DEPARTMENT OF GENERAL PLANNING

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
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'88 APR 22 P1:07

DONALD A. CLEGG
CHIEF PLANNING OFFICER

GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

JHM/DGP 88/NS-1

April 20, 1988

Honorable Marvin T. Miura, Interim Director
Office of Environmental Quality Control
State of Hawaii
165 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Final Environmental Impact Statement (FEIS)
Waialua Golf Course - Oceanic Properties Inc.
Tax Map Keys 6-5-1: Por. 2; 6-4-1: Por. 6

We are notifying you of our acceptance of the above as an adequate fulfillment of Chapter 343, HRS, and the EIS Rules.

Major issues considered to be controversial include:

1. Left turn storage lane into project site from Kaukonahua Road.

2. Non agricultural use of prime agriculture land.

Other unresolved issues to be addressed prior to the subsequent zoning process are:

1. Approval of a State Land Use District boundary Amendment to redesignate the project site from the existing Agricultural District to an Urban District.

2. Approval by the Honolulu City Council of a development plan amendment to redesignate the site from Agriculture to assorted urban uses.

3. The State Department of health and Board of Water Supply approval of a water master plan.

4. Highway improvement plans and programs as required by the City Department of Transportation Services and the State Department of Transportation.

5. A sewer master plan for on- and off-site system improvements approved by the Department of Public Works.

6. A drainage plan approved by the Department of Public Works.

These issues are discussed in the attached Acceptance Report. If there are any questions, please contact John McDonald of my staff at 527-6012.

Sincerely,

Donald Clegg

DONALD A. CLEGG
Chief Planning Officer

Attach.

cc: Mr. Tyrone Kusao, Planning and Zoning Consultant
Mr. Larry Lum, Oceanic Properties, Inc.

DEPARTMENT OF GENERAL PLANNING (DGP)
REFERENCE NO.: 88/NS-1

ACCEPTANCE REPORT: CHAPTER 343, HRS
FINAL ENVIRONMENTAL IMPACT STATEMENT
WAIALUA GOLF COURSE
OCEANIC PROPERTIES, INC. 22 P1:07
WAIALUA, OAHU, HAWAII
TAX MAP KEYS: 6-5-1: POR. 2;
6-4-1: POR. 6

A. <u>BACKGROUND</u>

The project site is located in Waialua, on the North Shore of the island of Oahu. Identified as Tax Map Key parcels 6-5-01: 2 and 6-4-01: 6, the project site is roughly L-shaped and encompasses approximately 214 acres.

The project site is located east of Kaukonahua Road, between Thomson Corner, which is its intersection with Farrington Highway, and Weed Circle, which is its intersection with Kamehameha Highway. The greater portion of the site is abutted by sugar cane fields. The southern boundary is defined by a gully formed by Paomoho Stream. Also, the southwestern corner of the project site is bordered by Midkiff Acres, a residential area. Another stream, the North Paomoho Stream, also traverses the site.

Over 60 percent of the site, or 142 acres, is currently in sugar cane cultivation. The remainder of the site, approximately 72 acres, is relatively unaltered in the gully area created by Paomoho Stream.

The topography of the site is very gentle in the sugar cane land, and changes to undulating in the streambed area.

The subject property is owned by Castle and Cooke, Inc. Castle and Cooke is the largest agricultural conglomerate on Oahu and is the only Hawaii Company serving both the pineapple and sugar markets.

The applicant proposes to construct an 18-hole championship golf course. Support facilities include a driving range, a clubhouse, and a repair and maintenance shed. The clubhouse, maintenance building, and 11 holes of golf are located in what is currently sugar cane land; 7 holes of golf are located in the stream valley of Paomoho Stream.

The course will feature a wide variety of golf holes with numerous tee and pin positions, allowing accommodation of golfers of all skill levels. The portion currently in cane, or the upper area of the course, will have an open feeling with wide fairways. The two water hazards will also function as drainage features and reservoirs for the golf course irrigation system for the entire golf course.

Vegetation on the golf course will be primarily in the form of large trees and tree masses which perform a number of functions, including the definition of fairways, backdropping of greens, screening and directing views, windbreaks, sound barriers, dust arrestors during cane harvest, and providing shade and color. Species of plant material used will be keyed to existing plant material in surrounding areas to create continuity in the landscape.

The proposed Waialua Golf Course will be a daily fee course which will be open to the public. No membership fees will be required and tee times will be arranged on a first-come-first-served basis.

Green fees are expected to be in the middle range of golf fees in Hawaii. While fees for the proposed course will be less than those of comparable courses operated in conjunction with hotels and resorts, they will be higher than those of municipal courses.

B. PROCEDURES

1. An EIS Preparation Notice, prepared by the applicant's consultant appeared in the "Environmental Quality Commission (EQC) Bulletin" on November 23, 1987. This was distributed to all interested Federal, State, and City and County agencies, as well as community interest groups.

2. Comments from consulted parties were received until December 23, 1987, allowing all parties the required 30-day minimum consultation period. Fifteen parties submitted written comments during this period, which were responded to in writing by the applicant.

3. The Draft EIS was received and distributed by the OEQC on January 20, 1988. The deadline for public review was then set for February 19, 1988.

4. Twenty-five parties made replies to the Draft EIS. The applicant made point-by-point responses to all substantive comments on the twenty-five replies received by the public review deadline, within the 14-day response period.

C. CONTENT

The Final EIS for the proposed North Shore Development adequately addresses the content requirements specified in Sections 11-200-17 and 11-200-18 of the EIS Rules.

D. RESPONSES TO COMMENTS

The applicant provided adequate point-by-point responses to all comments received within the 30-day response period established for the Draft EIS.

E. CONTROVERSIAL ISSUES

Two issues regarding the proposed project are considered to be controversial.

Traffic

Need for a left turn storage lane for entrance to project site from Kaukonahua Road.

Prime Agricultural Lands

Conflict with City and State goals of preserving prime agricultural lands.

F. UNRESOLVED ISSUES

We concur with the listing of unresolved issues found on page 10-1 of the Final EIS: Left turn into project area from Kaukonahua Road - unresolved.

The following issues require approvals prior to acceptance of an application for rezoning:

1. As mentioned by the applicant, a State Land Use District Amendment is required to redesignate the project site from the existing Agricultural District to an Urban District.

2. Approval of a development plan amendment to redesignate the site from Agriculture to assorted urban uses by the Honolulu City Council.

3. State Department of Health and City Board of Water Supply approval of domestic and irrigation water master plan.

4. Highway improvement plans and programs as required by the City Department of Transportation Services and the State Department of Transportation.

5. A sewer master plan for on- and off-site sewer system improvements approved by the Department of Public Works.

6. A drainage plan approved by the Department of Public Works which includes mitigation of downstream flood concerns.

7. Necessary permits and approvals required by new State Water Code.

G. DETERMINATION

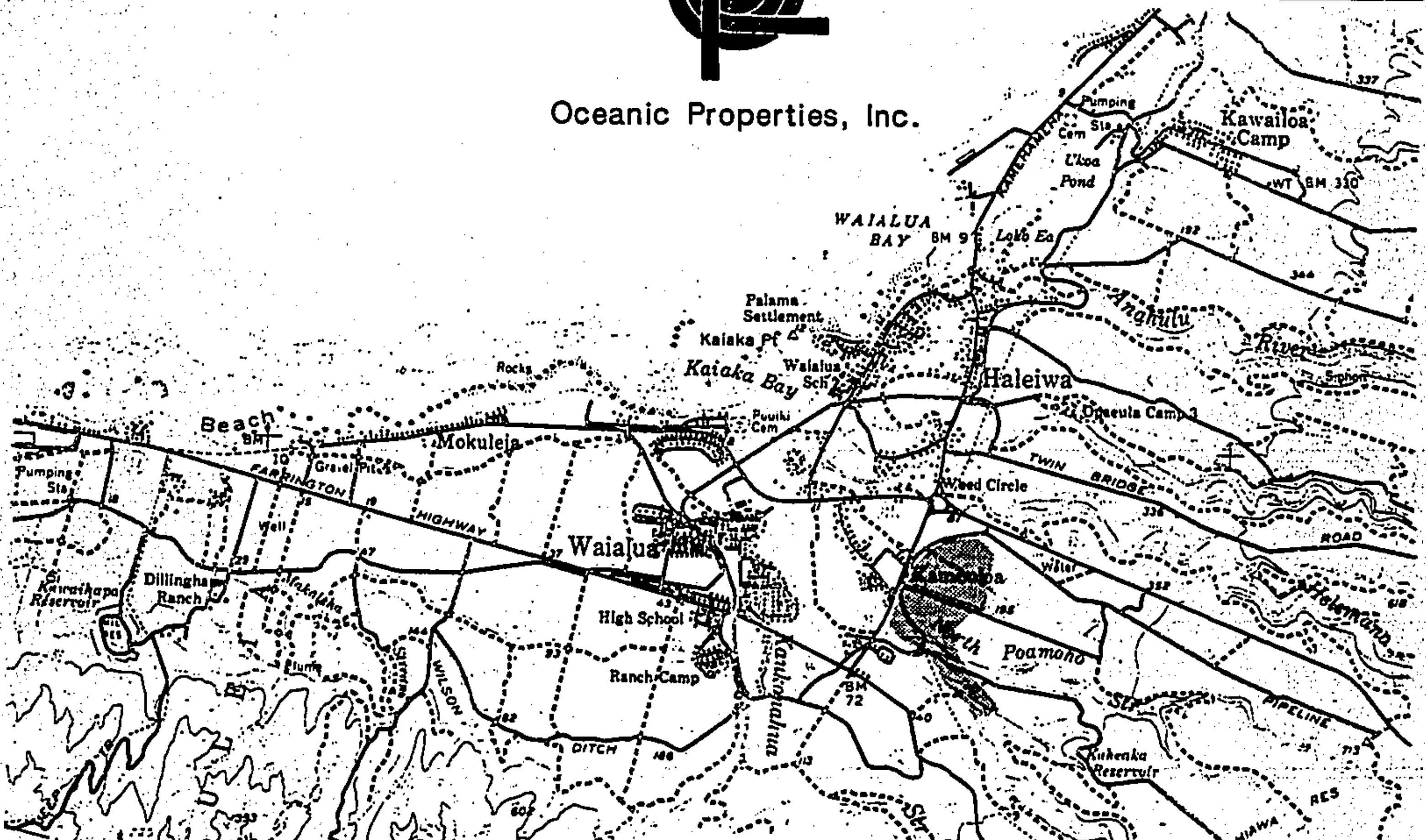
The Final EIS is determined to be acceptable under the procedures and requirements established in Chapter 343, HRS, and the State "EIS Rules." This determination does not imply a favorable recommendation on the applicant's request for any approvals or permits required by the Department of General Planning.

Approved: Donald Clegg
DONALD A. CLEGG
Chief Planning Officer
Department of General Planning

WAIALUA GOLF COURSE

Waialua, Oahu, Hawaii

Oceanic Properties, Inc.



FINAL

ENVIRONMENTAL IMPACT STATEMENT

APRIL 1988

WAIALUA GOLF COURSE

Waialua, Oahu, Hawaii

Oceanic Properties, Inc.

Prepared for:
Oceanic Properties, Inc.

Prepared by:
Tyrone T. Kusao, Inc.

Tyrone T. Kusao, AICP

For Submittal to:
City & County of Honolulu, Department of General Planning

FINAL

ENVIRONMENTAL IMPACT STATEMENT

APRIL 1988

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CHAPTER 1

INTRODUCTION AND SUMMARY

1. INTRODUCTION AND SUMMARY

Description of the Proposed Action

Oceanic Properties, Inc., proposes to construct an 18-hole championship golf course in Waialua, on the North Shore of the island of Oahu. Identified as Tax Map Key parcels 6-5-01:2 and 6-4-01:6, the project site is roughly L-shaped and encompasses approximately 214 acres. Support facilities include a driving range, a clubhouse, and a repair and maintenance shed. The proposed Waialua Golf Course will be a daily fee course which will be open to the public. Section 3.3 provides additional information on the proposed project.

Over 60 percent of the site, or 142 acres, is currently in sugar cane cultivation. The remainder of the site, approximately 72 acres, is relatively unaltered in the gully area created by Poamoho Stream. Section 3.1 provides additional information on the project site.

The project site currently lies within the Agricultural boundaries of the State Land Use Boundary Map. It is designated Agriculture on the North Shore Development Plan Land Use Map and has no designation on the North Shore Development Plan Public Facilities Map. The subject property is currently zoned Ag-1, Agriculture by the City and County of Honolulu.

Significant Beneficial and Adverse Impacts and Proposed Mitigation Measures

Chapter 2 presents the purpose and need for this project. The information indicates that the project will be a major asset to the region's recreational resources and will meet a current un-met demand for additional golf courses.

It is anticipated that the proposed project will require 30 full-time employees and will not cause the loss of any Waialua Sugar Company 430 employees. Further, the proposed project will cause an increase in tax revenues, which is further discussed in Section 5.12.

Construction activities will increase noise, air-borne dust and particulate emissions for the surrounding neighborhood. Further, stream water quality may be temporarily affected. None of these impacts are expected to be long-term in nature, however.

Impacts to the physical environment and infrastructure systems can be mitigated as follows:

- Improvements to the drainage system will be required to mitigate potential peak storm run-off (Section 5.2).

- The area's water, sewerage and drainage systems will need to be upgraded, at the developer's expense, to accommodate the proposed project (Section 5.6).

- Although no rare, threatened or endangered species were found in the biological survey, two endangered waterbirds, the Hawaiian Coot and Hawaiian Gallinule, may utilize the lower portion of Poamoho Stream. The U.S. Fish and Wildlife Service has offered its assistance in the selection of suitable chemicals for use on the proposed course. The biological consultants have recommended that the USFWS, as well as the State Division of Forestry and Wildlife, review the selection of biocides as the planned water hazard areas and greens will most likely attract use of these areas by migratory shorebirds and native waterbirds.

No significant archaeological resources were found in the archaeological study conducted for this project, as discussed in Section 5.5.

The proposed project will displace the on-site agricultural activities conducted on 142 acres, although Waialua Sugar Company has indicated that these losses are not expected to cause the company undue hardship, as discussed in Section 5.10.

Careful design of the driving range and the clubhouse will help minimize potential lighting and noise impacts on nearby residents.

<u>Alternatives Considered</u>

Chapter 11 presents a discussion on alternatives considered. The only current alternative to the proposed project is the no-action alternative, which implies that the Waialua Sugar Company would continue its sugar cultivation of the property's 140 acres and the gully area would continue to be unused.

The no-action alternative would not require improvements to the infrastructure and thus not require public maintenance of such improvements. While the potentially negative impacts during construction would not occur, the no-action alternative also would not generate the positive social and economic benefits accruing from the project.

Alternative design decisions are continued to be explored to determine the exact locations of tees, greens and fairways, as well as the clubhouse and driving range. Final design will depend on, among other studies, detailed land surveys.

Unresolved Issue

The March 8, 1988 letter (CHAPTER 14) from the State Department of Transportation (SDOT) recommends that a left turn storage lane be provided for southbound traffic on Kaukonahua Road, while our traffic report concluded that a separate lane would not be warranted. While the volumes during the weekday peak hour are substantially below the volumes needed to meet the warrant, the weekend traffic assignment at the access road was only marginally below, which may account for SDOT's position that the turn lane be provided. We therefore will conduct further studies to obtain additional traffic data for the weekend peak hour, which occurs on Sunday during the annual polo season.

The findings and subsequent analyses will be submitted to SDOT for their consideration and we will comply with their determination on this matter. The design plans for the access road intersection will be coordinated with the SDOT.

Compatibility with Land Use Plans and Policies

Chapter 6 demonstrates that the proposed project is generally compatible with land use plans and policies relating to recreation, the visitor industry, and general economic development. On the other hand, the conversion of prime agricultural lands required for a portion of the project will be in conflict with some of the stated objectives and policies relating to the promotion and maintenance of productive agricultural lands. However, the benefits accruing to the community and the company from the golf course would appear to off-set the loss of agricultural lands to some extent.

Major permits and approvals required to implement this project are as follows:

Type of Approval of Permit	Approving Agency	Status
Change of Land Use Designation from Agriculture to Urban	State Land Use Commission	To be filed
Change in North Shore Development Plan Land Use Map from Agriculture to Parks and Recreation	City Council	In process
Change in North Shore Development Plan Public Facilities Map	City Council	To be filed
Special Management Area Permit as prescribed by Ordinance 84-4	City Council	To be filed
Zoning change from Ag-1 to P-2, General Preservation District	City Council	To be filed

Other permits related to engineering requirements are presented in Section 6.1.

CHAPTER 2

STATEMENT OF PURPOSE AND NEED

2. STATEMENT OF PURPOSE AND NEED

The proposed project is designed to meet the increasing demand for golf courses on Oahu in 1991, the projected opening date for the proposed golf course.

A market feasibility study was conducted for this EIS to determine whether sufficient market demand will exist to support the proposed project (Helber, Hastert & Kimura, Planners, 1987). The study found that existing and projected market demand for rounds of golf play exceeded existing and projected supply. Further, the primary market areas in which the proposed course is located will fall significantly short of meeting projected market demands -- even with the proposed course. Appendix G contains the market study which is summarized below.

In 1986, Oahu's 28 golf courses represented about half of the statewide total of 57 courses. Oahu's courses generally fall into four categories.

- 11 are open to the public and are operated on a daily-fee basis,
- four are municipal courses,
- four are private country clubs, and
- nine are operated by the armed forces for the benefit of the armed forces.

Based on a standard of resident population per golf course hole, Oahu ranks a distant fourth amongst the four counties, with 1,715 residents per golf course hole. Maui, has 396 residents per golf course hole; Kauai, 475 and Hawaii, 567. After excluding those sources not available for public play on a regular basis, Oahu falls even further behind the rest of the State.

The market study identified three market areas to quantify the locational effect of existing and proposed golf courses relative to given population groups, as follows:

1. The <u>primary market area</u> encompasses the North Shore and Central Oahu Development Plan areas. These areas include the communities of Waipahu, Mililani, Wahiawa, Haleiwa and Waialua. The region's five courses include two public daily-fee courses, one municipal and two military courses.

   Seven new courses are proposed for the primary market area over the next ten years. Only the Waikele course is scheduled for operation in 1991.

2. The secondary market area includes the Ewa and Primary Urban Center Development Plan areas and is currently served by 11 golf courses, six of which are military, and two are private clubs. The remaining three are open to the public.

   Six new courses are being proposed for the secondary market area over the next 10-year period, five of which are expected to be operational by 1991. One of these, at the proposed Ko Olina resort in Ewa, is currently under construction.

3. The tertiary market area is the remainder of the island, which supports a total of twelve courses.

   Four courses are currently proposed for his market area over the next 10-year period, one of which is expected to be operational by 1991.

Of the proposed courses, 17 were determined to have a medium to high probability of development over the next 10-year period. Of the several located in the primary market area, only one is projected to be operational in 1991.

Estimates of projected demand for rounds of golf play were made by applying participation rates published in the State Recreation Function Plan to official population projections within each of the three market areas. The armed forces population component was subtracted from the population projections because of its unique exclusive-use privileges of military courses. Correspondingly, military courses were subtracted from the supply projections because they are not available for use by the general public.

The report estimated that the civilian resident population of the primary market area appears able to support a total of eight golf courses through 1990, increasing to nine courses by 2000. The island of Oahu was able to support 46 courses in 1985, rising to 54 courses in 2000. The impact of the expected visitor population appeared minimal within the primary market area; the greater impact was in the secondary market area where sufficient visitor demand existed in 1985 to support two courses.

Comparisons of existing and projected market demand for rounds of golf play were found to exceed existing and projected supply of golf courses on Oahu over the projection period, 1985-2000. Demand for rounds of golf within the primary market area (in which the proposed

Waialua course is located) currently exceed supply by a factor of 2:1. This trend is expected to continue through 1991.

In summary, the findings of the market study indicate that sufficient market demand exists to support the opening of an 18-hole daily-fee golf course at the Waialua site in 1991, as currently proposed by Oceanic Properties, Inc.

CHAPTER 3

PROJECT DESCRIPTION

3. PROJECT DESCRIPTION

3.1 Description of the Subject Property

The project site is located in Waialua, on the North Shore of the island of Oahu, as shown in Figure 3.1. Identified as Tax Map Key parcels 6-5-01:2 and 6-4-01:6, the project site is roughly L-shaped and encompasses approximately 214 acres, as illustrated in Figure 3.2.

The project site is located east of Kaukonahua Road, between Thomson Corner, which is its intersection with Farrington Highway, and Weed Circle, which is its intersection with Kamehameha Highway. The greater portion of the site is abutted by sugar cane fields. The southern boundary is defined by a gully formed by Paomoho Stream. Also, the southwestern corner of the project site is bordered by Midkiff Acres, a residential area. Another stream, the North Paomoho Stream, also traverses the site.

Over 60 percent of the site, or 142 acres, is currently in sugar cane cultivation. The remainder of the site, approximately 72 acres, is relatively unaltered in the gully area created by Paomoho Stream.

The topography of the site is very gentle in the sugar cane land, and changes to undulating in the streambed area.

3.2 Historical Perspective

The subject property is owned by Castle & Cooke, Inc. hereby referred to as C&C. C&C is the largest agricultural conglomerate on Oahu and is the only Hawaii company serving both the pineapple and sugar markets.

C&C and its subsidiaries, Waialua Sugar Company and Oceanic Properties, Inc. own approximately 42,000 acres of land in the Central and North Shore areas of Oahu. These lands extend from Waipahu north through Mililani Town to the urban center of Wahiawa near and to the small but growing communities of Waialua and Haleiwa and Oahu's North Shore (Helber, Hastert, Van Horn and Kimura [HHVHK], 1986).

The 214-acre project site is currently part of the Waialua Sugar Company plantation, a subsidiary of C&C which has 12,400 acres.

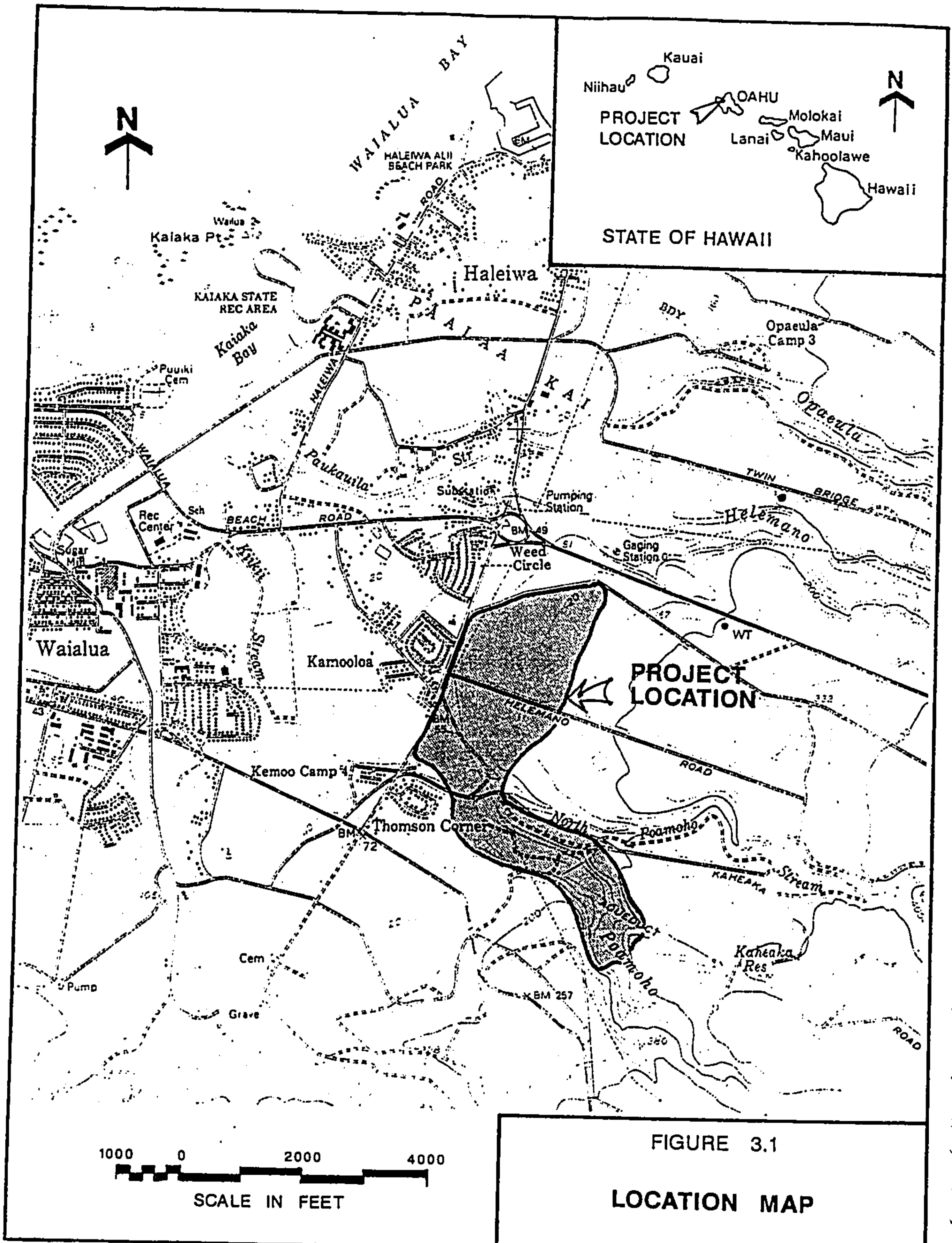


FIGURE 3.1

LOCATION MAP

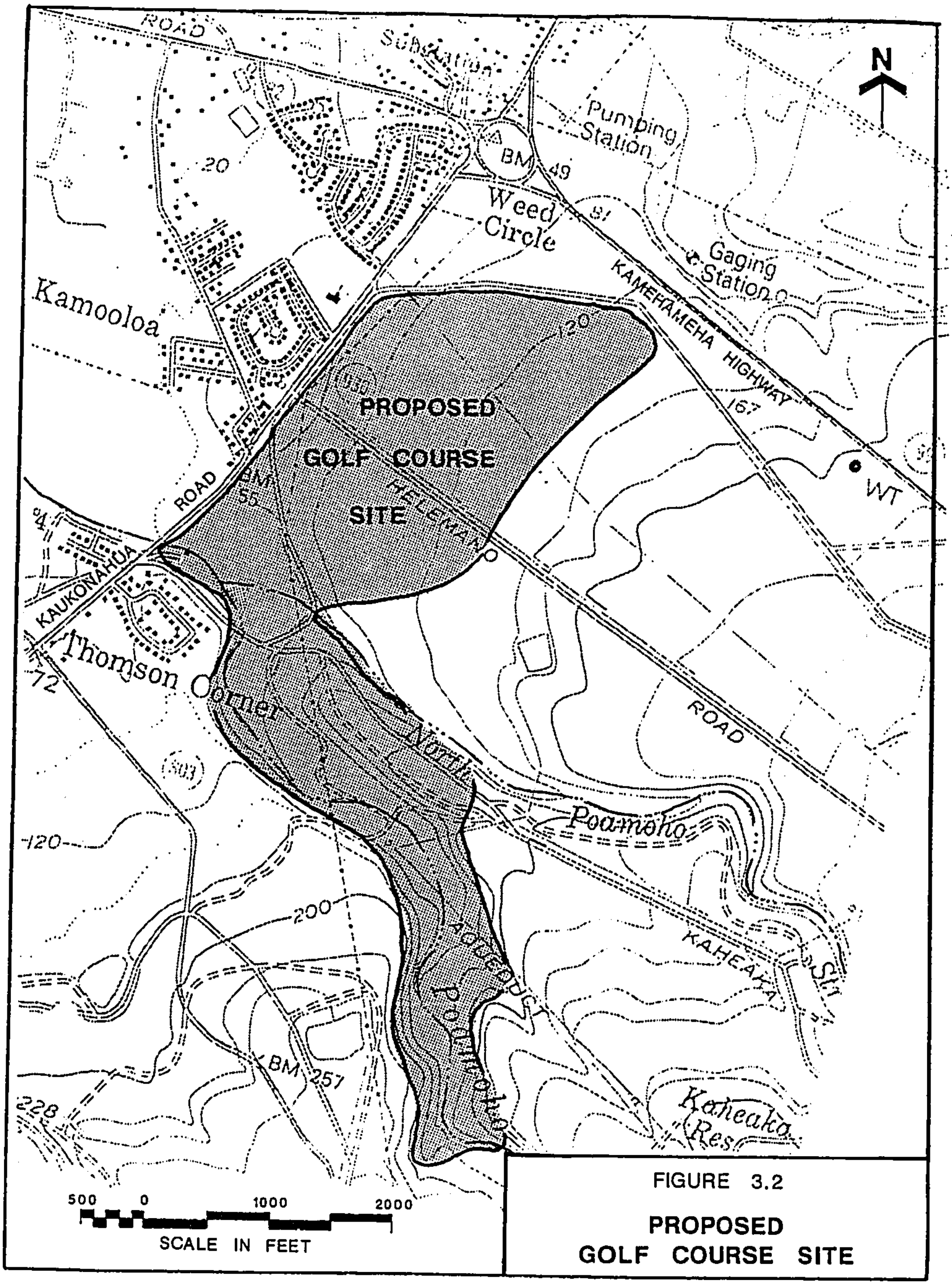


FIGURE 3.2

PROPOSED GOLF COURSE SITE

In 1986, C&C prepared the "Central Oahu/North Shore Plan," a working document which articulates a land use develop- ment plan and identifies desired land uses within the planning region over the next 10 to 15 years. The Central Oahu/North Shore Plan is an in-house working document which will be revised periodically to reflect the current situation. It is noted that the advisory council for this planning effort was comprised of representatives of neigh- borhood boards and community association in the Central and North Shore communities.

The objectives of this plan are as follows:

- To provide a flexible, long-range planning guide to facilitate rational decision-making regarding the uses of C&C lands in Central Oahu;

- To identify and preserve agricultural land to meet the needs of the Waialua Sugar Company and Dole planta- tions;

- To identify areas for future urban expansion and in-fill;

- To provide an ongoing vehicle for community and government dialogue and input relative to C&C land use plans; and

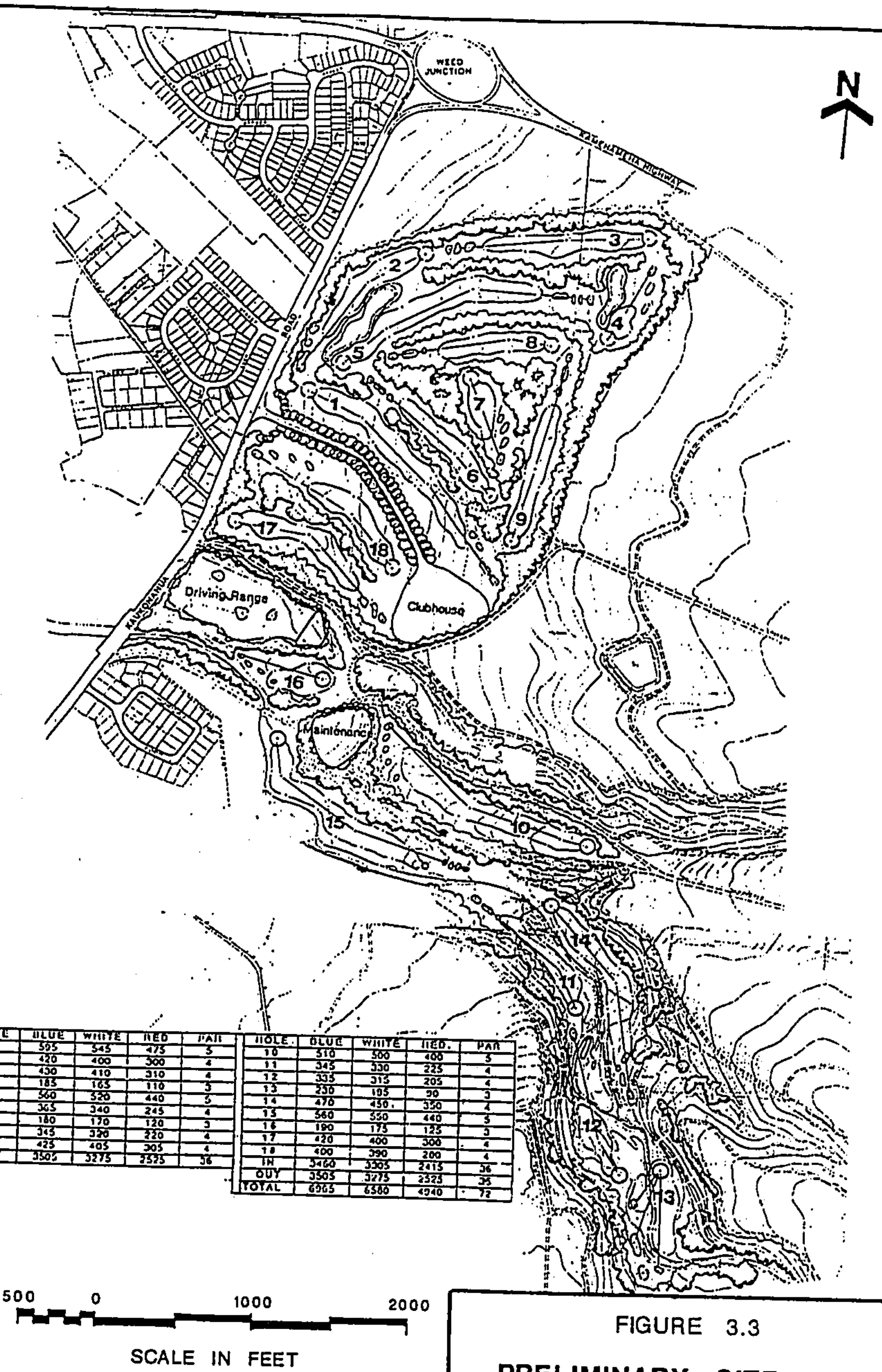
- To update the original 1974 <u>Oahu Land Study</u> prepared by C&C.

This plan recommends specific land use policies and company directions on growth management for C&C lands in these regions.

One of these recommendations is for a possible site for an 18-hole golf course. At the time this was recommended, several sites were being considered, with the most "promising lands" being located in the vicinity of Thomson's Corner (HHVHK, 1986).

3.3 Description of the Proposed Project

The applicant proposes to construct an 18-hole champion- ship golf course, which is shown on Figure 3.3. Support facilities include a driving range, a clubhouse, and a repair and maintenance shed. The clubhouse, maintenance building, and eleven holes of golf are located in what is currently sugar cane land; seven holes of golf are located in the stream valley of Paomoho Stream.



HOLE	BLUE	WHITE	RED	PAR
1	595	545	475	5
2	420	400	300	4
3	430	410	310	4
4	185	165	110	3
5	560	520	440	5
6	365	340	245	4
7	180	170	120	3
8	345	320	220	4
9	425	405	305	4
OUT	3505	3275	2525	36

HOLE.	BLUE	WHITE	RED.	PAR
10	510	500	400	5
11	345	330	225	4
12	335	315	205	4
13	230	105	90	3
14	470	450.	350	4
15	560	550	440	5
16	190	175	125	3
17	420	400	300	4
18	400	390	200	4
IN	3460	3305	2415	36
OUT	3505	3275	2525	35
TOTAL	6965	6580	4940	72

FIGURE 3.3

PRELIMINARY SITE PLAN

3.3.1 Golf Course

The 6,965 yard - Par 72 course will operate as two returning nine holes of golf. Players will cross an existing cane haul road by an elevated bridge to be built as part of the golf course service road/cart path system. Two restrooms, one at each end of the course will be available for the convenience of the golfers.

The course will feature a wide variety of golf holes with numerous tee and pin positions, allowing accommodation of golfers of all skill levels. The portion currently in cane, or the upper area of the course, will have an open feeling with wide fairways. The two water hazards will also function as drainage features and reservoirs for the golf course irrigation system for the entire golf course.

Vegetation on the golf course will be primarily in the form of large trees and tree masses which perform a number of functions, including the definition of fairways, backdropping of greens, screening and directing views, windbreaks, sound barriers, dust arrestors during cane harvest, and providing shade and color. Species of plant material used will be keyed to existing plant material in surrounding areas to create continuity in the landscape.

The proposed Waialua golf course will be a daily fee course which will be open to the public. No membership fees will be required and tee times will be arranged on a first-come-first-served basis.

Green fees are expected to be in the middle range of golf fees in Hawaii. While fees for the proposed course will be less than those of comparable courses operated in conjunction with hotels and resorts, they will be higher than those of municipal courses.

3.3.2 Support Facilities

The accompanying driving range will be operational 7 days a week, and possibly in the evenings. The lighting system for the driving range will be designed to direct light away from nearby residences.

The clubhouse will be designed to accommodate a pro shop, a dining room with a lounge, and facilities which will be available for community use, such as meetings and banquets.

3.3.3 Access

The golf course will be served by a single ingress-egress. The proposed road would intersect with Kaukonahua Road at a T-intersection, and a stop sign control for traffic exiting the golf course will be provided.

3.3.4 Drainage

The proposed golf course in the stream valley would maintain the natural slope and vegetation to allow for overland flow into the stream. In cases where the stream crosses a fairway, selective clearing of vegetation will be required to remove tall trees and bushes that may interfere with the flight of the ball or the vision of the golfer. Short, scrubby vegetation along the stream can remain.

In the plateau area, storm drainage will be directed to a 3 MG drainage detention pond on the makai side of the plateau near Kaukonahua Road. Storm runoff would exit the drainage pond via a series of swale/channels and drain pipes, with ultimate release at the driving range, which will serve as an open area where storm drainage can sheet flow into the stream.

3.3.5 Utilities

Water. Domestic and fire protection water requirements can be met by the Board of Water Supply (BWS) system after increasing the distribution system capacity. Based on BWS recommendations, the developer will install a 1,900(±) linear feet of 12-inch water main along Kaukonahua Road to service the golf course.

Irrigation water will be tapped off the Waialua Sugar Company irrigation system. The 14-inch pipe line along Helemano Road will be tapped at a point upstream of the 8-unit filter station to divert a small portion of the water to a storage ponds within the golf course. A pond capacity of two to three million gallons will be sufficient to store irrigation water for three to five days.

Wastewater. Wastewater generated by clubhouse activities will be conveyed to the Paalaa Kai Wastewater Treatment Plant through the existing sewer system of the Paalaa Kai subdivision. An 8-inch line from the golf course will be installed crossing Kaukonahua Road and connect to the existing manhole at the intersection of Paahihi Street and Alana Loop of the Paalaa Kai Subdivision, Unit 1.

Electrical and Communication. Electricity will be provided via a hook up to the existing line of Hawaiian Electric Company. This 12 KV distribution line is located within the property site.

The golf course will use existing aerial facilities of the Hawaiian Telephone Company.

3.4 Project Rationale

As one of Hawaii's major agricultural conglomerates, C&C has continuously demonstrated its commitment to its agricultural operations in Hawaii. The viability of its Hawaii sugar operation, however, has been in serious question because of its vulnerability to fluctuating world economics. In spite of these drawbacks, C&C continues to explore various ways to stablize its agricultural operations in Hawaii.

In some instances C&C's long-range effort to continue agriculture may appear to conflict with immediate operations in that existing agricultural lands may need to be "traded off" or replaced in order to enhance the overall value of C&C assets. Such is the case with the proposed project.

Based on the recommendation of the previously described "Central Oahu/North Shore Plan" and the market demand for a golf course in the area, C&C has decided to embark on this project. In this way, the property will be put to a higher use resulting in benefit to the company. Further, the provision of a golf course where none is readily available would be beneficial to the entire community.

3.5 Development Schedule

It is anticipated that the proposed project will open for operation in the summer of 1991. This target date is based on an application filing date of January 1988, and the selection of a construction contractor by December 1989. Sitework and construction activities would begin in early 1990, leaving six to eight months for maturation.

3.6 Project Costs

The project construction costs are estimated as follows:

Item	Estimate Cost
Golf course, including maintenance building and related furniture and equipment	$ 6.3 million
Off-site and on-site infrastructure	$ 3.3 million
Clubhouse, including design and construction	$ 1.1 million
TOTAL ESTIMATED CONSTRUCTION COSTS	$10.7 million

It is noted that the foregoing estimate does not include costs related to land, as no determination has been made as to whether Oceanic Properties will lease or acquire the land from Castle and Cooke Land Company at this time.

CHAPTER 4

EXISTING CONDITIONS

4. EXISTING CONDITIONS

4.1 Current On-Site and Surrounding Uses

Over two-thirds of the 214-acre site, or 142 acres, is currently in sugar cane cultivation. The remainder of the site, approximately 72 acres, is unused and relatively unaltered in the gully area created by Poamoho Stream.

Waialua Sugar Company currently leases two portions of the site to part time farmers. One portion is located near the proposed driving range and is used for banana cultivation. The other portion is located in the upper area of the gully and this is part of a larger off-site leased area used for grazing. It is noted that the overlap between project site and the leased lot is undetermined at this site because the land survey was not completed at the time of this writing (January 1988).

Bordering the southwestern corner of the project site is a residential area known as Midkiff Acres. Approximately 50 houses are located in Midkiff Acres.

West of the project site, across Kaukonahua Road is the 307-unit residential project, Paalaa Kai. Other facilities near the Paalaa Kai subdivision include a church, a bakery, and a food manufacturing operation.

4.2 Physical Characteristics

4.2.1 Topography

The project site is divided into two distinct topographic areas, a plateau and a stream valley. The plateau encompasses an area of approximately 142 acres, currently planted with sugar cane. Elevations range from 150 to 50 feet, with ground slopes less than 5 percent over most of the area. The plateau is bounded on the west by Kaukonahua Road, on the north and east by a Waialua Sugar Co. haul road, and on the south by North Poamoho Stream.

The remaining 72 acres of the project site are located in the Poamoho Stream Valley. Currently, the stream valley yields a moderate to dense vegetal growth, abundant in grassy ground cover. The tidal influence on Poamoho Stream extends only about 1,000 feet into the project site. Under dry weather conditions, the remaining upstream portions are limited to isolated puddles in low-lying areas. The slopes of the stream valley range from 10 to 30 percent. At the confluence of Poamoho and North Poamoho streams, slopes reduce to 1 to 2 percent in a flood plain.

Existing ground slopes for the project site are indicated on Figure 4.1. The following Table 4.1 is a slope analysis summary for the plateau and stream valley.

4.2.2 Soils

The Land Study Bureau, University of Hawaii, in their report "Detailed Land Classification" rates the Poamoho Stream section of the site "E" and the remainder of the site as "A" and "B". The soil survey for Oahu conducted by the soil Conservation Service classified the soil type for the major portions of the site as LaB, Lahaina Silty Clay and HeA, Haleiwa Silty Clay.

The Lahaina Silty Clay's representative profile is dark reddish-brown, silty clay about 15 inches thick of the surface layer and is medium acid. Permeability is moderate, and runoff is slow. Erosion hazard is slight.

The Haleiwa Silty Clay surface layer is dark-brown silty clay about 17 inches thick. The soil is neutral to slightly acid. Permeability is moderate. Runoff is very slow, and the erosion hazard is no more than slight.

The existing soil erosion potential in the plateau area is 7.56 tons/acre/year over approximately 142 acres, or 1,074 tons per year. In the stream valley, the calculated erosion potential is 2.14 tons/acre/year over approximately 72 acres, or 154 tons per year. (Engineering Concepts, 1987a).

4.3 Climatic Conditions

The climate experienced in the vicinity of Waialua is characterized as mild. The average temperature recorded at climatological station 847 maintained by the Waialua Sugar Company is in the mid-70s, with the average monthly temperature rarely dropping below 70 1/2.

Rainfall averages at approximately 2.5 inches per month. The prevailing breezes along the North Shore are tradewinds from the east-northeast. During the evenings the wind changes direction and blows from the south-southeast off the Koolau Mountains. The average wind velocity is approximately 6 miles per hour. In the winter, Kona winds from the southwest occur, which often produces storms.

The humidity varies between 60 and 80 percent, generally with a high of 98 percent and lows of 41 percent; the area can thus be characterized as humid. (Belt Collins, 1976).

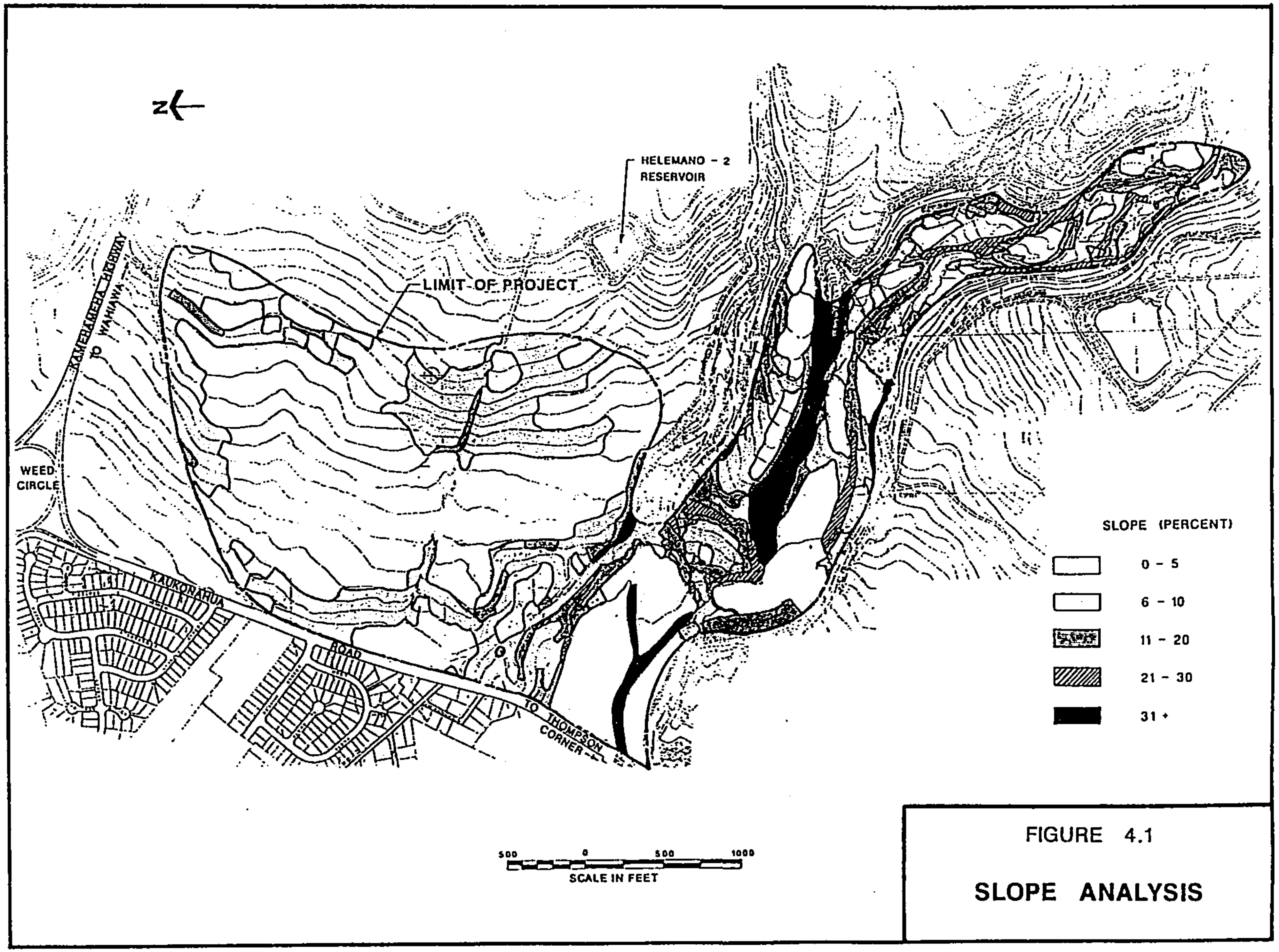


FIGURE 4.1

SLOPE ANALYSIS

TABLE 4.1

ACRES OF GOLF COURSE LAND

WITHIN SLOPE RANGE

Slope Range	Plateau	In Acres Stream Valley	Total Site
0 - 5%	92	19	111
6 - 10%	42	22	64
11 - 20%	5	18	23
21 - 30%	1	6	7
31% +	2	7	9
	142	72	214

(Engineering Concepts, Inc., 1987a)

4.4 Hydrological Characteristics

Water resources in the project vicinity include both surface water and groundwater, as depicted in Figure 4.2.

4.4.1 Surface Water

Poamoho Stream and North Poamoho Stream traverse the project site. The confluence of the two streams is located in a flood plain within the project site. Poamoho Stream is a tributary of Kiikii Stream, which discharges into Kaiaka Bay. The State of Hawaii Department of Health's Title 11 Regulations, Chapter 37-A, Water Quality Standards, states Kaiaka Bay is a Class A embayment. Kiikii Stream is designated as a Class 2 perennial stream and estuary, and Poamoho Stream is a Class 2 perennial stream.

The tidal influence on Poamoho Stream extends only about 1,000 feet into the project site. Under dry weather conditions, the remaining upstream portions are limited to isolated puddles in low-lying areas. The U.S. Geological Survey office maintains a crest flow stream gage station (station no. 2112) along Poamoho Stream within the project site. Annual maximum flows are recorded (or estimated by USGS) for the 10.9-square mile (6,976-acre) drainage area. The average annual stream flow data are not available for this gage station. (Engineering Concepts, Inc., 1987c).

Appendix F contains further information on existing surface water conditions.

4.4.2 Groundwater

Groundwater located in the Waialua-Haleiwa area is found in dike-free Koolau lava flows. Rainfall in the Koolau mountain range maintains and recharges the groundwater lens. Thick alluvial fill and weathered basalt in the Anahulu River Valley separate the Waialua-Haleiwa lens from the Kawailoa groundwater lens. In general, groundwater in the Waialua-Haleiwa lens flows toward the sea, and a small portion flows northwest to the Kawailoa lens. Seaward flows are confined by thick caprock that has developed near the shore. (Engineering Concepts, Inc., 1987c).

Appendix F contains more detail on groundwater conditions.

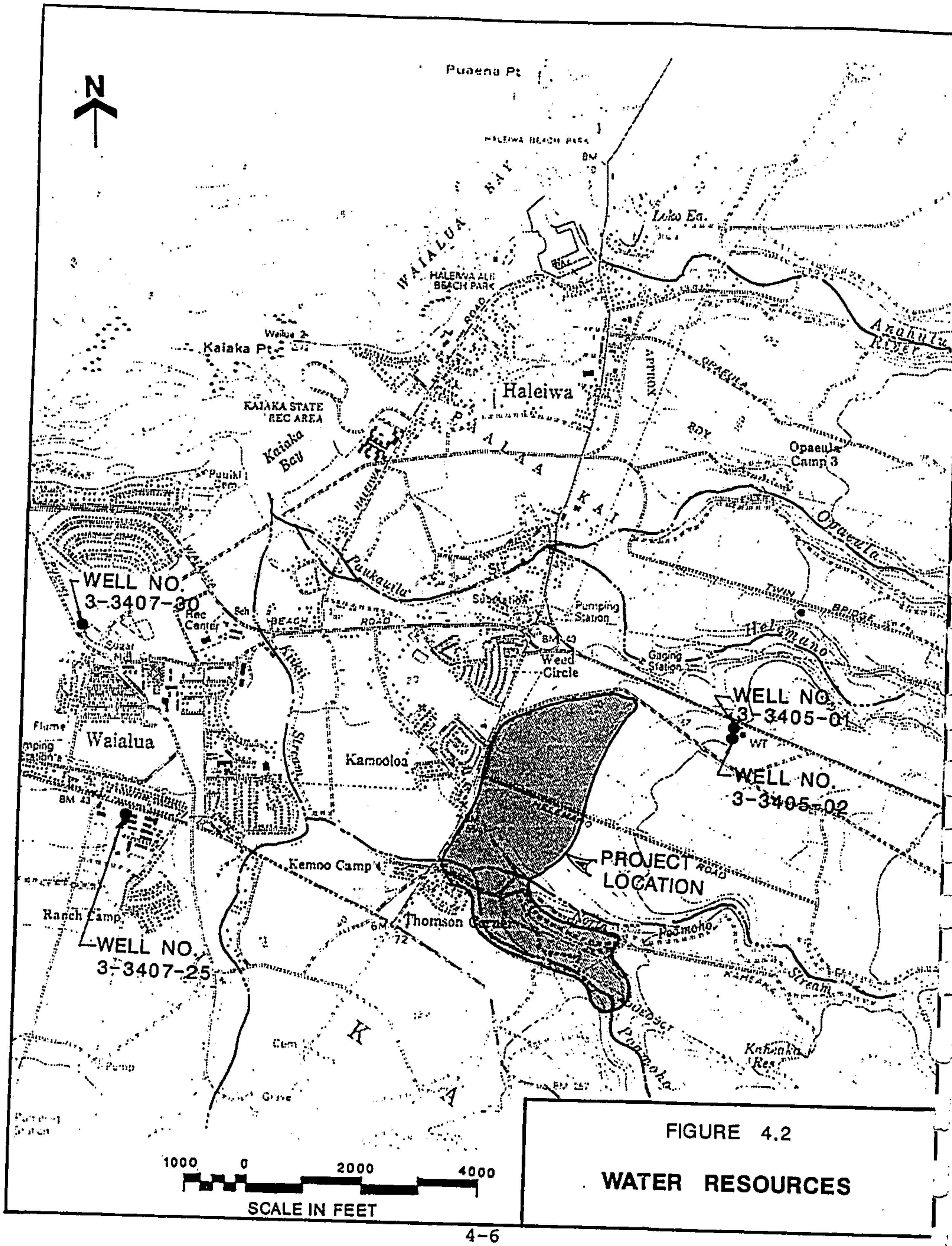


FIGURE 4.2

WATER RESOURCES

4.4.3. Drainage

Project Site

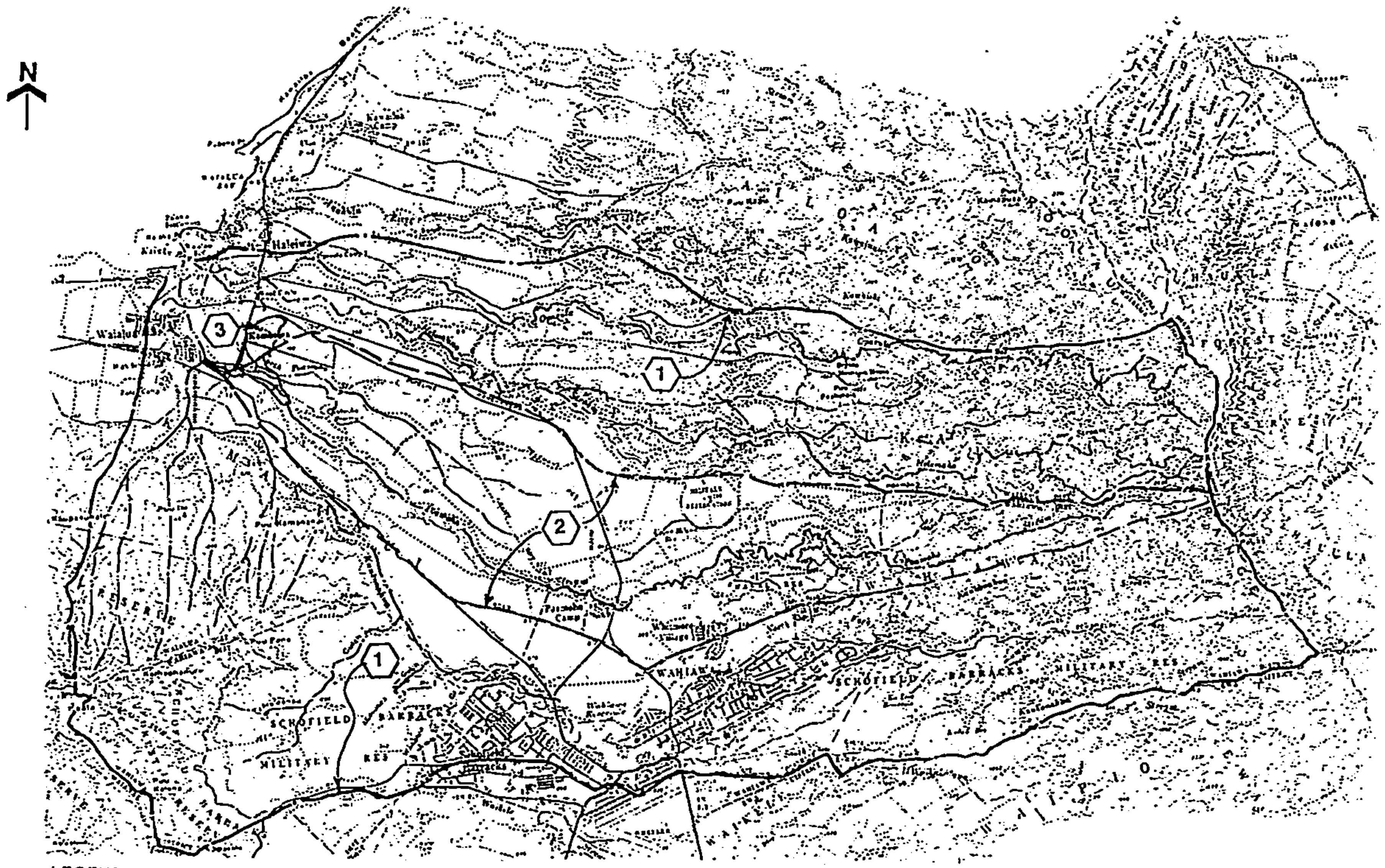
Runoff from the plateau area (sugar cane fields) travels from earth ditches along the field perimeter through a culvert to fields makai of Kaukonahua Road. In the stream valley, runoff flows overland into Poamoho Stream. Under existing conditions, runoff at the project site was calculated for 10- and 50-year storms using the Rational method. Runoff at the project site from the peak storm was calculated using Plate 6 of the City and County Storm Drainage Standards (1986).

