have formed several Waianae economic development and community action groups to try to create economic activities compatible with present lifestyles and labor force skills. Also, the previously discussed demographic trends and the Department of Hawaiian Home Lands' plans to double the number of Homestead units in the area suggest that ethnic Hawaiians will continue to dominate the Waianae Coast population for some time, and this alone will mean continuation of much of the present "Waianae lifestyle."

2.6 COMMUNITY ISSUES AND CONCERNS INDEPENDENT OF THE PROJECT

The purpose of this section is to identify major community concerns which may provide the context for resident assessments of the project. The focus here will be on general needs and issues, as well as attitudes toward the visitor industry.

Preliminary information about community concerns in regard to the proposed golf course and golf courses in general will be discussed in Section 4.0.

2.6.1 Information from Surveys

Attitudes on Economic Development and Other Issues: On an islandwide basis, the recent Hawaii State Plan Survey (Sunderland Smith Research Associates, 1990) indicates qualified support for recent and continuing growth on Oahu:

- . Sixty percent of Oahu respondents felt that growth and development had been mostly good for their community;
- . A majority (53 percent) wanted to see "some" or "a lot of" growth and development on the island; but
- . A larger majority (73 percent) agreed with the idea that the island had "pretty much reached its limits in terms of development.

In 1988, Waianae residents cited a lack of nearby jobs, 69 percent, the cost of housing, 60 percent, crime, 50 percent, and traffic as major problems in the area (see Table 11).

Thirty-five percent felt the quality of life in the area was better than it was five years ago; 27 percent thought it was worse; and 36 percent felt it was about the same.

Some past surveys focus on employment, economic development, and other socio-economic issues, as well as socio-cultural concerns. Data sources include a 1980-81 State Mental Health Survey of 408 Waianae District adults (Willinger and Sine, 1982); a survey of 2,366 native Hawaiians statewide (Alu Like, 1980), of which about about 10 percent were in Hawaii; and the City's Development Plan Surveys, conducted both islandwide (SMS Research, 1978a) and in Waianae (SMS Research, 1978b).

- (1) Unemployment historically has been a major--and perhaps the major--concern in Waianae. In the State Mental Health survey, when Waianae residents were asked to choose the three most serious social problems from a list of 20, "unemployment" ranked first with 58 percent (Willinger and Sine, 1982). Similarly, when asked to choose the three social programs they would most like to see expanded, "Help getting a job" was first with 61 percent.
- (2) Native Hawaiians in Waianae are even more concerned than Hawaiians elsewhere about economic needs. Asked which type of family needs were not being met, more than half the Waianae Hawaiian sample was able to name some type of need, while 62 percent of Hawaiians statewide said that no family need was unmet (Alu Like,

1980). The types of needs most often cited as unmet in Waianae were "Economic" and "Employment."

- (3) Crime and/or youth problems are also serious Waianae community concerns. While unemployment was the most frequently selected Waianae social problem in the State Mental Health Survey, the next five "runners-up" all dealt with crime and/or youth: juvenile delinquency, 43 percent; crime, 32 percent; drug abuse, 29 percent; school problems, 29 percent; problems of raising children, 20 percent (Willinger and Sine, 1982--percentages exceed 100 percent because of multiple responses). Another survey focusing on social and psychological problems also found that top-ranked problems included topics such as juvenile delinquency, teenage pregnancies, and hard drugs (Hale Ola o Ho'opakolea, 1982).
- (4) On the physical side, lack of nearby health services and lack of affordable housing were the first and second most frequently selected "problems" (from an original list of 41 possibilities) in Waianae, according to the City's Development Plan survey (SMS Research, 1978a). Islandwide, there was similar concern over housing, but distance from hospitals and doctors was much less frequently mentioned than in Waianae.
- (5) The need to save agricultural land from development was more frequently endorsed in Waianae than islandwide (Ibid.).

TABLE 11: GENERAL COMMUNITY ISSUES AND ATTITUDES (1988 SURVEY RESULTS)

	Honolulu C. & C.	Waianae	Ewa/ Central (1)
COMMUNITY ISSUES -- %'S RATED "BIG PROBLEM IN YOUR PART OF ISLAND"			
Cost of housing	64%	60%	63%
Traffic	60%	49%	55%
Cost of food and clothing	42%	44%	37%
Population growing too fast	39%	39%	43%
Crime	33%	50%	42%
Pollution of oceans or natural areas	29%	31%	32%
Lack of nearby jobs	28%	69%	43%
Beauty of area being de- stroyed by development	25%	41%	29%
Crowded beach parks	23%	17%	14%
Not enough sports and rec- reation facilities	20%	31%	29%
Not enough nearby stores, restaurants, entertain.	13%	28%	26%
Problems between people of different backgrounds	10%	17%	12%
Too many tourists (2)	6%	5%	6%

QUALITY OF LIFE "IN THIS PART OF THE ISLAND" VS. FIVE YEARS AGO

Today is ...	Better	27%	35%	26%
	Worse	23%	27%	30%
	Same	48%	36%	40%
	Not Sure	2%	2%	4%

DEMOGRAPHICS

Survey Base:	1,305	170	164
Length of Residence, Hawaii			
0 to 5 years	37%	28%	39%
6 to 20 years	43%	50%	37%
over 20 yrs or lifetime	18%	21%	23%
Place of Birth			
Hawaii	53%	69%	53%
Mainland U.S.	35%	21%	31%
Ethnicity			
Caucasian	35%	20%	33%
Japanese	21%	8%	14%
Hawaiian	18%	44%	19%

- NOTES: (1) Area includes all of Ewa but part of Central Oahu as well.
 (2) Surveyed attitudes to tourism and the visitor industry are described in Table 12.

Attitudes Toward Tourism and the Visitor Industry: A 1988 survey shows that attitudes toward tourism are by residents of the Waianae Coast area towards slightly more negative than that of Oahu residents as a whole. (See Table 12.)

- . Nearly two-thirds of Waianae Coast residents surveyed thought that tourism brought more benefits than problems, compared with nearly three-fourths of the entire Oahu population. More than one fourth of the residents disagreed that tourism brought more benefits than problems, compared to 17 percent for the island as a whole.
- . A full 85 percent of the area residents evaluated their contact with visitors as pleasant. While 56 percent described the effect of visitor activities on the area as more pleasant than unpleasant, 19 percent who found the effect unpleasant.
- . Nearly half of the area residents thought that Oahu needs more tourism jobs, but 70 percent felt there should be a stop to building more hotels on the island. More than 60 percent felt it was more important to keep things as they are than to increase tourism jobs; 65 percent felt future resorts should be close to existing hotels; and half felt the island is run for tourists at local people's expense.

On the Waianae Coast, the proposed Ko Olina development at West Beach (in Ewa, but near the Waianae boundary) sparked years of controversy and debate, with many residents speaking out on each side of the question. (This was in contrast to the Ewa district, where a clear majority of residents in public hearings supported the project.) However, there are no published survey data on opinions toward either that project.

TABLE 12: COMMUNITY INVOLVEMENT WITH AND VIEWS OF THE VISITOR INDUSTRY (1988 SURVEY RESULTS)

	Honolulu C. & C. -----	Waianae -----	Ewa/ Central (1) -----
<u>VISITOR INDUSTRY INVOLVEMENT</u>			
Currently working in the visitor industry	23%	21%	22%
Ever worked in the visitor industry	23%	20%	25%
Had a tourism job waiting when moved moved to Hawaii	4%	-	4%
Current job has contact with visitors	33%	42%	35%
<u>EVALUATION OF TOURISM AND THE VISITOR INDUSTRY</u>			
Overall effect of tourism on family and self			
Good	59%	54%	56%
Bad	4%	5%	4%
Tourism brought more benefits than problems			
Agree	74%	64%	77%
Disagree	17%	27%	17%
Don't Know	8%	9%	6%
Evaluation of contact with visitors			
Pleasant	82%	85%	88%
Unpleasant	4%	1%	3%
Mixed	5%	8%	4%
Effect of visitor activities on the area			
More pleasant	51%	56%	54%
More unpleasant	18%	19%	11%
Most enjoyable visitor contacts			
Outdoor recreation settings	27%	33%	30%
Commercial situations	29%	20%	37%
Tourist attractions	9%	6%	9%
No situations	10%	7%	7%
When visitors have interfered			
Traffic, driving, parking	43%	30%	36%
Recreation	20%	29%	20%
General tourist behavior	24%	41%	45%
Job/economic situations	3%	-	-

(Continued)

TABLE 12 (Cont).

	Honolulu C. & C. -----	Waianae -----	Ewa/ Cen. -----
<u>COMMENTS ON VISITOR INDUSTRY JOBS -- %'S AGREEING WITH VARIOUS STATEMENTS</u>			
The pay is pretty good	35%	40%	42%
Industry has poor hours & lay offs	56%	55%	54%
Tourism jobs lack advancement opportunities	46%	42%	42%
Workers treated like servants	33%	36%	34%
Residents cannot compete for jobs	39%	51%	45%
Kids should study tourism management	35%	46%	34%

GENERAL VIEWS ON TOURISM -- %'S AGREEING WITH VARIOUS STATEMENTS

This island needs more tourism jobs	42%	47%	55%
Stop building hotels on this island	70%	70%	68%
In my part of the island, it's more important to keep things as they are than to increase tourism jobs	63%	61%	61%
Future resorts should be close to existing hotels	67%	65%	73%
This island is run for tourists at local people's expense	43%	51%	40%

NOTE:

- (1) The survey identified under the name of "West Beach" an area -- the Ewa Neighborhood Board area -- similar to the Ewa district but stretching into Central Oahu both inland and around Pearl Harbor.

SOURCE: Community Resources, 1989a.

2.6.2 Neighborhood Board Issues and Concerns

The minutes of the Waianae Coast Neighborhood Board meetings from July 1987 through July 1990 were examined to identify major areas of concern in the Waianae Coast region.

A total of 51 different persons served on the Board from 1987 through 1990.

Major areas of concern were as follows:

- (1) **Land Use Developments:** The Board addressed various land use proposals which had generated consternation.

(A) Golf Course Proposals. The Board discussed an earlier version of the Lualualei project, a proposed golf course off Waianae Valley Road by developer Herbert Horita, a Kaiser Cement Corp plan for a golf course, and a proposed course at Ohikilolo. All met with considerable opposition.

The Board found the impending eviction of a farmer from his leasehold land to make way for a golf course a major community problem. Along with other issues--water use, foreign control of land, and increased property taxes for residences adjacent to golf courses--the transfer of agricultural land to non-agricultural use was prominent.

(B) Other Developments. The Board had objections to the Gentry Keystone Housing Project on the basis of the cost of the proposed units, insufficient parking space, and Gentry's decision to provide only leasehold lots. A proposal by Nitto Hawaii Makaha Valley Development Project was also objected to.

The Board backed Sheraton Makaha's expansion plans, which included transforming residential land to resort, because of the projected increase in jobs and the boost to area prosperity.

- (2) **Environmental Concerns:** Board members were concerned over the environmental ramifications of some projects. For instance, the overflow of sewerage in Waianae was cited as hazardous to Waianae's fish and reef. The Board supported the Waianae Boaters' Association in its efforts to have surge pollution corrected at Waianae Boat Harbor.

The Board urged the City to curb the military bombing at Makua. It also unanimously supported the City's resolution to remove unexploded ordinance from the site.

Further concern arose over military installations when a study raised the possibility of a link between the Lualualei transmitting towers' output of electro-magnetic radiation and resident leukemia deaths in Maili.

The problem of littering was a recurring issue. The Board supported campaigns aimed at community involvement in home improvement and the removal of derelict vehicles.

- (3) **Traffic:** Traffic problems included a need to upgrade and paint road-safety signs, the high number of road deaths due to speeding, the danger posed to bus commuters using the Helelua Street bus stop, and the high incidence of pedestrian fatalities.

The Board was dissatisfied with the congestion of Farrington Highway. It supported Senator Aki's proposal to widen the road. The Board also made repeated appeals to the State to provide a second access road for use as an emergency evacuation route from Waianae.

Also, the Board found the bus system's late night services to Waianae inadequate.

- (4) **Public Safety:** The Board paid great attention to crimes--notably thefts, robberies, and arson (brush fires). The fact that many of the offenders were youths was of additional concern to the Board.

During emergencies, many residents found 911 service insufficient and so preferred calling the Waianae police station directly. They also felt that the limited manpower at the Waianae station was a problem.

- (5) **Education:** Poor facilities, low compensation, and the neglected state of school buildings were cited as factors contributing to the region's high teacher turnover. This led students of all ages to suffer in acquiring basic educational skills. The Board sided with other local organizations in promoting educational task forces.

The Board saw the need for more schools and protested the State's decision not to build an elementary school on Waianae's Ala Akau Street. The Board also described school bus routes as sub-standard.

2.6.3 General Issues and Concerns of Persons Interviewed for this Study

Waianae Coast residents interviewed for this study (as discussed in Section 4.1) discussed their general concerns about life in their communities. Concerns over commuting and its impact on family life were especially prevalent. Also, residents noted problems in the delivery of public services to the Waianae Coast.

Residents of the Nanakuli/Maili/Lualualei area and residents of Waianae town (north of the project site) differed slightly in the way they identified community concerns. Waianae residents

tended to focus on family life problems, while identifying issues that may intensify those problems. Interviewees living nearer the project site tended instead to focus on the economic and transportation problems that all Waianae Coast areas share. Specifically, the major concerns mentioned by Nanakuli/Maili/Lualualei residents were:

- . Long travel times to work, and the need for more job opportunities closer to home.
- . Crowded buses in the early morning rush hour.
- . The need for more light industrial and more agricultural opportunities.
- . Overcrowding of public schools in the community.
- . The need for more government services--for example, there is only one City and County emergency unit for the entire Waianae Coast.
- . The need for more "affordable" housing for local residents.
- . Traffic increase due to local development and population growth.
- . The number of Japanese developers on the Waianae Coast.

Residents of Waianae town and valley (to the north) mentioned:

- . Long travel distances to work because of lack of jobs close to home.
- . Long commutes to and from work affect family life.
- . Major developments may be a blessing in disguise because they bring jobs closer to home.
- . Brush fires caused by local youths.
- . Agricultural water supply will no longer be adequate.
- . Preservation of historical Hawaiian burial sites.
- . Overcrowding in the home causes family tensions.
- . Population will increase if presently unused land is planned for development.

3.0 FORCES FOR CHANGE WITHOUT THE PROJECT

Specific project impacts are discussed in Section 4.0. This section provides information on anticipated and announced changes affecting the study area, apart from the Lualualei golf project. They are part of the context in which the potential impacts of the project must be assessed. Three major ongoing projects--the Ko Olina Resort, Campbell Industrial Park, and Kapolei--may have a major impact on the Waianae Coast area.

3.1 THE KO OLINA RESORT

The Ko Olina Resort, now being built to the south of Lualualei, will have a major impact on the Waianae Coast area, providing jobs for local residents at its hotels, condominiums, stores, and golf courses.

Within the next eight years, the resort will have up to 10,000 employees working in both construction and operations (personal communication, Gary Omori, Director of Community Relations, Ko Olina Resort, October 29, 1990). Within 15 years, after construction is completed, the resort's work force will be reduced to 8,000 permanent employees working in operations.

A large portion of the resort's employees will likely be Waianae Coast residents. The developer has made commitments to local hiring and to job training for area residents. Thus far, Leeward Oahu residents have been hired for most operational jobs (personal communication, Kauila Clark, Executive Director, West Oahu Employment Corporation, October 30, 1990). However, the large number of anticipated employees will mean that workers must be recruited outside the area.

Recruitment of a large number of workers outside the Waianae Coast area will likely put a strain on the existing infrastructure and create an even greater demand for affordable housing. As noted in Section 2.6.1, the lack of nearby health services and affordable housing were mentioned most by Waianae residents in a City and County Development Plan survey. An adequate water supply for agricultural irrigation is perceived as potential problem on the Waianae Coast. (See Section 4.1.3). Accelerated growth in the area will increase the need for these amenities. (See Section 3.5 for the City and County's infrastructure development projects scheduled for the Waianae Coast and Ewa communities.)

3.2 CAMPBELL INDUSTRIAL PARK

Campbell Industrial Park, owned by the Estate of James Campbell, leases lots to businesses for a variety of uses, including refineries, factories, warehouses and the like.

Various companies now located at the industrial park to the south of Ko Olina employ about 3,100 people (personal communication, Walter Yoshimitsu, Administrator of Industrial Properties, Campbell Industrial Park, October 28, 1990).

Employment is expected to increase at the rate of about 200 jobs a year for the next five years. It is projected that by the year 1995, companies at the park will be employing about 4,100 workers.

3.3 KAPOLEI

According to State plans, Kapolei is to be Oahu's second city rather than just a suburb. Planned elements include an urban center, commercial areas, and residential sections. Kapolei Village is a master-planned residential community with a full range of community support facilities, including recreational areas, commercial centers, day care facilities, public schools, and a park and ride facility. It is a project being developed by the State Housing Finance and Development Corporation (HFDC) in cooperation with the City and County's Department of Housing and Community Development on land owned by the Campbell Estate. The Kapolei Village development is scheduled to provide 5,000 housing units by 1995 (R.M. Towill Corporation, 1988).

The Kapolei Town Center and the Makakilo Shopping Center are estimated to generate from 9,000 to 19,000 jobs by the year 1995 (University of Hawaii, 1988).

3.4 OTHER ECONOMIC DEVELOPMENT ACTIVITIES

Waianae DP Area: The area's major development is located in the Makaha valley. Two important development companies in Makaha are Nitto Hawaii, which owns the Makaha Valley Country Club golf course and condominium units, and ANA, which owns the West Course golf course and the Sheraton Makaha.

Nitto Hawaii plans to expand its present golf course from 18 to 27 holes on an extra 85 acres, with a tentative opening date set for 1991. A new clubhouse, a maintenance area, and 25 additional parking stalls are also scheduled for construction with the course. Nitto Hawaii's plans further call for more housing units, a small park, and a recreation center (Thompson, 1990).

Expansion of Sheraton Makaha by 360 additional hotel units and 150 resort condominiums is scheduled for completion in 1993 and 1996, respectively. Additional plans are included for new conference, health spa, golf, tennis, and retail facilities.

A third major developer in the Makaha valley--Hawaii Aistar Company--proposes to create a Pacific Basin Conference Center.

Besides housing meeting rooms and recreational amenities, the proposed Center would have 300 hotel rooms.

Ewa DP Area: There are a number of important developments planned for Ewa besides the major projects already mentioned. Of these, Haseko's Ewa Marina residential and resort project located between Ewa Beach and Barbers Point Naval Air Station is the most ambitious. Phase I plans call for 4,850 units to be erected on 707 acres of land between 1992 and 2010. In Phase II, another 403 acres will be developed for a park, a golf course, and a mixed-use commercial complex (Hawaii State Office of Environmental Quality Control, 1990)

Ewa by Gentry's on-going development of 5,300 residential units on more than 900 acres is another important regional project. A golf course, school, and parks are part of the eventual project plans. Overall construction should be complete by 1994.

Nearby the Gentry development, renovation of the plantation villages in the Ewa Mill vicinity is also planned. More than 1100 units on 470 acres will be affected. Renovation is set to begin in 1993, with work finishing in 1999.

Golf course proposals due to be operational by 1992 include: an 18-hole course at Makakilo on 290 acres; a 27-hole Myers Hawaii course on 270 acres; and an 18-hole course at Puuloa on 133 acres.

3.5 INFRASTRUCTURE DEVELOPMENT

Several major infrastructure development projects have been scheduled by the State and City and County for the Waianae Coast and Ewa communities (City and County of Honolulu, 1990).

On-site infrastructure is largely in place for the study area's major proposed developments. Additional regional infrastructure will be required in order to meet projected needs. However, relatively few of the planned improvements are slated to be implemented soon.

The City and County of Honolulu classifies projects according to scheduling--within or beyond six years--and to whether or not their sites have been determined. Proposed improvements include:

Waianae Coast DP Area

- . Renovation of Waianae Police Station--within six years; site determined; funds for land acquisition and construction budgeted.
- . Improvements to Hamiko Road, Haleakala Avenue, Lualualei Homestead Road, Nanakuli Avenue and Plantation Road--

beyond six years; funds not budgeted.

- . Improvements or extensions to Makaha and Nanakuli sewers --within six years; either funds for land acquisition and construction budgeted or projects under way.
- . Makaha Well II and Waianae Wells I and II--within six years; sites determined; and project under way.
- . Makaha Wells III and IV--within six years; sites determined; and land acquisition or construction funds budgeted.
- . Construction of a Waianae Civic Center--within six years; site determined; funds not budgeted.

In Maili, improvements to Hakimo Road and Lualualei Homestead Road are planned but not scheduled for the coming six years.

Ewa DP Area

- . Ewa Police Station--within six years; site undetermined; funds not budgeted.
- . New fire stations at Campbell Industrial Park and Ko Olina--both within and beyond six years; sites undetermined; funds not budgeted.
- . Ewa Tenney Village Fire Station--beyond six years; site undetermined; funds not budgeted.
- . Relocation of Ewa Beach Fire Station--within six years; site undetermined; funds not budgeted.
- . Ewa Transportation Corridor--beyond six years; site determined; funds not budgeted.
- . Ewa Park-and-ride Facility--beyond six years; site undetermined; funds not budgeted.
- . Kahe Point and Kapolei Village Park-and-ride Facilities--within six years; sites undetermined; funds not budgeted.
- . West Loch Park and Ride Facility--within six years; site determined; funds not budgeted.
- . Transportation Center Complex, Ewa Villages--beyond six years; site undetermined; funds not budgeted.
- . Improvements to Farrington Highway from Kalaeloa Boulevard to Fort Weaver Road--beyond six years; site determined; funds not budgeted.

- . H-1/Makakilo Interchange--beyond six years; site determined; funds not budgeted.
- . Ewa Desalting Plant--construction under way.

With added population, Ewa will need new roadways, highway interchanges, and commuting facilities. These are nearly all planned for later than the next six years.

4.0 SOCIAL AND ECONOMIC IMPACTS

This section includes analysis of:

- . Community issues and concerns relating to the proposed Lualualei golf course;
- . Displacement or relocation of existing uses and occupants;
- . Employment and income impacts;
- . Fiscal impacts;
- . Recreational impacts; and
- . Anticipated impacts on the surrounding community, including opportunities for resident employment, support for community activities and organizations, and impacts on land values and property taxes.

Mitigation of adverse impacts and provision of benefits to the community by the developer are discussed in connection with impacts, rather than in a separate section.

4.1 COMMUNITY ISSUES AND CONCERNS

This subsection outlines the major community issues and concerns that have emerged as of December 1990.

4.1.1 Methods

To assess major community issues and concerns, Community Resources interviewed people both within and outside the Waianae Coast community. All together, more than 60 people were interviewed--a large majority of them residents of the Waianae Coast Community.

Interviews were held with residents of Nanakuli and Waianae, Hawaiian Homes homesteaders, members of the Waianae Neighborhood Board, members of the Kupuna Council, members of the Ewa Neighborhood Board, members of the Waianae Hawaiian Civic Club and members of various conservation groups.

Appendix A provides a list of interviewees, along with some of their organizational affiliations. Informants spoke as individuals, not as representatives of their organizations, but their affiliations provide an indication of the groups and viewpoints known to the informants.

Interviews were loosely structured, usually beginning with questions about background issues and then moving to the

specifics of the Lualualei project. Informants were told that overall input would be summarized in the social impact report for the EIS, but that individual comments would be kept confidential.

The purpose of the interviews, conducted in November and December 1990, was to identify major community issues and concerns. It was not a random public opinion survey. It provides a snapshot in time of community concerns, but the strength of particular concerns in the larger community cannot be quantified. Earlier issues and concerns that provide a context for understanding community response to the project include study area issues independent of the project, noted in Section 2.6, and the islandwide debate concerning golf course development that occurred in 1988-90. That debate is summarized in Section 4.1.3.

4.1.2 Community Involvement and Response

Until recently, there has been little constructive interaction between the developer of the proposed golf course and the residents who would be affected by it.

Mr. Sanjiro Nakade purchased the 259.25 acres in Lualualei, and it was soon revealed that a golf course was planned for the acreage. Mr. Royei Higa, then 69, received notice that the five-year lease on his 15-acre farm on the property was being revoked and his family would be evicted. The story received prominent play in the Honolulu newspapers in early 1988.

The initial news articles stirred community sympathy to opposition to the eviction and plans to develop the 18-hole golf course. A quotation from Mr. Higa in the Honolulu Advertiser-- "You can eat vegetables, but you no can eat golf balls"--became a rallying cry of opponents to the eviction and golf course proposal.

In April 1988, opponents to the eviction and proposed golf course staged a benefit concert and farm fair, attended by several hundred people, to save the Higa farm and oppose further development on the Waianae Coast (Yamaguchi, 1988a).

The Waianae Neighborhood Board unanimously called for denial of City permits required for non-conforming use of Agricultural lands. The City Council passed a resolution (No. 88-115) asking the Department of Land Utilization to deny a conditional use permit for the Lualualei golf course. The Council's explicit reasons for the resolution were (a) the use of land rated as "B" for agriculture; (b) the displacement of an agricultural tenant; and (c) a conditional use must contribute to the general welfare of the community or surrounding neighborhood.

The controversy also spurred State legislators to call for a re-examination of a 1985 law allowing golf courses to be built on agricultural land. Despite much public discussion, the law stands as written.

The landowner eventually reached a settlement with Mr. Higa, and when the golf course proposal was tabled, the controversy disappeared from the news media.

4.1.3 The Islandwide Reaction to Proposed Golf Developments

The 1988 Lualualei proposal was only one of several golf course projects critically received by the Oahu public. Applications for, or inquiries about, new golf course developments expanded dramatically during 1988 and 1989. Since 1985, Honolulu's Department of Land Utilization (DLU) has received nearly 40 applications or inquiries. The number of active projects fluctuates, as proposals are withdrawn or revived.

Golf course development has increasingly become a major public issue in recent years on both Oahu and the Neighbor Islands. While some economists view golf as a land-based export industry that is highly advantageous for Hawaii (Bank of Hawaii, 1989), others oppose golf course development strongly. In a public opinion survey taken in August 1990, 76% of the 800 respondents said golf courses are bad for Hawaii (Burris, 1990). Still, some residents support golf course development--mainly for economic and recreational reasons.

Several issues combine in many citizens' suspicions of golf course development, including environmental concerns, concerns about land use planning and control, attitudes toward growth in general, and views of Japanese ownership of land and businesses in Hawaii.

In 1990, two new golf courses opened in Leeward Oahu, the first new courses on the island since 1973. Others are under construction, but most of the course proposals have either been denied permits or have been withdrawn. Consequently, some of the most visible courses are projects now under construction which were awarded permits in the mid-1980's, when the provision of tee times to residents at reduced rates and other community benefits were not demanded.

Residents' concerns about golf courses are both general and site-specific. In most cases, site-specific issues must be viewed as general concerns, since some residents expect that problems noticed in one place will arise again elsewhere. Hence this summary of concerns includes issues which do not apply to all courses, but which many expect to be true of golf courses and golf-related developments.

Sources for this summary include newspaper and magazine reports (including Dayton, 1990; Dooley 1988, 1990; Essoyan, 1989; Hartwell, 1988; Oshiro, 1990; Yamaguchi 1988a, 1988b; Young, 1988); editorials and letters to the editor (Black, 1989; Honolulu Advertiser, 1989a, 1989, 1990; Murakami, 1988; Owens, 1989; Shimabuku, 1989; Teesdale, 1988); reviews of public testimony and letters in response to Environmental Impact

Statements (EIS's) (Grady, 1989; Hawaii Real Estate Research and Education Center, 1990); social impact assessments of golf course proposals (Community Resources, Inc., 1988, 1989b; Earthplan 1990); and a City and County summary report (City and County of Honolulu, 1989).

Table 13 provides a partial indication of Oahu residents' concerns, as aired in City Council hearings in 1989 and EIS letters. The table shows that different issues take on importance in different settings. Oahu residents' concerns with golf development in general include:

- . **Anticipated environmental impacts:** Water usage and the possibility that pesticides and other chemicals used on golf courses could affect groundwater are often mentioned as concerns. In some cases, golf courses are seen as affecting wetlands on or near the proposed projects.
- . **Anticipated impacts on agriculture:** Some officials and residents are concerned that golf course development raises the price of open land, including agricultural land, thus lowering the viability of agriculture as a land use. Similarly, City officials have asserted that land acquisition for golf courses somehow makes agricultural land too expensive for housing development. In specific cases, the displacement of farmers has been of concern, and some think that golf courses generally are displacing agriculture.

(At a general level, economists have argued that golf could replace plantation agriculture as an income-generating land use, to the benefit of Hawaii.)

- . **Impacts on nearby communities:** Some expect golf courses to affect nearby property values and land uses, bringing higher values, and hence higher taxes. In some "country" and agricultural areas, increased traffic due to golfers is a concern. Golf courses are expected to attract affluent outsiders--as visitors or perhaps as new residents--to outlying communities, resulting in social friction.
- . **Employment:** Some see golf courses as a source of nearby jobs for residents of communities far from urban centers. Others have contended that golf course employment is small and not well-paid.
- . **Concerns over land ownership and use:** Many residents express concern over the acquisition of large parcels by foreign owners and the dedication of so much land acreage to a game. The cumulative effect may be experienced as a loss of control over Hawaii's land. A less often

TABLE 13: FREQUENCY OF MENTION OF ISSUES IN CITY AND COUNTY HEARINGS ON GOLF COURSES AND OAHU ENVIRONMENTAL IMPACT STATEMENT LETTERS

<u>Public Hearings (1)</u>		<u>Environmental Impact Statements (2)</u>	
Issue	%	Issue	%
Compatibility with land use policies	90%	Permits	45%
Community issues	76%	Housing	73%
		Public safety	64%
		Location	45%
Hydrology, drainage	57%	Water	100%
		Wastewater, drainage	82%
		Coastal ecosystem	55%
Soils, Agriculture	38%	Agricultural land	91%
Lifestyles	38%	Bus service, park and ride, child care	27%
Hazards	38%		
Employment, economy	33%		
Population and socio-economic character	24%	Socio-economic impact	18%
		Population	27%
Public facilities	19%	Parks, recreation	55%
		Fire stations	55%
Fiscal impacts	19%	Public utilities	55%
		Schools	36%
		Police (personnel)	27%
		Refuse service	9%
Historical, archaeological and geographic issues	10%	Archaeological, hist. sites	100%
Physiography, geology	10%	Runoff, floods, erosion	91%
		Pesticides	73%
Flora and fauna	10%	Endangered species	82%
Infrastructure	10%	Traffic	82%
		Roadways	73%
		Infrastructure	36%
Air quality	5%	Air quality	45%
		Noise, nuisance	100%
		Pests, odor, dust	27%

NOTES:

(1) Adapted from Hawaii Real Estate Research and Education Center (1990), Table 3.

(2) Adapted from Ibid., Table 4, counting only the 11 Oahu EIS's included in that table.

expressed view is that golf courses preserve land in open space, providing visual benefits and keeping land open for the future.

- . **Return of Profit to Hawaii:** Developers are perceived as likely to make large profits from the sale of golf course memberships overseas. Some object to such profits under any conditions. Officials have suggested that exactions or development agreements should insure that developers of new golf courses provide sizable sums to local communities or government bodies, so as to return to the islands some of the income made from golf course development.
- . **Demand for golf:** New golf courses are widely seen as responding to demand from visitors. Some golfers see such demand as limiting their own opportunity to play, and welcome new courses as lowering the demand for golf tee times, whether at the new courses or existing ones. Interest in additional municipal courses is often mentioned. (Many golfers add that rates at proposed non-municipal courses are too high for their liking.)

4.1.4 Current Study Area Resident Issues and Concerns

The following issues and concerns have been identified from interviews. Although individual responses differed, differences in perspective among the various groups were small. Table 14 lists the major issues raised by Waianae Coast residents. For each group, issues are listed according to judgments of relative frequency of mention for the group. The table shows little difference in priorities for the two groups of residents.

While study area residents shared a common perspective, some variation followed from informants' involvement in activities closer to or further from the project site. Nanakuli/Maili/Lualualei residents mentioned possible property tax increases as a problem for adjacent properties, while Waianae and Ewa interviewees were concerned with a perceived general trend of golf courses affecting property taxes. Nearby residents saw a possible link between the course and their high school, while people living at a greater distance wondered whether the course would offer any benefits to the community. (However, the issue of jobs for nearby residents was mentioned more by Waianae informants than by Nanakuli/Maili/Lualualei residents. This difference may be illusory--the clearest message in the data is that residents of the Waianae Coast, not just Maili residents, are interested in more jobs in the immediate area.)

Although widespread negative publicity occurred in early 1988, community opposition to the project has since lessened considerably. According to residents, opposition to the project has fallen off for three major reasons:

TABLE 14: MAJOR ISSUES AND CONCERNS OF WAIANAЕ COAST RESIDENTS WITH REGARD TO THE LUAIJALEI GOLF PROPOSAL, 1990

NANAKULI/MAILI/LUAIJALEI RESIDENTS

Development would lessen chance of brush fires

The golf course could increase traffic slightly

Nearby property taxes could increase. Development could also incite speculation in the area.

The course would make Junior Golf a possible element in school activities

Concern that the course could overburden the water system

Interest in community benefits

Concern that golf development could lead to increased racial antagonism against Japanese developers

The course could be a nearby customer for local produce

WAIANAЕ RESIDENTS

Concern that the golf course could --- but sense that it would not -- affect existing Waianae Coast lifestyles

Golf development would be preferable to idle brush land

Golfers will benefit, but the general Waianae Coast community would likely not benefit from the course

Job opportunities near home

Concern that all profits from the golf course will go to Japan

Concern that the golf course could overburden the local sewage system

- . The tenants (that is, the Higa family) have settled with the developer and have been relocated;
- . There are no plans for resort development on the land; instead, an 18-hole golf course with a nursery would be built; and
- . The proposed development will provide jobs for local residents near their homes.

Resident issues and concerns with regard to the Lualualei proposal include:

- . Golf course development would clear the land, reducing the area where brush fires can occur;
- . The golf course would increase traffic slightly;
- . Concern that golf course development could affect existing lifestyles, coupled with the belief that the specific Lualualei proposal would not have far-reaching effects;
- . Golf course development could increase land values and therefore real property taxes, or it could lead to land speculation by owners of adjacent lands;
- . The golf course might make it possible for a junior golf program to be part of school activities;
- . The golf course could overburden the current water and sewage systems;
- . Interest in the developer's proposals for community benefits, especially with support for "affordable" housing.
- . Concern that the local community would derive few benefits from the golf course itself;
- . Interest in job opportunities near home;
- . Concerns about anti-Japanese sentiment in the area; and
- . Interest in the golf course as a possible customer for local farmers' produce.

In general, the consensus of opinion on the Waianae Coast area seems to be that residents would accept the golf course if the developer would work closely with community groups in the area and offer a number of jobs to local residents.

Residents of both Nanakuli and Waianae expressed the belief that potential tensions and conflicts might be relieved if the developer works closely with the community and its leaders--

especially with long-time residents such as members of the Kupuna Council.

4.2 DISPLACEMENT/RELOCATION OF EXISTING USES AND OCCUPANTS

Since no one has been living on the property for more than a year, there will be no displacement or relocation of occupants.

Aside from the 15-acre Higa family farm, the rest of the property has lain vacant and unused for many years, so development of the site as a golf course would have minimal effect on current agricultural activity in the area.

4.3 EMPLOYMENT IMPACTS

Employment opportunities are generated by the project directly through jobs created for the construction and operation of the development. In addition, indirect and induced employment is also expected. Indirect employment is created by jobs generated as a result of the purchase of goods and services required for the construction and operation of the project. Induced employment consists of jobs generated through the purchase of goods and services from the incomes of people with jobs directly and indirectly created by the project.

4.3.1 Construction Phase

During the construction phase, which will take approximately 24 months, total direct, indirect, and induced employment is estimated at 170 person-years, as shown in Table 15. A "person-year" is a year's full-time work for one worker. This standard measure is necessary because different projects take different lengths of time. The indirect and induced jobs were computed using employment multipliers from the Input-Output model of the economy developed by the Hawaii State Department of Business and Economic Development.

Direct employment for the construction of the golf course and the clubhouse involves both on-site and off-site jobs. Off-site jobs are those associated with administrative, transport, and service types of work. These jobs will be approximately 25 percent of direct on-site jobs. Direct employment in landscaping and field preparation for the nursery, however, is limited to on-site jobs. The direct on-site jobs are expected to total 57 person-years; off-site jobs amount to 10 person-years.

Construction generates nearly all the indirect and induced jobs forecast for the construction phase. Landscaping and nursery preparation account for only seven of 102 indirect and induced person years.

TABLE 15: PROJECTED EMPLOYMENT IMPACTS, CONSTRUCTION PHASE,
LUALUALEI GOLF COURSE

A. DIRECT ON-SITE EMPLOYMENT

	Average Number of Persons	Time Frame (mos.)	Person- Years
Golf course construction	16	18	24
Clubhouse construction	15	12	15
Golf course preparation	20	6	10
Nursery preparation (1)	15	6	8
SUB-TOTAL			57

B. TOTAL DIRECT EMPLOYMENT

All on-site construction	39 person-years
Off-site construction(@ 25 % of on-site)	10 person-years
On-site golf course preparation	10 person-years
On-site nursery preparation	8 person-years
TOTAL	67 person-years

C. TOTAL DIRECT, INDIRECT, AND INDUCED EMPLOYMENT

Direct employment (from construction)	49
X industry employment multiplier (2)	2.97
SUB-TOTAL	145
Direct employment (golf course preparation)	10
X industry employment multiplier (3)	1.45
SUB-TOTAL	15
Direct employment (nursery preparation)	8
X industry employment multiplier (4)	1.24
SUB-TOTAL	10
TOTAL DIRECT, INDIRECT, AND INDUCED FOR CONSTRUCTION PHASE	170 person-years

NOTES:

- (1) It is assumed that the nursery operations are of the open-field type. Estimated at one worker per acre for 6 months based on personal communication with Dr. Fred Rauch, Horticulture Specialist, University of Hawaii at Manoa, November, 1990.
- (2) Type 2 employment multiplier for "Other construction".
- (3) Type 2 employment multiplier for "Other agricultural products".
- (4) Type 2 employment multiplier for "Nursery and greenhouse products".

SOURCE Hawaii State Department of Business and Economic Development, Research and Economic Analysis Division, Unpublished multipliers from the 1982 State Input-Output Model.

4.3.2 Operations Phase

The analysis of employment impacts during the operations phase requires a different approach. A project can have employment impacts on the economy if it can be identified as the sole source of the impact. In the case of a golf course project which serves both visitors and residents alike, the portion of the project's business attributable to visitor spending can be considered as a sole source of impact. Visitor spending is estimated to be 40 percent of all spending in the project.

The project is expected to generate about 70 direct jobs. However, the employment impacts to the economy attributable to visitor spending will total an estimated 45 direct, indirect, and induced jobs as shown in Table 16.

4.4 INCOME IMPACTS

The analysis of the project's income impacts on the economy follows the same principles used for employment impacts. Both direct income impacts and its multiplier effects can be calculated.

During the construction phase, the total gross income generated by the project amounts close to \$5 million (in 1990 dollars) as shown in Table 17. In the operational phase, it is estimated that direct, indirect, and induced jobs supported by visitor spending will account for incomes of about \$1 million annually.

4.5 FISCAL IMPACTS

Fiscal impact assessment is an analysis of the impact on government costs and revenues associated with the project. Net revenue, or revenues minus costs, is calculated as well as the cumulative balance over a period of time.

The analysis provides separate fiscal impact assessments for the State and County governments. The State government's revenues would increase with the project through general excise tax and income tax collections, whereas the County government would gain mainly from increased property taxes.

To estimate increased government expenditures, an "average cost" method was used. Government costs are estimated in terms of the average cost of government per capita for the population served. The proposed golf course without membership cannot plausibly be treated as attracting new visitors to the City and County of Honolulu. It is not impossible that a few specialists on the golf course would be newcomers to Oahu. These employees and their families might amount to less than 15 people. Any increase in government costs, therefore, would be attributed to this increase in population.

TABLE 16: PROJECTED EMPLOYMENT IMPACTS, OPERATIONS PHASE,
LUALUALEI GOLF COURSE

A. DIRECT EMPLOYMENT

Type of Job	Number of Persons (1)	Base or Starting Wages (1)
Golf Operations	16	\$355,000
Grounds Department	20	\$385,000
Nursery Production	4	\$79,000
Clubhouse Administration	5	\$105,000
Clubhouse Food and Beverage	25	\$410,000
TOTAL	70	\$1,334,000

B. DIRECT, INDIRECT, AND INDUCED EMPLOYMENT IMPACTS

Industry (2)	Direct Employment	Visitor Share (3)	Industry Multiplier	Direct, Indirect, and Induced Employment Impacts (4)
Amusement Services	41	40 %	1.49	24
Eating and Drinking	25	40 %	1.89	19
Nursery and Greenhouse Production	4	40 %	1.24	2
TOTAL	70			45

NOTES:

- (1) Jobs are full time employment positions; many could be held by part-time employees. Base wages are in 1990 dollars based on comparable golf course rates (CRI interviews) and personal communication with Nils Morita, Research Statistician, Hawaii Agricultural Statistics Service Branch, Hawaii State Department of Agriculture, December 27, 1990. These 1990 figures are conservative, in that they do not reflect either expected future demand for golf course workers or higher wages for skilled personnel.
- (2) Industry definitions and multipliers from the 1982 State Input-Output Model (unpublished tabulations, Hawaii State Department of Business and Economic Development, Research and Economic Analysis Division). Direct jobs are classified based on the industries shown.
- (3) Based on allocation of golf rounds at the course.
- (4) Employment impacts consists of jobs attributable to visitor spending, not the total direct employment at the course, and associated indirect and induced jobs.

TABLE 17: PROJECTED DIRECT, INDIRECT, AND INDUCED INCOME IMPACTS, LUALUALEI GOLF COURSE

A. CONSTRUCTION PHASE		
Direct construction jobs		49
Average industry wage, 1989	(1)	\$35,020
Direct income		<u>\$1,715,980</u>
Industry income multiplier	(2)	2.21
SUB-TOTAL		\$3,792,316
Direct landscaping jobs		10
Average industry wage, 1989	(1)	\$33,336
Estimated direct income		<u>\$333,360</u>
Industry income multiplier	(2)	1.69
SUB-TOTAL		\$563,378
Direct nursery jobs		8
Average industry wage, 1989	(1)	\$20,904
Direct income		<u>\$167,232</u>
Industry income multiplier	(2)	1.59
SUB-TOTAL		\$265,899
TOTAL INCOME FROM CONSTRUCTION PHASE		\$4,621,593
TOTAL INCOME ADJUSTED TO 1990 DOLLARS (3)		<u>\$4,875,781</u>
B. OPERATIONAL PHASE		
Direct income, Amusement services		\$845,000
Visitor share	(4)	40%
Adjusted direct income		<u>\$338,000</u>
Industry income multiplier	(2)	1.92
SUB-TOTAL		\$648,960
Direct income, Eating and drinking		\$410,000
Visitor share	(4)	40%
Adjusted direct income		<u>\$164,000</u>
Industry income multiplier	(2)	2.03
SUB-TOTAL		\$332,920
Direct income, Nursery production		\$79,000
Visitor share	(4)	40%
Adjusted direct income		<u>\$31,600</u>
Industry income multiplier	(2)	1.59
SUB-TOTAL		\$50,244
TOTAL ANNUAL INCOME FOR OPERATIONAL PHASE		\$1,032,124
TOTAL INCOME ADJUSTED TO 1990 DOLLARS (3)		<u>\$1,088,891</u>

NOTES:

- (1) Source: Hawaii State Department of Labor and Industrial Relations, 1990.
- (2) Industry definitions and multipliers from 1982 State Input-Output Model, Hawaii State Department of Business and Economic Development, Research and Economic Analysis Division.
- (3) Adjustment based on increase in Consumer Price Index (Urban) for Honolulu. (Hawaii State Department of Business and Economic Development, 1990b).
- (4) Based on allocation of golf rounds at the course.

The alternative "marginal cost" approach consists of identifying the specific government expenditures (on capital improvements, personnel, and the like) made necessary by the development. Since no such expenditures are apparent, this approach would indicate that the project has no effect on government expenditures. The "average cost" method is used here in order to reach a maximal estimate of government costs, and hence disclose a potential adverse impact.

4.5.1 State Revenues and Expenditures

Revenues:

Construction Phase. Total revenues collected from the project will amount to an estimated \$1 million as shown in Table 18. The source of revenues comes from the following:

- An estimated \$880,000 collected as general excise tax on total construction cost of \$22 million;
- An estimated \$231,000 collected from individual tax returns of the workforce generated directly or as indirect/induced impacts. Such workforce income amounts to \$5 million.

Operations Phase. When the golf course is operational, the annual increase in State revenues would amount to about \$312,000 from the following sources as shown in Table 18:

- An estimated \$260,000 in general excise tax collections from the annual business income from operations. Business income includes golf fees, sales from the pro shop, and sales from food and beverage. It includes all transactions involving both residents and visitors. Visitor spending is relatively higher than spending by residents.
- Workforce income tax collections amounting to \$52,000 for 70 direct jobholders and 17 direct and induced jobs.

Expenditures: The developer of the proposed golf course would pay for project infrastructure and proposes to make contributions for nearby infrastructure projects, such as water supply and extension of the public sewer system in the adjacent communities. There are no obvious State expenditures directly associated with this project.

In order to estimate any costs incurred by the State government, the per capita expenditure approach is applied. Total expenditures per resident is presented in Table 19, which shows an average cost figure of nearly \$3,000 per Hawaii resident. Any

TABLE 18: PROJECTED STATE REVENUES FROM LUALUALEI GOLF COURSE
(CONSTRUCTION AND OPERATIONS)

A. CONSTRUCTION PHASE

General Excise Tax:

Estimated construction cost		\$22,000,000	
Tax rate	(1)	4.00%	
Estimated Revenue			\$880,000

Income Tax:

Estimated total construction workforce income	(2)	\$4,875,781	
Hawaii income tax as % of personal income	(3)	4.74%	
Estimated Revenue			\$231,112

TOTAL REVENUE FROM CONSTRUCTION PHASE (1990 \$) \$1,111,112

B. OPERATIONAL PHASE

General Excise Tax:

Estimated annual business income from operations		\$6,515,674	
Excise tax	(1)	4.00%	
Estimated revenue			\$260,627

Income Tax:

Estimated total operational workforce income	(2)	\$1,088,891	
Hawaii income tax collections as % of personal income	(3)	4.74%	
Estimated revenues			\$51,613

TOTAL ANNUAL REVENUES FROM OPERATIONAL PHASE (1990 \$) \$312,240

NOTES:

- (1) Based on 1988 General Excise Tax Collections for the State of Hawaii.
- (2) As shown in Table 17.
- (3) Computed on the basis of net labor and proprietors income and total individual tax collection for 1988.

SOURCES: Hawaii State Department of Business and Economic Development, 1989; Tax Foundation of Hawaii, 1989.

TABLE 19: PER CAPITA ALLOCATION OF STATE OF HAWAII GOVERNMENT EXPENDITURES,
1988

Function (1)	1988 Expenditures	Service Population Includes Visitors?	Expenditures per Resident (2)	Expenditures per Visitor (2)
General Government	\$227,087,985	No	\$206.78	—
Public Safety	\$112,668,465	Yes	\$92.44	\$92.44
Highways	\$78,624,434	Yes	\$64.51	\$64.51
Natural Resources	\$36,031,668	Yes	\$29.56	\$29.56
Health and Sanitation	\$126,173,783	Yes	\$103.52	\$103.52
Hospitals and Institutions	\$104,934,445	No	\$95.55	—
Public Welfare	\$380,823,381	No	\$346.77	—
Education	\$886,244,283	No	\$807.00	—
Recreation	\$19,221,645	Yes	\$15.77	\$15.77
Utilities	\$194,074,820	No	\$176.72	—
Debt Service	\$279,664,578	No	\$254.66	—
Retirement and Pension	\$131,079,086	No	\$119.36	—
Employees' Health and Hospital Insurance	\$441,644	No	\$0.40	—
Unemployment Compensation	\$55,827,128	No	\$50.84	—
Grants-in-Aid to Counties	\$32,867,045	No	\$29.93	—
Urban redevelopment and Housing	\$146,462,001	No	\$133.37	—
Cash Capital Improvements	\$109,635,672	Yes	\$89.95	\$89.95
Miscellaneous	\$58,877,586	No	\$53.61	—
TOTAL	\$2,980,739,649		\$2,670.74	\$395.76
ADJUSTED TOTAL (1990 DOLLARS)			\$2,980.17	\$441.62

NOTES:

(1) As identified in the Government in Hawaii, 1989, Tax Foundation of Hawaii.

(2) Based on a 1988 mid-year resident and de facto population of 1,098,200 and 1,218,800 respectively.

increase in government costs is associated with an increase in the population due to the project. As mentioned before, the project will result in an estimated increase of less than 15 newcomers to Oahu.

Table 20 shows the total annual increase in State government expenditures to range from \$18,000 to \$42,000. However, the increase in revenues more than offsets the increase in costs (also shown in the same table), with net revenues ranging from \$271,000 to \$294,000. Over a 25 year period and over a 50 year period, the net increase in revenues would range from \$6.8 million to \$7.4 million, and \$13.5 million to \$14.7 million, respectively.

4.5.2 County Revenues and Expenditures

Revenues:

Construction Phase. As shown in Table 21, County revenues when the golf course is being constructed and prepared will amount to about \$10,000 from building permits.

Operational Phase. The County of Honolulu will collect an estimated \$180,000 to \$181,000 in annual revenues derived from the operation of the golf course project. These revenues are an aggregate of the following:

- . An increase of \$179,500 will be generated from real property taxes. The golf course project itself raises the value of the land and buildings within the site. It is also possible that the adjacent lands and property will increase in value due to the influx of commercial activities from the project. However, such analysis is not within the scope of this study.
- . Other sources of County revenues such as licenses, fees, fines, penalties, and other earnings are sensitive to any increase in population. Following the same approach applied to State government expenditures, it is estimated that total increase in revenues for the county due to population growth is between \$700 to \$1,500 annually.

Expenditures: There are no known County expenditures directly in response to the infrastructure needs of the project. It is proposed that any infrastructure improvements will be the responsibility of the developer.

By the same principles used for State expenditures, Table 22 shows that expenditures per resident amounts to an estimated

TABLE 20: BALANCE OF INCREASE IN REVENUES AND COSTS, STATE OF HAWAII
FROM LUALUALEI GOLF COURSE DEVELOPMENT

A. ANNUAL INCREASE IN STATE REVENUES (OPERATIONS PHASE)

Excise tax revenues	\$260,627		
Income tax revenues	\$51,613		
TOTAL ANNUAL INCREASE IN REVENUES			\$312,240

B. ANNUAL INCREASE IN STATE EXPENDITURES (OPERATIONS PHASE)

Average cost of government services per resident	\$2,980		
Increase in number of residents due to golf course development	6 to 14		
TOTAL ANNUAL INCREASE IN EXPENDITURES		\$17,880	to \$41,720
NET ANNUAL INCREASE (REVENUES MINUS EXPENDITURES)		\$270,520	to \$294,360

C. BALANCE OF REVENUES MINUS EXPENDITURES (in constant 1990 dollars)

Annual net increase in revenues (after deduction of estimated costs)		\$270,520	to	\$294,360
25 year net increase		\$6,763,000	to	\$7,359,000
50 year net increase		\$13,526,000	to	\$14,718,000

TABLE 21: PROJECTED COUNTY REVENUES FROM LUALUALEI GOLF COURSE
(CONSTRUCTION AND OPERATIONS PHASES)

A. CONSTRUCTION PHASE

Building and grading permits (1) \$9,284

TOTAL REVENUES FROM CONSTRUCTION PHASE \$9,284

B. OPERATIONS PHASE

I.1. ESTIMATED TOTAL TAX REVENUES FROM REAL PROPERTY (2)

Property	Estimated Assessed Value (1990 \$)	Tax Rate per \$1000 Value (\$)	Estimated Tax Revenues (\$)
Golf course (176 acres)	\$18,000,000	9.00	\$162,000
Clubhouse area (1 acre)	\$100,000	9.45	\$945
Clubhouse building	\$2,500,000	9.45	\$23,625
Conservation area (68 acres)	\$6,780	9.00	\$61
Nursery area (15 acres)	\$766,500	9.00	\$6,899
All other buildings	<u>\$1,000,000</u>	9.00	<u>\$9,000</u>
TOTAL	\$22,373,280		\$202,530

I.2. INCREASE IN ANNUAL TAX REVENUES FROM REAL PROPERTY

Future taxes on project site	\$202,530
1990 Taxes on project site	<u>\$22,922</u>
DIFFERENCE	\$179,608

II. ANNUAL INCREASE IN REVENUES SENSITIVE TO POPULATION GROWTH

Revenues per resident	\$111
Estimated increase in population attributable to golf course	6 to 14
ESTIMATED ANNUAL INCREASE IN REVENUES FROM POPULATION	\$667 to \$1,556

TOTAL ANNUAL REVENUE INCREASE, OPERATIONS PHASE \$180,275 to \$181,164

NOTES:

- (1) From estimates provided by Building Department, City and County of Honolulu, November, 1990.
- (2) Acreages may vary in final plans for the course. Assessments based on City and County of Honolulu assessments for comparable courses and on discussions with Honolulu real property tax assessors concerning current trends in golf course assessment.

TABLE 22: PER CAPITA ALLOCATION OF GOVERNMENT EXPENDITURES,
CITY AND COUNTY OF HONOLULU

Function (1)	1988 Expenditures	Service Population Includes Visitors?	Expenditures per Resident	Expenditures per Visitor (2)
General Government	\$52,864,940	No	\$63.05	—
Public Safety	\$125,214,503	Yes	\$138.73	\$138.73
Highways	\$20,508,447	Yes	\$22.72	\$22.72
Health and Sanitation	\$50,607,902	Yes	\$56.07	\$56.07
Economic and Urban Development	\$22,145,879	No	\$26.41	—
Recreation	\$34,677,176	Yes	\$38.42	\$38.42
Mass Transit	\$47,194,216	No	\$56.28	—
Interest	\$35,784,218	No	\$42.68	—
Bond Redemption	\$17,143,570	No	\$20.45	—
Retirement and Pension	\$33,334,162	No	\$39.75	—
Cash Capital Improvements	\$48,437,101	Yes	\$53.66	\$53.66
Miscellaneous	\$29,544,886	No	\$35.24	—
Total	\$517,457,000		\$593.45	\$309.60
Adjusted Total (1990 Dollars)			\$662.21	\$345.47

NOTES:

(1) As identified in Tax Foundation of Hawaii, 1989.

(2) Based on 1988 mid-year resident and de facto populations of 838,500 and 902,600 respectively
(Hawaii State Department of Business and Economic Development, 1989).

\$700. This would bring the total increase in County expenditures of between \$4,000 and \$9,000 as shown in Table 23.

The City and County of Honolulu stands to gain in annual net revenues once the project is operational. The net increase is estimated to range from \$171,000 to \$177,000 annually. This would lead to accumulative amounts of \$4.3 million to \$4.4 million after 25 years, and \$8.6 million to \$8.8 million after 50 years.

4.6 POPULATION IMPACTS

Residential: Since there is no housing component to the project and the single tenant has been located, there will be no residential impact.

De Facto: Basing the golfer population on an average of 250 rounds per day, and assuming that about two-thirds of the golfers and three-fourths of the employees are physically present during peak hours, the project site would have about 200 people present at the busiest times.

4.7 RECREATIONAL IMPACTS

Unlike many golf courses proposed in recent years, the Lualualei project would provide more golf rounds for residents than for visitors to the island. Specific benefits proposed for residents include:

- . Allocation of 60% of golf rounds to residents;
- . Establishment of resident golf rates that would be less than 50% of visitor rates;
- . Developing a junior golf program, including play by local young people and free play for high school tournaments.

The resident rates would benefit golfers from all over Oahu. The junior golf program will likely affect the Waianae Coast community more than others. Also, the special rates for early or late play will be especially attractive to golfers who live a short distance from the course.

4.8 IMPACTS ON THE SURROUNDING COMMUNITY

4.8.1 Employment and the Surrounding Community

Many Waianae Coast residents identify unemployment and underemployment as problems for their area. They express interest in jobs near home, and identify long commutes as a major problem for area families and communities.

TABLE 23: BALANCE OF ANNUAL INCREASE IN REVENUES AND COSTS, CITY AND COUNTY OF HONOLULU, FROM LUALUALEI GOLF COURSE

A. ANNUAL INCREASE IN COUNTY REVENUES

Increase in real property revenues	\$179,608		
Revenues sensitive to population growth	\$1,111		
TOTAL ANNUAL INCREASE IN REVENUES			\$180,719

B. ANNUAL INCREASE IN COUNTY EXPENDITURES

Average cost of government services per resident	\$662		
Increase in number of residents due to golf course development	6 to 14		
TOTAL ANNUAL INCREASE IN EXPENDITURES		\$3,973	to \$9,271

C. BALANCE OF REVENUES MINUS EXPENDITURES

Annual net increase in revenue after estimated cost deductions	\$171,448	to	\$176,746
25 year net increase	\$4,286,212	to	\$4,418,654
50 year net increase	\$8,572,423	to	\$8,837,307

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Project jobs are hence attractive as a response to perceived community needs. Project operations jobs will offer both outdoor and indoor work. Along with jobs suitable for full-time breadwinners, the golf course can offer jobs for part-time workers supplementing family incomes and for young people who are just starting out.

Most of the jobs likely to be available require little technical training or experience. They offer the characteristic advantages and disadvantages of service-industry jobs--easy entry for younger or less educated workers, but relatively few jobs offering high compensation.

The developer has made a commitment to hire community residents as much as possible. The developer will support training programs for new workers. In addition, training programs helping project employees advance in their fields will be supported by the developer.

The impact of the project will be affected by the development of the Ko Olina Resort. With many new jobs created just outside the Waianae Development Plan Area, the study area's need for new jobs will decrease significantly. Nonetheless, the project will provide a variety of jobs, and will locate them closer to home for many Waianae Coast residents than Ko Olina. Also, the project may be a more congenial workplace for some residents than Ko Olina, since the project is proposed as a resident-oriented golf course, rather than a resort course.

By providing jobs near community residents' homes, the project will help some residents have time for family and community activities. It will thus respond to the concern expressed by community interviewees that Waianae Coast residents' long commutes have an adverse impact on family life.

4.8.2 Involvement with Community Organizations and Community Development

The developer has indicated readiness to contribute to the nearby community in several ways:

- . Cash contributions will be made. The amount will be based on a percentage of profits from operations. These funds could be directed to various community goals, depending on current needs, from the perspectives of the community and government authorities, for example:
 - * Contributions could go to the Hawaii State Department of Hawaiian Homelands to help implement plans for housing for Nanakuli area residents;
 - * Funds could be given to City and County agencies in order to help pay for the construction of water system

infrastructure or sewer improvements in the Nanakuli/Maili/Lualualei area; and/or

- * The golf course's contributions could go to community causes selected by a board of community leaders.

The sums involved have been estimated by the developer's representative as \$90,000 annually (in 1990 dollars) for the duration of project operations. The specific amounts to be contributed and the mechanism whereby recipients will be designated will be clarified through discussions with the City and County of Honolulu.

It is anticipated that these and other community benefits will be spelled out in development agreements with the City and County.

- . Meeting rooms in the clubhouse will be made available to facilities and other services will be available for free, or for minimal charges to cover salaries.

By providing rooms and services, the project will enable community groups to meet and to celebrate their association. This benefit will likely help local groups in the Nanakuli/Maili/ Lualualei area to encourage greater participation in group activities.

- . As noted above, the course's junior golf program will allow Nanakuli High School (and perhaps Waianae High School) players to practice, as well as to sponsor competitions at the course.

The proposed benefits will make the golf course a contributor to the local community, and will encourage community use of project facilities.

4.8.3 Impacts on Property Values and Taxes

Anticipated Impacts: In the debate over golf course development on Oahu, some residents expect golf courses to have extremely broad impacts on property values and taxes. Potential impacts of concern include:

- . Immediate impacts. Some citizens are concerned that a golf course will automatically affect property taxes;
- . Long-term impacts of golf course development. A further concern is that a golf course could change the character of the surrounding area, leading to higher land prices, a change in the community of people preferring to live in the area, and hence higher taxes; and
- . The golf course as a catalyst for further development. Even if a golf course would not affect nearby values and

taxes appreciably, some residents are concerned that a course would bring further development, which in turn could affect land values, taxes, and the make-up of the community.

Overview of Likely Trends: In the following sub-sections, the specific factors affecting and limiting the project's impacts on property values are discussed. These can be summarized and placed in the context of Oahu's economic and demographic trends:

- . Real estate prices will likely continue to rise, with or without the project.
- . While trends in property taxes, which depend on political decisions as well as expert judgments of value, cannot be definitively predicted, the trend has been to protect both residential and agricultural land from the brunt of tax increases. City and County operations cost increases have been kept low, relative to inflation, and increases in taxes on residential and agricultural land have also been restricted.
- . On a community or regional level, a golf course is not likely to affect tax assessments, and hence taxes, to a measurable extent. Islandwide market pressures are far more important than local developments.
- . Golf course development results in few and limited immediate increases in land values and taxes. Those increases occur only for certain properties very close to a course. In the Lualualei case, no such increases are likely, unless neighbors benefit from physical improvements--better roads and/or sewerage--paid for by the developer.
- . Long-term impacts of golf development can occur if a developer or owners of adjacent properties build homes on the course. Given the existing zoning, the proposed course layout, and the distribution of properties in the area, the construction of more than one or two fairway homes is unlikely. Hence impacts on land values from golf course development will be minimal.
- . Hawaii real estate data show no evidence that a golf course affects real estate prices generally. In other words, affluent buyers do not gain interest in an area just because there is a golf course down the road. In fact, real estate prices in the communities near golf courses have tended to increase less quickly than islandwide averages.
- . There is no evidence that a golf course, by itself, would serve as a catalyst for further development. Moreover, both government policy and community views militate against such development. As a result, it is extremely

unlikely that the Lualualei course could stimulate further development that would affect community property values and taxes.

Methodology: The above findings follow from repeated studies by Community Resources, Inc. between 1987 and the present. They draw on:

- . Interviews with real property tax assessors;
- . Market studies of changes in property values over time, using the Multiple Listings Service database;
- . Interviews with real estate professionals, developers, and persons who have lived near golf courses in rural areas;
- . A review of zoning and assessments in the area immediately surrounding the proposed golf course; and
- . Research on City and County policies regarding golf courses and development in "country" areas, including consultations with City and County officials.

Tax Assessment Criteria and Policies: Property taxes are determined by assessments--estimates of value made by expert appraisers working as civil servants--and by rates set by elected officials. Assessments depend on (a) land classification and (b) in most cases, market forces.

Future taxes cannot be predicted with certainty. Even in unusual cases where land value is arbitrarily fixed, and so not affected by market value, rates are set by the City Council and the Mayor. However, these elected officials have consistently controlled both increases in the cost of City operations, and increases in taxes, on property zoned residential and agricultural.

Property values mainly increase due to:

- . Physical improvements to the property itself.
- . Amenities that make the property more attractive to buyers.

A residential property abutting on a golf course is viewed by assessors as more valuable than ones at a distance, since some buyers view a golf course as, in effect, a large back yard, and will pay for the privilege of living next to one. Similarly, an attractive golf course view can be an amenity for residential areas. These are not amenities for non-residential land.

- . General market trends--usually identified through assessors' data on sales in the "neighborhood" (an area of similar properties) around the property.

Assessors do not assume that the value of new properties automatically carries over to existing ones. Nor do they compute the value of agricultural or residential land on the basis of golf course properties in an area. Instead, value of a particular parcel is estimated on the basis of sales of properties that are similar in zoning, use, location, and amenities.

Immediate Impacts of Golf Course Development: Immediate impacts on assessments occur when a golf course brings improvements or amenities to nearby properties. In Lualualei:

- . There are no definite plans for improvements which would affect nearby properties; and
- . Land surrounding the project site would not be subject to increased assessments due to amenities. Up to four properties could abut on golf holes, but these are not residential, and hence do not gain a market advantage from being next to a golf course:
 - * Adjacent properties are zoned F-1 (Military land) Ag-1 and Ag-2 (Agricultural), and, on the steep slopes south of the project, P-1 (Preservation).
 - * Project design minimizes the number of properties potentially affected by the course. Land on the project site north of Lualualei Naval Road will be used for a nursery, the golf clubhouse, maintenance facilities, and parking. As a result, several properties that run from Hakimo Road to the edge of the project site will not front on the golf course itself.

(One Hakimo Road property located mauka of the project nursery site, TMK 8-7-10:16, does front on a proposed golf hole. Again, part of a large parcel makai of the project site, TMK 8-7-9:1, is adjacent to golf holes. Both of these parcels are zoned as Agricultural.)

Potential Long-Term Impacts on Nearby Properties: In light of nearby zoning and land uses, the future construction of homes enjoying amenities from the golf course and attracting golf-related buyers is unlikely. If, hypothetically, owners of property abutting the golf course sought to develop fairway homes, they would need to (a) either justify such homes as farm dwellings, or apply for a change in zoning; (b) subdivide their parcels; (c) provide infrastructure; and (d) meet any City and County stipulations that demand on existing infrastructure, such as water transmission lines, not be excessive.

Without a change of zoning, the maximum number of fairway homes that could be built on each of the two properties is about four. Homes on Lualualei Naval Road would not have easy access to the course, since access to the proposed golf course is planned via Hakimo Road.

The small number of units potentially involved, potentially high costs, difficult permit process, and problems of access all stand as obstacles to golf-related residential development.

Non-residential development nearby occasioned by the golf course is also unlikely to happen:

- . In studies of the impacts of a golf course on rural Waimanalo, Community Resources, Inc. found no stimulation of either property values or new developments.
- . Commercial developments would not be permitted near the golf course without a change in zoning;
- . Other outdoor recreational uses could be developed near the course with permission from the Director of the Department of Land Utilization. However, the golf course would attract a relatively small number of people--some 250 golfers a day, on average--to the course. Whatever fraction of that number might also be interested in other sorts of recreation, such as horseback rides, is likely too small to support additional developments.

It is possible that a proposal for another golf course will be advanced for nearby land. This proposal cannot be viewed as an impact of the Lualualei project, because:

- . That project's development would depend on its developer's satisfying the community and government authorities that the project would be of value, and that the project would not strain available infrastructure and resources; and
- . There is no evidence that development of the Lualualei course would make another course more feasible. Since the Lualualei course (along with other courses now being built) would help to meet the large demand for golf now felt on Oahu, it would tend to decrease the size of the market for another golf course in the area.

Potential Long-Term Impacts at the Regional Level: Studies by Locations, Inc. and Community Resources, Inc. converge on the finding that no or minimal regional impacts on property values are likely as a result of development of a golf course.

The Locations, Inc. (1989a, 1989b) studies of real estate prices in communities near golf courses and golf-related developments form the only quantitative basis for projections of general impacts of golf course development on property values.

The Locations studies turned to data from Maui and the Big Island to learn whether the construction and opening of golf courses had a discernible effect on property values in nearby communities, as distinct from residential areas tied in with golf courses. (Since no courses were built on Oahu between 1973 and 1990, this longitudinal analysis could not be done for Oahu.) Oahu, Maui, and Big Island cases were examined in relation to islandwide averages in order to see whether communities near golf courses gained in value at high rates. Surprisingly:

- . No impact of golf course opening could be found on property values in nearby communities; and
- . Overall, real estate in communities near golf courses increased in value more slowly than the islandwide average.

In part, these findings may be due to the fact that available land for golf course construction is likely to be in areas at a distance from population centers. Real estate prices are apt to be lower in "country" areas than in island centers, and price increases are likely to affect outlying areas after central ones.

Community Resources, Inc. has conducted interviews with developers and planners concerning the impacts of golf course development on nearby communities in Hawaii, including planned communities with golf courses.

The widespread expectation that golf courses raise property values may be due to impacts of resort development. In resorts, golf courses are a component of successful development. Resort areas have grown in size in Hawaii, with the result that regional property values have in some cases increased dramatically. In non-resort situations, however, golf courses have had little or no impact on development and property values. Communities such as Pukalani (Maui) and Discovery Bay (Big Island) have not thrived because they contained a golf course. Again, golf courses unconnected with residential areas, such as the Silversword and Waiehu courses on Maui, have not had an appreciable impact on property values.

On Oahu, the Olomana course at the edge of Waimanalo is an example of a stand-alone golf course next to an agricultural area:

- . Real property records indicate, and long-term area residents agree, that the course has had no discernible impact on Waimanalo (Community Resources, Inc., 1989b);
- . Realtors have suggested that the area's reputation is changing, but they credit polo, not golf, as making the area seem more cosmopolitan; and

- . In recent years, an upscale development of "estate" lots has been created mauka of Kamehameha Highway, in Waimanalo and near the Olomana course. However, its buyers are said to be more affluent than most golfers at Olomana, and to be attracted to other courses rather than this daily fee course.

The proposed Lualualei course resembles the Waimanalo course as open to the public and charging Oahu residents rates well below those of resort courses. Accordingly, it is expected also to have no broad development impacts.

4.8.4 Impacts on Housing Development

It has been suggested that golf course development, as a general trend on Oahu, affects the cost and supply of housing (City and County of Honolulu, 1989). The hypothetical linkage between golf and housing has to do with Oahu's limited land. In some cases, golf courses were proposed by developers instead of housing, or on land where housing was an appropriate alternative use. (This argument deserves note as an issue in citizens' minds, although it has been challenged as analytically unsound [Hawaii Real Estate Research and Education Center, 1990].)

No impact of the project on housing is evident. Housing development is not a potential competing use of the project site, for several reasons:

- . The site is zoned as Agricultural and Preservation, not for residential use;
- . The local water and sewerage infrastructure is likely not adequate to support major residential developments at the site;
- . City and County policy calls for limited, low-density residential development in Oahu's "country" areas, including the Waianae Coast, so housing development on the project site would be hardly in keeping with the general trend of regional land use planning; and
- . The site adjoins the Lualualei Naval Magazine. While the site has not been identified as within a blast hazard zone, it is possible that residential development would be inappropriate due to potential hazards in the event of accidental explosions on the adjacent military land.

(Similarly, the West Loch Shoreline Park was situated on a spur of land near the edge of the existing Explosive Safety Quantity-Distance arc--the potential blast hazard zone--for the ammunition wharves at NAVMAG Lualualei, West Loch Branch [City and County of Honolulu, Department of Parks and Recreation, 1988]. As a result, a relatively low-density land use was placed nearer the

potential hazard area, and high-density residential uses were located at a greater distance, even though the park site had been zoned Residential.)

4.8.5 Impacts on Community Life and Character

The preceding sub-sections have identified positive impacts on the surrounding community -- notably employment, community contributions, and recreational opportunities -- and have found anticipated impacts on property values and taxes to be minimal or absent.

Nonetheless, golf courses are expected by many Oahu residents to be intrusive in rural communities. That potential can be minimized if:

- . Members of the nearby community are well represented in the golf course's workforce;
- . The project offers benefits adjusted to the felt needs of community residents, including employment opportunities that fit residents' needs for part-time work or other sorts of work and benefits for community groups;
- . The community finds its members welcome at the project, and does not view the project as taking land away from residents for the exclusive use of non-residents; and
- . The project is found not to generate cumulative impacts that would bring community-level change in demographics or land use.

The Lualualei Golf Course is planned to encourage its fit with the surrounding community in that:

- . The course is open to the public, with more than half its tee times designated for island residents;
- . A junior golf program will encourage local young people to use the course; and
- . Commitments to hire Waianae Coast residents, to fund job training programs, and to support the local community and community groups stand as acts in support of the surrounding community.

Because a golf course attracts a relatively few users for its land area, the additional traffic generated by the project is much less than for such land uses as housing or resorts. (Traffic impacts are analyzed in a separate consultant report.)

As noted in Section 4.8.3, the project cannot be considered a likely catalyst for further development. As a result, it should

affect the population and land of the surrounding community in only limited ways.

In an important sense, the final judge of changes brought by the project is the community itself. To the extent that the community finds the project to offer benefits, and finds changes brought by the project to be acceptable in the normal course of events, the project will not be disruptive.

Over time, the community could well come to find the project complementary with existing community life. At present, the Waianae Coast residents interviewed for this study find it quite possible that the project will be acceptable to the surrounding community if the developer works closely with community groups and offers jobs to local residents. The developer has taken steps to minimize disruption and to encourage community involvement with the project.

APPENDIX A:

KEY INFORMANTS INTERVIEWED FOR COMMUNITY ISSUES AND CONCERNS

(NOTE: Persons interviewed provided their comments as individuals and were not speaking on behalf of their organizations. Organizational affiliations are provided only to indicate the interests and networks of those interviewed.)

<u>Name</u>	<u>Organization/Affiliation</u>
Peter Apo	Member, Waianae Coast Neighborhood Board Member, Hawaii State House of Representatives
Audrey Boddy-Bush	Member, Waianae Coast Neighborhood Board
Kermit Brown	Member, Waianae Coast Neighborhood Board
Paul Burns	Firefighter, Nanakuli Fire Station
Frenchy DeSoto	Member, Waianae Homestead Association
Lorin Gill	Environmentalist
Gail Gomes	Member, Waianae Coast Neighborhood Board
Clarence Hew Lew	Firefighter, Nanakuli Fire Station
Velma Kekipi	Member, Waianae Coast Neighborhood Board
Germaine Keliikoa	Member, Waianae Coast Neighborhood Board Secretary, Waianae Homestead Association
Olive Kepa	President, Waianae Homestead Association
Gabe Kilakalua	Firefighter, Nanakuli Fire Station
Airleen Lucero	Member, Waianae Coast Neighborhood Board
James Manaku	Member, Waianae Coast Neighborhood Board
Emogene Martin	Member, Ewa Neighborhood Board President, Friends of Ewa Member, Ewa Beach Community Association Member, Leeward School Advisory
Sue Miller	Member, National Resources Defense Council
Kelly Miyahara	Member, Ewa Neighborhood Board
Myrtle Mokiao	Member, Waianae Coast Neighborhood Board

Art Morey	Member, Life of the Land
Kahale Morrison	Nanakuli resident
Robert Mossman	Firefighter, Nanakuli Fire Station
Solomon Naone	Member, Waianae Coast Neighborhood Board
Rick Scudder	President, Conservation Council
Greg Shannon	Member, Waianae Coast Neighborhood Board
Albert Silva	Chair, Waianae Coast Neighborhood Board
Viola Studebaker	Member, Waianae Coast Neighborhood Board
Vernon Taylor	Hakimo Road resident
Rozalyn Texeira	Member, Waianae Coast Neighborhood Board
Neddie Waiamau-Nunuha	Member, Waianae Coast Neighborhood Board
May Wright	Member, Waianae Coast Neighborhood Board

NOTE: In group interviews, 29 other residents of the Nanakuli/Maili/Lualualei area, not identified above, expressed their views.

APPENDIX B:

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APPENDIX E

Traffic Impact Assessment Report For The Lualualei Golf Course

Prepared by Pacific Planning & Engineering, Inc., September, 1990

TRAFFIC IMPACT ASSESSMENT REPORT

FOR

THE LUALUALEI GOLF COURSE

Lualualei, Oahu, Hawaii

TMK: 8-7-09:02, 8-7-10:06 & portion of 8-7-19:01

September 1990

Prepared for:

Hida Okamoto & Associates

Prepared by:

Pacific Planning & Engineering, Inc.

1144 Tenth Avenue, Suite 202

Honolulu, Hawaii 96816

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EXECUTIVE SUMMARY

Pacific Planning & Engineering, Inc. (PPE) was engaged to undertake a study to identify and assess future traffic impacts caused by the proposed Lualualei Golf Course on the island of Oahu. This report presents the findings and recommendations of the traffic study.

The organization of this study includes a description of the proposed project, study methodology used, existing roadways, traffic conditions, and an assessment of traffic impacts resulting from the project.

Project Description

Kabushiki Kaisha Oban is planning to develop the Lualualei Golf Course on 280 acres of land located on the Waianae Coast at Lualualei on the island of Oahu. The project site is approximately 2 miles mauka (North) of Farrington Highway, and access will be from Hakimo and Paakea Road.

The proposed development consists of an 18-hole championship golf course, a plant nursery to be converted to a future driving range, a clubhouse, and maintenance facility. The clubhouse will include a pro shop and restaurant. A paved entrance road for the project is planned from Paakea Road to the project's clubhouse. It is estimated that the golf course will employ 47 people, including personnel engaged in maintenance, restaurant operations, pro shop activities and administration. The entire development is expected to be completed in 1996.

Lualualei Golf Course is planned to be operated as public golf course similar to municipal courses, and will be open between 6:00 am and 6:00 pm, while the clubhouse restaurant will be open between 11:00 am and 5:00 pm. A total of 174 parking stalls will be provided near the clubhouse.

Conclusion and Recommendations

The traffic study indicates that the proposed Lualualei Golf Course project is not expected to create an adverse impact to existing traffic along Farrington Highway, Hakimo and Paakea Roads, when the project is completed and opened for public use in 1996.

The proposed Lualualei Golf Course is not likely to attract other traffic to the project site due to its remoteness and lack of other recreational attractions and, therefore, traffic into and out of the project site is expected to be composed primarily of golfers and employees.

The study also indicated that the project generated traffic will have minimal impact on existing traffic flow due to intermittent arrival and departure of golfers. Unlike visitors to a theater, who arrive and depart enmasse, golfers usually arrive at the club house based on individual "starting times" and thus traffic generated by the project is spread out throughout most of the day. As a result, the impact from project generated traffic will be minimal during the normal morning and afternoon peak hours.

Although the preliminary study indicates no major roadway improvements are necessary, widening Hakimo Road at the intersection with Farrington Highway is desirable to provide separate left-turn and right-turn lanes at the existing intersection which will improve the right-turn movements into and out of Hakimo Road.

PROJECT DESCRIPTION

Kabushiki Kaisha Oban is planning to develop the Lualualei Golf Course on the Waianae Coast at Lualualei on the island of Oahu. The project site is approximately 2 miles mauka (North) of Farrington Highway, and access will be from Hakimo and Paakea Road. The proposed project is located on a 280 acres of land, identified by Tax Map Key: 8-7-09:02, 8-7-10:06 and a portion of 8-7-19:01. Figure 1 shows the general project location and the roadway network in the project's vicinity.

The proposed development consists of an 18-hole championship golf course, a plant nursery to be converted to a future driving range, a clubhouse, and maintenance facility. The clubhouse will include a pro shop and restaurant. A paved entrance road for the project is planned from Paakea Road to the project's clubhouse. Figure 2 shows the proposed golf course site plan. It is estimated that the golf course will employ 47 people, including personnel engaged in maintenance, restaurant operations, pro shop activities and administration. The entire development is expected to be completed in 1996.

Lualualei Golf Course is planned to be operated as public golf course similar to municipal courses. Users of the golf course are expected to be primarily tourists and local residents. The golf course will be open between 6:00 am and 6:00 pm, while the restaurant will be open between 11:00 am and 5:00 pm. A total of 174 parking stalls will be provided near the clubhouse.

Approximately 85% of the golfers are expected to arrive in privately owned vehicles with the remaining 15% expected to be shuttled in vans and buses from hotels.

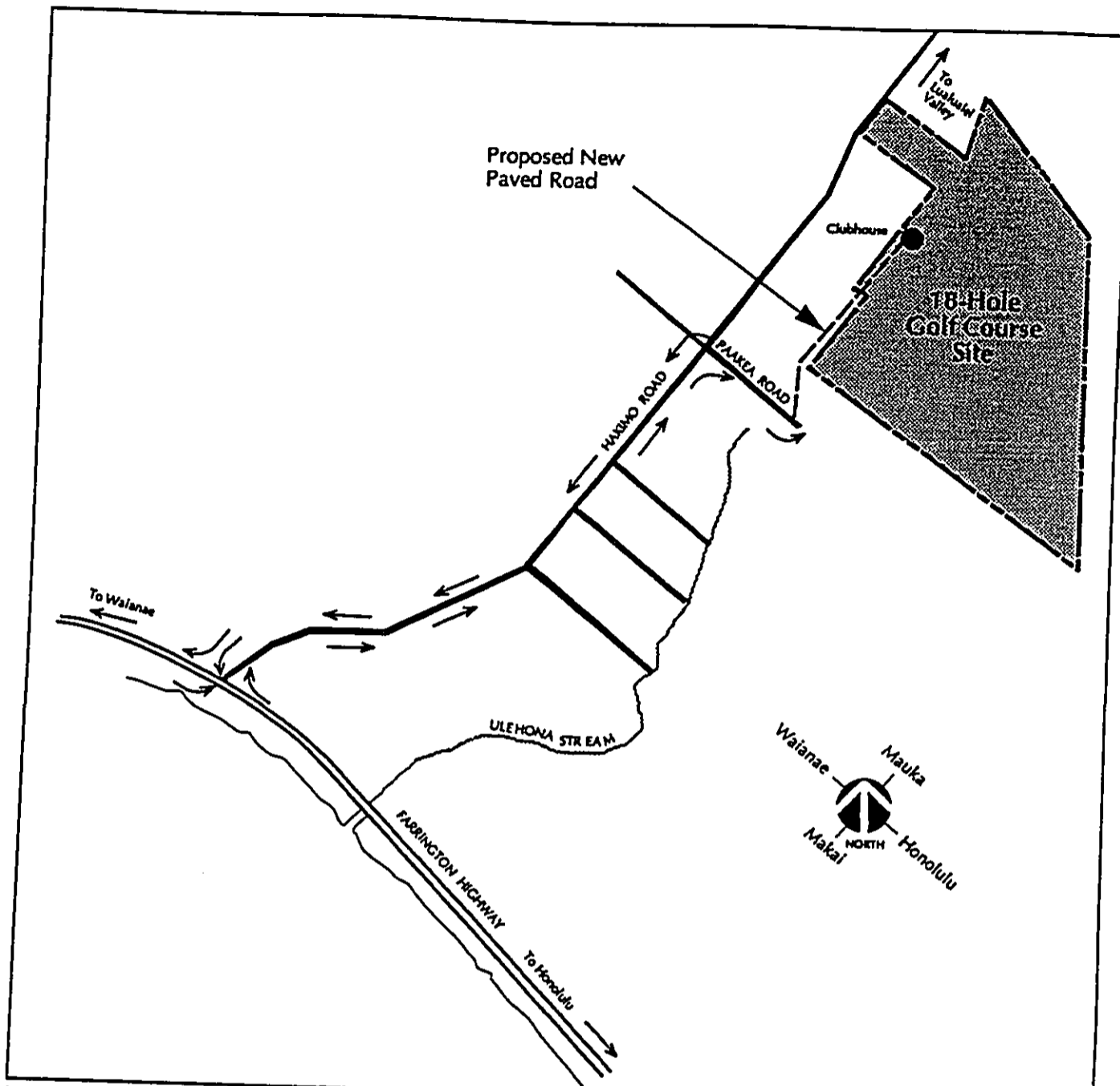
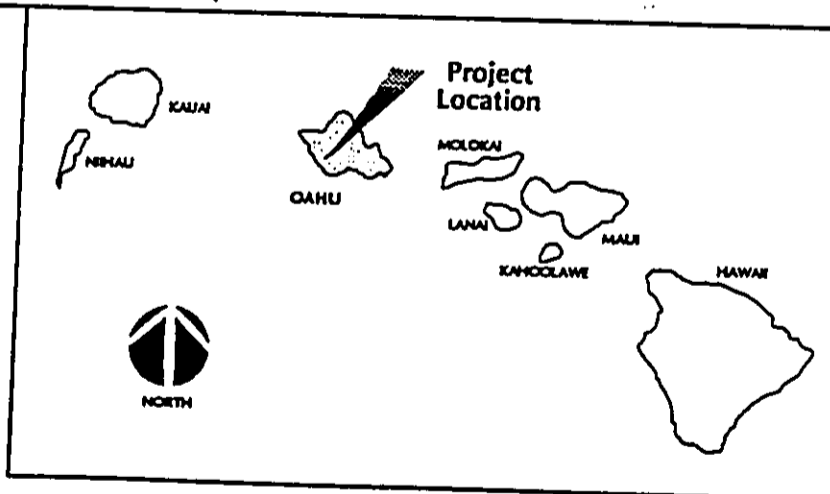


Figure 1. Location Map and Proposed Project Access Route



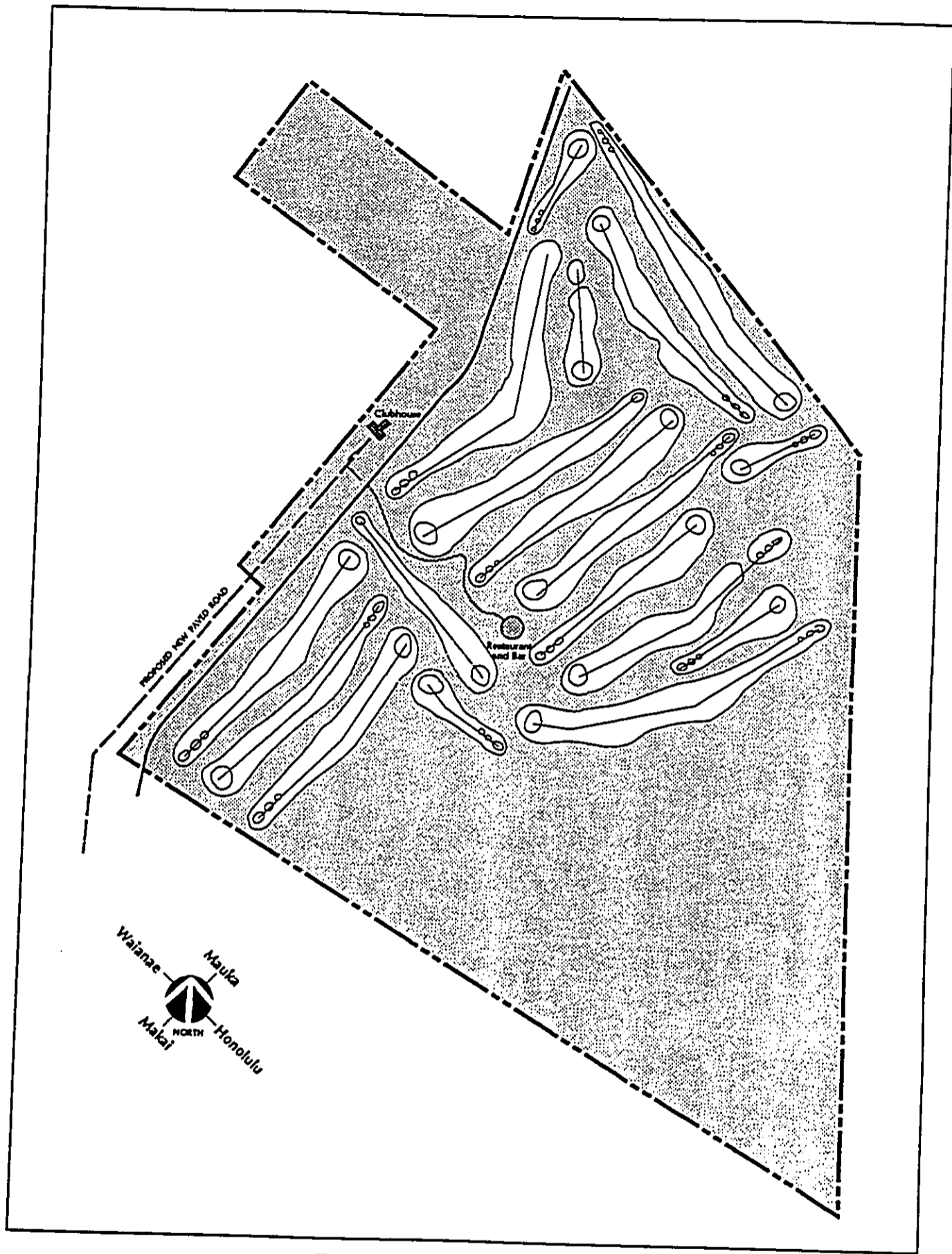


Figure 2. Project Site Plan

EXISTING CONDITIONS

An inventory of existing conditions was conducted to better understand the traffic impact of the proposed project. The review included the land uses in the area, roadway facilities, and existing traffic conditions. The survey was conducted to establish a baseline condition to forecast future traffic.