Storm Recurrence (yr.)	Peak Runoff (cfs)
10	92
50	122
PEAK	1,300

Calculations were based on rainfall intensities of 2.1 inches per hour and 2.8 inches per hour for the 10-year and the 50-year storms respectively. (Engineering Concepts, Inc., 1988a). Additional information is presented in Appendix C of this EIS.

Poamoho Drainage Basin

Poamoho Stream drainage basin encompasses approximately 18.1 square miles (11,584 acres), extending from the Koolau Mountain Range to Kiikii Stream in Waialua as shown on Figure 4.3. The 214-acre project site represents 1.85 percent of this drainage basin area. About one-half of the drainage basin is estimated to be devoted to agriculture, with about 520 hectares (1,285 acres) in sugar cane and about 2,008 hectares (4,962 acres) in pineapple. Other areas are occupied by small residential communities, military reservations, stream valleys, and steep mountain terrain.



LEGEND :

1. PAUKAUILA – KIIKII STREAM DRAINAGE BASIN 79.8 SQ. MI. (51,072 ACRES)
2. POAMONO STREAM DRAINAGE BASIN 18.1 SQ. MI. (11,584 ACRES)
3. PROJECT SITE 214 ACRES

1 .5 0 1 2 3 4

SCALE IN MILES

FIGURE 4.3

DRAINAGE BASIN

Based on frequency-discharge drainage area curves from the Federal Emergency Management Agency Flood Insurance Study (March 1980) for the City and County of Honolulu, peak runoff from Poamoho Stream at Kaukonahua Road was calculated for the 10-, 50-, and 100-year storms. Runoff from the peak storm was calculated using Plate 6 of the Storm Drainage Standard.

Storm Recurrence (yr.)	Peak Runoff (cfs)
10	9,750
50	14,800
100	17,100
PEAK	25,000

Paukauila-Kiikii Stream Drainage Basin

The project site is located within the Paukauila-Kiikii Stream drainage basin -- the largest drainage basin on the island, encompassing 79.8 square miles (51,072 acres). Illustrated in Figure 4.3 the drainage basin extends from the Koolau Mountain Range west to the Waianae Mountain Range and Kaiaka Bay. Paukauila and Kiikii streams, the main water courses, converge before reaching Kaiaka Bay.

Land use in the Paukauila-Kiikii Stream drainage basin is primarily agricultural. The 214-acre project site represents less than one-half percent of the entire drainage basin and contains less than three percent of the sugar cane land.

Studies on Oahu several years ago (Green et al, 1977) indicated that the herbicide diuron was transported from sugar cane and/or pineapple fields to Kaiaka Bay. While the herbicide could not be detected in water, it was found at low levels in sediments from both the stream and the bay. The quantities of diuron in sediments were thought to be too low to be of environmental consequence. Neither atrazine or ametryn was found in either water or sediments. (Engineering Concepts, Inc., 1988).

4.5 Flora and Fauna

4.5.1 Vegetation

Cane fields in various stages of cultivation make up the largest and most uniform vegetation type on the site. In the remaining acreage, two vegetation types can be recognized: gulch and streamside vegetation. All those plant species inventoried during the field studies by Char and Linney (1987) are presented in Appendix A.

A total of 135 vascular plant species were found on the site, of which the majority, 124, are exotic species introduced since the arrival of Western man. Six species are considered to have been introduced by the Polynesians, and only 5 are considered native, some only questionably so. No endemic species (i.e., native only to the Hawaiian Islands) were found on the site. All but the sugar cane are considered more or less weedy.

No federal and/or state designated rare, threatened or endangered (listed, proposed, candidate) species were found on the site. Nor were there any cultivated plants requiring conservation.

Cane fields. Within the active cane fields, there is an almost pure culture of sugar cane plants (*Saccharum officinale*) with very small amounts of nut sedge (*Cyperus rotundus*). Additional weedy species are restricted to the margins of fields where they invade from the adjacent roadsides and irrigation ditches. These species consist mostly of swollen finger-grass (*Chloris barbata*), two species of amaranth (*Amaranthus spinosus*, *Amaranthus viridis*), and two species of spurge (*Chamaesyce hirta*, *Chamaesyce hypericifolia*).

Near Poamoho Stream, where banana (*Musa X paradisiaca*) are cultivated, an assortment of miscellaneous weedy species, too numerous to list here, have colonized a large expanse of disturbed soil next to the cane fields. Near this same area, the lower portion of North Poamoho Gulch (a dry ditch at this point) has been used as an unauthorized dump for household trash and yard trimmings. A number of ornamental plants are becoming established here, including Madeira vine (*Anredera cordifolia*), dumb cane (*Dieffenbachia seguine*), cassava (*Manihot esculenta*), and *Heliconia*.

Gulch vegetation. This vegetation type is characterized by the presence of small to medium stands of kiawe trees (*Prosopis pallida*) and koa-haole shrubs (*Leucaena leucocephala*), with lesser amounts of Java plum (*Syzygium cumini*), silk-oak (*Grevillea robusta*), Chinaberry (*Melia azedarach*), and 'opiuma (*Pithecellobium dulce*). The ground is covered with a thick growth of Guinea grass (*Panicum maximum*) which forms "lumpy" patches between trees and shrubs. Three vines make up a significant component of the vegetation: liliko'i (*Passiflora edulis*), mauna-loa (*Canavalia cathartica*), and Mysore thorn (*Caesalpinia sepiaria*).

On the bluffs marking the edges of the gulch floor, tree and shrub components are simplified so that silk-oak and koa-haole form that vast majority of the cover. The koa-haole on these bluff areas are largely dead or dying back due to heavy psyllid infestation. The psyllid or jumping plant louse is a recently recorded insect species which attacks the young shoots and leaves of koa-haole. On those slopes that are too steep to support Guines grass, swollen finger-grass and sour grass (Digitaria insularis) make a solid ground cover. Rocky outcrops, largely devoid of vegetation, are frequent. On gentler slopes Guinea grass, and especially its diminutive variety trichoglume, predominate. Farther back in Poamoho Gulch, cattle and horses are grazed. This has kept the grasses shorter and the ground more open. A very large number of weeds (or ruderals) and pasture species are found in these areas but the dominant species is Guinea grass. There is also a scattering of smaller shrubs such as indigo (Indigofera suffruticosa), klu (Acacia farnesiana), and cocklebur (Xanthium strumarium).

The trees in the pasture areas are the same as those encountered in the lower gulch area, with the exception of a number of ornamental species evidently planted long ago around the pump house. These are date palm (Phoenix dactylifera), queen palm (Arecastrum romanzoffianum), Chinese fan palm (Livistona chinensis), bumelia (Bumelia buxifolia), mango (Mangifera indica), and kukui (Aleurites moluccana).

Streamside vegetation. This vegetation type is represented by two subtypes. In the lowest portion of Poamoho Stream, just above the Poamoho bridge area, elephant grass (Peennisetum purpureum) has completely overgrown the stream banks and adjacent areas. It forms an almost exclusive cover, crowding out other streamside species.

Except for this area dominated by elephant grass, most of the stream vegetation consists of a mixture of large trees such as Java plum, African tulip tree (Spathodea campanulata), Chinaberry, silk-oak, Christmasberry (Schinus terebinthifolius), Chinese banyan (Ficus microcarpa), 'opiuma, and monkeypod (Samanea saman). Ground cover in these stream areas is not dense due to the heavy shading for the trees above and the occasional flash floods which sweep the streamsides.

4.5.2 Birds and Mammals

The project site has been greatly disturbed and consists largely of sugar cane fields on gently sloping lands and introduced plant communities in the gulch areas. Likewise, the majority of the fauna on the site is composed of foreign or alien species. Of a total of 16 avian (bird) species which occur on the site, only the Lesser Golden Plover (*Pluvialis dominica*) is native, and then, only as a non-breeding regular migratory visitor. The lower portion of Poamoho Stream, just above the Poamoho bridge, is perennial and may be utilized by two endangered native waterbirds -- the Hawaiian Coot or 'Alae-ke'oke'o (*Fulica americana alai*) and the Hawaiian Gallinule or "Alae-'ula (*Gallinula chloropus sandvicensis*). However, none of these waterbirds were observed in this area during the survey by Char and Linney (1987).

Three broad faunal habitats are recognized on the project area. These correspond somewhat roughly to the vegetation types described in Section 4.5.1, but are less finely defined.

The predominant habitat on the project area consists of cane fields. The fields themselves provide only marginal habitat for the various species. Most animals prefer the margins of fields and the overgrown areas along cane-haul roads and irrigation ditches. Here, grasses and weedy species provide seed and also support a number of insect species. Individuals or, sometimes, small flocks of both dove species were occasional in this habitat. The Lesser Golden Plover or Kolea frequents the cane-haul roads and roadsides during its visits from August through early April. Occasionally, small flocks of Nutmey Mannikin were observed. Most of the bird species seen in these ares, however, were passing through on their way to more preferred habitats.

The open, grassy streamside areas mauka of Poamoho bridge are frequented by large flocks of mannikins and waxbills during the early morning hours. Guinea grass, which occurs along the margins of the elephant grass-dominated streamside, forms an extensive cover which provides abundant seed for these granivorous species. A few individuals of the Wrinkled Frog were found in Poamoho Stream where it meanders through the pasturelands in the gulch area.

No studies of aquatic resources within the project site have been conducted but a few observations and notes were made during this survey. The muddy, silted condition of the streams, however, made observations difficult. The guppy (Poecilia reticulata) and several unidentified poecillid species were observed in the stream. One small individual of the endemic goby o'opu nakea (Awaous stramineus), about 1.5 inches long, was observed in the stream area behind the pump house. The aquarium snail (Heliosoma sp.) was found in boulder-strewn areas of the stream.

Pasture areas support small- to medium-sized forest and scrub areas. The Red-vented Bulbul, two cardinal species, and Japanese White-eye were abundant in these areas; White-rumped Shama were frequently heard singing in wooded areas. The more open, grassy areas within the pastures were preferred by doves and plovers, as well as the Strawberry Finch.

4.6 Archaeological Resources

Over 60 percent of the project area is presently in sugarcane; thus the only portion surveyed was a section of approximately 60 acres extending along the bottom of Poamoho Gulch at the south end of the project area.

In a literature search, Chiniago, Inc. (1987) found that one site in the project area -- Site 3723 -- was identified by McCallister (1933). Site 3723, as shown in Figure 4.4, was described as "Worked Stones . . . Gravel and silt were found above the artifacts." The location of these stones at such a depth below alluvial deposits strongly suggests that they came to rest there as the result of secondary deposition, having had their origin much further upstream. It is most likely that they were not artifacts, but only stream gravels shaped by water transport.

Inspection of old maps and other sources revealed no indications of terracing, house lots, animal pens or other human activities in the survey area.

Site 3723 was encountered in the field survey by Chiniago, Inc., (1987). The site consisted of a boulder measuring 1.7 by 2.8 meters and standing to a height of 1.0 meter, on top of which had been places several angular basalt rocks measuring between about 20 X 20 X 35 centimeters and 40 X 40 X 50 centimeters. The rocks did not seem to have been placed with any special care, and there were no midden deposits, artifacts, or any other evidence of human activity in the vicinity.

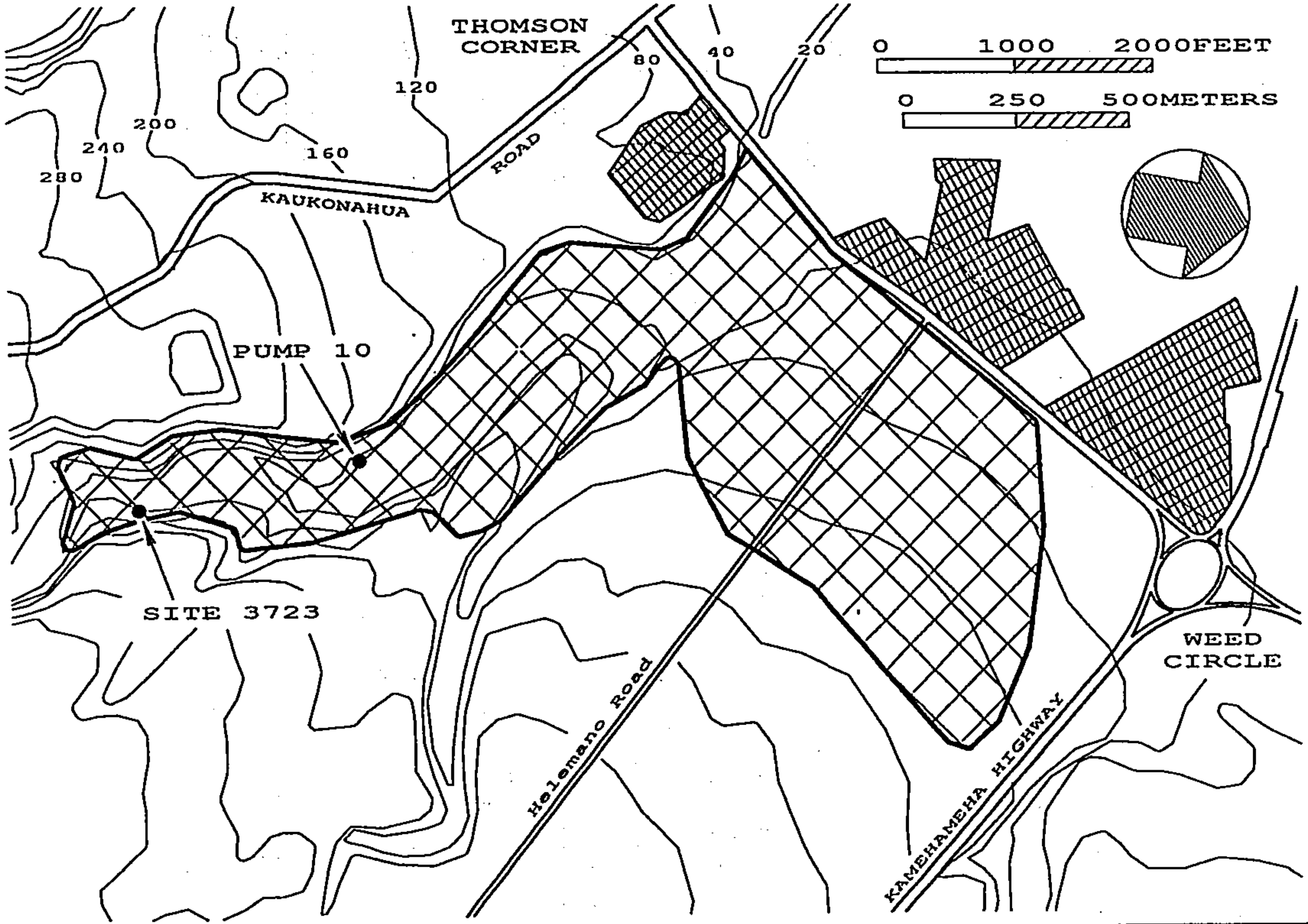


FIGURE 4.4

LOCATION OF ARCHAEOLOGICAL SURVEY AREA

Appendix B contains further discussion on the site's archaeological resources

4.7 Utilities

4.7.1 Water Supply

Two distinct water systems are operated in the vicinity of the project site by the Board of Water Supply (BWS) and Waialua Sugar Company. The BWS system provides municipal and fire protection water service to the surrounding community, while Waialua Sugar Co. operates its system primarily for irrigation. This section summarizes findings presented in Appendix F.

BWS System. The BWS has two reservoir/well sites servicing the Waialua-Haleiwa areas. The Haleiwa site has two wells with pumps rated at 700 gpm each with a 230 ft. head and a 1.0 million-gallon (MG) reservoir with a 225 ft. spillway elevation.

The Waialua site consists of two wells with 1,500 gpm pumping capacity and 235-foot head. The wells supply water to a 1.5 MG reservoir located along Kamehameha Highway. A 20-inch main transports water from the reservoir to the Waialua and Haleiwa communities for distribution.

An 8-inch water line that branches off of the 20-inch main is located adjacent to the project site along Kaukonahua Road. The 8-inch line services the Paalaa Kai subdivision located west of the project site. Currently, the 8-inch line is looped around the subdivision, connecting to a 16-inch line along Waialua Beach Road. There are no existing BWS water lines located within the project site. The existing BWS system is illustrated in Figure 4.5. No existing BWS lines are located within the project site. (Engineering Concepts, Inc., 1987c).

Waialua Sugar Co. System. The plantation irrigation system is divided into high level and low level service areas and is shown in Figure 4.6. In general, sugar cane fields in the vicinity of the project site are irrigated by water from pump station no. 10 located in the Poamoho Stream Valley within the project site. High lift water from pump station no. 10 is pumped to Helemano 4 reservoir and is used to irrigate fields makai of the 180-foot elevation. Fields mauka of the 180-foot elevation are irrigated with water from Wahiawa reservoir. Water from Wahiawa reservoir has been used to supplement water from Kaheaka reservoir to irrigate the lower fields during years of high rainfall.

Currently, the sugar cane fields within the project site are in drip irrigation. To prevent drip lines from clogging, water is filtered before application to the fields.

FIGURE 4.5
EXISTING BWS WATER SYSTEM

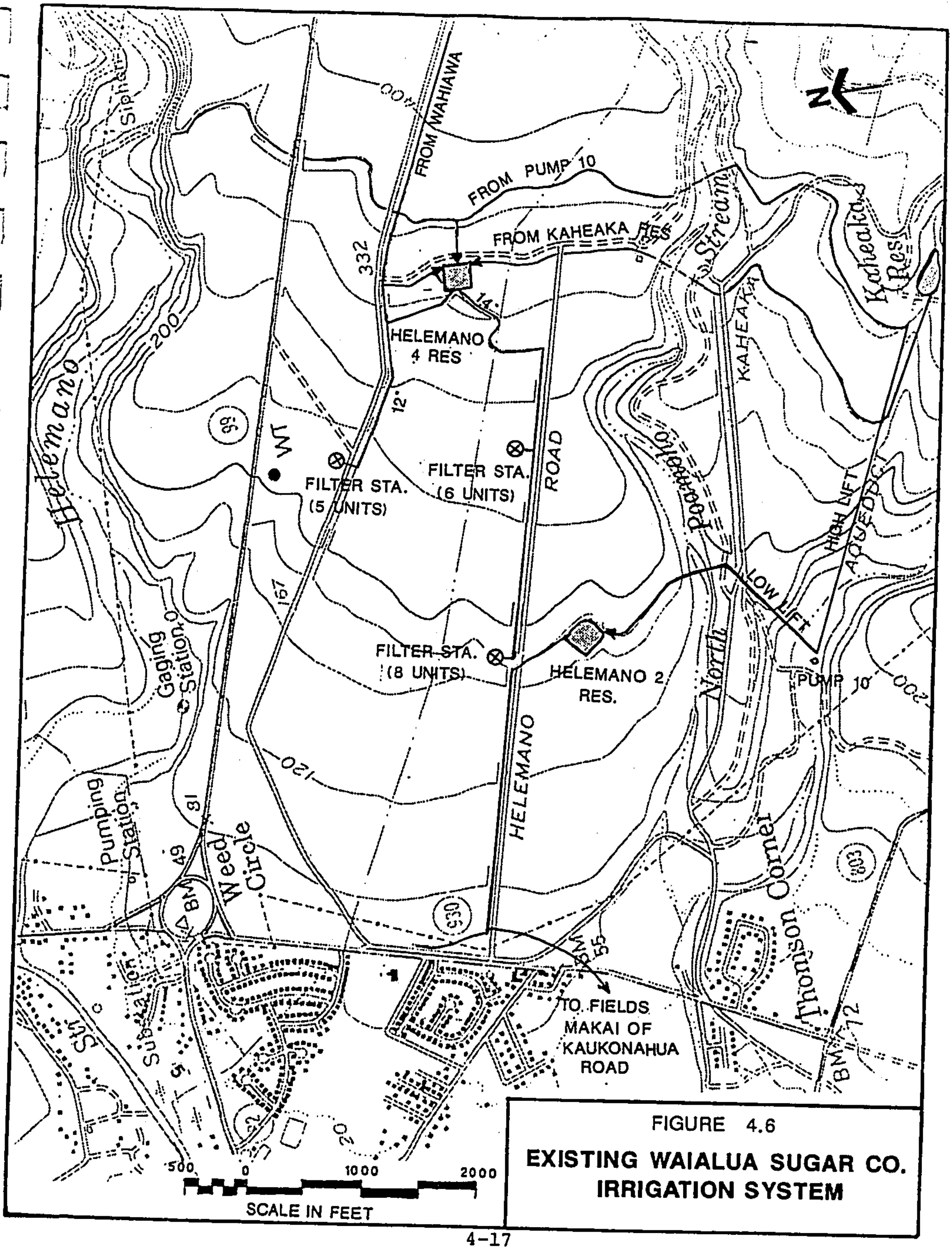


FIGURE 4.6

EXISTING WAIALUA SUGAR CO. IRRIGATION SYSTEM

4.7.2 Wastewater Facilities

Most of the residential/commercial units in the Waialua-Haleiwa area are serviced by cesspools. In a detailed analysis by Belt, Collins & Associates (1987), it was determined that between 15 and 30 percent of the cesspools are considered "defective". The remainder of the area is serviced by eighteen private wastewater treatment systems. Most of these private treatment systems service multi-family units along Waialua Beach Road.

The nearest municipal treatment facility, the Paalaa Kai Wastewater Treatment Plant (WWTP), is located approximately 2,000 feet west of the boundary of the proposed golf course. The Paalaa Kai WWTP is part of the Paalaa Kai Subdivision, Unit II, and fronts Waialua Beach Road.

This treatment facility was initially intended to treat wastewater flows generated by the Paalaa Kai Subdivision, Units I and II. The subdivision, covering a total area of approximately 47 acres, contains 307 single family residential units.

The Paalaa Kai WWTP is capable of providing better than secondary treatment of the wastewater. Effluent from the treatment plant is disposed of by means of 4-inch exfiltration wells. These wells are 50 feet in depth and have an injection rate of 95 gpm. Solids are disposed of at the Kawailoa or Kapaa sanitary landfills. (Engineering Concepts, Inc., 1987b).

The design flow data of the Paalaa Kai WWTP are as follows:

Design Average Flow:	144,000 gpd
Design Maximum Flow:	589,400 gpd
Design Peak Flow:	648,000 gpd

Appendix E contains further information on wastewater facilities.

4.7.3 Electrical and Telephone

Hawaiian Electric Company (HECO) provides electrical service to the surrounding area and existing power lines are depicted in Figure 4.7. Existing HECO 46 and 12 KV distribution lines cross the project site in the Poamoho Stream Valley. Approximately 3,000 linear feet of this distribution line is located within the project site.

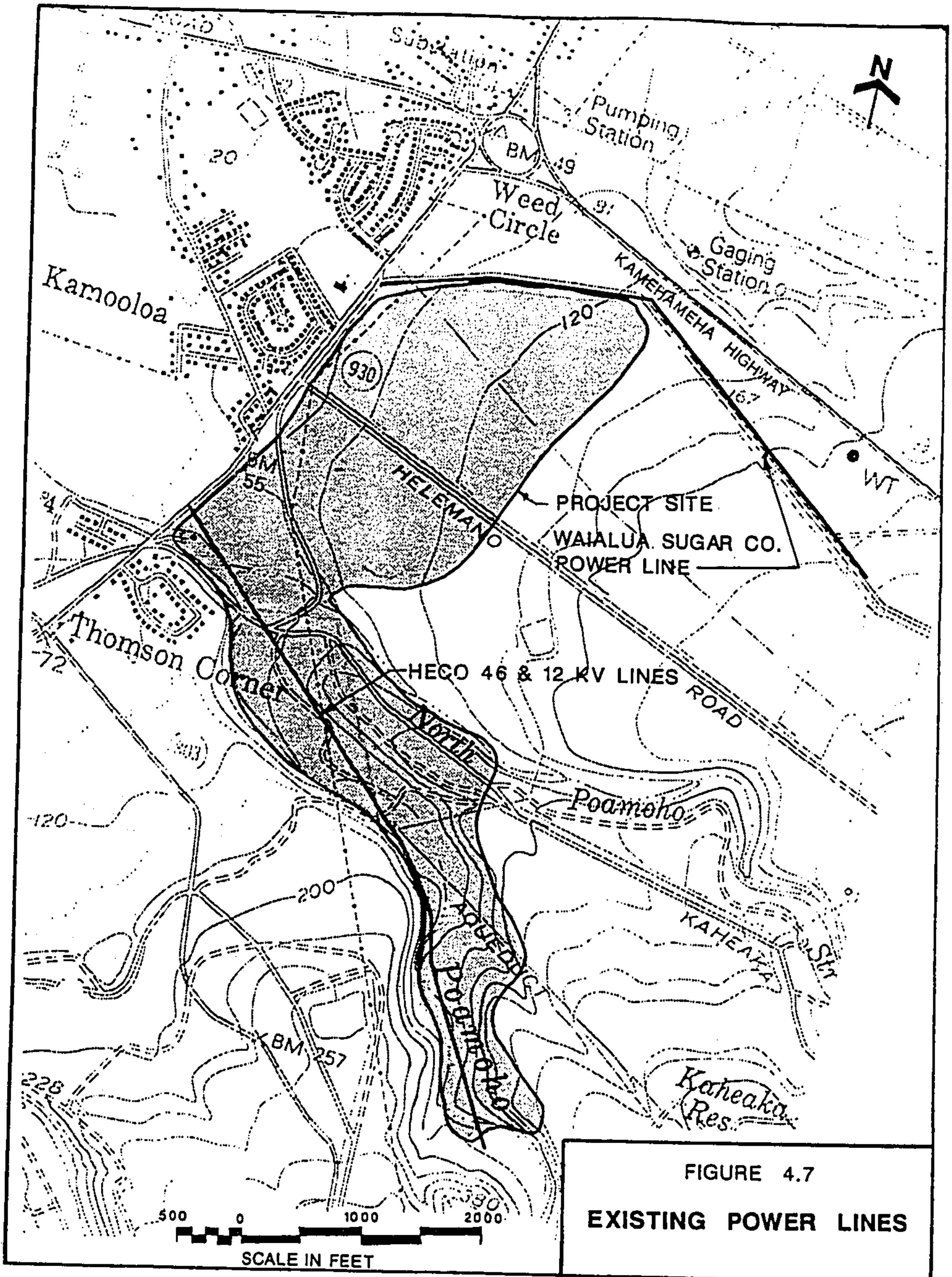


FIGURE 4.7

EXISTING POWER LINES

A Waialua Sugar Co. power line is located along the northern boundary of the project site. The power line originates near the Dole fruit stand in Wahiawa and runs to Waialua, supplying power for plantation operations.

Local telephone service is provided by Hawaiian Telephone Company (HTCO), a subsidiary of General Telephone and Electronics.

4.7.4 Fire Protection

The City and County of Honolulu Fire Department provides fire protection for the island. Fire stations in the vicinity of the project site are located in Waialua, Sunset Beach, and Wahiawa.

4.8 Roadways and Traffic

This section summarizes a portion of the traffic study, as contained in Appendix H.

4.8.1 Existing Roadway System

Kamehameha Highway, Waialua Beach Road, Farrington Highway and Kaukonahua Road are the major roads linking the Waialua area to other parts of the island. In the vicinity of the project, these roads are all two-way roads with one lane in each direction. Figure 4.8. illustrates the road way system.

At Thomson Corner, which is south of the project, a T-intersection is formed by Farrington Highway and Kaukonahua Road. The major east-west road, named Kaukonahua Road to the east and Farrington Highway to the west, connects Wahiawa to Waialua and Mokuleia. Kaukonahua Road is the minor leg to the north, connecting Thomson Corner to Weed Circle. All approaches to the intersection have single lanes shared by all movements. The minor north leg is stop-controlled.

Weed Circle is a traffic rotary situated approximately one mile north of Thomson Corner. Other roadways served by the rotary are Kamehameha Highway to the north (Haleiwa) and east (Wahiawa) and Waialua Beach Road to the west. Traffic entering the rotary from Kamehameha "ighway is given the right-of-way; traffic already in the rotary must yield to westbound Kamehameha Highway traffic from Wahiawa and stop for southbound Kamehameha traffic from Haleiwa. Entrance into Weed Circle from Waialua Beach Road and Kaukonahua Road are yield-controlled. Speed limit within the rotary is 25 miles per hour (mph).

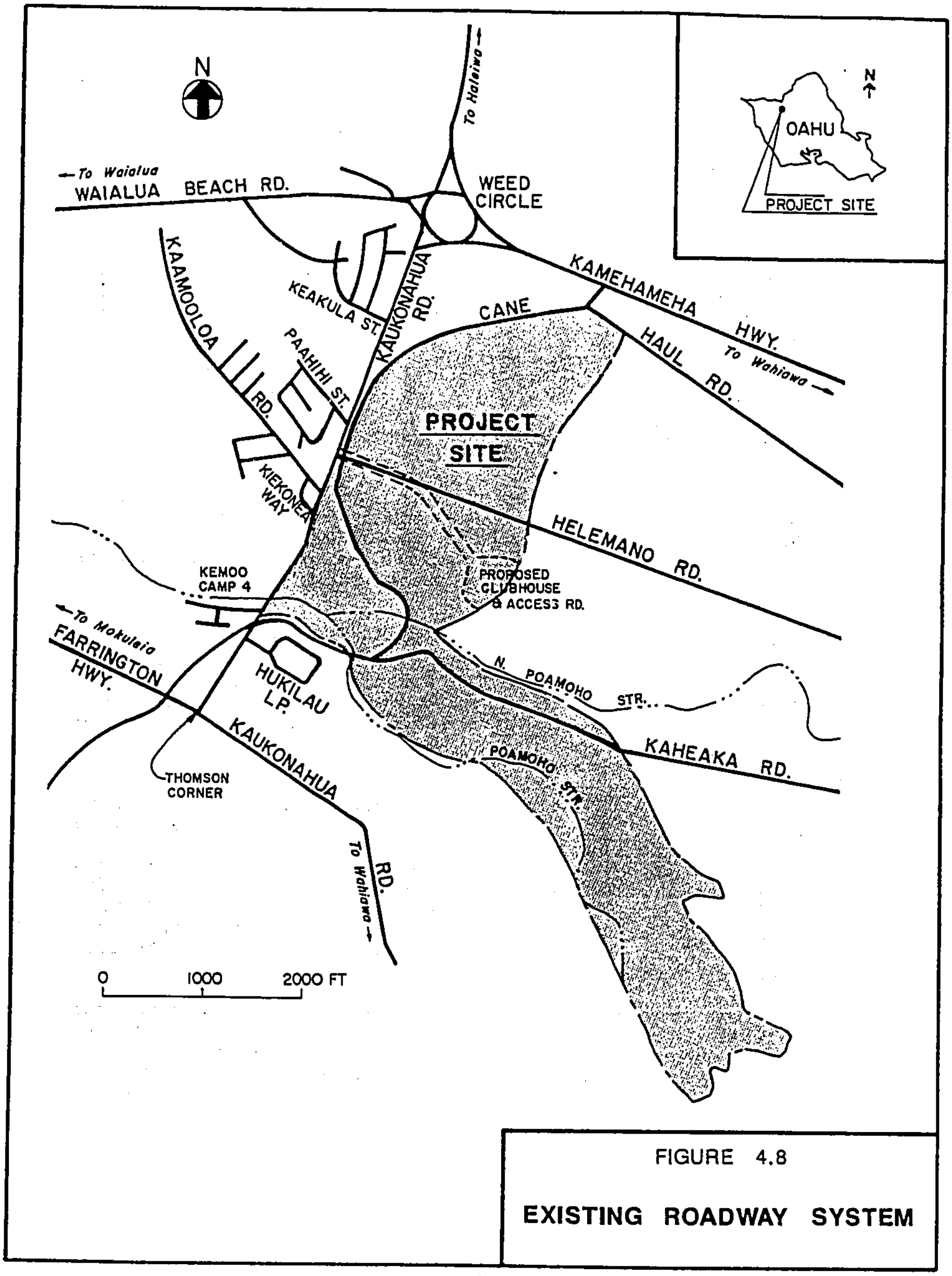


FIGURE 4.8

EXISTING ROADWAY SYSTEM

Kaukonahua Road between Weed Circle and Thomson Corner has a posted speed limit of 35 mph. Keakula Street, Paahihi Street, Kaamooloa Road, and Hukilau Loop serve residential areas and form T-intersections along Kaukonahua Road. The minor street approaches are stop-controlled with a single lane for left and right turns, while Kaukonahua Road approaches are single shared turn-through lanes.

Cane-haul and other agricultural roads also intersect the public road system. A cane-haul crossing of Kaukonahua Road occurs just north of Hukilau Loop; the cane-haul road network to the east can also be accessed at several other locations along Kaukonahua Road. An agricultural road proceeds south from Thomson Corner. These roadways have minimal traffic volumes, and have only seasonal use. (Parsons, Brinckerhoff, Quade and Douglas, 1987).

4.8.2 Existing Traffic Conditions

Kaukonahua Road in the vicinity of the proposed project serves local traffic generated by residents of the area, other Waialua traffic, commuters traveling between Oahu's North Shore and Central Oahu, and other vehicles visiting the area. The highest traffic volumes occur during weekday afternoons (PM Peak Hour) and in early afternoons on weekends.

Traffic counts taken by the Highways Division of the State Department of Transportation were evaluated to estimate existing (1988) weekday traffic volumes. Counts taken at Thomson Corner have not varied significantly between 1976 and 1985, as shown in Table 4.2. Existing weekday traffic volumes, therefore, were estimated using the latest available count, taken in November 1985.

The highest hourly traffic at Thomson Corner was recorded between 4:00 PM and 5:00 PM, during which time 1,750 vehicles were counted at the approach and departure legs of the intersection. The analysis of the unsignalized intersection, using the volumes from the traffic assignment shown in Figure 4.9, gives Level of Service (LOS) A for traffic turning left from eastbound Farrington Highway into Kaukonahua Road, and LOS B for traffic stopped on the southbound approach of Kaukonahua Road.

Between Thomson Corner and Weed Circle, Kaukonahua Road carries approximately 540 vehicles per hour (vph) during the PM Peak Hour. This volume is approximately 30 percent of the roadway's capacity. Evaluation of each of the T-intersections along this segment of road shows LOS A for all intersection movements.

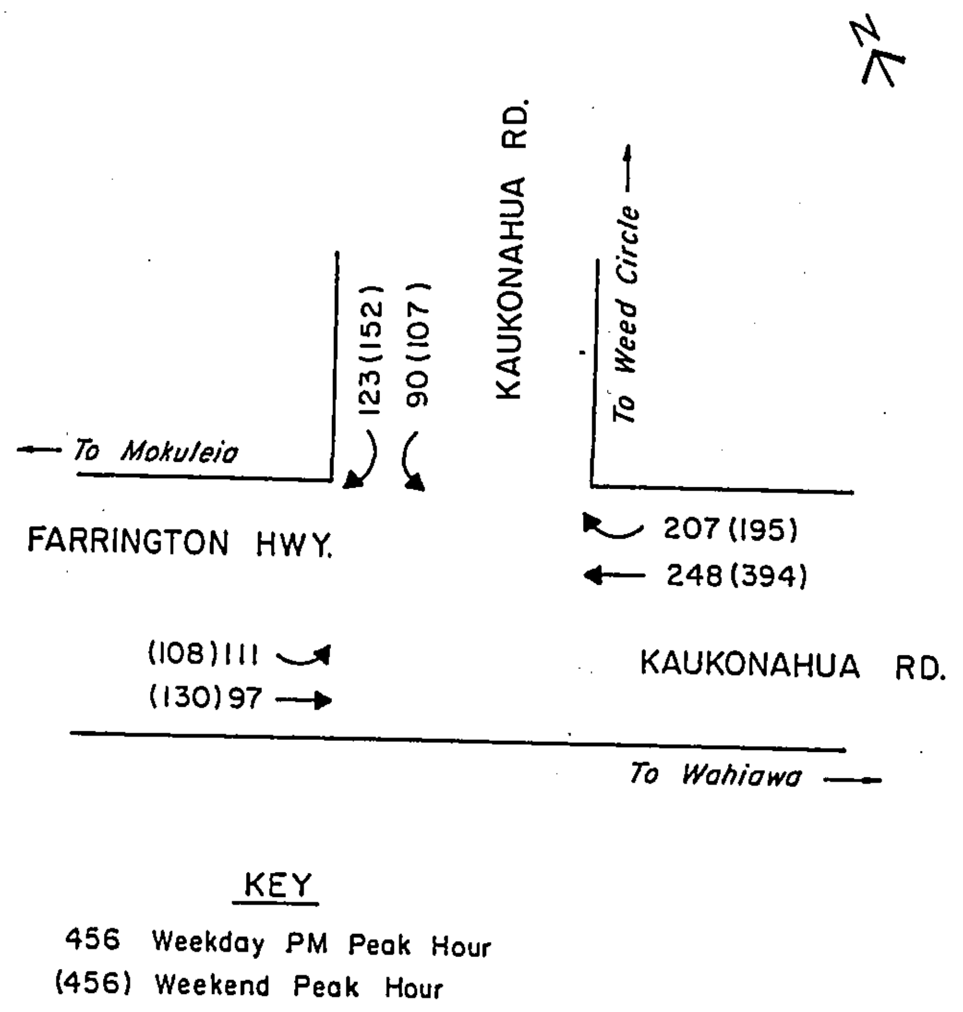


FIGURE 4.9

TRAFFIC ASSIGNMENT: EXISTING (1988) CONDITIONS, THOMSON CORNER

Table 4.2

TRAFFIC COUNT HISTORY

Thomson Corner

Date of Count	Entering traffic (vpd)
June 1976	7,883
April 1977	8,325
March 1978	8,671
August 1979	8,530
August 1981	7,641
August 1982	9,829
August 1983	9,442
September 1984	8,911
November 1985	8,887

vpd = vehicles per day

Source: State of Hawaii, Department of Transportation, Highways Division

State Highways Division traffic counts at Weed Circle show increasing traffic; between August and February 1985, daily entering traffic increased 23 percent. The increase, however, has occurred primarily on the Kamehameha Highway legs of the junction (Table 4.3). Based on the counts taken in this time, the 1988 traffic at Weed Circle is estimated to be 22,150 vehicles per day. Figure 4.10 shows the traffic assignment for Weed Circle.

Each merge location within Weed Circle was analyzed as an unsignalized intersection. Rotary traffic that stops or yields to Kamehameha Highway traffic would experience LOS C or average delays; northbound Kaukonahua Road traffic yielding to rotary traffic would be LOS A while LOS B describes the Waialua Beach Road entry.

Weekend conditions were evaluated based on traffic counts and field observations made in 1986 as part of a traffic study for a proposed development in Mokuleia. The weekend peak hour is expected to occur on Sunday, between 1:15 p.m. and 2:15 p.m. Weekend traffic volumes were estimated to increase at rates of one percent per year at Thomson corner and two percent per year at Weed Circle. (Parsons, Brinckerhoff, Quade and Douglas, Inc., 1986).

The unsignalized intersection analyses of the weekend traffic assignments shown in Figures 4.2 and 4.3 show long or very long delays occurring at both Thomson Corner and Weed Circle. Although LOS A describes the Farrington Highway-to-Kaukonahua Road left turn at Thomson Corner, southbound Kaukonahua Road traffic has LOS D. At each T-intersection along Kaukonahua Road between Thomson Corner and Weed Circle, weekend peak hour conditions are described by LOS A.

At Weed Circle, rotary traffic yielding to the high volume of traffic on Kamehameha Highway for Wahiawa experiences very long delays, or LOS E. Rotary traffic stopped for Kamehameha Highway traffic from Haleiwa has LOS C; the other yield-controlled junctions operate at LOS A. (Parsons, Brinckerhoff, Quade and Douglas, Inc., 1987).

Table 4.3

TRAFFIC COUNT HISTORY

Weed Circle

	Entering Traffic (vpd)			
	August 1982	August 1983	September 1984	February 1985
East (Kamehameha Hwy.)	3,670	3,969	4,860	5,516
North (Kamehameha Hwy.)	6,585	7,163	6,868	7,964
West (Waialua Beach Rd.)	2,621	2,925	2,880	2,895
South (Kaukonahua Rd.)	2,628	2,666	2,509	2,729
Total entering	15,504	16,723	17,117	19,104

vpd = vehicles per day

Source: State of Hawaii, Department of Transportation, Highways Division

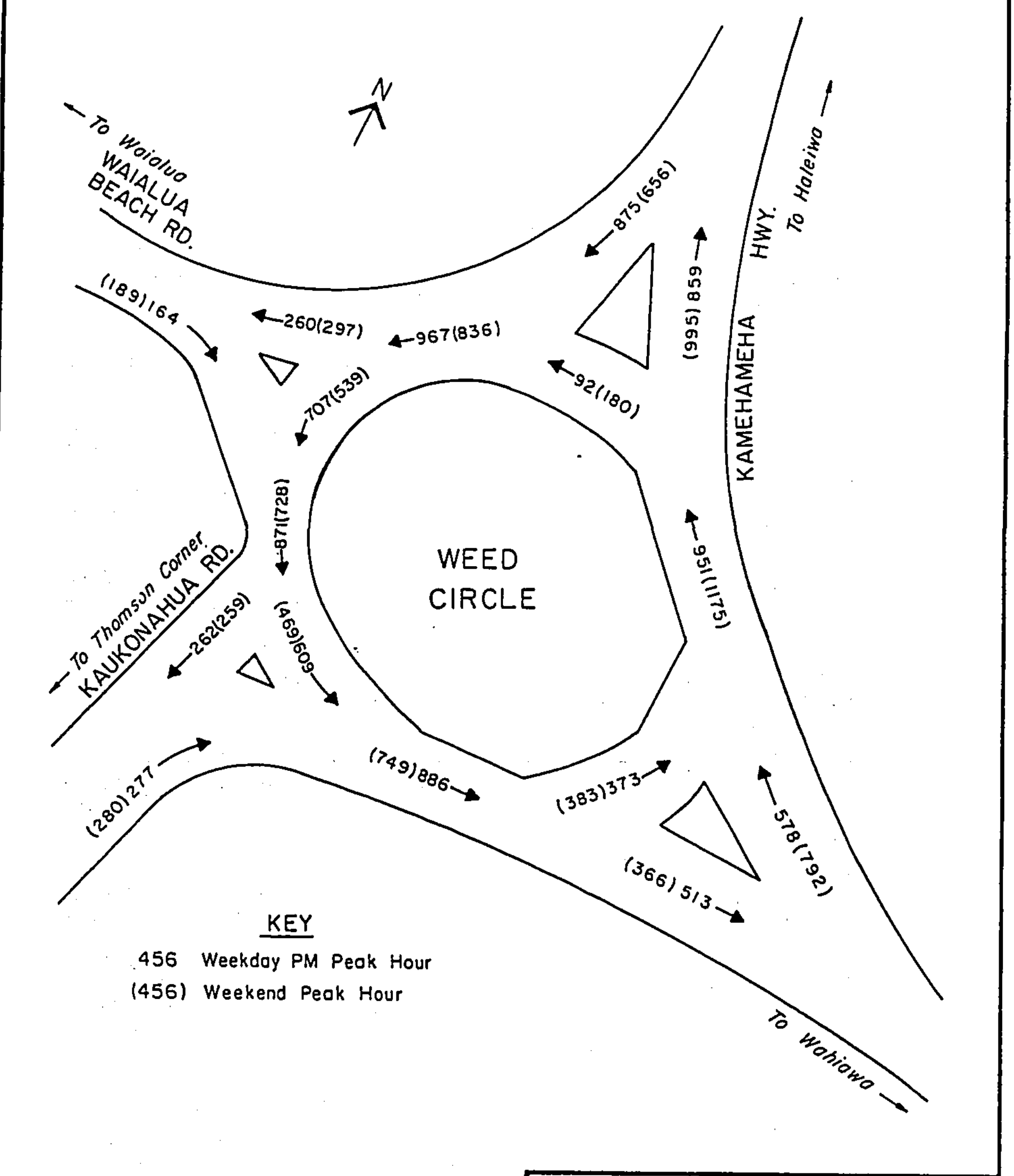


FIGURE 4.10

TRAFFIC ASSIGNMENT: EXISTING (1988) CONDITIONS, WEED CIRCLE

4.9 Air and Water Quality

4.9.1 Air Quality

There are no ambient air quality monitoring stations within the immediate vicinity of Waialua. Under prevailing trade wind conditions there is no industrial activity upwind for thousand of miles and it is reasonable to assume that present air quality is quite good.

The only significant sources of man-made air pollution in the area found by Root (1987) are motor vehicles traveling on nearby roadways and sugar cane growing and harvesting activities. Fugitive dust from cane cultivation and smoke from field burning at harvest time could create periodic high levels of particulates in the project area, but these activities are infrequent enough to present only a minor annoyance to area residents.

Natural air pollutant producers which could affect Waialua air quality include the ocean (sea spray), plants (aero-allergens), dust, and perhaps a distant volcanic eruption on the island of Hawaii. Concentration of pollutants from these kinds of sources should be fairly uniform for most Oahu locations.

The nearest long term air pollution monitoring station to the project site is located in Pearl City, about 15 miles to the southeast. At present, only particulates are measured at Pearl City, but until 1986 sulfur dioxide was also monitored there. For both pollutants, measured values for the past several years have been far below allowable air quality limits.

Oahu-wide air pollution monitoring data indicated that State of Hawaii ambient air quality standards for particulates, sulfur dioxide, nitrogen dioxide, and lead are currently being met at most locations.

On the other hand, carbon monoxide and ozone readings from urban Honolulu indicate that allowable State of Hawaii standards for these vehicle-related air pollutants are being violated at a rate of about one to three times a year. Ozone is an indicator of the formation of photochemical pollutants in the air, a condition which tends to develop if the air mass over the islands has been fairly stable with little wind flow for a period stretching over several days.

Concentration of carbon monoxide are more directly related to vehicular emissions and tend to be highest during peak hour traffic conditions. Carbon monoxide would thus be the pollutant most likely to cause difficulty in meeting allowable Air Quality Standards as a result of new project development on Oahu.

Appendix I contains the complete air quality study for this project.

4.9.2 Water Quality

The portion of Poamoho Stream within the project site experiences seasonal flow dependent on rainfall; thus, water quality information is limited. Downstream of the project site, Poamoho Stream flows to Kiikii Stream, which empties into Kaiaka Bay.

There is little information available on the aquatic community in Kiikii Stream. Sunn, Low, Tom & Hara, Inc., (1972) reported the presence of 200 planktonic organisms in Kiikii Stream, including copepods, mysid shrimps, fish and crab larvae, amphipods, and nematode worms. The stream is used primarily for fishing and crabbing. The most prominent type of fish catches were aholehole, mullet, goby, barracuda, and tilapia. Samoan and blue claw crabs were also found in Kiikii Stream. Boating and swimming in the stream are less common, possible due to turbitiy, muddy bottom layer, and large quantity of heavy organic debris on the stream bottom.

As presented in Section 4.2.2, existing soil erosion potential at the site is as follows:

1,074 tons	in plateau area
154 tons	in stream valley
1,228 tons	

Fertilizers. Fertilizers are applied to approximately 142 acres within the proposed development site presently cropped with sugar cane. The principal fertilizer nutrients applied are nitrogen (N), potassium (K), and phosphorus (P); water soluble forms are applied through the drip irrigation system. According to information provided by Waialua Sugar Co., 350 pounds per acre of N, 100 pounds per acre of P_2O_5, and 400 pounds per acre of K_2O are applied for each two-year crop. All fertilizer is applied during the first ten months of the crop cycle.

Pesticides. Pesticide use for insect and disease control in sugar cane culture is minimal since insects are controlled biologically. Fungicide is used only to treat seed pieces before planting (principally Benlate); thus, the quantities applied are small and localized. Only herbicides for weed control are applied to the soil as surface sprays, usually two or three times in the first six months after planting. Herbicide practices have not changed substantially in the past twenty years, with the exception of the adoption of the use of glyphosate (Roundup) for infield post-emergence spot spraying and control of weeds in field boundaries, ditches, and road sides. The principal pre-emergence herbicides used in the Waialua area are atrazine and ametryn. Typical quantities applied, according to information provided by Waialua Sugar Co., are 8 pounds active ingredient (ai) per acre per crop of ametyrne and 3 to 5 pounds of atrazine.

4.10 Social and Economic Characteristics

The project site is located within the designated boundaries of the U.S. Census Department "Waialua Division," as well as in the North Shore Development Plan Area and the North Shore Neighborhood Board of the City and County of Honolulu.

Situated in census tract 99.01, the project site is part of the Waialua community. Waialua had a 1980 population of 4,051 and is the most populous community in the North Shore Development Plan Area. Almost half of Waialua's population was Filipino, and a quarter was Japanese. Caucasians comprise almost one-fifth of the Waialua communities. Compared to other North Shore communities, Waialua's population was generally older. (Community Resources, Inc., 1986).

The size of Waialua's population has changed little over the past four decades. Although the community's physical appearance has changed -- with expanded commercial development and public facilities -- the sugar mill stack continues to dominate the Waialua skyline.

In more recent years, some commercial and public facility developments such as a small convenience shopping center and the Waialua Recreation Center, along with relatively newer residential subdivisions, such as the neighboring Paalaa Kai, have modernized the community's character. Further, these residential subdivisions have added to the population and brought more young families back into what had begun to be an aging community. (Community Resources, Inc., 1986).

Almost 40 percent of Waialua's 1980 civilian labor population were employed in either "Manufacturing" or "Agriculture" industries. By comparison, less that 10 percent of Oahu's 1980 population were employed in these industries.

Estimated unemployment rates for the Waialua and the other North Shore communities were similar to the Oahu unemployment rate of 5.1 percent. (Community Resources, Inc., 1986).

The North Shore's major current economic activities are the sugar operations at Waialua and diverse retail activities in the Haleiwa area.

CHAPTER 5

POTENTIAL IMPACTS AND MITIGATION

5. POTENTIAL IMPACTS AND MITIGATION

5.1 Grading

Impacts due to grading the golf course site include: (1) generation of dust and noise and (2) soil erosion. Based on a one-year construction schedule, these impacts are considered short-term.

Fugitive dust generated from grading activities can be mitigated by watering exposed surfaces and traffic areas by water truck or temporary sprinklers. The impact of construction noises on the surrounding community can be mitigated by limiting construction to weekdays and hours when residents are usually at work. Construction practices to mitigate dust and noise nuisances will be in conformance with the following State of Hawaii Department of Health Title 11 Regulations:

Chapter 42 - Vehicular Noise Control for Oahu

Chapter 43 - Community Noise Control for Oahu

Chapter 60 - Air Pollution Control

An estimate of soil erosion potential can be calculated using the Universal Soil Loss Equation (USLE). Based on applicable site parameters, erosion potential during construction will be 76 tons/acre/year in the plateau area and 214 tons/acre/year in the stream valley.

The developer will mitigate the soil erosion impacts by installing a sedimentation basin at the onset of grading and limiting grading to increments of 15 acres or less. Implementation of these measures will reduce soil erosion potential to 32 tons/acre/year and 90 tons/acre/year for the plateau and stream valley respectively.

The developer will undertake additional erosion control measures to further lessen construction impacts. These include the following:

1. Minimize the duration 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 periods to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).

6. Use temporary berms and cut-off 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.

The 214-acre golf course site represents less than 2 percent of the Poamoho Stream tributary area. Thus, changes in erosion potential at the site due to development will have a relatively small effect on the stream in relation to the entire drainage area.

Further information on grading impacts are presented in Appendix D.

5.2 Drainage

The quantity of runoff from the site is expected to increase after development. Based on the Rational Method, peak runoff for the 10- and 50-year storms is listed below.

Storm Recurrence (yr)	Peak Runoff (cfs)
10	271
50	360

Site drainage after development of the golf course will remain similar to existing conditions.

The proposed golf course in the stream valley would maintain the natural slope and vegetation to allow for overland flow into the stream. In cases where the stream crosses a fairway, selective clearing of vegetation will be required to remove tall trees and bushes that may interfere with the flight of the ball or the vision of the golfer. Short, scrubby vegetation along the stream can remain.

In the plateau area, stream drainage will be directed to a 3 MG drainage detention pond on the makai side of the plateau near Kaukonahua Road. Storm runoff would exit the drainage pond via a series of swale/channels and drain pipes, with ultimate release at the driving range. The drainage pond would provide a dampening effect, releasing runoff to the stream via the driving range at a slower rate than storm flows. The driving range will serve as an open area where storm drainage can sheet flow into the stream. Slopes across the driving range will be sufficient to prevent boggy conditions, but not sufficiently steep to cause erosion of the range. The golf course will be designed to incorporate small depressions to serve as temporary storage-flow abatement basins during heavy rains. Figure 5.1 illustrates this drainage modification.

Within the project site, runoff is calculated to increase by 195 percent for the 10-year storm and 195 percent for the 50-year storm. However, in comparison to the entire Poamoho Stream watershed, the increase in runoff represents only 2.8 percent and 2.4 percent for the 10-year and the 50-year storms respectively. The drainage detention pond will have a dampening effect on runoff to the stream and may be able to reduce runoff close to existing conditions. The drainage report for his project is presented in Appendix C.