Area Conditions

The proposed Lualualei Golf Course is planned to be located on existing agricultural land formerly used for cattle grazing and currently zoned AG-2 (Class 2 agricultural). The project site is located adjacent to the Lualualei Naval Ammunition Depot in a rural community consisting mainly of a military ammunition storage, agricultural, recreational, and governmental land uses.

Roadway Facilities

Vehicular access to the project will be primarily from Farrington Highway, Hakimo and Paakea Road, and a new two-lane paved road to be constructed parallel to Lualualei Naval Road between Paakea Road and the proposed Lualualei Golf Course clubhouse. Figure 1 shows the proposed vehicular access route to the project.

Farrington Highway is a rural arterial highway connecting major population centers along the Waianae Coast of Oahu such as Makaha, Waianae, Maile, and Nanakuli. It is the only roadway for through traffic along the Waianae Coast. Farrington Highway connects to H-1 Freeway at the Kalaeloa Interchange near Cambell Estate's industrial developments.

The H-1 Freeway carries the major traffic from Waianae and Ewa to and from Central Oahu and Honolulu.

Farrington Highway is a State-maintained Primary Federal Aid Highway with a 80-foot right-of-way and a 60-foot wide pavement near the intersection with Hakimo Road. There are four 11-foot wide lanes with two lanes serving traffic in both direction, and 8-foot wide paved shoulders on both sides of Farrington Highway. A 4-foot wide asphalt concrete paved pedestrian walkway with 6-inch asphalt concrete rolled curb is located along the mauka side of the highway. The posted speed limit along Farrington Highway is various between 25 - 35 mph. The intersection of Farrington Highway with Hakimo Road is signalized.

Hakimo Road is a County maintained road with 20-foot wide pavement designed for two-way traffic. The shoulders are unpaved and vary between 5 and 10 feet. Approximately 2.1 miles of Hakimo Road is paved while the remainder is an unpaved dirt road. The posted speed for Hakimo Road is 20 mph.

Paakea Road is also a County maintained road with posted speed limits of 20 mph, and has 20-foot wide pavement designed for two-way traffic. Paakea Road connects to Lualualei Naval Road near the Hawaiian Cement Company plant in Nanakuli.

Lualualei Naval Road is owned and maintained by the U.S. Navy. A portion of the road between Farrington Highway and the Lualualei Naval Ammunition Depot main gate is opened to the public, subject to temporary closures during emergencies. Although the U.S. Department of Navy had no objections to construction of an 18-hole golf course adjacent to the ammunition depot, a formal request to the department for use of Lualualei Naval Road to provide access into the project site was denied. As an alternative to major improvements and the dedication of portions of

Lualualei Naval Road to the City and County of Honolulu, the Department of the Navy recommended access to the project site from Hakimo Road with a golf cart underpass, and limited grade crossing Lualualei Naval Road for maintenance vehicles as shown on Figure 2.

The Developer is planning to acquire the necessary right-of-way and construct a two-way paved roadway between Paakea Road and the proposed Lualualei Golf Course clubhouse in lieu of access from the unpaved portion of Hakimo Road. Access between the clubhouse and 18-hole golf course will be through an underpass across Lualualei Naval Road.

Traffic Conditions

Traffic counts were obtained from the State Department of Transportation (DOT) Highways Division. Based on a review of traffic count data in the area, the peak traffic periods generally occur between 5:30 to 7:30 am in the morning and 3:00 to 5:00 pm in the afternoon. These weekday morning and afternoon peak hours were selected as the basis for forecasting traffic because it represents the worst case conditions for ambient traffic during the week.

Manual counts were taken by PPE at the intersection of Farrington Highway and Hakimo Road on Tuesday September 11, 1990, between 5:30 to 7:45 am and 3:00 to 5:00 pm. Counts were taken of passenger cars, trucks and buses by turning movements and approaches. Figure 3 shows the morning and afternoon peak hour traffic volumes at the study intersection. During the field counts, the weather was clear and sunny. The traffic count data are summarized in Appendix B.

Observed Traffic Conditions

The following observations were noted at the intersection of Farrington Highway with Hakimo Road during the field survey:

1. Traffic at the intersection of Farrington Highway and Hakimo Road operated very well during the morning and afternoon peak hours with little delays or congestion.
2. School buses and trucks attempting right-turns from Farrington Highway onto Hakimo Road were observed having difficulty due to the small turning radius provided at the intersection. Buses and trucks were observed encroaching into the center lane of Makaha bound traffic to turn right onto Hakimo Road. Some of the buses were also observed encroaching into the opposing lane (makai bound lane) of Hakimo Road in order to complete the right-turn movement.
3. The vehicular actuated traffic signals at the intersection of Farrington Highway and Hakimo Road operated very efficiently during the peak hours.

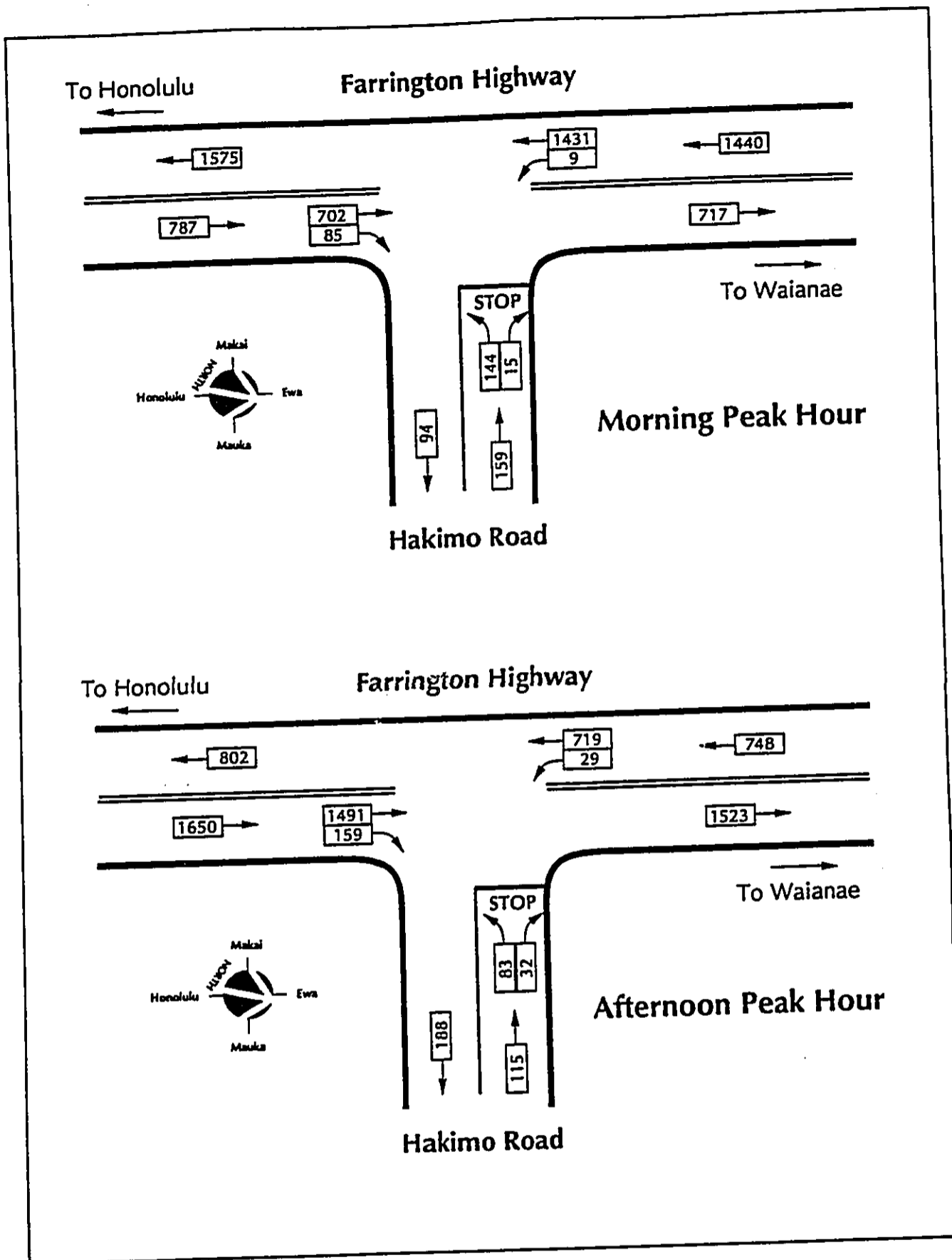


Figure 3. 1990 Existing Peak Hour Traffic Volumes

PROJECTED TRAFFIC CONDITIONS

A research of approved planned developments and improvements to transportation facilities was conducted to estimate future traffic conditions at the study intersection. Future traffic forecasts without and with the project were estimated for the year 1996, when the project is expected to be completed.

Future Ambient Traffic

Ambient traffic is traffic which would occur even if the proposed project was not built. Ambient traffic was forecasted by increasing the existing through traffic volumes along Farrington Highway by the historical traffic growth trend along the highway. Through-traffic is traffic without origin or destination near the project site.

The growth in through traffic on Farrington Highway was estimated using a linear regression analysis based upon historical data obtained from a nearby DOT traffic count station. Figure 4 illustrates the growth trend in Average Daily Traffic (ADT) along Farrington Highway at Makaha Bridge #2 (Station C-15-G). The plotted data show a steady increase in traffic growth on the order of 3.0% per year.

Based upon the traffic growth trend, the existing morning and afternoon peak hour through traffic volumes on Farrington Highway were increased by 18% (3.0% for six years) to obtain the forecast ambient traffic volumes in 1996.

In addition, research indicates there are three approved developments planned for completion before 1996 in the area of the Lualualei Golf Course

project. These developments are the Lualualei Residential and Industrial project, the expansion of the Makaha Resort, and the Waianae Kai Housing project. Projected trips generated by these developments were added to provide the total forecasted ambient traffic volumes for the year 1996.

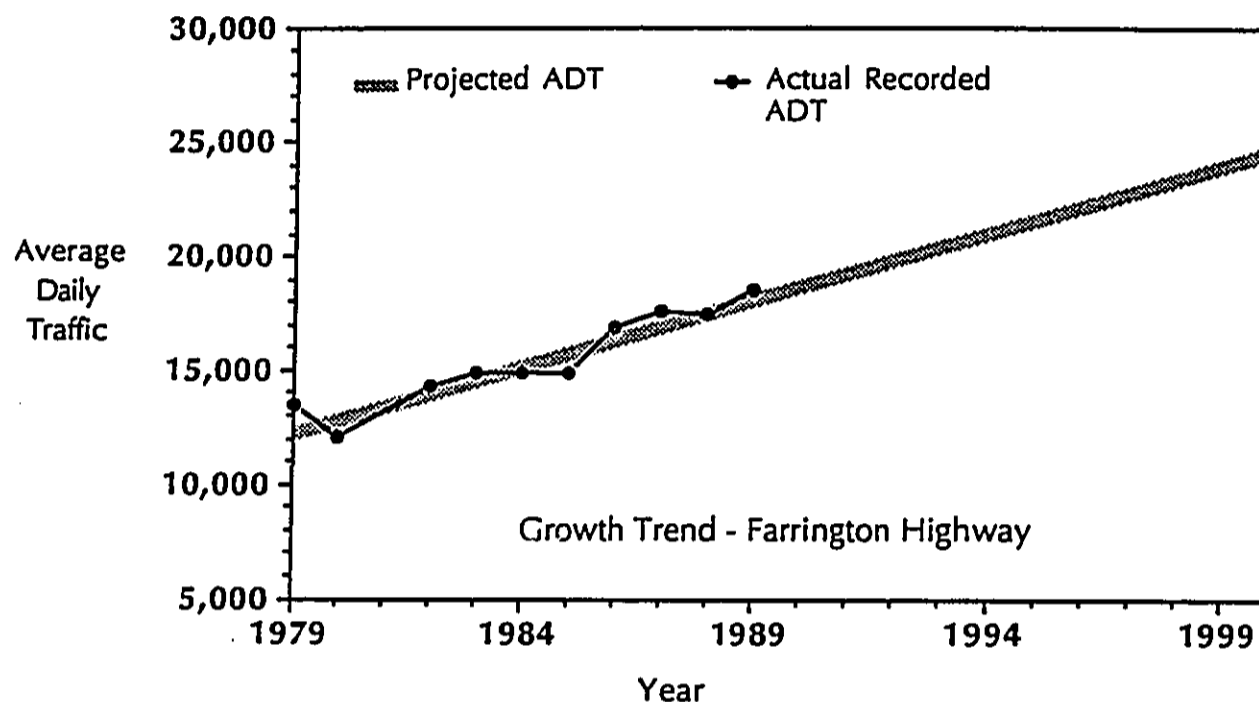


Figure 4. Historical Traffic Growth Trend on Farrington Highway

Trip Generation

Future traffic generated by the Lualualei Golf Course was based upon the land uses for the project. This development is planned to be a recreational amenity on the Waianae Coast providing an 18-hole championship golf course, driving range, and clubhouse. The clubhouse will include a restaurant and pro shop.

Vehicle trips entering and exiting the project were estimated based upon the type of land use. The estimate was made based upon trip generation data provided in the Institute of Transportation Engineers, Trip Generation Report (Fourth Edition) 1988. The trip rates provided in the Trip Generation Report are based on average conditions, and include amenities found at most golf courses such as a clubhouse, restaurant and driving range. Table 1 provides the land uses and resulting trip generation rates, while Table 2 provides the number of trips generated by the land use activities.

Table 1. Trip Generation Rates

<u>Land Use</u>	Weekday AM Peak Hour (vph) ¹		Weekday PM Peak Hour (vph)	
	<u>Enter</u>	<u>Exit</u>	<u>Enter</u>	<u>Exit</u>
	Golf Course (280 acres)	0.21	0.05	0.03

¹vehicles per hour

Table 2. Trip Generation

<u>Land Use</u>	Weekday AM Peak Hour (vph)		Weekday PM Peak Hour (vph)	
	<u>Enter</u>	<u>Exit</u>	<u>Enter</u>	<u>Exit</u>
	Golf Course (280 acres)	59	14	8

Trip Distribution

Trip distribution is the process by which trips from one area are connected with trips from another area, linking origins and destinations. The primary market for this project is expected to be tourists and local residents. These golf course users are expected to originate mainly from the Honolulu area. A smaller percentage are expected from the Waianae Coast area. Employees for the golf course are expected to originate mainly from the Waianae and Ewa districts. Based on these assumptions, 90% of the traffic generated by the project was distributed to Honolulu with the remaining 10% distributed to the Waianae area.

Traffic Assignment

Traffic assignment is the process which assigns vehicle trips to the roadway network. All project generated traffic was assigned to Paakea Road, Hakimo Road, and Farrington Highway since they are the only roadways providing direct access to the project. About 90% of project traffic is expected to enter and exit from the Honolulu direction and 10% from the Waianae direction.

TRAFFIC IMPACTS

The results of the traffic forecasted for the year 1996 *without* and *with* the project are provided in Tables 3 and 4, and graphically shown on Figures 5 and 6. The largest turning movements at the intersection of Farrington Highway and Hakimo road are the Waianae bound right-turns into the project from Farrington Highway, and the left-turns out of the project towards Honolulu.

Impacts on traffic resulting from the proposed Lualualei Golf Course were measured in terms of Level-of-Service (LOS) at the intersection of Farrington Highway with Hakimo Road. A operational analysis for signalized intersections was done in accordance to the latest Highway Capacity Manual (Special Report 209, 1985) analysis techniques. The LOS for traffic movements at an intersection are classified into six categories ranging from little or no delay (LOS A) to extremely long traffic delays (LOS F). Appendix A provides definitions for each LOS category. The analysis was done for the weekday morning and afternoon peak hours, and the LOS results of the operational analysis are shown in Table 5 and 6.

The results of the operational analysis indicate that traffic along Farrington Highway will not be delayed beyond normal driving conditions. The left-turn movement from Farrington Highway into Hakimo Road will operate at a good level of service (LOS B) and therefore is only expected to cause very minor delays along Farrington Highway. The results also indicate that the left and right-turn movements from Hakimo Road will also operate at Level-of-Service D or better with and without the project generated traffic.

**Table 3. 1996 Forecast Traffic Volumes
Weekday Morning Peak Hour**

Farrington Highway at Hakimo Road (signalized)

<u>Turning Movements</u>		Existing 1990	Without Project 1996	With Project 1996
Farrington Highway				
Northbound (To Waianae)	TH	702	1058	1058
	RT	85	95	148
Southbound (To Honolulu)	LT	9	10	16
	TH	1431	1941	1941
Hakimo Road				
Westbound (Makai)	LT	144	161	174
	RT	15	17	18

**Table 4. 1996 Forecast Traffic Volumes
Weekday Afternoon Peak Hour**

Farrington Highway at Hakimo Road (signalized)

<u>Turning Movements</u>		Existing 1990	Without Project 1996	With Project 1996
Farrington Highway				
Northbound (To Waianae)	TH	1491	2164	2164
	RT	159	178	185
Southbound (To Honolulu)	LT	29	32	33
	TH	719	1193	1193
Hakimo Road				
Westbound (Makai)	LT	83	93	184
	RT	32	36	46

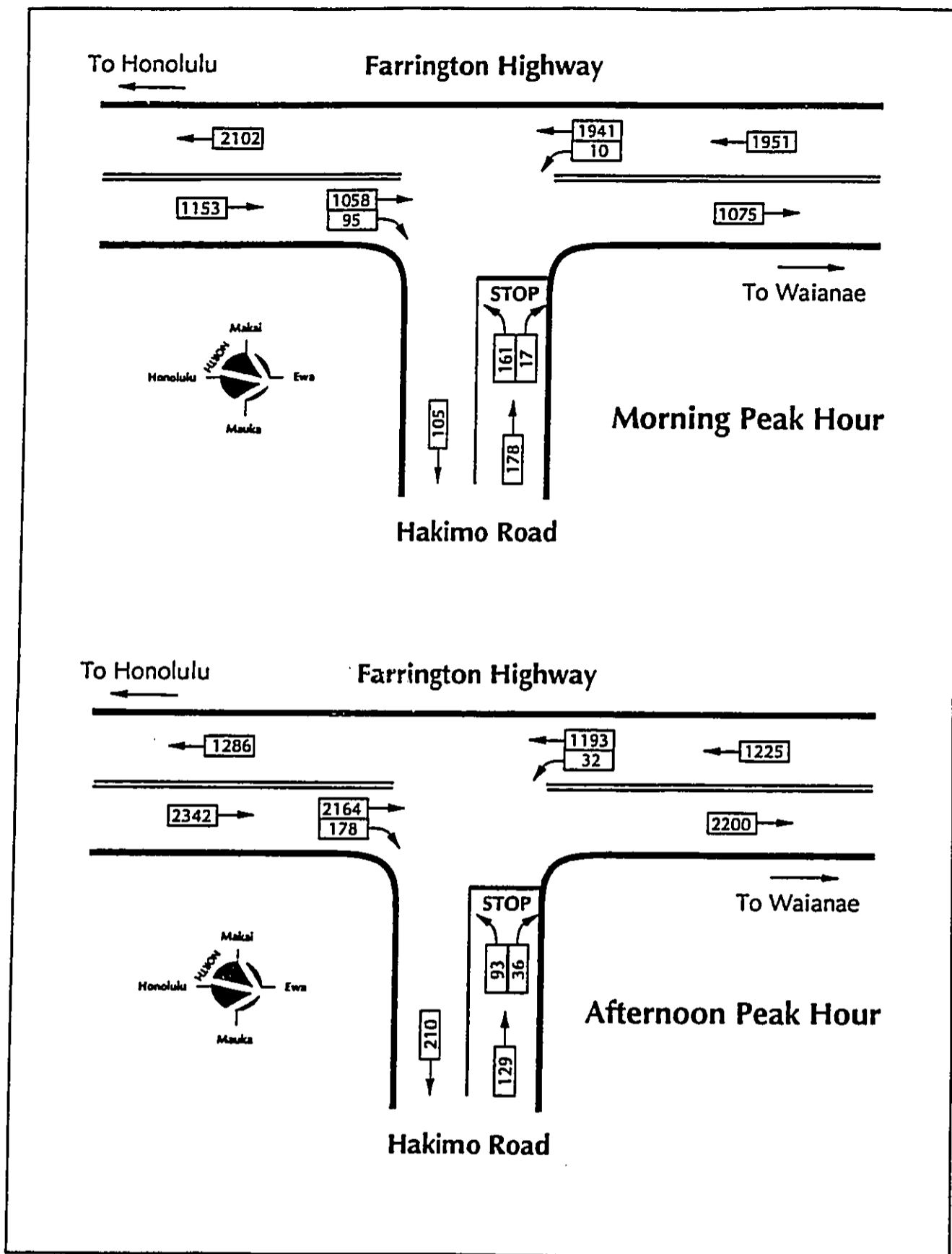


Figure 5. Forecasted 1996 Peak Hour Traffic Volumes Without Project

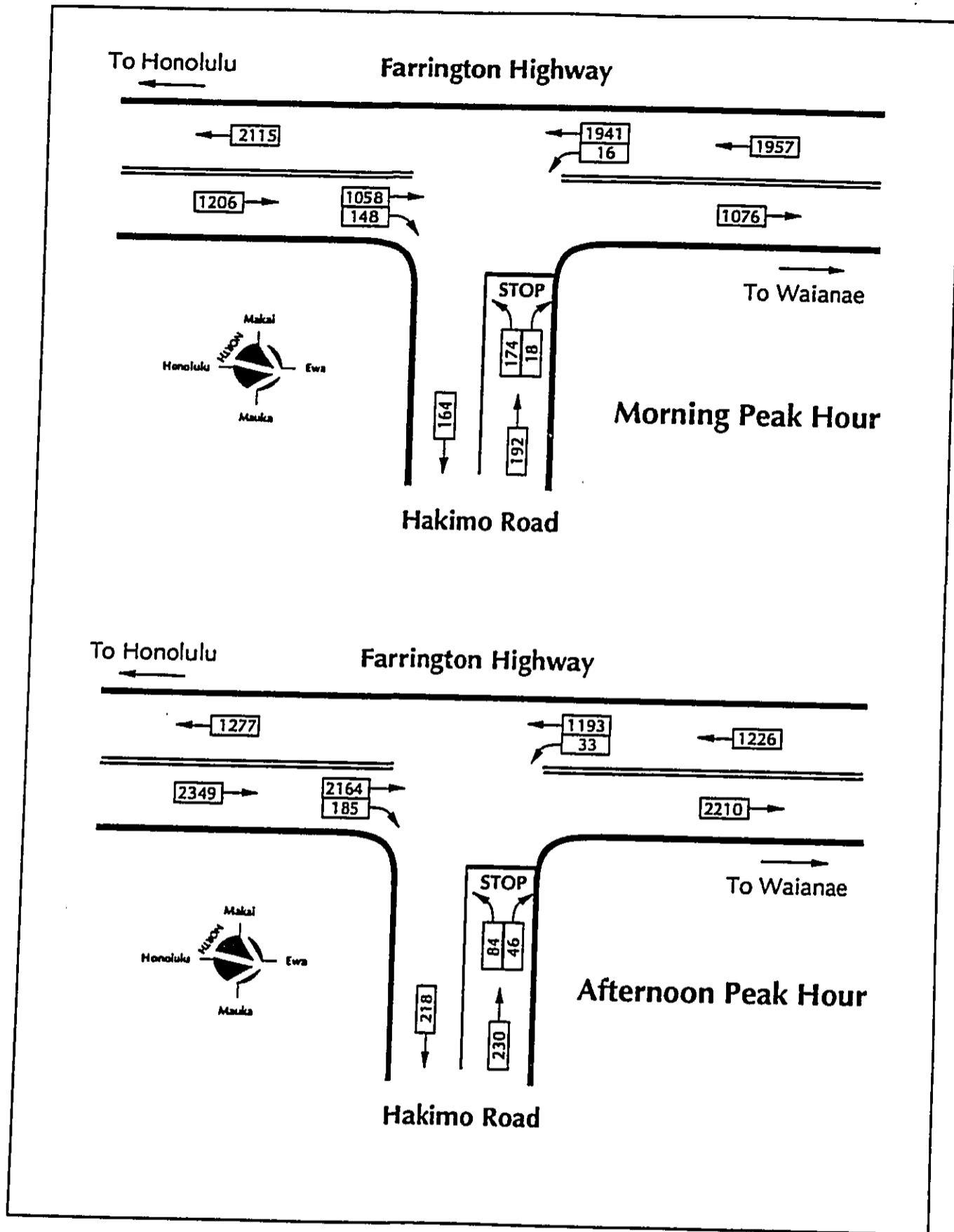


Figure 6. Forecasted 1996 Peak Hour Traffic Volumes With Project

**Table 5. Signalized Intersection Level-of-Service
Weekday Morning Peak Hour**

Farrington Highway with Hakimo Road

<u>Turning Movement</u>	<u>1990 Existing</u>	<u>1996 Without Project</u>	<u>1996 With Project</u>
Farrington Highway			
Northbound (to Waianae)	A	A	A
Southbound (to Honolulu)	B	B	C
Hakimo Road			
Westbound (Makai)	B	D	D

**Table 5. Signalized Intersection Level-of-Service
Weekday Afternoon Peak Hour**

Farrington Highway with Hakimo Road

<u>Turning Movement</u>	<u>1990 Existing</u>	<u>1996 Without Project</u>	<u>1996 With Project</u>
Farrington Highway			
Northbound (to Waianae)	B	C	C
Southbound (to Honolulu)	A	B	B
Hakimo Road			
Westbound (Makai)	B	C	D

CONCLUSION AND RECOMMENDATIONS

The traffic study indicates that the proposed Lualualei Golf Course project is not expected to create an adverse impact to existing traffic along Farrington Highway, Hakimo and Paakea Roads, when the project is completed and opened for public use in 1996.

The proposed Lualualei Golf Course is not likely to attract other traffic to the project site due to its remoteness and lack of other recreational attractions and, therefore, traffic into and out of the project site is expected to be composed primarily of golfers and employees.

The study also indicated that the project generated traffic will have minimal impact on existing traffic flow due to intermittent arrival and departure of golfers. Unlike visitors to a theater, who arrive and depart enmasse, golfers usually arrive at the club house based on individual "starting times" and thus traffic generated by the project is spread out throughout most of the day. As a result, the impact from project generated traffic will be minimal during the normal morning and afternoon peak hours.

Although the preliminary study indicates no major roadway improvements are necessary, widening Hakimo Road at the intersection with Farrington Highway is desirable to provide separate left-turn and right-turn lanes at the existing intersection which will improve the right-turn movements into and out of Hakimo Road.

APPENDIX A

DEFINITION OF LEVEL-OF-SERVICE
FOR
SIGNALIZED INTERSECTIONS

DEFINITION OF LEVEL-OF-SERVICE
FOR
SIGNALIZED INTERSECTIONS

Level of service for signalized intersections is defined in terms of *delay*. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Specifically, level-of-service criteria are stated in terms of the average stopped delay per vehicle for a 15-minute analysis period.

Level-of-service A describes operations with very low delay, i.e., less than 5.0 sec per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

Level-of-service B describes operations with delay in the range of 5.1 to 15.0 sec per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.

Level-of-service C describes operations with delay in the range of 15.1 to 25.0 sec per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level-of-service D describes operations with delay in the range of 25.1 to 40.0 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or a high v/c ratios (volume of cars to capacity of intersection). Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level-of-service E describes operations with delay in the range of 40.1 to 60.0 sec per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle length, and high v/c ratios. Individual cycle failures are frequent occurrences.

Level-of-service F describes operations with delay in excess of 60.0 sec per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

REFERENCE: Highway Capacity Manual (Special Report 209, 1985)

APPENDIX B

MANUAL TRAFFIC COUNT DATA

APPENDIX B

MANUAL TRAFFIC COUNT DATA

Location: Farrington Highway @ Hakimo Road

Date: September 11, 1990

AM Peak Hour Time	Farrington		Farrington		Hakimo Road		Total
	Waianae-		Honolulu-		Makai-		
	<u>Bound</u>		<u>Bound</u>		<u>Bound</u>		
	<u>RT</u>	<u>TH</u>	<u>TH</u>	<u>LT</u>	<u>LT</u>	<u>RT</u>	
5:30-5:45	4	49	370	1	38	2	464
5:45-6:00	7	57	355	2	27	1	449
6:00-6:15	13	93	328	5	33	5	477
6:15-6:30	46	128	393	0	46	5	618
6:30-6:45	13	174	432	1	36	1	657
6:45-7:00	12	219	328	5	36	3	603
7:00-7:15	14	181	278	3	26	6	508
7:15-7:30	9	174	304	4	46	10	547
7:30-7:45	26	183	215	6	46	11	487
AM Peak Hour 6:15 - 7:15							
Total	85	702	1431	9	144	15	2386

MANUAL TRAFFIC COUNT DATA

Location: Farrington Highway @ Hakimo Road

Date: September 11, 1990

PM Peak Hour Time	Farrington Waianae- Bound		Farrington Honolulu- Bound		Hakimo Road Makai- Bound		Total All
	RT	TH	TH	LT	LT	RT	
	3:00-3:15	29	203	227	3	26	
3:15-3:30	29	284	244	4	25	11	597
3:30-3:45	32	292	212	8	20	6	570
3:45-4:00	36	423	219	9	21	7	715
4:00-4:15	37	322	172	7	22	5	565
4:15-4:30	37	354	163	6	18	11	589
4:30-4:45	49	392	165	7	22	9	644
4:45-5:00	32	347	165	6	17	11	580
PM Peak Hour 3:45 - 4:45							
Total	159	1491	719	29	83	32	2513

APPENDIX F

Environmental Assessment Of Fertilizer, Herbicide And Pesticide Use On The Proposed Lualualei Golf Course

Prepared by Murdoch & Green, September, 1990

ENVIRONMENTAL ASSESSMENT

OF

FERTILIZER, HERBICIDE AND
PESTICIDE USE

ON THE PROPOSED

LUALUALEI GOLF COURSE

A REPORT TO

Hida, Okamoto, and Associates, Inc.

September 26, 1990

PREPARED BY

Charles L. Murdoch, Ph. D

Richard E. Green, Ph. D.

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SUMMARY AND CONCLUSIONS

This report addresses the potential environmental impact of fertilizer and pesticide application on the Lualualei Golf Course (18 holes). The principal focus is on the possible impact on quality of surface waters and groundwater aquifers. The 259 acre parcel of land is located about 2 miles from Farrington Highway inland from Nanakuli on leeward Oahu. The topography varies from nearly level in the lowland area adjacent to Lualualei Road to slopes as great as 30% near the boundaries on the slopes of Puu Haleakala. The area drains into Ulehawa Stream which passes through the northern portion of the property; the stream is dry most of the year. Most of the area consists of Lualualei extremely stony clay, which is not well suited for agriculture due to stoniness and undesirable texture. This location is quite arid, having an evaporation deficit of about 50 inches annually, thus recharge from rainfall is minimal. Two separate groundwater aquifers are associated with the site. A limestone aquifer underlies lower elevation areas; it contains low quality water which is unsuitable for drinking and perhaps even for irrigation. A deeper confined aquifer in basalt contains higher quality water which will likely be used for irrigation. It receives recharge from rainfall on talus slopes and ridges of exposed bedrock in higher elevation areas, principally outside the boundaries of the area to be developed.

An analysis of the types and amounts of fertilizers and pesticides likely to be used on a golf course suggests that only nitrate from fertilizers might move through the soil profile in sufficient quantity to be measurable in groundwater of the limestone aquifer; this water is already of poor quality due to its high salinity. The deeper basaltic aquifer would not receive much recharge from the developed area and thus would not be affected. The pesticides expected to be used are even less likely to impact on groundwater quality than nitrate. A comparison of the Attenuation Factors for the various pesticides indicates that the pesticides used in largest quantity are not expected to move to groundwater as a result of either high sorption on the soil or rapid degradation in the soil. Others which are potential leachers are not used in sufficient quantity to constitute a problem. The low permeability of the Lualualei soil when it is moist is another factor which will limit chemical leaching.

Contamination of shoreline waters by chemicals in runoff is very unlikely. Runoff-producing storms normally occur only in the winter months. When runoff from the golf course does occur, it will be highly diluted by waters from large areas of Lualualei Valley, since Ulehawa Stream, into which the golf course will drain, is a major drainage way for the valley. Construction of several lakes or ponds on the golf course will further mitigate any impact of chemicals on runoff waters.

Containment of applied chemicals in the soil profile and within the boundaries of the development will be enhanced by careful management of both chemicals and water. Both leaching and runoff can be reduced by applying water only when it is required for suitable plant growth. Irrigation based on a water balance method is recommended. Use of a slow-release nitrogen fertilizer in the winter months will reduce leaching and runoff losses of nitrate.

The chemicals applied in golf course management pose little hazard for birds or wildlife. Fertilizers are relatively non-toxic unless ingested in large amounts. With the exception of chlorpyrifos, the pesticides are of low toxicity to birds. Chlorpyrifos has a low solubility in water, is highly sorbed, and degrades rapidly; thus its use does not threaten either water quality or birds.

There will be no significant impact on air quality from application of pesticides in golf course management provided that appropriate application techniques are used. The spray equipment used in golf course maintenance is ground-operated. Nozzle heights are typically less than two feet. Low spray pressures and coarse nozzle openings result in relatively large droplet sizes which are not highly subject to drift.

RECOMMENDATIONS

1. Where grading is necessary, topsoil should be stockpiled and replaced over the areas to which chemicals will be applied.
2. Judicious use of fertilizers and pesticides, especially in the early establishment of turf, is essential, since pesticides and nitrogen will be more likely to move before an extensive root system and thatch layer are developed. Special care in pesticide application is also necessary during the winter months when runoff-producing storms are likely.
3. Slow-release nitrogen fertilizers should be used during the rainy season (November through February).
4. Irrigation management is critical to the conclusions reached above. For this reason we recommend that a U. S. Weather Bureau class A evaporation pan be used to measure evaporation and schedule irrigation application in the management of the proposed golf course. An excellent discussion of irrigation scheduling can be found in the book Golf Course and Grounds Irrigation and Drainage (Jarret, 1985).
5. As our conclusions are based on the assumption that sound management practices will be followed with regard to fertilizer and pesticide application and irrigation, we recommend that a qualified Golf Course Superintendent be given the responsibility of managing the golf course.

I. INTRODUCTION

This report addresses the potential environmental impact of fertilizer and pesticide application on the Lualualei Golf Course. The 18-hole golf courses will require application of fertilizers to supply essential nutrients to turfgrasses and ornamental plants, and pesticides to control their associated weed, disease, and insect pests. The term pesticide, used in its generic sense in this report, includes herbicides, fungicides and insecticides. The assessment provided in the report focuses principally on the potential for applied chemicals to move in surface runoff and to groundwater. Additionally, the potential for pesticide transport in the air and potential for negative impact on birds in the area are addressed briefly in the appendices. The toxicity and environmental behavior of pesticides which are likely to be used are considered in the analysis, as are soil, topographic and climatic factors which may impact on fertilizer and pesticide movement.

II. APPROACH

Key elements of the analysis are (1) calculation of quantities of applied chemicals (pesticides and fertilizer nutrients) which are likely to be used throughout the year, (2) compilation of soil, geologic and climatic information which will aid in the assessment of chemical movement, (3) estimation of water balance from rainfall, irrigation and evapotranspiration, (4) compilation of pesticide properties which may be of environmental significance, and (5) computation of the Attenuation Factor for pesticides used on golf courses, using properties of the chemicals and soil properties, in order to estimate the likelihood of chemical movement to groundwater.

A location map and a conceptual master plan map of the Lualualei Golf Course were provided by Hida, Okamoto and Associates, Inc. A groundwater assessment by Mink (1988) provided information on the nature of the relevant aquifers. Soil maps and associated soil survey publications provided information required for an assessment of infiltration and runoff potentials, as well as soil organic carbon contents. Published rainfall and evaporation data in the area provided an estimate of groundwater recharge with turf cover. Anticipated use of chemicals in golf course management is based on our own recommendations, and pesticide properties were obtained from published reports. We visited the site on September 1, 1990.

III. ANALYSIS OF FACTORS IMPACTING ON CHEMICAL MOVEMENT

A. Site Factors

1. Topography, geology and soils

The project site is located near the Waianae Coast on Southwest Oahu. It is accessed easily by the paved Lualualei Road (U. S. Navy right-of-way), being only about 2 miles from Farrington Highway and north of Lualualei Homestead. The 18-

hole golf course will be located east of Lualualei Road, with the north boundary being adjacent to the Navy Reservation lands. The area of the parcel is 259 acres.

The topography varies from nearly level in the lowland area adjacent to Lualualei Road to as much as 30% near the boundaries on the slopes of Puu Haleakala. The elevation ranges from about 60 feet near the road to about 400 feet at the highest point. The average slope across the widest reach of the parcel is about 14% over a distance of 2400 feet from west to east. The area drains into Ulehawa Stream which passes through the northern portion of the property, near the Navy Reservation. The stream is dry most of the year.

Most of the area (about 90%) consists of Lualualei extremely stony clay, with the mapping symbol LPE. It is classified Typic Chromusterts, very-fine, montmorillonitic, isohyperthermic. The high stone content of the soil at this site makes it very difficult to cultivate, thus it has a Capability Classification of VIIs, indicating severe limitations due to stoniness and undesirable texture. The soil is formed on talus slopes of the Waianae Mountains. The area marked LuB makes up the remainder of the parcel. It occurs along the stream and highway in the low elevation areas. This soil has a Capability Classification of IIIe if irrigated, and VIi if non-irrigated.

The Lualualei soil typically has only two horizons, the surface A horizon and the underlying parent material or C horizon. In areas of nearly level topography the A horizon may be about 2 feet deep, but on the talus slopes the surface soil is expected to be thinner. This soil cracks widely upon drying, but has a high shrink-swell potential so that the cracks close when the soil is thoroughly wetted. This shrink-swell characteristic has a great impact on the infiltration of water and permeability of the soil. When the soil is dry, water infiltration into the surface soil can be rapid, but once the cracks close in the wetted soil, the infiltration of water is greatly reduced. Consequently, runoff is medium to rapid on the steeper slopes. The organic carbon content of the surface soil is generally about 0.5% and may decrease to less than 0.1% at a depth of 3 feet (Soil Conservation Service, 1976, p. 204).

2. Rainfall, evapotranspiration and potential recharge

Lualualei Valley, on the leeward coast of Oahu, is relatively arid. Mean annual rainfall is approximately 20 to 30 inches and varies from about 3.5 inches in December and January to about 0.4 inches in June and July (Giambelluca et al., 1986). Mean pan evaporation is approximately 70 to 80 inches annually and varies from over 8 inches in July and August to about 4 inches in December and January (Ekern and Chang, 1985) (Figures 1 and 2). There is an evaporation deficit of approximately 50 inches annually and there are no months when rainfall equals pan evaporation. Thus with careful irrigation, recharge of groundwater would be minimal.

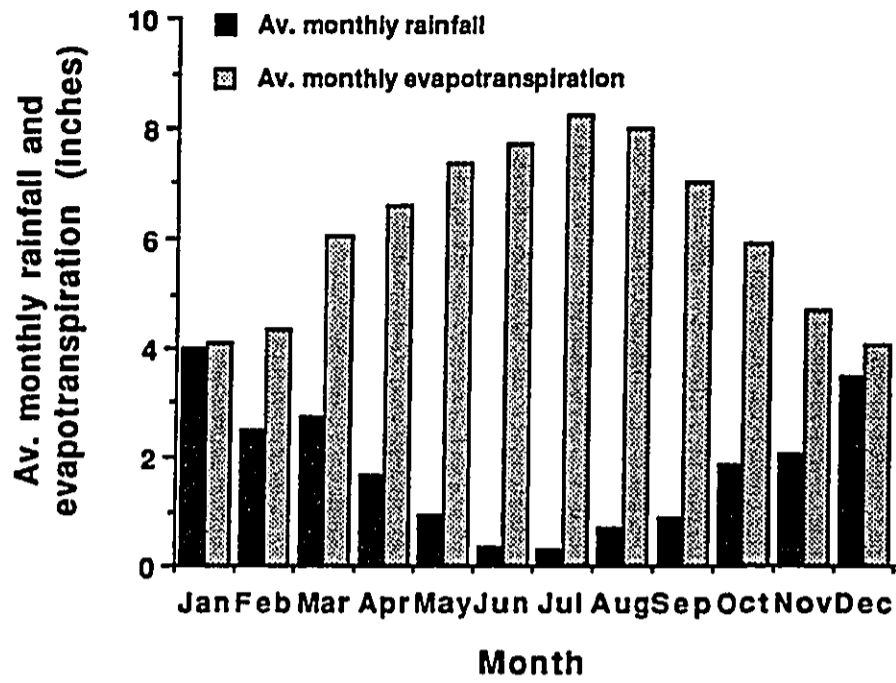


Figure 1. Mean monthly rainfall and pan evaporation for the Lualualei area (Ekern and Chang, 1985; Giambelluca et al., 1986).

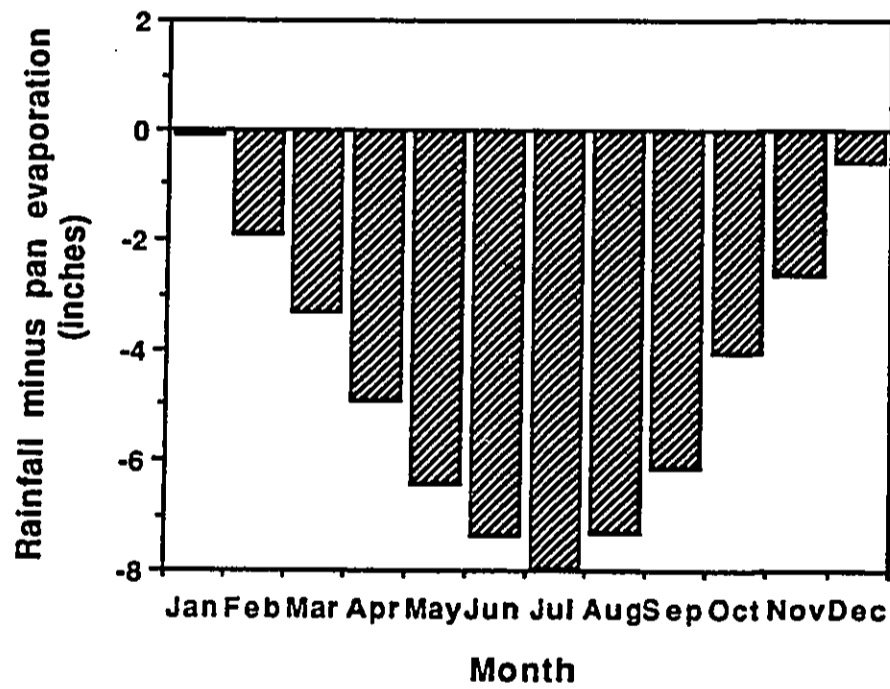


Figure 2. Rainfall minus pan evaporation for the Lualualei area.