5.3 Water Quality

Water quality impacts are addressed with regard to erosion and sediment loading, fertilizers, and pesticides. Additional information on water quality is contained in Appendix F.

5.3.1 Erosion and Sediment Loading

Turf grasses are relatively permanent. Once an area is established, it is not cultivated and subjected to the associated erosion that occurs when sugar cane fields are cultivated for replanting. The presence of a large turfed area, such as the proposed golf course, would reduce the sediment load entering Poamoho Stream and eventually Kaiaka Bay.

Based on the Universal Soil Loss Equation (USLE), annual soil erosion potential at the site after development is calculated to be:

108 tons	in plateau area
154 tons	in stream valley
262 tons	

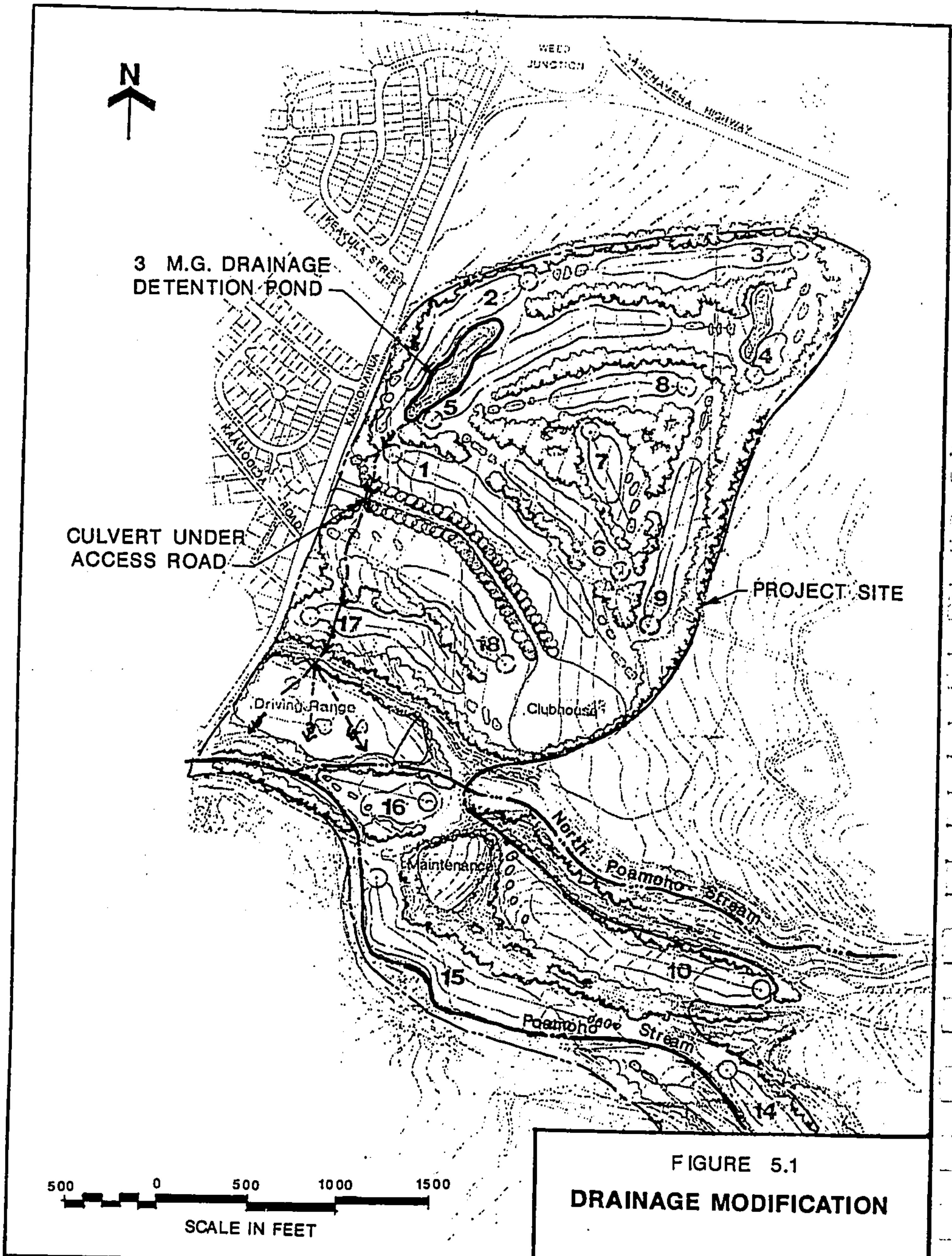


FIGURE 5.1

DRAINAGE MODIFICATION

The erosion potential of the plateau area should decrease by 90 percent and the erosion potential of the entire site should decrease by 79 percent after development.

Thus, the impact of sedimentation on Poamoho Stream will be less. (Engineering Concepts, 1987c).

<u>Fertilizer</u>. Fertilizers are normally applied to only the greens, tees, fairways, and part of the roughs of a golf course. Complete fertilizers (those containing N, P, and K) are usually applied.

Nitrogen applied in the ammonium (NH_4) form is rapidly coverted to the nitrate (NO_3) form, which does not bind to the soil and moves readily in water. Approximately 25 percent of applied nitrogen infiltrates into the ground under normal conditions. Under conditions where excessive rainfall occurs soon after application of a soluble nitrogen source, there may be excessive loss by surface runoff or leaching below the root zone. Nitrogen will be used rapidly after application due to high nitrogen uptake by turf grasses.

Because only a small portion of the golf course is fertilized, total fertilizer use will be similar to the existing sugar cane quantities. Sugar cane culture uses 350 pounds of nitrogen per acre for one year of the two-year growing cycle, resulting in about 25 tons of nitrogen for the 142 acres of the proposed golf course site that is presently in sugar cane. Golf courses require approximately 15.2 tons of nitrogen each year; thus, for a two-year period, about 30.4 tons of nitrogen would be applied in golf course fertilization. However, because the total amount of fertilizer for the two-year sugar cane crop is applied during the first ten months of the crop, fertilizer application rates are much more concentrated and are therefore more subject to runoff loss than those of golf courses.

Phosphorus attaches tightly to iron and aluminum hydroxides, which are plentiful in the soil, and moves little, if any, from the site of application. Ammonium nitrogen also moves little in soils. Problems with these chemicals may occur due to sediment transport, where soil particles themselves are transported via runoff to streams or drainage ponds.

Although the concentrations of phosphorus and ammonium nitrogen in runoff should not increase, concentrations in sediment deposited at the bottom of streams or ponds could increase due to chemicals bound to the soil. Erosion potential was calculated to decrease after development of the golf course; thus, sediment transport should decrease along with concentrations of sorbed chemicals in stream and pond sediments.

5.3.2 Pesticides

There are a number of weed, insect, and disease pests of turf grasses in Hawaii that sometimes require application of chemical pesticides. Pesticide are normally applied only in response to outbreaks of pests. There are few instances in which pesticides are applied in a regularly scheduled, preventive program. A typical pesticide program for golf courses in Hawaii is listed in Table 5.1.

Because the area treated with pesticides on a golf course is small, the total amount of pesticide applied is relatively small also. The pesticides used in golf course management are mostly of very low toxicity, either rapidly degraded in soil and/or sorbed tightly to organic matter or soil colloids and move little from the site of application. (See Table 5.2).

Because of the absorption of organic phosphate insecticides on organic layers in turf and their rapid breakdown, there is little chance of their movement from grassed areas into the ponds associated with the proposed golf course. Label instructions for application of these pesticides (which turf grass managers are required by law to follow) specifically prohibit their direct application to streams and ponds. (Murdoch & Green, 1988).

Based on the general characteristics of proposed golf course pesticides, interference with groundwater resources is not foreseen. Diazinon and chlorpyrifos, the proposed golf course pesticides of greatest concern due to wildlife toxicity, have half-lives of less than 1 week. In fact, 95% of decomposition occurs within 1 week. (Murdoch & Green, 1988). In comparison, some chemicals applied to agricultural crops which have been defected in groundwater supplies are atrazine (sugarcane), DBCP (pineapple), and EDB (pineapple). Both atrazine and EDP have half-lives in soil of 80 days. The half life of DBCP in soil is 180 days.

5.4 Biological Resources

As there is little of botanical interest on the site, the proposed project is not expected to have a significant impact on the total island populations of the species involved.

TABLE 5.1

A TYPICAL PESTICIDE PROGRAM FOR GOLF COURSES IN HAWAII

Turf Grass Area	Area (acres)	Chemical	Frequency	Rate/ Application	Annual Total
HERBICIDES					
Greens	3	MSMA	6 times/year	2 lb ai/acre	36 lb ai
		Bensulide	2 times/year	12 lb ai/acre	72 lb ai
Tees	3	MSMA	6 times/year	2 lb ai/acre	36 lb ai
		33 Plus	3 times/year	1 pint/acre	9 pints
		Bensulide	2 times/year	12 lb ai/acre	72 lb ai
Fairways	50	MSMA	6 times/year	2 lb ai/acre	600 lb ai
		33 Plus	3 times/year	1 pint/acre	19 gallons
		Metribuzin	2 times/year	0.75 lb ai/acre	75 lb ai
Perimeter areas	20	Glyphosate	3 times/year	1.5 lb ai/acre	90 lb ai
INSECTICIDES					
Greens	3	Chlorpyrifos	As needed	1 lb ai/acre	Approx 18 lb ai
Tees	3	Chlorpyrifos	As needed	1 lb ai/acre	Approx 18 lb ai
Fairways (spot treatments)		Chlorpyrifos	As needed	1 lb ai/acre	Approx 50 lb ai
		Diazinon	As needed	4 lb ai/acre*	Approx 250 lb ai
FUNGICIDES					
Greens	3	Metyalaxyl	As needed	1.3 lb ai/acre	Approx 25 lb ai
		Chlorothailonil	As needed	8 lb ai/acre	Approx 72 lb ai
Tees	3	Metyalaxyl	As needed	1.3 lb ai/acre	Approx 25 lb ai
		Chlorothailonil	As needed	8 lb ai/acre	Approx 72 lb ai
Fairways (spot treatments)		Chlorothailonil	As needed	8 lb ai/acre	Approx 250 lb ai

* Two 2 lb ai/acre applications spaced seven days apart, watered with minimum 1/4-inch water.

Source: Murdoch & Green, January 1988.

Table 5.2 Properties of typical pesticides used in golf courses in Hawaii.

Pesticide common name	Trade name(s)	Oral LD-50 (mg/kg body wt.)	Toxicity to fish & wildlife	Water Solubility	Soil behavior
Herbicides:					
MSMA	WeedHoe etc.	1800	Low	Very soluble	Tightly sorbed
glyphosate	Roundup, Kleenup	150	Mod. to birds, none to fish	Very soluble	Inactivated on soil contact
metribuzin	Sencor	2200	Moderate	122 mg/l	Moves readily, Rapidly degraded
bensulide	Betasan, Betamec	770	Mod. to fish	25 mg/l	Tightly sorbed-long residual
Insecticides					
diazinon	Spectricide	300-850	High	4 mg/l	Readily degraded
chloropyrofos	Dursban	135-163	High	2 mg/l	Slowly degraded, strongly sorbed
Fungicides					
chlorothaionil	Daconil 2787	10000	Low to birds, mod. to fish	0.6 mg/l	Half-life 1.5-3.0 mo.
metalaxyl	Subdue	669	Non-toxic	7.1 g/l	Rapidly degraded

Source: Murdoch & Green, January 1988

While most of the streamside vegetation will remain largely undisturbed, vegetation in some areas of Poamoho Stream and North Poamoho Stream may be disturbed for golf cart crossing. It is recommended that these areas be revegetated as soon as possible to prevent erosion and discharge of sediments into the stream.

Among the animal species inventoried during the survey, only the Golden Plover is native; all the rest are foreign species introduced intentionally or accidentally by man.

Wetland areas which support a number of endangered Hawaiian waterbirds and migratory species occur in the general Waialua-Hale'iwa area. Endangered waterbirds such as the Hawaiian Coot and Duck, as well as the migratory Golden Plover, are expected to utilize the water hazards and greens for feeding and loafing. Of concern, is the potential pesticide poisoning of these species. (Char and Associates, 1987).

It is noted, however, that 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 nontoxic unless ingested in large amounts. All herbicides and fungicides used in golf course maintenance in Hawaii are of low to moderate toxicity. The only chemicals used in golf course maintenance in Hawaii that are highly toxic to birds are the organic phosphate insecticides, especially diazinon and chlorphrifos. Half lives of these insecticides are relatively short.

Diazinon has been used on Hawaii golf courses for more than 20 years (both granular and liquid formulations). There have been no reports of bird injury from this pesticide on golf courses in Hawaii. From observations of birds using grassed areas and ponds on golf courses in Hawaii, it appears that golf courses are excellent habitats for birds.

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. At no time is it legal to use a pesticide anywhere in Hawaii unless its use is approved by the EPA and the Hawaii Department of Agriculture. (Murdoch & Green, 1988).

5.5 Archaeological Resources

An archaeological or historical site may be judged significant on three grounds: its desirability for exhibition to the public in a museum atmosphere, its cultural significance to an existing group, and its value for future scientific research. It is the opinion of Chiniago, Inc., (1987) that the single site found during this survey does not qualify to be placed in any of these categories. The site has been adequately recorded, and no further archaeological study is required.

The portion of the project area on the sloping hillsides outside of Poamoho Gulch has been in sugarcane cultivation for over 90 years, and has repeatedly been plowed to a depth of 20 inches. If any archaeological or historical remains had been located in this area, they have been destroyed. No further archaeological work is required there.

Although no surface evidence was found, there is a possibility that old agricultural deposits may be buried beneath the ground in Poamoho Gulch. If any remains are uncovered during construction, the State Historic Preservation Office will be consulted to determine procedures for their proper study before construction is allowed to proceed.

5.6 Utilities

5.6.1 Water Supply

Proposed Development. Based on BWS Water System Standards, the projected domestic water demand is 20,000 gallons per day (gpd) and the projected demand for fire protection is 2,000 gallons per minute (gpm) over a two-hour duration.

Irrigation requirements are based on a rate of 1.5 inches per week over 100 acres of land. The 100 acres includes the area occupied by tees, greens, and fairways on a typical golf course in Hawaii. This translates to a projected annual irrigation demand of 0.58 million gallons per day (MGD).

Connection to the existing BWS water system, as illustrated in Figure 5.2, is the proposed method of meeting domestic and fire protection demands at the site. There is adequate capacity at the existing Waialua reservoir and wells to meet projected water demands from the proposed golf course.

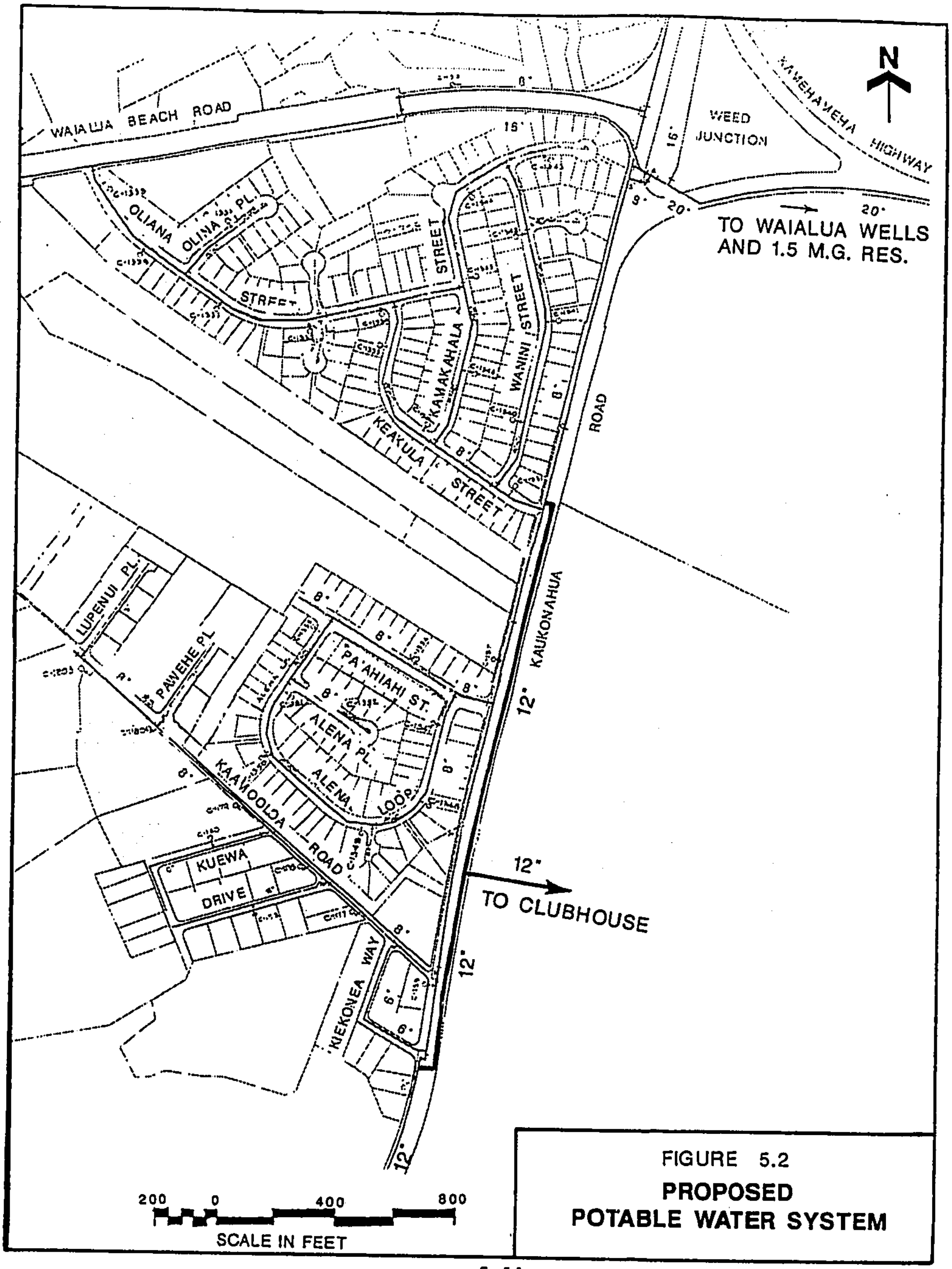


FIGURE 5.2
PROPOSED POTABLE WATER SYSTEM

However, the capacity of the existing 8-inch water line along Kaukonahua Road is insufficient to provide the required fire protection rate. To increase the capacity of the Kaukonahua line, a 12-inch main will be installed along Kaukonahua Road parallel to the existing 8-inch line. Approximately 1,900 linear feet will be required to span from the vicinity of Kiekonea Way toward Weed Junction to Keakula Street.

Potable water to the clubhouse will require a 12-inch line off of the proposed 12-inch main along Kaukonahua Road. A smaller water line will tap off the 12-inch clubhouse line to service restrooms in the maintenance building.

Irrigation water for the site will be supplied by the Waialua Sugar Co. irrigation system. The 14-inch pipe line along Helemano Road will be tapped at a point upstream of the 8-unit filter station to divert a small portion of the water to a storage pond within the golf course. A pond capacity of 2 to 3 million gallons will be sufficient to store irrigation water for three to five days. Figure 5.3 presents the proposed irrigation system.

Impacts and Mitigation. Positive impacts expected from the golf course development include:

1. A lower demand for irrigation water; and
2. An increased capacity of the BWS distribution system within the area of Kaukonahua Road.

Change in land use from sugar cane to golf course will decrease water demand for irrigation purposes from 0.92 MGD to 0.58 MGD, a 37 percent reduction in irrigation demand at the site.

The noncaprock areas of southern Oahu have rainfall patterns and soils similar to the project site. Thus, an estimate of groundwater recharge before and after development can be calculated based on Water Balance of the Pearl Harbor-Honolulu Basin, Hawaii, 1946-1975 by T.W. Giambelluca (1983).

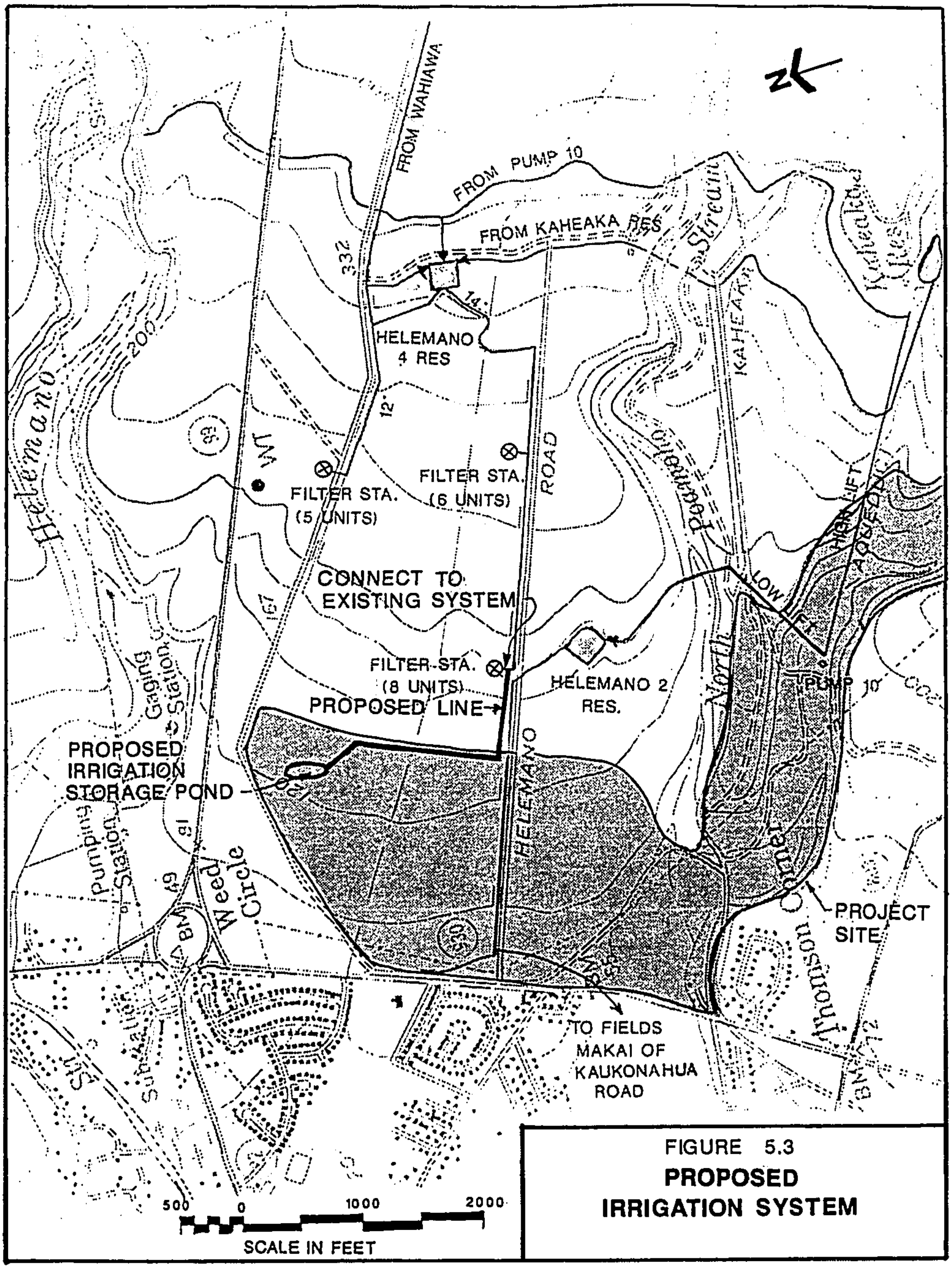


FIGURE 5.3
PROPOSED IRRIGATION SYSTEM

Source/Depletion	Existing Conditions	After Golf Course Development
Average Rainfall	+32 in/yr	+32 in/yr
Irrigation	+85 in/yr	+78 in/yr
Runoff	-2.7 in/yr	-6.4 in/yr
Evapotranspiration	-53 in/yr	-37 in/yr
Groundwater Recharge	+61 in/yr	+67 in/yr

Calculations indicate a slight increase in recharge after development of the golf course; thus, groundwater supplies should not be adversely impacted.

Addition of the 12-inch water line along Kaukonahua Road will increase the capacity of the BWS distribution system. Future developments along Kaukonahua Road may benefit from the increased capacity.

Negative impacts due to development of the golf course include:

1. Increased demand on the BWS system, and

2. Short-term construction impacts along Kaukonahua Road during installation of the 12-inch line.

The BWS reports in its Oahu Water Plan (4th Edition) that sustainable capacity of the Waialua wells was 2.00 MGD, with actual use of 1.67 MGD in 1980. The golf course will require an additional 0.02 MGD from the BWS system. Limitations of the BWS water system are due to infrastructure rather than source. Thus, negative impacts on the physical environment from a properly designed and operated water system should be negligible. (Engineering Concepts, Inc., 1987c).

Construction impacts due to installation of a 12-inch line along Kaukonahua Road will be short-term. Impacts can be mitigated by limiting construction to off-peak traffic hours.

Further information on water infrastructure and impacts are contained in Appendix F.

5.6.2 Proposed Wastewater Infrastructure

Projected Wastewater Flows. Wastewater flows from the golf course are anticipated to be primarily generated from clubhouse activities. These activities include: meal preparation and other related activities; personal hygiene, including toilet and lavatory; and showers.

The estimated average wastewater design flow is 20,000 gpd. The wastewater generated from the golf course will be of typical domestic composition.

Sewer Collection System. Wastewater generated from the clubhouse will be conveyed to the Paalaa Kai WWTP through the existing sewer system of the Paalaa Kai subdivision. An 8-inch line from the golf course will be installed crossing Kaukonahua Road and connecting to the existing manhole at the intersection of Paahihi Street and Alana Loop of Paalaa Kai Subdivision, Unit I.

Treatment and Disposal. The capacity of the Paalaa Kai WWTP, including the effluent disposal system, is 144,000 gpd. Currently, existing flows entering the treatment plant are 72,500 gpd. With an additional 20,000 gpd from the clubhouse, it would appear that the Paalaa Kai WWTP is capable of handling waste flows from the clubhouse.

In discussion with personnel of the Division of Wastewater Management (DWM), Department of Public Works, City and County of Honolulu, it was indicated that certain components of the solids treatment process are not capable of handling any additional waste flows. Specifically, an assessment by Belt, Collins & Associates indicated that an aerobic digestion unit and the sand drying beds at the Paalaa Kai WWTP are not adequate to accommodate any additional flows.

In order for the Paalaa Kai WWTP to accept waste flows from the proposed Waialua Golf Course, the following facilities must be constructed and are illustrated on Figure 5.4.

1. Aerobic digestion unit. Additional aerobic digestion capacity of 3,100 cfs is required. An aerobic digestion tank, air blower building, and necessary appurtenances will be required.

2. Sand drying beds. There are currently four compartments, each 54 feet by 20 feet. It is proposed to construct one additional sand bed compartment. Based on the design criteria of 3.5 square feet per capita, 700 square feet of sand bed area are required to accommodate waste flows from the proposed golf course.

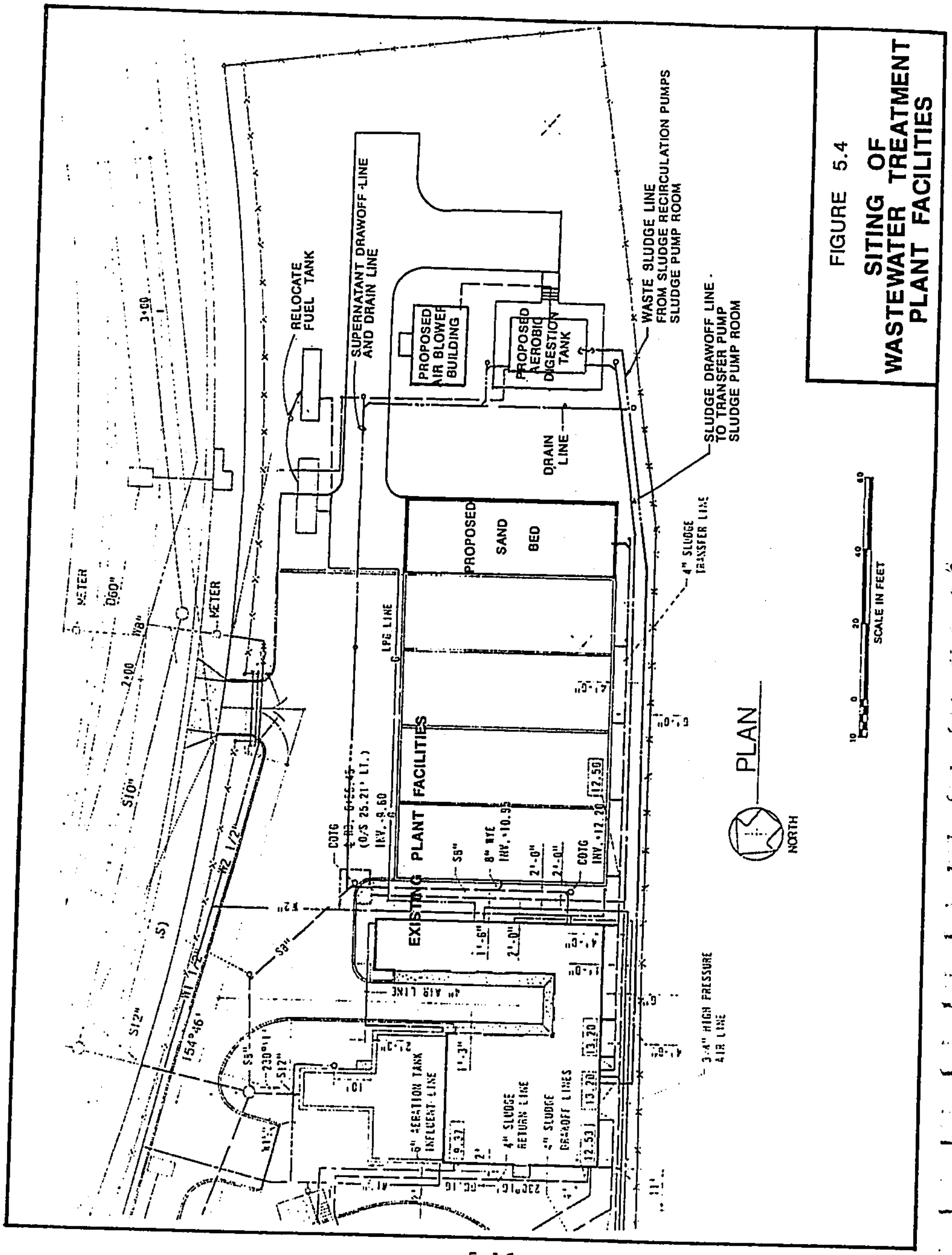


FIGURE 5.4
SITING OF WASTEWATER TREATMENT PLANT FACILITIES

Impacts and Mitigation Measures. As discussed further in Appendix E, the major impact of the additional flows from the golf course to the treatment plant would be directed at the solids treatment and handling system. Certain unit processes of the solids treatment and handling system are currently operating at design capacity. Additional flows to the Paalaa Kai WWTP would overtax these facilities, resulting in unstabilized and odorous sludge.

The proposed expansion of the solids treatment and handling system would eliminate the problem of overtaxing of the treatment process.

With regard to other unit processes and effluent disposal system, there should be no significant impact on effluent quality or odors since the facility is designed to handle the incremental flows from the golf course.

Short-term impacts would be construction-related. During the construction of the aerobic digester and air blower building, dust, noise, and traffic disruption would be noticeable.

Traffic would be affected primarily by trucks and heavy equipment entering and leaving the plant site, while dust and noise would occur from construction activities.

These impacts will be mitigated by implementing a watering program for dust control, regulating the hours of construction to minimize the impact of noise on adjacent neighbors, and scheduling construction traffic during off-peak hours. (Engineering Concepts, Inc., 1987b).

5.6.3 Electrical and Telephone

The electrical requirements for the proposed golf course are estimated to range between 25 and 65 kva. The minimum power requirement is based on light, power, and water heaters for locker room facilities, while the maximum requirement includes the addition of air conditioning and electric kitchen appliances.

Electricity can be provided by hook up to the existing Hawaiian Electric Company (HECO) 12 KV distribution line currently within the project site. The distribution line will be relocated beyond the project boundary at the developer's cost.

An option to relocation of the overhead distribution line is the installation of underground lines across the site. However, an underground system requires installation of two cables to provide back up service in case of a malfunction. The cost for underground distribution is three to six times higher than for overhead distribution and as a result, the developer will not implement this option.

HECO reports that there are no existing transmission lines (138 KV) within the project site, and it does not have future plans to install transmission facilities within the site. Thus, development of the proposed golf course will have no effect on HECO's transmission facilities.

Further, the existing Waialua Sugar Co. power lines will not be affected by the proposed golf course development.

According to Hawaiian Telephone Company (HTCO), the proposed golf course can utilize existing HTCO aerial facilities. There will be no significant effect on existing facilities or on the ability to maintain telecommunication services during construction. Adverse environmental effects resulting from HTCO telephone facilities are not foreseen.

5.6.4 Fire Protection Services

According to the Fire Department, fire protection is adequate, with primary company response from Waialua Fire Station. Assistance from the Sunset Beach or Wahiawa fire stations is available when necessary. The Fire Department requests that hydrants be located near the clubhouse and all other buildings in the development.

5.6.5 Solid Waste Disposal

The City and County of Honolulu Division of Refuse Collection has indicated refuse collection at the proposed golf course is available under the following conditions:

1. Adequate truck turnaround is provided.
2. A 3-cubic yard dumpster is provided.
3. Dumpster must be emptied without manual handling.
4. Minimum 12-foot wide access road, free of parking.

Refuse will be disposed of at the Kapaa sanitary landfill. Private collectors may also be solicited for refuse collection.

5.7 Traffic

5.7.1 Future Conditions Without the Project

The State Highways Division has programmed the Haleiwa Bypass Road project for completion by the end of 1992 (personal communication with H. Tao, Design Services, State Department of Transportation). The project will construct a two-lane highway bypassing Haleiwa town and connecting to Kamehameha Highway east of Weed Circle and north of Haleiwa. The project is expected to reduce traffic on Kamehameha Highway in Haleiwa, including Weed Circle.

With or without the proposed golf course, increases in traffic volumes in the North Shore area are expected. Although the proposed golf course is expected to be completed and in use by 1991, future conditions in 1993, without the Haleiwa Bypass Road, were evaluated to identify the project's potential traffic impact.

Weekday traffic volumes along Kaukonahua Road are not expected to change without development of the golf course. Traffic conditions at intersections would be similar to existing conditions since no roadway improvements are planned. The expected one percent per year increase in weekend traffic will have only minimal effect on traffic conditions; levels of service along Kaukonahua Road would not change.

At Weed Circle, however, traffic volumes are expected to increase considerably. Weekday traffic is projected to increase to 27,750 vehicles per day (vpd), with peak hour volumes increasing proportionately. Weekend peak hour traffic is also expected to increase, at a rate of two percent per year. Figures 5.5 and 5.6 show traffic assignments for 1993 without the proposed project.

The analyses indicate that PM Peak Hour conditions at Weed Circle would deteriorate slightly, falling to LOS B for traffic entering from Kaukonahua Road and LOS D for rotary traffic waiting for gaps in the westbound Kamehameha Highway traffic from Wahiawa. Weekend conditions would have greater change, with traffic demand exceeding capacity at the rotary/westbound Kamehameha Highway junction.

5.7.2 With the Proposed Project

The proposed project is an eighteen-hole golf course with a driving range and clubhouse. The traffic generated by the project is estimated from the total area of the site,

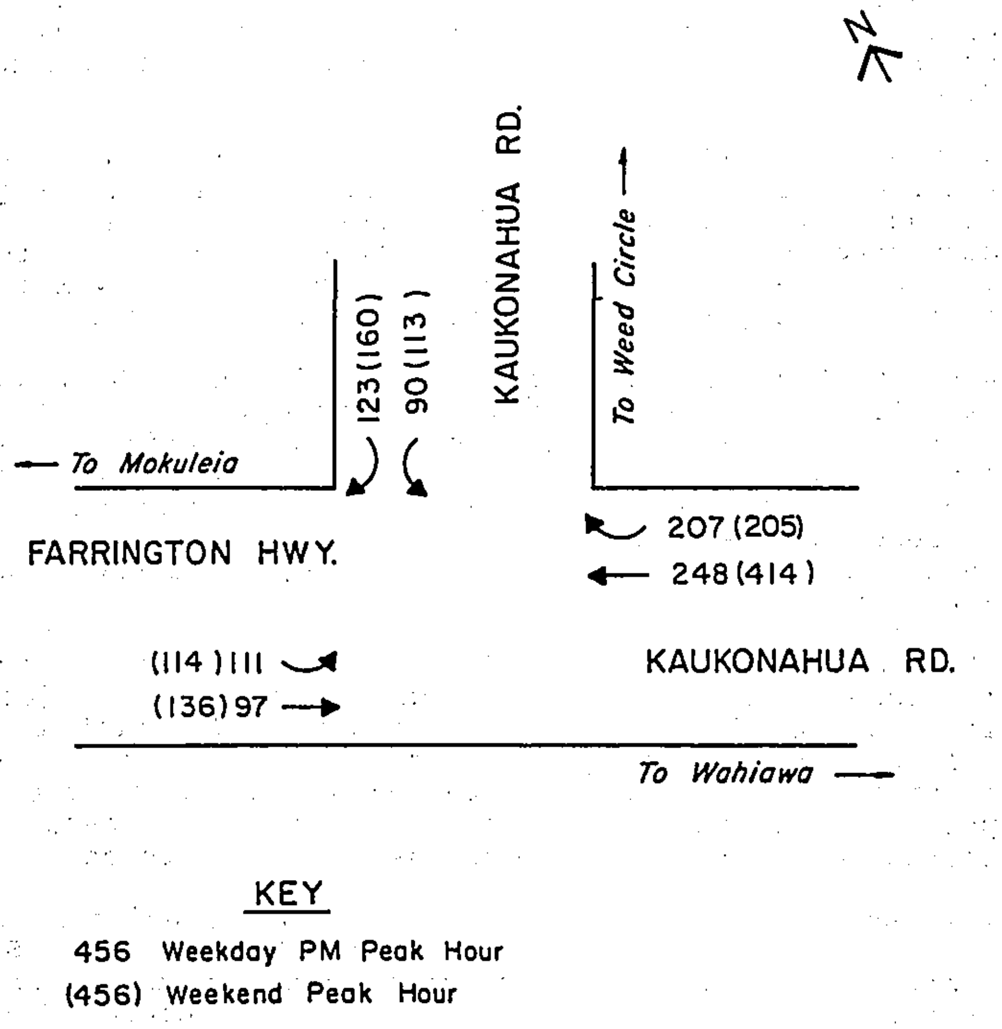


FIGURE 5.5

TRAFFIC ASSIGNMENT: FUTURE (1993) WITHOUT PROJECT, THOMPSON CORNER

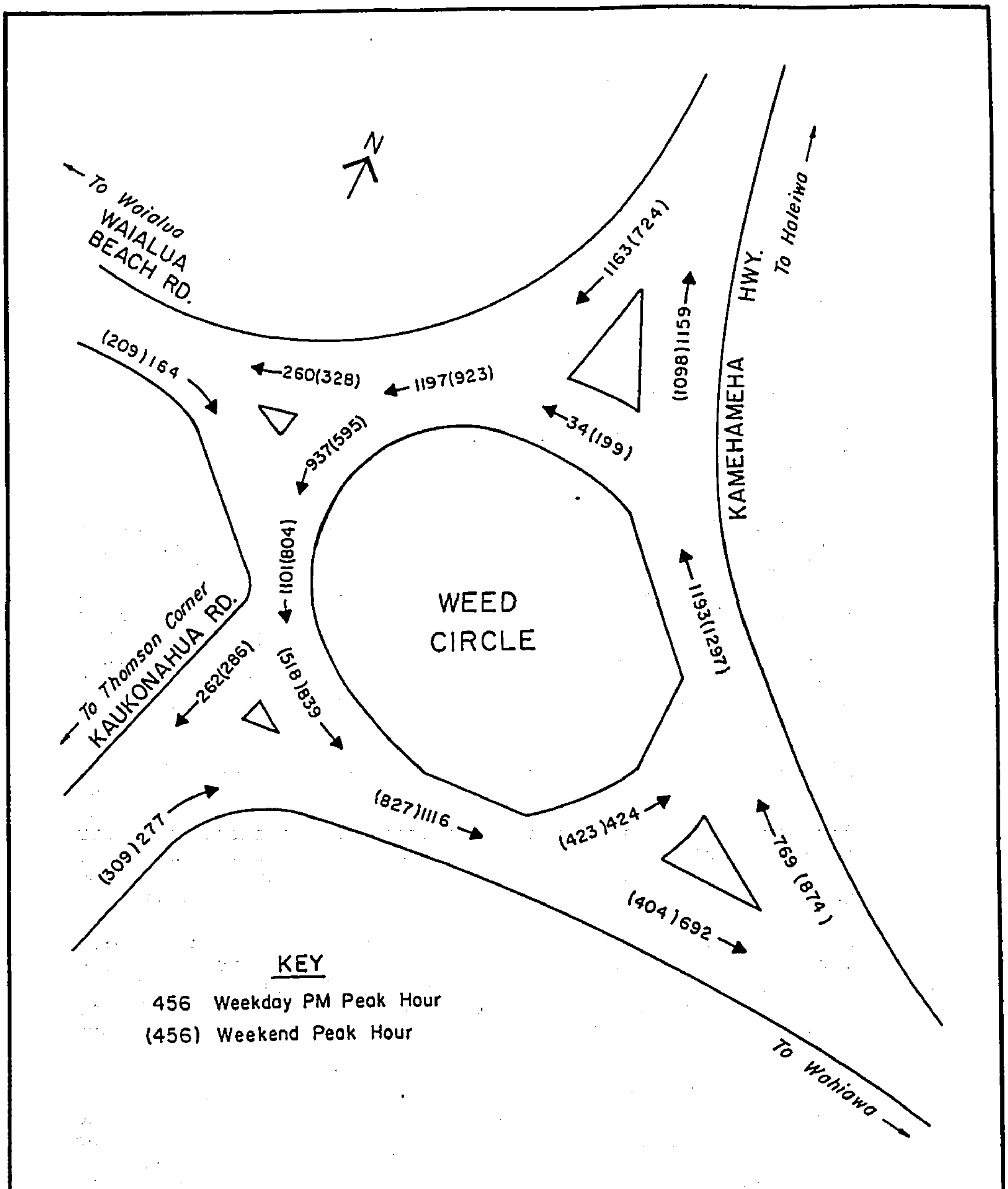


FIGURE 5.6

TRAFFIC ASSIGNMENT: FUTURE (1993) WITHOUT PROJECT, WEED CIRCLE

or 214 acres, as shown in Table 5.1. Traffic generated during the weekend peak hour was assumed to be divided equally between entering and existing.

Table 5.3

TRAFFIC GENERATION

	Trip Rate*	Traffic Generated
Average Weekday	6.9	1,480
PM Peak Hour - In	0.08	17
Out	0.31	66
Weekend Peak Hour	0.64	137

*Source: Institute of Transportation Engineers, Trip Generation (Third Edition).

Existing traffic volumes in the area were used to distribute project generated traffic. Table 5.2 shows the assignments of project traffic. Figures 5.7, 5.8 and 5.9 show future traffic assignments with the project. Project traffic was assumed to be part of the growth of traffic in the weekend peak hour, during which most trip purposes are recreational in nature. In the weekday PM peak hour, however, the project traffic was added to the other traffic in the area, since the other traffic included many diverse trip purposes.

Project Impacts. The proposed project will have minimal impacts when compared to future conditions without the project. At the southbound Kaukonahua Road approach to Thomson Corner, delays are expected to increase, with LOS E describing future weekend conditions with the project. Other levels of service during both peak hours at Thomson Corner and at Weed Circle would not change (Table 5.3).

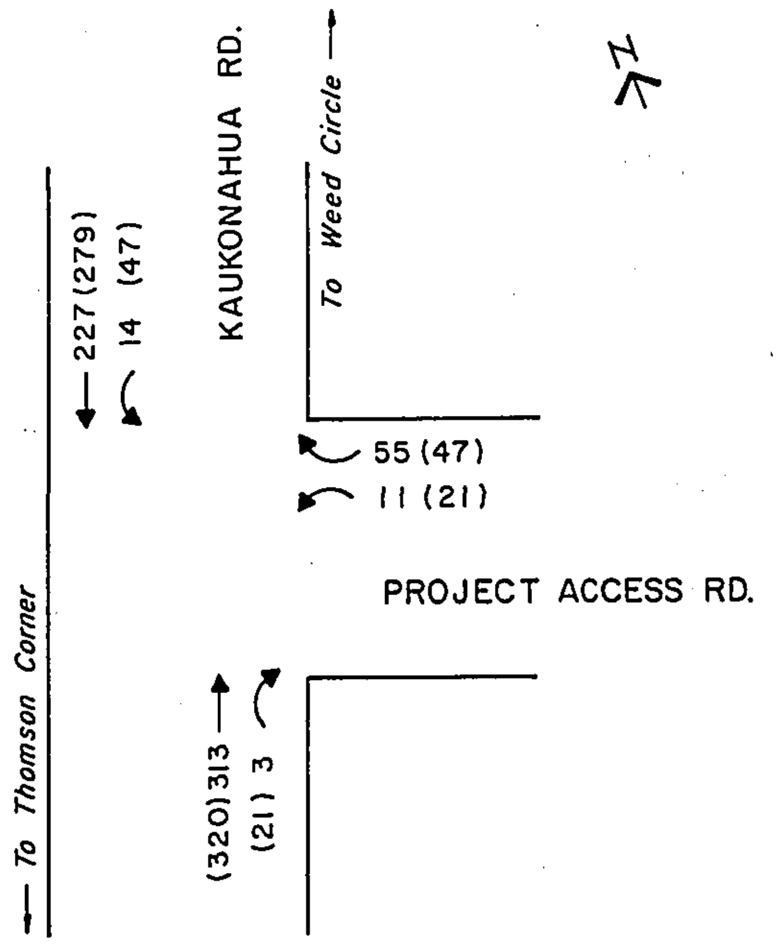
Along Kaukonahua Road, high levels of service will describe conditions at all intersections, including the project access road. An evaluation (Harmelink, 1967) of the left turn volumes at the project access road indicate that a separate left turn lane into the project should not be warranted.

The LOS F finding for rotary traffic at the merge with westbound Kamehameha Highway traffic during the weekend peak hour indicate that demand volumes would exceed theoretical capacity. This condition will be mitigated by the diversion of Kamehameha Highway traffic onto the Haleiwa Bypass Road, which is expected to be completed in

Table 5.4

TRAFFIC DISTRIBUTION

Roadway	PM Peak Hour from project	PM Peak Hour to project	Weekend Peak Hour from project	Weekend Peak Hour to project
Kamehameha Highway				
East (Wahiawa)	16	4	13	20
North (Haleiwa)	31	8	23	18
Kaukonahua Road				
East (Wahiawa)	4	2	8	14
Local	4	1	5	5
Farrington Highway				
West	6	1	12	6
Waialua Beach Road				
West	5	1	7	5
Total	66	17	68	68



KEY

456 Weekday PM Peak Hour
(456) Weekend Peak Hour

FIGURE 5.7
TRAFFIC ASSIGNMENT: FUTURE (1993) AT PROJECT ACCESS ROAD

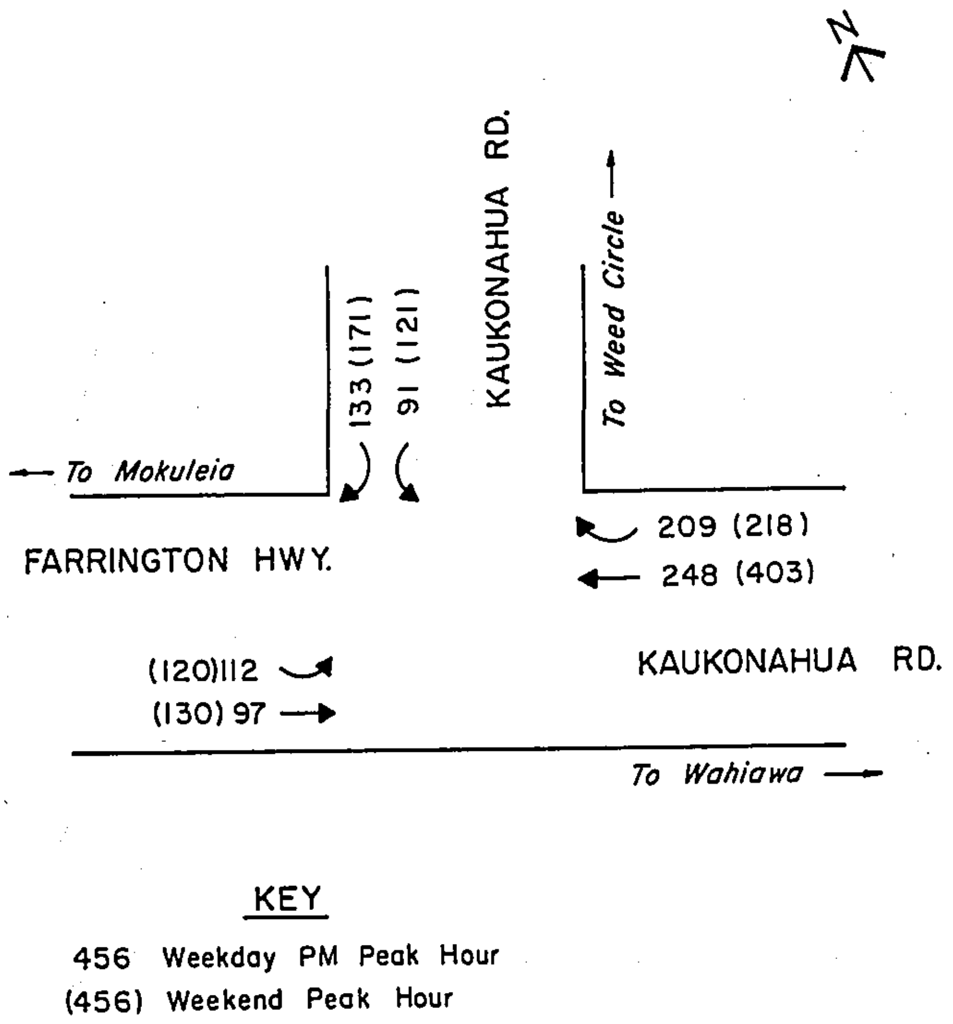


FIGURE 5.8
TRAFFIC ASSIGNMENT: FUTURE (1993) WITH PROJECT, THOMPSON CORNER

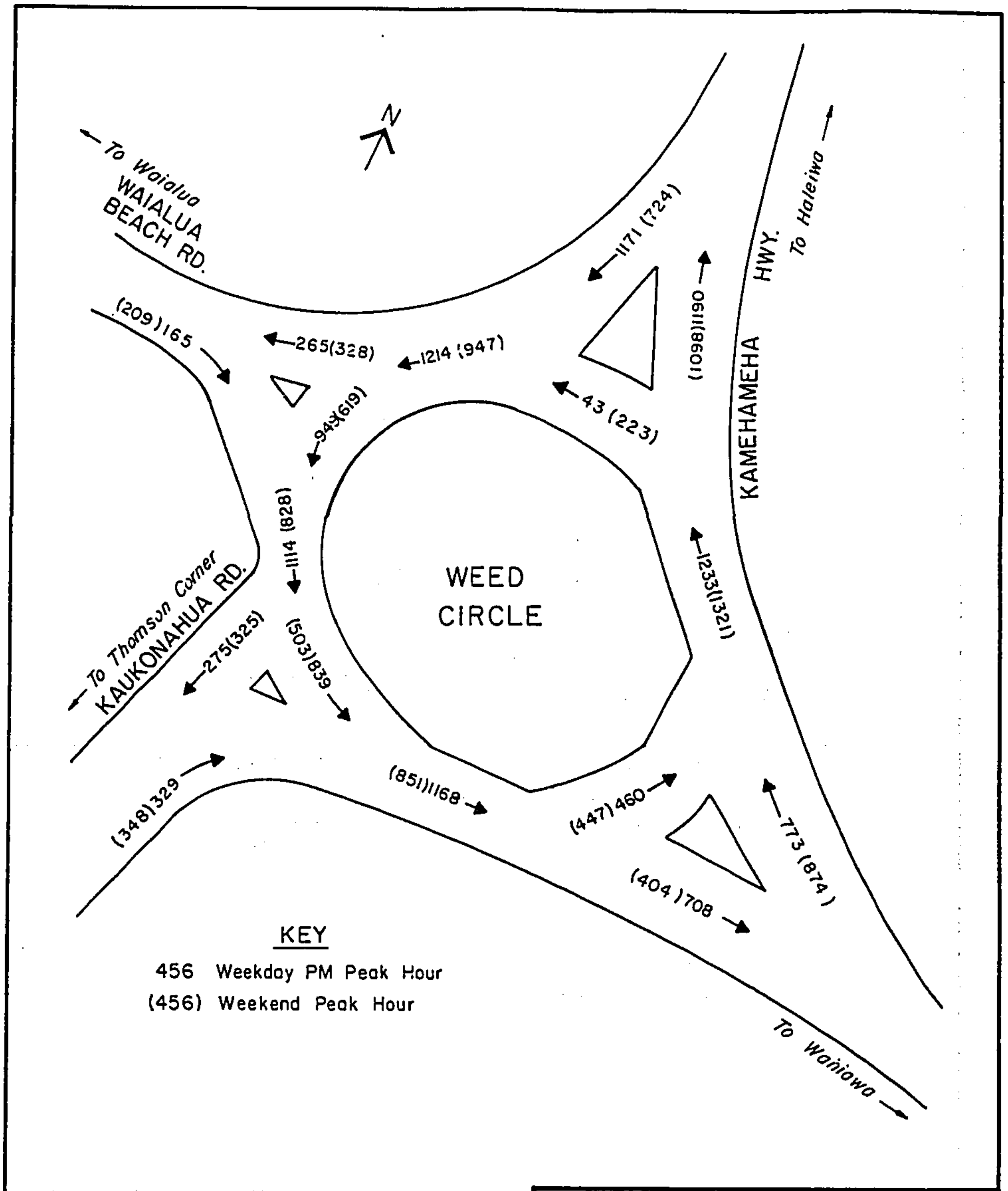


FIGURE 5.9
TRAFFIC ASSIGNMENT: FUTURE (1993) WITH PROJECT, WEED CIRCLE

Table 5.5

TRAFFIC ANALYSES FINDINGS

Location/Peak Hour	Existing (1988) Reserve	Existing (1988) LOS	Future (1991) without project Reserve	Future (1991) without project LOS	Future (1991) with project Reserve	Future (1991) with project LOS
THOMSON CORNER						
Farringtion Highway-EB left turn						
Weekday PM Peak Hour	629	A	629	A	626	A
Weekend Peak Hour	520	A	493	A	484	A
Kaukonahua Rd-SB (stop)						
Weekday PM Peak Hour	310	B	310	B	302	B
Weekend Peak Hour	152	D	112	D	91	E
PROJECT ACCESS ROAD						
Kaukonahua Road-SB left turn						
Weekday PM Peak Hour	-	-	-	-	856	A
Weekend Peak Hour	-	-	-	-	798	A
Project Road-WB (stop)						
Weekday PM Peak Hour	-	-	-	-	616	A
Weekend Peak Hour	-	-	-	-	501	A
WEED CIRCLE						
Rotary WB at SB Kamehameha Hwy. (stop)						
Weekday PM Peak Hour	225	C	179	D	167	D
Weekend Peak Hour	246	C	183	D	157	D
Waialua Beach Road at rotary (yield)						
Weekday PM Peak Hour	388	B	265	C	256	C
Weekend Peak Hour	455	A	384	B	367	B
Kaukonahua Road at rotary (yield)						
Weekday PM Peak Hour	414	A	257	C	200	C
Weekend Peak Hour	530	A	455	A	424	A
Rotary NB at EB Kamehameha Hwy. (yield)						
Weekday PM Peak Hour	238	C	58	E	15	E
Weekend Peak Hour	89	E	-4	F	-31	F

Notes: Reserve capacity from unsignalized intersection analysis
LOS = Level of service SB = southbound
NB = northbound EB = eastbound WB = westbound

1992. Prior to opening of the new bypass, long delays could be expected for weekend peak hour traffic which yield to westbound Kamehameha Highway traffic from Wahiawa.

Cane-haul operations will also be affected by development of the golf course. Alternative plans are being considered and coordinated with Waialua Sugar Company; the existing crossing near Hukilau Loop is expected to be maintained.

5.8 Air Quality

5.8.1 Impacts During Construction

There will be two types of air quality impact resulting directly from construction of the proposed Waialua Golf Course: (1) fugitive dust emissions from grading and dirt moving activities, as well as construction-related vehicles moving over unpaved surfaces and (2) air pollutant exhaust emissions from mobile and non-mobile construction equipment.

Construction of a golf course is likely to require significant alteration to the existing topography. Grading and other dirt-moving activity will thus present the potential for substantial emission of fugitive dust. The quantitative rate of emission for this type of site preparation is virtually impossible to estimate, however, and will vary daily depending on the amount of activity and the moisture content of exposed soil in work areas.

Construction equipment will also emit some air pollutants in the form of engine exhausts. The largest equipment is usually diesel-powered. Carbon monoxide emissions from large diesel engines are generally about equal to those from a single automobile, but nitrogen diozide emissions from this type of engine can be quite high. Fortunately, nitrogen diozide emissions from other sources in the area should be relatively low and the overall air quality impact of emissions from construction equipment should be insignificant compared to emission levels from roadways nearby.

In any case direct air quality impacts from project construction will last only as long as it takes to complete the project and several on-site control measures are available to substantially mitigate the magnitude of these impacts.

The developer will implement all necessary measures to control dust during construction. Adequate fugitive dust control can usually be accomplished by establishment of a watering program to keep bare-dirt surfaces in work areas from becoming significant dust generators. State of Hawaii Air Pollution Control Regulations (Administrative

Rules Chapter 60 of Title 11) 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 parking sites and establishing landscaping as early in the construction process as possible as well as good housekeeping on the jobsite have also proven to be helpful in abating fugitive dust emissions.

In the event that these measures prove to be insufficient it may also be necessary to erect dust-catching barriers to prevent the spread of fugitive dust to residences nearest to the construction site.

5.8.2 Direct Air Quality Impact of Pesticide Use

Once the Waialua Golf Course is completed and in use, it will be necessary to regularly apply various pesticides to maintain grass quality. The specific fertilizers and pesticides along with their potential application volumes and periods and locations of application are discussed in the report titled "Environmental Impact Of Fertilizers and Pesticides Use On The Proposed Waialua Golf Course" which comprises Appendix "L" of this document.

The Air Quality Study addresses ony the brief time that these chemicals are airborne, i.e. while they are being applied. As stated in the Air Quality Study, the chief health risk involved in the use of pesticides is to the applicator. Specific Warning and Caution labels are attached to product containers in accordance with Occupational Safety and Health guidelines. There are no federal or state ambient air quality standards which set limits on the permissible concentrations of these chemicals while they are airborne. When spray application is employed the primary objective is to spread the chemicals evenly over the surfaces for which they are intended. Application of these chemicals is thus a very localized phenomenon, and the amount of time that the chemicals are actually airborne constitutes a minuscule portion of their lifetimes.

There are no air quality modeling guidelines dealing with intermittent emissions from a moving point source, nor is it possible to estimate deposition rates with distance for each of the different chemicals without extensive field study. The main environmental guideline for safe spray application of all chemical fertilizers and pesticides is to use a course rather than fine spray.

The conclusion that the impact of these chemicals on air quality would be minimal assumes strict compliance with existing federal and state guidelines for their application and reliable enforcement of these guidelines by the Hawaii Department of Agriculture.

5.8.3 Indirect Air Quality Impact of Increased Traffic Congestion

While the proposed Waialua Golf Course cannot be considered to constitute a major direct source of air pollutants, by serving as an attraction for increased motor vehicle traffic in the area the project could be considered to be a potential indirect air pollution source.

Motor vehicles, especially those with gasoline-powered engines, are prodigious emitters of carbon monoxide. Motor vehicles also emit some nitrogen diozide and those burning fuel which contains lead as an additive contribute some lead particles to the atmosphere as well. The major control measure designed to limit lead emissions is a Federal law requiring the use of unleaded fuel in most new automobiles. As older cars are removed from the vehicle fleet lead emissions should continue to fall. In fact, on January 1, 1986, the Federal Environmental Protection Agency lowered the allowable amount of lead in gasoline to 0.1 gram per gallon. At the beginning of 1985 the standard was 1.1 grams per gallon. The EPA presently advocates a total band on lead in gasoline. Existing lead controls seem to have produced desired results in the Honolulu area, since measured lead levels at the Department of Health building have been below the threshold of detection for current monitoring equipment since early 1986.

Federal control regulations also call for increased efficiency in removing carbon monoxide and nitrogen dioxide from vehicle exhausts. By the year 1994 carbon monoxide emissions from the Oahu vehicle fleet then operating should be about one third less than the amounts now emitted. At present, however, no further reductions in vehicular emissions have been mandated for years following 1995, and increases in traffic levels after 1995 will result in directly proportional increases in vehicle-related pollutant emissions.

Additional information on air quality impacts are presented in Appendix I.

5.9 Noise Quality

5.9.1 General Considerations

The proposed golf course site is situated away from noise sensitive locations except for those residential neighborhoods along Kaukonahua Road between Thomson Corner and Weed Circle. No existing residences would be impacted by the new access road which is to be implemented between Kaukonahua Road and the Clubhouse Facility. The Clubhouse, which would be the most intensively used feature in the project, is to be located 1,500 feet from the nearest residence.

The ambient noise levels at the existing residences will be low in consideration of the low traffic volumes on Kaukonahua Road and the few scheduled aircraft operations over the area. At residences away from the road, the background noise would be dominated by neighborhood self-generated sounds e.g. occasionally local vehicle movements, lawn mowers, weed wackers, TV's, radios, and sounds from children and animals. Wind blowing in the sugar cane (54 dBA at 20 feet) and other foilage may often be the dominant sound.

The existing residents periodically hear the sounds associated with sugar cane planting, tending, and harvesting involving diesel-powered machinery and vehicles as well as aircraft used for spraying.

5.9.2 Potential Noise Impact from Clubhouse Activities

Noise sources from Clubhouse operations could include kitchen equipment, fans, airconditioning equipment, refrigeration equipment, pool pumps, as well as sound systems for announcements and music. The sounds from these sources should not usually be audible to the closest residents 1,500 feet distant in consideration of the sound level that could be acceptable at the Clubhouse and because of the large sound transmission losses involved.

Design measures, such as a wall or berm near an exterior sound source can introduce additional sound lessening. Also, if the sound source is located in an enclosed, airconditioned building, additional lessening of the noise levels can be achieved with standard construction.

The airconditioning equipment; fans; pool pumps; and any other stationary equipment on the project site will not exceed the allowable noise levels in local noise regulations. Public address sound systems and entertainment sounds will not cause "unreasonable" or "excessive" noise. The Clubhouse will not be in operation late into the night, but should cease operations by 7 p.m.

5.9.3 Ground Maintenance Noise

Noise from equipment associated with ground maintenance activities, including lawn mowers and leaf blowers, could have an adverse impact on surrounding residential neighborhood particularly when the equipment is near the houses. All equipment powered by internal combustion engines will have exhaust mufflers. Schedules will be developed so noisy maintenance operations do not occur near residences before 7 a.m. The noise from ground maintenance operations will not cause "unreasonable" or "excessive" noise.

5.9.4 Traffic Noise

Based on the traffic study for this project, the increase in traffic close to the project will be approximately 15 percent of existing traffic and that the highway level of service is not expected to change. It is estimated that residents in housing along Kaukonahua Road would experience less than one decibel increase in the average traffic noise level. Thus, the increase in traffic noise impact is not considered significant.

5.9.5 Noise Impact from Construction

Development of the project site will involve grubbing, grading, and the construction of infrastructure and buildings. The various construction phases of a development project may generate significant amounts of noise; the actual amounts are dependent upon the methods employed during each stage of the process. Typical construction equipment noise ranges in dB(A) are shown on Figure 2.

Earthmoving equipment such as bulldozers an diesel powered trucks will probably be the loudest equipment used during construction. Since it is anticipated that noise generated during construction will exceed allowable limits, a permit will be obtained from DOH. DOH may grant permits to operate vehicles, construction equipment, power tools, etc. which emit noise levels in excess of the allowable limits.

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

5.9.6 Noise Mitigation Measures

The design of the facility will include noise mitigation measures in the planning of the location and orientation of the airconditioning equipment, exhaust fans, pool pumps, etc., such that local noise regulations will be satisfied.

Further information on the potential noise impacts of this project is contained in Appendix J.

5.10 Agriculture

The project site has currently three types of agricultural activities -- (1) sugar cultivation, (2) banana cultivation on leased land and (3) grazing on leased land. The latter two are much smaller in scale compared to the sugar activities and will therefore be discussed first.

It is anticipated that the project will not cause the termination of either the banana cultivation nor the grazing operations.

The banana patch is located near the vicinity of the proposed driving range. It sits on land which is currently leased from Waialua Sugar Company; this lease is renewable on a year-to-year basis. Oceanic Properties, Inc., intends to situate the driving range outside of the banana patch, thus allowing this activity to continue.

The on-site grazing activities are actually part of an operation occurring on a large leased parcel abutting the project site. This larger leased parcel is on an "extended lease," which allows either Waialua Sugar Company or the lessee to terminate on a year's notice.

This larger leased parcel appears to slightly overlap with the project site in the upper gully area, although the exact acreage will be determined only after a land survey. The proposed golf course will displace the current on-site grazing activities. Note, however, that it is anticipated that the overall grazing operation will continue, since the displaced acreage is only a very small portion of the entire leased parcel.

The proposed golf course will cause the displacement of current on-site sugar activities. Note that this agricultural impact is somewhat minimized, since Waialua Sugar is not using the entire project area. The gully area, which encompasses 72 acres, is unsuitable for sugar cane cultivation.

This displacement is anticipated to cause a loss in sugar yield and revenues, as follows. (Note that this information is based on applying the overall 1986 yield averages of Waialua Sugar Company to the on-site 142 acres in cultivation):

> Loss in tons per harvest of 142 acres: 2,200 tons per harvest, or 1,100 tons per year
>
> Estimated loss in revenues from 142 acres: $380,000 per harvest, which includes $374,000 from sugar cane revenues and $6,000 from molasses (based on $340 of gross revenues per ton)

The project site constitutes 1.2 percent of the total 11,520 acres cultivated by Waialua Sugar company. The annual tonnage loss resulting from this project would represent approximately 1.5 percent of the total 72,466 tons produced in 1986. In terms of revenues, Waialua Sugar Company derived over $25 million in 1986 from its sugar crop and molasses. This means that the estimated loss in sugar revenues resulting from this project ($190,000 per year) would constitute .76 percent of the annual revenues from sugar.

Waialua Sugar Company has indicated that these losses are not expected to cause the company undue hardship. The company will have one more harvest, and no employee will be terminated due to this loss in acreage. A letter from Waialua Sugar explains the company's position on this matter and is presented in Appendix K.

5.11 Impacts on Surrounding Community

Social impacts are hereby discussed from both a regional and immediate community perspective. For purposes of this report, the "regional community" is the North Shore Development Plan Area which includes communities extending from Waialua through Pupukea. The "immediately-surrounding community" includes the Paalaa Kai and Midkiff Acres subdivisions.

5.11.1 Regional Community

Potential social impacts on the regional community include the following:

1. Addition of a "Community" Golf Course -- The proposed project will add another type of course -- daily-fee -- to the existing resort (Kuilima) and municipal (Kahuku) courses with green fees for the proposed course falling between the resort and municipal courses.

(Note that the regional community, as defined in this section is different from the Primary Target Area designated in the market study report for this project).

2. Additional facilities for community activities -- The community will have access to the clubhouse and dining facilities for meetings and other community activities.

3. No population increase -- The proposed golf course will neither directly increase nor induce population growth.

4. Maintenance of open space quality -- The proposed golf course will replace the sugar cane fields with another form of open space.

5. Traffic -- As discussed in Section 5.7.1, regional traffic conditions are expected to increase with or without the project. The proposed project will increase traffic, though its impact is minimal when compared to without-the-project scenario.

Oceanic Properties, Inc., has informally discussed the proposed golf course with the North Shore Neighborhood Board at their October 1987 meeting. It is noted, however, that the project was discussed in the context of the larger Central Oahu/North Shore Plan, and was therefore not discussed in detail. Further discussions with the community will take place.

5.11.2 Immediate Neighborhood

Potential social impacts on the immediately surrounding neighborhood of Paalaa Kai and Midkiff Acres are as follows:

1. Driving range lights -- The proposed driving range is anticipated to operate 7 days a week, and possibly in the evenings. Neighborhood residents may experience an increase in evening lighting because of this change. The lighting system for the driving range will therefore be designed to direct light away from nearby residences.

2. Public safety -- Residents near golf courses often express concerns about golf balls hitting their persons or property. The proposed golf course is being designed to minimize these occurrences.

3. Termination of cane burning -- Implementation of the proposed golf course will lessen the soot and smoke associated with cane burning for the immediately surrounding communities.

4. Construction impacts -- The surrounding residents may experience the noise and dust of construction activities associated with the golf course. Other sections in this report present mitigating measures to minimize these impacts.

5.12 Economic Impacts

Based on the Oceanic Properties' experience with the Mililani Golf Course (prior to its sale in 1986), it is anticipated that the proposed project will require 30 full-time employees.

The proposed Waialua Golf Course will not cause the loss of any of Waialua Sugar Company 430 employees.

The proposed golf course will result in an increase in tax revenues. Currently, annual real property taxes are approximately $577 for the subject property. Development of the project site as proposed is expected to increase the annual real property tax revenue to $4,800. Note that these estimates are based on the previous experiences of Oceanic Properties with the Mililani Golf Course.

CHAPTER 6

RELATIONSHIP OF PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR AFFECTED AREA

6. RELATIONSHIP OF PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR AFFECTED AREA

6.1 List of Necessary Approvals

Type of Approval of Permit	Approving Agency	Status
Federal:		
Federal Register 219, Nationwide Permit 12, 13, 14 (permit to go over stream)	U.S. Corps of Engineers	To be filed
State:		
Change of Land Use Designation from Agriculture to Urban	State Land Use Commission	To be filed
Instream Flow Standard and Permit to Alter Stream Channel	Dept. of Land and Natural Resources	To be filed
Water Use Permit in Designated Groundwater Control Areas	Dept. of Land and Natural Resources	To be filed
Community Noise Control Permit	Dept. of Health	To be filed
Permit to Perform Work Upon State Highways	Dept. of Transportation	To be filed
Access to State Highway	Dept. of Transportation	To be filed
City and County of Honolulu:		
Change in North Shore Development Plan Land Use Map from Agriculture to Parks and Recreation	City Council	In process

Change in North Shore Development Plan Public Facilities Map	City Council	To be filed
Special Management Area Permit as prescribed by Ordinance 84-4	City Council	To be filed
Zoning change from Ag-1 to P-2, General Preservation District	City Council	To be filed
Building Permit	Building Dept.	To be filed
Grading Permit Sewer Connection Permit	Dept. of Public Works	To be filed

<u>6.2 State</u>

<u>6.2.1 Hawaii State Plan</u>

The <u>Hawaii State Plan</u> serves as a guide for the future long-range development of the State. As such, goals, objectives, policies and priorities are set forth to provide a basis for determining priorities and allocating resources. This section identifies those sections of the Plan which we felt were applicable to the project followed by our comments thereon.

Sec. 226-7. <u>Objective and policies for the economy -- agriculture</u>

> Policy (b)(6) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.

Sec. 226-103. <u>Economic priority guidelines</u>

Priority guideline (c)(1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.

<u>Comment</u>: Because the proposed Waialua golf course will displace 142 acres of agricultural land, much of which is prime, the project does not directly assist the State in attaining the goals, objectives and priorities specifically relating to the promotion and maintenance of agricultural lands.

It is noted, however, that, as demonstrated in Section 5.10, the proposed project will not cause major disruption or discontinuation of the total sugar operations, nor will it interfere with operations of Waialua Sugar. The project scale and magnitude is such that its impact on the agricultural industry is <u>minimal</u>.

Further, the project is related to the <u>long-term</u> viability of Castle and Cooke. The company's sugar operation has been in serious question because of its vulnerability to fluctuating world economics. Although the proposed golf course is not expected to totally reverse this current financial problem, the project site will be put to a higher use resulting in benefit to the company. This is just <u>one step</u> in helping the company continue to sustain its other agricultural operations in Hawaii.

Priority guideline (d)(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.

Comment: LESA (1986) estimates that Oahu's production goals acreage are as follows:

Agricultural Production Goals Acreage for Oahu

	1983 Actual	1990	1995
Total Export Commodity (includes sugarcane)	39,894	40,393	40,942
Total Local Consumption Commodity	22,645	15,466	16,710
Total Acres	62,539	55,859	57,652

In 1983, the actual production acreage for sugar cane totalled 27,200 acres. The production goal for 1990 sugar cane was 25,900 acres; for 1995, 25,300 acres. Like the anticipated trend in the total production acreage, the sugar cane acreage is anticipated to decrease.

The project site comprises 214 acres, 72 of which are in a gully area not suitable for sugar cane. The proposed Waialua Golf Course would remove 142 acres from sugar cane production.

This acreage represents less than a half percent of the agricultural production requirements for 1990 and 1995. The 142 acres represent 0.3 percent of the total goals acreage for export products and 0.2 percent of the total agricultural acreage.

In terms of lands used for sugar cane cultivation, the 142 acres represent 0.5 percent of the total estimated production requirement for 1990 and 1995.

LESA projects a requirement of 4,000 acres for diversified agriculture. Implementation of the proposed project would mean that this land would not be available for such activity.

It appears, than, that the project will not have major impacts on LESA agricultural production requirements.

Sec. 226-104 Population growth and land resources priority guidelines

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

Comment: The total acreage required for the golf course amounts to 214 acres of which 142 acres (60%) are used for cane cultivation while the remaining 72 acres (40%) comprise unused gulch land. The use of gulch land not suited for agriculture for a portion of the project appears to be in keeping with the foregoing objectives and policies. On the other hand, it is recognized that much of the land presently devoted to cane cultivation is considered prime and is proposed for another use.

In terms of impact on Waialua Sugar Company's operation, the loss of 142 acres to the project represent 1.2 percent of the total 11,520 acres under cultivation. In terms of revenues, this amounts to $190,000 per year or .76 percent of the total $25,000,000.00 in revenue generated in 1986. As explained by Waialua Sugar Company, "with proper planning, the economic viability of Waialua Sugar will not be greatly affected by demand of this parcel." (See Appendix J).

As noted earlier, the use of this property for golf course will result in overall benefit to Castle and Cooke. As such, it will place C&C in a better position to assist its subsidiary operations such as Waialua Sugar Company to continue with its agricultural operation.

Sec. 226-6 Objectives and policies for the economy - in general

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

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

Comment: The golf course will cover a varied range of employment choices from food services to course maintenance and management. The golf course development will diversify the economic opportunities in an area lacking convenient job choices for the residents living in the North Shore area.

Sec. 226-8 Objectives and policies for the economy - visitor industry

Objective (a) Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawaii's economy.

Policy (b)(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspiration of Hawaii's people.

Policy (b)(3) Improve the quality of existing visitor destination areas.

Comment: The proposed golf course will serve a clientele similar to the Mililani course which is a mix of tourists and local golfers. The proposed golf course provides an additional option for a golfing experience thereby strengthening the golfing choices on Oahu and enlarging the service facilities for visitors. The project site is well situated to provide alternative choices for tourists at the Turtle Bay Resort and the future West Beach Resort Complex. The proposed project will meet the social, economic and physical needs of Hawaii's residents by providing primary jobs, steady employment and the opportunity to engage in recreational pursuits.

Sec. 226-10 Objectives and policies for the economy - potential growth activities.

Objective (a) Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawaii's economic base.

Policy (b)(2) Expand Hawaii's capacity to attract and service international programs and activities that generate employment for Hawaii's people.

<u>Comment</u>: The proposed project, through its availability to overseas visitors, provides an impetus for expanding a growth activity which serves to increase and diversify Hawaii's economic base. Recent estimates indicate approximately 200,000 visitors annually play golf in Hawaii, spending 30 million dollars on green fees.

Sec. 226-12 <u>Objective and policies for the physical environment - scenic, natural beauty, and historic resources</u>.

Objective (a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.

(b) To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:

Policy (b)(3) Promote the visual and aesthetic enjoyment of mountains, ocean vistas, scenic landscapes, and other natural features.

Policy (b)(5) Encourage the design of developments and activities that complement the natural beauty of the island.

<u>Comments</u>: The golf course will be designed to fit the natural attributes of the site, encompassing the two distinctive topographical variations of the site. The southern part of the course will be designed to reflect the natural topographical features of the Poamoho Stream, while the northern section is designed to capture the panoramic views of the ocean and the Waianae mountains from the sloping plateau. The clubhouse will also be placed in this area to capture these same spectacular views. The course with its open space character will complement the adjoining spacious features of the Northshore.

The Priority Directions in Part III of the Hawaii State Plan are applicable to the proposed golf course in a number of the priority guidelines.

Sec. 226-103 Economic priority guidelines

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

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

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

Priority guideline (b)(1) Promote visitor satisfaction by fostering an environment which enhances the Aloha Spirit and minimizes inconveniences to Hawaii's residents and visitors.

Priority guideline (b)(4) Encourage visitor industry practices and activities which respect, preserve and enhance Hawaii's significant natural, scenic, historic, and cultural resources.

Comment: The proposed golf course supports the economic health and quality of the visitor industry by providing an additional recreational facility which is in heavy demand by visitors. The course equally supports the recreational needs of Hawaii's devoted golfers by providing a new course for play and at the same time reducing the demands on other Oahu courses. The open space character of a golf course supports the visual and aesthetic qualities of Oahu's natural landscape.

6.2.2 Functional Plans

The twelve State Functional Plans manage and coordinate functional area activities and guide resource allocation in decision-making.

The Functional Plans most relevant to the proposed Waialua Golf Course are the State Agricultural Plan and the State Recreation Plan. As discussed earlier, since the proposed project will displace 142 acres of productive agricultural land with non-agricultural use, the project is not supportive of the objective relating to retention of productive land in agricultural use as contained in the State Agriculture Plan.

However, the proposed project is in conformance with the State Recreation Functional Plan, namely the following:

> Policy A (2). Ensure that intended uses for a site respect community values and are compatible with the area's physical resources and recreation potential.
>
> Policy A (3). Emphasize the scenic and open space qualities of physical resources and recreation areas.

6.2.3 Hawaii Coastal Zone Management Program

As contained in Section 205A-2 of the Hawaii Revised Statutes, the objectives of the Hawaii Coastal Zone Management Program are designed to protect valuable and vulnerable coastal resources such as coastal ecosystems, special scenic and cultural values and recreational opportunities.

The proposed project is in general conformance with the objectives of the Coastal Zone Management Program, particularly the objective for Scenic and Open Space Resources -- "Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources."

6.3 City and County of Honolulu

6.3.1 General Plan

The Oahu General Plan sets out the social, economic and design objectives and policies for the general welfare of its residents. This section will discuss those particular areas of concern within the General Plan which will relate to the proposed project.

Economic Activity

> Objective A: To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living.
>
> Policy 1: Encourage the growth and diversification of Oahu's economic base.
>
> Policy 2: Encourage the development of small businesses and larger industries which will contribute to the economic and social well-being of Oahu residents.

Policy 3: Encourage the development in appropriate locations on Oahu of trade, communications, and other industries of a non-polluting nature.

> Comment: The proposed golf course further diversifies Oahu's economic base and enlarges the employment options for its residents. The project is non-polluting while enhancing the recreational options for both visitor and resident golfers. The golf course is ideally located to provide employment for the residents of the Northshore, thereby assisting in relieving the Honolulu-bound traffic corridors of some vehicular trips and shortening the work trip travel time for employees.

Objective B: To maintain the viability of Oahu's visitor industry.

Policy 9: Encourage the visitor industry to provide a high level of service to visitors.

> Comment: The additional golf course broadens the recreational base for visitors and provides another alternative in selecting a golf course for play.

Energy

Objective B: To conserve energy through the more efficient management of its use.

Policy 1: Ensure that the efficient use of energy is a primary factor in the preparation and administration of land use plans and regulations.

> Comment: The proposed golf course in Waialua provides employment options for nearby residents living along the Northshore, reducing driving distances to employment centers which in turn curtails the use of fossil fuels. Driving distances for Northshore golfers are also reduced.

Culture and Recreation

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

Policy 2: Develop and maintain a system of regional parks and specialized recreation facilities.

Policy 10: Encourage the private provision of recreation and leisure-time facilities and services.

<u>Comment</u>: The proposed golf course increases the specialized recreational facilities for Oahu residents and visitors. The need for more golf courses on Oahu is evident from the excessive use of the Municipal courses. The remaining courses which are open to visitors and the general public on a daily fee basis are also operating at or near capacity. The proposed golf course will be privately constructed and maintained, thereby relieving Hawaii's residents of governmental expenditures in developing a new golf course.

<u>6.3.2 Development Plan</u>

<u>Common Provisions</u>. The Common Provisions of the Development Plan address private golf courses as an open space resource. Open space resources are to provide visual relief and contrast to the built environment and to serve as outdoor space for public use and enjoyment. The proposed golf course satisfies this criteria by providing an opportunity for residents and visitors to enjoy the scenic beauty of the ocean and the nearby mountains while engaging in a recreational activity.

<u>Special Provisions</u>. Section 2, Urban Design Principles and Controls for the Northshore.

1. Specific Urban Design Considerations

b. Public Views - important views to be protected include:

- Panoramic views of Waialua Town and Haleiwa Town from the Wahiawa approach of Kamehameha Highway and Kaukonahua Road.

- Views of the Waianae mountains from Kaukonahua Road and Kamehameha Highway in Haleiwa near Weed Circle.

<u>Comment</u>: The proposed golf course is located on the hillside between Kamehameha Highway and Kaukonahua Road. The views of Waialua Town, Haleiwa Town and the Waianae mountains will be enhanced because of the opportunity to embrace this expansive area from a stationary viewing point such as the golf course. Presently this panoramic view is only available to traveling motorists on Kamehameha Highway and Kaukonahua Road.

6.3.3 Special Management Rules and Regulations

The City and County of Honolulu Department of Land Utilization and City Council review development proposed in the Special Management Area based on the guidelines set forth in Section 4, Ordinance 84-4. A portion of the project is in the Shoreline Management Area. The applicant will apply for an SMA Permit as necessary.

CHAPTER 7

RELATIONSHIP BETWEEN SHORT TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7. RELATIONSHIP BETWEEN SHORT TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The current use of most of the project site is agricultural, primarily in the form of sugar cane cultivation. The proposed golf course will discontinue this use, thus causing a short term loss of the 140 acres used for agricultural production.

The proposed project will, however, have the following long-term effects on the natural environment:

- Open space qualities will be maintained.
- The natural environment will be stabilized because the proposed golf course will introduce a non-cyclical activity.
- The natural environment will <u>not</u> be committed to a more intense urban use, such as resort uses, which has the potential to preclude continuation of green, generally unobstructed open space.
- The proposed golf course will not pose long-term risks to health and safety.

Further, other long range trade-offs generated by uses on this land include the establishment of a permanent recreational facility available for public use, an increase in tax revenues, and the diversification of available employment in the region.

CHAPTER 8

ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED

8. ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED

As discussed in Chapter 5 of this EIS, there are certain adverse environmental impacts which cannot be avoided, but can be mitigated through recommended measures.

Construction activities will increase noise, air-borne dust and particulate emissions for the surrounding neighborhood. Further stream water quality may be temporarily affected. None of these impacts are expected to be long-term in nature, however.

Improvements to the drainage system will be required to mitigate potential storm water run-off. The area's water, sewerage and drainage systems will need to be upgraded, at the developer's expense, to accommodate the proposed project. Careful monitoring of fertilizers and pesticides used for the golf course will help preserve the water quality and protect the ecosystem of flora and fauna. Careful design of the driving range and the clubhouse will help minimize potential lighting and noise impacts on nearby residents.

CHAPTER 9

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

9. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

There will be an irreversible commitment of 142 acres of agricultural land, much of which is designated prime. It is noted, however, that the proposed golf course will substitute the existing agricultural open space with another form of open space. A golf course is unlike other more intense urban uses which require extensive structures and infrastructure improvements and it is therefore possible, though not probable, to reinstate agricultural uses.

A permanent commitment of private funds and other resources to plan, design and construct the proposed golf course and on- and off-site utilities is expected. Further, commitments to employ workers and operate the facility will be made, which will also result in a commitment to increase tax revenues and diversifying economic activities in the area. A public commitment to maintain the improved infrastructure will be required, and will be somewhat mitigated by Oceanic Properties through user fees such as sewer connection fee.

CHAPTER 10

SUMMARY OF UNRESOLVED ISSUES

10. SUMMARY OF UNRESOLVED ISSUES

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

The matter of the left turn into the project area from Kaukonahua Road remains unresolved. The March 8, 1988 letter (Chapter 14) from the State Department of Transportation (SDOT) recommends that a left turn storage lane be provided for southbound traffic on Kaukonahua Road, while our traffic report concluded that a separate lane would not be warranted. While the volumes during the weekday peak hour are substanitally below the volumes needed to meet the warrant, the weekend traffic assignment at the access road was only marginally below, which may account for SDOT's position that the turn lane be provided. We therefore will conduct further studies to obtain additional traffic data for the weekend peak hour, which occurs on Sunday during the annual polo season.

The findings and subsequent analyses will be submitted to SDOT for their consideration and we will comply with their determination on this matter. The design plans for the access road intersection will be coordinated with the SDOT.

CHAPTER 11

ALTERNATIVES TO THE PROPOSED ACTION

11. ALTERNATIVES TO THE PROPOSED ACTION

The no-action alternative implies that the Waialua Sugar Company would continue its sugar cultivation of the property's 140 acres and the gully area would continue to be unused.

The no-action alternative would not require improvements to the infrastructure and thus not require public maintenance of such improvements. While the potentially negative impacts during construction would not occur, the no-action alternative also would not generate the potentially positive social and economic impacts.

No other alternative uses were considered for this site.

Alternative design decisions are based primarily on topographical considerations, particularly those related to the gully area. The current layout is preliminary, and flexibility of certain elements -- such as the exact locations of tees, greens and fairways, as well as the clubhouse and driving range -- is imperative until a land survey is completed.

CHAPTER 12

CONSULTED PARTIES AND PARTICIPANTS IN THE DEIS PREPARATION PROCESS

12. CONSULTED PARTIES AND PARTICIPANTS IN THE DEIS PREPARATION PROCESS

12.1 Consulted Parties

The Environmental Impact Statement Preparation Notice (EISPN) for the proposed Waialua Golf Course was published in the OEQC Bulletin of November 23, 1987. The thirty-day review period, announced in the OEQC Bulletin ended on December 23, 1987. In addition, a more detailed EISPN, including maps of the project, was mailed directly to the agencies and organizations listed below. The list contains parties believed to have an interest in the project or who requested consulted party statuss. All 16 agencies have responded in writing.

Federal Agencies

United States Department of Agriculture, Soil Conservation Service
Department of the Army, U.S. Army Corps of Engineers
United States Department of the Interior, Fish & Wildlife Service
United States Department of the Interior, Geological Survey

State Agencies

Department of Agriculture
Department of Health
Department of Land & Natural Resources, Division of Water & Land Management
Department of Business & Economic Development
Department of Land and Natural Resources, Division of State Parks
Department of Transportation

County Agencies

Department of Land Utilization
Department of Public Works
Department of Transportation Services
Fire Department

Public Utilities

Hawaiian Electric Co., Environmental Department
Hawaiian Telephone Co., Engineering and Construction

12.2 Parties Notified Re Development Plan Amendment Application

In accordance with Section 8.2 d, Rules Of The Department of General Planning For Processing Amendments To The Development Plans Of The City And County Of Honolulu, the following individuals and organizations were notified about this project. The notification material consisted of a transmittal letter, project location map and the project fact sheet.

1. The Honorable Randall Iwase
   District Councilman
   Honolulu Hale, Room 100
   Honolulu, Hawaii 96813

2. North Shore Neighborhood Bd. No. 27
   P.O. Box 607
   Haleiwa, Hawaii 96712

3. Waialua Community Association
   66-434 Kamehameha Highway
   Haleiwa, Hawaii 96712

4. Haleiwa Community Association
   Mrs. Sally Amantiad
   61-168 Punalau Place
   Haleiwa, Hawaii 96712

5. Mr. & Mrs. Donald T. Koga
   65-128 Hukilau Loop
   Waialua, Hawaii 96791

6. Mr. & Mrs. Walter H. Watanabe
   66-124 Hukilau Loop
   Waialua, Hawaii 96791

7. Mr. & Mrs. Roy T. Sakai
   P.O. Box 610
   Haleiwa, Hawaii 96712

8. Mr. & Mrs. Roger Lavarias
   65-118 Hukilau Loop
   Waialua, Hawaii 96791

9. Mr. Dennis Silva
   65-114 Hukilau Loop
   Waialua, Hawaii 96791

10. Mr. & Mrs. Tsutomu Fujioka
P.O. Box 578
Waialua, Hawaii 96791

11. Mr. & Mrs. Antonio Comanga
65-106 Hukilau Loop
Waialua, Hawaii 96791

12. Mr. & Mrs. Jacob Y. Ng
P.O. Box 393
Haleiwa, Hawaii 96712

13. Mr. & Mrs. Juanito Ines
P.O. Box 235
Waialua, Hawaii 96791

14. Mr. & Mrs. Richard Oyama
65-078 Hukilau Loop
Waialua, Hawaii 96791

15. Mr. & Mrs. Lawrence Lunasco
65-076 Hukilau Loop
Waialua, Hawaii 96791

16. Mr. Henry Amara
P.O. Box 193
Haleiwa, Hawaii 96712

17. Church of Jesus Christ of Latter Day Saints
50 East North Temple 22N
Salt Lake City, Utah 84150

18. Mr. Gregory Suenaka
66-873 Paahihi Street
Waialua, Hawaii 96791

19. Mr. Germiniano Antonio
66-882 Alena Loop
Waialua, Hawaii 96791

20. Mr. Regino Aceret
66-886 Alena Loop
Waialua, Hawaii 96791

21. Mr. Adelisa Martinez
66-890 Alena Loop
Waialua, Hawaii 96791

22. Mr. Thomas Holland
66-892 Alena Loop
Waialua, Hawaii 96791

23. Mr. Samuel Deuz
66-894 Alena Loop
Waialua, Hawaii 96791

24. Mr. Carlos Esteban
66-896 Alena Loop
Waialua, Hawaii 96791

25. Mr. Jose Billedo
66-898 Alena Loop
Waialua, Hawaii 96791

26. Mr. William Cox
66-900 Alena Loop
Waialua, Hawaii 96791

27. Mr. Petronio Balicoco
66-902 Alena Loop
Waialua, Hawaii 96791

28. Mr. Allen Lau
66-906 Alena Loop
Waialua, Hawaii 96791

29. Mr. Francisco Agoo
66-908 Alena Loop
Waialua, Hawaii 96791

30. Mr. Smitty Koga
1259 Rycroft St., #302
Honolulu, Hawaii 96814

31. Mr. Ralph Koga
67-339 Kukea Circle
Waialua, Hawaii 96791

32. Koga & Sons, Inc.
Haleiwa Supermarket, Ltd.
66-197 Kamehameha Highway
Haleiwa, Hawaii 96712

33. Mr. Robert Peru
66-961 Kaukonahua Road
Waialua, Hawaii 96791

34. Mr. Quilardo Ozoda
66-948 Kaukonahua Road
Waialua, Hawaii 96791

35. Mr. Leon Valbuena
66-949 Kaukonahua Road
Waialua, Hawaii 96791

36. Mr. Murashige Seigi
P.O. Box 501
Waialua, Hawaii 96791

37. Mr. James Hardin
67-152 Kanaulu Street
Waialua, Hawaii 96791

38. Mr. Max Smith
7 Kailuana Place
Kailua, Hawaii 96734

39. Mr. Clarence Rego
66-962 Oliana Street
Waialua, Hawaii 96791

40. Mr. Cipriano Aquilizan
1621 Kaumole Street
Pearl City, Hawaii 96782

41. Mr. Gordon Y. Kuwada
65-070 Hukilau Loop
Waialua, Hawaii 96791

12.3 Participants in the DEIS Preparation Process

Name	Position	Highest Degree	Area of Expertise
William Barrera	President Chiniago, Inc.	M.S.-Antropology	Archaeology
Berna Cabacungan	Sub Consultant T. Kusao, Inc.	B.A.-English	Community Planning/ Social Impact Assessments
Winona Char	President Char & Assoc.	M.S.-Botany	Botany
Ron Darby	President Darby & Assoc.	M.S.-Eng./Acoustics	Acoustical Consulting
Tom Fee	Environmental Engineer Helber Hastert & Kimura	M.S.-Urban & Regional Planning	Market Research
Ken Ishizaki	Vice President Engineering Concepts, Inc.	M.S.-Sanitary Eng.	Utilities Infrastructure Water Quality
Tyrone Kusao	President T. Kusao, Inc.	M.S.-City & Regional Planning	Planning & Zoning Consultant
George K. Linney	Sub Consultant Char & Assoc.	Ph.D. Candidate-Botany	Biology
Larry K.S. Lum	Project Mgr. Oceanic Prop. Inc.	B.S.-Business Admin.	Project Management
Dana Miyamoto	Environmental Engineer Engineering Concepts, Inc.	B.S.-Civil Eng.	Utilities Infrastructure
Julian Ng	Traffic Engineer Parsons Brinckerhoff Quade & Douglas, Inc.	B.S.-Civil Eng.	Traffic Engineer
Barry D. Root	Consultant	M.S.-Geography M.S.-Public Health	Air Pollution

CHAPTER 13

COMMENTS DURING THE CONSULTATION PROCESS

13. COMMENTS DURING THE CONSULTATION PROCESS

As was noted in the previous chapter, all consulted parties responded in writing. The following pages contain: (1) a copy of DGP's determination letter requiring an EIS, (2) the project Notice in the OEQC Bulletin of November 23, 1987, (3) a copy of the EISPN, 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

DONALD A. CLEGG
CHIEF PLANNING OFFICER

GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

JM/DGP 9/87-3746

November 12, 1987

Tyrone T. Kusao, Inc.
Planning and Zoning Consultant
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

North Shore Development Plan
Amendment Application from Agriculture
to Parks and Recreation
at Waialua, North Shore, Oahu
Tax Map Keys 6-5-01: 2, 6-4-01: 6

This is to inform you that your request to amend the North Shore Development Plan will be processed in the 1988 Annual Amendment Review.

Your request for a development plan amendment is subject to an environmental assessment pursuant to Chapter 343, HRS, the State Environmental Impact Statement (EIS) law. It has been determined that an EIS will be required for the subject amendment application.

In order that your request is processed in the 1988 Annual Amendment Review, this department must accept the final EIS by May 4, 1988. The State Office of Environmental Quality Control (OEQC) has been notified of our determination. They will be publishing a notice in their "OEQC Bulletin."

If there are any questions, please call John McDonald of my staff at 527-6012.

Sincerely,

DONALD A. CLEGG
Chief Planning Officer

Attach.

cc: OEQC
Mr. Larry Lum, Project Manager
Oceanic Properties, Inc.

465 SOUTH KING STREET, KEKUANAOA BUILDING, #104 | HONOLULU, HAWAII 96813 | TELEPHONE (808) 548-6915

OEQC BULLETIN

OFFICE OF ENVIRONMENTAL QUALITY CONTROL

JOHN WAIHEE
GOVERNOR

MARVIN T. MIURA, Ph.D.
DIRECTOR

Volume IV | November 23, 1987 | Number 22

REGISTER OF CHAPTER 343, HRS DOCUMENTS

****

<u>DEVELOPMENT OF A GOLF COURSE AT WAIALUA, NORTH SHORE, OAHU</u>, Oceanic Properties Inc./City and County of Honolulu Dept. of General Planning

The applicant is requesting the amendment of the North Shore Development Plan in order to develop an 18-hole championship golf course. The proposed amendment would redesignate lands identified as TMK: 6-5-01:2 and 6-4-01:6 from agriculture to parks and recreation. The proposed golf course will be located generally between Weed Circle and Thompson Corner, mauka of Kaukonahua Rd. A club house, driving range and equipment building will also be included in the construction program.

Contact: Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop St., Suite 2507
Honolulu, HI. 96813

Deadline: December 23, 1987.

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

DONALD A. CLEGG
CHIEF PLANNING OFFICER

GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

JM/DGP 9/87-3746

November 12, 1987

Honorable Marvin T. Miura, Interim Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Chapter 343, HRS
Environmental Impact Statement (EIS) Preparation
Notice for Development of a Golf Course
at Waialua, North Shore, Oahu
Tax Map Keys 6-5-01: 2; 6-4-01: 6

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 environmental assessment, serves as the EIS Preparation Notice. It should be published in the OEQC Bulletin under the "Register of Chapter 343, HRS Documents."

The contact person for this EIS will be:

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

If there are any questions, please contact John McDonald of my staff at 527-6012.

Sincerely,

DONALD A. CLEGG
Chief Planning Officer

Encl.

cc: Mr. Larry Lum, Project Manager
Oceanic Properties, Inc.
Mr. Tyrone T. Kusao

APPLICATION FOR A DEVELOPMENT PLAN
AMENDMENT AND ENVIRONMENTAL ASSESSMENT
FOR A

PROPOSED GOLF COURSE
AT
WAIALUA, OAHU

TMK: 6-5-01:2
6-4-01:6

Prepared for:

Oceanic Properties, Inc.
P. O. Box 2780
Honolulu, HI 96803

Prepared by:

Tyrone T. Kusao, Inc.
1188 Bishop St., Suite 2507
Honolulu, HI 96813

OCTOBER, 1987

TABLE OF CONTENTS

TABLE OF EXHIBITS

Application for a Development Plan
Amendment and Environmental Assessment
for a Proposed Golf Course at
Waialua, Oahu, Hawaii

I. BACKGROUND

A. Essential Information

1. Applicant : Oceanic Properties, Inc.
P. O. Box 2780
Honolulu, Hawaii 96803

2. Land Owner : Castle and Cooke, Inc.
650 Iwilei Road
Honolulu, Hawaii 96817

3. Agent : Tyrone T. Kusao, Inc.
1188 Bishop Street, Ste. 2507
Honolulu, Hawaii 96813

3. Request:

To designate lands from agriculture to parks and recreation.

4. Area : 214 ± acres

5. Location:

The property lies in the vicinity of Waialua Town. The proposed golf course is generally between Weed Circle and Thompson Corner, mauka of Kaukonahua Road. A major portion of the land is currently used for sugar cane production. The remainder of the site is a gully area created by Poamoho Stream. A residential area developed around Hukilau Loop borders the site on the southwest. Please refer to Figure 1, Project Location.

6. T.M.K.: : 6-5-01:2
6-4-01:6

7. State Land Use : Agricultural

8. Development Plan Designation

Land Use : Agriculture

Public Facilities : None

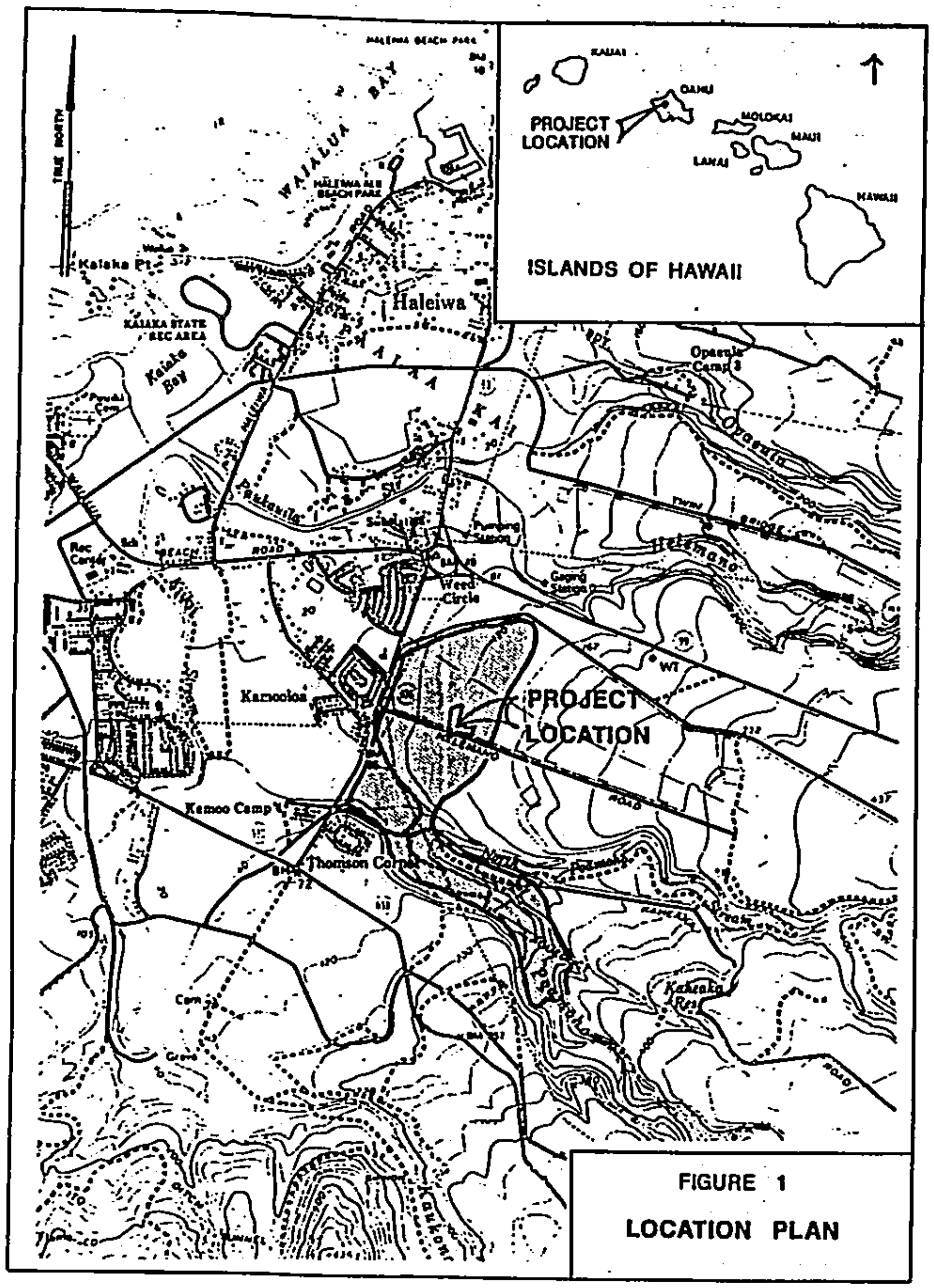


FIGURE 1

LOCATION PLAN

9. Zoning

AG-1 Restricted Agricultural District

B. Description of the Property

1. Property Boundary:

T.M.K.: 6-5-01:2 and 6-4-01:6. See Figure 2.

2. Topography and Slope:

Topographically, the site has two distinct areas. The Poamoho Stream section drops from an elevation of 175 feet on the upper reaches of the stream to a 20 foot elevation at Kaukonahua Road on the west. Within the meandering stream, the slopes along the stream embankments range from 10 to 30 percent. The northwestern part of the project site is a gentle plateau with a ground slope from 0 to 10 percent. The elevation within this gentle ground slope ranges between an elevation of 150 feet on the east to 55 feet at the juncture with Kaukonahua Road .

3. Existing Uses:

Except for the Poamoho Stream area, the site is presently in sugar cane.

4. Soils:

The Land Study Bureau, University of Hawaii, in their report "Detailed Land Classification" rates the Poamoho Stream section of the site "E" and the remainder of the site as "A" and "B". The soil survey for Oahu conducted by the Soil Conservation Service classified the soil type for the major portions of the site as LaB, Lahaina Silty Clay and HeA, Haleiwa Silty Clay.

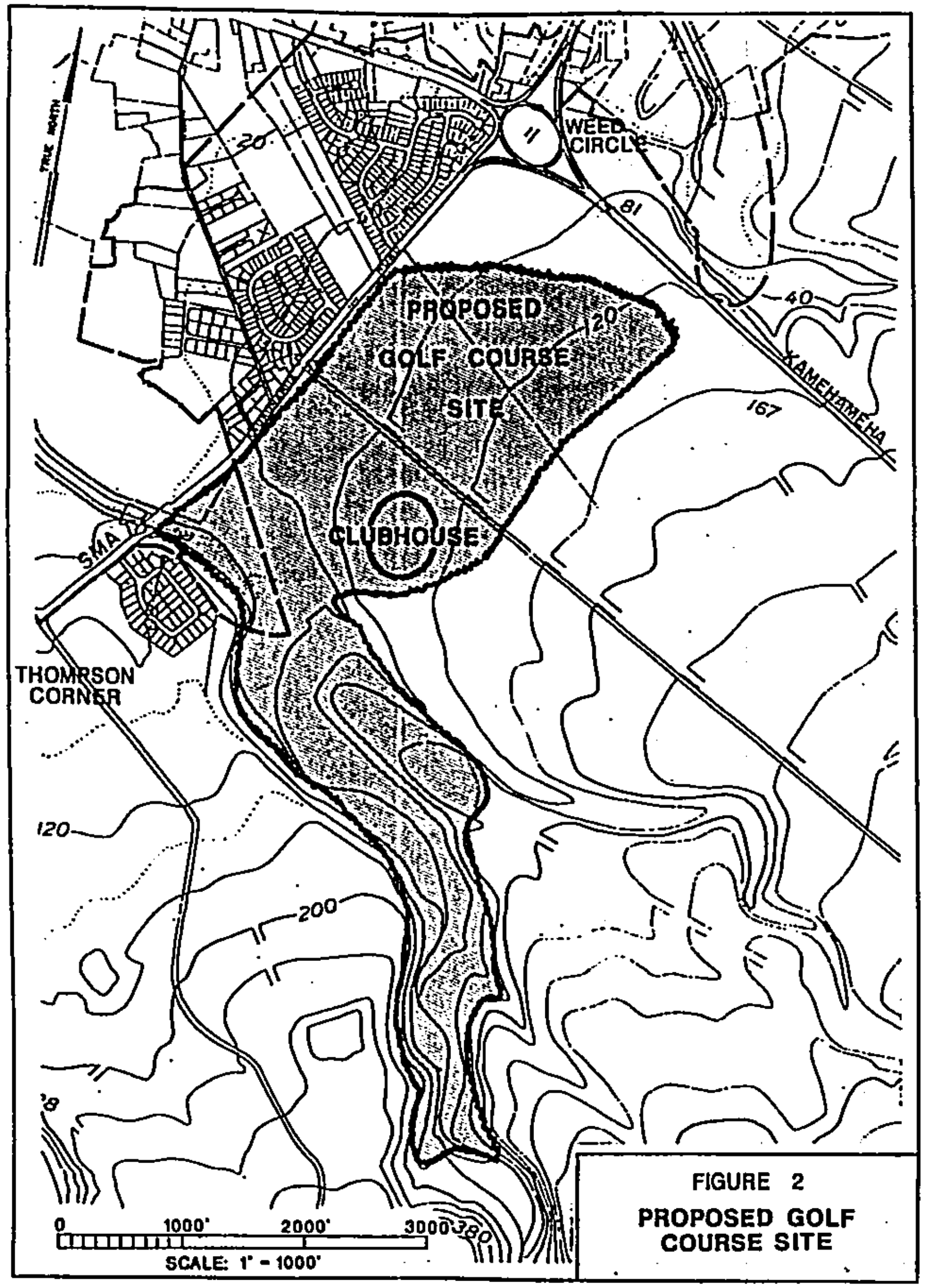


FIGURE 2
PROPOSED GOLF COURSE SITE

The Lahaina Silty Clay's representative profile is dark reddish-brown, silty clay about 15 inches thick for the surface layer and is medium acid. Permeability is moderate. Runoff is slow and the erosion hazard is slight.

The Haleiwa Silty Clay surface layer is dark-brown silty clay about 17 inches thick. The soil is neutral to slightly acid. Permeability is moderate. Runoff is very slow, and the erosion hazard is no more than slight.

5. Location Map: See Figure 1.
6. Topographic Map: See Figure 2.
7. Project Layout: See Figure 2.

II. DEVELOPMENT PROPOSAL

A. Applicant's Proposed Use of Property

The applicant proposes to construct an 18-hole Championship Golf Course. A club house, driving range and equipment building will also be included in the construction program.

B. Development Timetable

It is the applicant's intention to proceed as expeditiously as possible. The State and City and County approval process is anticipated to require two years. Design and construction of the golf course and club house will require another two years. Barring any unforeseen problems, the golf course should be in operation within five years.

C. Approximate Cost

The total project cost including design, engineering, and construction is estimated to be in the range of 7 to 8 million dollars.

III. NEED FOR PROPOSED DEVELOPMENT

A. Public Problem or Need

The construction of golf courses on Oahu has not kept pace with the demands of a growing population and the increase in visitors. There are 28 golf courses on Oahu. Four of the golf courses are private, offering golfing opportunities on a membership fee basis and therefore are not open to the general public. Nine courses are operated by the military, which also restrict use by the general public. Of the remaining courses, three are resort oriented, eight are privately owned and opened to the public and the remaining four are operated by the City and County of Honolulu, one of which is a 9-hole course at Kahuku.

The newest municipal course is Ted Makalena, which opened in 1971. Since that period, the resident population has increased approximately 28 percent while the number of tourists visiting Oahu has increased more than 100 percent. The public courses are heavily used with the Ala Wai ranking as the most played course in the world. As a reflection of the disparity between the resident and tourist growth as compared to a static supply of golf courses, the present golf facilities on Oahu are being used close to their capacity.

To meet this demand, numerous golf courses are proposed for construction. However, only one course, the West Beach Resort Golf Course is under construction. Of the golf courses proposed for construction, only the proposed golf course at the Turtle Bay Hilton falls within the general service area for Northshore golfers. The closest golf courses, except for military courses,

to the proposed Waialua project site is the existing Turtle Bay Hilton, and the Mililani Golf Club. Both courses are approximately 12 miles from the proposed golf course.