3. Groundwater

The relevant groundwater aquifers associated with this site have been described by Mink (1988). An aquifer containing brackish water is in limestone which extends throughout Lualualei Valley. The limestone is about 100 feet thick and is underlain by clays and calcareous sediments containing salty water. The limestone aquifer is tapped by several small wells in the valley, but few if any are presently used due to the salinity of the water. Of greater interest is the basalt aquifer associated with elevations above 120 feet on the property. The aquifer consists of basalt compartments between dikes in the Waianae volcanic series. Water extracted from this source would likely not be potable but should be adequate for irrigation, with a salinity of 500 to 1000 mg/L chloride (Mink, 1988). The basalt aquifer is recharged by rainfall on talus slopes and ridges of exposed bedrock.

B. Management Factors

1. Fertilizers

Fertilizers are applied to golf courses to supply those essential nutrients which are used in large amounts and which are deficient in most soils. In typical soils, the elements which are normally applied in a turfgrass fertilization program are nitrogen (N), phosphorus (P), and potassium (K). Fertilizers are normally applied to only the greens, tees, fairways, and part of the roughs of a golf course. Typical areas in each of these types of turf for a 18-hole golf course are estimated in the discussion below.

Turfgrasses use much more N than other elements. Based on turfgrass clipping composition, it has been shown that the turfgrasses grown in Hawaii use about twice as much N as K and about 4 times as much N as P.

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 (NH_4) likewise moves little in soils. Nitrogen applied in the ammonium form, however, is rapidly converted to the nitrate form (NO_3) 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. Thus nitrogen movement can be mitigated by applying a slow-release nitrogen fertilizer in which the nitrogen is in an insoluble form when applied (Brown, et al., 1977) or by applying small amounts of soluble N through the irrigation system and irrigating only to replace soil moisture used by evapotranspiration (Snyder, et al., 1984).

Fertilizer use rates for the different golf course areas are shown in Table 1.

Complete fertilizers (ones containing N, P, and K) are usually applied. Because nitrogen is applied in larger quantities and also because it is the only fertilizer element likely to cause contamination of ground or surface waters, only nitrogen application rates are given.

Table 1. Approximate fertilizer use for an 18-hole golf course in Hawaii.

Type of turf	Area (acres)	Fertilizer amount (lb. N/1000 sq. ft.)	Application frequency	Total annual application (tons N)
Greens	3	0.5	2 weeks	0.85
Tees	3	1.0	3 weeks	1.15
Fairways	50	1.5	8 weeks	10.00
Roughs	<u>30</u>	1.0	3 months	<u>2.60</u>
Total	86			14.60

2. Pesticides

There are a number of weed, insect and disease pests of turfgrasses in Hawaii which sometimes require application of chemical pesticides. Pesticides are normally applied only in response to outbreaks of pests. There are few instances in which pesticides other than herbicides are applied in a regularly scheduled, preventative program. A typical pesticide program for golf courses in Hawaii is given in Table 2 below. There are several chemicals which may be substituted for certain ones in this suggested program. Properties of the chemicals listed in Table 2, as well as those of most chemicals used in turf in Hawaii, are given in Appendix Table A-1.

Table 2. Approximate pesticide use for an 18-hole golf course in Hawaii.

Turfgrass area	Area (acres)	Chemical	Frequency	Rate/application	Annual total
I. Herbicides					
A. Greens	3	MSMA	6 times/year	2 lb. ai./acre	36 lb. ai
		bensulide	2 times/year	12 lb ai/acre	72 lb. ai
B. Tees	3	MSMA	6 times/year	2 lb. ai./acre	36 lb. ai
		Trimec®	3 times/year	1 pint/acre	9 pints
		bensulide	2 times/year	12 lb. ai./acre	72 lb. ai
C. Fairways	50	MSMA	6 times/year	2 lb. ai./acre	600 lb. ai
		Trimec®	3 times/year	1 pint/acre	19 gallons
		metribuzin	2 times/year	0.75 lb. ai./acre	75 lb. ai.
D. Perimeter areas	20	glyphosate	3 times/year	1.5 lb ai./acre	90 lb. ai.
II. Insecticides					
A. Greens	3	chlorpyrifos	As needed	1 lb. ai./acre	Approx. 18 lb. ai.
B. Tees	3	chlorpyrifos	As needed	1 lb. ai. acre	Approx. 18 lb. ai.
C. Fairways	Spot treatments	chlorpyrifos	As needed	1 lb. ai./acre	Approx. 50 lb. ai.
III. Fungicides					
A. Greens	3	metalaxyl	As needed	1.3 lb. ai./acre	Approx. 25 lb. ai.
		chlorothalonil	As needed	8 lb. ai./acre	Approx. 72 lb. ai.
B. Tees	3	metalaxyl	As needed	1.3 lb. ai./acre	Approx. 25 lb. ai.
		chlorothalonil	As needed	8 lb. ai./acre	Approx. 72 lb. ai.
C. Fairways	Spot treatments	chlorothalonil	As needed	8 lb. ai./acre	Approx. 250 lb.ai.

3. Irrigation

Because rainfall is not uniformly distributed throughout the year, all golf courses are irrigated to supplement rainfall. Golf courses usually have permanent sprinkler irrigation systems with sophisticated control systems. Many are computer controlled, so that each sprinkler head on the golf course can be adjusted to apply a selected amount of water on each cycle.

The irrigation requirement of plants can be calculated from pan evaporation (PE) and rainfall (R) data if the water use requirement (transpiration plus evaporation) of the crop being grown is known. The water use requirement of warm-season turfgrasses is approximately 50% of pan evaporation (Handreck and Black, 1984). Irrigation systems are never completely efficient. If one assumes a 90% efficiency of water application, then irrigation requirement can be calculated as $(0.6 PE) - R$. Water use requirement for warm-season turfgrasses was calculated for the Lualualei Golf Course site from pan evaporation (Ekern and Chang, 1985) and rainfall (Giambelluca, et al., 1986) data, assuming 150 acres as the size of the golf course. Based on these data, average monthly irrigation requirements range from zero in January and December to 18 million gallons in July (Figure 3). The total annual irrigation requirement for the Lualualei area averages approximately 106 million gallons. This is considerably less than the commonly cited one million

gallons per day required for golf courses in Hawaii. Murabayashi (1989) reported that irrigation amounts for 11 golf courses in the State varied from 0.0023 million gallons per day per acre (mgd/acre) to 0.011 mgd/acre, a 478% difference. Average water use for the 11 golf courses was 0.006 mgd/acre. Based on Murabayashi's data, the average 150 acre golf course would require approximately 0.9 million gallons of water per day or 329 million gallons per year.

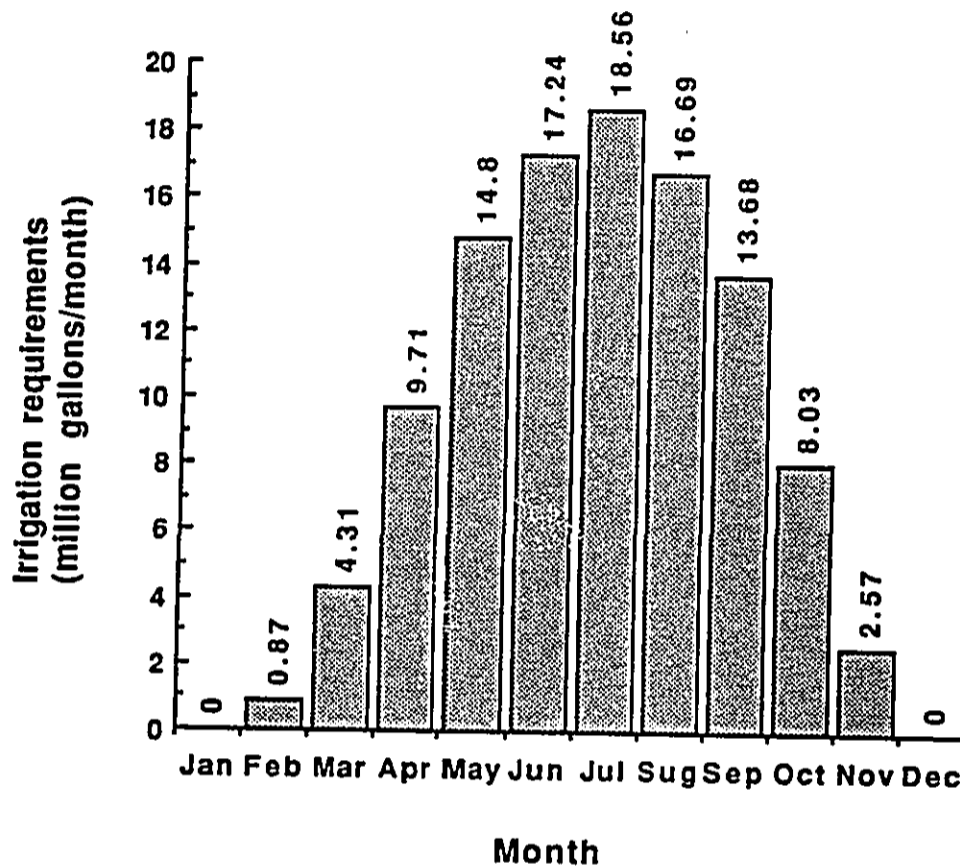


Figure 3. Mean monthly irrigation requirement for the Lualualei Golf Course area.

Irrigation practices may have a large influence on the movement of soluble nitrogen fertilizers in soils. If excessive irrigation water is applied soon after application of soluble nitrogen sources, the likelihood of runoff or leaching of nitrogen below the root zone is increased. From the above it is apparent that basing irrigation amounts on calculated water use is a much more efficient method of water utilization than is currently being practiced. The data reported by Murabayashi (1989) was from golf courses in areas ranging from very arid (the Kona Coast, Keihi) to relatively wet (Princeville). The Lualualei area is relatively arid, yet the average annual irrigation requirement for turfgrasses at this location is only approximately one-third the amount reported by Murabayashi. Basing irrigation scheduling on

water use rates will not only result in large savings of water, but also reduce the likelihood of chemicals being leached from the rootzone.

IV. Potential for Chemical Movement to Groundwater and Surface Waters

A. Issues of concern and the scope of this assessment

The principal issue addressed in this report is the potential for movement of fertilizers and pesticides to groundwater and surface waters.

The presence of agricultural chemicals in groundwaters at many locations in the State (Honolulu Star Bulletin, Aug. 13, 1989) is reason for caution in the use of chemicals in recreational areas such as parks and golf courses as well as in agriculture. It is important to recognize, however, that detection of a chemical in water bodies, even in potable water, does not necessarily constitute a health hazard as defined by the U. S. Environmental Protection Agency (EPA). In an effort to assist federal, state and local officials in responding to drinking water contamination, the EPA has set "Lifetime Health Advisory" levels (concentrations in drinking water) for many chemicals. EPA estimates these levels after reviewing available human data and experimental animal studies to evaluate potential human health effects. The Health Advisories are considered tentative and are updated as new information becomes available. Some agricultural chemicals which have reached groundwater in Hawaii, for example nitrate from fertilizers and the herbicide atrazine, have been detected at many locations in the State, but seldom are at a concentration considered a threat to human health. Also, Health Advisory Levels (HAL) vary widely for different chemicals: for nitrate the level is 10,000 micrograms per liter (10 milligrams/liter) of water while for atrazine it is 3 micrograms per liter. Thus for these two chemicals, the HAL's differ by a factor of 3,333. The relative oral toxicity of a number of pesticides registered for use in golf courses, given in Appendix Table A-1, reflect the wide range of toxicities obtained in animal feeding studies.

In the assessment which follows, we attempt to evaluate the potential for groundwater and surface water contamination by chemicals which might be applied to the proposed Lualualei Golf Course. Our assessment does not include an estimate of the chemical concentration in waters or of human exposure or risk. Useful estimates of health risk are not possible when concentrations of chemicals in water are not known. However, when the evidence indicates the likelihood of no contamination or of concentrations well below the Health Advisory Level, further analysis of health risk is neither possible nor appropriate.

B. Potential impact on groundwater quality

Because the area treated with pesticides on a golf course is small, the total amount of pesticide applied is relatively small also. Most pesticides used in golf course management are of low toxicity (Appendix Table A-1). Most are either

rapidly degraded in soil and/or are sorbed tightly to organic matter or soil colloids and move little from the site of application. The pesticides in Appendix Table A-1 which are most likely to move below the root zone are metribuzin, mecoprop, dicamba, simazine, and trichlorfon. The relative mobility of these chemicals can be quantified by computation of the Attenuation Factor (AF) of each chemical for an appropriate set of conditions. Attenuation of chemical movement by the soil includes both retardation of movement due to sorption on soil organic matter and degradation in the soil by both biological and chemical pathways. The AF numerical index (Rao et al., 1985) is presently being evaluated (Khan and Liang, 1989; Loague et al., 1989) for use in an assessment methodology which the State of Hawaii will use in pesticide regulation. The AF index can have numerical values from AF = 0 (total attenuation) to AF = 1 (no attenuation). By definition, AF is the fraction of chemical remaining in the soil after a single application when the recharge is sufficient to carry the chemical to the bottom of a soil layer of a given depth (for example, 50 cm). For soil and water recharge conditions of practical interest in Hawaii, AF values for the five chemicals which are most likely to move beyond a depth of 50 cm are shown in Table 3. AF values range from 2.1×10^{-6} for simazine (lowest contamination potential) to 7.1×10^{-3} for trichlorfon (highest contamination potential). For comparison, DBCP, which was used for 25 years in pineapple and has contaminated groundwater at many locations, has $AF = 4.6 \times 10^{-1}$, indicating a much higher likelihood for DBCP movement to groundwater than any of the chemicals listed in Table 3. Also, the total amounts of chemicals in Table 3 which are used on golf courses are relatively small. Trichlorfon is not used in Hawaii to our knowledge, although it is labeled. Mecoprop and dicamba are components of the herbicide Trimec®. Total annual mecoprop and dicamba application for the 18-hole golf courses will be approximately 20 and 4 pounds, respectively. The total amount of metribuzin applied will be approximately 75 lb. annually. Simazine is used on few golf courses in Hawaii. If used, simazine application would not exceed 100 lb. annually.

Table 3. Attenuation factors (AF) for the most mobile pesticides labeled for use on golf courses.†

<u>Pesticide</u>	<u>AF</u>
Metribuzin	3.5×10^{-6}
Mecoprop	1.3×10^{-3}
Dicamba	7.1×10^{-5}
Simazine	2.1×10^{-6}
Trichlorfon	7.1×10^{-3}

†Based on the following conditions: soil organic carbon content = 1.5%; soil bulk density = 1.2 g/cm^3 ; soil water content = 35% by volume; water recharge = 0.1 cm/day; depth of penetration = 50 cm.

It is unlikely that any of the chemicals used on the golf course would reach the aquifer in sufficient concentration to adversely affect human health. Nitrate and metribuzin are the two chemicals which are applied in sufficient quantities and are sufficiently mobile and persistent to possibly be detected in groundwater. It is unlikely that the small amount of metribuzin used on golf courses would contribute a measurable amount to the groundwater and the contribution of nitrate from fertilizer may be small relative to background nitrate present in the aquifer. If fertilizer nitrate did reach the aquifer, it would not likely increase the level sufficiently to be of concern to human health; the nitrate Health Advisory Level (HAL) is 10 mg/L. The metribuzin HAL is 200 µg /L.; detection at even 1 µg/L in aquifer water is unlikely. The more vulnerable limestone aquifer has such high salinity that it will not be used for potable water and probably not for irrigation. The higher quality basalt aquifer receives most of its natural recharge from areas which are at elevations above those to be developed for the golf course.

Recharge of groundwater in the deeper basalt aquifer from infiltration of rainfall in the development area will be minimal due to low rainfall and high evapotranspiration most of the year. Recharge of groundwater from irrigation water may occur at elevations between about 125 and 400 feet, but the combination of careful water management and the low permeability of the Lualualei soil when maintained in a moist condition will minimize deep penetration of water and solutes.

Thus we do not anticipate an adverse effect of fertilizers and pesticides on groundwater quality when proper management is exercised in both irrigation and chemical use.

C. Potential Impact on Surface Water Quality

Runoff-producing storms are not expected to occur most of the year. During the winter months (November through February) runoff is more likely. Thus, special care in management of chemicals and irrigation should be exercised during this period. Runoff from the golf course during high-rainfall periods will contribute to streamflow in Ulehawa Stream. This stream is dry most of the year, but during the winter months is the channel carrying runoff from Lualualei valley to the ocean. Fertilizer nitrate or pesticides in runoff from the golf course are not expected to be detectable in coastal waters at Nanakuli where the stream enters the ocean. The golf course is located about two miles from the coastline, providing a relatively large distance for mixing and dilution of golf course runoff with other runoff waters from Lualualei Valley. The developers are also planning to build several lakes on the golf course; these will serve as detention basins during periods of rapid runoff, and will further mitigate any negative impact of chemicals in runoff waters.

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APPENDICES

Appendix Table A-1. Properties of pesticides used on turf in Hawaii

Pesticide common name	Trade name (s)	Oral LD-50 (mg/kg body wt)*	Toxicity to fish and wildlife*	Soil sorption Index (Koc)**	Water solubility (mg/l)**	Half-life in soil (days)**	Leaching potential**
I. Herbicides							
MSMA	WeedHoe etc.	1800	Low	10000	1000000	100	Small
glyphosate	Roundup, Kleenup	150	Mod. to birds, none to fish	10000	1000000	30	Small
metribuzin	Sencor	2200	Moderate	41	1220	30	Small
2,4-D	part of mixtures	370-700	High to fish	109	300000	10	Medium
mecoprop	dito	700-1500	Low	3	560000	21	Large
dicamba	dito	1000-2000	Non toxic to fish	2	800000	14	Large
oryzalin	Surflan	10000	Mod. to birds, toxic to fish	2700	2.5	60	Small
oxadiazon	Ronstar	8000	Toxic to fish	990	15	30	Small
propyzamide	Kerb	5620-8350	Low	138	3.5	75	Large
simazine	Princep	>5000	Low	5000	0.5	30	Small
chlorthal-dimethyl	Dacthal	>3000	Low	10000	25	60	Small
bensulfide	Belatan, Belamec	770	Mod. to fish	100000	1000000	.3600	Small
paraquat dichloride	Ortho Paraquat CL	150	Mod. to birds, none to fish	11000	0.1	30	Small
benfluralin	Balan	10000	Low to birds, high to fish				
II. Insecticides							
chlorpyrifos	Dursban	135-163	High	6070	2	30	Small
bendiocarb	Ficam	40-156	High				
carbaryl	Sevin	400-850	Moderate	229	40	7	Small
trichlorfon	Dylox	450-630	Moderate	2	154000	27	Large
III. Fungicides							
anilazine	Dyrene	<5000	Low	3000	10	1	Small
benomyl	Benlate	8500	Low	2100	2	100	Small
chlorothalonil	Daconil 2787	>10000	Low to birds, mod. to fish	1380	0.6	20	Small
iprodione	Chipco 26019 RP	3500	Low	500	13	20	Small
mancozeb	Dithane M-45	>8000	Low	1000	0.5	35	Small
quinotozone	PCNB, Terrachlor	12000	Non-toxic	1000	0.44	21	Small
thiram	Tersan	7500	Low	383	30	20	Medium
triadimefon	Bayleton	568	Non-toxic	273	260	21	Medium
metaxyl	Subdue	669	Low	16	7100	7	Medium
thiophanate-methyl	Clearv 3336	7500	Low	1000	3.5	0	Small

*From: Hartley, Douglas and Hamish Kidd (Eds.) 1983. The Agrochemicals Handbook. Unwin Bros., Ltd. Old Working, Surrey, England.

**From: Wauchope, R. D. 1988. U. S. D. A.-ARS Interim Pesticide Properties Database, Version 1.0. Unpublished

Appendix Table A-2. Toxicity classes of pesticides.

Class	Description	Warning Statement	Oral LD50
1	Highly Toxic	Poison, Skull & Crossbones	1-50
2	Moderately Toxic	Danger	51-500
3	Low Toxicity	Warning	500-5,000
4	Very Low Toxicity	Caution	>5,000

APPENDIX B

IMPACT ON MIGRATORY BIRDS AND ENDANGERED HAWAIIAN WATERBIRDS.

The fertilizers, herbicides, and fungicides used in golf course maintenance pose little or no hazard to birds frequenting the grassed areas or ponds associated with golf courses. Fertilizers are relatively non-toxic unless ingested in large amounts. All herbicides and fungicides used in golf course maintenance in Hawaii are of low to moderate toxicity (Appendix Table 1). The only chemicals used in golf course maintenance in Hawaii which are highly toxic to birds are the organic phosphate insecticides, especially chlorpyrifos.

Although chlorpyrifos is toxic to birds, it is strongly adsorbed on the thatch layer of turf and moves little from the site of application. One reason for its weakness in controlling soil infesting insects is the inability to get the insecticide through the thatch layer to the depth needed to contact these insects. Recent studies (Sears and Chapman, 1980; Tashiro, 1980) have shown that chlorpyrifos applied to turfgrasses does not penetrate more than 2 to 3 centimeters in the soil. In addition to resistance to movement in the soil, it has been shown that it is rapidly degraded in the soil, both by hydrolysis and microbial action (Miles et al. 1979).

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

The likelihood of bird injury by pesticides used in maintenance of the proposed golf course can be reduced by proper application of pesticides with reduced toxicity to birds. Appendix Table 1 shows that carbaryl and trichlorfon are less toxic to birds than chlorpyrifos. In most cases these insecticides may be substituted for chlorpyrifos with little loss of effectiveness.

Golf courses are frequently visited by birds. As far as we are aware, there have been no reported incidents of bird kill in Hawaii from chemicals applied in golf course management. Waterfowl and fish appear to thrive in ponds and water hazards on golf courses in Hawaii. Many golf courses cultivate white amur fish in the ponds to control algae. Mosquito fish are generally stocked to prevent mosquito problems. We are aware of no incidents of fish or waterfowl injury from chemicals applied to golf courses.

The labeling of herbicides and pesticides by EPA for particular uses, enforced by the Hawaii Department of Agriculture, is perhaps the best assurance of protection of humans and wildlife from their hazards. All pesticides must be applied in compliance with federal and state laws regulating their use. Hazards to both humans and wildlife are included in the decision to label a pesticide for specific uses, including use on golf courses, and in developing regulations on allowable application procedures of the pesticide for various uses.

APPENDIX C

IMPACT ON AIR QUALITY

Most herbicides and pesticides used on golf courses are of relatively low mammalian toxicity, with LD₅₀ values ranging from hundreds to several thousand mg/kg body weight (Appendix Table 1). None of the chemicals listed in Table 2 above are highly volatile. A measure of volatility is the vapor pressure (VP). The compounds used in highest quantity, for which vapor pressure data is readily available, are chlorothalonil (VP=1.3 x 10⁻⁵ atm at 25° C) and chlorpyrifos (VP=2.4 x 10⁻⁸ atm at 25° C). In comparison, DBPC, which is known to be volatile, has a vapor pressure of 1.2 x 10⁻³ atm at 21° C, i.e. at least 100 times the vapor pressure of chlorothalonil and 100,000 times the vapor pressure of chlorpyrifos. In addition, pesticides are applied on golf courses in dilute sprays (50 to 100 gallons of spray solution per acre) to open areas. For these reasons there is little likelihood of volatility once the pesticides are applied.

If properly applied, there is also little potential for drift of spray particles from golf course spray equipment. The greatest danger of significant drift of pesticides is from aerial application. Golf course pesticides are applied with ground spray equipment. Boom height of spray equipment is less than one meter. Low spray pressures (20 to 40 psi) and coarse spray droplets further reduce the hazard of airborne fine droplets. Droplets larger than 100 micrometers diameter are not highly subject to drift.

Most of the spray volume from typical flat-fan nozzles used in agricultural spray equipment is from droplets larger than 100 micrometers. Table 3 below shows a typical distribution of droplet sizes for a flat-fan nozzle (the type used in most golf course spray equipment). At the low concentrations used in pesticide application, this would not result in significant quantities of pesticides being carried downwind. High wind speed would increase the likelihood of drift of fine spray droplets, however, because high wind speed distorts spray patterns and results in poor coverage; spraying in periods of high wind is not common practice. Table 4 below shows the percent of spray application volume deposited at 4 and 8 feet downwind and the distance downwind for the volume to drop to 1% or below for flat-fan nozzles under different conditions. Even under high wind conditions (almost 10 mph) and spraying at 40 psi, the distance downwind at which 1% or less of the total spray volume was deposited was only 17 feet.

Appendix Table D-1 Droplet size range for a typical flat-fan nozzle at 20 and 40 psi. (from Hofman et al., 1986)

Droplet size range (microns)	Percent of spray volume	
	20 psi	40 psi
0-21	0.1	0.4
21-63	3.0	10.4
63-105	10.7	20.1
105-147	16.2	25.4
147-210	36.7	35.3
210-294	27.5	7.7
>294	5.8	0.7

Appendix Table D-2. Percent of spray volume deposited at 4 and 8 feet downwind and the distance in feet for the volume of spray solution to drop to 1% of the total spray volume (from Hofman et al., 1986).

Nozzle ht. (in.)	Pressure (psi)	Wind speed (mph)	Percent deposited		Distance to drop to 1% of volume
			4 ft.	8 ft.	
14	40	3.5	3.1	0.6	7.0
27	40	3.5	5.9	1.5	13.0
18	30	5.3	9.3	2.2	14.0
18	25	9.9	10.3	3.1	15.5
18	40	9.9	9.1	3.6	17.0

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

The greatest danger of airborne pesticides is to the applicators of pesticides themselves. Mixing of wettable powder formulations and being in close proximity to airborne spray particles, particularly when operating spray equipment in a downwind position, places spray operators in particularly vulnerable positions. EPA and OSHA have strict standards which specify

that spray operators wear appropriate protective clothing and breathing apparatuses.

APPENDIX G

Terrestrial Vertebrate Animals Of The Proposed Lualualei Golf Course

Prepared by Andrew J. Berger, September, 1990

Terrestrial Vertebrate Animals of the
Proposed Luaualei Golf Course

By Andrew J. Berger

This study was done in accordance with instructions received in a letter dated March 19, 1990, from Mr. Harvey H. Hida, President of Hida, Okamoto & Associates, Inc. of Honolulu, and Mr. Hida's letter of July 11, 1990, which approved my proposal of March 22, 1990. Field studies of the project site were conducted on August 18 and 20, 1990.

The Habitat at the Proposed Site

In comparison with a native or endemic dry land ecosystem on the leeward coasts of the Hawaiian Islands, the project site can properly be called a "true wasteland." The dominant plants are kiawe or mesquite (Prosopis pallida), koa haole (Leucaena glauca), and vast stretches of dead introduced grasses. The land just below the project site has suffered a brush fire recently so is blackened grass and small shrubs.

The fact is that much of the native vegetation in the lowlands was destroyed by the early Hawaiian settlers. This destruction was completed by the feral cattle, goats, and sheep that Captain Cook and later ship captains released in the islands (Division of Forestry and Wildlife, 1989). Although there appear to be no pigs in this dry area, pigs, especially on Kauai, Maui, and Hawaii still do great damage to the native forests today (Mueller-Dombois, et al., 1981; Engilis, 1990).

Amphibians and Reptiles

There are no endemic amphibians or land reptiles in the Hawaiian Islands. All, therefore, have been introduced by man.

1. Amphibians

Four species of frogs have been introduced to the island of Oahu.

1. Giant Neotropical Toad (Bufo marinus)

This toad was first introduced to the islands in 1932 "when Dr. C. E. Pemberton brought 148 adult toads from Puerto Rico. Eighty of these were liberated in a taro patch near Waipio, Oahu, and 68 were released in a swampy part of Manoa Valley" (Oliver and Shaw, 1953:77). The toads were very successful, and "in a little over two years more than 100,000 descendents of the original stock were distributed through Dr. Pemberton's activities throughout the islands." Hunsaker and Breese (1967) wrote that this toad was the "commonest species of amphibian in Hawaii." The neotropical toad is found throughout the entire region. They are active primarily at night and I saw only one toad during my studies.

2. Gold and Black Poison Frog (Dendrobates auratus).

This frog was introduced to Oahu "to assist in the control of insect pests." Oliver and Shaw state that the species was released in the upper part of Manoa Valley in 1932. Hunsaker and Breese (1967) wrote that "additional plantings with subsequent establishment have been made in Waiahole Valley, and the population has been observed to fluctuate in size at this

locality, again according to the amount of water available." McKeown (1978) said that this frog is found in well-foliated valleys on both Leeward and Windward Oahu." He added that, in summer and fall "these frogs spend their time in moist places such as under debris, logs, stones, tangled rood systems or under elevated valley homes." However, I know of no records of this frog at low elevations or in the Waianae region, and I do not believe that they inhabit this dry area.

3. American Bullfrog (Rana catesbeiana)

"This was probably one of the first species of amphibian to be introduced to the Hawaiian Islands and may have been one of the frogs that was imported prior to 1867" (Oliver and Shaw, 1953). The frogs were abundant enough to be harvested commercially by 1900. Tinker (1941) wrote that "the University of Hawaii has organized 'frog clubs' to encourage the production of frogs for food." The species is not nearly so common now, presumably because of the draining of so many wetland areas and also because of the widespread use of pesticides and herbicides during recent decades. Bullfrogs are active primarily at night, and I neither saw nor heard any during my field studies, nor did I see any suitable habitat for this primarily aquatic animal.

4. Wrinkled Frog (Rana rugosa)

This frog was introduced to Hawaii from Japan in 1896 (McKeown, 1978). It is most common in mountain streams, although Shallenberger (1977:245) found this species at Punahoolapa Pond on the north shore of Oahu. McKeown noted that the wrinkled frog and the bullfrog rarely are found together because the

bullfrog is such an aggressive feeder. There is no habitat for this frog in the project area.

II. Reptiles

1. Blind Snake (Typhlops braminus)

"This small, secretive snake was apparently introduced from the Philippines in the dirt surrounding plants that were brought in for landscaping the campus of the Kamehameha Boys School in Honolulu. It was first found there in January of 1930" (Oliver and Shaw, 1953). By 1967, Hunsaker and Breese (1967) wrote that "it appears now to occupy the lowland area over the entire island." It now is found on all of the main islands in the Hawaiian chain (McKeown, 1978).

These blind, worm-like snakes are rarely seen until they are flooded from their underground burrows by heavy rain or unless one looks for them under branches and other debris on the ground. I did not search for these snakes because they are of no significance for an impact assessment.

2. Lizards. Eleven species of lizards (in four different families) occur on Oahu. All are foreign to the islands. All are insect eaters, and all adapt very well to both urban and rural areas. Their presence, however, is irrelevant to an environmental impact assessment.

a. Family Iguanidae

1. Green iguana (Iguana iguana)

2. Green anole lizard (Anolis carolinensis porcatus)

b. Family Chamaeleonidae

3. Jackson's chameleon (Chamaeleo jacksoni)

c. Family Gekkonidae

4. Mourning gecko (Lepidodactylus lugubris)
5. Stump-toed gecko (Gehyra mutilata)
6. Tree gecko (Hemiphyllodactylus typus)
7. Indo-Pacific gecko (Hemidactylus gamoti)
8. House gecko (Hemidactylus frenatus)

d. Family Scincidae

9. Metallic skink (Leiolopisma metallicum)
10. Snake-eyed skink (Cryptoblepharus boutoni)
11. Moth skink (Lipinia noctua)

The Birds

Three groups of birds occur in the Hawaiian Islands:

I. Introduced or exotic birds, II. Indigenous or native birds, and III. Endemic birds.

I. Introduced Birds

More than 170 species of alien birds have been intentionally introduced to the Hawaiian Islands (Berger, 1981; Long, 1981). I found the following species on the project site or on lands adjacent to the site. I include birds seen on "lands adjacent to the site" for several reasons. First, the site is surrounded by areas of other land uses or vegetation; secondly, my field studies were limited to two days in August, 1990, and birds seen nearby undoubtedly visit the site from time to time and certainly will do so if the land use is changed. I must point out, however, that although I have studied Hawaiian birds on all of the main islands for many years, never have I studied

an area with such a depauperate number of vertebrate animals. I found no endemic birds, no indigenous birds, and only nine species of introduced birds.

I. Order Columbiformes

a. Family Columbidae, Pigeons and Doves

1. Spotted or Lace-necked Dove (Streptopelia chinensis)

This Asian dove was introduced to the Hawaiian Islands at an early date; the exact date is unknown, but the birds are said to have been very common on Oahu by 1879. The species is now very common on all of the islands and is classified as a game bird in Hawaii. Although as many as 4,755 doves were shot by hunters during the 1967-1968 game bird season, no more than four birds have been killed annually since 1970 (Walker and Saito, 1984)

This dove also is called the lace-necked dove because of the conspicuous bands of white spots on the back of the neck. Although this dove does occur where the annual rainfall exceeds 100 inches, the highest densities are found in drier areas where the introduced mesquite or kiawe (Prosopis pallida) is one of the dominant plant species. Schwartz and Schwartz (1949), for example, reported densities as great as 100 birds per square mile in dry areas on Molokai. This dove is very common on the project site and in all surrounding areas.

2. Barred Dove or Zebra Dove (Geopelia striata)

This species is called the zebra dove in its native habitat in the Orient and Australia. This species is said to have been introduced to the islands sometime after 1922

(Bryan, 1958). It now is common to abundant on all of the main islands. This dove also prefers the drier areas, and Schwartz and Schwartz (1949) reported densities as high as 400 to 800 birds per square mile in some areas on Oahu: for example, Barber's Point to Makaha.

The small zebra dove also is classified as a game bird in Hawaii, but, because of its small size few birds have been shot in recent years (Walker and Saito, 1984).

One study of the food habits of the barred dove in Hawaii revealed that the diet consists of 97 percent seeds and other plant materials; the 3 percent animal matter included several species of beetles, weevils, and wireworm larvae. Kocan and Banko (1974) reported on zebra doves from the Big Island that were infected with trichomonas. This parasite has "catastrophic" effects on doves in North America.

The zebra dove is very common along cane haul roads and anywhere where there are weed seeds.

II. Order Passeriformes

The remaining introduced birds that I found in the project region belong to the large order of perching birds or song birds.

a. Family Pycnonotidae, Bulbuls

Although all members of this family are listed as "prohibited entry" by the State Quarantine Division of the Department of Agriculture, two species are now well established on Oahu.

3. Red-vented Bulbul (Pycnonotus cafer)

The history of the spread of the red-vented bulbul on Oahu since the mid-1960s has been discussed by Berger (1975a, 1981), and of the red-whiskered bulbul (P. jocosus) by Van Riper, Van Riper, and Berger (1979).

Bulbuls are a scourge to both fruit and flower growers in Hawaii because they eat not only ripe fruits and peppers but also buds and flowers. "State and Federal officials are launching a three-pronged effort to keep Oahu's bulbul population from spreading to the Neighbor Islands. . . . If the birds become established on the Neighbor Islands, where about 70 percent of the State's commercial fruit, flower and vegetable crops are grown, farmers could suffer major economic losses" (Conrow, 1989).

The red-vented bulbul is one of the more conspicuous birds throughout the project region.

b. Family Zosteropidae, White-eyes and Silver-eyes

4. Japanese White-eye (Zosterops i. japonicus)

Caum (1933) wrote that the Japanese white-eye or Mejiro was first introduced from Japan to Oahu by the Territorial Board of Agriculture and Forestry in 1929. Later importations were made by the Hui Manu and by private individuals. Singing contests were held with this species in Hawaii.

The white-eye rivals the house sparrow and the European starling in North America as a successful exotic species, and

the white-eye now undoubtedly is the most common song bird in the islands (Berger, 1981). It now is found from sea level to tree line on Maui and Hawaii, and it is found in the driest habitats (e.g., Kawaihae, Hawaii) and in areas with 300 or more inches of rain per year. It is a very common species in all habitats in the lowlands of Oahu.

c. Family Sturnidae, Starlings and Mynas

5. Common Indian Myna (Acridotheres tristis)

The common myna, which is native to Sri Lanka, India, Nepal, and adjacent regions, "was introduced from India in 1865 by Dr. William Hillebrand to combat the plague of armyworms that was ravaging the pasture lands of the islands. It has spread and multiplied to an amazing extent; reported to be abundant in Honolulu in 1879, it now is extremely common throughout the Territory" (Caum, 1933). The myna continues to be abundant especially in the lowland areas of the inhabited islands, being most common in residential and rural areas, especially in the vicinity of man and his buildings. It is a common species throughout the lowland areas on Oahu.

d. Family Ploceidae, Weaverbirds and Their Allies

(1) Subfamily Estrildinae, Waxbills

6. Ricebird or Nutmeg Mannikin (Lonchura punctulata)

Also called the spotted munia, this species has a wide distribution in Sri Lanka, India, Nepal, Burma, and southward to Malaysia and the Indo-Chinese region, and in the the Philippines. The species was introduced to Hawaii about

1865 by Dr. Willian Hillebrand. Caum (1933) wrote that this species "feeds on the seeds of weeds and grasses and does considerable damage to green rice." Although rice is no longer grown in Hawaii, the ricebird has continued to be destructive to certain crops (see house finch, to follow).

Ricebirds are highly gregarious and flock of 100 or more birds are not uncommon at certain times of the year. The ricebird also is a prolific species and I have found active nests in every month of the year. Ricebirds are not inhabitants of dense thickets or forests, but occur everywhere where there are open spaces and a supply of weed seeds, for example, golf courses along dirt roads or cane haul roads, and in residential areas. Ricebirds are common throughout the project region, and I found one nest in one of the kiawe trees.

(2) Subfamily Passerinae, Sparrow Weavers

7. House Sparrow (Passer domesticus)

Also erroneously called the English sparrow (it has a wide distribution in Europe and Asia), this sparrow was first imported to Oahu in 1871, when nine birds were brought in from New Zealand (where they had previously been introduced from England). Caum (1933) wrote that "whether or not there were further importations is not known, but the species was reported to be numerous in Honolulu in 1879."

The house sparrow in North America (first introduced in Brooklyn, New York, in 1852) became a serious pest and many thousands of dollars were spent in attempting to control the

populations (Dearborn, 1912. In India, as well as in North America, the house sparrow causes "collosal damage to the food-grain in standing crops and storages" (Rana and Idris, 1986). Various repellants have been tried in India to protect the crops (see Rana, 1989).

The house sparrow typically is found in the vicinity of man and his buildings, but they also forage in outlying areas. This sparrow apparently never became a problem in Hawaii. The birds are omnivorous in diet eating weed seeds as well as insects and their larvae. The house sparrow is common in the general project area.

e. Family Fringillidea , American Sparrows and Allies

(1) Subfamily Emberizinae

8. Red-crested Cardinal (Paroaria coronata)

This species was long called the Brazilian cardinal (a petstore name) in Hawaii, but its native range also includes Uruguay, Paraguay, Brazil, and parts of Bolivia and Argentina. The species was released several times between 1928 and 1931 (Caum, 1933). This cardinal is a common species on Oahu and is found in residential districts as well as in rural areas. It occurs throughout the project region.

(2) Subfamily Carduelinae

9. House Finch (Carpodacus mexicanus frontalis)

This finch was introduced to Hawaii from California "prior to 1870, probably from San Francisco" (Caum, 1933).

The house finch now is an abundant species on all islands, and may well be the second most common song bird in the islands.

Although house finches sometimes eat overripe fruits, especially papaya (hence the vernacular name of 'papayabird"), the species is predominately a seed-eater. House finches and ricebirds caused great damage to experimental sorghum crops on Kauai and Hawaii during 1971 and 1972. A Report by the Senate Committee on Ecology, Environment, and Recreation said that "ricebirds and linnets [equals house finch] caused a 30 to 50 percent loss in the sorghum fields at Kilauea on Kauai last year. . . . seed-eating birds at Kohala ate 50 tons of sorghum grain in a 30-acre experimental field that was supposed to produce 60 tons" (Honolulu Advertiser, March 14, 1972, page B-2). Such seed-eating birds limit the scope of the much talked-about diversified agriculture in Hawaii.

The house finch is common throughout the project area.

Additional Comments

As mentioned earlier (pages 5 and 6), I have never studied a region in Hawaii with such a depauperate terrestrial vertebrate fauna: for example, only nine species of introduced birds. By comparison, in a study of similar size in the Ewa plains region, I recorded 18 species of introduced birds (Berger, 1989), and in the West Loch area, I found 20 species of introduced birds (Berger, 1987).

I believe that I have missed only one of these introduced species during my daytime field studies.

I. Order Strigiformes

a. Family Tytonidae, Barn Owls

1. Barn Owl (Tyto alba pratincola)

The first barn owls were imported from California and released on Hawaii Island during April 1958. Barn owls were released at Hauula, Oahu, on two different occasions. Seven birds were imported from the San Diego Zoo and released during September 1959; 11 additional owls were imported from the San Antonio, Texas, Zoo and released at Hauula during October 1959 (Tomich, 1962). As with the mongoose much earlier, the barn owls were introduced in the hopes that they would prey on the abundant rats that were destroying sugar cane. No long-term food habits study has been conducted in Hawaii, but on Hawaii Island Tomich (1971) found that almost 90 percent of the barn owl pellets that he examined contained only the remains of the house mouse. He commented that, although the barn owl sometimes eats rats, it is not likely a significant factor in the economic control of rats in Hawaii. Moreover, Byrd and Telfer (1980) reported that barn owls on Kauai and Kaula Island had killed more than 100 seabirds and their chicks. On Oahu, a barn owl killed six white terns (Gygis alba) in Kapiolani Park (Elepaio, 46, 1986:175).

No detailed study of the spread of the barn owl from the Hauula release site since 1960 has been made, but the birds have

been seen and found dead or injured on both windward and leeward sides of Oahu. Barn owls are nocturnal in habits and I did not see any during my daytime field studies. It seems reasonable to assume however, that one or more owls forages over the general region for food at night.

Other very common to abundant introduced species of birds that are found in nearly all habitats in the lowland areas of Oahu include:

I. Order Columbiformes

a. Family Columbidae, Pigeons and Doves

1. Rock Dove or Feral Pigeon (Columba livia)

The pigeon probably was the first exotic bird to be introduced to the Hawaiian Islands. Its importation has been traced back to 1796. Schwartz and Schwartz (1949) wrote that the feral pigeon roosts and nests the year around in sheltered portions of cliffs along the sea coast, in rocky gulches, and in collapsed lava tubes up to 10,000 feet on Mauna Kea. These authors also found heavy parasitism by tapeworms, and they stated that the tapeworm infestation retards proper nutrition and "occludes the intestine, produces undesirable toxins, and hinders breeding."

Navvab Gojrati (1970) reported on infection by bird malaria, Haemaphysalis, and Leucocytozoon in birds that he studied at the Honolulu Zoo. Kishimoto and Baker (1969) reported finding the fungus Cryptococcus neoformans in 13 out of 17 samples of pigeon droppings collected on Oahu. The full significance of their

findings was never determined in Hawaii, but, in man, this fungus causes a chronic cerebrospinal meningitis, and Hull (1963) remarked that in all but the cutaneous form the "prognosis is very grave."

Most the the feral pigeons that are found in most areas of Oahu probably come from some nearby pigeon loft.

A large number of waxbills and other seed-eating finches have been intentionally released on the slopes of Diamond Head since the mid-1960s: these include the orange-cheeked waxbill (Estrilda melpoda), red avadavat or red munia (Amandava amandava), black-headed munia (Lonchura malacca atricapilla), Java sparrow (Padra oryzivora), and the warbling silverbill (Lonchura malabarica cantans). None of these common birds seem to have found their way to the project region, perhaps because it is too dry. A comment on the warbling silverbill seems pertinent because of its rapid spread on Oahu.

I. Order Passeriformes

a. Family Ploceidae. Weaverbirds and Their Allies

(1) Subfamily Estrildinae, Waxbills

1. Warbling Silverbill (Lonchura malabarica cantans)

This silverbill is native to Africa, from Senegal to western and southern Sudan (Traylor, 1968). Silverbills have been characterized as being "predominantly desert birds," although this does not seem to be true in Hawaii.

There are no published records of the release of this species

in Hawaii (Caum, 1933; Bryan, 1958; Berger, 1975b, 1981).

It is assumed that cage birds were released on the Puuwaawaa Ranch on Hawaii, probably during the 1960s. I first discovered this silverbill near Kawaihae, Hawaii, on March 22, 1972 (Berger, 1975b). Later observations have revealed that large populations have become established on the Big Island.

The warbling silverbill was first reported on Oahu in 1984 (Conant, 1984). Since that time they have been seen in Niu Valley, Pololo Valley, in Maili, on the Kaneohe Marine Corps Air Station, and in Kaneohe (Pyle, 1989). It is a prolific species and it will undoubtedly spread around the island in a few years.

The warbling silverbill seems to have made its way to Kauai where it has been recorded at Poipu and near Kekaha in recent years (Pratt, 1987).

The significance of the silverbill is that it is a prolific species and is predominantly a seed-eating bird. With the other seed-eating species already well established on Oahu the harvesting of small grain crops on Oahu will be virtually impossible.

II. Indigenous Birds

These are species that occur naturally in Hawaii but also in other parts of the Pacific Basin. These birds are native to the islands, but they are not unique to them. In this category are 22 species of seabirds, the Hawaiian black-crowned night heron

(Nycticorax n. hoactli), and more than 25 species of ducks and shorebirds that spend their winter or nonbreeding season in the Hawaiian Islands. These include such birds as the pintail duck (Anas acuta), greater scaup duck (Aythya marila), the wandering tattler (Heteroscelus incanus), ruddy turnstone (Arenaria interpres), sanderling (Calidris alba), and the lesser golden plover.

I. Order Charadriiformes

a. Family Charadriidae.

1. Lesser Golden Plover (Pluvialis dominica fulva)

This is the only winter resident that would occupy the project region. The other winter residents are found on ponds, reservoirs, or reef flats.

The golden plover occurs from sea level to tree line on Maui and Hawaii. These birds frequent lawns in residential areas, the lawn around the State Capital, golf courses, weedy pastures, cane haul roads, open areas in the mountains, and mud flats along the sea shore.

Johnson et al., (1981) studied wintering behavior of plovers on Oahu; they reported that the birds begin to arrive in Hawaii beginning in August, but that juvenile birds hatched that year did not arrive until late September. They found that the wintering population was composed of territorial and non-territorial birds in approximately equal numbers. Each of the territorial birds "reoccupied the same territory it had defended previously."

Johnson and Nakamura (1981) also studied the roosting

of plovers on the flat roofs of buildings on Oahu. At the Pacific Palisades Elementary School in Honolulu they found 125 plovers roosting on the roof at 10:30 p.m. on April 17, 1980.

The nesting habitat of the golden plover in Canada has been discussed by Byrkjdal (1989).

Although the golden plover is a very common winter resident on Oahu, they apparently had not yet returned to their wintering grounds by the time of my field studies. I would expect to find them on the lawns around the naval housing and they certainly would forage on the fairways if the proposed golf course is built.

III. Endemic Birds

These are species of birds that are unique to the Hawaiian Islands. They do not occur naturally in any other part of the world. These include several species of endangered Hawaiian waterbirds and what is generally classified as the forest birds, although one (the Pueo) is also a bird of open grasslands.

I have now studied Hawaiian birds (both endemic and introduced) for more than 26 years. I feel moved, therefore, to add a little "editorial," as follows:

Who cared then? Who cares now?

More species and subspecies of unique birds have become extinct in Hawaii than in all of North America and Mexico combined. More species and subspecies of unique birds are now classified as endangered or threatened with extinction in Hawaii than in all of North America and Mexico!

Who cares now or who cared 100 years ago? A few biologists cared then and now, that's who.

The politicians and the great land owners didn't care then and very few care now.

"That the Hawaiian biota should have been raped, ravaged, and devastated during the nineteenth century was regrettable even though understandable, but that this rape has continued not only into the twentieth century but even into the eighth decade of that century is a sad commentary on man as an animal species. Man is, indeed, a disease on the planet earth" (Berger, 1981).

In 1890 Wilson wrote: "I appeal to the land-owners and to the Legislature of Hawaii to unite in protecting their country's birds. I would suggest that not only should forestlands be fenced in so far as practicable, but that no exotic birds should be introduced. Several species of Hawaiian birds which were to be found in Cook's time, and others which were obtained even so late as 1840, have become extinct, and it would not be rash to say that ere another century has elapsed but few native species will remain." And, indeed, that is true today.

Henshaw (1902) also bemoaned the lack of interest of the Hawaiians in the birdlife. He wrote: "The impression seems to be general that in the olden times the natives were extremely acquainted with Hawaiian birds, which is true, and that even the present day natives are very well posted on the subject; the latter is by no means the case. . . . In the olden days when it was an important part of their duty for the priests to watch the motions of certain birds and listen to their songs that by this means they might learn the will of the Gods, and when the bird-catcher plied his calling that the feather tribute might not be wanting to pay the taxes imposed by the chiefs, then we may be sure bird-lore was well-nigh universal."

Were there others who were concerned about the unique Hawaiian forests and their animal life? Yes, quite a few; for example,

Munro, 1944; L.W. Bryan, 1947; Fisher, 1948; Richardson, 1949; Greenway, 1958; Warner, 1960, 1961; Laycock, 1966; Fisher, Simon and Vincent, 1969; Krutch, 1969; Berger, 1972, 1981; ^{(J. Pratt, 1974),} Martin, 1975; Zimmerman, 1975; Temple, 1977; King, 1981; Yates, 1984; Pratt, Bruner, and Berrett, 1987; Schreiber, Attenborough, and Prestt, 1987; Collar and Andrew, 1988; Wilcove, 1989.

To be sure, there were no field studies of any of the Hawaiian forest birds done between 1902 and when I arrived in Hawaii in 1964. In 1964, there were no Federal biologists in Hawaii. Most of the real field biologists of the U.S. Fish & Wildlife Service have been withdrawn from Hawaii in the past few years.

And what about the "public servants" of the State of Hawaii? Well, the late governor John Burns finally signed into law a good rare and endangered species law in 1975. However, where is the evidence that any department of the State government has paid any attention to that law? There is some evidence that they have not. For example, since 1975 the State has been sued twice on behalf of the endangered Hawaiian honeycreeper, the Palila, to force the Department of Land and Natural Resources to eliminate the feral sheep and the mouflon sheep from Mauna Kea, the last habitat for this endangered species. These two law suits were filed by the Sierra Club Legal Defense Fund and the Hawaii Audubon Society.

And, now in 1990, both State and Federal biologists, after a delay of 100 years, are concerned about the fate of the Hawaiian crow. They want to capture some of the few remaining wild crows and put them in the totally inadequate facilities at Olinda, Maui.

And, when is a careful and thorough study of the biology of the wild Nene on Hawaii and Maui going to be conducted by competent and well trained field biologists? After all, it has just been a little more than 40 years since the captive rearing program was started at Pohakuloa on the Big Island, primarily with Federal monies. It would seem that 40 years should be an adequate time period to determine what happens to captive birds after their release into the native habitat.

And, what are students in Hawaii's public and private schools today being taught about the unique Hawaiian plants and animals (primarily snails, insects, and birds)? About the unique Hawaiian ecosystems that once existed? And what caused the devastation of most of those ecosystems? And what can be done to stop the continuing desecration of those ecosystems?

If the children don't learn these things in school, how can we expect the lawyers, insurance salesmen, and other politicians that control the State to have an awareness of these problems?

Who cared then and who cares now? The caring should have started 50 to 100 years ago!

Lets build more hotels and golf courses!!!

The Endemic Hawaiian Birds

There is no suitable native forest habitat for any of the Hawaiian forest birds anywhere near the project site.

There is no suitable habitat for any of the endangered Hawaiian waterbirds on or anywhere near the project site.

The only terrestrial endemic Hawaiian bird that could inhabit the general Waianae region is the Pueo or Hawaiian owl (Asio flammeus sandwichensis). This owl is diurnal in habits and I did not see any during my field studies, nor do I know of any published record of its occurrence there. I do not think that the habitat is suitable for this owl, which is considered endangered by the State Division of Forestry and Wildlife but not by the U.S. Fish & Wildlife Service.

The Mammals

I. Endemic Mammals

The only endemic landmammal in Hawaii is the Hawaiian bat (Lasiurus cinereus semotus), a subspecies of the North American hoary bat. The Hawaiian bat occurs primarily on the islands of Hawaii and Kauai (Tomich, 1986; Kramer, 1971; Ten Bruggencate, 1983). I know of no evidence that there is a resident population of bats on the island of Oahu.

II. Introduced Mammals

All of the introduced mammals in Hawaii have proven to be highly destructive to man, his buildings, products, or agricultural crops and/or to the native forests and their animal life. None is an endangered species and none is of concern as far as detrimental effects resulting from this, or any other, proposed project. It would, in fact, be a great boon to the islands if it were possible to exterminate all of them.

With the possible exception of the house mouse (Mus musculus), all of the smaller alien mammals prey on birds and their eggs or young. These small mammals include the roof rat (Rattus rattus), Polynesian rat (Rattus exulans), Norway rat (Rattus norvegicus), and the small Indian mongoose (Herpestes auropunctatus), as well as feral cats (Felis catus) and feral dogs (Canis familiaris). The mongoose is diurnal in habits and I saw several during my field studies. Because the rodents are serious pests, I did not set night traplines in order to sample the population. It

is reasonable to assume that all of them occur in the project site (Tomich, 1986; Kramer, 1971).

Summary and Conclusions

1. St. John (1973) discussed more than 4,500 species of introduced flowering trees and shrubs that have been planted in the Hawaiian Islands. Virtually all of the plants in the project area are introduced or alien species, a number of which are pest species. There is no semblance of any endemic ecosystem anywhere near the project site. The proposed project, therefore, will have no adverse effects on any native ecosystem.

2. Because there are no endemic amphibians or land reptiles in the Hawaiian Islands, all of those that are present are alien to the islands. Some (e.g., the bullfrog) pose a threat to the downy young of the endangered Hawaiian waterbirds; the neotropical toad has poison glands that are a threat to dogs and to young children. All of these introduced animals are irrelevant to an environmental impact assessment.

3. None of the introduced species of birds discussed in this report is an endangered species and a number have proven to be serious pests to agriculture in Hawaii. The destruction to sorghum crops by the ricebird and the house finch has been discussed above. The two species of dove and the myna have been implicated in the spread of the seeds of such noxious plants as Lantana camara. The Japanese white-eye and the red-vented bulbul cause considerable damage to ornamental flowers and to fruit crops (see Keffer, et al.,

1976). The barn owl has been reported to kill seabirds and their chicks on Kauai and the white tern on Oahu. It is reasonable to conclude that these alien bird species are of no concern in an environmental impact assessment. Moreover, a change in land use would actually provide more habitat for some of the introduced species that give pleasure to many people.

4. The planned project would have no effect on any of the seabirds.

5. The planned project would have no effect on the black-crowned night heron, primarily because there is no habitat on or near the project site for this heron.

6. The proposed project would have no adverse effect on the wintering ducks or shorebirds. In fact, the building of a golf course would increase the foraging habitat for the lesser golden plover.

7. There are no endemic forest birds anywhere near the project site. In fact, very few of these birds still survive on Oahu.

8. There is no suitable wetland habitat for any of the endangered Hawaiian waterbirds on or near the project site. Therefore, the proposed project would have no adverse effects on any of these waterbirds.

9. I have never seen the Pueo or Hawaiian owl in the project region nor have I found any published record of its occurrence there. Scott, et al., (1986) wrote that the Pueo "was most often seen "in grasslands, shrublands, and montane parklands" on the Big Island.

10. All of the mammals that occur in the project region are alien or introduced species, and most are destructive to man, his buildings, and agricultural products. Their occurrence in the project region is irrelevant to an impact assessment.

11. According to the Pacific Business News (June 11, 1990, page 2) "44 new golf courses are needed for the tourist industry to meet current demands. . . and 14 more courses will be needed to satisfy expected growth in resident and visitor population over the next 10 years." And according to the Star-Bulletin and Advertiser for April 15, 1990 (page G1) a study "shows that Oahu could use 27 additional golf courses." Be that as it may, the construction of a golf course in the project region would have no adverse effect on any endemic ecosystem or on any native plant or animal.

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APPENDIX H

Botanical Survey, Proposed Lualualei Golf Course, Lualualei, Nanakuli, Oahu

Prepared by Char & Associates, September, 1990

BOTANICAL SURVEY
PROPOSED LUALUALEI GOLF COURSE
LUALUALEI, NANAKULI, O'AHU

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September 1990

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BOTANICAL SURVEY
PROPOSED LUALUALEI GOLF COURSE
LUALUALEI, NANAKULI, O'AHU

INTRODUCTION

The site of the proposed Lualualei Golf Course consists of approximately 259.25 acres of land in Lualualei Valley, Nanakuli. It is located along the northeasterly perimeter of Lualualei Valley, along the base of Pu'u Heleakala Ridge. About one-third of the site, situated below the 200-foot elevation contour, is relatively flat with slopes up to 12%. Above the 200-foot elevation level, the slopes become steeper ranging from 10 to 30%. Along the foothills of Pu'u Heleakala Ridge and the rear portions of the project site, the slopes rise abruptly and steeply. No golf course construction is planned for these steeply sloping areas. Vegetation on the property is primarily a kiawe-buffel grass association with a smaller portion of the site, roughly 15 acres, covered by a weedy mixture of plants which have overgrown a former vegetable farm.

Field studies to assess the botanical resources on the project site were conducted on 16 August 1990. The primary objectives of the survey were to: 1) describe the major vegetation types; 2) inventory the terrestrial vascular flora; and 3) search for threatened and endangered plant species protected by Federal and State laws.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area.

Recent topographic maps were examined to determine access, terrain characteristics, boundaries, and reference points.

Access was from the Lualualei Naval Road. A number of dirt roads service the 15-acre parcel which was formerly used for vegetable cultivation. In addition, a number of dirt roads, some overgrown, lead to the back portions of the property where they end abruptly at the bottom of steep slopes.

A walk-through survey method was used. Areas most likely to harbor native plant communities or rare species, as the small gullies which cross the property, Ulehawa Stream, and the steep slopes at the golf course's boundary were more intensively surveyed. Notes were made on plant associations and distribution, substrate types, topography, exposure, etc. Plant identifications were made in the field; plants which could not be positively determined were collected for later identification in the herbarium and for comparison with the recent taxonomic literature.

The species recorded are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. A survey taken at a different season and under varying environmental conditions would no doubt yield slight variations in the species checklist, especially of the weedy annual taxa. A recent fire of unknown origin has killed many of the kiawe trees and destroyed almost all the ground cover on a large portion of the project site.

DESCRIPTION OF THE VEGETATION

Two major vegetation types are recognized on the project site and are discussed in detail below. A list of all those species inventoried during the field studies is presented at the end of the report.

Where Ulehawa Stream crosses the property, a more intensive survey was made as Marsillea villosa, a candidate endangered species, occurs in such low-lying areas on the northeast corner of the Radio Transmitting Facility at Lualualei, near Ma'ili'ili Stream (Botanical Consultants 1984; Traverse Group, Inc. 1987). However, no plants of Marsilea or any other threatened or endangered plants were found on the subject property.

Abandoned Fields

A corner of the property is bound by the Lualualei Naval Magazine and the Naval Road. The land is level and the soil deep with few stones. About 15 acres were leased to a tenant farmer for vegetable cultivation until early 1988. A few of the crop plants and much of the irrigation system is still evident. The vegetation on the abandoned fields consists of a weedy mixture of grasses and herbaceous species usually associated with agricultural lands. Small shrubs of koa-haole (Leucaena leucocephala), about 3 to 6 ft. tall, are scattered through the fields. Weedy species which are locally common on the abandoned fields include bristly fox-tail (Setaria verticillata), Guinea grass (Panicum maximum), lion's-ear (Leonotis nepetifolia), false mallow (Malvastrum coromandelianum), red pualele (Emilia fosbergii), sowthistle (Sonchus oleraceus), and 'uhaloa (Waltheria indica).

A narrow band of koa-haole shrubs, from 5 to 12 ft. tall, borders the side of the fields facing the Naval Road and also along Ulehawa Stream. Plants of Chinese violet (Asystasia gangetica) are commonly associated with the koa-haole shrubs along the stream.

Also included in this vegetation type are the areas around the abandoned and burnt out quonset huts and storage sheds; these areas support the same weedy mixture of plants. In one area, near the quonset huts, there is a leaking water pipe and the vegetation is dense with a lush growth of green panic grass (Panicum maximum

var. trichoglume), spiny amaranth (Amaranthus spinosus), golden crownbeard (Verbesina encelioides), sourgrass (Digitaria insularis), Abutilon grandifolium, Cuba jute (Sida rhombifolia), and wiregrass (Eleusine indica).

Kiawe-Buffel Grass Association

Except for the abandoned vegetable fields and the areas around structures and storage sites, kiawe (Prosopis pallida) covers almost all of the project site. It occurs on both Lualualei clay and Lualualei stony clay soils (Foote et al. 1972).

The forest may vary from open woodland to closed-canopy stands depending on past disturbances and substrate types. On the flatter portions of the site, as along the Naval Road and on the proposed nursery/future driving range facility, the kiawe forest is dense with canopy cover ranging from 50 to 60%. Tree height is from 20 to 25 ft. tall with a subcanopy layer of koa-haole in many places. Ground cover consists of dense clumps of buffel grass (Cenchrus ciliaris) with few other species. However, where the buffel grass cover is sparse, as in areas with rocky soil or along Ulehawa Stream, the following plants are found: Guinea grass, lantana (Lantana camara), wild basil (Ocimum basilicum), pohapoha (Passiflora foetida), slender mimosa (Desmanthus virgatus), indigo (Indigofera suffruticosa), pitted beardgrass (Bothriochloa pertusa), and klu (Acacia farnesiana).

At about the 100-foot elevation contour, the composition of the forest changes with the trees more open, 30 to 50% cover, and Guinea grass and green panic grass become co-dominant with buffel grass. Wiliwili (Erythrina sandwicensis), an endemic native tree species, is found in the small, dry stream bed next to the dirt road leading to an old quarry(?) and well site on the NAVMAG side of the property.

Above the 250-foot elevation, the ground rises steeply with rocky outcroppings becoming numerous and vegetation cover decreasing. The kiawe trees are of shorter-stature here, from 12 to 15 ft. tall, and shrubs of koa-haole are common often forming small thickets.

Much of the kiawe forest on the site has recently been burned leaving many of the trees standing but dead. The ground cover has also been almost completely burnt off except for scattered buffel grass stubble, these may resprout during the rainy season, and small patches of grasses and weeds which escaped the fire. Past disturbances to the vegetation of the site also include grazing as evidenced by fencelines and old livestock pens.

DISCUSSION AND RECOMMENDATIONS

Introduced or alien species are the primary components of the two vegetation types recognized on the project site. Of a total of 61 species inventoried during the field studies, 54 (88%) are introduced or alien, and 7 (12%) are native. Of the natives, 6 are indigenous, that is, they occur in the Hawaiian Islands and elsewhere, and 1 is endemic, that is, it is native to only the Hawaiian Islands. None of the native species are officially listed threatened and endangered plants (U. S. Fish and Wildlife Service 1989); nor are any proposed or candidate for such status (U. S. Fish and Wildlife Service 1990). All of the native plants, which include such species as 'ilima (Sida fallax), 'uhaloa, wiliwili, popolo (Solanum americanum), hoary abutilon (Abutilon incanum), and koali-'awania (Ipomoea indica), can be found throughout the Hawaiian Islands in similar environmental conditions.

The proposed golf course, club house, and ancillary facilities are not expected to have a significant impact on the botanical resources as the vegetation is composed largely of introduced species with smaller numbers of common native plants. Vegetation

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PLANT SPECIES LIST -- Proposed Lualualei Golf Course

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of two groups: Monocots and Dicots. The taxonomy and nomenclature of these two groups of flowering plants follow Wagner *et al.* (1990). In most cases, common English and/or Hawaiian names follow St. John (1973) or Porter (1972).

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian names, when known.
3. Biogeographic status. The following symbols are used:
 - E = endemic = native only to the Hawaiian Islands
 - I = indigenous = native to the islands and also elsewhere
 - X = introduced or alien = all those plants brought to the islands intentionally or accidentally after Western contact (1778); not native.
4. Presence (+) or absence (-) of a particular species within each of two major vegetation types recognized on the project site (see text for discussion):
 - af = Abandoned Fields
 - k-bg = Kiawe-Buffel Grass Association

VEGETATION TYPE

af k-bg

STATUS

COMMON NAME

SCIENTIFIC NAME

MONOCOTS

COMMELINACEAE (Dayflower Family)
Commelina benghalensis L.

POACEAE (Grass Family)
Bothriochloa pertusa (L.) A. Camus
Cenchrus ciliaris L.
Chloris barbata (L.) Sw.

Chloris radiata (L.) Sw.
Cynodon dactylon (L.) Pers.
Digitaria insularis (L.) Mez.

ex Ekman
Eleusine indica (L.) Gaertn.
Panicum maximum Jacq.
Panicum maximum var. *trichoglume*
 Eyles ex Robyns
Rhynchelytrum repens (Willd.) Hubb.
Setaria verticillata (L.) P. Beauv.

DICOTS

ACANTHACEAE (Acanthus Family)
Asystasia gangetica (L.) T. Anderson

AMARANTHACEAE (Amaranth Family)
Achyranthes aspera L.
Alternanthera sessilis (L.) DC.
Amaranthus spinosus L.

hairy honohono	X	+	+
pitted beardgrass	X	-	+
buffel grass	X	+	+
swollen finger grass, mau'ulei	X	+	+
radiate finger grass	X	+	-
Bermuda grass, manienie	X	+	-
sourgrass	X	+	+
wiregrass, goosegrass	X	+	-
Guinea grass	X	+	+
green panicgrass	X	+	+
Natal redtop	X	-	+
bristly foxtail	X	+	+
Chinese violet, asystasia	X	+	+
achyranthes	X	+	+
khaki weed	X	+	-
spiny amaranth, pakai kuku	X	+	+

VEGETATION TYPE

af k-bg

STATUS

COMMON NAME

SCIENTIFIC NAME

SCIENTIFIC NAME	COMMON NAME	STATUS	af	k-bg
ASTERACEAE (Sunflower Family)				
<i>Ageratum conyzoides</i> L.	ageratum, maile hohono	X	+	+
<i>Bidens pilosa</i> L.	Spanish needle, beggar's tick, ki	X	+	+
<i>Conyza bonariensis</i> (L.) Cronq.	hairy horseweed, 'ilioha	X	+	+
<i>Emilia fosbergii</i> Nicolson	red pualele	X	+	+
<i>Pluchea symphytifolia</i> (Mill.) Gillis	pluchea sour bush	X	+	+
<i>Sonchus oleraceus</i> L.	sowthistle, milkweed, pualele	X	+	+
<i>Tridax procumbens</i> L.	coat buttons	X	+	+
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.	golden crownbeard	X	+	-
<i>Xanthium strumarium</i> var. <i>canadense</i> (Mill.) Torr. ex A. Gray	cocklebur	X	+	+
BUDDLEJACEAE (Butterfly Bush Family)				
<i>Buddleia asiatica</i> Lour.	Asiatic butterfly bush, huele-'ilio	X	-	+
CACTACEAE (Cactus Family)				
<i>Opuntia ficus-indica</i> (L.) Mill.	prickly pear, panini	X	-	+
CHENOPODIACEAE (Goosefoot Family)				
<i>Chenopodium murale</i> L.	'aheahea	X	+	+
CONVOLVULACEAE (Morning-glory Family)				
<i>Ipomoea indica</i> (J. Burm.) Merr.	koali-'awania	I	+	+
<i>Ipomoea obscura</i> (L.) Ker-Gawl.	field bindweed	X	+	+
<i>Jacquemontia ovalifolia</i> (Choisy) H. Hallier	pa'u-o-Hi'i-'aka	I	+	+
<i>Merremia aegyptia</i> (L.) Urb.	hairy merremia, koali kua hulu	X?	+	+

20

VEGETATION TYPE

af k-bg

STATUS

COMMON NAME

SCIENTIFIC NAME

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPE
EUPHORBIACEAE (Spurge Family)			
Chamaesyce hirta (L.) Millsp.	hairy spurge, garden spurge	X	+
Chamaesyce hypericifolia (L.) Millsp.	graceful spurge	X	+
Ricinus communis L.	castor bean, kōlī	X	+
FABACEAE (Pea Family)			
Acacia farnesiana (L.) Willd.	klu	X	+
Crotalaria incana L.	fuzzy rattlepod	X	+
Desmanthus virgatus (L.) Willd.	slender mimosa	X	+
Erythrina sandwicensis Degener	wiliwili	E	+
Indigofera suffruticosa Mill.	indigo, 'iniko	X	-
Leucaena leucocephala (Lam.) de Wit	koa-haole	X	+
Macropodium lathyroides (L.) Urb.	wild bushbean, cow pea	X	+
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe, algaroba	X	+
Samanea saman (Jacq.) Merr.	monkeypod	X	-
LAMIACEAE (Mint Family)			
Hyptis pectinata (L.) Poit.	comb hyptis	X	+
Leonotis nepetifolia (L.) R. Br.	lion's-ear	X	-
Ocimum gratissimum L.	wild basil	X	+
MALVACEAE (Mallow Family)			
Abutilon grandifolium (Willd.) Sweet	abutilon, mao	X	+
Abutilon incanum (Link) Sweet	hoary abutilon, mao	I?	+
Malvastrum coromandelianum (L.) Garcke	false mallow, hauuoi	X	+
Sida fallax Walp.	'ilima	I	+
Sida rhombifolia L.	Cuba jute	X	+
Sida spinosa L.	prickly sida	X	+
MORACEAE (Mulberry Family)			
Ficus microcarpa L. f.	Chinese banyan	X	+
NYCTAGINACEAE (Four-o'clock Family)			
Boerhavia coccinea Mill.	red-flowered boerhavia	X	-

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>VEGETATION TYPE</u> af k-bg
PASSIFLORACEAE (Passion Flower Family) Passiflora foetida L.	pohapoha	X	+ +
SOLANACEAE (Nightshade Family) Lycopersicon esculentum Mill. Nicandra physalodes (L.) Gaertn. Solanum americanum Mill.	tomato apple-of-Peru popolo	X X I?	+ - + + - +
STERCULIACEAE (Cocoa Family) Waltheria indica L.	'uhaloa, hi'aloa	I?	+ +
VERBENACEAE (Verbena Family) Lantana camara L.	lantana	X	+ +

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)

SUMMARY

A botanical survey was conducted on the site of the proposed golf course in August 1990. Roughly 130 acres of the ±259-acre parcel is suitable for golf course development. This covers most of the areas below the 200 to 250-foot elevation contours. The field studies focused principally on the level to moderately sloping areas where golf course development is planned. A number of limited transects and binocular observations were made for the area above the 250-foot contour.

Kiawe forest, which may vary from open woodland to closed-canopy stands, forms the dominant vegetation type. Buffel grass is the most common ground cover associate in this forest type. At about the 200 to 250-foot elevation and upwards, rocky outcroppings become numerous and koa-haole shrubs become more common. On about 15 acres of the flatter, level portion of the site, adjacent to the Lualualei Naval Magazine (NAVMAG), is an open field once cultivated for vegetable crops until early 1988. These abandoned fields support a weedy assortment of species commonly associated with agricultural lands.

A total of 61 plant species are found on the project site, of which the majority, 54 (88%), are introduced species; 7 (12%) are native. None of these plants are designated as threatened or endangered by the Federal and State governments. The proposed golf course project is not expected to have a significant negative impact on the botanical resources of the site.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

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APPENDIX I

Noise Study For The Lualualei Golf Course Project, Nanakuli, Hawaii

Prepared by Y. Ebisu & Associates, Inc., November, 1990

**NOISE STUDY
FOR
THE LUALUALEI GOLF COURSE PROJECT
NANAKULI, HAWAII**

**Prepared for:
HIDA, OKAMOTO & ASSOCIATES, INC.**

**Prepared by:
Y. EBISU & ASSOCIATES
1126 12th Avenue, Room 305
Honolulu, Hawaii 96816**

NOVEMBER 1990

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CHAPTER I. SUMMARY

The existing and future traffic noise levels in the vicinity of the proposed Lualualei Golf Course project were evaluated for their potential impact along roadways which would service the project. The change in future traffic noise levels associated with the project traffic are anticipated to be very low.

Due to the relatively small increases in traffic anticipated to result from the project, risks of adverse noise impacts from traffic noise increases are considered to be low, and the proposed project should not cause adverse noise impacts along the roadways servicing the project. For these reasons, special traffic noise mitigation measures are not considered necessary.

Risks of adverse noise impacts from clubhouse activities are also low due to the relatively large buffer distances to the nearest residence, and due to the probable use of total closure and air conditioning of the facility. Noise mitigation measures for the clubhouse will probably be limited to measures such as closure and air conditioning of the clubhouse facility.

Risks of adverse noise impacts from operation of the ball collection tractor on the future Driving Range are higher due to the shorter distances between the rear of the range and neighboring residences. However, noise levels from the tractors are not expected to be excessive and out of character with the existing area, and curfews on its operation may be used to minimize risks of adverse noise impact.

CHAPTER II. PURPOSE

The purposes of this noise study were to predict and evaluate the traffic noise increases associated with motor vehicle traffic to and from the proposed Lualualei Golf Course. The scope of the noise study included evaluations of potential noise impacts on existing residences and noise sensitive receptors within the project environs. The proposed project will include a full-size, 18-hole golf course, a clubhouse with dining area, driving range and supporting facilities. In addition to potential noise impacts from increased traffic noise levels, potential noise impacts from on-site recreational activities associated with the proposed project were also evaluated.

CHAPTER III. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (Ldn). This descriptor incorporates a 24-hour average of instantaneous A-Weighted Sound Levels as read on a standard Sound Level Meter. The minimum averaging period for the Ldn descriptor is 24 hours (by definition). Additionally, sound levels which occur during the nighttime hours of 10:00 PM to 7:00 AM are increased by 10 decibels (dB) prior to computing the 24-hour average by the Ldn descriptor. A more complete list of noise descriptors is provided in APPENDIX B to this report.

TABLE 1, derived from Reference 1, presents current federal standards and acceptability criteria for residential land uses exposed to various levels of environmental noise. Noise levels typical of communities on Oahu are shown in FIGURE 1. As a general rule, noise levels of 55 Ldn or less occur in rural areas, or urbanized areas which are shielded from high volume streets. In urbanized areas, Ldn levels generally range from 55 to 65 Ldn, and are usually controlled by motor vehicle traffic noise. Residences which front major roadways are generally exposed to levels of 65 Ldn, and as high as 72 Ldn when the roadway is a high speed freeway. Due to noise shielding effects from intervening structures, residences which are located within interior lots are usually exposed to lower noise levels of 60 Ldn or less.

For the purposes of determining noise acceptability for funding assistance from federal agencies (FHA/HUD and VA), an exterior noise level of 65 Ldn or lower is considered acceptable. This standard is applied nationally (see Reference 2), including Hawaii. Because of our open-living conditions, the predominant use of naturally ventilated dwellings, and the relatively low exterior-to-interior sound attenuation afforded by these naturally ventilated structures, an exterior noise level of 65 Ldn does not

TABLE 1

**EXTERIOR NOISE EXPOSURE CLASSIFICATION
(RESIDENTIAL LAND USE)**

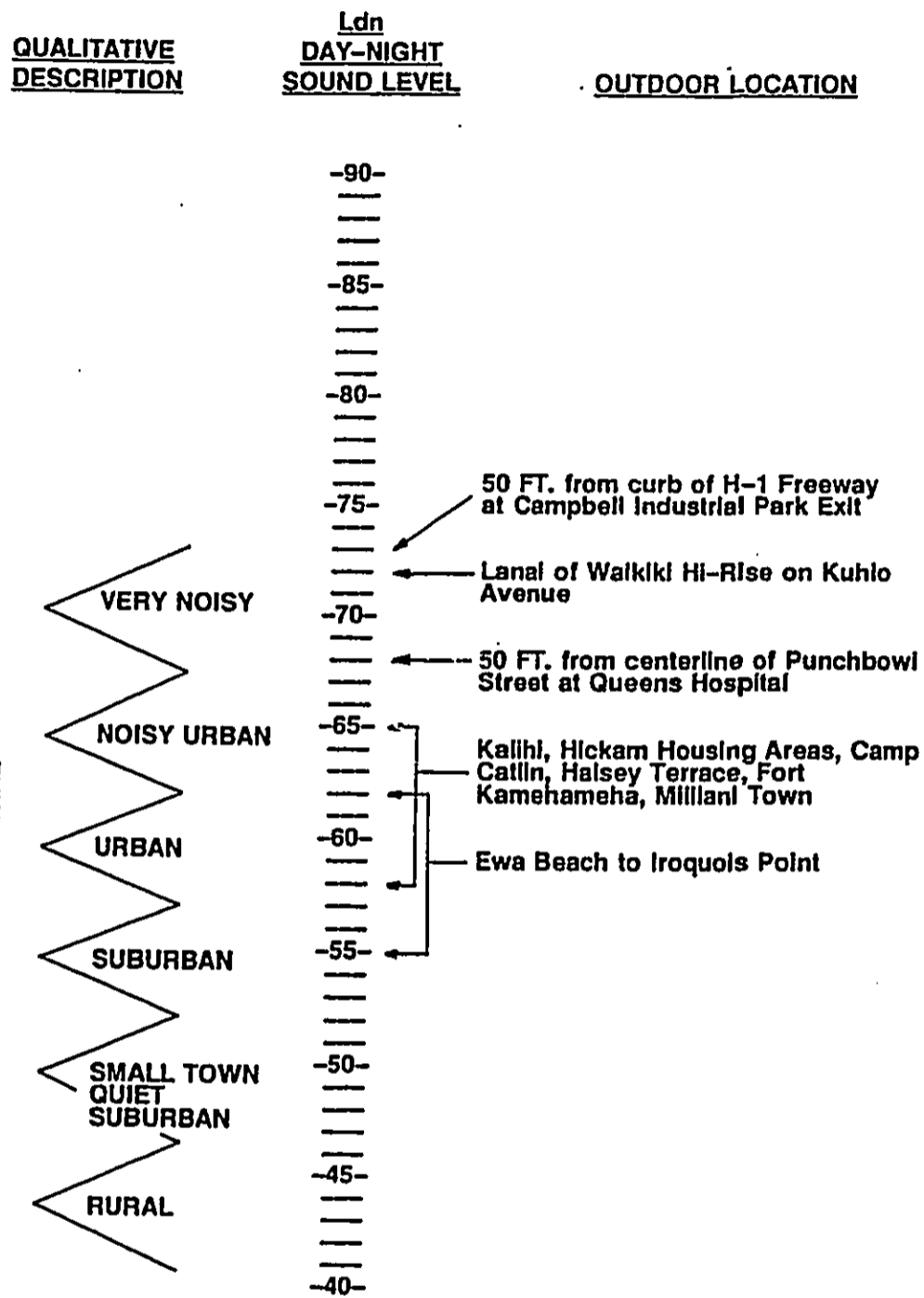
NOISE EXPOSURE CLASS	DAY-NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL⁽¹⁾ STANDARD
Minimal Exposure	Not Exceeding 55 L _{dn}	Not Exceeding 55 L _{eq}	Unconditionally Acceptable
Moderate Exposure	Above 55 L _{dn} But Not Above 65 L _{dn}	Above 55 L _{eq} But Not Above 65 L _{eq}	Acceptable ⁽²⁾
Significant Exposure	Above 65 L _{dn} But Not Above 75 L _{dn}	Above 65 L _{eq} But Not Above 75 L _{eq}	Normally Unacceptable
Severe Exposure	Above 75 L _{dn}	Above 75 L _{eq}	Unacceptable

Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the L_{eq} instead of the L_{dn} descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 L_{eq}.

FIGURE 1

RANGE OF EXTERIOR BACKGROUND AMBIENT NOISE LEVELS



eliminate all risks of noise impacts. For these reasons, and as recommended in Reference 3, a lower level of 55 Ldn is considered as the "Unconditionally Acceptable" (or "Near-Zero Risk") level of exterior noise. However, after considering the cost and feasibility of applying the lower level of 55 Ldn, government agencies such as FHA/HUD and VA have selected 65 Ldn as a more appropriate regulatory standard.

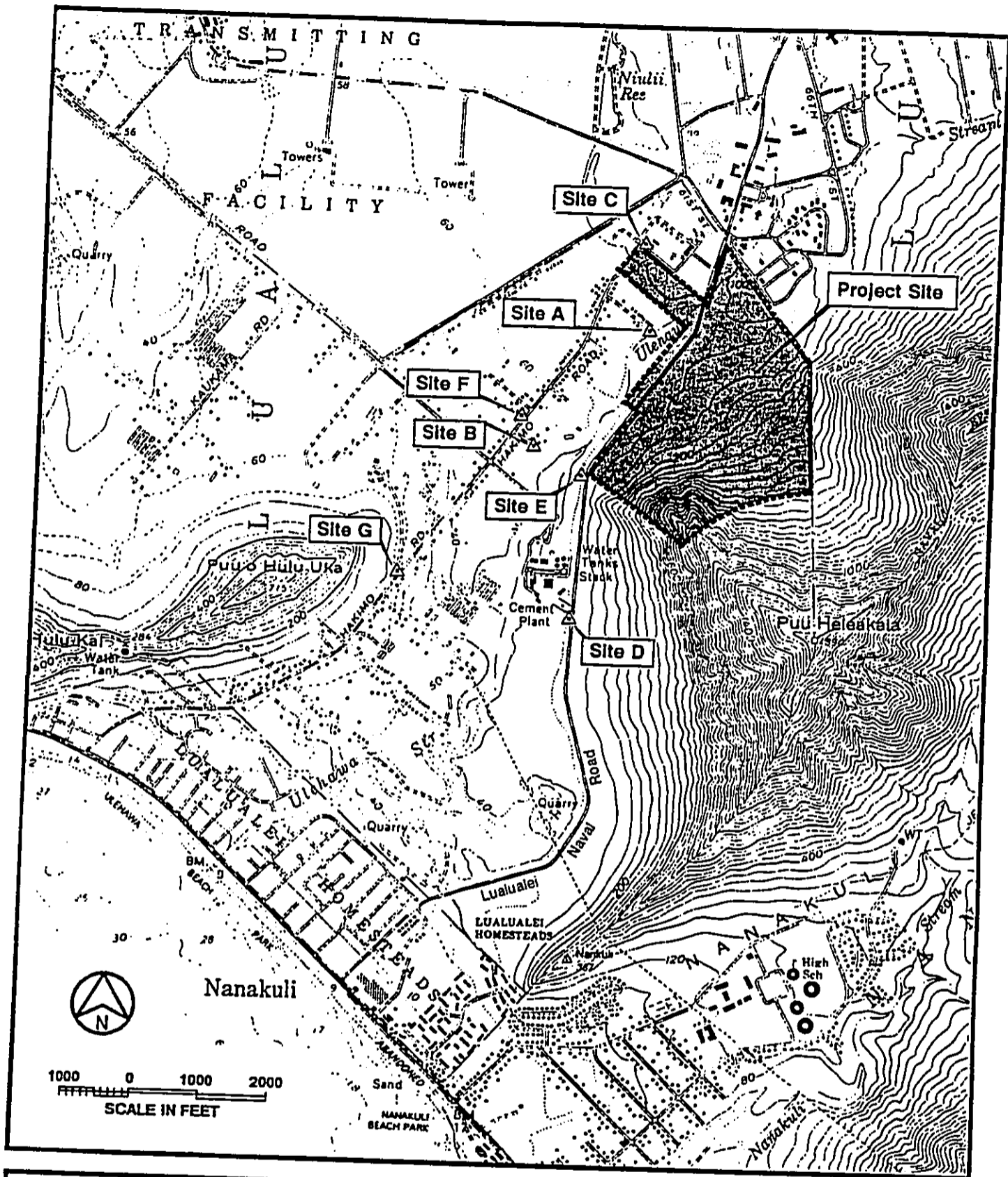
State Department of Health (DOH) noise regulations (References 4 and 5) apply on the island of Oahu, and are intended to minimize noise impacts from stationary as well as motor vehicle noise sources. These regulations would apply to all noise sources within the boundaries of the project site, as well as to light and heavy vehicles which would travel to and from the site on public roadways (or trafficways). Unless the routes used by heavy vehicles to and from the project site are designated as truck routes by the Director of Health, heavy vehicles traveling to and from the project facilities will be required to comply with the vehicle noise emission limits of Reference 5.

CHAPTER IV. GENERAL STUDY METHODOLOGY

Existing background ambient noise levels were measured at seven locations in the project environs to provide a basis for developing the project's traffic noise contributions along Hakimo Road, as well as for describing the existing noise environment at noise sensitive locations which are removed from roadway traffic. The locations of these seven measurement sites are shown in FIGURE 2. Measurements were performed in August 1990 during the off-peak traffic period as well as during the PM peak hour period. The results of the noise measurements were also compared to calculations of existing traffic noise levels to validate the traffic noise computer model used. These noise measurement results, and their comparisons with computer model predictions are summarized in TABLE 2.

Traffic noise calculations for the existing conditions as well as noise predictions for the Year 1996 following completion of the proposed development were performed using the Federal Highway Administration (FHWA) Noise Prediction Model (Reference 6). Traffic data entered into the noise prediction model were: hourly traffic volumes; average vehicle speeds; and estimates of traffic mix. The traffic study for the project (Reference 7), and Hawaii State DOT traffic counts at the intersection of Farrington Highway and Lualualei Naval Road (Reference 8), were the primary sources of data inputs to the model. For existing and future traffic, it was assumed that the PM peak hour $Leq(h)$ was 1 dB less than the 24-hour Ldn . This assumption was based on computations of the hourly Leq and 24-hour Ldn of traffic noise along Farrington Highway at Lualualei Naval Road.

The projected increases in traffic noise levels attributable to project related traffic were calculated, and noise impact risks evaluated. The relative contributions of non-project and project related traffic to the total noise levels were also calculated, and an evaluation of possible traffic noise impacts was made.



LOCATIONS OF NOISE MEASUREMENT SITES

FIGURE 2

TABLE 2

TRAFFIC NOISE MEASUREMENTS

Location	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume			Measured Leq (dB)	Predicted Leq (dB)
			Auto	Med. Truck	Heavy Truck		
D. 50 FT from the center- line of Lualualei Naval Road (8/15/90).	1600	55	81	12	3	60.9	61.0
	TO 1700						
F. 50 FT from the center- line of Hakimo Road, near Kuualoha Rd. (8/20/90).	1210	35	41	6	6	54.9	55.2
	TO 1310						
G. 50 FT from the center- line of Hakimo Road, near Hakimo Pl. (8/20/90).	1329	38	101	14	12	59.2	59.4
	TO 1429						

The possibility of adverse noise impacts from on-site activities were evaluated by comparing predicted noise levels along the property lines of the project with existing background ambient noise levels in the project environs and with the existing separation distances (or buffer space) to the nearest noise sensitive neighbors.