B. Intended Market

The proposed golf course will be open to public play, making it available to both residents and tourists. While the facility is available to meet the growing demand on an island wide basis, the immediate service area will be the Northshore community which currently does not have immediate access to a golf course without having to drive 12 miles to the Turtle Bay or the Mililani golf courses. Both courses are presently operating at near capacity, particularly on week-ends and holidays.

C. Designated Use vs. Proposed Use

Site Breakdown:

Sugar = 142 ± acres, 66 percent
Gully = 72 ± acres, 34 percent
214 ± acres, 100 percent

The project site is designated Agriculture and is used by the Waialua Sugar Company for the production of sugar cane. Approximately 66 percent of the site is planted in sugar cane with the remainder of the site in the Poamoho Stream gully. The removal of approximately 142 acres from sugar cane production should not affect the economic viability of the Waialua Sugar Company nor restrict the opportunities for diversified agriculture on Oahu.

The need for additional golf facilities on Oahu is evident from the extraordinary demand at the municipal courses where on one day

30,000 telephone calls had been logged for tee times to three municipal courses in one hour. Existing courses are operating at or near capacity. Additional courses are needed to satisfy both resident and visitor demands, as reflected in the resident and visitor growth since 1971, the year in which the last municipal course was constructed.

IV. FEDERAL, STATE AND CITY PLAN/PROGRAMS

A. Federal N/A

B. State of Hawaii

1. Hawaii State Plan

Objectives and Policies of the Hawaii State Plan Related to the Proposed Project are as Follows:

Objectives and policies for the economy - in general

(a) Planning for the State's economy in general shall be directed toward achievement of the following objectives:

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

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

Comment: The golf course will cover a varied range of employment choices from food services to course maintenance and management. The golf course development will diversify the economic opportunities in an area lacking convenient job choices for the residents living in the Northshore area.

Objectives and policies for the economy - visitor industry

(a) Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawaii's economy.

(b) To achieve the visitor industry objective, it shall be the policy of this State to:

(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspiration of Hawaii's people.

(3) Improve the quality of existing visitor destination areas.

(5) Ensure that visitor facilities and destination areas are carefully planned and sensitive to existing neighboring communities and activities.

(6) Develop the industry in a manner that will provide the greatest number of primary jobs and steady employment for Hawaii's people.

Comment: The proposed golf course will serve a clientele similar to the Mililani course which is a mix of tourists and local golfers. The proposed golf course provides an additional option for a golfing experience thereby strengthening the golfing choices on Oahu and enlarging the service facilities for visitors. The project site is well situated to provide alternative choices for tourists at the Turtle Bay Resort and the future West Beach Resort Complex. The proposed project will meet the social, economic and physical needs of Hawaii's residents by providing primary jobs, steady employment and the opportunity to engage in recreational pursuits.

Objectives and policies for the economy - potential growth activities.

(a) Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawaii's economic base.

(b) To achieve the potential growth activity objective, it shall be the policy of this State to:

(2) Expand Hawaii's capacity to attract and service international programs and activities that generate employment for Hawaii's people.

Comment: The proposed project, through its availability to overseas visitors, provides an impetus for expanding a growth activity which serves to increase and diversify Hawaii's economic base. Recent estimates indicate approximately 200,000 visitors annually play golf in Hawaii, spending 30 million dollars on green fees.

Objective and policies for the physical environment - scenic, natural beauty, and historic resources.

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.

(b) To achieve the scenic, natural beauty, and historic resources objective, it shall be the policy of this State to:

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

(5) Encourage the design of developments and activities that complement the natural beauty of the island.

Comments: The golf course will be designed to fit the natural attributes of the site, encompassing the two distinctive topographical variations of the site. The southern part of the course will be designed to reflect the natural topographical features of the Poamoho Stream, while the northern section is designed to capture the panoramic views of the ocean and the Waianae mountains from the sloping plateau. The club house will also be placed in this area to capture these same spectacular views. The course with its open space character will complement the adjoining spacious features of the Northshore.

The Priority Directions in Part III of the Hawaii State Plan are applicable to the proposed golf course in a number of the priority guidelines.

Economic priority guidelines

(b) Priority guidelines for the visitor industry:

(1) Foster a social environment which enhances the Aloha Spirit by minimizing inconveniences to Hawaii's people and visitors.

(2) Protect the economic health and quality of the visitor industry.

(9) Maintain and enhance visitor satisfaction.

(e) Priority guideline for developing economic activities to encourage the development of industries which promise long-term growth potentials and which have the following characteristics:

(1) An industry that can take advantage of Hawaii's unique location and available manpower resources.

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

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

Comments: The golf course supports the economic health and quality of the visitor industry by providing an additional recreational facility which is in heavy demand by visitors. The course equally supports the recreational needs of Hawaii's devoted golfers by providing a new course for play and at the same time reducing the demands on other Oahu

courses. The open space character of a golf course supports the visual and aesthetic qualities of Oahu's natural landscape.

c. City

1. General Plan: The Oahu General Plan sets out the social, economic and design objectives and policies for the general welfare of its residents This section will discuss those particular areas of concern within the General Plan which will relate to the proposed project.

Economic Activity

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

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

Policy 2: Encourage the development of small businesses and larger industries which will contribute to the economic and social sell-being of Oahu residents.

Policy 3: Encourage the development in appropriate locations on Oahu of trade, communications, and other industries of a non-polluting nature.

Comment: The proposed golf course further diversifies Oahu's economic base and enlarges the employment options for its residents. The project is non-polluting while enhancing the recreational options for both visitor and resident golfers.

The golf course is ideally located to provide employment for the residents of the Northshore, thereby assisting in relieving the Honolulu-bound traffic corridors of some vehicular trips and shortening the work trip travel time for employees.

Objective B: To maintain the viability of Oahu's visitor industry.

Policy 9: Encourage the visitor industry to provide a high level of service to visitors.

Comment: The additional golf course broadens the recreational base for visitors and provides another alternative in selecting a golf course for play.

Energy

Objective B: To conserve energy through the more efficient management of its use.

Policy 1: Ensure that the efficient use of energy is a primary factor in the preparation and administration of land use plans and regulations.

Comment: The proposed golf course in Waialua provides employment options for nearby residents living along the Northshore, reducing driving distances to employment centers which in turn curtails the use of fossil fuels. Driving distances for Northshore golfers are also reduced.

Culture and Recreation

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

Policy 2: Develop and maintain a system of regional parks and specialized recreation facilities.

Policy 10: Encourage the private provision of recreation and leisure-time facilities and services.

Comment: The proposed golf course increases the specialized recreational facilities for Oahu residents and visitors. The need for more golf courses on Oahu is evident from the excessive use of the Municipal courses. The remaining courses which are open to visitors and the general public on a daily fee basis are also operating at or near capacity.

The proposed golf course will be privately constructed and maintained, thereby relieving Hawaii's residents of governmental expenditures in developing a new golf course.

2. Development Plan

a. Common Provisions

Comment: The Common Provisions of the Development Plan address private golf courses as an open space resource. Open space resources are to provide visual relief and contrast to the built environment and to serve as outdoor space for public use and enjoyment. The proposed golf course satisfies this criteria by providing an opportunity for residents and visitors to enjoy the scenic beauty of the ocean and the nearby mountains while engaging in a recreational activity.

b. Special Provisions

Section 2, Urban Design Principles and Controls for the Northshore

1. Specific Urban Design Considerations
   b. Public Views - important views to be protected include:
      - Panoramic views of Waialua Town and Haleiwa Town from the Wahiawa approach of Kamehameha Highway and Kaukonahua Road.
      - Views of the Waianae mountains from Kaukonahua Road and Kamehameha Highway in Haleiwa near Weed Circle.

<u>Comment</u>: The proposed golf course is located on the hillside between Kamehameha Highway and Kaukonahua Road. The views of Waialua Town, Haleiwa Town and the Waianae mountains will be enhanced because of the opportunity to embrace this expansive area from a stationary viewing point such as the golf course. Presently this panoramic view is only available to traveling motorists on Kamehameha Highway and Kaukonahua Road.

   c. Land Use Map: The project site designated Agriculture on the Northshore Development Plan.
   d. Public Facilities Map: N/A

3. Others: N/A

V. IMPACTS

A. <u>Demographic</u>

1. Residential Population: The proposed golf course will not increase nor decrease the resident population.
2. Visitor Population: The project in itself will not directly impact the number of visitors.

3. Character or Culture of the Neighborhood: The golf course will not alter the character or culture of the adjacent community. The open space characteristics of the golf course will retain the visual openness of the site.
4. Displacement: No population or business activities will be displaced as a result of the proposed development. That portion of the site which is used for the growing of sugar can will be supplanted by the golf course.
5. Other Social Impacts: The golf course will provide a convenient, new recreational facility for the use of Northshore residents.

B. <u>Economic Impacts</u>

1. Economic growth: The proposed golf course and club house will be constructed in one phase. The rate and pattern of the economic impact will be immediate, represented in the form of two impact types. The first type will be the construction efforts or short-term impact. The second type is the long-term impact, referring to the operational phase. There is a current and long-term demand for golf course facilities which is not being adequately addressed. The applicant is prepared to construct the facility as soon as permit procedures are approved to partially meet the deficiency.
2. Employment: As noted, the proposed project will generate both short-term and long-term employment opportunities. During the short-term or construction phase of the project, approximately 80 full-time jobs per year should occur, based

upon comparable developments. In addition, DPED estimates that for each full-time direct construction employee, 2.4 full-time equivalent employees are also supported. Upon completion of the golf course, it is estimated 30 full-time jobs will be created. These full-time employees would also generate additional employment elsewhere in the state. Based upon studies by DPED, it is estimated that each full-time golf course employee would generate .02 indirect and induced employment positions.

3. Government Revenue: The golf course will increase the real property taxes of the site, particularly for the portion of the site occupied by the Poamoho Stream which is currently unproductive. Other local and State tax revenues will be generated during the construction and operational phases in the form of sales and income taxes.

4. Location Vis-a-Vis Intended Market: The proposed golf course is well sited to service the golfing needs of both the Northshore and Central Oahu residents. The Turtle Bay and West Beach Resorts are within convenient driving distances to the proposed golf course. With the new resort growth occurring in these two areas and the expanding residential population of Central Oahu, the golf facility is well suited to meet the present and expanding golfing demands of this major area.

C. <u>Housing Impacts</u>

1. Increase Supply: The project will not impact the housing inventory.

2. Affordable Units: N/A

D. <u>Public Services</u>

1. Traffic Impacts: The proposed project will be accessed from Kaukonahua Road, a two-lane highway. Traffic volumes generated by the 214-acre golf course, estimated using average trip rates from the Institute of Transportation Engineers, are shown below.

Traffic Generation

	Total In & Out	Entering	Exiting
Average Weekday	1,480	740	740
Weekday - AM Peak Hour	58	47	11
Weekday - PM Peak Hour	83	17	66
Weekend Peak Hour	137	27	110

The State Department of Transportation estimates that Kaukonahua Road between Weed Circle (intersection with Kamehameha Highway and Waialua Beach Road) and Thomson Corner (intersection with Farrington Highway) had an average daily traffic of approximately 5,700 vehicles per day in 1985. Peak hour two-way traffic volumes on Kaukonahua Road were calculated to be 426 vehicles per hour (vph) in the morning (AM) peak hour, and 511 vph in the afternoon (PM) peak hour. Weekend peak hour traffic totaled 550 vph in 1986, according to an estimate prepared by Parsons Brinckerhoff Quade and Douglas, Inc.

Existing peak hour conditions on Kaukonahua Road, based on the above traffic volumes, are described by "Level of Service C" for two-lane rural highways. Traffic volumes are approximately 25-30 percent of capacity. The increase in traffic due to the project will be approximately 15 percent of existing traffic, and highway levels of service are not expected to change as volume-to-capacity ratios increase to 30-35 percent. The project traffic is expected to be distributed in several directions at Weed Circle and Thomson Corner, resulting in minimal impacts to traffic beyond these junctions.

The project access roadway will form a T-intersection with Kaukonahua Road. An unsignalized intersection, controlled by a stop sign for traffic leaving the golf course, would have adequate capacity to serve the volumes generated by the project.

2. Water: The potable water needs for the project can be met by the Board of Water Supply system. Water is supplied by the Waialua Wells (1,500 gpm), while storage needs can be provided by the Waialua Reservoir (1.5 million gallons).

   An 8-inch transmission main runs along Kaukonahua Road on the west. It is intended to tap this transmission main for potable water needs.

   Approval of this plan will be required by the Board of Water Supply. A master plan delineating the essential criteria and data will be prepared and submitted to the Board of Water Supply for review and approval.

   Irrigation water to meet the demands of the golf course will be provided by utilizing the sugar cane irrigation system. The source of irrigation water will be Pump No. 10 located near the Poamoho Stream Valley.

   A reservoir, along with transmission mains, will be constructed to provide both irrigation water for the golf course and fire protection for the club house.

3. Wastewater: Wastewater from the proposed golf course will be generated primarily from club house activities. Alternative treatment and disposal schemes are currently being evaluated. Alternatives include utilizing the existing Paalaa Kai Wastewater Treatment Plant or constructing a new on-site treatment plant. The recommended scheme will be submitted to the State of Hawaii Department of Health and the City and County of Honolulu Department of Public Works for review and approval.

4. Drainage: Previous flood studies by the U.S. Corps of Engineers indicate the valleys of Poamoho Stream and North Poamoho Stream are within the 100-year flood interval. Design considerations will limit construction of buildings and utilities, thereby reducing damage during the 100-year flood.

5. Solid Waste: The Haleiwa-Waialua area is served by the municipal system. Refuse collected in this area is taken to the Kapaa landfill for disposal. The project site can be served by the municipal system.

6. Schools: N/A

7. Parks: N/A

8. Police: Police service can be provided by the Wahiawa station for the project site area, along with the Haleiwa-Waialua area.

9. Fire: Fire protection can be provided by the Waialua Fire Station, located on Haleiwa Road approximately 1.5 miles from the project site The backup station would be the Sunset Fire Station to the north.

10. Utilities: The project site can utilize the same electrical and telephone network used by the communities of Haleiwa and Waialua.

11. Others: N/A

12. List of Agencies Consulted: Agencies will be contacted in connection with the preparation of the project's Environmental Impact Statement.

E. Environmental Impacts

1. Noise: Temporary noise levels will increase in the area during the construction phase. The noise levels which occur will be within the limits prescribed under applicable noise ordinances and regulations.

The proposed golf course will not generate any adverse noise levels in the long-term after the course is in operation. The club house, which would be the most intensively used feature of the course, will be approximately 1,500 feet east of Kaukonahua Road and centrally located within the golf course proper. The isolated location of the club house within the course will shield surrounding areas from any possible noise emissions.

With the estimated low volume of traffic entering and leaving the project site after completion of the course, noise emerging from this source will be minimal.

2. Air Quality: Short-term impacts can be expected from construction activities including dust and diesel emissions particularly during the grading stage of the golf course. This aspect of construction is controlled by wetting down the soil and implementing other related control measure such as grassing barren soil as soon as the grading is completed.

Long-term air quality impacts will be at a minimum since the traffic generated by the course will be dispersed throughout the day based upon the staggered tee times. The parking lot for the course will be placed adjacent to the club house which is well removed from any adjoining activities. The placement of the parking lot on the sloping plateau in a wind exposed location will further disperse any vehicular fumes.

3. Compatibility with Surrounding Environment: The proposed golf course, as classified under Development Plan Common Provisions, is an open space resource. The open space character of the golf course will be compatible with the adjacent agricultural activities and the nearby residential development south and west of the project site. The course will be designed to retain the basic topographical features of the site and the club house will be placed and designed to capture the scenic viewing qualities of this Northshore area. The overall design of the course will blend in with the existing open, rural nature of the area.

4. Historic and Archaeological Resources: Approximately 66 percent of the site has been under sugar cane cultivation. The remaining 34 percent of the site is represented by the

gully area created by the Poamoho Stream. With the disturbance to the ground area created by the cane cultivation and the stream, it is highly unlikely any historic or archaeological resources exist on the site. Before construction would occur on the site an assessment and field reconnaissance survey will be conducted on the site. Not withstanding, any archaeological feature uncovered during construction, the findings will be reported to the State Historic Preservation Office and all appropriate action will be initiated by the applicant.

5. <u>Natural Features</u>

a. Water resources: Two streams traverse the project site: Poamoho Stream and the North Poamoho Stream. No stream flow from either of these streams will be utilized. Potable water needs will have to be obtained from the Board of Water Supply. Irrigation demands will be obtained from the irrigation system of Waialua Sugar Plantation.

b. Flood plain management: The majority of the site is not located in the flood plain (reference: Flood Plain Information, Waialua-Haleiwa, Oahu, Hawaii, November 1970; Department of the Army, Pacific Ocean Division, Corps of Engineers), except for the valleys of the Poamoho and North Poamoho Streams. Preliminary plans call for construction of a golf course and no structural facilities in the valleys of the Poamoho and North Poamoho Streams.

c. Wetlands Protection: N/A

d. Coastal Zone Management: The special management area projects into the project site at the juncture of the Poamoho and North Poamoho Streams immediately east of Kaukonahua Road. No structures are proposed in this area.

e. Unique Natural Features: The natural physical features of the Poamoho Streams will remain basically undisturbed. The golf course will be designed to retain the natural qualities of these streams. Golf holes will be placed to minimize any disturbances to the topographical features embodied in these streams.

f. Vegetation and Animal Life: Since a major portion of the project site has been under sugar cane cultivation, it is highly unlikely any rare flora colonies exist or that the site has been a nesting area for any endangered animals. No known rare or endangered flora or fauna are known to exist on the site.

g. Agricultural Lands: Sixty six percent of the site is used for agricultural purposes.

h. Open Space: The open space character of the site will be retained since a golf course is a recognized open space resource.

6. <u>Hazards</u>

a. Nuisances and Site Safety: N/A

b. Thermal Explosives: N/A

c. Airport Clear Zone: N/A

13-17

F. <u>Alternatives Considered</u>

1. <u>No Action</u>: This is the only alternative considered by the applicant. Other uses permitted by the Land Use Ordinance do not appear feasible for this site, given its location and the operational requirements associated with the other uses permitted in the district, particularly the Conditional Uses. Leaving the site in agriculture deprives the applicant from providing a golf course which fulfills a community wide need. The removal of 142 acres of agricultural land will not adversely impact the operation of the Waialua Sugar Company nor create shortages in agricultural land which could be used for diversified agriculture. The project site is well suited to provide a specialized recreational facility in an area currently lacking a convenient golf course.

7. <u>Proposed Mitigation Measures</u>

The proposed development will not create any known conditions which require mitigation measures, other than those measures needed during the construction phase, which are temporary in nature.

VII NOTIFICATION REQUIREMENTS

A. The following list of parties have been furnished a copy of the summary sheet and map of the proposed golf course:

1. The Honorable Randall Iwase
District Councilman
Honolulu Hale, Room 100
Honolulu, Hawaii 96813

2. North Shore Neighborhood Bd. No. 27
P. O. Box 607
Haleiwa, Hawaii 96712

3. Waialua Community Association
66-434 Kamehameha Highway
Haleiwa, Hawaii 96712

4. Haleiwa Community Association
Mrs. Sally Amantiad
61-168 Punalau Place
Haleiwa, Hawaii 96712

5. Mr. & Mrs. Donal T. Koga
65-128 Hukilau Loop
Waialua, Hawaii 96791

6. Mr. & Mrs. Walter H. Watanabe
66-124 Hukilau Loop
Waialua, Hawaii 96791

7. Mr. & Mrs. Roy T. Sakai
P. O. Box 610
Haleiwa, Hawaii 96712

8. Mr. & Mrs. Roger Lavarias
65-118 Hukilau Loop
Waialua, Hawaii 96791

9. Mr. Dennis Silva
65-114 Hukilau Loop
Waialua, Hawaii 96791

10. Mr. & Mrs. Tsutomu Fujioka
P. O. Box 578
Waialua, Hawaii 96791

11. Mr. & Mrs. Antonio Comanga
65-106 Hukilau Loop
Waialua, Hawaii 96791

12. Mr. & Mrs. Jacob Y. Ng
P. O. Box 393
Haleiwa, Hawaii 96712

13. Mr. & Mrs. Juanito Ines
P.O. Box 235
Waialua, Hawaii 96791

14. Mr. & Mrs. Richard Oyama
65-078 Hukilau Loop
Waialua, Hawaii 96791

15. Mr. & Mrs. Lawrence Lunasco
65-076 Hukilau Loop
Waialua, Hawaii 96791

16. Mr. Henry Amara
P. O. Box 193
Haleiwa, Hawaii 96712

17. Church of Jesus Christ of Latter Day Saints
50 East North Temple 22N
Salt Lake City, Utah 84150

18. Mr. Gregory Suenaka
66-873 Paahihi Street
Waialua, Hawaii 96791

19. Mr. Germiniano Antonio
66-882 Alena Loop
Waialua, Hawaii 96791

20. Mr. Regino Aceret
66-886 Alena Loop
Waialua, Hawaii 96791

21. Mr. Adelisa Martinez
66-890 Alena Loop
Waialua, Hawaii 96791

22. Mr. Thomas Holland
66-892 Alena Loop
Waialua, Hawaii 96791

23. Mr. Samuel Deuz
66-894 Alena Loop
Waialua, Hawaii 96791

24. Mr. Carlos Esteban
66-896 Alena Loop
Waialua, Hawaii 96791

25. Mr. Jose Billedo
66-898 Alena Loop
Waialua, Hawaii 96791

26. Mr. William Cox
66-900 Alena Loop
Waialua, Hawaii 96791

27. Mr. Petronio Balicoco
66-902 Alena Loop
Waialua, Hawaii 96791

28. Mr. Allen Lau
66-906 Alena Loop
Waialua, Hawaii 96791

29. Mr. Francisco Agoo
66-908 Alena Loop
Waialua, Hawaii 96791

30. Mr. Saitty Koga
1259 Rycroft St., #302
Honolulu, Hawaii 96814

31. Mr. Ralph Koga
67-339 Kukea Circle
Waialua, Hawaii 96791

32. Koga & Sons, Inc.
Haleiwa Supermarket Ltd.
66-197 Kamehameha Highway
Haleiwa, Hawaii 96712

33. Mr. Robert Peru
66-961 Kaukonahua Road
Waialua, Hawaii 96791

34. Mr. Quilardo Ozoda
66-948 Kaukonahua Road
Waialua, Hawaii 96791

35. Mr. Leon Valbuena
66-949 Kaukonahua Road
Waialua, Hawaii 96791

36. Mr. Murashige Seiji
P. O. Box 501
Waialua, Hawaii 96791

B. 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 of each abutting parcel".

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

Oceanic Properties, Inc.

DGP REF. NO:
MAP REF. NO:
NB AREA: Northshore #27
ACREAGE: 214 Acres
TMK: 6-5-01:2
6-4-01:6

(DP AREA)
DEVELOPMENT PLAN LAND USE AMENDMENTS
BEING CONSIDERED

<u>Amendment/Project Information</u>

Amendment Request: Agriculture to Park and Recreation

Location: Vicinity of Waialua Community Along Kaukonahua Road Between Weed Circle and Thomson Corner

Owner: Castle and Cooke, Inc.
650 Iwilei Road
Honolulu, Hawaii 96817

Developer: Oceanic Properties, Inc.
P. O. Box 2780
Honolulu, Hawaii 96813

Requested By:
Oceanic Properties Inc.

Basis for Request: To meet the demand for additional golf courses.

Type of Project: Golf Course

Impact on Provision of Housing: None

<u>Existing Conditions</u>	<u>Present Plan/Zoning Designations</u>
Land Use: Sugar Cane Production and Gulch Lands	State Land Use: Agricultural
Structures Number: None Type: None Height: None	DP Public Facilities Map: N/A DP Special Provisions: N/A
ALISH: 66 percent Prime and 34 percent not classified	Zoning: AG-1, Restricted Agricultural District

Soil Features: Lahaina Silty Clay and Haleiwa Silty Clay.
Both soil types are: moderate for permeability, slow runoff and erosion hazard is no more than slight.

Possible Constraints: None

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 S. BERETANIA STREET, ROOM 309
HONOLULU, HAWAII 96814

FRANK F. FASI
MAYOR

FRANK K. KAHOOHANOHANO
FIRE CHIEF

LIONEL E. CAMARA
DEPUTY FIRE CHIEF

November 24, 1987

Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Attention: Mr. Ken Ishizaki

Gentlemen:

SUBJECT: EIS PREPARATION NOTICE FOR PROPOSED
WAIALUA GOLF COURSE, TMK 6-5-01:2; 6-4-01:6

We have reviewed the subject EIS notice and have no objections to the proposal as stated.

We request that fire hydrants be provided near the clubhouse and at any other buildings in the development.

Fire protection otherwise is adequate with primary company response from Waialua Fire Station and, if necessary, assistance coming from Sunset Beach or Wahiawa Fire Stations.

Sincerely,

Frank K. Kahoohanohano

FRANK K. KAHOOHANOHANO
Fire Chief

FKK/CAM:sb

cc: Tyrone T. Kusao, Inc.

ENGINEERING CONCEPTS, INC.

CONSULTING ENGINEERS

November 30, 1987

Mr. Frank K. Kahoohanohano, Chief
Fire Department
City and County of Honolulu
1455 South Beretania St., Room 305
Honolulu, Hawaii 96814

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of November 24, 1987 regarding the EIS preparation notice for the project.

The EIS will incorporate your request to locate fire hydrants near the clubhouse and other buildings in the development. Your comment on the adequacy of fire protection provided from Waialua, Sunset Beach, and Wahiawa fire stations is appreciated.

Very truly yours,

Ken Ishizaki

Ken Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

NOV 30 1987

Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Re: Environmental Impact Statement Preparation Notice for Proposed Waialua Golf Course, TMK: 6-5-01:2; TMK: 6-4-01:6

Dear Mr. Ishizaki:

We have reviewed the subject notice and recommend that the impact statement address the following concerns:

a. potential nutrient enrichment of Poamoho Stream;

b. potential discharge of sediments into Poamoho Stream during project construction;

c. potential pesticide poisoning of endangered Hawaiian waterbirds and migratory shorebirds that may frequent golf course greens, water hazards, and sand traps;

d. potential contamination of Poamoho Stream by pesticides, herbicides, and fungicides used to maintain the golf course.

Discussion of these concerns should include a description of the fertilizers and biocides which will be applied during normal maintenance, their normal application rates, and calculations of their concentrations in runoff waters from the site. Given the proximity of the proposed golf course to wetland waterbird habitats in Mokuleia, Ukoa Pond, and Kahuku, it seems highly probable that endangered Hawaiian Coots and Ducks, and migratory shorebirds such as the Golden Plover will be attracted to the new golf course. The Service is concerned that these birds may be exposed to high levels of toxic chemicals while feeding and loafing on the proposed course. To the best of our knowledge, this potential effect can be reduced by careful application of selected biocides with reduced toxicity to aquatic organisms and waterbirds. We offer our assistance in the selection of suitable chemicals for use on the proposed course.

We also suggest that the environmental impact statement address the aquatic community structure of Poamoho Stream and discuss potential impacts of the project upon these resources. Specific measures to mitigate disturbances to the stream should be evaluated, such as the maintenance of a vegetative buffer consisting of native trees and ground cover along the stream bank throughout the length of the property, and the modification of drainage to avoid point-source discharges into Poamoho Stream.

Please contact me if you have any questions about our comments or desire to meet with our professional staff.

We appreciate this opportunity to comment.

Sincerely yours,

Ernest Kosaka

Ernest Kosaka, Field Supervisor
Office of Environmental Services
Pacific Islands Office

cc: Tyron T. Kusao, Inc.

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

December 3, 1987

Mr. Ernest Kosaka, Field Supervisor
Office of Environmental Services
Pacific Islands Office
Fish and Wildlife Service
U.S. Department of the Interior
300 Ala Moana Blvd., Box 50167
Honolulu, Hawaii 96850

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of November 30, 1987 regarding the EIS preparation notice for the project.

We appreciate your comments and concerns about the fate of sediments, pesticides, and fertilizers on the Poamoho Stream environment and wildlife. Your comments and concerns will be considered in the draft EIS.

We welcome your input and assistance in selecting suitable chemicals to reduce toxicity to aquatic organisms and waterbirds and will be contacting you for this information shortly.

Very truly yours,

Ken Ishizaki

Ken Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

United States Department of the Interior

GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
P. O. Box 50166
Honolulu, Hawaii 96850

November 30, 1987

Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Attn: Mr. Ken Ishizaki

Subject: EIS Preparation Notice for Proposed Waialua Golf Course

Dear Mr. Ishizaki:

We have reviewed the subject EIS preparation notice and and have no comments. Thank you for the opportunity to review the notice.

Sincerely,

William Meyer
William Meyer
District Chief

ENGINEERING CONCEPTS, INC.

CONSULTING ENGINEERS

December 3, 1987

Mr. William Meyer, District Chief
Water Resources Division
Geological Survey
U.S. Department of the Interior
P. O. Box 50166
Honolulu, Hawaii 96850

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of November 30, 1987 in which you note that your agency has no comments to make on the EIS preparation notice for the project.

Very truly yours,

Ken Ishizaki
Ken Ishizaki, P.E.
Vice President

DM/bs

cc: Tyrone T. Kusao, Inc.✓

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

HAWAIIAN TEL GTE
Beyond the call

Interoffice Correspondence

Reference:

November 30, 1987

Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

ATTENTION: Mr. Ken Ishizaki

Dear Sir:

Environmental Impact Statement (EIS) Preparation
Notice of Proposed Waialua Golf Course
Tax Map Keys 6-5-01:2 and 6-4-01:6

We appreciate the opportunity to review and comment on the Development Plan Amendment and Environmental Assessment for the proposed Waialua Golf Course and would like to offer at this time our comments relative to V.D.10 on page 20.

The proposed Golf Course will utilize existing aerial facilities and will have no significant effect on our existing facilities or our ability to maintain telecommunication services during its construction.

Also, we do not foresee any adverse environmental effects resulting from our telephone facilities.

If you have any questions, please call Nelson Yrizarry at 834-6222.

Sincerely,

Walter Matsumoto
Oahu Engineering and
Construction Manager

G-0004 (Rev. 7/86)

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

December 4, 1987

Mr. Walter Matsumoto
Oahu Engineering & Construction
Manager
Hawaiian Telephone Company
P. O. Box 2200
Honolulu, Hawaii 96841

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of November 30, 1987 regarding the EIS preparation notice for the project.

We appreciate your comments on the effect of the proposed golf course on existing telephone facilities and its resulting environmental impact. Your comments will be included in the draft EIS.

Very truly yours,

Ken Ishizaki

Ken Ishizaki, P.E.
Vice President

DM/bs

cc: Tyrone T. Kusao, Inc.

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

ALFRED J. THIEDE
DIRECTOR AND CHIEF ENGINEER

ENV 87-236

December 7, 1987

Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Dear Mr. Ishizaki:

Subject: EISPN For Proposed Waialua Golf Course
(TMK: 6-5-01:2; 6-4-01:6)

We have reviewed the subject EISPN and have the following comments:

1. Municipal sewers will not be available until the early 2000. If the Paalaa Kai WWTP is being considered, the plant will have to be expanded.
2. If municipal refuse collection service is requested, adequate service roads must be provided with turnarounds for the collection vehicle. The refuse containers must be easily accessible. If a substantial amount of solid waste is generated, it may be desirable to utilize a private refuse collector.
3. We have no drainage comments at this time.

Very truly yours,

ALFRED J. THIEDE
Director and Chief Engineer

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

December 14, 1987

Mr. Alfred J. Thiede
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of December 7, 1987 regarding the EIS preparation notice for the project.

In response to your comments on wastewater and solid waste disposal:

1. Paalaa Kai WWTP is being considered for treatment and disposal of wastewater generated at the proposed golf course. The necessary wastewater treatment plant expansion required to accommodate additional flows from the proposed golf course will be addressed in the draft EIS.
2. The requirements for municipal refuse collection service will be incorporated in the draft EIS.

Very truly yours,

Ken Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

250 W... • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

JOHN WAIHEE
GOVERNOR OF HAWAII

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

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

LIBERT K. LANDGRAF
DEPUTY

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

December 9, 1987

Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Ave., Suite 206
Honolulu, Hawaii 96814

Dear Mr. Ishizaki:

SUBJECT: Review of EIS Preparation Notice for Proposed Waialua Golf Course
Paalaa and Kamananui, Waialua, Oahu
TMK: 6-5-01: 2; & 6-4-01: 6

Thank you for the opportunity to comment on this project.

A number of historic sites were recorded in the area in a survey which was done around 1930. Although these sites have been destroyed by cultivation, the early survey was far from comprehensive, and there is a probability that some sites may still be present in the gulch area. We believe that the project may have an effect on significant historic sites.

We recommend professional archaeological survey of the 72 acres of gully area which has not been in sugar cane production. The survey's final report should be submitted to our office for review and comment. The report should also be included in the EIS and serve as your basis for significance evaluation of any historic sites which may be present.

If you have further questions, please contact Dr. Joyce Bath, our staff archaeologist for Oahu.

Sincerely,

RALSTON H. NAGATA
State Parks Administrator
and Deputy State Historic Preservation Office

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538 6652
RES (808) 395 1338

December 16, 1987

Mr. Ralston Nagata
Deputy State Historic Preservation Officer
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii

Attention: Dr. Joyce Bath

Subject: EISPN For Proposed Waialua Golf Course.

Dear Mr. Nagata:

Appreciated receiving your letter of December 9, 1987 addressed to Mr. Ken Ishizaki of Engineering Concepts, Inc. concerning historic sites on the proposed golf course property.

The firm of Chiniago, Inc. has been retained to do the archaeological survey and their report will be included in the EIS document. Additionally we will be forwarding you a copy of the report for review and comment.

Your attention to this matter is sincerely appreciated.

Very truly yours,

Tyrone T. Kusao

TTK:afk
cc: Mr. William Barrera, Jr.

STATE OF HAWAII
DEPARTMENT OF BUSINESS
AND ECONOMIC DEVELOPMENT

LAND USE COMMISSION

Room 104, Old Federal Bldg., 335 Merchant Street
Honolulu, Hawaii 96813 Telephone 548-4611

December 9, 1987

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

Dear Mr. Kusao:

Subject: EIS Preparation Notice for Development of a Golf Course at Waialua, North Shore, Oahu, Tax Map Keys 6-5-01: 2 and 6-4-01: 6

Thank you for providing us a copy of the subject EIS Preparation Notice.

We have no comments to offer at this time except that the proposed site is designated within the State Land Use Agricultural District and appears to be rated a master productivity of "A" and "B" and will require a Special Permit or a District Boundary Amendment.

If you have any questions, please call me or my staff at 548-3073.

Sincerely,

Esther Ueda

ESTHER UEDA
Executive Officer

EU:to

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813

BUS (808) 538 6652
RES (808) 395-1338

January 12, 1988

Ms. Ester Ueda, Executive Officer
Department of Business & Economic Development
Land Use Commission
Room 104, Old Federal Bldg.,
335 Merchant Street
Honolulu, Hawaii 96813

Re: EIS Preparation Notice for Proposed Waialua Golf Course, TMK: 6-5-01:2 and TMK: 6-4-01:6

Dear Ms. Ueda:

Thank you for your letter dated December 9, 1987 concerning the above mentioned golf course. We appreciate your attention to this matter.

Very truly yours,

Tyrone T. Kusao

Tyrone T. Kusao

TTK:afk

cc: Engineering Concepts, Inc.

DEC 14 1987

Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840

ENV 2-1
JMG

Brenner Munger Ph.D. PE
Manager
Environmental Department

December 10, 1987

Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Dear Mr. Ishizaki:

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Development of a Golf Course at Waialua, North Shore, Oahu

We have reviewed the subject EISPN and have the following comments:

1. We do not have any existing transmission facilities nor do we presently have plans for future transmission facilities in the subject project area.

2. An existing HECO 12KV distribution line in the project area (see Enclosure 1) may need to be relocated. Costs for relocating this line, if necessary, must be covered by developer. The existence of this distribution line and possible relocation should be mentioned in the subject EISPN.

Sincerely,

Brenner Munger

Enclosure

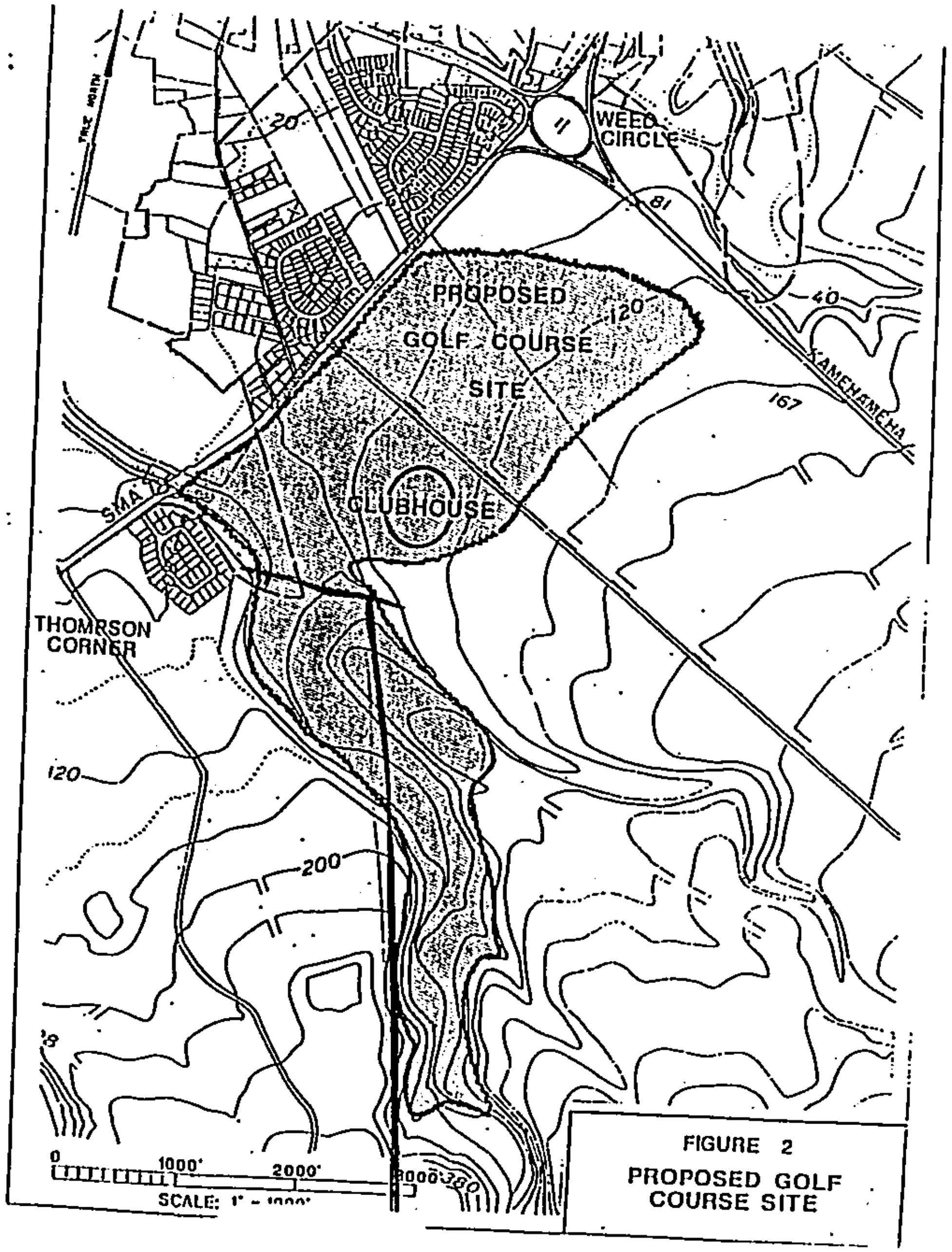


FIGURE 2
PROPOSED GOLF COURSE SITE

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

December 14, 1987

Dr. Brenner Munger, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840-0001

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of December 10, 1987 with comments regarding the preparation notice for the project.

We will incorporate your comments on existing and future transmission facilities in the Draft EIS.

Possible relocation of an existing 12 KV distribution line will also be addressed in the Draft EIS.

We appreciate you bringing these items to our attention.

Very truly yours,

Ken Ishizaki

Kenneth Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. BOX 50004
HONOLULU, HAWAII
96850

December 11, 1987

Engineering Concepts, Inc.
ATTN: Mr. Ken Ishizaki
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Re: EIS Preparation Notice for Proposed Waialua Golf Course,
TMK: 6-5-01:02 and TMK: 6-4-01:06

Dear Mr. Ishizaki:

The above mentioned document has been reviewed and the following comments are offered for your consideration:

The proposed environmental impact statement should address the land that is presently in sugarcane and is classified as prime agricultural land, and discuss any possible effects on adjacent lands.

Please send any further documents or correspondence to Mr. Stratford Whiting, District Conservationist, P.O. Box 50006, Honolulu, HI 96850 for review or comment.

Sincerely,

Herbert J. Sayford, acting

RICHARD N. DUNCAN
State Conservationist

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

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

December 21, 1987

Mr. Stratford Whiting
District Conservationist
U.S. Soil Conservation Service
P. O. Box 50006
Honolulu, Hawaii 96850

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for clarifying the comments made by Mr. Richard N. Duncan, State Conservationist, in his letter of December 11, 1987 regarding the EIS preparation notice for the project.

Economic and logistic impacts on Waialua Sugar Company and their fields bordering the proposed golf course will be addressed in the Draft EIS.

Very truly yours,

Ken Ishizaki

Ken Ishizaki, P.E.
Vice President

DM/bs

cc: Tyrone T. Kusao, Inc.

250 War[illegible] Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

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

REPLY TO ATTENTION OF: December 14, 1987

Planning Branch

Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Ave., Suite 206
Honolulu, Hawaii 96814

Dear Mr. Ishizaki:

We have reviewed the EIS Preparation Notice for the proposed golf course at Waialua, Oahu. The following comments are offered.

a. A Department of the Army permit will be required if any fill is placed in Poamoho Stream. There are no wetlands adjacent to the stream at the project area. Operations Branch discussed the foregoing information with the applicant during a site visit on October 22, 1987.

b. Operations Branch has advised the applicant regarding the possible applicability of Nationwide authorizations (33 CFR 330.5(a)(1-26)) for specific activities, e.g., utility line crossings, minor bank stabilization activities, and culverted crossings.

c. According to the Flood Insurance Rate Map (FIRM) for the island of Oahu, the project sites are located in the following zones:

1) Zone X, unshaded (area outside of the 500-year flood plain).

2) Zone A (special flood hazard area inundated by the 100-year flood), with a base flood elevation of 30 feet above mean sea level (copy of relevant portion of FIRM is enclosed).

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Enclosure

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

December 21, 1987

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
U.S. Army Engineer
District, Honolulu
Fort Shafter, Hawaii 96858-5440

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of December 14, 1987 regarding the EIS preparation notice for the project.

We have reviewed your comments and will consider them in the preparation of the Draft EIS.

Very truly yours,

Kenneth Ishizaki, P.E.
Vice President

DM/bs

cc: Tyrone T. Kusao, Inc.

250 Wa[illegible] Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

DIRECTOR
EDWARD Y. HIRATA

DEPUTY DIRECTORS
JOHN K. UCHIMA
RONALD N. HIRANO
DAN T. KOCHI

IN REPLY REFER TO:
STP 8.2542

December 15, 1987

Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Dear Mr. Ishizaki:

EIS Preparation Notice
Proposed Waialua Golf Course
Waialua, Hawaii

We recommend that a left-turn storage lane for southbound traffic on Kaukonahua Road entering the site should be provided.

The design plans for the access road intersection with Kaukonahua Road must be coordinated with and approved by our Highways Division. The cost of all intersection improvements will be borne by the developer.

We appreciate this opportunity to provide comments.

Very truly yours,

Edward Y. Hirata

Edward Y. Hirata
Director of Transportation

cc: Larry Lum
Ty Kusao
Julian Ng

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

January 11, 1988

Mr. Edward Y. Hirata, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

SUBJECT: Proposed Waialua Golf Course
Waialua, Oahu, Hawaii
(Re: STP 8.2542)

Thank you for your comments in response to the EIS Preparation Notice for the subject project.

A traffic impact assessment report is being prepared for the project, and it will address the need for a left-turn storage lane for traffic from southbound Kaukonahua Road. The report will be part of the EIS. Our civil engineers will coordinate our plans with your Highways Division.

Very truly yours,

Ken Ishizaki

Ken Ishizaki, P.E.
Vice President

bs

cc: Tyrone T. Kusao, Inc.
Parsons Brinckerhoff Quade & Douglas, Inc.

250 Ward [illegible] • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

JOHN WAIHEE
GOVERNOR OF HAWAII

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

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

In reply, please refer to:
EPHSO

December 16, 1987

Mr. Tyrone Kusao
Tyrone Kusao, Inc.
1188 Bishop St., Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Proposed Waialua Golf Course, North Shore, Oahu

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

Noise

In preparation of the environmental impact statement for the subject project, the following noise concerns and regulatory requirements must be addressed:

1. The applicant indicated that the clubhouse is proposed to be centrally located within the golf course, approximately 1,500 feet east of Kaukonahua Road; also, the approximate distance to residential communities. However, due to anticipated low background noise levels, disturbances can occur from its associated activities. Mitigative measures to minimize potential noise impacts from related activities, such as entertainment and loudspeakers, should be addressed.

2. Noise from equipment associated with ground maintenance activities, including lawn mowers and leaf blowers, may have an adverse impact on surrounding residential neighborhood. Mitigative measures must be included to minimize such noise impacts.

3. Stationary equipment such as air conditioners, exhaust fans, pumps, and compressors must be designed so that noise emanating from such equipment will be in compliance with Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu.

4. The applicant has indicated that noise levels during the construction phase will be within the limits prescribed under applicable noise ordinances and rules. However, noise fromm construction equipment can be expected to exceed statutory limits and therefore must comply with the provisions of Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu.

a. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the rules.

b. Construction equipment and onsite vehicles requiring an exhaust of gas or air must be equipped with mufflers.

c. The contractor must comply with the conditional use of the permit as specified in the rules and conditions issued with the permit.

5. Traffic noise from heavy vehicles travelling to and from the construction site must be minimized near existing residential areas and must comply with the provisions of Title 11, Administrative Rules Chapter 42, Vehicular Noise Control for Oahu.

Wastewater Disposal

We have no comments to make until such time that a more definitive wastewater disposal alternative is selected.

Sincerely,

Bruce S. Anderson

BRUCE S. ANDERSON, Ph.D.
Deputy Director for
Environmental Health

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS. (808) 538-6652
RES. (808) 395-1338

December 26, 1987

Dr. Bruce S. Anderson
Deputy Director for Environmental Health
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Subject: Environmental Impact Statement For Waialua Golf Course

Dear Dr. Anderson:

Thank you for your letter of December 16, 1987 containing your comments regarding the proposed Waialua Golf Course. We will address your concerns in our Draft EIS document.

We appreciate your review of the EISPN and your comments thereon.

Very truly yours,

Tyrone T. Kusao

TTK:afk

JOHN WAIHEE
GOVERNOR

SUZANNE D. PETERSON
CHAIRPERSON, BOARD OF AGRICULTURE

DEPUTY TO THE CHAIRPERSON

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

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

December 17, 1987

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

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Proposed Waialua Golf Course
Oceanic Properties, Inc.
TMK: 6-4-01: 6
6-5-01: 2 Waialua, Oahu
Area: 214 acres

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

According to the EISPN, the applicant will be seeking to amend the designation of the subject parcel on the North Shore Development Plan from agriculture to parks and recreation.

The Draft EIS should address the following issues:

- a complete soils description with references to the Agricultural Lands of Importance to the State of Hawaii (ALISH) system, Land Study Bureau Overall Productivity Rating system and the Soil Conservation Service Soil Survey which indicate the suitability of agricultural use on the site;
- what alternative sites were considered for the golf course, especially those with less agronomic suitability than the subject site;
- the full impact on the economic viability of Waialua Sugar Company resulting from the cessation of sugarcane production on approximately 142 acres. This would include the loss in tons of sugar per acre, lost revenues, location and cost of replacement field preparation (if any), and any other indicators of adverse impact;
- the impact of this development on future agricultural production requirements and expansion of diversified

agriculture, as identified in the Final Report of the Land Evaluation and Site Assessment (LESA) Commission (February 1986);
- the potential of establishing viable alternative agricultural uses on the project site;
- the broader economic and resource impact on the State from the irrevocable loss of prime agricultural lands;
- conformity to the State Agricultural Functional Plan and its objectives and policies, particularly, Implementing Action B(5)(c), and;
- the relationship to the following Hawaii State Plan objectives, policies and priority guidelines:

226-7(b)(6) "Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs."

226-103(c)(1) "Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries."

226-103(d)(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."

226-104(b)(2) "Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district."

Thank you for the opportunity to comment. We will provide further comment upon our receipt and review of the Draft Environmental Impact Statement.

Suzanne D. Peterson

SUZANNE D. PETERSON
Chairperson, Board of Agriculture

cc: Mr. John H. Hewetson, President and Manager, Waialua Sugar Company
OSP
LUD
LUC
DGP
OEQC

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS. (808) 538 6652
RES. (808) 395-1330

December 21, 1987

Ms. Suzanne D. Peterson
Chairperson
Board of Agriculture
P.O. Box 22159
Honolulu, Hawaii 96822-0159

Attention: Mr. Paul J. Schwind

Subject: Environmental Impact Statement For Waialua Golf Course

Dear Ms. Peterson:

Thank you for your letter of December 17, 1987 containing your comments regarding the proposed Waialua Golf Course. We will address your concerns in our Draft EIS document.

We appreciate your review of the EISPN and your comments thereon.

Very truly yours,

Tyrone T. Kusao

Tyrone T. Kusao

TTK:afk

JOHN WAIHEE
GOVERNOR OF HAWAII

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

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

LIBERT K. LANDGRAF
DEPUTY

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

DEC 29 1987

DOC. NO.: 2296E
FILE NO.: 88-251

Engineering Concepts, Inc.
250 Ward Ave., Suite 206
Honolulu, Hawaii 96814
Attn: Mr. Ken Ishizaki

Dear Mr. Ishizaki:

SUBJECT: Environmental Impact Statement (EIS) Preparation Notice for Proposed Waialua Golf Course
TMKs: 6-5-01: 2; 6-4-01: 6

We have reviewed your Environmental Assessment (EA) for the proposed Waialua Golf Course. Our Division of Water and Land Management has the following comment to offer:

The proposed project is located in the Waialua Ground Water Control Area.

The proposal to use ground water from Pump 10, currently used for the irrigation of sugar cane, would require the approval of the Board of Land and Natural Resources. Further, any future modification of Poamoho Stream would require a permit from the new Commission on Water Resource Management.

Thank you for consulting us on this project.

Very truly yours,

WILLIAM W. PATY, Chairperson
Board of Land and Natural Resources

13-37

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

January 4, 1988

Mr. William W. Paty, Chairperson
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Waialua Golf Course
Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of December 29, 1987 regarding the EIS preparation notice for the project.

As the project progresses, we will be contacting your agency for more information about the Commission on Water Resource Management permit and approval for use of groundwater from pump 10.

Very truly yours,

Kenneth Ishizaki

Kenneth Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

JOHN E. HIRTEN
DIRECTOR

JOSEPH M. MAGALDI, JR.
DEPUTY DIRECTOR

PL1.0899
TE-9708

December 29, 1987

Mr. Tyrone T. Kusao
Planning and Zoning Consultant
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: EIS Preparation Notice for Proposed
Waialua Golf Course
TMK: 6-5-01: 2
TMK: 6-4-01: 6

This is in response to your letter of November 18, 1987 requesting comments for the subject project.

Since the proposed access on Kaukonahua Road is a State Department of Transportation facility, we have no comments to offer.

Sincerely,

JOSEPH M. MAGALDI, JR.
DEPUTY DIRECTOR

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1338

January 5, 1988

Mr. Joseph M. Magaldi, Jr.
Deputy Director
Department of Transportation Services
City and County of Honolulu
650 S. King Street,
Honolulu, Hawaii 96813

Re: EIS Preparation Notice for Proposed
Waialua Golf Course
TMK 6-5-01: 2
TMK 6-4-01: 6

Dear Mr. Magaldi:

Thank you for your letter dated December 29, 1987 concerning the above mentioned golf course. We appreciate your attention to this matter.

Very truly yours,

Tyrone T. Kusao

TTK:afk

cc: Engineering Concepts, Inc.
Parsons Brinckerhoff Quade & Douglas, Inc.

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

JOHN P. WHALEN
DIRECTOR

JN/DGP 9/87-3746(AC)

January 7, 1988

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

Dear Mr. Kusao:

Environmental Impact Statement Preparation
Notice (EISPN) for Waialua Golf Course, Waialua, Oahu
Tax Map Keys 6-5-01: 2 and 6-4-01: 6

Thank you for providing the Department of Land Utilization (DLU) the opportunity to review the above-referenced preparation notice. We offer the following comments for your consideration:

1. The EIS should assess the traffic impacts at Weed Circle and Thompson Corner. These are critical linkages to traffic flow in the Haleiwa-Waialua area and should be included in the traffic analysis.

2. Will imported fill material be required to construct the proposed golf course? If so, how will this affect existing drainage patterns?

We hope these comments will assist you in your preparation of the EIS. Should you need further assistance, please contact Art Challacombe of our staff at 523-4648.

Very truly yours,

John P. Whalen

JOHN P. WHALEN
Director of Land Utilization

JPW:ey
(230N)

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813

BUS (808) 538 6652
RES (808) 395 1338

January 12, 1988

Mr. John P. Whalen
Director
Department of Land Utilization
650 S. King Street, 7th Floor
Honolulu, Hawaii 96813

Attention: Mr. Art Challacombe

Subject: Waialua Golf Course EIS,
THK: 6-5-01:2 and 6-4-01:6

Dear Mr. Whalen:

Thank you for your letter of January 7, 1988 commenting on the proposed golf course in Waialua.

The EIS will assess traffic impacts at both Weed Circle and Thomson Corner. Further, no imported fill material is planned for golf course construction and consequently we do not anticipate impact on the existing drainage pattern resulting from such material.

Very truly yours,

Tyrone T. Kusao

Tyrone T. Kusao

TTK:afk

CHAPTER 14

COMMENTS AND RESPONSES DURING PREPARATION OF THE FINAL EIS

14. COMMENTS AND RESPONSES DURING PREPARATION OF THE FINAL EIS.

Sixty (60) copies of the Draft Waialua Golf Course Environmental Impact Statement (DEIS) were received by the Office of Environmental Quality Control on January 20, 1988. Notice of the DEIS was published in the January 23, 1988 OEQC Bulletin and sixty copies of the report were distributed to interested public agencies, organizations and individuals. Additionally five copies of the DEIS were delivered to the accepting agency, the Department of General Planning, City and County of Honolulu. A total of 25 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 Waialua Golf Course EIS:

Federal Agencies

United States Department of Agriculture, Soil Conservation Service
United States Department of the Army, U.S. Army Engineer District, Honolulu
United States Department of the Interior, Fish and Wildlife Service
Untied States Department of the Navy, Naval Base Pearl Harbor

State Agencies

Department of Agriculture
Department of Business and Economic Development, Housing Finance and Development Corporation
Department of Accounting and General Services, State Public Works Engineer
Department of Business and Economic Development, Land Use Commission
Department of Defense, Office of the Adjutant General
Office of Environmental Quality Control
Office of Hawaiian Affairs
Department of Health
Department of Land and Natural Resources
Department of Transportation
University of Hawaii at Manoa, Environmental Center

County Agencies

Building Department
Fire Department
Department of Housing and Community Development
Department of Land Utilization
Police Department
Department of Public Works
Department of Transportation Services
Board of Water Supply

Others

American Lung Association
Hawaiian Electric Company, Inc.