CHAPTER V. EXISTING NOISE ENVIRONMENT

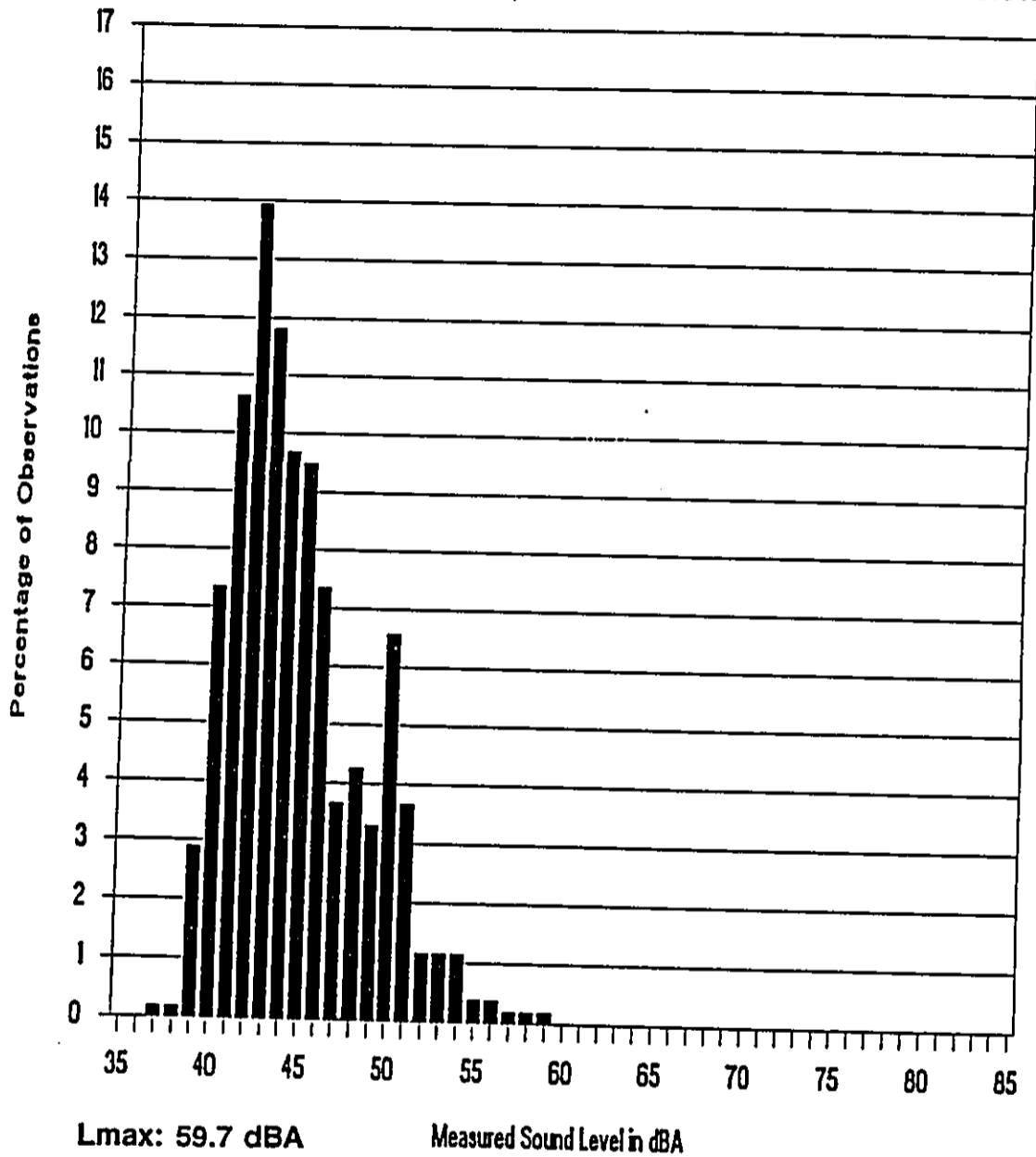
The existing background ambient noise levels in the project environs are controlled by traffic on Lualualei Naval Road, local traffic on Hakimo Road, birds, dogs, wind, and foliage. At residences in the immediate vicinity of the project site and which are removed from Lualualei Naval Road, existing average background ambient noise levels range from 45 to 55 Ldn, which is in the "Minimal Exposure, Unconditionally Acceptable" noise exposure category. FIGURES 3 thru 6 depict the results of background ambient noise measurements at Sites A, B, C, and E, which were removed from the two roadways. Measured background noise levels were relatively low, with minimum levels (Lmin) measured at 38 to 40 dB, and average levels (Leq) measured at 46 to 50 dB. The existing noise levels in the residential areas west of the proposed golf course are low. During the quiet periods between local traffic, background ambient noise levels along the roadway are controlled by the sound of dogs, birds, wind, and distant traffic.

Along Lualualei Naval Road, at approximately 50 FT setback distance from the roadway's centerline, existing traffic noise levels are approximately 62 Ldn, which is in the "Moderate Exposure, Acceptable" noise exposure category. Along Hakimo Road, at approximately 50 FT setback distance from the roadway's centerline, existing traffic noise levels are approximately 61 Ldn, which is also in the "Moderate Exposure, Acceptable" noise exposure category. Traffic noise levels along a roadway's Right-of-Way generally represent the worst case (or highest) levels due to the close proximity of the Right-of-Way to the noise sources. Traffic noise levels at 100 to 300 FT setback distances from the highway centerline are generally in the "Minimal Exposure, Unconditionally Acceptable" to "Moderate Exposure, Acceptable" categories, with 5 to 10 Ldn lower noise levels resulting from shielding and distance effects. An exception occurs for elevated receptor locations which are not shielded from the roadway by intervening

FIGURE 3
BACKGROUND NOISE LEVELS
AT MONITORING SITE 'A'
(1415 HRS TO 1430 HRS)

DATE: August 15, 1990

METER RESPONSE: Slow

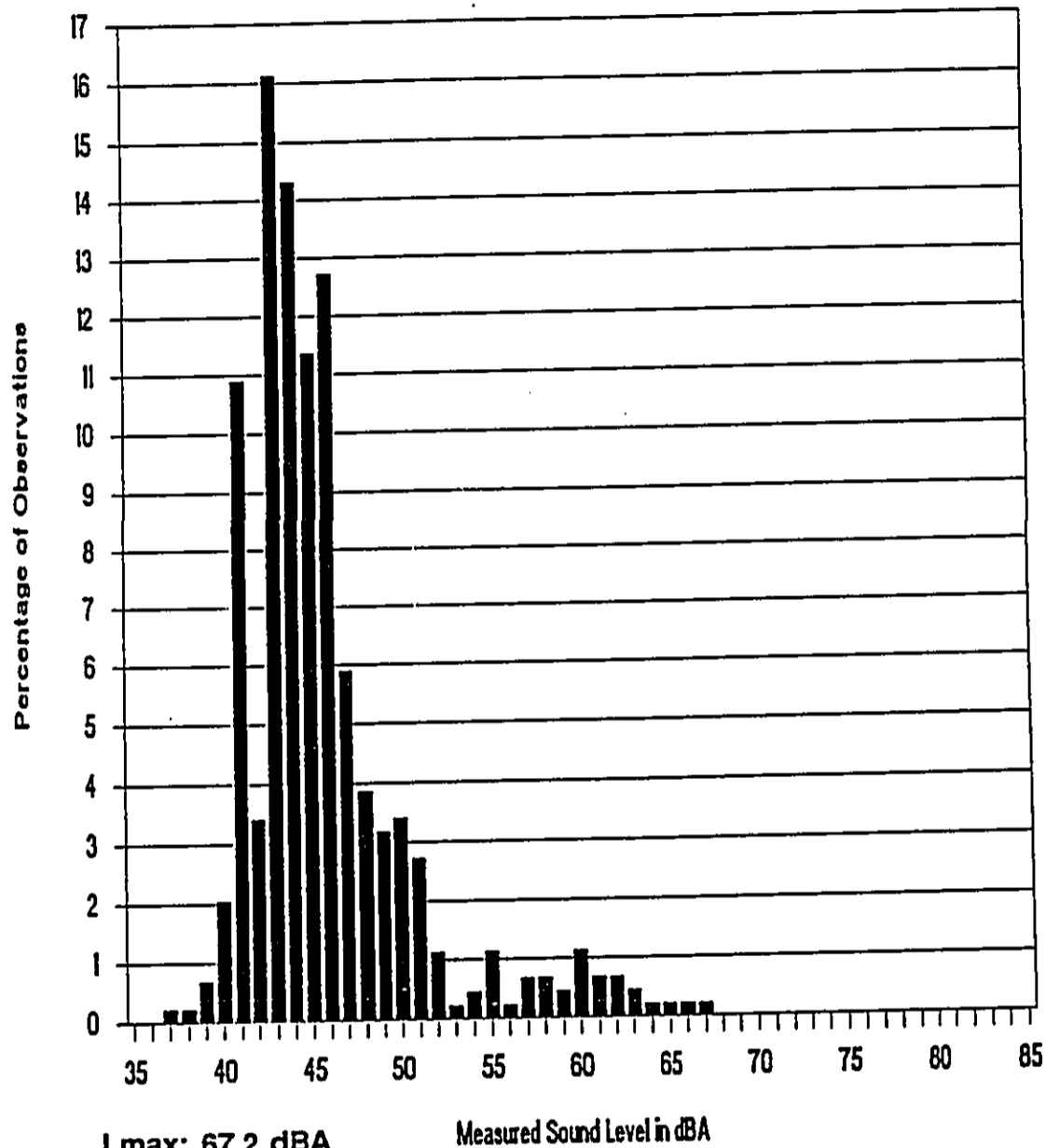


Lmax: 59.7 dBA
L10: 50.0 dBA
Leq: 46.4 dBA
Lmin: 37.8 dBA

FIGURE 4
BACKGROUND NOISE LEVELS
AT MONITORING SITE 'B'
(1443 HRS TO 1457 HRS)

DATE: August 15, 1990

METER RESPONSE: Slow

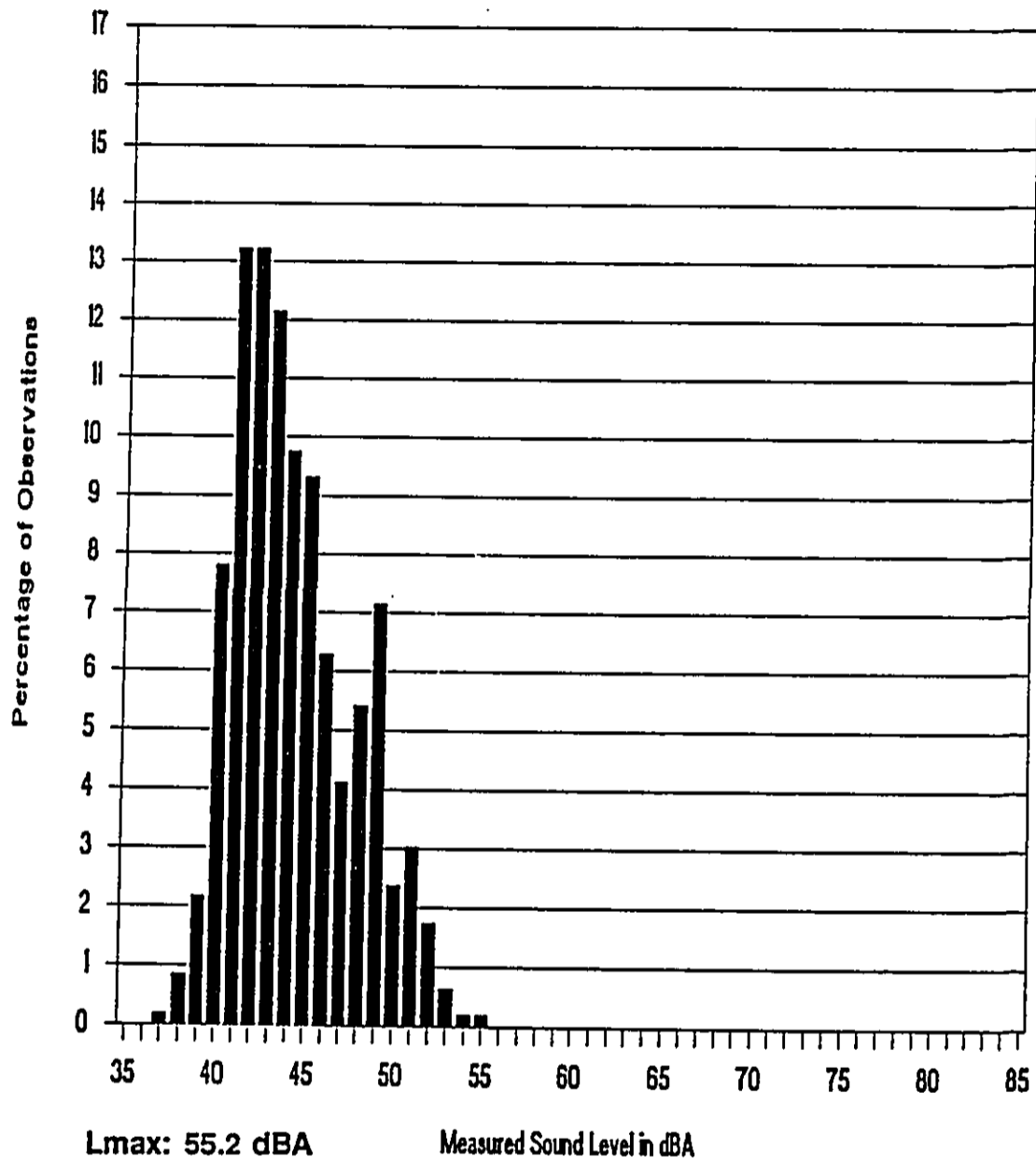


Lmax: 67.2 dBA
 L10: 51.0 dBA
 Leq: 49.0 dBA
 Lmin: 37.6 dBA

FIGURE 5
BACKGROUND NOISE LEVELS
AT MONITORING SITE 'C'
(1505 HRS TO 1522 HRS)

DATE: August 15, 1990

METER RESPONSE: Slow



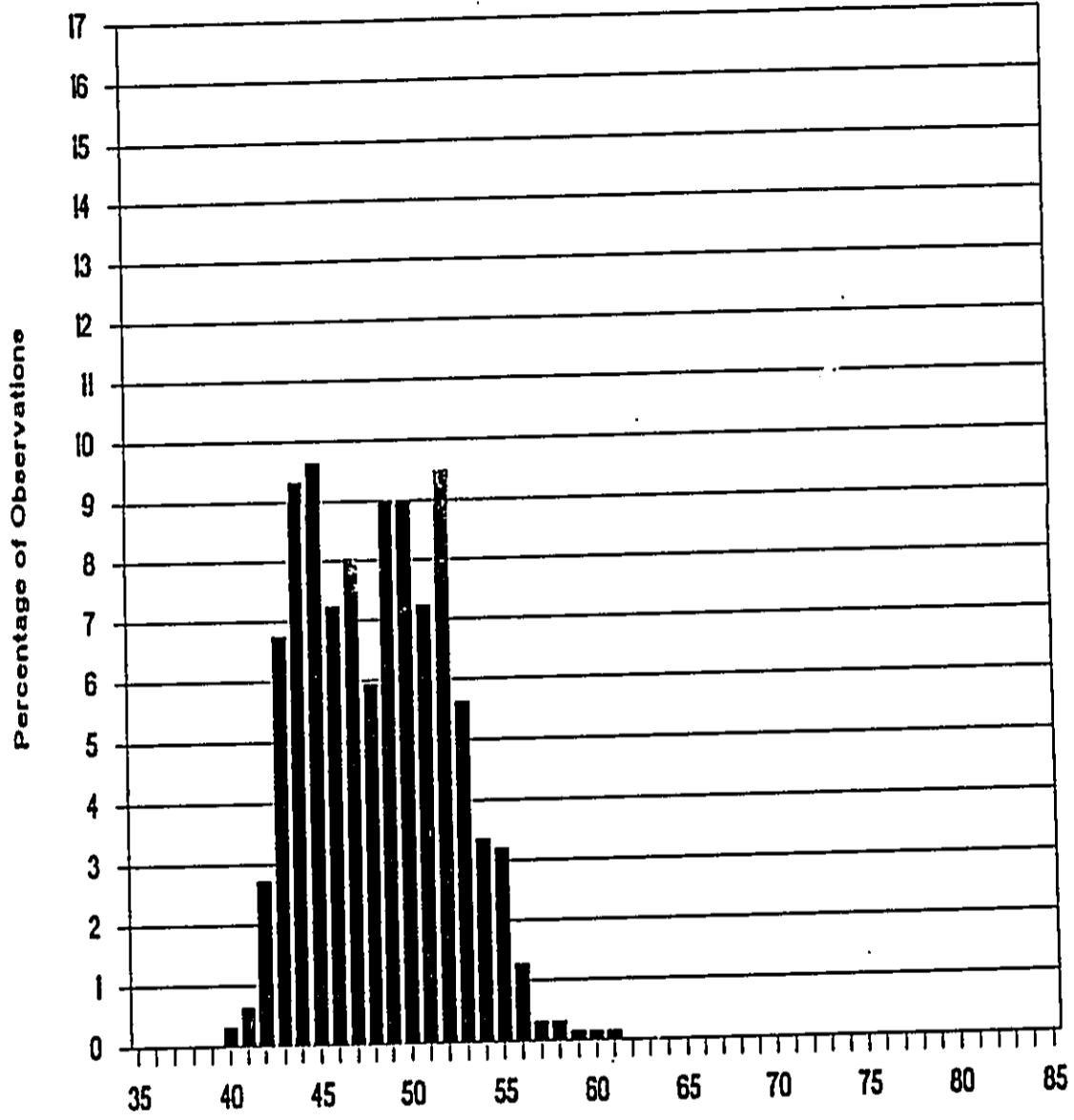
Lmax: 55.2 dBA
L10: 49.0 dBA
Leq: 45.6 dBA
Lmin: 37.9 dBA

Measured Sound Level in dBA

FIGURE 6
BACKGROUND NOISE LEVELS
AT MONITORING SITE 'E'
(1734 HRS TO 1750 HRS)

DATE: August 15, 1990

METER RESPONSE: Slow



Lmax: 61.1 dBA
L10: 53.0 dBA
Leq: 49.9 dBA
Lmin: 40.4 dBA

Measured Sound Level in dBA

terrain features or man-made structures.

Results of calculations of existing traffic noise levels along Lualualei Naval Road and Hakimo Road during the PM peak hour period are shown in TABLE 3. The traffic volumes used for the peak hour periods were obtained from Reference 7. TABLE 4 presents the calculated setback distances between the roadway centerlines and the iso-noise contours associated with the 60, 65, and 70 Ldn levels of existing traffic noise. The traffic noise levels shown in the tables only apply when unobstructed line-of-sight conditions exist to the roadways. These conditions would generally occur along the Right-of-Way, within any open space fronting the roadway, or at the upper levels of any man-made structure or natural terrain feature.

The existing traffic noise levels along Lualualei Naval Road and Hakimo Road are moderate (approximately 61 to 62 Ldn) at 50 FT setback distance from the roadway centerline. Maximum noise levels (Lmax) associated with heavy truck and bus traffic on the two roadways are in the order of 78 to 85 dB at this setback distance. Minimum background ambient noise levels of approximately 35 to 50 dB occur between periods of traffic flow.

TABLE 3

COMPARISONS OF EXISTING AND CY 1996 TRAFFIC NOISE LEVELS
ALONG ACCESS ROADS TO PROJECT SITE
(PM PEAK HOUR AND 50 FT FROM ROADWAY CENTERLINES)

LOCATION	SPEED (MPH)	VPH	***** HOURLY LEQ IN dB *****		
			AUTO	MT	HT ALL VEH
EXISTING (CY 1990) PM PEAK HR. TRAFFIC:					
Lualualei Naval Road	55	96	55.1	57.6	55.4
Hakimo Road @ Farrington Hwy.	30	303	49.8	53.1	59.2
Farrington Hwy. Toward Honolulu	45	2,452	66.2	63.8	70.0
Farrington Hwy. Toward Waianae	45	2,271	65.8	63.5	69.7

CY 1996 PM PEAK HR. TRAFFIC WITH THE PROJECT:

Lualualei Naval Road	55	113	55.8	58.4	56.1
Hakimo Road @ Farrington Hwy.	30	448	51.7	54.4	59.9
Farrington Hwy. Toward Honolulu	45	3,626	67.9	65.5	71.7
Farrington Hwy. Toward Waianae	45	3,436	67.6	65.3	71.5

Notes:

The following assumed traffic mixes of autos, medium trucks, and heavy trucks were used for existing and future conditions:

- (a) Lualualei Naval Road: 84.5% autos, 12.5% medium trucks, and 3% heavy trucks and buses.
- (b) Existing Hakimo Road: 79% autos, 11% medium trucks, and 10% heavy trucks and buses.
- (c) Future Hakimo Road: 82% autos, 10% medium trucks, and 8% heavy trucks and buses.
- (d) Farrington Highway: 90.5% autos, 4% medium trucks, and 5.5% heavy trucks and buses.

TABLE 4
EXISTING AND CY 1996 DISTANCES TO 60, 65, AND 70 Ldn CONTOURS

STREET SECTION	60 Ldn SETBACK (FT)		65 Ldn SETBACK (FT)		70 Ldn SETBACK (FT)	
	EXISTING	CY 1996	EXISTING	CY 1996	EXISTING	CY 1996
Lualualei Naval Road	68	76	31	35	15	16
Hakimo Road @ Farrington Hwy.	63	73	29	34	14	16
Farrington Hwy. Toward Honolulu	378	491	176	228	81	106
Farrington Hwy. Toward Waianae	359	474	167	220	77	102

Notes:

- (1) All setback distances are from the roadways' centerlines.
- (2) See TABLE 3 for traffic volume, speed, and mix assumptions.
- (3) Ldn assumed to be equal to PM Peak Hour Leq plus 1 dB on all roadways.
- (4) Setback distances are for unobstructed line-of-sight conditions.
- (5) Soft ground conditions assumed along all roadways.

CHAPTER VI. FUTURE TRAFFIC NOISE ENVIRONMENT

Predictions of future traffic noise levels were made using the traffic volume assignments of Reference 7. The future projections of project plus non-project traffic on the roadway sections which would service the project are shown in TABLE 3 for the afternoon or PM peak hour of traffic in CY 1996. TABLE 4 summarizes the predicted increases in setback distances to the 60, 65, and 70 Ldn traffic noise contour lines along the roadways servicing the project and attributable to increases in project plus non-project traffic by CY 1996.

From TABLE 3, moderate project plus non-project traffic noise increases of 1.0 dB are predicted to occur by CY 1996 along Hakimo Road, which is expected to serve as the primary access roadway to the proposed project. The increase in traffic noise along this roadway section, which is attributable to project traffic is 0.5 dB, which is considered to be minimal. The future traffic noise environment in the project environs will not be significantly changed by the proposed project due to the relatively low volumes of traffic expected to be generated by the project.

Based on the maximum of 174 parking stalls planned for the clubhouse facility, an maximum of 348 vehicle trips could occur under worst case conditions during the period immediately before and after a social function at the clubhouse. This additional volume of traffic which could occur on Hakimo Road between the hours of 10:00 AM to 10:00 PM will not affect the forecasted noise levels as measured by the Ldn descriptor along Hakimo Road due to the dominating influence of non-project traffic on total forecasted noise levels.

CHAPTER VII. DISCUSSION OF PROJECT RELATED TRAFFIC NOISE
IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

The increases in traffic noise levels attributable to the project are predicted to be approximately 0.5 dB (or Ldn) along Hakimo Road, which is expected to serve as the primary access to the project. An increase in traffic noise of 0.5 dB should not be perceptible and is not considered to be significant. For this reason, traffic noise impacts associated with the project are not considered to be significant.

In absolute terms, forecasted noise levels along Hakimo Road are not expected to exceed the 65 Ldn FHA/HUD standard at 50 FT setback distance from the roadway's centerline. Existing and future residences along Hakimo Road which are not shielded from traffic noise by walls, buildings, or natural terrain features but are at setback distances greater than 34 FT from the roadway's centerline can be expected to be exposed to "Moderate, Acceptable" traffic noise levels.

Along Farrington Highway, where traffic volumes, speeds, and noise levels are significantly higher, the additive noise contributions from project traffic should be even less significant when compared to non-project traffic contributions. Project traffic noise impacts along Farrington Highway are not anticipated because of the dominating influence of non-project traffic noise over project traffic noise levels.

CHAPTER VIII. OTHER NON-TRAFFIC NOISE CONSIDERATIONS

Clubhouse. Adverse noise impacts from the planned Clubhouse activities are not anticipated due to the normally available option of total closure and air conditioning of the facility's dining and social function areas. In addition, a relatively large buffer distance of approximately 200 to 300 FT is planned between the facility and its nearest noise sensitive neighbor--a residence west of the proposed Clubhouse facility. Sound attenuation treatment of the Clubhouse facility and the mechanical equipment (air conditioning equipment, exhaust fans, etc.) associated with the Clubhouse may also be required to minimize adverse noise impacts on neighboring residences. This type of treatment is not unusual or extraordinary for this type of facility, and can be implemented as required.

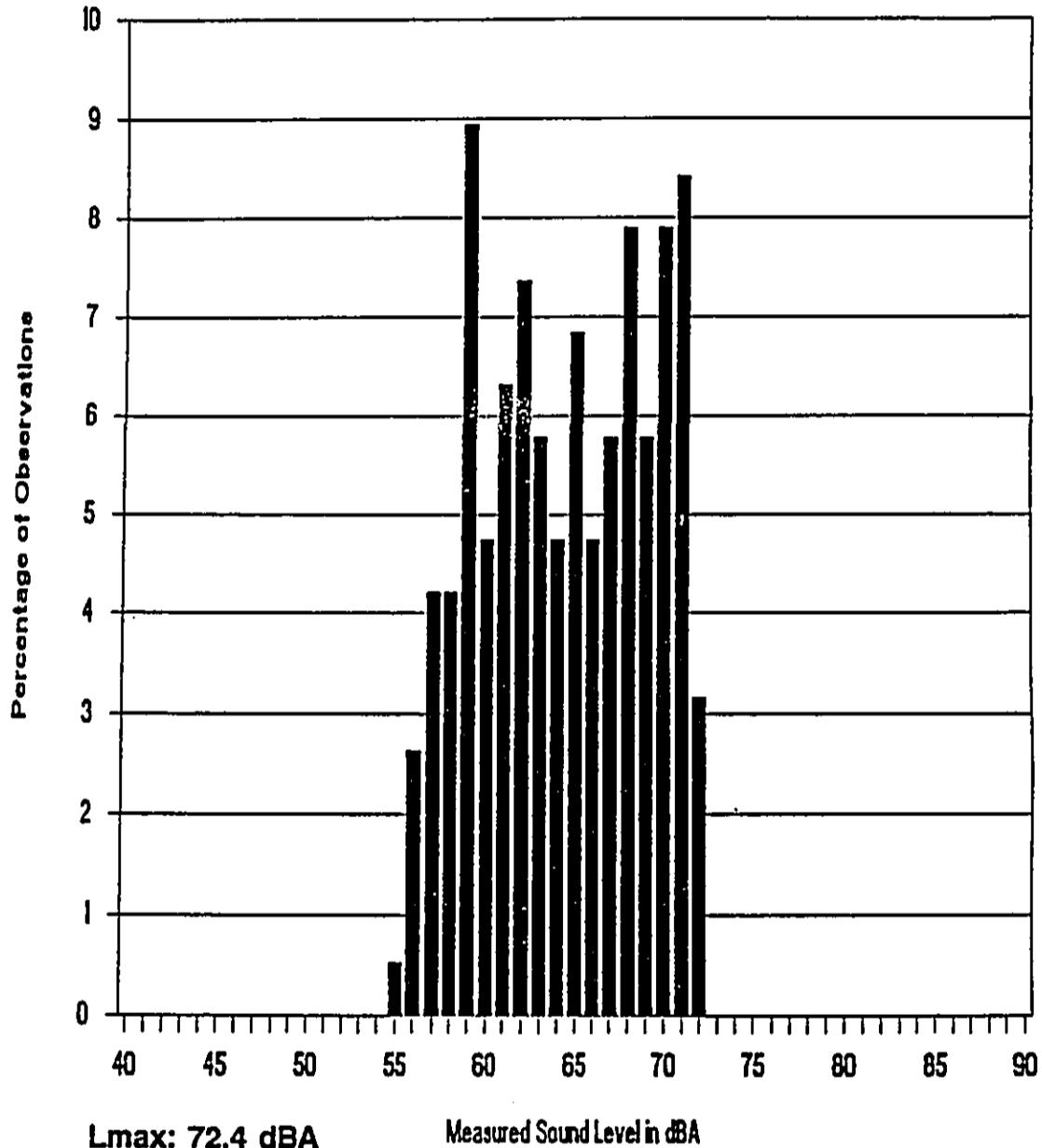
Driving Range. Risks of adverse noise impacts from the future Driving Range are also expected to be low due to the large distances (300+ FT) between the practice tees and the neighboring residences. The loudest noise source associated with the proposed Driving Range operation is expected to be the tractor which is used to recover the balls on the range. Measured noise levels from tractors used on golf courses are shown in FIGURES 7 and 8. Typical noise levels of these tractors range from 66 to 74 dB at 50 FT distance. Even with the planned 50 to 100 FT wide buffers around the Driving Range, these tractors will probably be audible during the quiet periods. However, these noise events are expected to be intermittent, and are similar to other farm equipment used within an Agricultural District. The use of properly muffled and maintained tractor equipment is recommended within the entire golf course project. In addition, the use of evening and nighttime curfews on operation of these equipment in close proximity to neighboring residences may also be employed to minimize adverse noise impacts from these tractors.

Construction Noise. Audible construction noise will probably

FIGURE 7
NOISE LEVELS FROM TRACTOR/MOWER
AT 50 FT DISTANCE
(Jacobsen 535)

DATE: October 10, 1990

METER RESPONSE: Slow

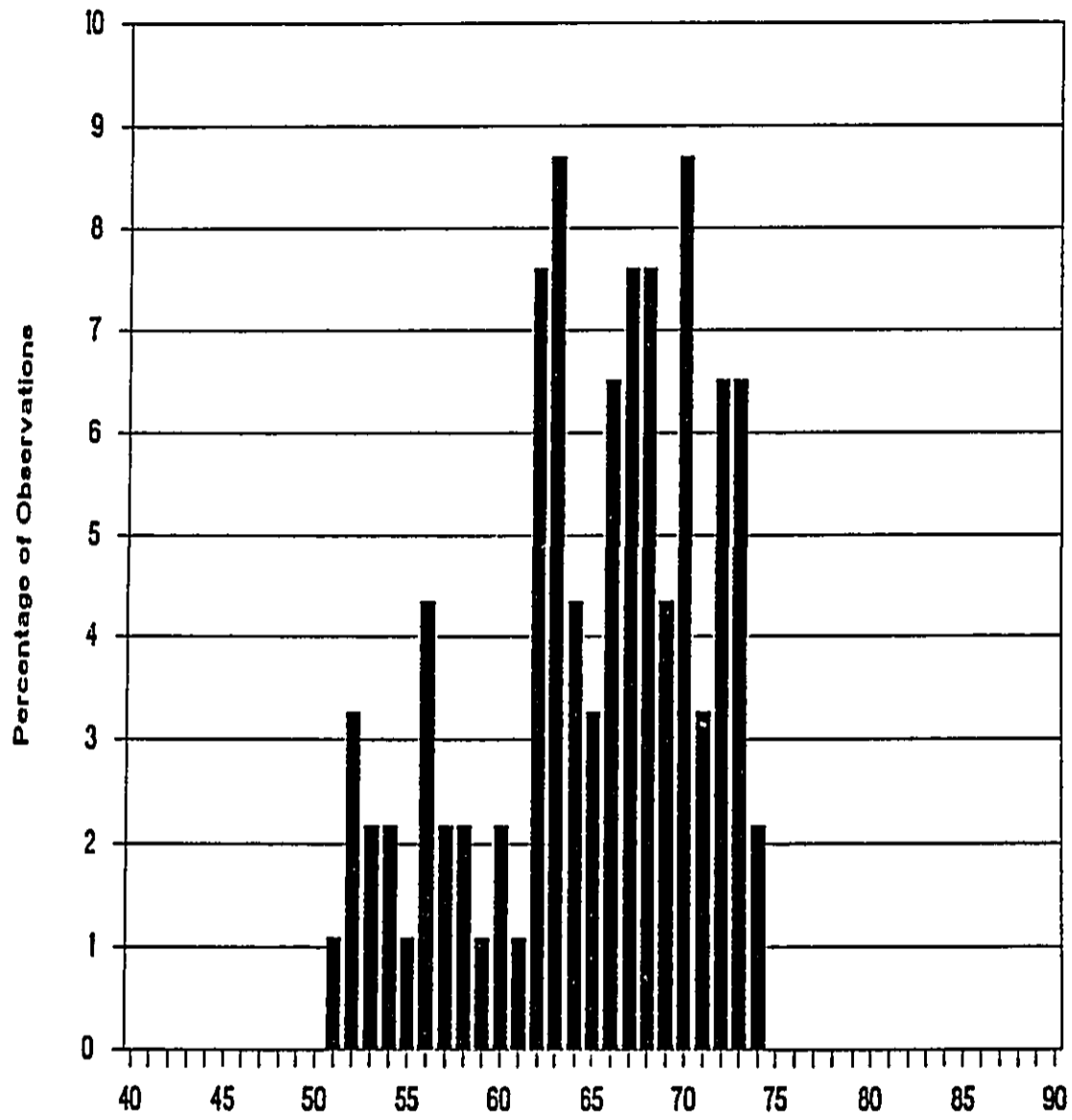


Lmax: 72.4 dBA
L10: 71.0 dBA
Leq: 66.4 dBA
Lmin: 55.0 dBA

FIGURE 8
NOISE LEVELS FROM TRACTOR/MOWER
AT 50 FT DISTANCE
(Kubota L-3750)

DATE: October 10, 1990

METER RESPONSE: Slow



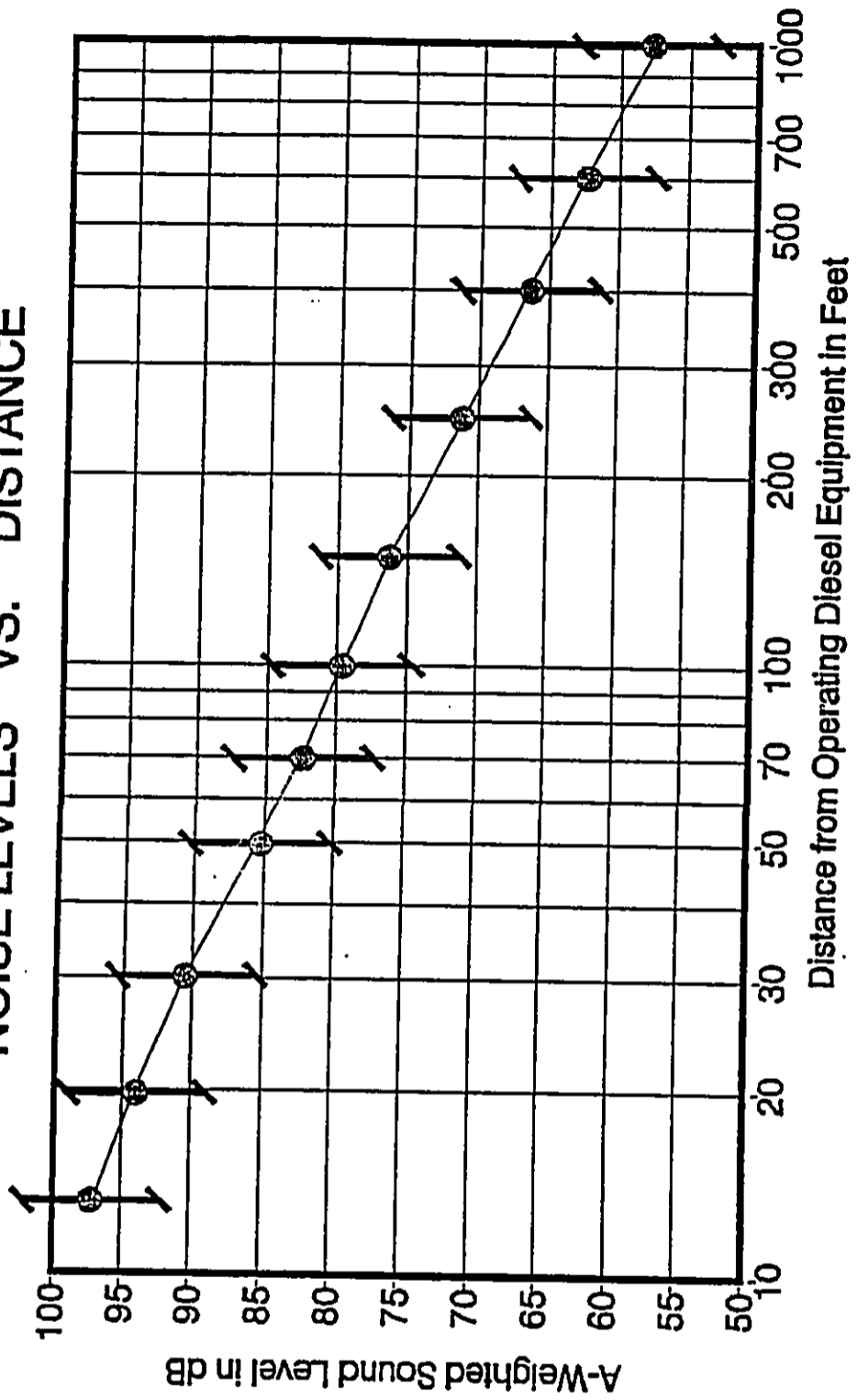
Lmax: 74.1 dBA
 L10: 72.0 dBA
 Leq: 67.8 dBA
 Lmin: 51.8 dBA

Measured Sound Level in dBA

be unavoidable during the project construction period. Short term noise impacts associated with construction of the project may occur. Typical noise levels vs. distance from construction equipment are shown in FIGURE 9. Typical noise levels at 100 FT distance from mass grading operations are shown in FIGURE 10. Because of the relatively high noise levels associated with construction activities, mitigation of construction noise to inaudible levels will not be practical in all cases. The use of properly muffled and maintained construction equipment should be required on the job site.

Permissible noise levels during construction are regulated by the State Department of Health under the permit procedures of Reference 4. The incorporation of State Department of Health construction noise limits and curfew times, which are applicable on the island of Oahu are other noise mitigation measures which are normally applied to construction activities. Use of these procedures by contractors has been successful in mitigating construction noise, and should also be used on this project. TABLE 5 depicts the allowed hours of construction for normal construction noise (levels which do not exceed 95 dB at the project's property line) and for construction noise which exceeds 95 dB at the project's property line. Noisy construction activities are not allowed on holidays, Saturdays, Sundays, during the early morning, and during the late evening periods under the DOH permit procedures.

ANTICIPATED RANGE OF CONSTRUCTION
NOISE LEVELS VS. DISTANCE



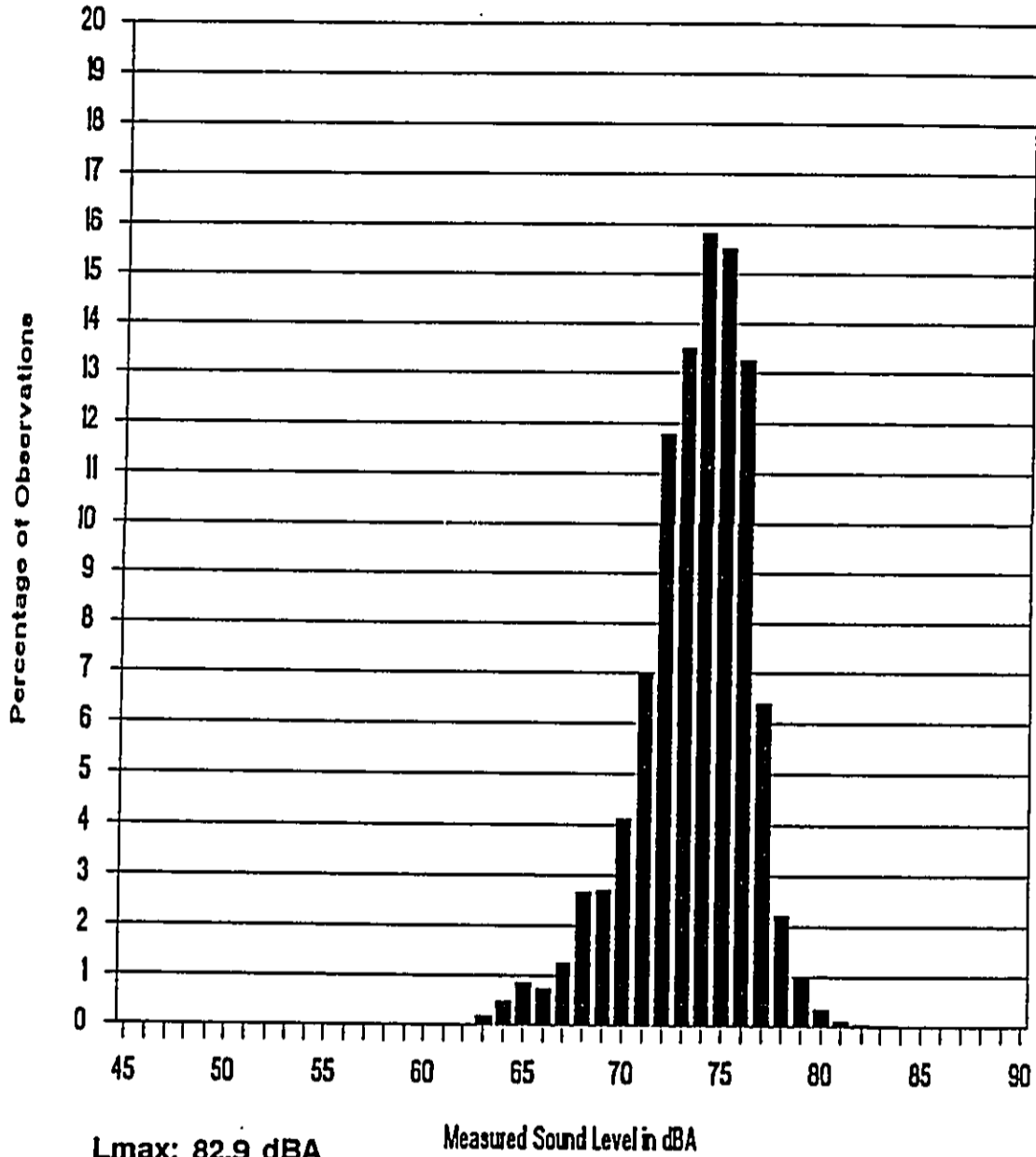
CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE
9

FIGURE 10
TYPICAL NOISE LEVELS FROM
GRADING WORK AT 100 FT DISTANCE

DATE: May 21, 1990

METER RESPONSE: Slow

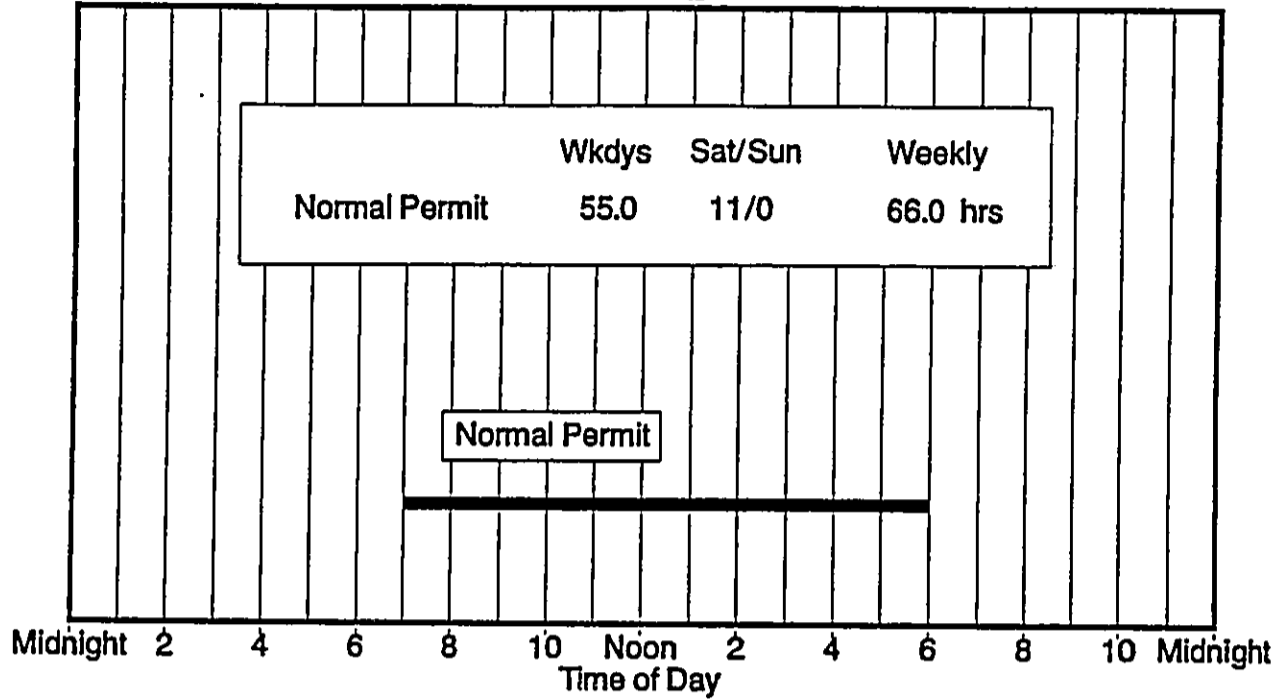


Lmax: 82.9 dBA
 L10: 77.0 dBA
 Leq: 74.7 dBA
 Lmin: 63.0 dBA

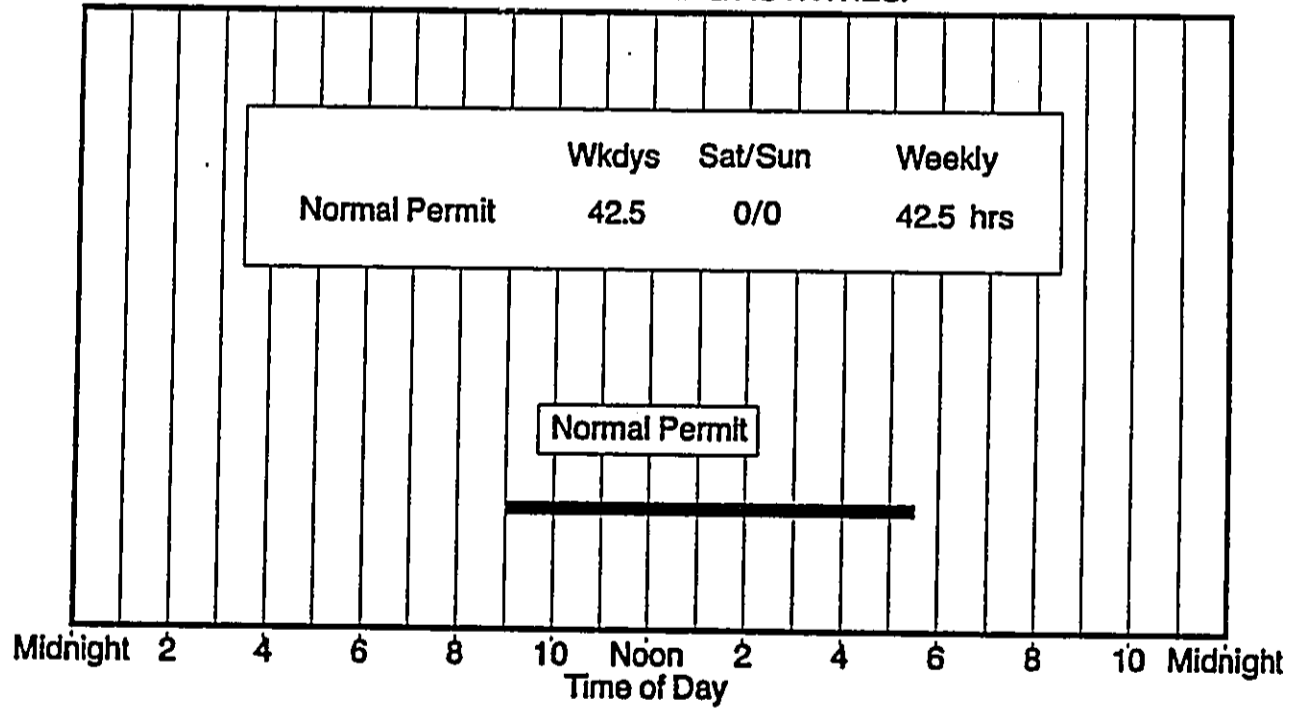
Measured Sound Level in dBA

TABLE 5
AVAILABLE WORK HOURS UNDER DOH
PERMIT PROCEDURES FOR CONSTRUCTION NOISE

a. DOH PERMIT FOR NOISE EMISSIONS \leq 95 dBA.



b. DOH PERMIT FOR IMPACT PILE DRIVING ACTIVITIES.



APPENDIX A. REFERENCES

- (1) "Guidelines for Considering Noise in Land Use Planning and Control;" Federal Interagency Committee on Urban Noise; June 1980.
- (2) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; July 12, 1979.
- (3) "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety;" Environmental Protection Agency (EPA 550/9-74-004); March, 1974.
- (4) "Title 11, Administrative Rules, Chapter 43, Community Noise Control for Oahu;" Hawaii State Department of Health; November 6, 1981.
- (5) "Title 11, Administrative Rules, Chapter 42, Vehicular Noise control for Oahu;" Hawaii State Department of Health; October 27, 1981.
- (6) "Barry, T. and Reagan, J., "FHWA Highway Traffic Noise Prediction Model," FHWA-RD-77-108, Federal Highway Administration, Washington, D.C., December 1978.
- (7) "Traffic Impact Assessment Report for The Lualualei Golf Course;" Pacific Planning & Engineering, Inc.; September, 1990.
- (8) March 21-22, 1990 24-hour Traffic Counts, Station 14, Farrington Highway at Lualualei Naval Road; State Department of Transportation.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the L_{Cdn} with the L_Adn.

Although not included in the tables, it is also recommended that "L_{pn}" and "L_{epN}" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (L_A) was measured before and after the installation of acoustical treatment. The measured L_A values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, L_{eq} is designated the "equivalent sound level". For L_d, L_n, and L_{dn}, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (L_{pn} was found to be 75 dB. L_{pn} = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

<u>TERM</u>	<u>SYMBOL</u>
1. A-Weighted Sound Level	L_A
2. A-Weighted Sound Power Level	L_{WA}
3. Maximum A-Weighted Sound Level	L_{max}
4. Peak A-Weighted Sound Level	L_{Apk}
5. Level Exceeded x% of the Time	L_x
6. Equivalent Sound Level	L_{eq}
7. Equivalent Sound Level over Time (T) (1)	$L_{eq}(Y)$
8. Day Sound Level	L_d
9. Night Sound Level	L_n
10. Day-Night Sound Level	L_{dn}
11. Yearly Day-Night Sound Level	$L_{dn}(Y)$
12. Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq}(1)$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq}(WASH)$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78, NOISE REGULATION REPORTER.

APPENDIX B (CONTINUED)

**TABLE II
RECOMMENDED DESCRIPTOR LIST**

<u>TERM</u>	<u>A-WEIGHTING</u>	<u>ALTERNATIVE⁽¹⁾ A-WEIGHTING</u>	<u>OTHER⁽²⁾ WEIGHTING</u>	<u>UNWEIGHTED</u>
1. Sound (Pressure) ⁽³⁾ Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2. Sound Power Level	L_{WA}		L_{WB}	L_W
3. Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4. Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5. Level Exceeded x% of the time	L_x	L_{Ax}	L_{Bx}	L_{px}
6. Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7. Equivalent Sound Level ⁽⁴⁾ Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9. Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10. Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13. Energy Average value over (non-time domain) set of observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level exceeded x% of the total set of (non-time domain) observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average L_x value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified as $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine.

APPENDIX J

Air Quality Impact Report, Lualualei Golf Course

Prepared by J.W. Morrow, January, 1991

AIR QUALITY IMPACT REPORT

LUALUALEI GOLF COURSE

January 9, 1991.

PREPARED FOR

Harvey Hida & Associates, Inc.

PREPARED BY

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7	Off-Site Stationary Air Pollution Sources

1. INTRODUCTION

Kabushiki Kaisha Oban is proposing development of an 18-hole championship golf course in Lualualei Valley, Nanakuli, Oahu (Figure 1). The approximately 259-acre site is located some two miles north of Farrington Highway and adjacent to the U.S. Navy's Lualualei Naval Ammunition Depot (TMK 8-7-9: por. 2; 8-7-10: 6 & 10; and 8-7-19: por. 1). Project completion is expected by 1996. Existing site conditions are depicted in Figure 2.

The purpose of this report is to assess the air quality impact of the proposed development. The project can be considered an "indirect source" of air pollution as defined in the federal Clean Air Act [1] since it will attract mobile sources of air pollution, i.e., motor vehicles. Thus, much of the focus of this analysis is on the project's ability to generate traffic and the resultant impact on air quality. Air quality impact was evaluated for existing (1990) and future (1996) conditions.

Also, during routine operation of the golf course, various pesticides are used which may result in air pollution contributions. This potential impact has been addressed.

Finally, during construction of the various buildings and facilities air pollutant emissions will be generated due to vehicular movement, grading and general dust-generating construction activities. These impacts have also been addressed.

2. AIR QUALITY STANDARDS

A summary of State of Hawaii and national ambient air quality standards is presented in Table 1 [2,3]. Note that Hawaii's standards are not divided into primary and secondary standards as are the Federal standards.

Primary standards are intended to protect public health with an adequate margin of safety while secondary standards are intended to protect public welfare through the prevention of damage to soils, water, vegetation, man-made materials, animals, wildlife, visibility, climate, and economic values [4].

Some of Hawaii's standards are clearly more stringent than their Federal counterparts but, like their Federal counterparts, may be exceeded once per year. It should also be noted that in April, 1986, the Governor signed amendments to Chapter 59 (Ambient Air Quality Standards) making the State's standards for particulate matter and sulfur dioxide the same as national standards. In the case of particulate matter, however, this uniformity did not last long. On July 1, 1987, the EPA revised the Federal particulate standard to apply only to particles 10 microns or less in

diameter (PM-10) [5], leaving the State once again with standards different than the Federal ones.

In the case of the automotive pollutants [carbon monoxide (CO), oxides of nitrogen (NOx), and photochemical oxidants (Ox)], there are only primary standards. Until 1983, there was also a hydrocarbons standard which was based on the precursor role hydrocarbons play in the formation of photochemical oxidants rather than any unique toxicological effect they had at ambient levels. The hydrocarbons standard was formally eliminated in January, 1983 [6].

The U.S. Environmental Protection Agency (EPA) is mandated by Congress to periodically review and re-evaluate the Federal standards in light of new research findings [7]. The last review resulted in the relaxation of the oxidant standard from 160 to 235 micrograms/cubic meter (ug/m³) [8]. The carbon monoxide (CO), particulate matter, sulfur dioxide (SO₂), and nitrogen dioxide (NO₂) standards have been reviewed, but no new standards were proposed.

Finally, the State of Hawaii also has fugitive dust regulations for particulate matter (PM) emanating from construction activities [9]. There simply can be no visible emissions from fugitive dust sources.

3. EXISTING AIR QUALITY

3.1 General. The State Department of Health maintains a network of air monitoring stations around the state to gather data on the following regulated pollutants:

- o total suspended particulates (TSP)
- o particulate matter <10 microns (PM-10)
- o sulfur dioxide (SO₂)
- o carbon monoxide (CO)
- o ozone (O₃)
- o lead (Pb)

In the case of TSP, PM-10, and SO₂, measurements are made on a 24-hour basis to correspond with the averaging period specified in the standards. Samples are collected once every six days in accordance with U.S. Environmental Protection Agency (EPA) guidelines. Carbon monoxide and ozone, however, are measured on a continuous basis due to their short-term (1-hour) standards.

Lead concentrations are determined from the TSP samples which are sent to an EPA laboratory for analysis. Note that the lead standard is a quarterly average.

While present air quality appears quite good due to the generally low density of development in the surrounding area, there is some degree of uncertainty due to the presence of a cement manufacturing plant within one mile and an electrical generating station within five miles of the site. Mobile source emissions from traffic along the adjacent Lualualei Road and Farrington Highway probably have minimum effect due to their low volume and distance, respectively. Some legal and illegal open burning in the largely rural area may also occasionally affect air quality. There is no Department of Health (DOH) air monitoring station in the immediate vicinity of the project site. The nearest site on the leeward side of Oahu is at Barbers Point, some 8 miles southeast of Lualualei.

3.2 Department of Health Monitoring Sites. Recent data from the Barbers Point, Department of Health, and Sand Island stations are summarized in Tables 2 - 4. The data indicate that PM-10, TSP, and SO₂ standards are being met. In fact, much of the time sulfur dioxide concentrations are below the detectable limit of the measurement method being employed.

Photochemical oxidants are secondary pollutants formed in the atmosphere largely as a result of anthropogenic emissions of hydrocarbons and oxides of nitrogen. Since there are no ambient standards for hydrocarbons, there is no monitoring. In the case of NO₂, the State ceased routine monitoring in 1976. As indicated by federal and state standards, ozone is monitored at Sand Island as a surrogate for photochemical oxidants. Recent monitoring data from that station indicate that the state's 1-hour standard is being met over 99% of the time.

As noted above, the State also has been having particulate samples analyzed for lead content, and Table 5 summarizes ambient lead levels over the years. Generally, airborne lead levels have declined as expected due to the federal program for gradual phaseout of leaded gasoline. Particulate lead accumulated over the years in roadside soils and plants, however, will remain indefinitely in the area and provide inhalation exposure whenever dust is re-entrained in the air as a result of scouring winds or mechanical disturbance due to vehicular motion.

3.3 Onsite Carbon Monoxide Sampling. Since the Farrington Highway - Hakimo Road intersection was identified by the traffic consultant [10] as the primary intersection impacted by the project, air sampling was conducted at that intersection on December 18-19, 1990. Both a.m. and p.m. peak traffic hour periods were sampled.

The sampling site was located approximately 10 meters from the road edge on the south (makai) side due to the winds prevailing at the time. A continuous carbon monoxide (CO) instrument was set up and operated during the peak hours. An anemometer and vane were installed to record onsite surface winds. A simultaneous manual count of traffic along Farrington Highway was also made. The variability of each of the parameters measured during the peak hour is clearly seen in Figures 3 and 4.

Onsite winds during the afternoon sampling period were about evenly split between easterly tradewinds and onshore seabreezes with the latter putting the sampler upwind of the source. Wind speeds averaged 1.3 meters per second (m/sec). Atmospheric stability was neutral to slightly unstable and temperature was 79 degrees Fahrenheit (F). West-bound and east-bound traffic counts on the Honolulu side of the intersection were 1768 and 960 vph, respectively, slightly higher than the 1650 and 802 reported by the traffic consultant [10]. The 1-hour average CO concentration of 1 mg/m³ was substantially lower than the computer-predicted concentrations discussed in Section 6 primarily because of the higher wind speed and better than "worst case" wind directions which prevailed during the onsite period.

During the morning sampling period on December 19th, winds were light but gusty trade winds averaging 1.3 m/sec from the northeast. Stability was neutral and temperature was 73 F. West- and east-bound traffic volumes were 535 and 1265 vph, respectively, lower than the 787 and 1575 reported in the traffic assessment [10]. The 1-hour CO concentration of 2 mg/m³, although higher than the p.m. period due to the relatively steady ENE trades, was again lower than the computer predictions in Section 6 because of the better than "worst case" wind conditions.

4. CLIMATE & METEOROLOGY

4.1 Temperature & Rainfall. The National Climatic Data Center in its 1982 annual summary for Honolulu notes that:

"Hawaii's equable temperatures are associated with the small seasonal variation in the amount of energy received from the sun and the tempering effect of the surrounding ocean. The range of temperature averages only 7 degrees between the warmest months (August and September) and the coolest months (January and February) and about 12 degrees between day and night. Daily maximums run from the high 70's in winter to the mid-80's in summer, and daily minimums from the mid-60's to the low 70's. However, the Honolulu Airport area has recorded as high as 93 degrees and as low as 53" [11].

Annual rainfall in the area ranges 20 to 30 inches [12]. Its climatic classification, according to Thornwaite [13], therefore ranges from semiarid steppe to subhumid grassland.

4.2 Surface Winds. While surface winds on an annual basis are clearly dominated by the northeasterly trade winds (Table 6), there are distinct diurnal and terrain effects. In coastal areas onshore flows (sea breezes) occur on clear days and can extend far inland. At night offshore (land breezes) flows go out to sea. Under valley conditions, upslope flows occur on clear days while lower velocity, downslope (drainage) winds occur at night. Such effects were observed during the December 18-19 air sampling when partly sunny conditions caused onshore sea breezes to give a more westerly component to the otherwise prevailing easterly trade winds during the afternoon whereas downslope flows coincided with the northeasterly trade winds during the early morning.

5. HIGHWAYS AND TRAFFIC

Primary access to the project site will be via Farrington Highway, Hakimo Road, and Paakea Road. Farrington Highway is a State 4-lane undivided highway while Hakimo Road is a 2-lane County roadway (Figure 5). Based on the traffic consultant's review of State DOT records, the peak periods were identified as occurring at 6:15 - 7:15 a.m. and 3:45 - 4:45 p.m. [10]. These times, reported traffic volumes, and geometrics from the traffic assessment were used in projecting future air quality impacts.

6. MOBILE SOURCE IMPACT

6.1 Emission Factors. Automotive emission factors for carbon monoxide (CO) were generated for calendar years 1990 and 1996 using the Mobile Source Emissions Model (MOBILE-3) [14]. To localize emission factors as much as possible, the August, 1988 age distribution for the City & County of Honolulu [15] was input in lieu of the national statistics normally used.

6.2 Microscale Analysis. Analyses such as this generally involve estimation of concentrations of non-reactive pollutants. This is due to the complexity of modeling pollutants which undergo chemical reactions in the atmosphere and are subject to the effects of numerous physical and chemical factors which affect reaction rates and products. For projects involving motor vehicles as the principal air pollution source, carbon monoxide is normally selected for modeling because it has a relatively long half-life in the atmosphere (about 1 month) [16], and it comprises the largest fraction of automotive emissions.

In this instance, a microscale screening analysis was performed

for the Hakimo Road intersection with Farrington Highway. The updated version of an EPA guideline model CALINE-4 [17,18] was employed with an array of receptors spaced at distances of 10 - 30 meters from the road edge. Because of the growing level of urbanization and traffic in the area, a background CO concentration of 1.0 milligram per cubic meter (mg/m³) was assumed.

Worst case meteorological conditions were selected for the a.m. and p.m. peak traffic hours. A wind speed of 1 meter per second, an acute wind/road angle, and appropriate stability categories ("stable" for a.m. and "neutral" for p.m.) (Pasquill-Gifford Classes "F" and "D", respectively) [19], were all selected to maximize concentration estimates in the vicinity of the intersection. Review of the traffic data and preliminary modeling indicated that northwesterly winds were most likely to produce the maximum CO concentrations near the intersections under study; thus, this wind direction was input for the modeling.

Maximum one-hour carbon monoxide (CO) concentrations were then computed for the peak traffic hours. The analyses were performed for existing (1990) and future conditions (1996) both with and without the proposed project. The results are summarized in Figure 6.

7. OTHER LONG-TERM IMPACTS

7.1 Off-Site Stationary Sources. In addition to the direct impacts generated by any proposed project, the project itself may be impacted by existing or future elements of the surrounding environment. In this case, there are two such elements.

The first is a power plant. Currently, most of Oahu's electrical energy is generated at Hawaiian Electric Company's (HECO) Kahe Generating Station located about five miles south-southeast of the project site (Figure 7). This is currently a six-unit, approximately 650-megawatt facility firing low-sulfur fuel oil. A seventh 150-megawatt unit was proposed by HECO [20], but two out-of-state companies proposed and are now building a gas turbine and coal-fired power plant at Campbell Industrial Park to sell power to the utility [21]. Nevertheless, the Kahe facility may be expended in the future to meet a growing population's electrical demand. Under southeasterly (kona) wind conditions the emissions from Kahe may affect air quality in the project area although air quality standards would continue to be met due to the distance from the source. Additionally, the pertinent health-related standards are 24-hour and annual average standards which is significant since the users of the proposed golf course will not reside at the site and thus not have long-term exposure.

Hawaiian Cement's Nanakuli plant is situated along Lualualei Road approximately one mile away south of the project site [Figure 7]. As with Kahe, under southerly wind conditions, emissions from this facility would affect air quality in the project area, but again air quality standards would be met. Finally, it should be noted that both Kahe and Hawaiian Cement are permitted by the State Department of Health and must demonstrate continued compliance with both emission and ambient air quality standards.

7.2 Pesticide Use. Pesticides are routinely required at golf courses in order to maintain fairways and greens. Typical pesticide use at a 18-hole golf course was obtained from another report prepared for this project [22].

The herbicides MSMA, glyphosate, metribuzin, and bensulide all have relatively low mammalian toxicities with oral LD₅₀ values on the order of hundreds or thousands of milligrams active agent per kilogram body weight (mg/kg) [23, 24]. MSMA and metribuzin have OSHA air standards of 0.5 mg/m³ and 5 mg/m³, respectively [24]. These are 8-hour time-weighted averages.

The insecticide chlorpyrifos is a moderately toxic organophosphate which can affect the normal functioning of mammalian nervous systems through its inhibition of the enzyme cholinesterase. It has oral LD₅₀ values in the range of 60 - 82 mg/kg. The OSHA standard for airborne concentrations of chlorpyrifos is 0.2 mg/m³ as an 8-hour average [24].

The fungicides metalaxyl and chlorothalonil have relatively low acute toxicities with oral LD₅₀ values in the hundreds and thousands of mg/kg [24]. Chlorothalonil, however, has also demonstrated some carcinogenic potential in animals [24].

If properly used in accordance with label instructions, all of the aforementioned chemicals should present no hazard to the properties or owners of properties adjoining the proposed golf course. In fact, the greatest risk in using such chemicals is generally to the users themselves if they do not strictly follow label instructions. This is because the user may come in contact with the concentrated product while nearby properties and people may only be exposed to the greatly diluted and dispersed application solution.

The potential for significant airborne concentrations of these chemicals is relatively slight when one considers the dilution factor in application solutions plus the coarse spray that is normally used to assure adequate coverage in the desired area and avoidance of drift. Should a user improperly apply these chemicals under wind conditions which would contribute to drift, then there would be an increased possibility of downwind exposure

of property and people. In order to assess the possible impact of such an event on people, a dispersion modeling analysis was performed for each of the chemicals. The results of this modeling are summarized in Table 7.

8. CONSTRUCTION IMPACT

The principal source of short-term air quality impact will be construction activity. Construction vehicle activity will increase automotive pollutant concentrations along the principal access roads as well as in the vicinity of the project site itself. During off-peak hours, the additional construction vehicle traffic should not exceed road capacities although the presence of large trucks can reduce a roadway's capacity as well as lower average travel speeds thereby contributing to additional air pollution emissions.

The site preparation and earth moving will create particulate emissions as will building and on-site road construction. Construction vehicles movement on unpaved on-site roads will also generate particulate emissions. EPA studies on fugitive dust emissions from construction sites indicate that about 1.2 tons/acre per month of activity may be expected under conditions of medium activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50 [25].

Since the onsite soils are generally stony clays and clays, in all probability having silt content equal to or greater than the 30% cited above [26], and the computed P/E Index for the area ranging 24 - 39 indicating greater aridity than the aforementioned EPA case, it may be assumed that there is a potential for fugitive dust problems.

In addition to the onsite impacts attributable to construction activity, there will also be offsite impacts due to the operation of concrete batching plants needed for construction. Since it is also too early to identify specific facilities that will be providing the concrete, the discussion of air quality impacts is necessarily generic.

Design and operating features of a typical concrete batching plant were obtained for this analysis. This plant (Rex Transit Mix Batch Plant, Model LO GO 5) [27], is a portable unit capable of producing up to 100 cubic yards of concrete per hour.

Assuming 8 hours/day operation and published EPA emission factors [25] for both direct plant emissions and fugitive dust emissions, estimates of worst case ambient impact were derived using the PTPLU screening model [28]. Ninety percent control of particulate emissions from the plant itself and 60% control of fugitive dust emissions from the process were assumed. One-hour concentration

estimates were adjusted to 8-hour averages using an EPA-recommended factor [29] and then to 24-hour averages based on a weighted averaging technique. The worst case concentration of total suspended particulates (TSP) was thus estimated to be 105 micrograms/cubic meter (ug/m³) due to the plant operation.

Since it is not known where exactly the plant(s) will be located and thus what the background concentration of TSP will be, it is somewhat difficult to predict cumulative concentrations for comparison with standards. However, if the batch plant's 105 ug/m³ were assumed to be all < 10 microns and were added to the second highest 24-hour PM-10 concentration (42 ug/m³) from the 1989 Barbers Point data, the sum would still comply with the federal 24-hour standard of 150 ug/m³.

9. DISCUSSION AND MITIGATION

9.1 Microscale Analysis. The results of the modeling indicate that both state and federal 1-hour CO standards would be met beyond 10 meters from the intersection, but that exceedances were possible under worst case meteorological conditions in close proximity to the intersection studied. This was the case both for existing traffic volumes as well as future conditions both with and without the proposed golf course. CO concentrations under the "with project" scenario ranged from 2 to 7% higher than under the "without project" scenario.

It must be emphasized that these projections are based on "worst case" conditions of traffic volume, wind direction, and wind speed. The probability of these worst case conditions occurring simultaneously is relatively low, particularly during the p.m. peak hours when wind speeds tend to be higher. For example, the overall frequency of northwest winds of low velocity (0 - 3 knots), as reported at the airport, is about 1% for all hours of the year (see Table 6) and for specific hours such as a.m. and p.m. peak traffic hours would be substantially less than 1%.

The trend of CO levels over the 1990 - 1996 period was also downward. The apparent reduction in ambient impact despite projected increases in traffic exemplifies the effect of the federal motor vehicle control program. In this instance, the projected rate of reduction in emissions per vehicle over the 1990 - 1996 period was greater than the projected rate of increase in traffic volume over the same period; thus, a net decrease in cumulative emissions and ambient impact results. One of the key elements of the recently passed federal clean air legislation was reduction of motor vehicle emissions; thus, the projected trend reported here may have an even sharper downward slope in the long term.

Estimates of 8-hour concentrations can be derived by applying a

"persistence" factor of 0.6 to the 1-hour concentrations. This "persistence" factor is recommended in an EPA publication on indirect source analysis [30]. When using this approach, any 1-hour CO concentration greater than 8.4 mg/m³ would indicate exceedance of the State's 8-hour standard. Similarly, any 1-hour concentration over 15.7 mg/m³ would indicate exceedance of the federal 8-hour standard. By reviewing Figure 6, one can quickly see that the 8-hour results would be similar to the 1-hour analysis except that in 1990, exceedance of the State 8-hour standard might extend to 20 meters from the intersection rather than only 10 meters.

In terms of mitigation, the principal long-term means of mitigating mobile source impacts on Oahu will be:

- federally mandated stringent emission standards on new vehicles
- the development of non- or less-polluting vehicles
- provision of efficient public transit

In this particular case, given the relatively low level of traffic generation by the proposed project, encouragement of car- and van-pooling by groups of golfers would be one logical way of reducing traffic and air quality impact.

9.2 Pesticide Use. The results of the modeling indicated airborne pesticide concentrations several orders of magnitude below the effects and standards levels. More importantly, however, proper use of pesticides in accordance with the legally required label instructions should prevent any significant air quality impact. Use of other non-chemical means of pest control wherever possible would also help reduce or eliminate the potential for air quality impact.

9.3 Construction Impacts. Since as noted in Section 8, there is a potential for fugitive dust generation during construction, it will be important for adequate dust control measures to be employed during the construction period. Dust control could be accomplished through frequent watering of unpaved roads and areas of exposed soil. The EPA estimates that twice daily watering can reduce fugitive dust emissions by as much as 50%. The soonest possible landscaping of completed areas will also help.

With regard to construction vehicle effects, proper maintenance of vehicle engines will help reduce emissions, while scheduling truck traffic during offpeak hours will reduce the impact on Farrington Highway.

Offsite construction related activity such as asphalt and concrete batching will affect air quality in the vicinity of the batch plant site but such plants must demonstrate compliance with state and federal standards before they receive operating permits.

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T A B L E S

TABLE 1

SUMMARY OF STATE OF HAWAII AND FEDERAL
AMBIENT AIR QUALITY STANDARDS

POLLUTANT	SAMPLING PERIOD	FEDERAL STANDARDS		STATE STANDARDS
		PRIMARY	SECONDARY	
1. Total Suspended Particulate Matter (TSP) (micrograms per cubic meter)	Annual Geometric Mean	--	--	60
	Maximum Average in Any 24 Hours	--	--	150
2. PM-10 (micrograms per cubic meter)	Annual	50	50	--
	Maximum Average in Any 24 Hours	150	150	--
3. Sulfur Dioxide (SO ₂) (micrograms per cubic meter)	Annual Arithmetic Mean	80	--	80
	Maximum Average in Any 24 Hours	365	--	365
	Maximum Average in Any 3 Hours		1,300	1,300
4. Nitrogen Dioxide (NO ₂) (micrograms per cubic meter)	Annual Arithmetic Mean		100	70
5. Carbon Monoxide (CO) (milligrams per cubic meter)	Maximum Average in Any 8 Hours		10	5
	Maximum Average in Any 1 Hour		40	10
6. Ozone (O ₃) (micrograms per cubic meter)	Maximum Average in Any 1 Hour		235	100
7. Lead (Pb) (micrograms per cubic meter)	Maximum Average in Any Calendar Quarter		1.5	1.5

TABLE 2
 AIR MONITORING DATA
 BARBERS POINT, OAHU
 1974-89

YEAR	PARTICULATES*			SO ₂			NO ₂		
	RANGE	MEAN	>AQS	RANGE	MEAN	>AQS	RANGE	MEAN	>AQS
1974	23-132	47	1	<5-10	<5	0	<20-40	25	0
1975	13-137	52	1	<5-11	<5	0	< 5-25	11	0
1976	12-101	40	1	<5-7	<5	0	< 5-29	14	0
1977	25-134	54	1	<5-18	<5	0	-----	--	-
1978	22-127	48	1	<5-40	<5	0	-----	--	-
1979	23-223	76	10	<5-27	<5	0	-----	--	-
1980	29-158	53	2	<5-10	<5	0	-----	--	-
1981	26-188	51	2	<5-40	<5	0	-----	--	-
1982	15- 63	41	0	<5-12	<5	0	-----	--	-
1983	28-193	--	2	<5-95	--	1	-----	--	-
1984	17-112	50	1	<5-<5	<5	0	-----	--	-
1985*	24-138	57	3	<5-25	<5	0	-----	--	-
1986*	7-66	26	0	<5-10	<5	0	-----	--	-
1987*	10-40	22	0	<5-13	<5	0	-----	--	-
1988*	10-48	24	0	<5-19	<5	0	-----	--	-
1989*	10-44	25	0	<5-20	<5	0	-----	--	-

- NOTES: 1. Particulates = 1974-84, total suspended particulates (TSP)
 1985-89, particulate matter <10 microns (PM-10)
 2. SO₂ = sulfur dioxide
 3. NO₂ = nitrogen dioxide
 4. >AQS = number of violations of state air quality standard
 5. All concentrations are in micrograms per cubic meter of air.
 6. Sampling station was moved from Barbers Point Lighthouse
 to the Chevron Refinery site due to salt spray from the
 ocean on 17 March 1972.
 7. The samplers were elevated to a rooftop on 7 August 1979.
 8. Source: State Department of Health

TABLE 4

SUMMARY OF AEROMETRIC DATA COLLECTED
AT THE DEPARTMENT OF HEALTH BUILDING

1971 - 1987

NITROGEN DIOXIDE	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980-87
(24-hr values)										
Period of sampling (mos.):	10	12	12	12	12	3	n.d.	n.d.	n.d.	n.d.
Number of samples:	83	113	99	90	91	22				
Range of values:	<20-159	<20-236	<20-95	<20-95	16-70	12-63				
Mean of values:	56	56	46	37	33	35				
Number of times State AQS exceeded:	1	2	0	0	0	0				

CARBON MONOXIDE	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
(Daily 1-hr maxima)										
Period of sampling (mos.):	12	8	n.d.	n.d.	n.d.	6	12	12	12	12
Number of samples:	365	208				169	318	342	348	345
Range of values:	0-20.7	0-17.3	Station moved to Kaimuki			0-8.6	0.6-10.9	0.0-10.4	0.2-13.5	0.3-11.1
Arithmetic mean of daily maximum values:	3.1	3.0				2.4	2.4	1.5	2.2	1.7
Number of days State AQS exceeded:	19	10	10			0	1	1	3	1

TABLE 5
 LEAD MONITORING DATA
 HONOLULU, OAHU
 1970-89

AVERAGE CONCENTRATION
 (micrograms/cubic meter)

YEAR	1st QUARTER	2nd QUARTER	3rd QUARTER	4th QUARTER
1970	0.78	0.81	0.65	0.92
1971	1.65	0.63	0.65	1.05
1972	--	0.75	0.65	0.48
1973	0.52	0.52	0.72	0.55
1974	0.84	0.61	0.70	0.92
1975	0.65	0.81	0.59	1.05
1976	0.91	0.65	0.99	1.00
1977	0.89	0.59	0.48	0.80
1978	--	--	--	0.72
1979	0.39	0.25	0.26	0.42
1980	0.41	0.23	0.21	0.20
1981	0.25	--	--	--
1982	0.21	0.16	0.09	0.21
1983	n/a	n/a	n/a	n/a
1984	0.3	0.2	0.2	0.3
1985	0.1	0.03	0.02	0.1
1986	0.1	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.01
1989	0.0	0.02	0.01	n/a

Source: Department of Health

TABLE 6

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION
HONOLULU INTERNATIONAL AIRPORT

Direction	Wind Speed (Kts)						TOTAL
	0 - 3	4 - 7	8 - 12	13 - 18	19 - 24	>24	
N	0.0149	0.0261	0.0075	0.0020	0.0002	0.0000	0.0506
NNE	0.0114	0.0219	0.0106	0.0046	0.0005	0.0000	0.0490
NE	0.0114	0.0449	0.0829	0.0853	0.0204	0.0018	0.2466
ENE	0.0088	0.0637	0.1559	0.1209	0.0224	0.0014	0.3731
E	0.0039	0.0179	0.0329	0.0210	0.0023	0.0001	0.0782
ESE	0.0021	0.0056	0.0050	0.0015	0.0003	0.0001	0.0146
SE	0.0021	0.0059	0.0091	0.0049	0.0006	0.0002	0.0228
SSE	0.0023	0.0074	0.0123	0.0038	0.0008	0.0002	0.0268
S	0.0025	0.0104	0.0127	0.0033	0.0005	0.0003	0.0296
SSW	0.0011	0.0041	0.0053	0.0017	0.0003	0.0000	0.0125
SW	0.0007	0.0031	0.0058	0.0022	0.0003	0.0001	0.0122
WSW	0.0006	0.0017	0.0031	0.0022	0.0005	0.0001	0.0082
W	0.0019	0.0030	0.0021	0.0009	0.0002	0.0001	0.0082
WNW	0.0027	0.0051	0.0012	0.0003	0.0001	0.0000	0.0094
NW	0.0084	0.0153	0.0031	0.0008	0.0003	0.0000	0.0279
NNW	0.0087	0.0166	0.0041	0.0012	0.0002	0.0000	0.0308
TOTAL:	0.0835	0.2527	0.3534	0.2567	0.0496	0.0043	1.0002

SOURCE: National Weather Service

TABLE 7

ESTIMATES OF DOWNWIND PESTICIDE CONCENTRATIONS

Product	Active Agent Concentration (ug/m ³)
MSMA	10
Bensulide	63
Trimec	5
Metribuzin	4
Glyphosate	8
Chlorpyrifos	5
Metalaxyl	7
Chlorothalonil	42

Conditions: Windspeed: 4.5 m/sec
 Stability category: D (neutral)
 Downwind distance: 100 m
 Exposure duration: 5 - 10 minutes
 Treated area: 1 acre
 Application height: 0.5 m
 Active agent drift: 0.4%

FIGURES

FIGURE 1
PROJECT LOCATION

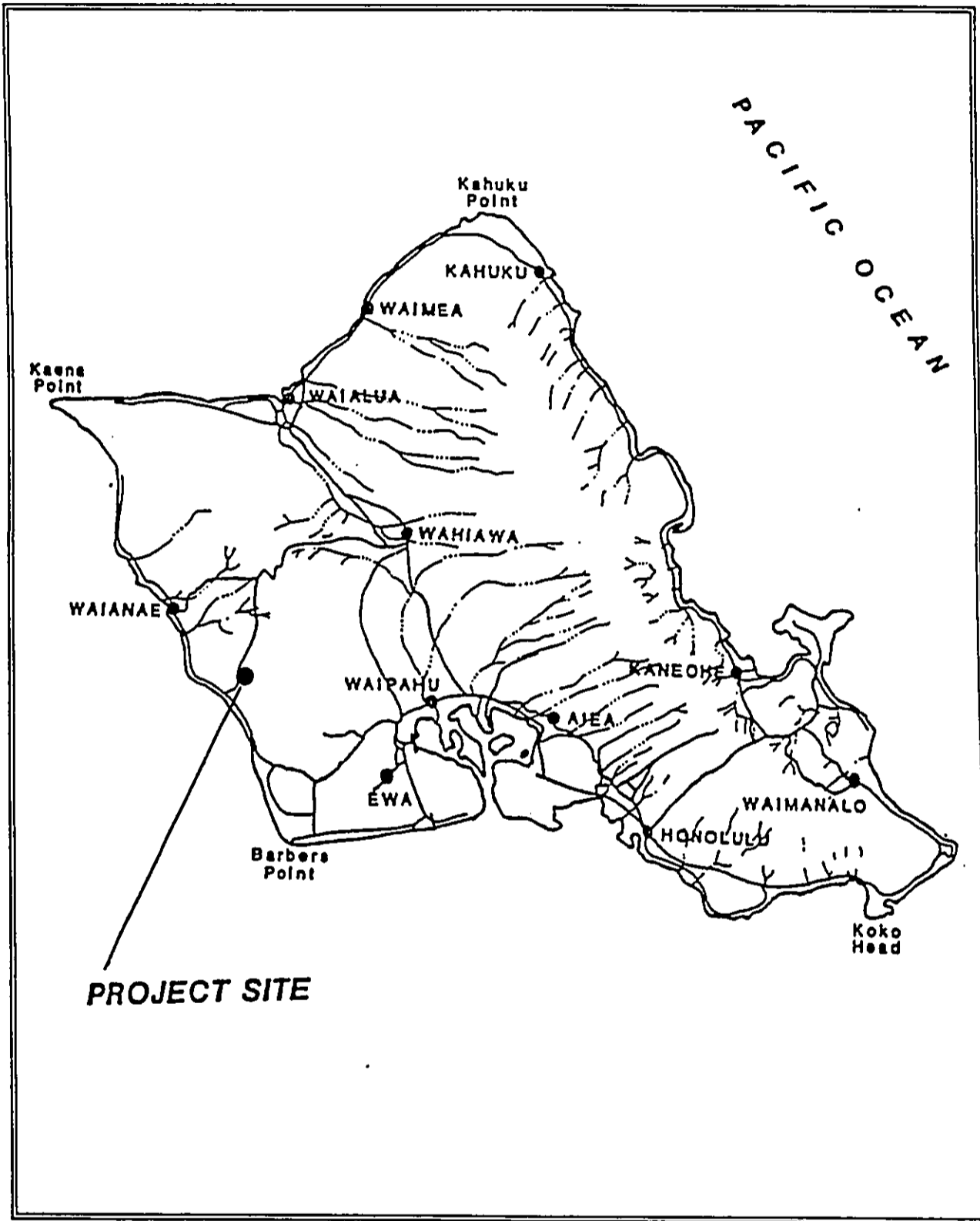


FIGURE 3
A.M. PEAK HOUR CONDITIONS
FARRINGTON HIGHWAY AT HAKIMO ROAD
DECEMBER 19, 1990

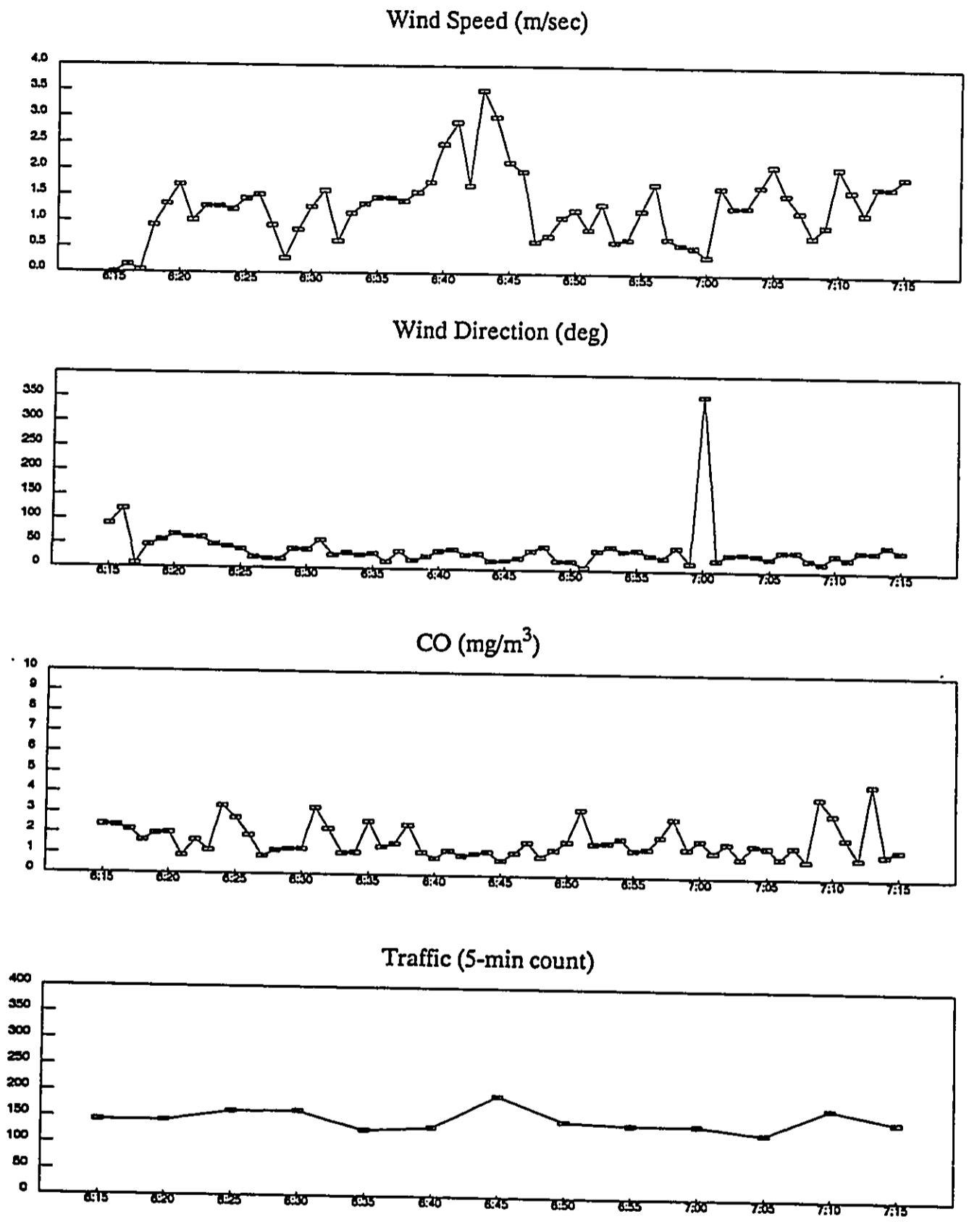
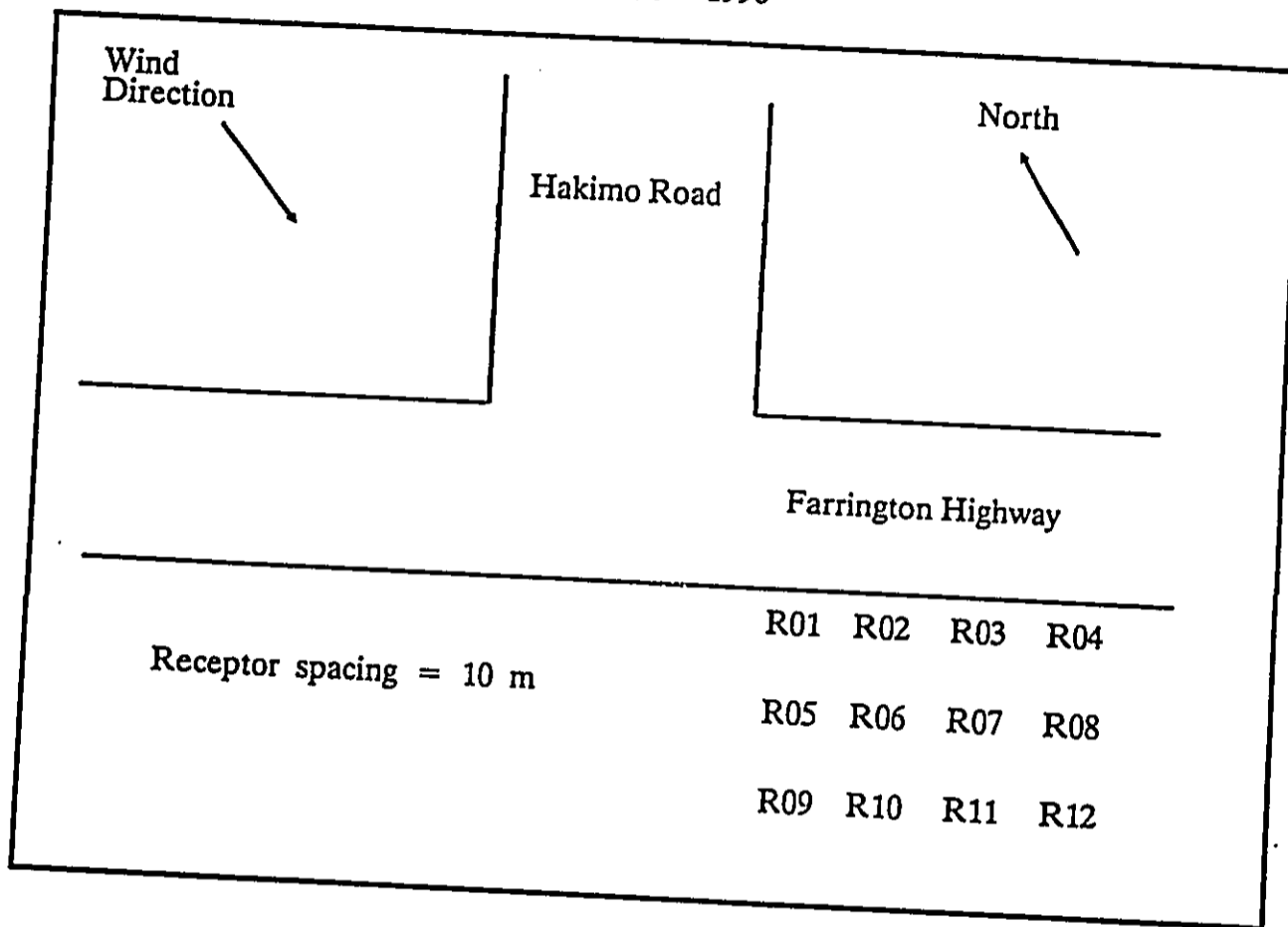


FIGURE 6
ESTIMATES OF MAXIMUM 1-HOUR
CARBON MONOXIDE CONCENTRATIONS

Farrington Highway at Hakimo Road
 Peak Traffic Hours
 1990 - 1996



Receptor	Concentration (mg/m ³)					
	1990	A.M. 1996 w/o	1996 w/proj	1990	P.M. 1996 w/o	1996 w/proj
R01	10.9	8.5	8.8	11.9	8.9	9.1
R02	13.2	9.9	10.0	12.9	9.8	10.3
R03	14.6	10.5	10.7	12.9	10.1	10.7
R04	15.0	10.6	10.8	12.2	9.9	10.6
R05	5.9	5.2	5.4	7.4	5.9	6.0
R06	7.5	6.2	6.3	8.3	6.5	6.6
R07	8.8	6.8	7.0	8.8	6.8	7.2
R08	9.8	7.4	7.5	9.0	7.1	7.5
R09	3.8	3.6	3.8	5.2	4.6	4.7
R10	4.7	4.2	4.3	5.8	4.8	4.9
R11	5.7	4.8	4.9	6.4	5.1	5.2
R12	6.7	5.4	5.5	6.8	5.5	5.7

APPENDIX K

Lualualei Golf Course: Impacts On Agriculture

Prepared By Decision Analysts Hawaii, Inc. 1991

LUALUALEI GOLF COURSE:
Impacts on Agriculture

LUALUALEI GOLF COURSE:
Impacts on Agriculture

PREPARED FOR:
Kabushiki Kaisha Oban

PREPARED BY:
Decision Analysts Hawaii, Inc.