UNITED STATES DEPARTMENT OF AGRICULTURE | SOIL CONSERVATION SERVICE | P. O. BOX 50004 HONOLULU, HAWAII 96850

March 3, 1988

Mr. Donald A. Clegg
Chief Planning Officer
Dept. of General Planning
City & County of Honolulu
650 S. King Street
Honolulu, HI 96813

Dear Mr. ~~Clegg~~: Don

Subject: Environmental Impact Statement (EIS) -
Waialua Golf Course, Waialua, Oahu

We have no comments to offer at this time regarding the above-subject matter. Thank you for the opportunity in allowing us to review the above EIS.

Sincerely,

RICHARD N. DUNCAN
State Conservationist

cc:
Mr. Tyrone T. Kusao, Tyrone T. Kusao, Inc. 1188 Bishop St., Suite 2507,
Honolulu, HI 96813

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS. (808) 538-6652
RES. (808) 395-1338

March 7, 1988

Mr. Richard N. Duncan
State Conservationist
United States Department of Agriculture
P.O. Box 50004
Honolulu, Hawaii 96850

Subject: Draft EIS For Waialua Golf Course
THK 6-5-01:2 and 6-4-01:6

Dear Mr. Duncan:

Thank you for your letter dated March 3, 1988 to Mr. Donald A Clegg, Chief Planning Officer, Department of General Planning 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: Dept. of General Planning

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

March 2, 1988

REPLY TO ATTENTION OF:
Planning Branch

Mr. Donald A. Clegg, Chief Planning Officer
City and County of Honolulu Department of
General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

We have reviewed the Draft Environmental Impact Statement for the proposed Waialua Golf Course, Waialua, Oahu. Our comments on the EIS Preparation Notice (letter dated December 14, 1987) are still applicable. Operations Branch (telephone 438-9258) should be consulted regarding the need for a Department of the Army permit prior to placing fill in any stream.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Copy furnished:

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop St., Suite 2507
Honolulu, HI 96813

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

March 10, 1988

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
U.S. Army Engineer District,
Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

Attention: Planning Branch

Subject: Waialua Golf Course Draft EIS
Waialua, Oahu, Hawaii

Thank you for your letter of March 1, 1988 to Mr. Donald Clegg, Chief Planning Officer, Department of General Planning, in which you state the comments made on the EIS preparation notice are still applicable.

We have been advised of your policies and will consider them in development of the project. We will continue to maintain contact with the Operations Branch of the U.S. Army Corps of Engineers as detailed planning and design of the golf course proceed.

Please convey our appreciation to your staff for their support and cooperation provided during this project.

Very truly yours,

Kenneth Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

United States Department of the Interior
FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P. O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

4 FEB 1988

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Re: Environmental Impact Statement, Waialua Golf Course, Waialua, Oahu

Dear Mr. Clegg:

We have reviewed the referenced material and find that due to its nature, the proposed project will have no significant deleterious impact on fish and wildlife resources.

We thank you for addressing our concerns regarding the potential impacts of pesticides on migratory birds and endangered species.

Please do not hesitate to call on us if we may be of further assistance.

Sincerely yours,

Ernest Kosaka

Ernest Kosaka, Field Supervisor
Office of Environmental Services
Pacific Islands Office

cc: ✓Tyrone T. Kusao, Inc.
DLNR

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1100 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1330

February 6, 1988

Mr. Ernest Kosaka, Field Supervisor
Office of Environmental Services
Pacific Islands Office
United States Department of the Interior
300 Ala Moana Blvd.,
P.O. Box 50167
Honolulu, Hawaii 96850

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Mr. Kosaka:

Thank you for your letter dated February 4, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning
Engineering Concepts Inc.

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

IN REPLY REFER TO
5090 (24B)
Ser N5B/346

Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 S King Street
Honolulu, HI 96813

Dear Mr. Clegg:

DRAFT ENVIRONMENTAL IMPACT STATEMENT
WAIALUA GOLF COURSE, WAIALUA, OAHU

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

Thank you for the opportunity to review the Draft.

Sincerely,

Enclosure

Copy to:
Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop Street, Suite 2507
Honolulu, HI 96813

Office of Environmental Quality Control

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538 6652
RES (808) 395 1330

February 6, 1988

Mr. W. K. Liu
Assistant Base Civil Engineer
Department of the Navy
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Mr. Liu:

Thank you for your letter dated February 2, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning

JOHN WAIHEE
GOVERNOR

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

SUZANNE D. PETERSON
CHAIRPERSON, BOARD OF AGRICULTURE

ROBERT Y. TSUYEMURA
ACTING DEPUTY
TO THE CHAIRPERSON

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

COPY

March 8, 1988

MEMORANDUM

To: Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu

Subject: Draft Environmental Impact Statement (DEIS) for
Waialua Golf Course
Oceanic Properties, Inc.
TMK: 6-4-01: 6
6-5-01: 2 Waialua, Oahu
Area: 214 acres

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

The DEIS satisfactorily addresses our concerns on the impact of the proposed golf course on the Waialua Sugar Company. The DEIS, however, does not address the broader resource-oriented concerns described in our response to the EIS Preparation Notice (letter to Mr. Tyrone T. Kusao, Inc., dated December 17, 1988). These concerns include the following:

- the impact of this development on future agricultural production requirements and expansion of diversified agriculture, as identified in the Final Report of the Land Evaluation and Site Assessment (LESA) Commission (February 1986);
- the potential of establishing viable alternative agricultural uses on the project site;
- the broader economic and resource impact on the State from the irrevocable loss of prime agricultural lands;
- conformity to the State Agriculture Functional Plan and its objectives and policies, particularly, Implementing Action B(5)(c).

The DEIS also does not describe the relationship of the proposed use to the agriculturally-related objectives, policies and priority guidelines of the Hawaii State Plan. We hope some effort is made to address these concerns in the Final EIS.

We hereby request a copy of the Final EIS.

Ry Tsuyemura
for SUZANNE D. PETERSON
Chairperson, Board of Agriculture

cc: Mr. Tyrone T. Kusao
Mr. John H. Hewetson, President and Manager
Waialua Sugar Company
OSP (attn: LUD)
OEQC

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813

BUS (808) 538 6652
RES (808) 395-1338

March 21, 1988

Suzanne D. Peterson, Chair
Board of Agriculture
State of Hawaii
Department of Agriculture
1428 South King Street
Honolulu, Hawaii 96814-2512

Dear Ms. Peterson,

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

Thank you for your letter dated March 8, 1988, to Mr. Donald Clegg regarding the Draft Environmental Impact State (DEIS) for the proposed Waialua Golf Course. This letter responds to your comments expressed to Mr. Clegg on the DEIS.

1. Final Report of the Land Evaluation and Site Assessment (LESA) Commission

LESA (1986) estimates that Oahu's production goals acreage are as follows:

Agricultural Production Goals Acreage for Oahu

	1983 Actual	1990	1995
Total Export Commodity (includes sugarcane)	39,894	40,393	40,942
Total Local Consumption Commodity	22,645	15,466	16,710
Total Acres	62,539	55,859	57,652

In 1983, the actual production acreage for sugarcane totalled 27,200 acres. The production goal for 1990 sugarcane was 25,900 acres; for 1995, 25,300 acres. Like the anticipated trend in the total production acreage, the sugarcane acreage is anticipated to decrease.

The project site comprises 214 acres, 72 of which are in a gully area not suitable for sugarcane. The proposed Waialua Golf Course would remove 142 acres from sugarcane production.

This acreage represents less than a half percent of the agricultural production requirements for 1990 and 1995. The 142 acres represent 0.3 percent of the total goals acreage for export products and 0.2 percent of the total agricultural acreage.

In terms of lands used for sugarcane cultivation, the 142 acres represent 0.5 percent of the total estimated production requirements for 1990 and 1995.

LESA projects a requirement of 4,000 acres for diversified agriculture. Implementation of the proposed project would mean that this land would not be available for such activity.

It appears, then, that the project will not have major impacts on LESA agricultural production requirements.

2. Potential of establishing viable alternative agricultural uses on the project site

In an effort to find viable alternatives for sugar and pineapple, Castle and Cooke, Inc., established a Diversified Agricultural Task Force in mid-1983. The task force's findings were incorporated in a 1984 study of its Central Oahu agricultural lands.

The study indicated that Dole and Waialua Sugar, as well as the Hawaii Sugar Planters Association, the University of Hawaii and several other Hawaii companies have searched for economically viable agricultural alternatives. In all of these explorations, there has been little success (mostly with relatively small, entrepreneur-type operations) because of limited economic viability.

Cost factors which weighed heavily against economic viability included:

<u>Vegetable crops</u>

To service the needs of the market, the vegetable farmer needs to achieve excellent quality and dependable continuous production. The area experiences a wide deviation from average rainfall, since the historical pattern for Central Oahu provided usually wet winters, moist springs, dry summers and dry falls. This is particularly difficult for moisture stress sensitive vegetable crops, such as leafy vegetables, tomatoes, melons and cucumbers.

<u>Ornamental greenhouse crops</u>

Foliage plans and flowers are usually grown in specialized media, not soil. Ornamental stock plants do not require prime agricultural lands, but do require areas that have high insulation, a supply of clean irrigation water and electricity.

<u>Papaya</u>

Commercial production of papayas could be hampered in the Central Oahu plain because of the prevalence of mosiac virus.

<u>Macadamia</u>

Drip irrigation would be necessary to achieve economically feasible production of macadamia nuts in the region.

The single conclusion of this task force was that any meaningful diversified crop would require irrigation; thus, a portion of the project site may be suitable for diversified agriculture activity.

Note, however, that some of these crops would require large acreages, and Castle and Cooke intends to continue its current agricultural activities on contiguous lands as long as possible.

3. <u>The broader economic and resource impact on the State from the irrevocable loss of prime agricultural lands</u>

The DEIS states on page 9-1 that although the land will be committed to an non-agricultural use, "the proposed golf course will substitute the existing agricultural open space with another form of open space. A golf course is unlike other more intense urban uses which requira extensive structures and infrastructure improvements and it is therefore possible, though not probable, to reinstate agricultural uses."

Further, as explained on page 3-8 of the DEIS, Castle and Cooke has continuously demonstrated its commitment to its agricultural operations in Hawaii. To enhance the overall value of the company's assets, some trade-offs of existing agricultural lands are needed. The company embarked on the proposed golf course based on the recommendation of the "Central Oahu/North Shore Plan" and the market demand for a golf course in the area. It is envisioned that the project site will be put to a higher use resulting in benefit to the company.

4. <u>Conformity to the State Agriculture Functional Plan and its objectives and policies, particularly Implementing Action B(5)(c)</u>

The DEIS discusses the project's relationship to the State Agriculture Functional Plan on page 6-6. It states that "since the proposed project will displace 142 acres of productive agricultural land with non-agricultural use, the project is <u>not</u> supportive of the objective relating to the retention of productive land in agricultural use. . .(emphasis added in this letter)"

This statement is particularly appropriate for Objective B (4) which "Encourage[s] productive agricultural use of the most suitable agricultural lands."

You noted Implementing Action B(5)(c) which states:

> "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 land for other objectives of the Hawaii State Plan".

The proposed golf course reponds to two public needs. The first relates to the <u>long-term</u> viability of Castle and Cooke. As we stated in the DEIS, the company's sugar operation has been in serious question because of its vulnerability to fluctuating world economics. Although the proposed golf course is not expected to totally reverse this current financial problem, the project site will be put to a higher use resulting in benefit to the company. This is just <u>one step</u> in helping the company continue to sustain its other agricultural operations in Hawaii.

The second public interest is related to recreation. The project's market study (Appendix G in the DEIS) demonstrated a very strong need for a golf course in this region. It was shown that the current demand for rounds of golf in this area is <u>twice</u> the current supply. The proposed golf course is therefore an active attempt to conform with the State Recreation Plan, particularly Policies A (2) and A (3).

5. <u>Other comments</u>

We discussed the project's relationship with the Hawaii State Plan on pages 6-2 to 6-6 in the DEIS. Per your request, we have included more discussion on the project's relationship of the proposed use to the agriculturally-related objectives, policies and priority guidelines of the Hawaii State Plan in the Final EIS.

Very truly yours,

Tyrone T. Kusao

cc: Mr. Donald Clegg, Chief Planning Officer, Department of General Planning

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
Department of Business and Economic Development
Housing Finance and Development Corporation
P. O. BOX 17907
HONOLULU, HAWAII 96817

Joseph K. Conant
Executive Director

IN REPLY REFER
TO:
88:PLNG/578JT

February 9, 1988

Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (EIS) for the proposed Waialua Golf Course

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

Thank you for the opportunity to comment.

Sincerely,

JOSEPH K. CONANT
Executive Director

cc: ✓Tyrone T. Kusao

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1100 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 536 6652
RES (808) 395-1338

February 11, 1988

Mr. Joseph K. Conant
Executive Director
Department of Business & Economic Development
State of Hawaii
P.O. Box 17907
Honolulu, Hawaii 96817

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Mr. Conant:

Thank you for your letter dated February 9, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning

JAN 25 1988

Mr. Donald A. Clegg
Chief Planning Officer
City and County of Honolulu
Department of General Planning
650 South King Street, 8th Floor
Honolulu, Hawaii

Dear Mr. Clegg:

Subject: Waialua Golf Course
Draft Environmental Impact Statement

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

Very truly yours,

T. Tominaga

TEUANE TOMINAGA
State Public Works Engineer

SS:jk
cc: Mr. Tyrone T. Kusao

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1338

(P)1071.8

February 2, 1988

Mr. Teuane Tominaga
State Public Works Engineer
Department of Accounting and General Services
Division of Public Works
P.O. Box 119
Honolulu, Hawaii 96810-0119

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Mr. Tominaga:

Thank you for your letter dated January 25, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning

STATE OF HAWAII
DEPARTMENT OF BUSINESS
AND ECONOMIC DEVELOPMENT

LAND USE COMMISSION

Room 104 Old Federal Bldg., 335 Merchant Street
Honolulu, Hawaii 96813 Telephone 548-4611

January 29, 1988

Mr. Donald A. Clegg
Chief Planning Officer
City & County of Honolulu
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft EIS for the Proposed Waialua Golf Course

Thank you for this opportunity to comment.

We have no comments to offer at this time.

Sincerely,

Esther Ueda

ESTHER UEDA
Executive Officer

EU:to

cc: / Tyrone Kusao

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813

BUS (808) 538 6652
RES (808) 395 1338

February 2, 1988

Ms. Esther Ueda
Executive Officer
Land Use Commission,
Room 104, Old Federal Bldg.,
335 Merchant Street
Honolulu, Hawaii 96813

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Ms. Ueda:

Thank you for your letter dated January 29, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning concerning the above-referenced report.

Your letter will be reproduced in the Final EIS together with this response.

Very truly yours,

Tyrone T. Kusao

Tyrone T. Kusao

TTK:afk

cc: Department of General Planning

STATE OF HAWAII
DEPARTMENT OF DEFENSE

FEB 09 1988

Engineering Office

Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Waialua Golf Course
Waialua, Oahu

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,

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

Enclosure

cc:
Mr. Tyrone T. Kusao

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS. (808) 538-6652
RES. (808) 395-1336

February 11, 1988

Mr. Jerry M. Matsuda
Major, Hawaii Air National Guard
State of Hawaii
Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Major Matsuda:

Thank you for your letter dated February 9, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 SOUTH KING STREET, ROOM 104
HONOLULU, HAWAII 96813

MARVIN T. MIURA, Ph.D.
DIRECTOR

TELEPHONE NO.
548-6915

January 27, 1988

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

Dear Mr. Kusao:

Subject: Draft Environmental Impact Statement for the Waialua Golf Course, Waialua, Oahu

The Draft EIS was officially received by the Office of Environmental Quality Control on January 20, 1988 and was published in the January 23, 1988 OEQC Bulletin. The deadline for comments and the end of the 45-day public review period is March 8, 1988. We have requested all written comments be directed to the City and County of Honolulu Department of General Planning with copies to you.

Copies of the statement have been sent to the agencies, libraries, and organizations on the attached distribution list.

Should you have any questions regarding this EIS, please do not hesitate to contact Faith Miyamoto at 548-6915.

Sincerely,

Marvin T. Miura
Marvin T. Miura, Ph.D.
Interim Director

Faith Miyamoto
Faith Miyamoto
Planner

Attachment
cc: DGP (w/attachment)

John Waihee
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 SOUTH KING STREET, ROOM 104
HONOLULU, HAWAII 96813

DIRECTOR

TELEPHONE NO
548-6915

January 21, 1988

Dear Reviewer:

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

TITLE: Waialua Golf Course

LOCATION: Waialua, Oahu

CLASSIFICATION: Applicant Action

Your comments or acknowledgments of no comments on the EIS are welcomed. Please submit your reply to the accepting authority or approving agency:

Mr. Donald A. Clegg, Chief Planning Officer
C & C of Honolulu Dept. of General Planning
650 S. King St.
Honolulu, HI 96813

Please send a copy of your reply to the proposing party:

Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.
1188 Bishop St., Suite 2507
Honolulu, HI 96813

Your comments must be received or postmarked by: March 8, 1988

If you have no further use for this EIS, please return it to the Office of Environmental Quality Control.

Thank you for your participation in the EIS process.

DISTRIBUTION LIST

( ) E.A.
( ) APPLICANT ACTION
( ) AGENCY ACTION

(x) EIS
(x) APPLICANT ACTION
( ) AGENCY ACTION

Title: Waialua Golf Course

Location: Waialua, Oahu

Proposing Agency/Applicant: Oceanic Properties, Inc.

Accepting Authority/
Approving Agency: City & County of Honolulu Dept. of General Planning

Deadline for Comments: March 8, 1988

Date Sent/By: January 22, 1988

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Library Copy: 1
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Copy of Distribution List Sent to: Tyrone T. Kusao, Inc.; DGP

Date Sent: January 27, 1988

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LIBRARIES		
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(b)** Copy desired only if project is in respective county.

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Kailua Library		
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Manoa Library		
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Molokai Library		
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KAUAI:		
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Kapaa Library		
Koloa Community-School Library		
Waimea Library		

North Shore Neighborhood Board No. 27
P.O. Box 607
Haleiwa, HI 96712

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

March 17, 1988

Mr. Donald A. Clegg, Chief
Dept. of General Planning
City and County of Honolulu
650 S. King St.
Honolulu, HI. 96813

Dear Mr. Clegg:

SUBJECT: Draft EIS: Waialua Golf Course, Kamananui/Paalaa Uka, Oahu
TMK: 6-5-01:2, 6-4-01:6

This project is yet another which will convert agricultural lands to urban commercial use and will use water that might be put to agricultural and residential uses. Such actions have an adverse impact on a substantial number of Hawaiians who would like to see our rural heritage and lifestyle maintained. Thur urbanization of Oahu is neither inevitable nor is it the only alternative. Hawaiians rely on the State and Counties to have a plan that incorporates the needs of Hawaiians and provides for the wise use of our natural resources. Planned growth is like skilled craftsmanship. This project will contribute to land speculation, which will also have an adverse effect on many poor Hawaiians who have no opportunity to own or deal in real estate.

The office of Hawaiian Affairs strongly supports projects which provide for rural residential housing and diversified agricultural use.

Our office would like to make a field inspection of the project area. Contact our cultural specialist Earl Neller at 946-2642.

Sincerely,

Kamaki A. Kanahele III

Kamaki A. Kanahele III
Administrator

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant
1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1338

April 4, 1988

Mr. Kamaki A. Kanahele III
Administrator
Office of Hawaiian Affairs
1600 Kapiolani Blvd., Suite 1500
Honolulu, Hawaii 96814

Subject: Draft EIS For Proposed Waialua Golf Course

Dear Mr. Kanahele:

Thank you for your letter dated March 17, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, containing your comments regarding the subject Draft EIS.

While the proposed golf course project will take away 142 acres presently in sugar cane cultivation, one of the long range implications of this action would be to assist Castle and Cooke's agricultural operations in Hawaii. The basis for this conclusion is contained in Section 3.4 Project Rationale of the Draft EIS which provides, in part, as follows:

> "As one of Hawaii's major agricultural conglomerates, C & C has continuously demonstrated its commitment to its agricultural operations in Hawaii. The viability of its Hawaii sugar operation, however, has been in serious question because of its vulnerability to fluctuating world economics. In spite of these drawbacks, C & C continues to explore various ways to stabilize its agricultural operations in Hawaii.
>
> In some instances C & C's long-range effort to continue agriculture may appear to conflict with immediate operations in that existing agricultural lands may need to be 'traded off' or replaced in order to enhance the overall value of C & C assets. Such is the case with the proposed project."

For your information, arrangements have been made for your cultural specialist to visit the project site.

Very truly yours,

Tyrone T. Kusao

CC: Department of General Planning

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

February 22, 1988

COPY

In reply, please refer to:
EPHSO

MEMORANDUM

To: Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning, City & County of Honolulu

From: Deputy Director for Environmental Health

Subject: Draft Environmental Impact Statement (DEIS) for Waialua Golf Course, Waialua, Oahu

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Administrative Rules, please be informed that we do not have any objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

BRUCE S. ANDERSON, Ph.D.

cc: Mr. Tyrone T. Kusao

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1100 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1338

March 1, 1988

Mr. Bruce S. Anderson
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96813

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Mr. Anderson:

Thank you for your letter dated February 22, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning

JOHN WAIHEE
GOVERNOR OF HAWAII

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

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

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DEPUTY

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

FEB 17 1988

Doc. No.: 2725E
File No.: 88-348

Honorable Donald A. Clegg
Chief Planning Officer
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg,

Subject: Waialua Golf Course, Draft EIS
TMK: 6-5-01: 2; 6-4-1: 6

In response to your request, we have reviewed the document cited above and have the following comments to offer.

The project developer should be aware of the requirements of the new State Water Code. When administrative rules are adopted, the developer may need approval from the Commission on Water Resource Management for a stream channel alteration permit for stream crossingo. He will also need to apply for a modified water source permit since water use will be reclassified from agricultural to urban (golf course).

Also, there is recent indication that Diazinon may have an adverse impact on birds. Since several bird species (including endangered waterbirds attracted to the ponds and waterways) will be using the golf course as feeding grounds, Diazinon should not be used unless cleared by the EPA and the Department of Agriculture.

Finally, we have some questions regarding the archeological report (Appendix B). We will conduct a field and literature check to assess the report and conclusions in Section 4.6, "Archeological Resources". If any concern arise, it will be relayed to you.

Thank you for the opportunity to comment on this project.

Very truly yours,

WWPaty

William W. Paty, Chairperson
Board of Land and Natural Resources

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

March 10, 1988

Mr. William W. Paty, Chairman
Board of Land and Natural
Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Waialua Golf Course Draft EIS
Waialua, Oahu, Hawaii

Thank you for your letter of February 17, 1988 to Mr. Donald Clegg, Chief Planning Officer, Department of General Planning, with comments on the Draft EIS. We have reviewed your comments and have the following response:

1. The project developer has been made aware of the new State Water Code requirements and will apply for necessary permits as detailed planning and design of the project proceed.

2. The potential for harming migratory birds and endangered Hawaiian waterbirds with pesticides applied to the proposed golf course is discussed by C.L. Murdoch and R.E. Green in their report to Engineering Concepts, Inc. in Appendix C of the Draft EIS.

   Recent developments in the application of diazinon to turf grasses have been brought to our attention by Dr. Murdoch. The attached letter of March 7, 1988 addresses your comments and should clarify any questions you may have concerning the use of diazinon on golf courses.

Very truly yours,

Kenneth Ishizaki

Kenneth Ishizaki, P.E.
Vice President

DM/bs

Attachment

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

March 7, 1988

Charles L. Murdoch
45-602 Hinamoe Lp.
Kaneohe, HI 96744

Ms. Dana Miyamoto
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, HI 96814

Dear Dana:

This is in response to the concern about the use of diazinon on the proposed Wailua Golf Course expressed by Mr. William Patey, Chairman, Board of Land and Natural Resources in his letter of February 17, 1988 to Donald A. Clegg, Chief Planning Officer, Department of General Planning.

In the analysis of the impact of agricultural chemicals used on the proposed golf course which Dr. Green and I performed for your company, we pointed out that diazinon was under scrutiny by the federal Environmental Protection Agency (EPA) because of kill of migratory birds on golf courses on the mainland United States (page 5, second paragraph under the heading "Potential for Poisoning Migratory Birds and Endangered Water Birds with Pesticides Applied to the Proposed Wailua Golf Course"). The EPA had, in fact, previously issued an intent to remove golf course and sod farm uses from the label of diazinon. CIBA-GEIGY, the manufactures of diazinon, took the case to court and the use of diazinon was allowed to continue until the case was settled.

On January 25, 1987 Administrative Law Judge Gerald Harwood ruled that the benefits of diazinon are sufficient to justify the continued use of diazinon on golf courses and sod farms under CIBA-GEIGY's proposed label, but only if the use is reclassified as restricted use. CIBA-GIEGY has agreed to revise their label so that its use on golf courses and sod farms are restricted uses. The new label will also change application procedures so that split applications of 2 lbs. ai./ acre each spaced 7 days apart will be required rather than one application of 4 lb. ai./acre. The new label will also require that each application must be watered in with a minimum of 1/4 inch of water. Applications will not be allowed in the vicinity of golfers.

This information was contained in a letter of February 1, 1988 from Dr. Janet L. Moore, Staff Entomologist. CIBA-GIEGY Co. to university researchers in the U. S. who had worked with diazinon for control of various insect pests in the past. At the time at which Dr. Moore wrote the letter, EPA still had 20 days to appeal the ruling. I have not heard if they appealed or not.

As we pointed out in our report, diazinon has been used on golf courses for more than 20 years. As far as I am aware, there has never been a report of bird injury from use of this insecticide on golf courses in Hawaii.

We also pointed out (page 6, paragraph 4 of our report) the obvious fact that use of all pesticides in Hawaii is determined by EPA and monitored by the Hawaii Department of Agriculture. All uses of pesticides must be approved by the EPA. These uses can be cancelled at any time if just cause is determined. At no time is it legal to use a pesticide anywhere in Hawaii unless its use is approved by the EPA and the Hawaii Department of Agriculture. As we stated in our analysis, this is perhaps the best assurance of protection of humans and wildlife from injury by pesticides.

Charles L. Murdoch

Charles L. Murdoch Ph. D.

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

EDWARD Y. HIRATA
DIRECTOR

DEPUTY DIRECTORS
JOHN K. UCHIMA
RONALD N. HIRANO
DAN T. KOCHI
JEANNE K. SCHULTZ

IN REPLY REFER TO:
STP 8.2712

March 8, 1988

Mr. Donald Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear ~~Mr. Clegg~~: Don

Draft Environmental Impact Statement
Waialua Golf Course, Waialua, Oahu

We wish to reiterate our comments of December 15, 1987 on the EIS Preparation Notice which recommended a left-turn storage lane for southbound traffic on Kaukonahua Road be provided. From a safety standpoint, we feel this improvement is necessary because it will facilitate left-turn movements for traffic accessing the golf course property.

The design plans for the access road intersection with Kaukonahua Road must be coordinated with and approved by our Highways Division. The cost of all intersection improvements will be borne by the developer.

We appreciate this opportunity to provide comments.

Very truly yours,

Ed

Edward Y. Hirata
Director of Transportation

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1338

April 4, 1988

Mr. Donald A Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 S. King Street, 8th Floor
Honolulu, Hawaii 96813

Subject: Waialua Golf Course, Waialua, Oahu
State DOT comments on DEIS

Dear Mr. Clegg:

The March 8, 1988 letter (STP 8.2712) from the State Department of Transportation (SDOT) recommends that a left turn storage lane be provided for southbound traffic on Kaukonahua Road, while our traffic report concluded that a separate lane would not be warranted. While the volumes during the weekday peak hour are substantially below the volumes needed to meet the warrant, the weekend traffic assignment at the access road was only marginally below, which may account for SDOT's position that the turn lane be provided. We therefore will conduct further studies to obtain additional traffic data for the weekend peak hour, which occurs on Sunday during the annual polo season.

The findings and subsequent analyses will be submitted to SDOT for their consideration and we will comply with their determination on this matter. The design plans for the access road intersection will be coordinated with the SDOT.

Very truly yours,

Tyrone T. Kusao

Tyrone T. Kusao

cc: SDOT-STP, HWY-P, HWY-T
Oceanic Properties, Inc.
Parsons Brinckerhoff Quade and Douglas, Inc.
Engineering Concepts, Inc.

University of Hawaii at Manoa

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

March 8, 1988
RE:0487

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Draft Environmental Impact Statement
Waialua Golf Course
Waialua, Oahu

The above referenced project involves construction of an 18-hole golf course, a driving range, clubhouse, and a repair and maintenance shed. The Environmental Center has conducted a review of this Draft Environmental Impact Statement (EIS) with the assistance of P. Bion Griffin, Anthropology; Yu-Si Fok, Henry Gee, and Edwin Murabayashi, Water Resources Research Center; James Parrish, Hawaii Cooperative Fishery Research Unit; and Jennifer Crummer, Environmental Center.

General Comments

Numerous statements indirectly imply that mitigative measures will be undertaken without committing the project developer to specific mitigative actions. It is inappropriate to limit discussion to what mitigative measures could be undertaken.

Also, our reviewers expressed concerns regarding the assemblage of the Draft EIS. The Appendices have been poorly compiled, and in most instances, are poorly organized. As a consequence, reviewing primary data sources has been unnecessarily difficult.

Endangered Species

Although the applicant has stated on page 1-2 that no rare, threatened, or endangered species were found during the biological survey, it is acknowledged that the Hawaiian Coot and Gallinule, both endangered species, are believed to utilize these waters (page 4-12). The fact that none were seen on the survey day is irrelevant if those species are known to frequent the stream.

It is also stated that "careful monitoring and application of fertilizers and pesticides used for the golf course will help preserve water quality and protect the ecosystem of flora and fauna." This may be true, however, there is no indication in the Draft EIS that any monitoring will take place. If monitoring of chemical additives is proposed, a monitoring schedule and analysis protocol should be delineated.

Poamoho Stream

Cursory notes of the aquatic environment, as suggested on page 4-12, should not be construed as true characteristics of the overall stream ecosystem. We wonder if a literature check was undertaken to identify previous studies of the Poamoho Stream.

Grading Phase

There seems to be a mistake on the third paragraph of page 5-1. Should not the values for erosion potential of 76 tons/acre/day and 214 tons/acre/day be per year?

As noted earlier, mitigative measures are mentioned here in regard to soil erosion (page 5-1). However, there is no mention of actual implementation. Will any of these measures be adopted into the actual construction contract?

The last paragraph discusses the removal of vegetation for clearance. It is stated that the "vegetation along the stream can remain." This zone should remain as undisturbed as possible, as this area serves as a buffer between the developed fairway and the stream environment. This is an important means of controlling, to some extent, sediment and pesticides entering the stream.

Pesticides

There is no quantitative information given regarding the application of pesticides, specifically, what types of pesticides will be utilized, how often, and in what quantities. Some of these data could be incorporated from the Appendix.

The Appendix Table 1, by Murdoch and Green, contains pertinent information regarding toxicity levels, water solubility, and soil behavior. The pesticides that will be utilized should be indicated, and their qualities should be outlined in the text.

Diazinon is the only pesticide mentioned in the text. This biocide is listed on Appendix Table 1 as highly toxic to fish and wildlife and has been reportedly responsible for the death of Canadian Geese in the Continental United States. Without the listing specific pesticides it is difficult to ascertain potential impacts to wildlife.

Mr. Donald A. Clegg -3- March 8, 1988

We thank you for the opportunity to review this document. We look forward to your response and consideration of our comments.

Yours truly,

John T. Harrison
Environmental Coordinator

cc: OEQC
L. Stephen Lau
Tyrone Kusao
P. Bion Griffin
Yu-Si Fok
Henry Gee
Edwin Murabayashi
James Parrish
Jennifer Crummer

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538 6652
RES (808) 395 1338

March 21, 1988

Mr. John T. Harrison
Environmental Center
University of Hawaii, Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Subject: Draft EIS For Waialua Golf Course

Dear Mr. Harrison:

Thank you for your letter of March 8, 1988 addressed to the Chief Planning Officer containing your comments on the subject Draft EIS. We have reviewed your comments and have prepared this response with the assistance of Engineering Concepts, Inc., and Char and Associates.

General Comments

Based on your observations concerning mitigative measures, we will review the EIS in its entirety and describe such actions more accurately in terms of the actions to be undertaken by the developer and others. Further, the necessary revision will be made in the Final EIS document.

With regard to the Appendix section of the report we will take the following corrective actions in the Final EIS document, to improve its organization and accessibility:

1 - Each page in the Appendix section will be numbered at the bottom. For example, Appendix "A" will be numbered A-1, A-2, etc., Appendix "B", B-1, B-2, etc.

2 - On the division sheet for the Appendix section, we will print the report title and name of preparer.

3 - The Appendices listing the Table of Contents will be provided with page reference numbers.

4 - The Appendices section of the report will also be provided with a listing of the reports contained therein.

Endangered Species

The following will replace the existing statements re endangered species and monitoring of fertilizers and pesticides in the Final EIS document:

> "Although no rare, threatened or endangered species were found during the biological survey, two endangered waterbirds, the Hawaiian Coot and Hawaiian Gallinule, may utilize the lower portion of Poamoho Stream. The U.S. Fish and Wildlife Service has offered its assistance in the selection of suitable chemicals for use on the proposed course. The biological consultants have recommended that the USFWS, as well as the State Division of Forestry and Wildlife, review the selection of biocides as the planned water hazard areas and greens will most likely attract use of these areas by migratory shorebirds and native waterbirds."

Poamoho Stream

No specific stream studies or a literature search were made as the biological survey covered only the terrestrial resources. The description of the stream are, as we state, only observations and notes of the stream on the project site and do not imply true characteristics of the overall Poamoho Stream ecosystem.

Grading Phase

The third paragraph of Section 5.1, Grading, will be revised to state erosion potentials of 76 tons/acre/year and 214 tons/acre/year.

A statement on actual implementation of mitigative measures for soil erosion is premature due to the preliminary planning stage of the project (design of the golf course is one to two years away). Please note that the grading permit, as administered by the City and County of Honolulu, requires an approved grading plan, which in turn requires approved erosion control measures. The grading plan delineates specific erosion control measures that the contractor must comply with. Thus, construction cannot proceed without adoption of defined measures to mitigate soil erosion.

We concur with maintenance of vegetation along the stream as a buffer zone between fairways and the stream environment.

Pesticides

At your request, the following tables by Murdoch and Green, located in Appendix C, will also be incorporated in the text of the EIS (Section 5.3.2, Pesticides):

> 1 - Table 2, A Typical Pesticide Program for Golf Courses in Hawaii.
>
> 2 - Appendix C, Table 1, Properties of Pesticides Used in Turfgrass in Hawaii (only those pesticides listed above in Table 2 will be included).

It is difficult to discuss which pesticides will be used on the golf course. Pesticides are generally applied in spot treatments for localized outbreaks. Actual application rates and areas of application are highly variable, dependent on type of outbreak and extent of affliction.

Diazinon was presented in the text because of the notoriety given this specific pesticide. A typical pesticide program delineating type, application rate, and frequency is discussed by Murdoch and Green in Appendix C of the EIS. Further, we have consulted with the U.S. Fish and Wildlife Service regarding the concern over the use of pesticides.

We thank you for your thorough analysis of our document and hope our responses prove satisfactory.

Very truly yours,

Tyrone T. Kusao

TTK:afk
cc: Department of General Planning
Engineering Concepts, Inc.
Char and Associates

PB 88-108

January 29, 1988

MEMO TO: MR. DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: HERBERT K. MURAOKA
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: DRAFT EIS FOR WAIALUA GOLF COURSE

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

Thank you for the opportunity to review the draft EIS.

HERBERT K. MURAOKA
Director and Building Superintendent

TH:ly
cc: J. Harada
Tyrone Kusao
Tyrone Kusao, Inc.

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1338

February 2, 1988

Mr. Herbert Muraoka
Director and Building Superintendent
City and County of Honolulu
650 South King Street, 2nd Floor
Honolulu, Hawaii 96813

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Mr. Muraoka:

Thank you for your letter dated January 29, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 S. BERETANIA STREET, ROOM 305
HONOLULU, HAWAII 96814

FRANK F. FASI
MAYOR

FRANK K. KAHOOHANOHANO
FIRE CHIEF

LIONEL E. CAMARA
DEPUTY FIRE CHIEF

February 9, 1988

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: FRANK K. KAHOOHANOHANO, FIRE CHIEF

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT--WAIALUA GOLF COURSE

Reviewing the materials provided, we foresee no adverse impact on Fire Department facilities or services.

We have no further comments at this time.

Should you have any questions, please contact Battalion Chief Kenneth Word at 943-3838.

FRANK K. KAHOOHANOHANO
Fire Chief

FKK/LD:sb

cc: Tyrone T. Kusao, Inc.

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1100 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1338

February 11, 1988

Mr. Frank K. Kahoohanohano
Fire Chief
City and County of Honolulu
1455 S. Beretania Street, Room 305
Honolulu, Hawaii 96814

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Chief Kahoohanohan:

Thank you for your letter dated February 9, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU HAWAII 96813
PHONE 523-4181

FRANK F. FASI
MAYOR

MIKE MOON
DIRECTOR

ROBERT MIYASATO
DEPUTY DIRECTOR

February 16, 1988

<u>MEMORANDUM</u>

TO: Donald Clegg, Chief Planning Officer
Department of General Planning

FROM: Mike Moon

SUBJECT: Draft Environmental Impact Statement
for the Waialua Golf Course, Waialua, Oahu

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

Robert Miyasato
for MIKE MOON
Director

cc: Mr. Tyrone T. Kusao

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1100 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813

BUS (808) 538-6852
RES (808) 395-1330

February 17, 1988

Mr. Michael Moon
Director
Department of Housing & Community Development
City and County of Honolulu
650 S. King Street, 5th Floor
Honolulu, Hawaii 96813

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Mr. Moon:

Thank you for your letter dated February 16, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning concerning the above-referenced report.

Your letter will be reproduced in the Final EIS together with this response.

Very truly yours,

Tyrone T. Kusao
Tyrone T. Kusao

TTK:afk
cc: Department of General Planning

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

JOHN P. WHALEN
DIRECTOR

LU1/88-443(mstm)

March 4, 1988

MEMORANDUM

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: JOHN P. WHALEN, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
FOR WAIALUA GOLF COURSE, WAIALUA, OAHU
TAX MAP KEYS 6-5-01: 02 AND 6-4-01: 06

Thank you for the opportunity to review the DEIS. We have the following comments to offer:

1. The Drainage Report (Appendix C) states that the drainage detention pond on the makai side of the plateau near Kaukonahua Road will release runoff to Poamoho Stream via the driving range at a slower rate than storm flows. In addition, it states that the pond may be able to reduce runoff close to existing conditions. Please identify existing runoff conditions and provide an analysis to justify the anticipated reduced runoff.

2. The List of Necessary Approvals notes a required permit to alter a stream channel, to be filed with the Department of Land and Natural Resources. It is not clear in the DEIS which stream(s) will be impacted, and we recommend that the EIS address this concern.

Thank you for the opportunity to comment. If you have any questions, please contact Maureen St. Michel of our staff at 527-5349.

JOHN P. WHALEN
Director of Land Utilization

1667B

cc: √Tyrone T. Kusao

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

March 16, 1988

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

Subject: Waialua Golf Course Draft EIS
Waialua, Oahu, Hawaii

Thank you for your letter of March 4, 1988 to Mr. Donald Clegg, Chief Planning Officer, Department of General Planning, with comments on the Draft EIS. We have reviewed your comments and offer the following response:

1. The golf course layout shown in the EIS is conceptual in nature and subject to revision upon completion of a detailed topographic survey and conditions imposed by regulatory agencies. Thus, anticipated runoff routing will be performed at a later time in conjunction with the design of the golf course. The statements in the EIS concerning reduction of future runoff rates close to existing conditions by implementing detention ponds are general, limited by preliminary planning. However, during the development of the construction plans, features will be incorporated in the design to maintain runoff rates close to existing conditions.

2. As detailed planning and design of the project proceed, the developer will submit a permit application to DLNR for alteration of stream channels by construction of golf cart crossings. Both Poamoho Stream and North Poamoho Stream will be affected. The Final EIS will state this concern in Section 5.4, Biological Resources.

Very truly yours,

Kenneth Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone (808) 538-0920

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 - AREA CODE (808) 943-3111

FRANK F. FASI
MAYOR

DOUGLAS G. GIBB
CHIEF

WARREN FERREIRA
DEPUTY CHIEF

OUR REFERENCE CS-LK

February 8, 1988

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR WAIALUA GOLF COURSE

The construction of any recreational facility will require police services for traffic control, criminal investigations and other calls for services.

Police officers assigned to the Wahiawa Station will be responding to calls for service at and in the vicinity of the proposed facility.

When the golf course, clubhouse and driving range become operational, we would recommend that noise, lights, and other factors that may affect the proposed project's residential neighbors be taken into consideration to help minimize calls for police service to the area.

Thank you for the opportunity to review and offer our comments on the subject document.

for DOUGLAS G. GIBB
Chief of Police

cc: Mr. Tyrone T. Kusao

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1100 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813

BUS (808) 538-6652
RES (808) 395-1330

February 11, 1988

Douglas G. Gibb
Chief of Police
City and County of Honolulu
1455 South Beretania Street
Honolulu, Hawaii 96814

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Chief Gibb:

Thank you for your letter dated February 8, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning concerning the above-referenced report.

The project will address your concerns relating to noise, lights and other factors in planning for the various facilities.

Your letter will be reproduced in the Final EIS together with this response.

Very truly yours,

Tyrone T. Kusao

TTK:afk

cc: Department of General Planning

ENV 88 41

February 12, 1988

MEMORANDUM

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: ALFRED J. THIEDE, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT EIS FOR WAIALUA GOLF COURSE, WAIALUA, OAHU, HAWAII
TAX MAP KEY: 6-4-01:6 and 6-5-01:2)

We have reviewed the subject Draft EIS and have the following comments:

1. The peak storm runoff flows at the project site (page 4-7) should be verified by the Division of Engineering. The calculation should be sent to the Drainage Section.
2. Plate 6 of the City and County Drainage Standards should be used in determining the peak storm runoff flows from the Poamoho Stream at Kaukonahua Road (page 4-9).
3. Wastewater requirements for the proposed golf course will be satisfied with the proposal expansion of the Paalaa Kai WWTP.

Sam Callejo
ALFRED J. THIEDE
Director and Chief Engineer

cc: Tyrone T. Kusao, Inc.

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

March 1, 1988

Mr. Alfred J. Thiede
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

SUBJECT: Waialua Golf Course
Draft Environmental Impact Statement
Waialua, Oahu, Hawaii

Thank you for your letter of February 12, 1988 with comments on the Draft EIS. We have reviewed the comments and have the following response:

1. We contacted Mr. Sumio Tano of the Drainage Section and will send him calculations for peak storm runoff flows at the project site for verification.
2. The peak storm runoff flow from Poamoho Stream at Kaukonahua Road will be calculated using the City and County of Honolulu Storm Drainage Standards, Plate 6. The computed flow will be incorporated in the Final EIS.

Very truly yours,

Kenneth Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

March 1, 1988

Drainage Section
Division of Engineering
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attention: Mr. Sumio Tano

Subject: Waialua Golf Course
Draft Environmental Impact Statement
Waialua, Oahu, Hawaii

At the request of Mr. Albert Thiede in his memorandum of February 12, 1988 to Mr. Donald Clegg, we have enclosed storm runoff flow calculations for verification by your division. Included are the following:

1. Runoff at the project site for 10-year and 50-year storms using the Rational Method.

2. Runoff at the project site and Poamoho Stream drainage basin for the peak storm using Plate 6 of the City and County Storm Drainage Standards.

Copies of the memorandum mentioned above and the portion of the Draft EIS of concern are also enclosed for your reference. Please call if you have any questions or require additional information.

Very truly yours,

Kenneth Ishizaki

Kenneth Ishizaki, P.E.
Vice President

DM/bs

Attachment

cc: Mr. Alfred Thiede
Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

JOHN E. HIRTEN
DIRECTOR

JOSEPH M. MAGALDI, JR.
DEPUTY DIRECTOR

PL 1.0987
TE-512

February 26, 1988

MEMORANDUM

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: JOHN E. HIRTEN, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR PROPOSED WAIALUA GOLF COURSE
TMK: 6-5-01: POR. 2
6-4-01: POR. 6

This is in response to your letter of January 21, 1988.

We have no comments to offer at this time.

(for) JOHN E. HIRTEN

cc: Mr. Tyrone T. Kusao
Tyrone T. Kusao, Inc.

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1100 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1336

February 29, 1988

Mr. John E. Hirten
Department of Transportation Services
City and County of Honolulu
650 S. King Street,
Honolulu, Hawaii 96813

Subject: Draft EIS For Waialua Golf Course
TMK 6-5-01:2 and 6-4-01:6

Dear Mr. Hirten:

Thank you for your letter dated February 26, 1988 to Mr. Donald A. Clegg, Chief Planning Officer, Department of General Planning 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: Department of General Planning

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

February 24, 1988

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: DRAFT EIS FOR WAIALUA GOLF COURSE, TMK: 6-5-01: 2 AND 6-4-01: 6

Thank you for the opportunity to review and comment on the environmental document for the proposed golf course.

We have the following comments:

1. Construction plans for the water main installation should be submitted for our review and approval.

2. We will not provide water for landscape irrigation and for irrigation of the golf course. Non-potable sources should be developed for irrigation.

3. In addition to our Waialua Wells, we also have the Haleiwa Wells which serve the Waialua-Haleiwa areas. The Haleiwa Wells have two pumps rated at 700 gpm each with a 230-foot head along with a 1.0 mg reservoir with a 225-foot spillway elevation.

4. Data and reference sources inferring that pesticides used in golf course management will not affect groundwater resources in the area should be incorporated in the discussion on pesticides (pgs. 5-6, Section 5.3.2 Pesticides).

5. A discussion on the contribution that irrigation water has on groundwater recharge should be included as a possible impact.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

6. In order to accommodate wastewater flows from the golf course, the operating capacity of the Paalaa Kai WWTP would have to be increased. A statement or discussion on the ability of the existing effluent disposal system at the WWTP to handle the additional flows should be included in the document (pgs. 5-14).

If you have any questions, please contact Lawrence Whang at 527-6138.

cc: Tyrone T. Kusao, Inc.

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

March 10, 1988

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96813

Attention: Mr. Larry Whang

Subject: Waialua Golf Course Draft EIS
Waialua, Oahu, Hawaii

Thank you for your letter of February 24, 1988 to Mr. Donald Clegg, Chief Planning Officer, Department of General Planning, with comments on the Draft EIS.

We have reviewed your comments and have the following response:

1. Design of the golf course is one to two years away; thus, we will contact the BWS at a later date regarding approvals for the water main installation.

2. As stated in Section 5.6.1, Water Supply, of the Draft EIS, irrigation can be supplied by the Waialua Sugar Company irrigation system. It is not the intention of the developer to utilize the BWS system for irrigation purposes.

3. We will include the information on the Haleiwa wells in Section 4.7.1, Water Supply, of the Final EIS.

4. The following information will be included in Section 5.3.2, Pesticides, of the Final EIS:

   a. Reference to the report by C.L. Murdoch and R.E. Green entitled "Environmental Assessment of Fertilizer and Pesticide Use on the Proposed Waialua Golf Course."

   b. Comparison of chemicals identified in drinking water supplies with proposed golf course pesticides.

   It should be noted that there are no data available on the impact of golf course pesticides on groundwater resources. Thus, conclusions on the impact of golf course pesticides are based on their general characteristics.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone: (808) 538-0920

5. A discussion on the impact of irrigation on groundwater recharge will be included in the Final EIS in Section 5.6.1, Water Supply.

6. The Final EIS will include a discussion on the capacity of the existing effluent disposal system to handle the additional flows in Section 5.6.2, Proposed Wastewater Infrastructure.

Very truly yours,

Ken Ishizaki

Ken Ishizaki, P.E.
Vice President

DH/bs

cc: Tyrone T. Kusao, Inc.

245 North Kukui Street, Honolulu, Hawaii 96817, Telephone (808) 537-5966

AMERICAN LUNG ASSOCIATION of Hawaii
The Christmas Seal People®

March 8, 1988

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft EIS for Waialua Golf Course

We have reviewed the subject EIS with particular attention to the section addressing air quality impacts and have the following comments to offer.

We note that Section 5.8.2 (p. 5-26) of the DEIS addressed the possible air quality impact of pesticide use on the proposed golf course. Unfortunately, no information was provided to indicate what specific chemicals were likely to be used, the frequency of use, nor what their impact might be on air quality downwind of the golf course. Particularly in light of the close proximity of residential areas across Kaukonahua Road and their downwind location in terms of the prevailing east-northeasterly trade winds, it would seem appropriate to include a more detailed assessment of possible impacts of pesticide use.

The DEIS also states on page 5-26 that "...while the change to golf course use will probably result in increased use of agricultural chemicals, the potential for significant degradation of overall air quality in the Waialua area from golf course pesticide use is judged to be minimal." The conclusion in this case appears to be purely speculative and unsupported by any facts presented in the DEIS. And as noted above, the focus of interest in terms of possible pesticide impact would seem to be more appropriately placed on the immediately adjacent property owners rather than the "overall air quality in the Waialua area."

Given the general public concern about pesticides and chemicals in the environment and other local problems associated with golf course use or pesticides, we strongly recommend that this EIS not be accepted until a more detailed analysis of pesticide use and possible impacts is prepared and included.

Sincerely yours,

James W. Morrow

James W. Morrow
Director
Environmental Health

JWM:ct
L8812

cc: OEQC
UH-Environmental Center
T. Kusao

TYRONE T. KUSAO, INC.
Planning and Zoning Consultant

1188 BISHOP STREET, SUITE 2507
HONOLULU, HAWAII 96813
BUS (808) 538-6652
RES (808) 395-1338

March 21, 1988

Mr. James W. Morrow
Director, Environmental Health
American Lung Association of Hawaii
245 N. Kukui Street
Honolulu, Hawaii 96817

Subject: Draft EIS For Waialua Golf Course.

Dear Mr. Morrow:

Thank you for your letter dated March 8, 1988 to the Chief Planning Officer containing comments on air quality impacts of the proposed golf course. I have referred your letter to Barry D. Root, the project's air quality consultant, for review and response. Attached hereto is his response to your comments.

I am also enclosing a copy of draft report by Murdoch and Green titled "Environmental Impact Of Fertilizer And Pesticide Use On The Proposed Waialua Golf Course" as it addresses some of the points raised in your letter.

Very truly yours,

Tyrone T. Kusao

TTK:afk

cc: Department of General Planning
Mr. Barry Root

Barry D. Root
46-198 Lilipuna Road
Kaneohe, Hawaii 96744

March 18, 1988

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

SUBJECT: Air Quality Study for Waialua Golf Course - Response to Comments from Mr. James W. Morrow of the American Lung Association of Hawaii in letter dated March 8, 1988.

The specific fertilizers and pesticides along with their potential application volumes and periods and locations of application were not addressed in the Air Quality Section of the Draft EIS because these chemicals and their environmental impact potential are described elsewhere in the document, specifically Appendix C which contains a report titled ENVIRONMENTAL IMPACT OF FERTILIZER AND PESTICIDE USE ON THE PROPOSED WAIALUA GOLF COURSE. Since this report is included in Appendix C after a related report on drainage, it is possible that Mr. Morrow may have overlooked it. The majority of his concerns are addressed by the report in Appendix C.

The Air Quality Study addresses only the brief time that these chemicals are airborne, i.e. while they are being applied. As stated in the Air Quality Study, the chief health risk involved in the use of pesticides is to the applicator. Specific Warning and Caution labels are attached to product containers in accordance with Occupational Safety and Health guidelines. There are no federal or state ambient air quality standards which set limits on the permissible concentrations of these chemicals while they are airborne. When spray application is employed the primary objective is to spread the chemicals evenly over the surfaces for which they are intended. Application of these chemicals is thus a very localized phenomenon, and the amount of time that the chemicals are actually airborne constitutes a minuscule portion of their lifetimes.

There are no air quality modeling guidelines dealing with intermittent emissions from a moving point source, nor is it possible to estimate deposition rates with distance for each of the different chemicals without extensive field study. The main environmental guideline for safe spray application of all chemical fertilizers and pesticides is to use a coarse rather than fine spray.

The conclusion that the impact of these chemicals on air quality would be minimal assumes strict compliance with existing federal and state guidelines for their application and reliable enforcement of these guidelines by the Hawaii Department of Agriculture.

Barry D Root

Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

ENV 2-1
JA/G

Brenner Munger, Ph.D., PE
Manager
Environmental Department
(808) 548-6880

February 9, 1988

Mr. Donald A. Clegg
Chief Planning Officer
City & County Of Honolulu
Department of General Planning
650 South King Street
Honolulu, HI 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (EIS) for Proposed Waialua Golf Course, Waialua, Oahu, Hawaii

We have reviewed the above document and have several comments. The proposed development crosses an existing HECO 46kv subtransmission and 12kv distribution overhead line (See Enclosure 1), which will remain energized during project construction. As a result, we recommend that the following HECO notes be included as part of the final construction plans.

1. The Contractor is to exercise extreme caution when the excavation and construction crosses or is in close proximity of our lines and is to maintain 13'-0" clearance for his equipment while working close to and/or under the overhead facilities.

2. The Contractor is to comply with the directions of the State of Hawaii Occupational Safety and Health Law (DOSH).

3. When excavation is adjacent to or under existing structures or facilities, the Contractor is responsible for properly sheeting and bracing the excavation and stabilizing the existing ground to render it safe and secure from possible slides, cave-ins and settlement, and for properly supporting existing structures and facilities with beams, struts or underpinning to fully protect them from damage.

4. Should it become necessary, any work required to relocate HECO facilities shall be done by HECO. The Contractor shall be responsible for all costs and coordination.

5. The Contractor shall be liable for any damages to HECO's facilities.

6. The Contractor shall report any damages to HECO's facilities to the HECO Trouble Dispatch at phone 548-7961.

7. A minimum of 30'-0" shall be maintained between HECO overhead conductors and the final land grade of the development.

8. Service roads and/or trails leading to and from HECO's facilities shall remain accessible for HECO's use at all times.