March 1991

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EXECUTIVE SUMMARY

The proposed Lualualei Golf Course would require about 259 acres of land which is located within Lualualei Valley. The impact of this project on agriculture is summarized below.

Agronomic Conditions

It is estimated that less than 20 percent of the property has good soils and level land suitable for agriculture. However, commercial farming on these good soils would be limited in that relatively expensive irrigation water would preclude those low-value crops that require considerable water. Furthermore, except for about 15 acres, the land would have to be cleared of rocks and bushes before it could be farmed.

Recent Agricultural Use of Property

Until 1988, about 15 acres of the lower portion of the project site were used for a truck farm under a farmer-tenant lease to Mr. Ryoei Higa. In an amicable and voluntary agreement, Mr. Higa agreed to relocate his operation to another site in exchange for consideration. In effect, the adverse impact of the proposed golf course on this small truck-farm operation has already been mitigated.

Impact on Existing Agriculture Activities

The proposed development would not affect existing plantation-agriculture or diversified-agriculture activities on the property since none currently exist, nor would the development interfere with nearby agricultural activities in Lualualei Valley. Furthermore, the groundwater source for golf course irrigation would not affect existing agricultural activities within Lualualei Valley as no farm relies on this water source.

The proposed golf course may increase the values of the few agricultural parcels which abut or have prominent views of the golf course, but it is unlikely that agricultural lease rents, taxes, and the current agricultural use of lands would be affected.

Potential Crops

Given the agronomic conditions of the property and the relatively high cost of land, water and labor on Oahu, the most promising crops for the property would include mustard cabbage, daikon, eggplant, flowers and nursery products, semi-head lettuce, and green onions. These are the commercial crops which are grown profitably in significant quantities in the Waianae District. For most of these crops, however, production is declining on Oahu as a result of a shift to the Neighbor Islands where land and labor is generally less expensive.

Availability of Land for Diversified Agriculture

Even though the proposed project would result in the loss of a small amount of "prime" agricultural land, this loss would not adversely affect the growth of diversified agriculture. There are four reasons for this assessment: (1) a vast amount of agricultural land and water in the State has been freed from sugar and pineapple production due to past plantation closings and reductions in operations—over 120,000 acres since 1968, including announced reduction plans—and most of this land has favorable soil ratings and remains available for diversified-agriculture activities; (2) it is very probable that additional sugarcane acreage and water will be freed, given the existence of unprofitable sugar operations; (3) some, if not most, of the sugar companies would make their lands available for profitable replacement crops to the extent that such crops exist; and, in contrast, (4) land requirements to accommodate the growth of diversified agriculture are surprisingly modest compared to the available supply.

In addition, the greater the success of diversified agriculture, the greater the amount of land which will be released from sugar for diversified agriculture.

In summary, the factor limiting the growth of diversified agriculture is *not the land supply*—far more land has been and continues to be freed from plantation agriculture than can be absorbed by diversified agriculture and urban development. Rather the limiting factors to the growth of diversified agriculture are (1) the *market demand* for those crops that can be grown profitably in Hawaii, and (2) for the case of small-scale (but not large-scale) farmers, *subdivision requirements* which limit their access to agricultural land. The proposed Lualualei Golf Course would involve far too little land to affect the growth of diversified agriculture.

Potential Conversion to Agricultural Use

A golf course is not an irretrievable commitment of resources; if future economic conditions warrant, the golf course could be converted to agricultural use. Although such a conversion is possible, it is regarded as highly improbable.

Positive Impacts on Diversified Agriculture

To an undetermined extent, the Lualualei Golf Course would stimulate the growth of diversified agriculture by increasing the demand for plants and trees from nursery operations. Also the golf course would provide about 20 grounds-maintenance jobs involved with the cultivation of grasses and plants, applying fertilizers and chemicals, maintaining irrigation systems, etc. In terms of function, these jobs are similar to certain jobs in the agriculture industry, and require similar skills and training.

Consistency with State and County Plans

The proposed Lualualei Golf Course (1) would not adversely affect any plantation agriculture activities; (2) would not adversely affect any existing diversified-agriculture activities; (3) would not limit the growth of diversified agriculture since, in other parts of the State, far more agricultural land has been released from plantation agriculture than has been absorbed by other activities; and (4) would contribute to the economy, including the addition of a number of agriculture-type jobs. However, the proposed golf course has displaced a small 15-acre truck farm, but this displacement has already been mitigated through an amicable and voluntary agreement which involved relocation in exchange for consideration.

In view of these findings, the project would not conflict with the major thrust of the Hawaii State Plan, the State Agriculture Functional Plan, and the General Plan of the City and County of Honolulu. This thrust in all three plans calls for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture. To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured. The thrust of these plans is not to preserve prime agricultural lands simply for the sake of preserving them—preservation is to occur only if a potential need for these agricultural lands exists.

However, less than 20 percent of the project would conflict with the lower-level State agricultural guidelines which call for Agricultural Lands of Importance to be protected from development.

LUALUALEI GOLF COURSE: IMPACTS ON AGRICULTURE

The proposed Lualualei Golf Course would require about 259 acres of land which is located within Lualualei Valley on the Leeward Coast and approximately 2.4 miles mauka of the town of Nanakuli. The impact of this project on agriculture is summarized in this report.

AGRONOMICAL CONDITIONS

Soil Types and Uses

The affected acreage consists of five soil types which are listed below in alphabetical order:

LuA	Lualualei clay, 0 to 2 percent slopes
LuB	Lualualei clay, 2 to 6 percent slopes
LPE	Lualualei extremely stony clay, 3 to 35 percent slopes
PvC	Pulehu very stony clay loam, 0 to 12 percent slopes
rRK	Rock land.

For each soil type, Table 1 shows the approximate acreage, possible agricultural uses, and two soil ratings (explained below). Soil types LuA and LuB, which comprise approximately 14 percent of the project area, are suitable for sugar, truck crops and pasture operations. Soil types LPE, PvC, and rRK comprise approximately 86 percent of the project area; these soils are suitable only for pasture activities.

Soil Ratings

The soils in the petition area have been rated for their agricultural quality under four classification systems commonly used in Hawaii: (1) Land Capability Grouping, (2) Agricultural Lands of Importance to the State of Hawaii, (3) Overall Productivity Rating, and (4) Proposed Land Evaluation and Site Assessment. These classification systems are discussed below.

Table 1.— PROPOSED LUALUALEI GOLF COURSE:
SOIL TYPES, ACREAGE, AGRICULTURAL USES,
AND SCS AND LESA RATINGS

Soil Type	Acreage	Agricultural Uses	SCS Rating ¹	LESA Rating
LPE	140	Pasture	VIIIs	18
rRK	72	Pasture	VIIIs	15
LuB	20	Sugar, Truck Crops, Pasture	IIIe	73
LuA	17	Sugar, Truck Crops, Pasture	IIIIs	73
PvC	10	Sugar, Truck Crops, Pasture	IVs	50

1. Soil types LuA and LuB are irrigated; LPE, rRK and PvC are non-irrigated.

Source: United States Department of Agriculture, Soil Conservation Service, *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*, August 1972.

(1) *Land Capability Grouping by the United States Department of Agriculture Soil Conservation Service (SCS).*

This classification system rates soils according to eight levels, ranging from the highest classification level, I, to the lowest level, VIII. These ratings are shown in Table 1 and are described here in descending order of the ratings. Soil types LuA and LuB—which cover about 14 percent of the proposed project area—have land capability ratings of IIIIs and IIIe, respectively. The III indicates that the soils have severe limitations that reduce the options on plants, require special conservation practices, or both. The subclassification “s” soils have severe limitations because of stoniness, unfavorable texture, shallowness, or low water-holding capacity. The subclassification “e” indicates that soils are subject to severe erosion if they are cultivated and not protected.

Soil type PvC, which covers 4 percent of the project area, has a land capability rating of IVs. The “IV” indicates that the soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Two soil types, rRK and LPE, which cover 82 percent of the project area, have a land capability rating of VIIIs; the VII indicates that the soils have very severe limitations that make them unsuitable for cultivation, and restrict their use largely to pasture.

- (2) *Agricultural Lands of Importance in the State of Hawaii (ALISH)*, by the SCS, University of Hawaii (UH) College of Tropical Agriculture and Human Resources, and the State of Hawaii, Department of Agriculture.

This system classifies lands into three categories: (a) *prime* agricultural land which is land that is best-suited for the production of crops because of its ability to sustain high yields with relatively little input and with the least damage to the environment; (b) *unique* agricultural land which is non-prime agricultural land that is currently used for the production of specific high-value crops; and (c) *other* agricultural land which is non-prime and non-unique agricultural land that is of importance to the production of crops. About 45 acres of of the subject land is rated as "prime" agricultural land, while the remainder of the land is unclassified.

- (3) *Overall Productivity Rating*, by the UH Land Study Bureau (LSB).

This classification rates soils according to five levels, with "A" representing the class of highest productivity and "E" the lowest. About 5 percent of the project area soils are rated "B," and the remainder are rated "E." With irrigation, an additional 35 percent of the soils would be rated "B."

- (4) *Proposed Land Evaluation and Site Assessment (LESA) System*, by the State of Hawaii Land Evaluation and Site Assessment Commission

Based on soil quality, locational attributes, improvements, nearby activities, and land-use plans, this proposed classification system would designate a sufficient amount of the better agricultural lands to meet projected agricultural goals projected by the LESA Commission. If the LESA classification approach were applied to the proposed site, about 14 percent of the designated lands would be termed "important agricultural lands" (IAL), which would include all lands having a rating of 66 or over, out of a possible total of 100. The ratings for each soil type are shown in Table 1. However, the designations would be subject to change based on a change in nearby activities and a change in County land-use plans. Also, the designation could be changed if an overriding public benefit were demonstrated.

Terrain¹

As indicated by the soil types, a portion of the property is relatively level, but most of it has relatively steep slopes which extend up the southern side of Lualualei Valley. The elevation of the site ranges from approximately 65 feet above sea level near Lualualei Navy Road to nearly 1,900 feet along the mauka portions of the site; the golf course would extend up to an elevation of about 250 feet. Ulehawa Stream—normally a dry-bed stream—crosses the level portions of the site along a course that generally runs parallel to the Lualualei Navy Road.

The better soils occur at the lower elevations on level land.

Rainfall¹

The project site is located in one of the most arid regions on Oahu, with a mean annual rainfall of approximately 20 to 30 inches. Monthly rainfall averages about 0.4 inch during the summer months, and 3.5 inches during the winter months. For growing crops, such low and uneven rainfall requires supplemental irrigation which would be the equivalent of about 50 inches of rainfall per year.

Availability of Water¹

Farmers in Lualualei Valley irrigate their crops using relatively expensive water from the Board of Water Supply. Although untapped, non-potable ground water is available at a cost which would be similar to that for municipal water.

Summary

Based on the above, it is estimated that less than 20 percent of the property has good soils and level land suitable for agriculture. However, commercial farming on these good soils would be limited in that relatively expensive irrigation water would preclude those low-value crops that require considerable water. Furthermore, except for about 15 acres, the land would have to be cleared of rocks and bushes before it could be farmed.

1. Hida, Okamoto & Associates, *Lualualei Golf Course*, Draft Environmental Impact Statement, February 1991.

PAST AND CURRENT ACTIVITIES IN THE AREA¹

Waianae Sugar Plantation

Historically, a portion of Lualualei Valley was planted in sugarcane as part of the Waianae Sugar Plantation which ceased operations in 1946. Water for this plantation is now a source for the municipal system.

Recent Agricultural Use of Property

Until 1988, about 15 acres of the lower portion of the project site were used for a truck farm under a farmer-tenant lease to Mr. Ryoei Higa. In an amicable and voluntary agreement, Mr. Higa agreed to relocate his operation to another site in exchange for consideration. In effect, *the adverse impact of the proposed golf course on this small truck-farm operation has already been mitigated.*

Crops grown on the property included tomatoes, lettuce, mustard cabbage, pak choi and daikon. These are comparatively low-profit crops for Oahu as indicated by (1) declining production trends on Oahu and (2) production of these crops primarily on the Neighbor Islands.²

Current Use of the Land

The property is currently vacant and overgrown with grasses and bushes.

Surrounding Activities

The eastern and southern boundaries of the site lie in the foothills of Puu Haleakala Ridge which remains undeveloped.

The northern boundary of the site abuts the Lualualei Naval Ammunition Depot.

To the west across Lualualei Road and Ulehawa Stream are open and undeveloped lands, single-family homes occupying 1- to 5-acre parcels, and some small farms. As mentioned above, the small farms in the area use water from the municipal system.

2. Hawaii Agricultural Statistics Service, *Statistics of Hawaiian Agriculture, 1989.*

IMPACTS ON EXISTING AGRICULTURE ACTIVITIES

Direct Impacts

The proposed development would not affect existing plantation-agriculture or diversified-agriculture activities on the property since none currently exist, nor would the development interfere with nearby agricultural activities in Lualualei Valley.

Indirect Impacts: Water¹

Regarding water use by the golf course, an estimated 0.6 million gallons per day (mgd) would be used to irrigate approximately 100 acres of greens, fairways, roughs, landscaping, and a plant nursery. The supply would consist of three non-potable on-site wells, and treated wastewater from the clubhouse.

The groundwater would be pumped from a currently untapped source which is located directly below the property. Consequently, the use this groundwater source for golf course irrigation would not affect existing agricultural activities within Lualualei Valley as no farm relies on this water source.

Indirect Impacts: Land Values and Rents

Regarding land values, if it is anticipated that homes or some other high-value development will be constructed on agricultural land in the next 25 years, then the current *market* value of this land will be significantly higher than the *agricultural* value of the land. On Oahu, the value of an agricultural parcel typically reflects its long-term development potential rather than current or anticipated profits from farming the land.

To the extent that the proposed golf course is perceived to increase the long-term development potential of nearby agricultural lands, it would also increase the current market value of nearby lands. On the other hand, if the long-term development potential of the nearby lands is perceived to be unaffected—possibly due to inadequate infrastructure or other development limitations, anticipated community opposition, and/or government policy to discourage growth in the area—then the golf course would not increase the value of nearby lands.

If the nearby lands do increase in value, this represents a market signal that, at some time in the future, greater benefits can be derived from the nearby land than were previously anticipated. The properties most affected would be those abutting the golf course or those which would have a prominent view of the golf course. Once developed, such properties typically command a premium of about 25 percent over similar properties which do not abut the golf course, or have a prominent view of it. The values of these properties are generally unaffected by a golf course.³

3. Studies performed by Locations, Inc.

It should be noted that any increase in land value which does occur increases the overall wealth of the landowner. The increased property taxes of \$9 per year for every \$1,000 increase in land value would slightly offset this increase in value. However, if the land is dedicated to agriculture, then the land will be taxed at its low agricultural value rather than at its market value, with property taxes being unaffected by any increase in the market value of the land.

Until development occurs—assuming that it does in fact occur—the land may be put to some temporary use, and this can include an agricultural activity which can last for decades. In the meanwhile, lease rents will be unaffected. The reason for this is that if the highest and best permitted use of the land (i.e., the most profitable permitted use) is agriculture, then the lease rents will reflect the farmer's ability to pay for his agricultural use of the land. A landowner should not increase lease rents so much that he will make farming the land unprofitable since this would force the farmer off the land, thereby resulting in less income to the landowner. In fact, there are recent examples in Hawaii where land has become more valuable, but landowners have lowered lease rents because the highest and best permitted use of the land (an agricultural activity) has become less profitable than it was in the past, and the farmers are correspondingly only able to pay lower rents.

In the case of the proposed Lualualei Golf Course, few neighboring agricultural properties would be likely to increase in value if the golf course were developed because the golf-course site is nearly surrounded by a combination of mountains, Lualualei Naval Ammunition Depot, and Lualualei Naval Road. Furthermore, no housing or other development associated with the golf course is anticipated.

In summary, the proposed golf course may increase the values of the few agricultural parcels which abut or have prominent views of the golf course, but it is unlikely that agricultural lease rents, taxes, and the current agricultural use of lands would be affected.

IMPACTS ON THE GROWTH OF DIVERSIFIED AGRICULTURE

The development of the proposed golf course constitutes a commitment of about 259 acres of land to a non-agricultural use, of which less than 50 acres are potentially suitable for growing crops. This commitment of land raises the question of whether the Lualualei Golf Course would affect adversely the growth of diversified agriculture—either immediately or over the long term. Before addressing this question, *potential crops* and the *availability of land for diversified agriculture* are discussed below.

Potential Crops

Given the relatively sunny conditions, the soils, and other agronomical conditions in Lualualei Valley, crops suited for area include: avocados, Chinese bananas, snap beans, bitter-melon, mustard cabbage, sweet corn, cucumbers, daikon, long eggplant, round eggplant, semi-head lettuce, limes, dry onions, green onions, Chinese peas, sweet peppers, potatoes, sweet potatoes, pumpkins, radishes, Italian squash, oriental squash, tomatoes, watermelon, seed crops, forage crops, flowers, and potted foliage. However, the property is unsuitable for those crops which are grown in the cooler climates of such high-elevation areas as Kula on Maui and Waimea on the Big Island. These would include such crops as broccoli, burdock, Chinese cabbage, cauliflower, celery, head cabbage, lettuce, dry onions, and romaine.

Most of the above crops which are agronomically suited for the subject property would be unprofitable given the high water, land and labor costs which prevail in the area. Also, most of the demand is supplied by existing growers elsewhere in the State. Nevertheless, commercial crops which are grown profitably in significant quantities in the Waianae District include *mustard cabbage, daikon, eggplant, flowers and nursery products, semi-head lettuce, and green onions*. In addition, *dairy, hog, and poultry* operations occur in leeward Oahu. For most of these crops and activities, production is declining on Oahu as a result of a shift to the Neighbor Islands where land and labor is generally less expensive.²

The land could be used for cattle grazing. However, this would constitute a very low-value use, and the carrying capacity would be low. Furthermore, it would be uneconomical to irrigate the land in order to increase grass production and thereby increase the cattle carrying capacity.

Availability of Land for Diversified Agriculture

From an island-wide or Statewide perspective, the proposed development would involve far too little prime agricultural land to affect the growth of diversified agriculture. For the purposes of this discussion, prime agricultural land is loosely defined to mean any high-quality agricultural land capable of providing high yields for a variety of crops, assuming the availability of low-cost irrigation water and no problems with access to the land.

Demand for Prime Agricultural Land

The highest projections known to the consultant for the growth of diversified agriculture are those prepared by the Land Evaluation and Site Assessment (LESA) Commission. These projections—which are shown in Tables 2 and 3 for the State and Oahu, respectively—were prepared in 1985. The projections represent an attempt to quantify the amount of agricultural land that will be required to (1) accommodate resident-plus-visitor population growth, (2) increase food and animal-feed self-sufficiency, and (3) increase crop exports.

As indicated, the LESA Commission projected that an estimated 52,684 additional acres of land would be required Statewide to accommodate the increase in production from 1983 to 1995. The corresponding figure for Oahu is 7,979 acres. The crops and acreage requirements are categorized according to those which generally do not require prime agricultural land (although some crops may be grown profitably on prime agricultural land), those which generally do require prime agricultural land, plus a contingency of 10 percent for all acreage used for purposes other than beef and cattle production.

The relevant figures from Tables 2 and 3 are not the total figures, but rather the increase in the amount of *prime* agricultural land that is projected to be required to accommodate diversified agriculture: the increase is 8,858 acres for the State, and 2,314 for Oahu. These increased requirements for prime agricultural land are surprisingly small. Nevertheless, the projected land requirements, as small as they are, are high in that diversified agriculture is growing more slowly than the LESA Commission projections. A more realistic estimate of the amount of *prime* agricultural land that will be required to accommodate the Statewide growth of diversified agriculture over the next decade to the year 2000 is probably far less than 2,000 acres.⁴ Furthermore, land is being freed from plantation agriculture faster than it can be absorbed by other crops (see discussion below).

If diversified agriculture is to require a large amount of prime agricultural land, then additional crops will have to be grown for the export market rather than for the small Hawaii market. However, the extreme difficulty of developing large export markets should be noted. For over a century, numerous and extensive crop searches and experiments have been conducted by many people and organizations, and have led to surprisingly few major long-term successes in Hawaii, thereby confirming the extreme difficulty of identifying new export crops and developing them into new and profitable industries. Furthermore, the difficulty in developing export markets is increasing because of increasing competition from other agricultural areas which

4. Plasch, Bruce S., Peter Garrod, et. al., *An Economic Development Strategy and Implementation Program for Molokai*.

Table 2.— LESA AGRICULTURAL ACREAGE REQUIREMENTS,
STATE OF HAWAII: 1983 AND 1995

Crop or Activity	1983	1995	Increase
Crops and Activities which Generally Do Not Require Prime Agricultural Lands			
Beef/cattle ^{1,2}	765,450	365,090	--
Livestock:			
Dairy	1,000	1,182	182
Eggs/Poultry	281	515	234
Swine	<u>600</u>	<u>1,050</u>	<u>450</u>
Subtotal for Livestock	1,881	2,747	866
Unique Crops:			
Aquaculture	500	4,500	4,000
Coffee	2,000	5,700	3,700
Flowers/Nursery	1,786	3,040	1,254
Papaya	2,120	11,850	9,730
Taro/Watercress	<u>400</u>	<u>527</u>	<u>127</u>
Subtotal for Unique Crops	6,806	25,617	18,811
Macadamia Nuts	15,800	27,000	11,200
Crops and Activities which Generally Do Require Prime Agricultural Lands			
Plantation:			
Sugarcane ^{2,3}	194,300	177,700	-16,600
Pineapple	<u>36,000</u>	<u>36,049</u>	<u>49</u>
Subtotal for Plantation	230,300	213,749	-16,551
Other:			
Guava	965	1,400	435
Seed Corn	730	1,060	330
Bananas	1,100	2,200	1,100
Feed/Forage ^{2,4}	8,705	12,495	3,790
Fruits	635	1,156	521
Vegetables/Melons ⁵	<u>4,340</u>	<u>7,022</u>	<u>2,682</u>
Subtotal for Other Crops	16,475	25,333	8,858
Contingency ⁶	<u>--</u>	<u>29,500</u>	<u>29,500</u>
TOTAL	1,036,712	689,036	--
TOTAL, Excluding Beef/Cattle	271,262	323,946	52,684

**Table 2.— LESA AGRICULTURAL ACREAGE REQUIREMENTS,
STATE OF HAWAII: 1983 AND 1995**
(continued)

1. Includes marginal grazing and pasture lands. The 1983 figure includes arid zones and other areas having low carrying capacity, while the 1995 figure does not.
2. Often includes land in a holding operation awaiting discovery of profitable uses.
3. The decline in acreage primarily reflects the loss of Puna Sugar Co.
4. Includes some pastureland and 8,000 acres of guinea grass on Molokai.
5. Overstated in that the acreage figures are for harvested acres, rather than for the amount of land required (i.e., the acreage requirements for a crop harvested twice a year should be halved).
6. Based on 10% of all acreage other than that for beef/cattle. This contingency amounts to double counting in that the LESA projections are already high. Also, the contingency figure allows for an additional 17,770 acres for expansion of sugarcane, even though the sugar industry is expected to decline, not expand.

Table 3.— LESA AGRICULTURAL ACREAGE REQUIREMENTS,
CITY AND COUNTY OF HONOLULU: 1983 AND 1995

Crop or Activity	1983	1995	Increase
Crops and Activities which Generally Do Not Require Prime Agricultural Lands			
Beef/cattle ^{1,2}	18,200	10,090	--
Livestock:			
Dairy	340	40	62
Eggs/Poultry	250	390	140
Swine	144	200	56
Subtotal for Livestock	734	992	258
Unique Crops:			
Aquaculture	300	2,400	2,100
Flowers/Nursery	495	850	355
Papaya	70	170	100
Taro/Watercress	60	85	25
Subtotal for Unique Crops	925	3,505	2,580
Crops and Activities which Generally Do Require Prime Agricultural Lands			
Plantation:			
Sugarcane ²	27,200	25,300	-1,900
Pineapple	11,829	11,800	-29
Subtotal for Plantation	39,029	37,100	-1,929
Other:			
Guava	--	242	242
Seed Corn	125	180	55
Bananas	540	836	296
Feed/Forage ^{2,3}	1,741	2,912	1,171
Fruits	90	200	110
Vegetables/Melons ⁴	1,155	1,595	440
Subtotal for Other Crops	3,651	5,965	2,314
Contingency ⁵	--	4,756	4,756
TOTAL	62,539	62,408	--
TOTAL, Excluding Beef/Cattle	44,339	52,318	7,979

**Table 3.— LESA AGRICULTURAL ACREAGE REQUIREMENTS,
CITY AND COUNTY OF HONOLULU: 1983 AND 1995**
(continued)

1. Includes marginal grazing and pasture lands. The 1983 figure includes arid zones and other areas having low carrying capacity, while the 1995 figure does not.
2. Often includes land in a holding operation awaiting discovery of profitable uses.
3. Includes some pasture.
4. Overstated in that the acreage figures are for harvested acres, rather than for the amount of land required (i.e., the acreage requirements for a crop harvested twice a year should be halved).
5. Based on 10% of all acreage other than that for beef/cattle. This contingency amounts to double counting in that the LESA projections are already high. Also, the contingency figure allows for an additional 17,770 acres for expansion of sugarcane, even though the sugar industry is expected to decline, not expand.

have lower costs and can compete more effectively in the world market due to continuing improvements in transportation. Nevertheless, success has been achieved with high-value mechanized crops which market "Hawaii," and obtain market exposure and good will as a side-benefit of tourism. However, rather than adding to the demand for agricultural land, most of these crops replace sugarcane (see below).

Supply of Prime Agricultural Land

Regarding the supply of land in Hawaii, an enormous and growing supply of prime agricultural land is available for alternative uses. Since 1968, about 90,000 acres of Hawaii's prime agricultural land have been freed from sugar and pineapple production: approximately 62,700 acres of land freed from sugar production (about 15,200 acres on Oahu and 47,500 on the Neighbor Islands), and approximately 27,300 acres freed from pineapple production (about 6,600 acres on Oahu and 20,700 on the Neighbor Islands).⁵⁻⁷ In addition, Hamakua Sugar Co., Inc. is in the process of selling about 8,000 acres of land on the Big Island in order to reduce its debt; Ka'u Agribusiness Co., Inc. has announced that it will contract operations by 4,200 acres; McBryde Sugar Co., Ltd. is converting 5,000 acres of its sugarcane land to diversified agriculture; The Lihue Plantation Co., Ltd. has announced plans to contract operations by over 3,300 acres; and Dole Pineapple has announced plans to phase out its 7,000-acre pineapple operation on Lanai. Also, in order to accommodate urbanization, Oahu Sugar Co., Ltd. and Pioneer Mill Co., Ltd. are in the process of gradually contracting operations by about 4,000 acres and 1,400 acres, respectively. Total acreage released from plantation agriculture in Hawaii since 1968, or scheduled to be released by the year 2000, amounts to over 120,000 acres. This is about 4.7 times the 25,644 acres in sugarcane on Oahu in 1988, and more than the entire acreage in sugarcane on Kauai, Oahu, and Maui.⁸

Much of the land which has been freed from sugar and pineapple production has been or is scheduled to be converted to urban, diversified-agriculture, and aquaculture uses. After making allowances for these conversions, uncommitted acreage which remains available to diversified agriculture and aquaculture amounts to many tens of thousands of acres. Much of this land is fallow, in pasture, or in some other low-value land-holding operation.

The Statewide supply of prime agricultural land that is fallow may increase given the real possibility of future sugar plantation closings. Some of Hawaii's sugar plantations are unprofitable but remain in operation today only because they are committed to lease and/or energy contracts which make closing prohibitively expensive. However, these contracts will eventually come to an end.

5. Hawaiian Sugar Planters' Association, *Hawaiian Sugar Manual 1988*.

6. Hawaii Agricultural Statistics Service, *Statistics of Hawaiian Agriculture 1987*.

7. Robert C. Schmitt, *Historical Statistics of Hawaii*.

8. Hawaiian Sugar Planters' Association, *Hawaiian Sugar Manual 1989*, Honolulu, Hawaii.

Furthermore, a portion of the sugarcane land is in holding awaiting the discovery of profitable replacement activities; this land forms part of the supply of prime agricultural land available to profitable diversified-agriculture crops. Also, the greater the success of large-scale diversified agriculture, the greater the amount of land which will be released for diversified agriculture. Recent examples of sugarcane land being released for other crops include: macadamia nut orchards on land released from Mauna Kea Agribusiness Co., Inc.; macadamia nut and citrus orchards on land released from Ka'u Agribusiness Co., Inc.; macadamia nut orchards and pineapple operations on land released from Wailuku Agribusiness Co., Inc.; coffee orchards on land released by McBryde; seed corn and nursery operations on land released from HC&S; and seed corn operations on land released from Kekaha Sugar Co., Ltd.

Many of the lands freed, to be freed, or which can be freed from sugar and pineapple production have excellent agricultural qualities and climatic conditions, and are well-suited for a variety of crops. Also, water is available for most of these lands, particularly those lands which have been freed from sugar production.

Additional lands which have been made available for diversified agriculture are in government-sponsored agricultural parks throughout the State. Lands for agricultural activities which do not require prime agricultural land include pasture land, land for livestock operations, and "unique" lands as classified by ALISH (see page 3). Unique lands are not prime agricultural lands, but are important lands for certain crops, the principal examples are the coffee lands in Kona, and certain lava lands in Puna which are particularly well-suited for growing papaya. The supply of unique lands is quite large and is distinct from the supply of prime agricultural lands.

Availability of Land to Small-Scale Farmers

Even though considerable agricultural land exists in the State, small agricultural parcels are seldom available to small-scale farmers under long-term leases because land-use regulations and the political environment make it unprofitable and too risky to the landowner to lease out small farm parcels. Agricultural use constitutes a low-value use of the land and, correspondingly, farmers pay relatively low lease rents. At the same time, in order to rent land to small-scale farmers, landowners are required to subdivide the property. Applicable County subdivision regulations (designed for rural estates) require expensive electrical power, paved rather than gravel roads, and buried rather than surface water lines. Thus the combination of low rents and expensive subdivision requirements makes it unprofitable for the landowner to subdivide land into parcels for small farms. For example, rather than developing the State agri-

cultural park in Kahuku, it would have been—as surprising as it may seem—less expensive for the State to give each farmer in the park \$100,000.⁹

In addition, there is the risk that when the leases expire, small-scale farmers will turn to the Legislature in an attempt to prevent landowners from raising lease rents, or to prevent landowners from evicting them in favor of a higher and more profitable use of the landowner's land—this often occurs in long-term leases for land on which small-scale farmers have built homes (e.g., Waihole-Waikane, Kona, Waianae, Kalama Valley). Such an economic environment favors leases to large-scale operators (including cooperatives consisting of many small-scale farmers), short-term and illegal leases of unsubdivided land, subdivision of the land into rural estates for sale to buyers who can afford the costs of the subdivision requirements, or leaving the land fallow.

In summary, the shortage of small parcels of land for farmers is a serious problem. Nevertheless, a vast supply of prime agricultural land does exist and is available for those profitable diversified agriculture activities that are large in scale, or for which the subdivision requirements are somehow circumvented.

Outlook for Diversified Agriculture

Based on the above assessment, ample prime agricultural land will be available to easily accommodate the Statewide requirements of diversified agriculture. This conclusion derives from the following: (1) a vast amount of prime agricultural land and water is available Statewide, having been freed from sugar and pineapple production in recent years; (2) it is very possible that additional sugarcane acreage and water will be freed, given the existence of unprofitable sugar operations; (3) some, if not most, of the sugar operations would make their lands available for profitable replacement crops to the extent that such crops exist; and, in contrast, (4) land requirements for diversified agriculture are surprisingly modest. In other words, the limiting factor is not the *land supply*, but rather the *market demand* for those crops that can be *grown profitably* in Hawaii and, for small farms, *expensive subdivision requirements*. The proposed Lualualei Golf Course involves too little land to affect this conclusion, and would therefore not affect adversely the Statewide growth of diversified agriculture.

Consistency with Overseas Long-Term Trends

The increased availability of prime agricultural land in Hawaii compared to that of prior decades results from some very long-term and accelerating trends that are occurring throughout

9. This is based on 220 usable acres divided into 24 lots, a land cost to the State of \$50 per acre per year; improvement costs of \$3.4 million for developing the farm plots (electric power, roads, etc.); rents received from farmers of \$300 per acre per year; an 8-percent discount rate based on State bonds; and a 30-year term for the bond and the lease. Improvements are not to County standards.

the United States, Europe, and many developed and developing market economies.^{10,11} For example, U.S. farmers are paid by the government not to farm their land, resulting in about 30 million acres of agricultural land lying fallow. In Europe, quotas are used to limit production. The principal agricultural problem has been overproduction, which has occurred as a result of the tremendous success of increasing yields and other technological advances, coupled with a slowing of the population growth rate. Because yields increase somewhat faster than population growth for most major crops, resources must be freed gradually from agriculture in order to maintain balanced markets, and to increase income to the farmers who remain. Otherwise agricultural products glut the market; this is followed by low prices, a decline in farmers' income, and bankruptcies.

Furthermore, the export market has not been able to absorb the excess production, partly due to the agricultural successes achieved in many developing countries. For example, India once suffered from severe food problems. With the introduction of modern agriculture, however, its farm industry has been transformed, making India self-sufficient and even an exporter of many foods it once had to import. Similar gains have been achieved throughout Asia and Central and South America. The agricultural failures have occurred primarily in the command economies of Eastern Europe and Africa, and in areas experiencing civil and other wars.

Of significance to Hawaii, sugar clearly has been part of this trend, with the supply of sweeteners increasing more rapidly than demand, particularly in the early and mid-1980s with the market success of high-fructose corn syrup. For the future, some of the newer sweeteners have the theoretical potential of causing the release of all the land in the world that is now planted in sugarcane and sugarbeets.

The major agricultural problem facing the United States and many other economies, therefore, is how to limit agricultural production while maintaining an efficient economy and minimizing social problems. This is a problem that arises from the tremendous successes in agriculture production, and contrasts sharply with, and invalidates, the 200-year old prediction of Thomas Malthus that population will increase faster than the food supply.

Potential Conversion to Agricultural Use

A golf course is not an irretrievable commitment of resources; if future economic conditions warrant, the golf course could be converted to agricultural use. Although such a conversion is possible, it is regarded as highly improbable.

10. Dvoskin, Dan, "Excess Capacity and Resource Allocation in Agriculture, 1940-1985," *Agricultural Outlook*, U.S. Department of Agriculture, Economic Research Service, October 1986.

11. Norman E. Borlaug and Christopher R. Dowsell, "World Revolution in Agriculture."

POSITIVE IMPACTS ON DIVERSIFIED AGRICULTURE

To an undetermined extent, the Lualualei Golf Course would stimulate the growth of diversified agriculture by increasing the demand for plants and trees from nursery operations.

Also of significance is the fact that the golf course would provide about 20 grounds-maintenance jobs involved with the cultivation of grasses and plants, applying fertilizers and chemicals, maintaining irrigation systems, etc. In terms of function, these jobs are similar to certain jobs in the agriculture industry, and require similar skills and training. These jobs will help compensate for the decline in agricultural field employment in Hawaii. Between 1978 and 1988, the Statewide decline has averaged 260 jobs per year; the average annual loss has been 148 field jobs in the sugar industry, 85 field jobs in the pineapple industry, and 28 field jobs in diversified agriculture.¹² The proposed development would allow a few people to continue working or to obtain employment in an activity that is closely related to farming, thereby retaining and increasing their skills and knowledge of plant cultivation. Retaining and improving agricultural labor skills may, in the long term, contribute to the growth of diversified agriculture.

12. Department of Business and Economic Development, *The State of Hawaii Data Book, 1988*.

CONSISTENCY WITH STATE AND COUNTY PLANS

The proposed Lualualei Golf Course (1) would not adversely affect any plantation agriculture activities; (2) would not adversely affect any existing diversified-agriculture activities; (3) would not limit the growth of diversified agriculture since, in other parts of the State, far more agricultural land has been released from plantation agriculture than has been absorbed by other activities; and (4) would contribute to the economy, including the addition of a number of agriculture-type jobs. However, the proposed golf course has displaced a small 15-acre truck farm, but this displacement has already been mitigated through an amicable and voluntary agreement which involved relocation in exchange for consideration.

In view of these findings, the project would not conflict with the major thrust of the Hawaii State Plan, the State Agriculture Functional Plan, and the General Plan of the City and County of Honolulu. This thrust in all three plans calls for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture (see Table 4). To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured. The thrust of these plans is not to preserve prime agricultural lands simply for the sake of preserving them—preservation is to occur only if a potential need for these agricultural lands exists.

However, less than 20 percent of the project would conflict with the lower-level State agricultural guidelines which call for Agricultural Lands of Importance to be protected from development.

**Table 4.-- SELECTED STATE AND COUNTY OBJECTIVES,
POLICIES, AND GUIDELINES RELATED
TO AGRICULTURAL LANDS**

HAWAII STATE PLAN (Chapter 226, Hawaii Revised Statutes, as amended):

Section 226-7 Objectives and policies for the economy--agriculture.

- (a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:
 - (1) Continued viability in Hawaii's sugar and pineapple industries.
 - (2) Continued growth and development of diversified agriculture throughout the State.
- (b) To achieve the agricultural objectives, it shall be the policy of the State to:
 - (6) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.

Section 226-103 Economic priority guidelines.

- (c) Priority guidelines to promote the continued viability of the sugar and pineapple industries:
 - (1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.
- (d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:
 - (1) Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.

Section 226-104 Population growth and land resources priority guidelines.

- (b) Priority guidelines for regional growth distribution and land resource utilization:
 - (2) Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

Table 4.-- **SELECTED STATE AND COUNTY OBJECTIVES,
POLICIES, AND GUIDELINES RELATED
TO AGRICULTURAL LANDS**
(continued)

STATE AGRICULTURAL FUNCTIONAL PLAN (June 1985)

(Functional plans are guidelines for implementing the State Plan, and are not adopted by the State Legislature.)

B. Objective: Achievement of Productive Agricultural Use of Lands Most Suitable and Needed for Agriculture.

(5) **Policy:** Provide greater protection to agricultural lands in accordance with the Hawaii State Constitution.

(c) **Implementing Action:** Identify important agricultural lands to promote diversified agriculture, increased agricultural self-sufficiency, and assure the availability of agriculturally suitable lands.

(d) **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 the 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.

**CITY AND COUNTY OF HONOLULU
GENERAL PLAN, Objectives and Policies (Resolution No. 87-211)**

Economic Activity

Objective C. To maintain the viability of agriculture on Oahu.

Policy 4. Provide sufficient agricultural land in Ewa, Central Oahu, and the North Shore to encourage the continuation of sugar and pineapple as viable industries.

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.

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