Sincerely,

Brenner Munger

Enclosure

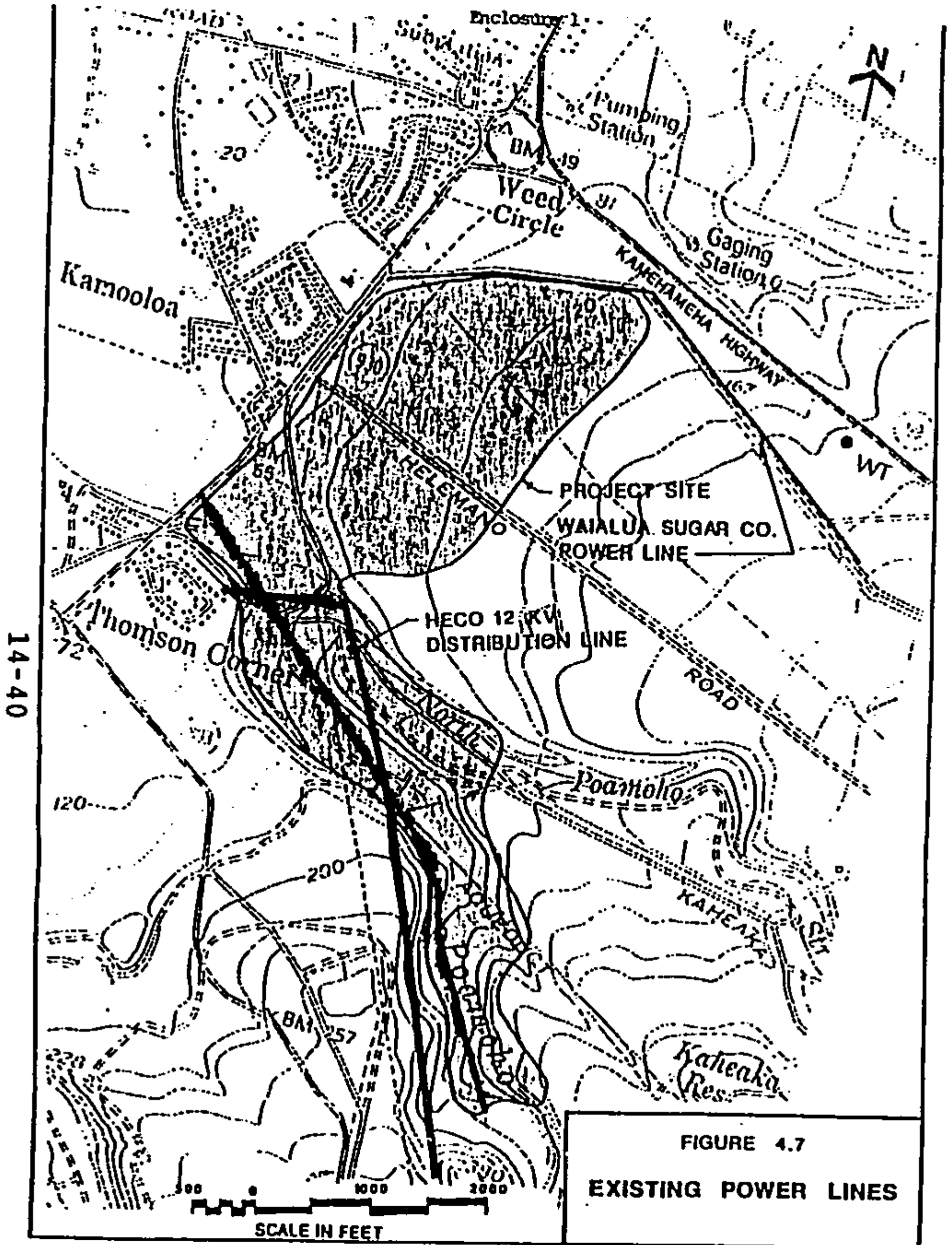

FIGURE 4.7
EXISTING POWER LINES

4-19

ENGINEERING CONCEPTS, INC.
CONSULTING ENGINEERS

February 23, 1988

Dr. Brenner Munger, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840-0001

Subject: Waialua Golf Course EIS
Waialua, Oahu, Hawaii

Thank you for your letter of February 9, 1988 to Mr. Donald Clegg, City and County of Honolulu Department of General Planning, with comments concerning the Draft EIS.

The power line alignment on Figure 4.7 of the Draft EIS will be revised to show the location of the existing 46 KV subtransmission and 12 KV distribution overhead lines.

Oceanic Properties, Inc., the developer, recognizes its responsibility for relocating the lines. However, a decision at this time to relocate segments of the existing power lines would be premature for the following reasons:

1. Land use approvals by government agencies have not been obtained. Without these approvals, development of the golf course project cannot proceed.

2. The planning of the golf course is not at a stage where it can be determined which segments of the existing lines require relocation.

In regard to the construction notes you recommended for inclusion in the final construction plans, we will contact HECO for current construction notes at a later date since design of the golf course is one to two years away.

Very truly yours,

Kenneth Ishizaki, P.E.
Vice President

DM/bs

cc: Tyrone T. Kusao, Inc.

250 Ward Avenue, Suite 206 • Honolulu, Hawaii 96814 • Telephone (808) 538-0920

FEB 18 1988

HAWAIIAN ELECTRIC COMPANY, INC. · PO BOX 2750 · HONOLULU, HI 96840-0001

HEI

February 17, 1988

Engineering Concept
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Attention: Dana Miyamoto

Gentlemen:

46/12 Kv Lines within the
Proposed Waialua Golf Course

Per your request, attached is a drawing entitled "Existing Power Lines" which shows marked in red Hawaiian Electric's existing 46 and 12 kv lines within the proposed Waialua Golf Course.

Would you confirm, as we discussed on 2/12/88, that the developer will pay for the cost of relocating our existing 46 and 12 kv lines and that the land owner will grant to Hawaiian Electric a substitute easement.

Should you have any questions, please call me at 548-6810.

Sincerely,

Charles T. Ane
Land Agent

Encl.

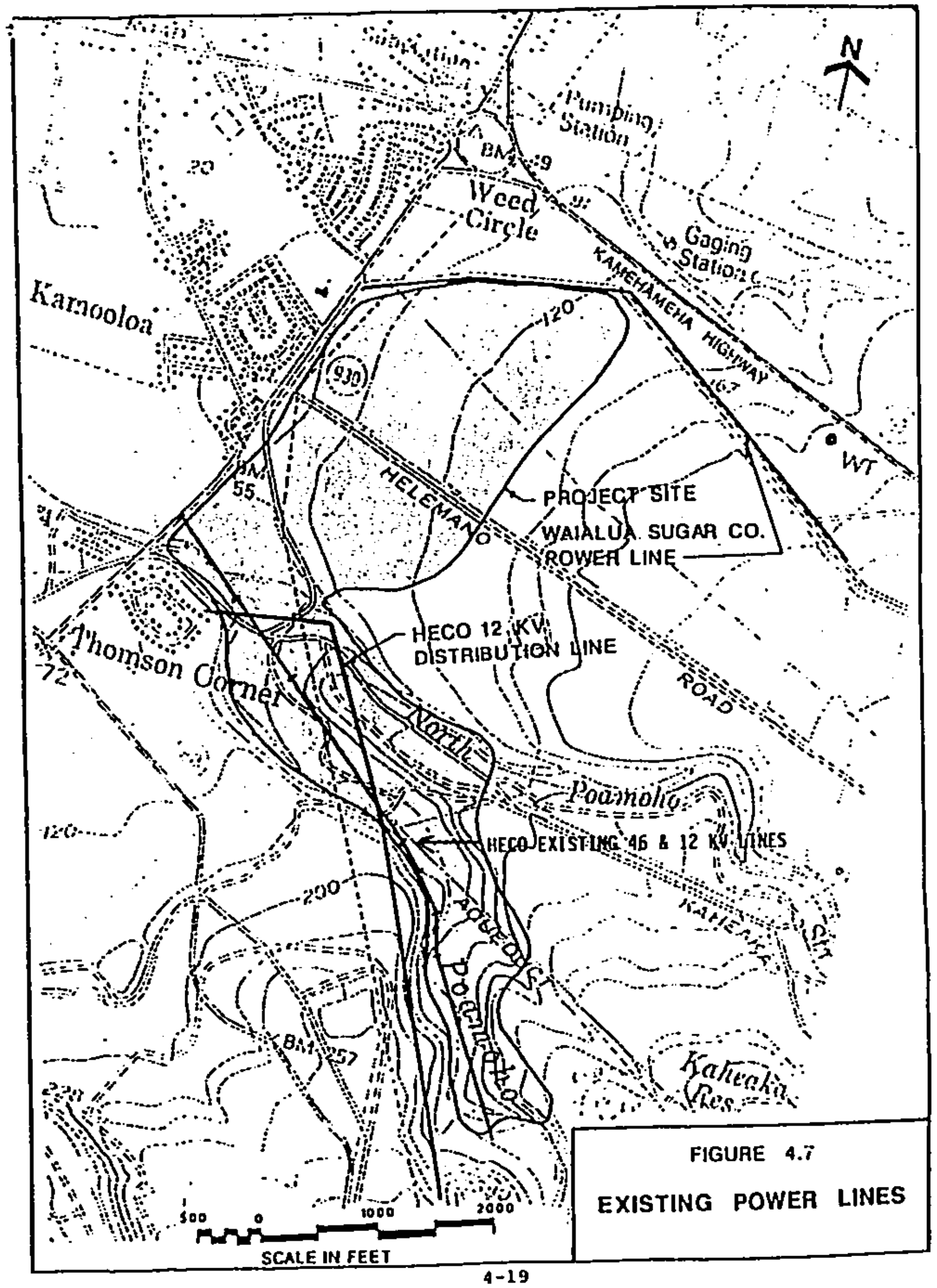

FIGURE 4.7
EXISTING POWER LINES

4-19

OCEANIC PROPERTIES INC

650 Iwilei Road
P O Box 2780
Honolulu Hawaii 96803
Telephone (808) 548-4811

February 26, 1988

Hawaiian Electric Company, Inc.
Land and Rights of Way Department
P. O. Box 2750
Honolulu, Hawaii 96840-0001

ATTENTION: Mr. Charles T. Ane

SUBJECT: PROPOSED WAIALUA GOLF COURSE

Gentlemen:

Thank you for your letter of February 17, 1988 to Engineering Concepts, Inc. which included the revised location of the 46 and 12 KV overhead lines within the proposed project. The power line alignment on Figure 4.7 of the Draft EIS will be revised according to your findings.

Oceanic Properties, Inc. recognizes its potential responsibility for relocating the existing power lines should the project proceed as reflected in the preliminary design. However, we feel a commitment at this time to relocate segments of the existing power lines would be premature due to the following conditions:

1. The project has not yet received the necessary land use approvals from the State Land Use Commission and City Council that would allow the project to proceed.

2. The design and planning stage of the project is not at a point where it can be determined which segments, if any, of the existing lines may require relocation.

We will be in contact with HECO throughout the government approval and planning processes to assure your concerns are properly addressed in the detailed design and planning of the project.

We sincerely appreciate your time and effort in reviewing the project and the help we have received from your department in identifying HECO lines in the areas.

If you have any questions or would like additional information on the project, please feel free to call either myself or Ken Ishizaki at Engineering Concepts, Inc.

Very truly yours,

Larry Lum, Project Manager

cc: Engineering Concepts, Inc.
Tyrone Kusao, Inc.

1251E

CHAPTER 15

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15. REFERENCES

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APPENDICES

APPENDICES

APPENDIX A

BIOLOGICAL SURVEY
PROPOSED WAIALUA GOLF COURSE
WAIALUA DISTRICT, O'AHU

BIOLOGICAL SURVEY

PROPOSED WAIALUA GOLF COURSE

WAIALUA DISTRICT, O'AHU

by

Winona P. Char
George K. Linney

CHAR & ASSOCIATES
Botanical/Environmental Consultants
Honolulu, Hawaii

Prepared for: TYRONE T. KUSAO, INC.

December 1987

Table of Contents

BIOLOGICAL SURVEY
PROPOSED WAIALUA GOLF COURSE
WAIALUA DISTRICT, O'AHU

INTRODUCTION

Oceanic Properties proposes to develop a golf course on approximately 214 acres of land located between Weed Circle and Thompson Corner, mauka of Kaukonahua Road. The majority of the property (±142 acres) is currently under sugar cane cultivation with the remaining acreage (±72 acres) used for grazing or uncultivated.

A survey to describe and inventory the major terrestrial plant and vertebrate animal communities found on the project area was conducted on 04 December 1987.

BOTANICAL SURVEY

There have been a number of recent flora surveys which have been conducted for the general Mokuleia-Waialua-Haleiwa region. These include the botanical surveys for the Waialua-Haleiwa Wastewater Facilities Plan (Char 1986), the proposed resort and residential development at Mokuleia (Char and Linney 1986), the Makua-Kaena State Park Plan (Environmental Impact Study Corp. 1977), and a survey of the wetland areas for the Corps of Engineers (Elliott and Hall 1977). However, to our knowledge there have been no botanical surveys which have dealt specifically with the project area.

The lands proposed for golf course development have been disturbed for sometime and, as a result, the vegetation is dominated by introduced (or alien) species. Monodominant plantings of sugar cane cover the gently sloping lands while the more rugged Poamoho Gulch areas, which are used primarily for grazing cattle and horses, support a varied mixture of grasses, weedy herbs, and tree and shrub species. A pump house and associated pipelines are also found in the gulch.

No rare, threatened or endangered species designated by federal and/or state agencies were found on the project site during the course of the field studies. Also, no areas supporting remnant native plant communities (i.e., sensitive areas) were found.

Survey Methods

Prior to undertaking the survey, a search was made of the pertinent literature to familiarize the investigators with previous studies conducted in the general area.

Existing topographic maps were examined to determine access, terrain characteristics, and potential logistical and technical problems.

An intensive walk-through survey method was used. More intensive surveys were conducted for the less-disturbed gulch and stream areas as native species are more likely to occur in these areas. Binocular observations were made of the steep gulch walls. Access onto most of the project site was by paved (Helemano Road) and unpaved canehaul roads. The primary access used into the Poamoho Gulch area was the pump house road. From there a number of cattle and horse trails meander across the gulch floor and up some of the slopes.

Species identification was made in the field. Plants which could not be positively identified were collected for later determination in the herbarium and laboratory. The species recorded are indicative of the season (rainy vs. wet) and environmental conditions under which the survey was conducted. A survey taken at a different time and under varying environmental conditions would no doubt yield slight variations in the species list, especially of the weedy, annual plants.

Description of the Vegetation

The proposed Waialua golf course site comprises some 214 acres of agricultural land, of which approximately 142 acres is in active sugar cane cultivation, and about 72 acres in pasture or uncultivated land. Cane fields in various stages of cultivation make up the largest and most uniform vegetation type on the site. In the remaining acreage, two vegetation types can be recognized: gulch and streamside vegetation. All those plant species inventoried during the field studies are presented in Appendix A.

1. Cane fields. Within the active cane fields, there is an almost pure culture of sugar cane plants (*Saccharum officinale*) with very small amounts of nut sedge (*Cyperus rotundus*). Additional weedy species are restricted to the margins of fields where they invade from the adjacent roadsides and irrigation ditches. These species consist mostly of swollen finger-grass (*Chloris barbata*), two species of amaranth (*Amaranthus spinosus*, *Amaranthus viridis*), and two species of spurge (*Chamaesyce hirta*, *Chamaesyce hypericifolia*).

Near Poamoho Stream, where bananas (*Musa X paradisiaca*) are cultivated, an assortment of miscellaneous weedy species, too numerous to list here, have colonized a large expanse of disturbed soil next to the cane fields. Near this same area, the lower portion of North Poamoho Gulch (a dry ditch at this point) has been used as a unauthorized dump for household trash and yard trimmings. A number of ornamental plants are becoming established here, including Madeira vine (*Anredera cordifolia*), dumb cane (*Dieffenbachia seguine*), cassava (*Manihot esculenta*), and *Heliconia*.

2. Gulch vegetation. This vegetation type is characterized by the presence of small to medium stands of kiawe trees (*Prosopis pallida*) and koa-haole shrubs (*Leucaena leucocephala*), with lesser amounts of Java plum (*Syzygium cumini*), silk-oak (*Grevillea robusta*), Chinaberry (*Melia azedarach*), and 'opiuma (*Pithecellobium dulce*). The ground is covered with a thick growth of Guinea grass (*Panicum maximum*) which forms "lumpy" patches between trees and shrubs. Three vines make up a significant component of the vegetation: liliko'i (*Passiflora edulis*), mauna-loa (*Canavalia cathartica*), and Mysore thorn (*Caesalpinia sepiaria*).

On the bluffs marking the edges of the gulch floor, tree and shrub components are simplified so that silk-oak and koa-haole form the vast majority of the cover. The koa-haole on these bluff areas are largely dead or dying back due to heavy psyllid infestation. The psyllid or jumping plant louse is a recently recorded insect species which attacks the young shoots and leaves of koa-haole. On those slopes that are too steep to support Guinea grass, swollen finger-grass and sour grass (*Digitaria insularis*) make a solid ground cover. Rocky outcrops, largely devoid of vegetation, are frequent. On gentler slopes Guinea grass, and especially its diminutive variety *trichoglume*, predominate. Farther back in Poamoho Gulch, cattle and horses are grazed. This has kept the grasses shorter and the ground more open. A very large number of weeds (or ruderals) and pasture species are found in these areas but the dominant species is Guinea grass. There is also a scattering of smaller shrubs such as indigo (*Indigofera suffruticosa*), klu (*Acacia farnesiana*), and cocklebur (*Xanthium strumarium*).

The trees in the pasture areas are the same as those encountered encountered in the lower gulch area, with the exception of a number of ornamental species evidently planted long ago around the pump house. These are date palm (*Phoenix dactylifera*), queen palm (*Arecastrum romanzoffianum*), Chinese fan palm (*Livistona* chinensis), bumelia (Bumelia buxifolia), mango (Mangifera indica), and kukui (Aleurites moluccana).

3. Streamside vegetation. This vegetation type is represented by two subtypes. In the lowest portion of Poamoho Stream, just above the Poamoho bridge area, elephant grass (Pennisetum purpureum) has completely overgrown the stream banks and adjacent areas. It forms an almost exclusive cover, crowding out other streamside species.

Except for this area dominated by elephant grass, most of the stream vegetation consists of a mixture of large trees such as Java plum, African tulip tree (Spathodea campanulata), Chinaberry, silk-oak, Christmasberry (Schinus terebinthifolius), Chinese banyan (Ficus microcarpa), 'opiuma, and monkeypod (Samanea saman). Ground cover in the stream areas is not dense due to the heavy shading from the trees above and the occasional flash floods which sweep the streamsides.

FAUNAL SURVEY

The project site has been greatly disturbed and consists largely of sugar cane fields on gently sloping lands and introduced plant communities in the gulch areas. Likewise, the majority of the fauna on the site is composed of foreign or alien species. Of a total of 16 avian (bird) species which occur on the site, only the Lesser Golden Plover (Pluvialis dominica) is native, and then, only as a non-breeding regular migratory visitor. The lower portion of Poamoho Stream, just above the Poamoho bridge, is perennial and may be utilized by two endangered native waterbirds -- the Hawaiian Coot or 'Alae-ke'oke'o (Fulica americana alai) and the Hawaiian Gallinule or 'Alae-'ula (Gallinula chloropus sandvicensis). However, none of these waterbirds were observed in this area during the survey.

Survey Methods

The survey was conducted on 04 December 1987 between the hours of 0630 and 1400.

Birds were detected both by sight and by their vocalizations. In addition, the presence of birds was determined by tracks, nests, droppings, etc. Mammalian presence was determined primarily by observation of tracks and scat (droppings) and by damage to vegetation.

Faunal Habitats

Three broad faunal habitats are recognized on the project area. These correspond somewhat roughly to the vegetation types described in the preceeding flora section but are less finely defined.

The predominant habitat on the project area consists of cane fields. The fields themselves provide only marginal habitat for the various species. Most animals prefer the margins of fields and the overgrown areas along canehaul roads and irrigation ditches. Here, grasses and weedy species provide seed and also support a number of insect species. Individuals or, sometimes, small flocks of both dove species were occasional in this habitat. The Lesser Golden Plover or Kolea frequents the canehaul roads and roadsides during its visits from August through early April. Occasionally, small flocks of Nutmeg Mannikin were observed. Most of the bird species seen in these areas, however, were passing through on their way to more preferred habitats.

The open, grassy streamside areas mauka of Poamoho bridge are frequented by large flocks of mannikins and waxbills during the early morning hours. Guinea grass, which occurs along the margins of the elephant grass-dominated streamside, forms an extensive cover which provides abundant seed for these granivorous species. A few individuals of the Wrinkled Frog were found in Poamoho Stream where it meanders through the pasturelands in the gulch area. No studies of aquatic resources within the project site have been conducted but a few observations and notes were made during this survey. The muddy, silted condition of the stream, however, made observations difficult. The guppy (Poecilia reticulata) and several unidentified poecillid species were observed in the stream. One small individual of the endemic goby o'opu nakea (Awaous stramineus), about 1.5 inches long, was observed in the stream area behind the pump house. The aquarium snail (Heliosoma sp.) was found in boulder-strewn areas of the stream.

Pasture areas support small- to medium-sized forest and scrub areas. The Red-vented Bulbul, two cardinal species, and Japanese White-eye were abundant in these areas; White-rumped Shama were frequently heard singing in wooded areas. The more open, grassy areas within the pastures were preferred by doves and plovers, as well as the Strawberry Finch.

Annotated Species List

The following includes species inventoried on the project site. Domesticated animals such as cows and horses are excluded. For each species the common and scientific names are provided. Bird names are in accordance with Pratt et al. (1987). The origin and status of each species is also given. "Foreign" species are all those species introduced to the islands by man; "Visitors" are non-breeding regular migrants to the islands.

1. Avifauna (Birds)

a. Lesser Golden Plover or Kolea (Pluvialis dominica); Foreign
Also known as the Pacific Golden Plover, this migratory visitor is found on all the Hawaiian Islands, where they

prefer open areas such as mudflats, lawns, fields, and grassy mountain slopes. On the project site, they were found along canehaul roads and the open portions of the pasture area.

b. Cattle Egret (Bubulcus ibis); Foreign
This small, white heron with yellowish legs and bill is found around wetland areas. Birds are frequently encountered around the nearby wetlands and streams of Waialua and Haleiwa. It is not uncommon to observe these birds on newly harvested cane fields searching for insects. During this survey, small flocks of birds were observed flying over the project site.

c. Spotted Dove (Streptopelia chinensis); Foreign
Also known as the Lace-necked Dove or Chinese Dove, this species feeds on grass and weed seeds. It is usually found in open or grassy areas on all the islands. On the project site, it is found occasionally along the canehaul roads, in weedy patches, and in open to semi-wooded pasture areas.

d. Zebra Dove (Geopelia striata); Foreign
This smaller of the two doves, also known as the Barred Dove, occurs commonly in small flocks. It is abundant in residential areas throughout the islands. On the project site, it was found in the same habitats as the Spotted Dove but in slightly larger numbers.

e. Northern Cardinal (Cardinalis cardinalis); Foreign
Also known as the Kentucky Cardinal, the male is colored a bright red; females are reddish-brown. Pairs of birds were observed and heard in trees along the streamside and in dense scrub and forested portions of the pasturelands where they were quite common.

f. Red-crested Cardinal (Paroaria coronata); Foreign
This grayish-colored bird with head and crest colored red to

reddish-brown is also known as the Brazilian Cardinal. Small flocks of birds were frequently observed in trees along the streamside and in the pasturelands.

g. Common Myna (Acridotheres tristis); Foreign
Very few birds were seen on the project site itself, and then, most of them were only flying over the site. Mynas are more common on the adjacent residential areas where they can be heard in the early morning hours.

h. Chestnut Mannikin (Lonchura malacca); Foreign
Also known as the Black-headed Munia. On the project site, this species is found in small flocks on the grassy stream-side area near Poamoho bridge. It can sometimes be seen with mixed flocks of Nutmeg Mannikin and Strawberry Finch.

i. Nutmeg Mannikin (Lonchura punctulata); Foreign
Also known as Spotted Munia or Ricebird, this was one of the more common birds in the grassy streamside habitat on the project site. Small flocks of birds were occasionally seen in the cane fields, usually along irrigation ditches where it is weedy. The birds feed on seeds of grasses and weeds.

j. Black-rumped Waxbill (Estrilda troglodytes); Foreign
This small, grayish-brown bird which has a distinctive band of red along the side of its head, just above the eye, is also known as the Red-eared Waxbill. The birds also have reddish-orange colored bills. On the project site, this is the most abundant species in the grassy streamside habitat where it occurs in large flocks.

k. Strawberry Finch (Amandava amandava); Foreign
Males of the species are strawberry red with white speckles and can be easily distinguished from the two mannikin species with which it may associate. Birds are common in the grassy streamside habitat and in grassy portions of the pastureland.

l. White-rumped Shama (Copsychus malabaricus); Foreign
This attractive bird is considered by many to be one of the best song birds in the islands (Hawaii Audubon Society 1984). It is also known as the Shama Thrush. Shama are common on the project site where there is a dense cover of trees and shrubs.

m. Japanese White-eye (Zosterops japonicus); Foreign
Also known by its Japanese name, Meijiro. The White-eye was common in wooded and scrub areas, quickly moving from branch to branch in search of insects. Neatly woven nests of fibers and grasses were observed in koa-haole and other taller growing shrub species.

n. Red-vented Bulbul (Pycnonotus cafer); Foreign
This conspicuously noisy and gregarious bird was found in the open, grassy streamside area as well as the pasturelands. The birds often gather in small flocks in trees during the morning hours. Birds were observed feeding on fruit of Java plum, Christmasberry, and guava in the pasture area.

o. House Sparrow (Passer domesticus); Foreign
Like the Myna, this species was associated with the nearby residential areas. Birds were observed flying over the project site to more preferred habitats.

p. House Finch (Carpodacus mexicanus); Foreign
Also known as Linnet or, locally, as Papayabird because of its fondness for the fruit. Birds were heard in the grassy streamside area in the early morning hours. Small flocks of birds were also observed on the grassy slopes of Poamoho Gulch.

2. Mammals

Only two mammal species, the Hawaiian Hoary Bat or 'ope'ape'a

(Lasiurus cinereus semotus) and the Hawaiin Monk Seal (Monachus schauinslandi), are native to the islands; all others are introduced or foreign species accidentally or intentionally brought to the islands by the Polynesians or by later immigrants after Western contact. All mammals on the project site are foreign. During this survey, tracks and scat of Mongoose (Herpestes auropunctatus) were found in the pasture areas. Partially gnawed fruits of guava, indicative of rat damage, were also found here. Two species of rat -- Roof Rat (Rattus rattus) and Pacific Rat (Rattus exulans) -- are expected to occur on the site. The ubiquitous House Mouse (Mus musculus) is also expected to occur here, especially in the pasture area.

3. Reptiles and Amphibians

The Wrinkled Frog (Rana rugosa) was observed in pools along Poamoho Stream where it meanders through the pastureland. A number of gecko and skink species are also likely to occur on the project site. No intensive survey for amphibians and reptiles, however, was made as none of these are native to the islands.

DISCUSSION AND RECOMMENDATIONS

Flora

A total of 135 vascular plant species were found on the site, of which the majority, 124, are exotic species introduced since the arrival of Western man. Six species are considered to have been introduced by the Polynesians, and only 5 are considered native, some only questionably so. No endemic species (i.e., native only to the Hawaiian Islands) were found on the site. All but the sugar cane are considered more or less weedy.

No federal and/or state designated rare, threatened or endangered (listed, proposed, candidate) species were found on the site. Nor were there any cultivated plants requiring

conservation. There is little of botanical interest on the site and the proposed project is not expected to have a significant impact on the total island populations of the species involved.

The middle section of Poamoho Stream, despite its insignificant flow, was particularly attractive, with the large trees imparting a park-like appearance. This natural feature will be incorporated into the site development. The course will be designed to fit the natural topography of the site and the stream areas will basically remain undisturbed.
Some areas adjacent to the stream, such as at golf cart crossings, will be disturbed. It is recommended that these areas be revegetated as soon as possible to prevent soil loss and discharge of sediments into the stream.

Fauna

Habitat on the site consists primarily of actively cultivated sugar cane fields; streamside and pastureland habitats occupy a somewhat smaller area. Vegetation in these habitats is composed almost exclusively of introduced or exotic plants. Likewise, almost the entire terrestrial faunal communities consist of foreign species. Only the Golden Plover is native.

The proposed project is not expected to have a significant impact on the fauna already present on the site as almost all are foreign. Species which are commensal with man, such as the Myna and House Sparrow, will no doubt increase in numbers.

Of concern, is the potential pesticide poisoning of endangered Hawaiian waterbirds, such as the Hawaiian Coot and Duck or Koloa (Anas wyvilliana) and migratory shorebirds such as the Golden Plover. Wetland waterbird habitats are found at the nearby Crowbar Ranch ponds at Mokule'ia, 'Uko'a Pond, several freshwater marshes between Hale'iwa and Waialua towns, and a number of streams and rivers which empty into Waialua and Kaiaka Bay. Some of these sites have been identified as important waterbird habitat by the U. S. Fish and Wildlife Service (1978).

It is recommended that the U. S. Fish and Wildlife Service and the State Division of Fish and Wildlife (Department of Land and Natural Resources) review the selection of suitable biocides for the maintenance of the golf course. Mitigation measures include the careful selection and use of chemicals that are EPA approved and meet the requirements of the State Department of Health and Department of Agriculture.

Golf courses and use of golf courses by endangered bird species are not incompatible. Golf courses can provide additional feeding and loafing sites for such species. Good examples are provided by the Princeville courses on Kauai which are located near the Hanalei Wildlife Refuge, one of the more important waterbird habitats in the islands, and by the Volcano golf course, located next to the Hawai'i Volcanoes National Park. The Princeville courses are utilized by the endangered Hawaiian Coot and other native waterbird and migratory species. The Volcanoes course is frequented by the endangered Nene (Nesochen sandvicensis) as well as the Golden Plover.

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APPENDIX A. LIST OF PLANT SPECIES
WAIALUA GOLF COURSE PROJECT

On the following pages is a list of all the vascular plants found on the project site during the course of this survey. Ferns are presented separate from the flowering plants, which are further divided into monocots and dicots. Within each of the three groups, plants are arranged alphabetically by family and within each family by genus. For each species, the author citation is provided as well as the common English or Hawaiian name, when known, and the biogeographic status. Fern taxonomy follows Wagner and Wagner (1987); flowering plant taxonomy follows Wagner et al.(In prep.).

The following abbreviations are used:

Scientific name
- s.l. = in a very broad sense (sensu lato)
- sp. = species not determined; inadequate material for identification
- var. = variety
- c.f. = specimens collected closely resemble this species

Biogeographic status
- I = indigenous = native to the Hawaiian Islands and one or more other geographic areas
- P = Polynesian introduction = brought to the islands by man before Western contact, not native
- X = introduced, exotic or alien = brought to the islands by man after Western contact either intentionally or accidentally, not native

SPECIES LIST

SCIENTIFIC NAME	COMMON NAME	BIOGEOGRAPHIC STATUS	VEGETATION TYPE c	g	s
FERNS					
Aspleniaceae					
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	sword fern	X	-	+	-
Thelypteris parasitica (L.) Iwats.	wood fern	X	-	+	-
FLOWERING PLANTS					
MONOCOTS					
Araceae					
Alocasia macrorrhiza (L.) Schott.	'ape	P	-	-	+
Dieffenbachia seguine (Jacq.) Schott	dumb cane	X	+	-	-
Cannaceae					
Canna indica L.	Indian shot	X	+	-	-
Commelinaceae					
Commelina diffusa N. L. Burm	dayflower	X	+	+	+
Cyperaceae					
Cyperus rotundus L.	nutgrass, nut sedge	X	+	-	-
Gramineae					
Brachiaria subquadripara (Trin.) Hitchc.		X	-	+	-
Chloris barbata (L.) Sw.	finger-grass	X	+	+	-

SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Cynodon dactylon (L.) Pers.	Bermuda grass	X	+ + -
Dactyloctenium aegyptium (L.) Willd.	beach wire grass	X	- + -
Digitaria ciliaris (Roetz.) Koeler	crab grass	X	- + -
Digitaria insularis (L.) Mez ex Ekman	sour grass	X	- + -
Digitaria radicosa (Presl.) Miq.	crab grass	X	- + -
Echinochloa colonum (L.) Link	jungle rice	X	+ - -
Echinochloa crusgalli (L.) Beauv.	barnyard grass	X	- + -
Eleusine indica (L.) Gaertn.	goose grass	X	+ - -
Panicum maximum Jacq.	Guinea grass	X	- + -
Panicum maximum Jacq. var. trichoglume Eyles ex Robyns	green panic grass	X	- + -
Pennisetum purpureum Schumach.	elephant grass	X	- - +
Saccharum officinale L.	sugar cane	P	+ - -
Setaria palmaefolia (Koen.) Stapf	palm grass	X	- - +
Sorghum halapense (L.) Pers.	Johnson grass	X	+ - -
Liliaceae s.l.			
Asparagus setaceus (Kunth.) Jessop	asparagus-fern	X	+ - -
Cordyline terminalis (L.) Kunth.	ti	P	- + -
Musaceae			
Musa x paradisiaca L.	banana, mai'a	P	+ - -
Palmae			
Arecastrum romanzoffianum (Cham. in Choris) Becc.	queen palm	X	- + -
Livistona chinensis (Jacq.) Mart.	Chinese fan palm	X	- + -
Phoenix dactylifera L.	date palm	X	- + -

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SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Strelitziaceae			
Heliconia sp.	heliconia	X	+ - -
DICOTS			
Acanthaceae			
Asystasia gangetica (L.) T. Anders.	Chinese violet	X	- + -
Justicia betonica (L.) Lindau	white shrimp plant	X	- - +
Amaranthaceae			
Achyranthes aspera L.	achyranthes	X	- + -
Amaranthus spinosus L.	spiny pigweed	X	+ + -
Amaranthus viridis L.	slender amaranth	X	+ + -
Anacardiaceae			
Mangifera indica L.	mango	X	- + +
Schinus terebinthifolius Raddi	Christmas berry	X	- + +
Aristolochiaceae			
Aristolochia littoralis Parodi	pelican flower	X	- - +
Basellaceae			
Anredera cordifolia (Ten.) van Steenis	Madeira vine	X	+ + -
Bignoniaceae			
Spathodea campanulata Beauv.	African tulip tree	X	- + +

18

SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Buddlejaceae			
Buddleia asiatica Lour.	buddleia	X	- + -
Cactaceae			
Opuntia ficus-indica (L.) Mill.	panini	X	- + -
Caricaceae			
Carica papaya L.	papaya	X	- + -
Caryophyllaceae			
Cerastium fontanum Baumg.	common mouse-ear chickweed	X	- + -
Compositae			
Ageratum conyzoides L.	ageratum	X	+ + -
Bidens alba (L.) DC.	Spanish needle	X	- + -
Bidens pilosa L.	Spanish needle	X	+ + -
Calyptocarpus vialis Less.	hierba del caballo	X	- + -
Conyza canadensis (L.) Cronq.	horseweed	X	+ + -
Crassocephalum crepidioides (Benth.) S. Moore	crassocephalum	X	- + -
Emilia coccinea (Sims) G. Don	emilia	X	+ - -
Gnaphalium purpureum L.	purple cudweed	X	- + -
Pluchea x fosbergii Cooperrider & Galang	pluchea	X	- + +
Pluchea symphytifolia (Miller) Gillis	pluchea	X	- + +
Sigesbeckia orientalis L.	small yellow crown-beard	X	- + -
Sonchus oleraceus L.	sowthistle	X	+ + -
Synedrella nodiflora (L.) Gaertn.	synedrella	X	- + -

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SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Tridax procumbens L.	coat buttons	X	- + -
Vernonia cinerea (L.) Less.	ironweed	X	+ + -
Xanthium strumarium L.	cocklebur	X	- + -
Convolvulaceae			
Ipomoea alba L.	moon flower	X	- - +
Ipomoea cairica (L.) Sweet	koali	I	- + +
Ipomoea indica (J. Burm.) Merr.	koali awahi'a	I	- + -
Ipomoea obscura (L.) Ker-Gawl.	bindweed	X	- + +
Ipomoea triloba L.	pink bindweed	X	- + -
Merremia aegyptia (L.) Urban	koali kua hulu	I	+ + -
Cruciferae			
Coronopus didymus (L.) Sm.	wart cress	X	- + -
Cucurbitaceae			
Momordica charantia L.	bittermelon	X	+ + +
Euphorbiaceae			
Aleurites moluccana (L.) Willd.	kukui	P	- + +
Chamaesyce hirta (L.) Millsp.	spurge	X	+ + -
Chamaesyce hypericifolia (L.) Millsp.	spurge	X	+ - -
Euphorbia cyathophora Murr.	summer poinsettia	X	+ - -
Manihot esculenta Crantz	manioc, tapioca, cassava	X	+ - -
Phyllanthus debilis Klein ex Willd.	phyllanthus	X	+ + -
Ricinus communis L.	castorbean	X	+ + +

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SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Labiatae			
Hyptis pectinata (L.) Poit.	comb hyptis	X	- + -
Leonotus nepetaefolia (L.) R. Br.	lion's ear	X	- + -
Stachys arvensis L.	staggerweed	X	- + -
Leguminosae			
Acacia farnesiana (L.) Willd.	klu, huisache	X	- + -
Caesalpinia cf. decapetala (Roth) Alston	Mysore thorn	X	- + -
Canavalia cathartica Thouars	maunaloa	X	- + +
Chamaecrista nictitans (L.) Moench.	partridge pea, lau-ki	X	+ + -
Crotalaria incana L.	rattlepod	X	+ - -
Crotalaria mucronata Desv.	rattlepod	X	- + -
Desmanthus virgatus (L.) Willd.	virgate mimosa	X	- + -
Desmodium incanum DC.	beggar's ticks	X	- + -
Desmodium triflorum (L.) DC.		X	- + -
Indigofera suffruticosa Mill.	indigo	X	- + -
Leucaena leucocephala (Lam.) de Wit	koa-haole	X	- + +
Macroptilium lathyroides (L.) Urb.	wild bush-bean	X	- + -
Medicago sativa L.	alfalfa	X	+ - -
Mimosa pudica L.	sleepinggrass	X	- + -
Pithecellobium dulce (Roxb.) Benth.	'opiuma	X	- + +
Prosopis pallida (Humb. & Bonpl. ex Willd) H.B.K.	kiawe, mesquite	X	- + +
Samanea saman (Jacq.) Merr.	monkey pod	X	- + +
Senna occidentalis (L.) Link	coffee senna	X	- + -
Senna pendula (Humb. & Bonpl. ex Willd.) Irwin & Barneby	cassia	X	- + -

SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Malvaceae			
Malva parviflora L.	cheeseweed	X	+ + -
Malvastrum coromandelianum (L.) Garcke	malvastrum	X	+ + -
Sida rhombifolia L.	sida	X	+ + -
Melastomataceae			
Clidemia hirta (L.) D. Don	Koster's curse	X	- - +
Meliaceae			
Melia azedarach L.	Chinaberry	X	- + +
Sandoricum koetjape (Burm. f.) Merr.	santol	X	- - +
Moraceae			
Ficus microcarpa L. f.	Chinese banyan	X	- + +
Myrtaceae			
Psidium cattleianum Sabine	strawberry guava	X	- - +
Psidium guajava L.	guava	X	- + +
Syzygium cumini (L.) Skeels	Java plum	X	- + +
Nyctaginaceae			
Mirabilis jalapa L.	four o'clock	X	- + +
Onagraceae			
Ludwigia octovalvis (Jacq.) Raven	primrose-willow	P?	- + +

SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Oxalidaceae			
Oxalis corniculata L.	yellow wood-sorrel	X?	+ + -
Oxalis corymbosa DC.	pink wood sorrel	X	+ - -
Passifloraceae			
Passiflora edulis Sims	lilikoʻi	X	- + +
Passiflora foetida L.	love-in-a-mist	X	- + +
Passiflora suberosa L.		X	- + +
Phytolaccaceae			
Rivina humilis L.	rouge plant	X	- - +
Plantaginaceae			
Plantago major L.	common plantain	X	+ + -
Plumbaginaceae			
Plumbago zeylanica L.	ʻilieʻe	I	- + -
Polygonaceae			
Antigonon leptopus H. & A.	coral vine	X	- + -
Portulacaceae			
Portulaca oleracea L.	common purslane	X	+ + -
Portulaca pilosa L.		X	- + -

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SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Proteaceae			
Grevillea robusta A. Cunn. ex R. Br.	silk-oak	X	- + -
Rubiaceae			
Spermacoce assurgens Ruiz & Pavon	borreria	X	+ + -
Sapotaceae			
Bumelia buxifolia Willd. ex H.B.K.	bumelia	X	- + +
Solanaceae			
Lycopersicon pimpinellifolium Mill.	currant tomato	X	- - +
Nicandra physalodes (L.) Gaertn.	apple of Peru	X	- + -
Solanum americanum Mill.	popolo	X	- + -
Solanum seaforthianum Andr.	potato vine	X	- + +
Sterculiaceae			
Waltheria indica L. var. americana (L.) R. Br. ex Hosaka	ʻuhaloa, hiʻaloa	I?	+ + -
Tiliaceae			
Triumfetta semitriloba Jacq.	Sacramento bur	X	- + -
Umbelliferae			
Centella asiatica (L.) Urban	asiatic pennywort	X	- + +
Ciclospermum leptophyllum (Pers.) Sprague		X	- + +

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SCIENTIFIC NAME	COMMON NAME	STATUS	VEG. TYPE
Verbenaceae			
Lantana camara L.	lantana	X	- + -
Stachytarpheta jamaicensis (L.) Vahl	stachytarpheta	X	- + -
Stachytarpheta urticifolia (Salisb.) Sims	stachytarpheta	X	- + -
Verbena litoralis H.B.K.	vervain	X	- + -

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APPENDIX B

WAIALUA, OAHU: ARCHAEOLOGICAL SURVEY OF PROPOSED GOLF COURSE

WAIALUA, OAHU: ARCHAEOLOGICAL SURVEY OF PROPOSED GOLF COURSE

Prepared for:

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NOVEMBER 1987

I. INTRODUCTION

An archaeological survey was conducted on approximately 240 acres intended for a golf course in the *ahupua'a* of Kamananui and Paalaa Uka, Waialua, Oahu [Figures 1 and 2]. As over 60 percent of the survey area is presently in sugarcane, the only portion which was surveyed was a section of approximately 60 acres extending along the bottom of Poamoho Gulch at the south end of the project area. The fieldwork was completed in one day by one person.

The surveyed area is relatively flat, and consists primarily of alluvial bottomland presently used as pasture. Moderately thick groves of trees and occasional dense growths of grass are present. This appears to be relatively recent growth, and suggests that the valley floor has been disturbed considerably during the historic period.

II. LITERATURE SEARCH

McAllister [1933] lists three sites, two of which [Sites 206 and 207] were outside of the present project on the seaward side of the paved road that marks the northwest boundary. The third site was at Pump 10:

> *"Site 206. Kahakahuna heiau, Pala-kai, was once located on the sea side of the road and north of the old mill site. The stones have been removed and the slightly elevated ground upon which it was built is used for agricultural purposes.*
> *"Site 207. Kawai heiau was located just below the junction of Poamoho and Kaheeka gulches, on the elevation below the Waialua Plantation manager's house. It was one of the first heiaus to be*

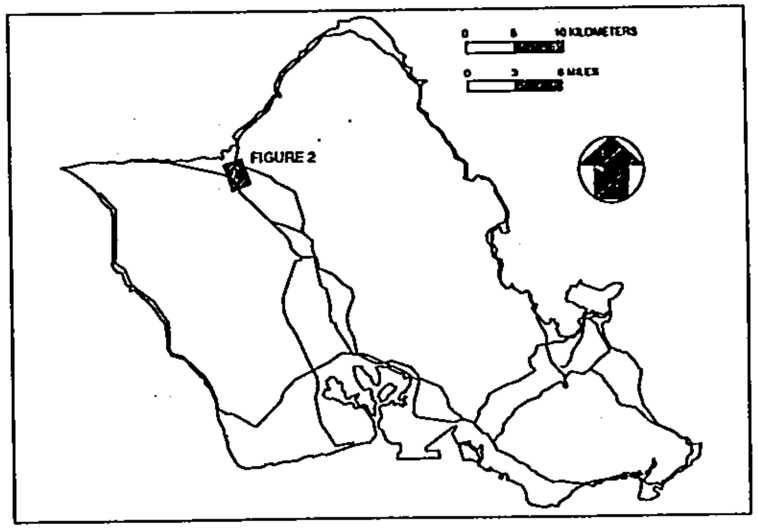

Figure 1. Map of Oahu, Showing Location of Project Area.

destroyed.

"Site 209. Worked Stones, found some years ago in Poamoho Gulch.

"When the shaft for the pump in Poamoho Gulch was being dug, a number of artificially worked stones were found at depths of 13 to 18 feet. Gravel and silt were found above the artifacts, according to G. L. Trist, who was in charge of the work. The stones are said to have resembled Ulumaika."

As McAllister did not see the stones, we cannot be certain that they were produced by human activity. Even if they were, their location at such a depth below alluvial deposits would argue strongly that they came to rest there as the result of secondary

"Formerly there were large terrace areas along the flatlands between the junction of Helemano and Poamoho Streams and the flatland west of Poamoho. There were also small terraces areas up in the lower flats of Poamoho and Kaukonahua Valleys...Poamoho is probably too narrow for taro terraces. It is likely that in these gulches, as at Waimea, sweet potatoes and bananas were planted around home sites along the ridge and near taro patches at the bottom of the gulch" [Handy 1940:85].

According to the United States Geological Survey Haleiwa Quadrangle dated 1983, Helemano and

Figure 3. SITE 3723, Looking Northwest.

deposition, having had their origin much further upstream. It is most likely that they were not artifacts, but only stream gravels shaped by water transport.

Inspection of three old maps revealed no indications of terracing, house lots, animal pens or other human activities in the survey area [Emerson 1892, State Survey Division 1900, 1900-01].

Handy discussed agricultural sites in the *ahupua'a* of Kamananui:

Poamoho Streams do not join. It is likely that Handy was referring to the junction of Paukauila Stream and Kiikii Stream which are fed by Helemano and Poamoho Streams, respectively. The large terrace areas to which he refers are well outside of the present project area.

III. SURVEY RESULTS

Only one site, designated as SITE 3723 in the State of Hawaii site numbering system, was found

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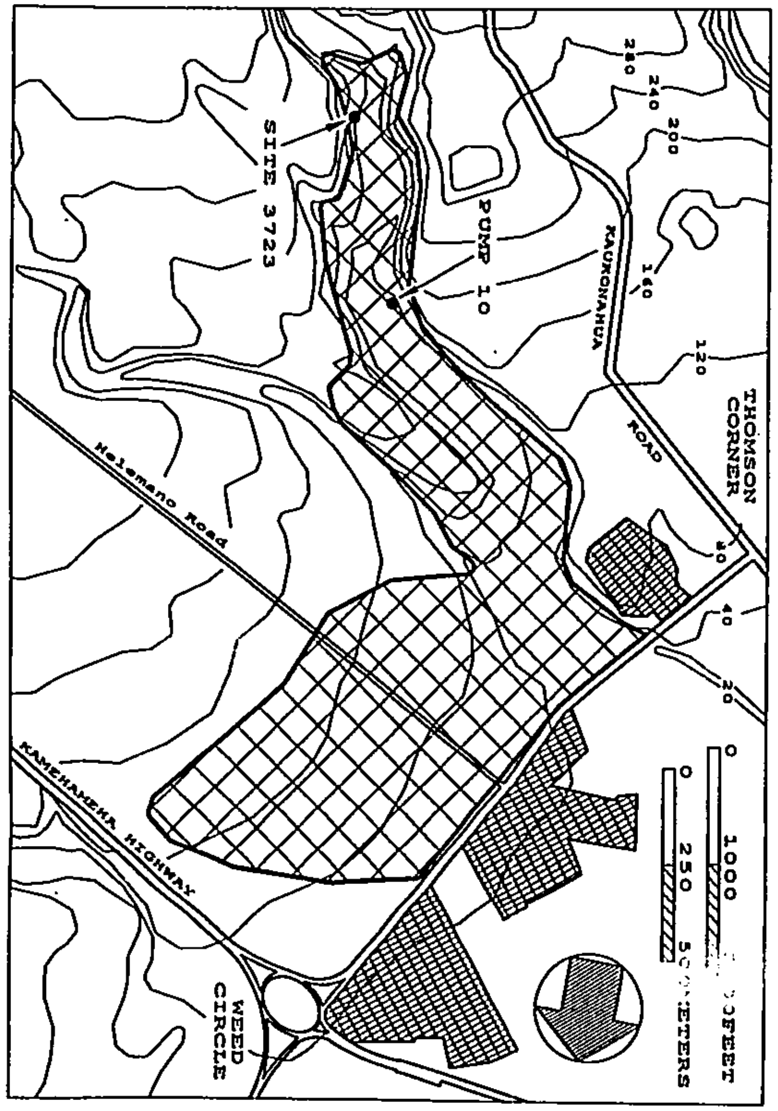

Figure 2. Location of Survey Area.

[Figure 3]. This consisted of a boulder measuring 1.7 by 2.8 meters and standing to a height of 1.0 meter, on top of which had been placed several sub-angular basalt rocks measuring between about 20 by 20 by 35 centimeters and 40 by 40 by 50 centimeters. The rocks did not seem to have been placed with any special care, and there were no midden deposits, artifacts, or any other evidence of human activity in the vicinity.

IV. SIGNIFICANCE AND RECOMMENDATIONS

An archaeological or historical site may be judged significant on three grounds: its desirability for exhibition to the public in a museum atmosphere, its cultural significance to an existing group, and its value for future scientific research. It is our opinion that the single site found during this survey does not qualify to be placed in any of these categories. The site has been adequately recorded, and no further archaeological study is required.

The portion of the project area on the sloping hillsides outside of Poamoho Gulch has been in sugarcane cultivation for over 90 years, and has repeatedly been plowed to a depth of 20 inches. If any archaeological or historical remains had been located in this area, they have been destroyed. No further archaeological work is required there.

Although no surface evidence was found, there is a possibility that old agricultural deposits may be buried beneath the ground in Poamoho Gulch. If any remains are uncovered during construction the State Historic Preservation Office should be consulted to determine procedures for their proper study before that construction is allowed to proceed.

Literature Cited

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1933 *Archaeology of Oahu*. Bernice P. Bishop Museum, Bulletin 104. Honolulu.

State Survey Division

1901 Map of the Waialua Agr'l Co. Lands at Paalaa, Waialua, Oahu. Survey and Map by W. A. Wall, Honolulu 1900. Tracing by Geo. F. Wright and H. E. Newton, December 1901. Registered Map No. 2055.

State Survey Division

1900-01 Map of the Waialua Agricultural Co. Lands at Kamananui and Mokuleia, Waialua, Oahu. Survey and Map by W. A. Wall, 1900 and 1901. Registered Map No. 2054.

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United States Geological Survey

1983 Haleiwa Quadrangle. 7.5 Minute Series (Topographic). Denver.

APPENDIX C

DRAINAGE REPORT
FOR THE
PROPOSED WAIALUA GOLF COURSE

DRAINAGE REPORT

FOR THE

PROPOSED WAIALUA GOLF COURSE

Prepared for:

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March 1988

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TABLES

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INTRODUCTION

Oceanic Properties, Inc. is proposing the construction of an 18-hole golf course in the vicinity of Waialua Town. The proposed golf course will be situated generally between Weed Circle and Thompson Corner and mauka of Kaukonahua Road. A major portion of the land is currently used for sugar cane production, with the rest of the site relatively unaltered in the gully area created by Poamoho Stream (see Figure 1).

The objective of this report is to present the necessary facilities planning and preliminary engineering documentation for drainage at the proposed Waialua Golf Course. Specifically, this report addresses the following:

1. Background information on the proposed project
2. Existing site and watershed conditions
4. Proposed development and resulting drainage and chemical application modifications
5. Impacts and mitigation of the proposed development affecting the site and the watershed

BACKGROUND

Proposed Project

The proposed Waialua Golf Course will consist of an 18-hole golf course, driving range, equipment building, and clubhouse. The clubhouse will be situated on the plateau area at an elevation of ±110 feet, while the driving range and equipment building will be constructed in the gully area of Poamoho Stream (see Figure 2).

Land Use and Zoning Designation

The proposed golf course site is presently designated an agricultural district by the State Land Use Commission. Oceanic Properties, Inc. has recently submitted an application for a

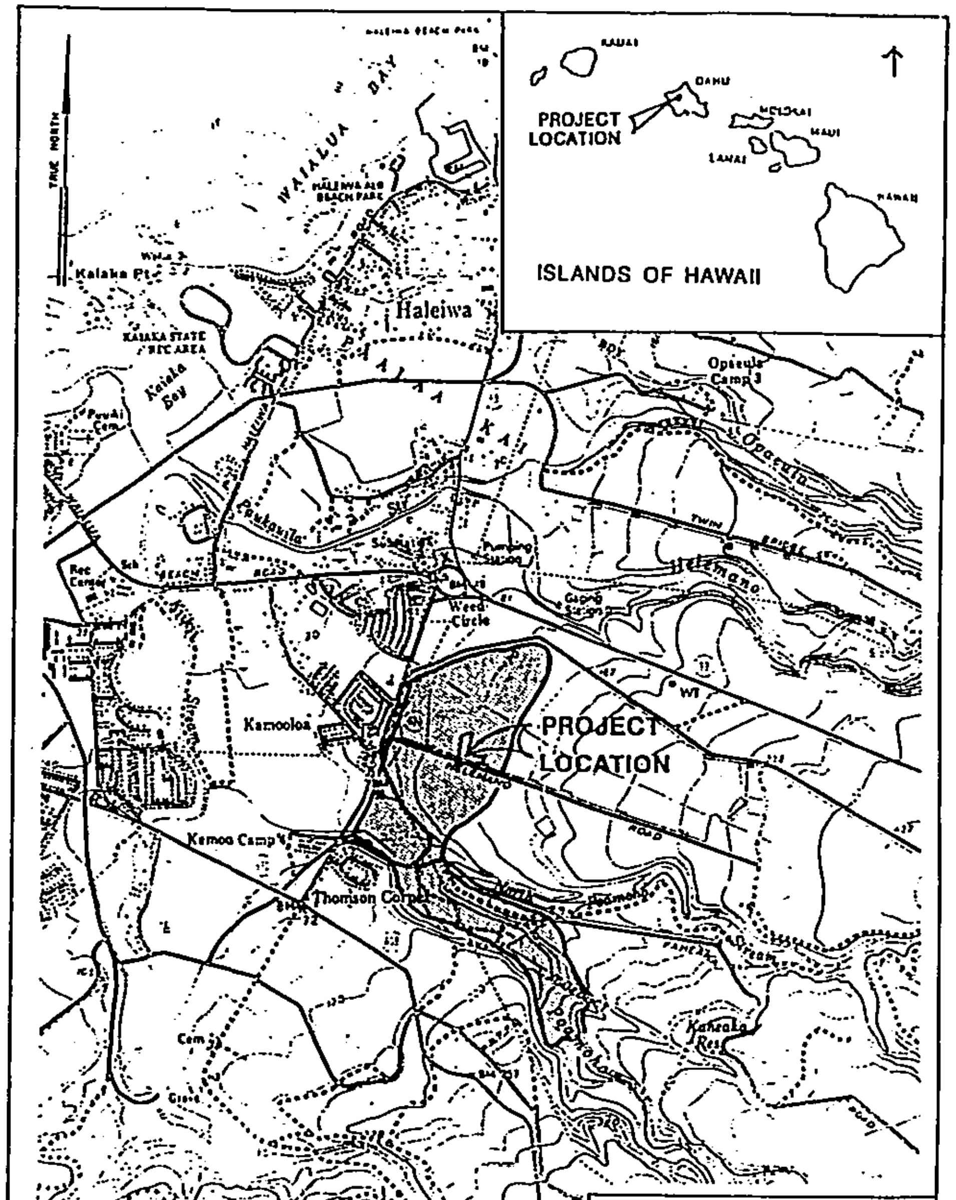

FIGURE 1
LOCATION PLAN

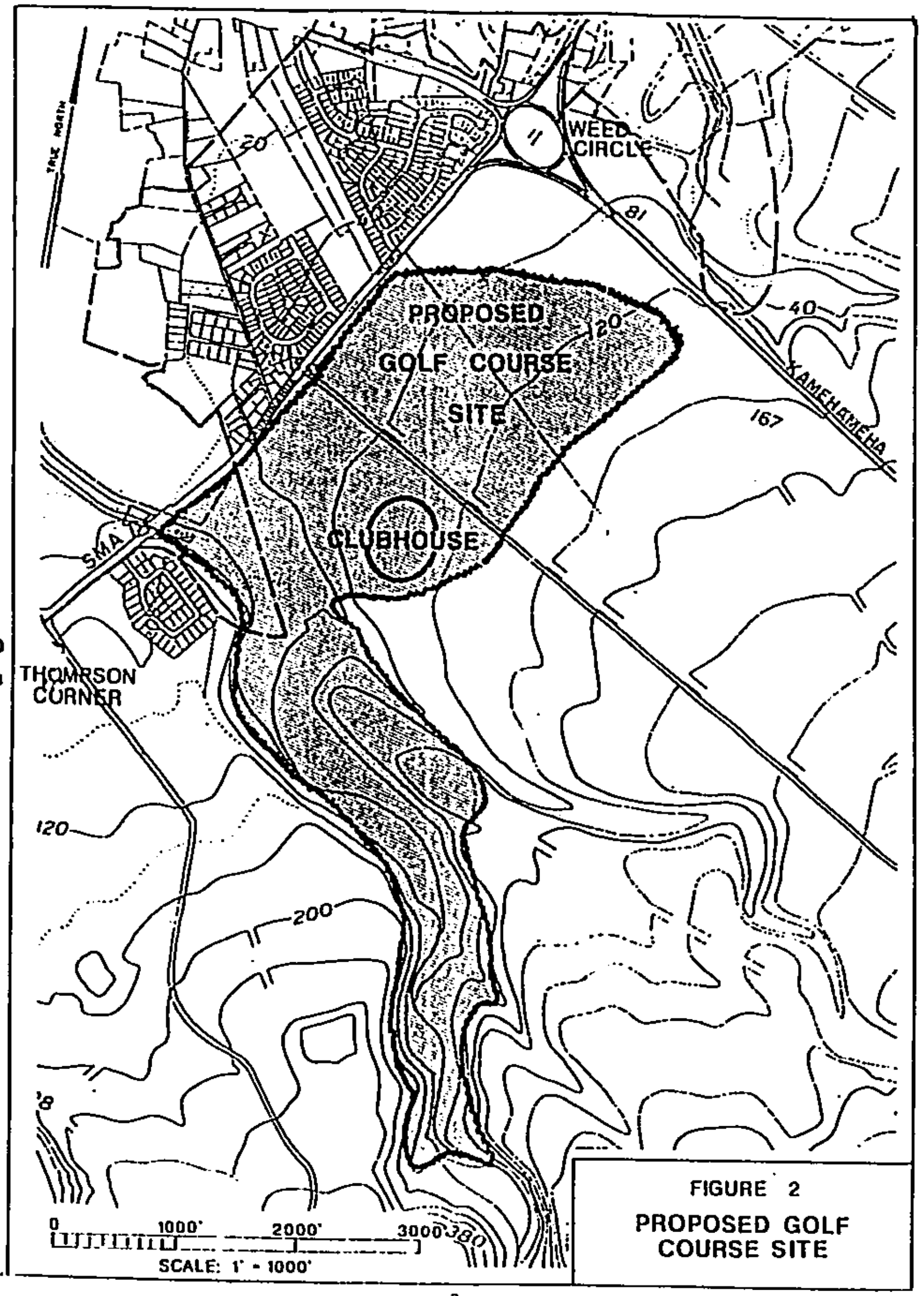

FIGURE 2
PROPOSED GOLF COURSE SITE

development plan amendment to change the county land use classification from agricultural to parks and recreation.

EXISTING CONDITIONS

Site characteristics, water quality, runoff quantity, chemical application, and aquatic environment within the project site and watershed will be presented in this section.

Project Site

The 214-acre project site is divided into two distinct topographic areas, a plateau and a stream valley.

The plateau encompasses an area of approximately 142 acres, currently planted with sugar cane. Elevations range from 150 to 50 feet, with ground slopes less than 5 percent over most of the area. The plateau is bounded on the west by Kaukonahua Road, on the north by a Waialua Sugar Co. haul road, on the east by sugar cane fields, and on the south by North Poamoho Stream.

The remaining 72 acres of the project site are located in the Poamoho Stream Valley. Currently, the stream valley yields a moderate to dense vegetal growth, abundant in grassy ground cover. The stream valley exists in a natural state, for the most part, with only a few structures (irrigation wells, irrigation lines, power lines) traversing the area. The slopes of the stream valley range from 10 to 30 percent. At the confluence of Poamoho and North Poamoho streams, slopes reduce to 1 to 2 percent in a flood plain.

Runoff

Runoff from the plateau area (sugar cane fields) travels from earth ditches along the field perimeter through a culvert to fields makai of Kaukonahua Road. In the stream valley, runoff flows overland into Poamoho Stream. Under existing conditions, runoff at the project site was calculated for 10- and 50-year storms using the Rational Method. Runoff at the project site from the peak storm was calculated using Plate 6 of the City and County Storm Drainage Standards (1986).

Storm Recurrence (yr)	Peak Runoff (cfs)
10	92
50	122
Peak	1300

Calculations were based on rainfall intensities of 2.1 inches per hour and 2.8 inches per hour for the 10-year and the 50-year storms respectively.

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Fertilizers

Fertilizers are applied to approximately 142 acres within the proposed development site presently cropped with sugar cane. The cane is drip irrigated, providing efficient use of applied water. The principal fertilizer nutrients applied are nitrogen (N), potassium (K), and phosphorus (P); water soluble forms are applied through the drip system. According to information provided by Waialua Sugar Co., 350 pounds per acre of N, 100 pounds per acre of P_2O_5, and 400 pounds per acre of K_2O are applied for each two-year crop. All fertilizer is applied during the first ten months of the crop cycle.

Pesticides

Pesticide use for insect and disease control in sugar cane culture is minimal since insects are controlled biologically. Fungicide is used only to treat seed pieces before planting

(principally Benlate); thus, the quantities applied are small and localized. Only herbicides for weed control are applied to the soil as surface sprays, usually two or three times in the first six months after planting. Herbicide practices have not changed substantially in the past twenty years, with the exception of the adoption of the use of glyphosate (Roundup) for infield post-emergence spot spraying and control of weeds in field boundaries, ditches, and road sides. The principal pre-emergence herbicides used in the Waialua area are atrazine and ametryn. Typical quantities applied, according to information provided by Waialua Sugar Co., are 8 pounds active ingredient (ai) per acre per crop of ametyrne and 3 to 5 pounds of atrazine.

Water Quality/Aquatic Environment

The tidal influence on Poamoho Stream extends only about 1,000 feet into the project site. Under dry weather conditions, the remaining upstream portions are limited to isolated puddles in low-lying areas. The U.S. Geological Survey office maintains a crest flow stream gage station (station no. 2112) along Poamoho Stream within the project site. The gage station is attached to the outlet structure of a culvert crossing at Kaheaka Road and records the annual maximum flow from the 10.9-square mile (6,976-acre) drainage area. Annual maximum flows recorded (or estimated by USGS) at gage station 2112 are reported in Table 1. The average annual stream flow data are not available for this gage station.

Poamoho Drainage Basin

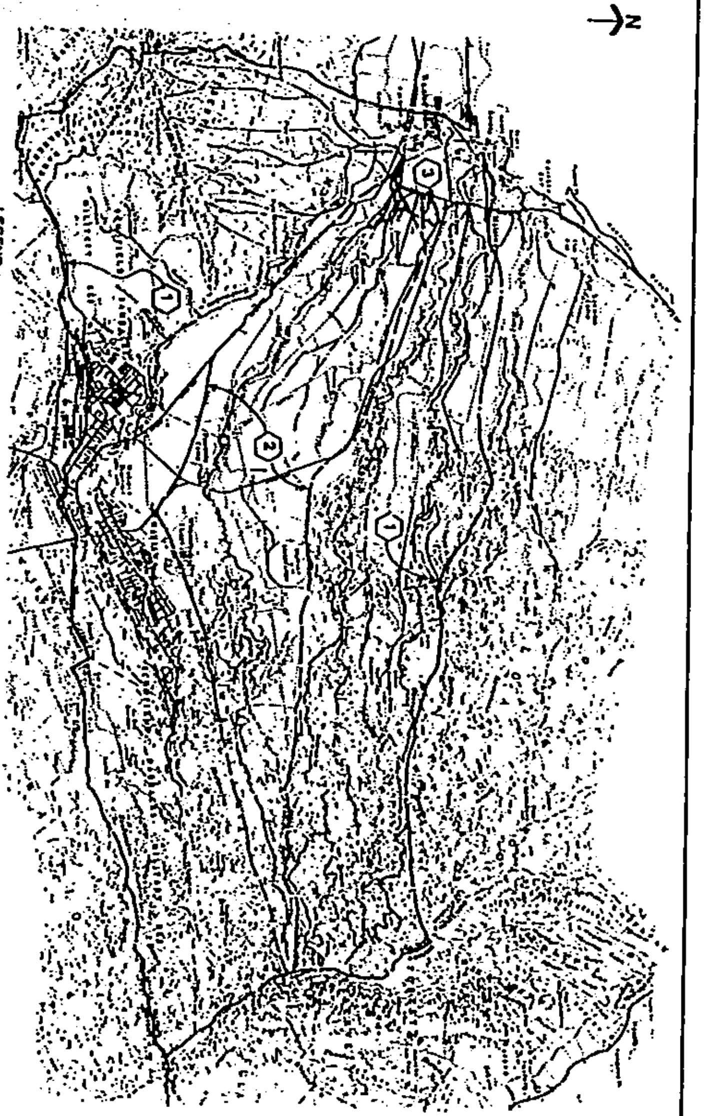
Poamoho Stream drainage basin encompasses approximately 18.1 square miles (11,584 acres), extending from the Koolau Mountain Range to Kiikii Stream in Waialua (see Figure 3). The 214-acre project site represents 1.85 percent of this drainage basin area. About one-half of the drainage basin is estimated to

TABLE 1

USGS GAGE STATION 2112

ANNUAL MAXIMUM FLOW MEASUREMENTS

Year	Annual Maximum Flow (cfs)
1975	1,800
1976	1,500
1977	1,600
1978	250
1983	1,200
1984	100
1985	150



LEGEND :
1 PAUKAUILA - KIIKII STREAM DRAINAGE BASIN 79.8 SQ. MI. (51,072 ACRES)
2 POAMONO STREAM DRAINAGE BASIN 18.1 SQ. MI. (11,584 ACRES)
3 PROJECT SITE 214 ACRES

FIGURE 3
DRAINAGE BASIN

be devoted to agriculture, with about 520 hectares (1,285 acres) in sugar cane and about 2,008 hectares (4,962 acres) in pineapple. Other areas are occupied by small residential communities, military reservations, stream valleys, and steep mountain terrain.

Based on frequency-discharge drainage area curves from the Federal Emergency Management Agency Flood Insurance Study (March 1980) for the City and County of Honolulu, peak runoff from Poamoho Stream at Kaukonahua Road was calculated for the 10-, 50-, and 100-year storms. Runoff from the peak storm was calculated using Plate 6 of the Storm Drainage Standards.

Storm Frequency (yr)	Peak Runoff (cfs)
10	9,750
50	14,800
100	17,100
Peak	25,000

Paukauila-Kiikii Stream Drainage Basin

The project site is located within the Paukauila-Kiikii Stream drainage basin--the largest drainage basin on the island, encompassing 79.8 square miles (51,072 acres). The drainage basin extends from the Koolau Mountain Range west to the Waianae Mountain Range and Kaiaka Bay. Paukauila and Kiikii streams, the main water courses, converge before reaching Kaiaka Bay. Paukauila Stream is formed at the confluence of Helemano and Opaeula streams. Kiikii Stream is formed by the confluence of Kaukonahua and Poamoho streams (see Figure 4).

Land use in the Paukauila-Kiikii Stream drainage basin is primarily agricultural. Green et al reported that approximately

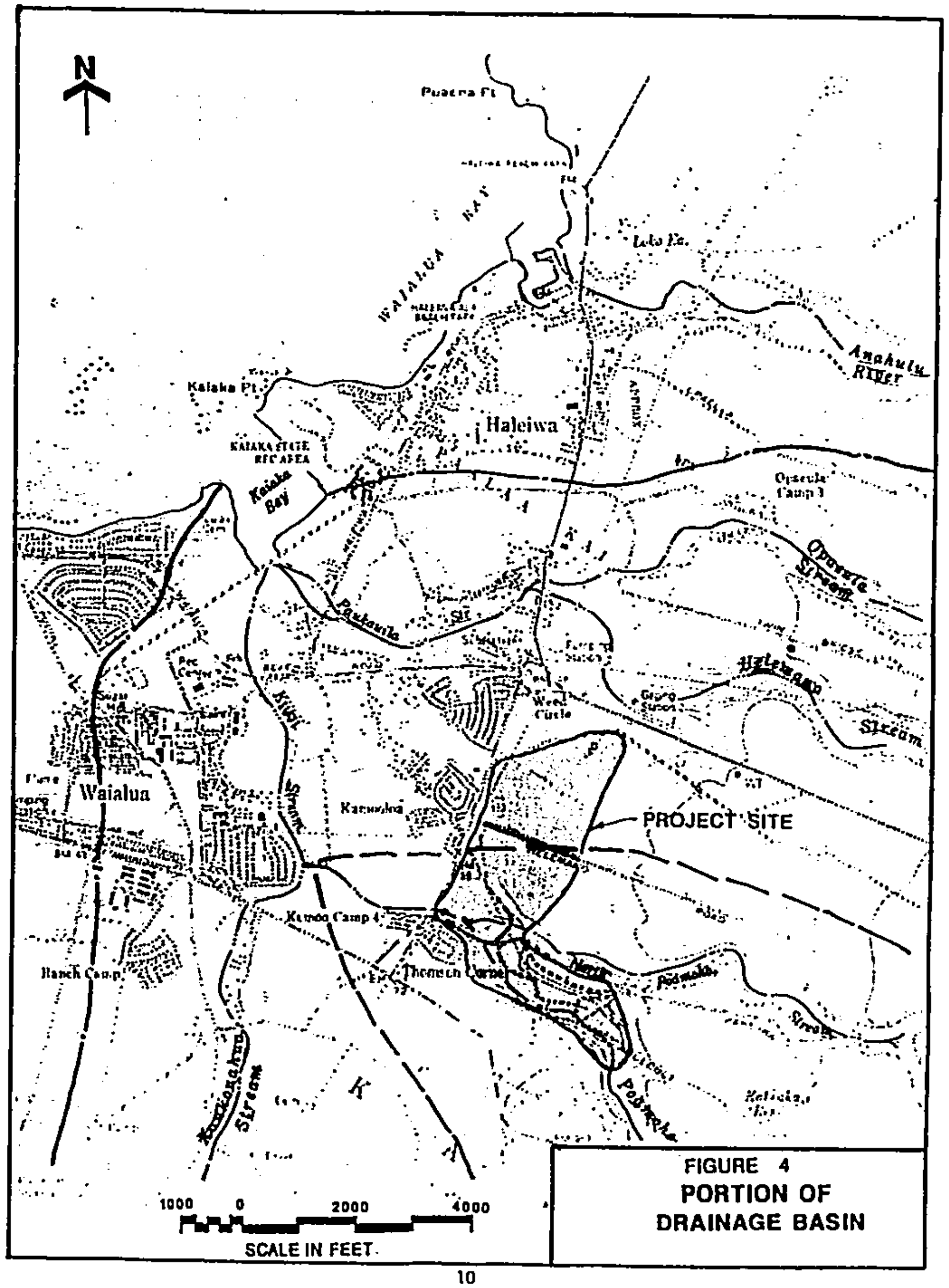


FIGURE 4
PORTION OF
DRAINAGE BASIN

5,427 hectares (13,410 acres) were cropped in 1977. Approximately 2,080 hectares (5,140 acres) were planted with sugar cane and about 3,347 hectares (8,270 acres) in pineapple. The 214-acre project site represents less than one-half percent of the entire drainage basin and contains less than three percent of the sugar cane land.

Studies on Oahu several years ago (Green et al, 1977) indicated that the herbicide diuron was transported from sugar cane and/or pineapple fields to Kaiaka Bay. While the herbicide could not be detected in water, it was found at low levels in sediments from both the stream and the bay. The quantities of diuron in sediments were thought to be too low to be of environmental consequence. Neither atrazine or ametryn was found in either water or sediments.

There is little information available on the aquatic community in Kiikii Stream. Sunn, Low, Tom & Hara, Inc. (1972) reported the presence of 200 planktonic organisms in Kiikii Stream, including copepods, mysid shrimps, fish and crab larvae, amphipods, and nematode worms. The stream is used primarily for fishing and crabbing. The most prominent type of fish catches were aholehole, mullet, goby, barracuda, and tilapia. Samoan and blue claw crabs were also found in Kiikii Stream. Boating and swimming in the stream are less common, possibly due to turbidity, muddy bottom layer, and large quantity of heavy organic debris on the stream bottom.

MODIFICATIONS AFTER DEVELOPMENT

Runoff

The quantity of runoff from the site is expected to increase after development. Based on the Rational Method, peak runoff for the 10- and 50-year storms is listed below.

Storm Recurrence (yr)	Peak Runoff (cfs)
10	271
50	360

Site drainage after development of the golf course will remain similar to existing conditions.

The proposed golf course in the stream valley would maintain the natural slope and vegetation to allow for overland flow into the stream. In cases where the stream crosses a fairway, selective clearing of vegetation will be required to remove tall trees and bushes that may interfere with the flight of the ball or the vision of the golfer. Short, scrubby vegetation along the stream can remain.

In the plateau area, storm drainage will be directed to a 3 MG drainage detention pond on the makai side of the plateau near Kaukonahua Road. Storm runoff would exit the drainage pond via a series of swale/channels and drain pipes, with ultimate release at the driving range (see Figure 5). The drainage pond would provide a dampening effect, releasing runoff to the stream via the driving range at a slower rate than storm flows. The driving range will serve as an open area where storm drainage can sheet flow into the stream. Slopes across the driving range will be sufficient to prevent boggy conditions, but not sufficiently steep to cause erosion of the range. The golf course will be designed to incorporate small depressions to serve as temporary storage-flow abatement basins during heavy rains.

Fertilizers

Fertilizers are applied to golf courses to supply those essential nutrients that are used in large amounts and that are deficient

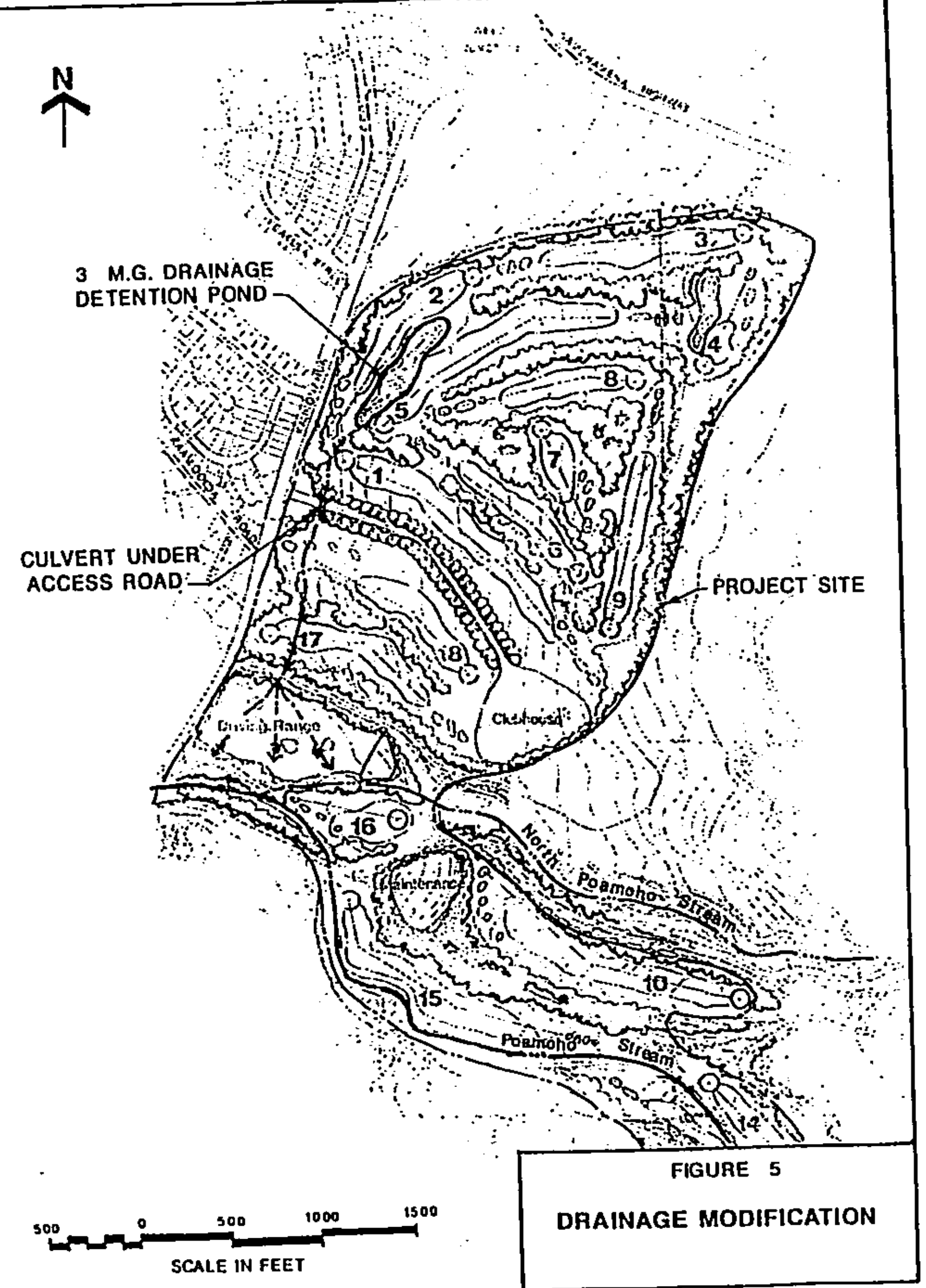


FIGURE 5

DRAINAGE MODIFICATION

in most soils. Typically, the elements that are applied in a turf grass 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.

Fertilizer use rates are shown in Table 2. Complete fertilizers (those containing N. P, and K) are usually applied. Only nitrogen application rates are given because nitrogen is applied in larger quantities and is the only fertilizer element likely to be introduced into ground or surface waters.

Nitrogen applied in the ammonium (NH_4) form is rapidly converted to the nitrate (NO_3) form, which does not bind to the soil and moves readily in water. Approximately 25 percent of applied nitrogen infiltrates into the ground under normal conditions. Under conditions where excessive rainfall occurs soon after application of a soluble nitrogen source, there may be excessive loss by surface runoff or leaching below the root zone. Nitrogen will be used rapidly after application due to high nitrogen uptake by turf grasses.

Phosphorus attaches tightly to iron and aluminum hydroxides, which are plentiful in the soil, and moves little, if any, from the site of application. Ammonium nitrogen also moves little in soils. Problems with these chemicals may occur due to sediment transport, where soil particles themselves are transported via runoff to streams or drainage ponds.

Pesticides

There are a number of weed, insect, and disease pests of turf grasses in Hawaii that sometimes require application of chemical pesticides. Pesticides are normally applied only in response to outbreaks of pests. There are few instances in which pesticides

C-9

TABLE 2

APPROXIMATE FERTILIZER USE RATES FOR DIFFERENT AREAS OF A TYPICAL GOLF COURSE IN HAWAII

Type of Turf	Area (acres)	Fertilizer Amount (lb N/1,000 sf)	Application Frequency	Total Annual Application (tons N)
Greens	3	0.5	2 weeks	0.85
Tees	3	1.0	3 weeks	1.13
Fairways	50	1.5	8 weeks	10.60
Roughs	30	1.0	3 months	2.60
Total	86			15.18

Source: Murdoch & Green, January 1988.

Note: Based on turf grass clipping composition, it has been shown that the turf grasses grown in Hawaii use about twice as much N as K and about four times as much N as P.

are applied in a regularly scheduled, preventive program. A typical pesticide program for golf courses in Hawaii in given in Table 3.

IMPACT AND MITIGATION

Positive impacts expected from the golf course development are--

1. Decreased erosion potential and sediment loading. Turf grasses are relatively permanent. Once an area is established, it is not cultivated and subjected to the associated erosion that occurs when sugar cane fields are cultivated for replanting. The presence of a large turfed area, such as the proposed golf course, would reduce the sediment load entering Poamoho Stream and eventually Kaiaka Bay.

2. Decreased fertilizer concentration. At first glance it would appear that more fertilizers are being applied to the golf course than to sugar cane because of the higher application rates to turf grasses. However, because only a small portion of the area is fertilized, total fertilizer use will be similar. Sugar cane culture uses 350 pounds of nitrogen per acre for one year of the two-year growing cycle, resulting in about 25 tons of nitrogen for the 142 acres of the proposed golf course site that is presently in sugar cane. Golf courses, as shown in Table 2, require approximately 15.2 tons of nitrogen each year; thus, for a two-year period, about 30.4 tons of nitrogen would be applied in golf course fertilization. However, because the total amount of fertilizer for the two-year sugar cane crop is applied during the first ten months of the crop, fertilizer application rates are much more concentrated and are therefore more subject to runoff loss than those of golf courses.

TABLE 3

A TYPICAL PESTICIDE PROGRAM FOR GOLF COURSES IN HAWAII

Turf Grass Area	Area (acres)	Chemical	Frequency	Rate/ Application	Annual Total
HERBICIDES					
Greens	3	MSMA	6 times/year	2 lb ai/acre	36 lb ai
		Bensulide	2 times/year	12 lb ai/acre	72 lb ai
Tees	3	MSMA	6 times/year	2 lb ai/acre	36 lb ai
		33 Plus	3 times/year	1 pint/acre	9 pints
		Bensulide	2 times/year	12 lb ai/acre	72 lb ai
Fairways	50	MSMA	6 times/year	2 lb ai/acre	600 lb ai
		33 Plus	3 times/year	1 pint/acre	19 gallons
		Metribuzin	2 times/year	0.75 lb ai/acre	75 lb ai
Perimeter areas	20	Glyphosate	3 times/year	1.5 lb ai/acre	90 lb ai
INSECTICIDES					
Greens	3	Chlorpyrifos	As needed	1 lb ai/acre	Approx 18 lb ai
Tees	3	Chlorpyrifos	As needed	1 lb ai/acre	Approx 18 lb ai
Fairways (spot treatments)		Chlorpyrifos	As needed	1 lb ai/acre	Approx 50 lb ai
		Diazinon	As needed	4 lb ai/acre*	Approx 250 lb ai
FUNGICIDES					
Greens	3	Metyalaxyl	As needed	1.3 lb ai/acre	Approx 25 lb ai
		Chlorothailonil	As needed	8 lb ai/acre	Approx 72 lb ai
Tees	3	Metyalaxyl	As needed	1.3 lb ai/acre	Approx 25 lb ai
		Chlorothailonil	As needed	8 lb ai/acre	Approx 72 lb ai
Fairways (spot treatments)		Chlorothailonil	As needed	8 lb ai/acre	Approx 250 lb ai

* Two 2 lb ai/acre applications spaced seven days apart, watered with minimum 1/4-inch water.

Source: Murdoch & Green, January 1988.

Although the concentrations of phosphorus and ammonium nitrogen in runoff should not increase, concentrations in sediment deposited at the bottom of streams or ponds could increase due to chemicals bound to the soil. Soil erosion potential was evaluated for conditions before and after development (Engineering Concepts, Inc., December 1987). Erosion potential was calculated to decrease after development of the golf course; thus, sediment transport should decrease along with concentrations of sorbed chemicals in stream and pond sediments.

Other impacts are--

1. Increase in runoff quantity. Within the project site, runoff is calculated to increase by 195 percent for the 10-year storm and 195 percent for the 50-year storm. However, in comparison to the entire Poamoho Stream watershed, the increase in runoff represents only 2.8 percent and 2.4 percent for the 10-year and the 50-year storms respectively. The drainage detention pond will have a dampening effect on runoff to the stream and may be able to reduce runoff close to existing conditions.

2. Increased use of pesticides. Because the area treated with pesticides on a golf course is small, the total amount of pesticide applied is relatively small also. The pesticides used in golf course management are mostly of very low toxicity, either rapidly degraded in soil and/or sorbed tightly to organic matter or soil colloids and move little from the site of application.

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 nontoxic unless ingested in large amounts. All herbicides and fungicides used in golf course maintenance in Hawaii are of low to moderate toxicity. The only chemicals used in golf course maintenance in Hawaii that are highly toxic to birds are the organic phosphate insecticides, especially diazinon and chlorpyrifos. Half lives of these insecticides are relatively short (see Table 4).

Diazinon has been used on Hawaii golf courses for more than 20 years (both granular and liquid formulations). There have been no reports of bird injury from this pesticide on golf courses in Hawaii. From observations of birds using grassed areas and ponds of golf courses in Hawaii, it appears that golf courses are excellent habitats for birds.

Because of the adsorption of organic phosphate insecticides on organic layers in turf and their rapid breakdown, there is little chance of their movement from grassed areas into the ponds associated with the proposed golf course. Label instructions for application of these pesticides (which turf grass 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.

TABLE 4

HALF-LIFE AND TIME REQUIRED FOR 95% DISAPPEARANCE OF EIGHT ORGANIC PHOSPHATE INSECTICIDES IN NON-STERILE SANDY LOAM SOIL

Insecticide	Half-Life (weeks)	Weeks for 95% Decomposition
Diazinon	< 1	1
Chlorpyrifos	< 1	1
Parathion	< 1	3
Fensulfothion	< 1	4
Chlorfenvinphos	< 1	5
Trichloronat	1.5	20
Fonofos	3.0	20
Ethion	7.0	> 24

Source: Murdoch & Green, January 1988.

REFERENCES

1. Engineering Concepts, Inc., Soil Erosion Report for the Proposed Waialua Golf Course, Waialua, Oahu, Hawaii, December 1987.

2. Green R.E., K.P. Goswami, M. Mukhtar, and H.Y. Young, "Herbicides from Cropped Watersheds in Stream and Estuarine Sediments in Hawaii," Journal of Environmental Quality, Vol. 6, No. 2, April-June 1977.

3. Murdoch, C.L. and R.E. Green, Environmental Impact of Fertilizer and Pesticide Use on the Proposed Waialua Golf Course, January 1988.

4. Sunn, Low, Tom & Hara, Inc., Draft EIS on the Cooling Water Discharge in Kiikii Stream, August 1972.

APPENDIX D

SOIL EROSION REPORT
FOR THE
PROPOSED WAIALUA GOLF COURSE

SOIL EROSION REPORT

FOR THE

PROPOSED WAIALUA GOLF COURSE

WAIALUA, OAHU, HAWAII

Prepared for:

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Honolulu, Hawaii

Prepared by:

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December 1987

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TABLE

FIGURE

This report will assess the soil erosion potential at the project site before and after development of the proposed golf course. The short-term impacts of soil erosion during construction will also be addressed, along with methods to mitigate the potential impacts.

SITE CHARACTERISTICS

The project site is divided into two distinct topographic areas, a plateau and a stream valley. The plateau encompasses an area of approximately 142 acres, currently planted with sugar cane. Elevations range from 150 to 50 feet, with ground slopes less than 5 percent over most of the area. The plateau is bounded on the west by Kaukonahua Road, on the north and east by a Waialua Sugar Co. haul road, and on the south by North Poamoho Stream.

The remaining 72 acres of the project site are located in the Poamoho Stream Valley. Currently, the stream valley yields a moderate to dense vegetal growth, abundant in grassy ground cover. The tidal influence on Poamoho Stream extends only about 1,000 feet into the project site. Under dry weather conditions, the remaining upstream portions are limited to isolated puddles in low-lying areas. The slopes of the stream valley range from 10 to 30 percent. At the confluence of Poamoho and North Poamoho streams, slopes reduce to 1 to 2 percent in a flood plain.

Existing ground slopes for the project site are indicated on Figure 1. A slope analysis summary for the plateau and stream valley is presented in Table 1.

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

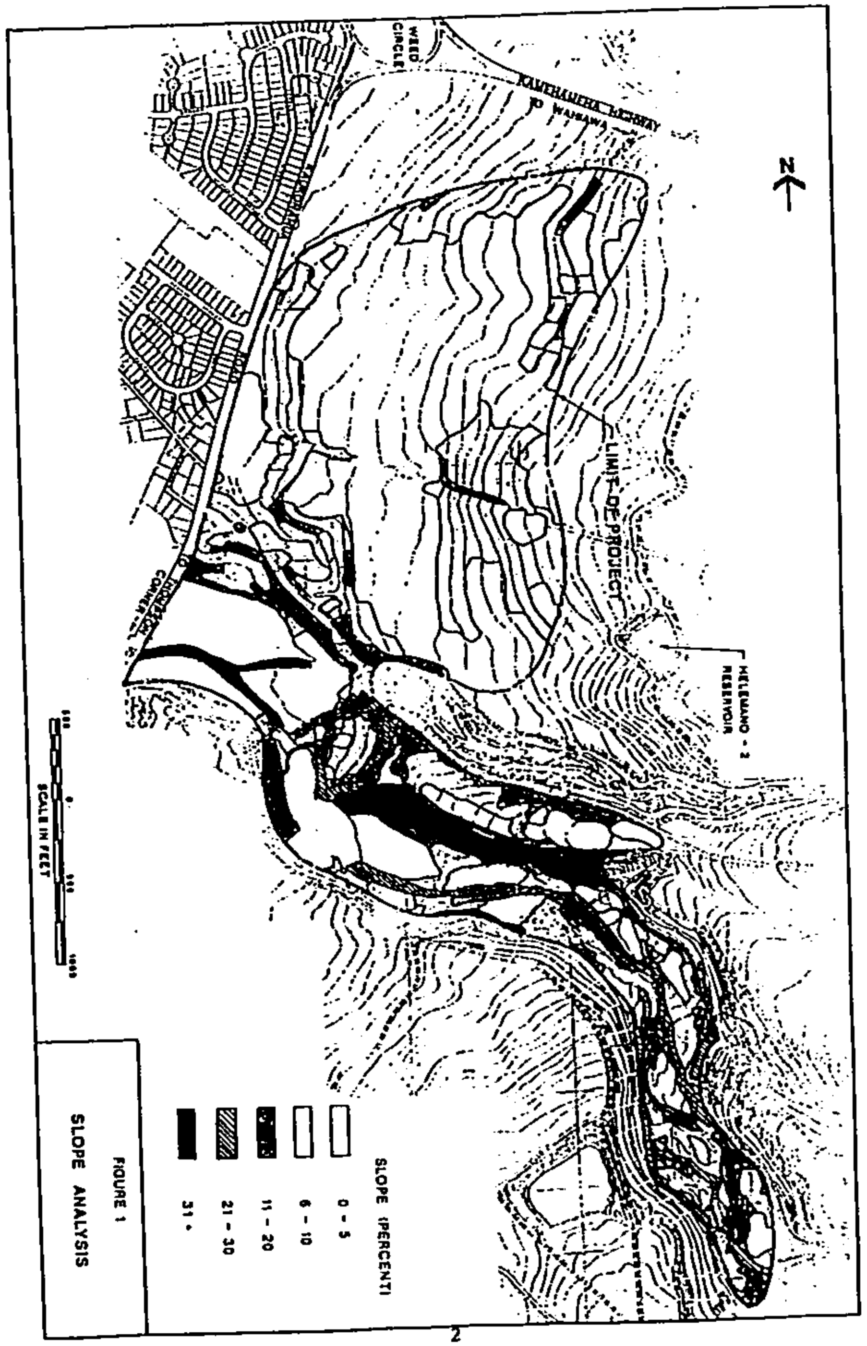

FIGURE 1
SLOPE ANALYSIS

TABLE 1

ACRES OF GOLF COURSE LAND

WITHIN SLOPE RANGE

Slope Range	Plateau (acres)	Stream Valley (acres)	Total Site (acres)
0 - 5%	92	19	111
6 - 10%	42	22	64
11 - 20%	5	18	23
21 - 30%	1	6	7
31% +	2	7	9
	142	72	214

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--

$$A = RKLSCP$$

where:
- A = soil loss (tons per acre per year)
- R = rainfall factor
- K = soil erodibility 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 300. A soil erodibility factor (K) of 0.20 was selected after evaluating the U.S. Department of Agriculture Soil Survey and the City and County of Honolulu Soil Erosion Standards and Guidelines. The K value for the site was based on the average of all K values for all soil types at the site. 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 an LS factor for calculations. This factor also remains constant before and after development. However, the plateau (LS = 1.26) and stream valley (LS = 3.57) will have different factors to reflect the differences in topography.

EXISTING SOIL EROSION POTENTIAL

The existing soil erosion potential for the site can be estimated by the USLE using the following parameters:

	Plateau	Stream Valley
R	300	300
K	0.2	0.2
LS	1.26	3.57
C	0.10 (sugar cane)	0.01 (medium stocked woodland)
P	1 (up and down slope farming)	1

The existing soil erosion potential in the plateau area is 7.56 tons/acre/year over approximately 142 acres, or 1,074 tons per year. In the stream valley, the calculated erosion potential is 2.14 tons/acre/year over approximately 72 acres, or 154 tons per year.

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--

	Plateau	Stream Valley
R	300	300
K	0.2	0.2
LS	1.26	3.57
C	0.01 (grass)	0.01 (grass)
P	1	1

Soil erosion potentials after development are calculated to be 0.76 tons/acre/year (108 tons/year) and 2.14 tons/acre/year (154 tons/year) in the plateau area and stream valley respectively. Thus, the annual per acre erosion rate in the stream valley should remain the same before and after development. The erosion potential in the plateau area should decrease by

6.8 tons/acre/year (966 tons/year), or 90 percent. The erosion potential of the entire site should decrease by 79 percent after development of the golf course. Thus, the impact of sedimentation in Poamoho and North Poamoho streams will be less.

SHORT-TERM IMPACTS AND MITIGATION

Construction of the golf course will involve land disturbing activities that result in soil erosion. These land disturbing activities will consist of removing 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 calculate soil erosion potential based on these short-term construction impacts. Applicable parameters for the equation are--

	Plateau	Stream Valley
R	300	300
K	0.2	0.2
LS	1.26	3.57
C	1 (bare soil)	1 (bare soil)
P	1	1

Soil erosion potential during construction will be 76 tons/acre/year in the plateau area and 214 tons/acre/year in the stream valley.

Short-term construction impacts can be mitigated by incorporating erosion control measures. These measures include incremental grading of the site in areas of 15 acres or less and installation of a sedimentation basin at the onset of grading. Implementation of these measures will decrease the cover and management factor (C) to 0.42 and will reduce soil erosion potential to 32 tons/acre/year and 90 tons/acre/year for the plateau area and the stream valley respectively. Additional erosion 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 cut-off 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.

The 214-acre golf course site represents less than 2 percent of the Poamoho Stream tributary area. Thus, changes in erosion potential at the site due to development will have a relatively small effect on the stream in relation to the entire drainage area.

APPENDIX E

WASTEWATER MANAGEMENT PLAN
FOR THE
PROPOSED WAIALUA GOLF COURSE

WASTEWATER MANAGEMENT PLAN

FOR THE

PROPOSED WAIALUA GOLF COURSE

Prepared for:

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March 1988

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FIGURES

INTRODUCTION

Oceanic Properties, Inc. is proposing the construction of an 18-hole golf course in the vicinity of Waialua Town. The proposed golf course will be situated generally between Weed Circle and Thompson Corner and mauka of Kaukonahua Road. A major portion of the land is currently used for sugar cane production, with the rest of the site relatively unaltered in the gully area created by Poamoho Stream (see Figure 1).

The objective of this report is to present the necessary facilities planning and preliminary engineering documentation for the proposed wastewater infrastructure to accommodate wastewater flows from the proposed Waialua Golf Course. Specifically, this report addresses the following:

1. Background information on the proposed project
2. Wastewater flows
3. Identification of facilities
4. Facility design data and information

The proposed wastewater facilities will be constructed to City and County of Honolulu standards and are intended to be dedicated to the City for operation and maintenance.

PROJECT BACKGROUND

Proposed Project

The proposed Waialua Golf Course will consist of an 18-hole golf course, driving range, equipment building, and clubhouse. The clubhouse will be situated on the plateau area at an elevation of ±110 feet, while the driving range and equipment building will be constructed in the gully area of Poamoho Stream (see Figure 2).

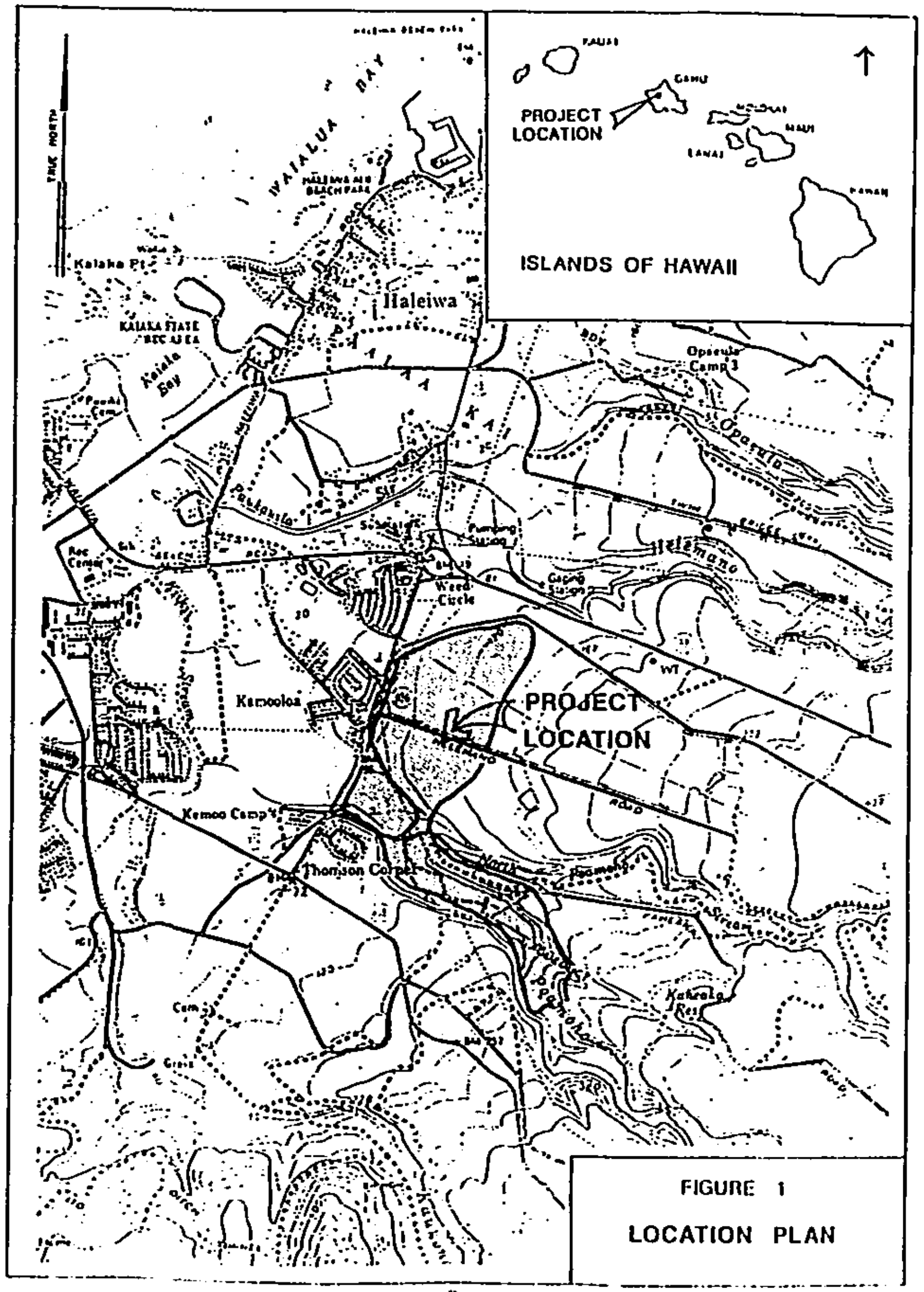

FIGURE 1
LOCATION PLAN

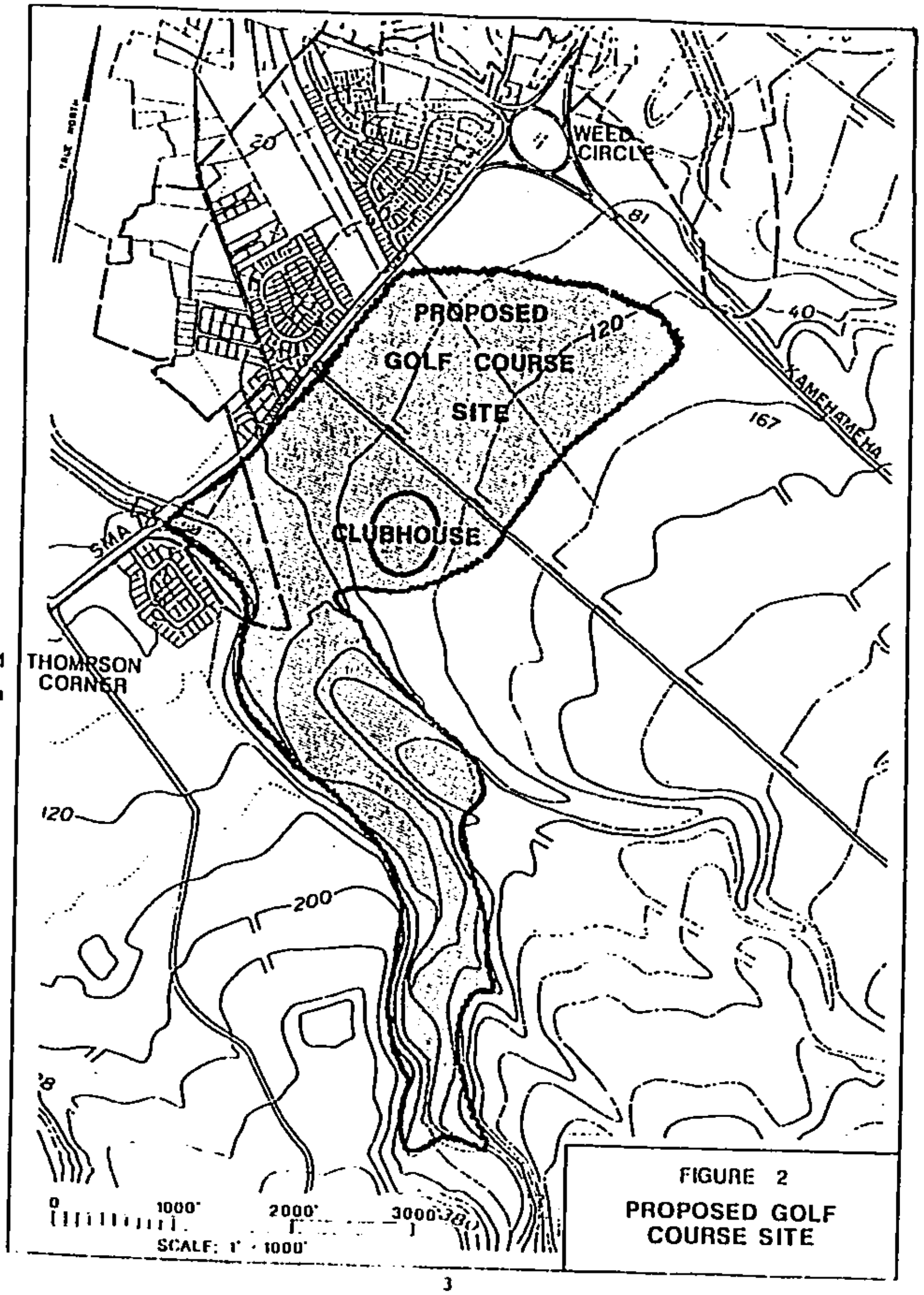

FIGURE 2
PROPOSED GOLF COURSE SITE

Topographically, the site has two distinct areas. The Poamoho Stream section drops from an elevation of 175 feet on the upper reaches of the stream to a 20-foot elevation at Kaukonahua Road on the west. Within the meandering stream, the slopes along the stream embankments range from 10 to 30 percent. The northwestern part of the project site is a gentle plateau with a ground slope from 0 to 10 percent. The elevation within this gentle ground slope ranges between an elevation of 150 feet on the east and 55 feet at the juncture with Kaukonahua Road.

Land Use and Zoning Designation

The proposed golf course site is presently designated an agricultural district by the State Land Use Commission. Oceanic Properties, Inc. has recently submitted an application for a development plan amendment to change the county land use classification from agricultural to parks and recreation.

Existing Wastewater Facilities

The proposed golf course is located in the Waialua-Haleiwa area. Most of the units in this area are serviced by cesspools. In a detailed analysis by Belt, Collins & Associates (1987), it was determined that between 15 and 30 percent of the cesspools are considered "defective."

The remainder of the area is serviced by eighteen private wastewater treatment systems. Most of these private treatment systems service multi-family units along Waialua Beach Road. Approximately half of these private treatment plants utilize the extended aeration process, with effluent disposal by means of seepage pits or gravity-fed injection wells.

The nearest municipal treatment facility, the Paalaa Kai Wastewater Treatment Plant (WWTP), is located approximately 2,000 feet west of the boundary of the proposed golf course. The Paalaa Kai WWTP is part of the Paalaa Kai Subdivision, Unit II, and fronts Waialua Beach Road.

This treatment facility was initially intended to treat wastewater flows generated by the Paalaa Kai Subdivision, Units I and II. The subdivision, covering a total area of approximately 47 acres, contains 307 single family residential units.

The Paalaa Kai WWTP is situated on a 38,000-square foot lot. The Paalaa Kai WWTP is capable of providing better than secondary treatment of the wastewater. Effluent from the treatment plant is disposed of by means of 4-inch exfiltration wells. Solids are disposed of at the Kawailoa or Kapaa sanitary landfills.

The design flow data of the Paalaa Kai WWTP are as follows:

Design Average Flow:	144,000 gpd
Design Maximum Flow:	589,400 gpd
Design Peak Flow:	648,000 gpd

A schematic process flow diagram of the Paalaa Kai WWTP is shown on Figure 3.

Generally, the raw wastewater enters the plant and is degritted in a grit chamber. Following degritting, the wastewater is comminuted and conveyed to an aerated surge tank. The wastewater is pumped into the Orbal treatment unit for biological treatment. This Orbal unit utilizes the activated sludge process for biological treatment, followed by final clarification.

Following clarification, the effluent is "polished" by a tertiary filter. The filter utilizes a mixed media, with a pulse mix cycle to keep the larger colloidal particles in suspension for the purpose of extending the length of the filter run.

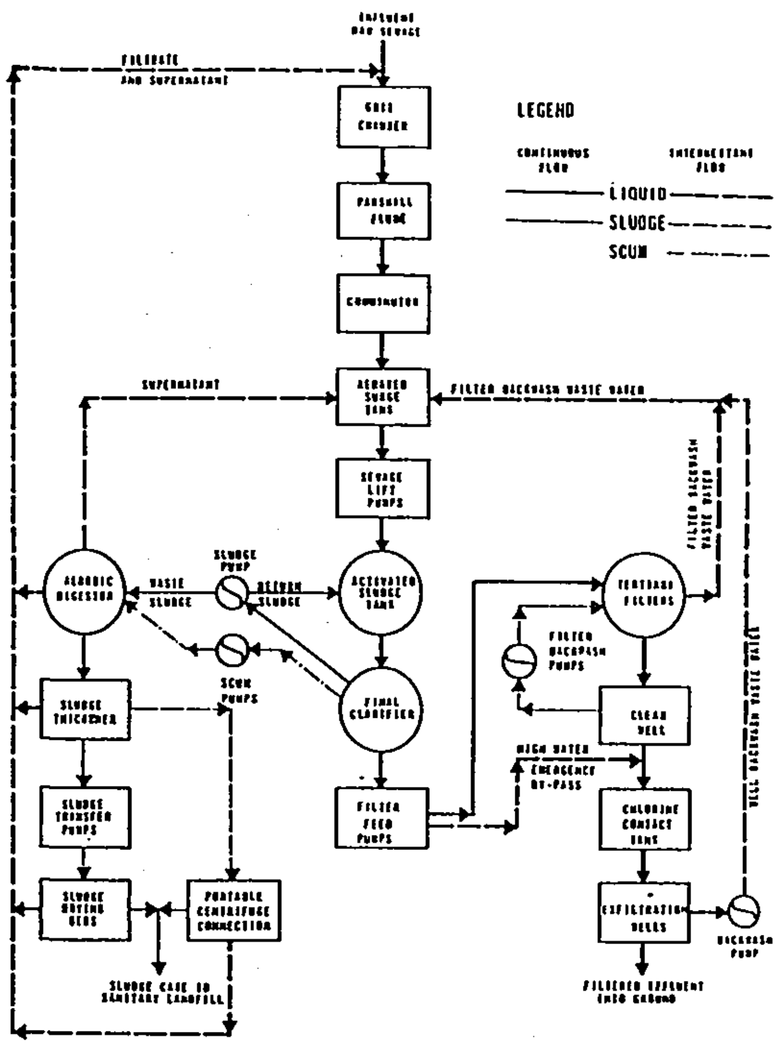

FIGURE 3

SCHEMATIC PROCESS FLOW DIAGRAM FOR PAALAA KAI WWTP

Following filtration, the filtered effluent is chlorinated prior to effluent disposal. Effluent is disposed of in 4-inch, PVC-cased wells. The wells are close to 50 feet in depth and have an injection rate of 95 gpm.

The solids treatment flow train consists of aerobic digestion, sludge thickening, and sludge drying beds. There are provisions for a portable centrifuge to aid in the dewatering of the stabilized sludge.

The design data for each of the major unit processes of the Paalaa Kai WWTP are found in Appendix A.

Currently, the flow to the Paalaa Kai WWTP averages approximately 72,500 gallons per day (gpd).

Projected Wastewater Flows

Wastewater flows from the golf course are anticipated to be primarily generated from clubhouse activities. These activities include: meal preparation and other related activities; personal hygiene, including toilet and lavatory; and showers.

The estimated average wastewater design flow is 20,000 gpd. The wastewater generated from the golf course will be of typical domestic composition.

PROPOSED WASTEWATER INFRASTRUCTURE

This section will address two major components of the wastewater infrastructure related to the proposed Waialua Golf Course: (1) the sewer collection system and (2) treatment and disposal.

Sewer Collection System

Wastewater generated from the clubhouse will be conveyed to the Paalaa Kai WWTP through the existing sewer system of the Paalaa Kai subdivision. An 8-inch line from the golf course will be installed crossing Kaukonahua Road and connecting to the existing manhole at the intersection of Paahihi Street and Alana Loop of Paalaa Kai Subdivision, Unit I (see Figure 4).

Treatment and Disposal

The capacity of the Paalaa Kai WWTP, including the effluent disposal system, is 144,000 gpd. Currently, existing flows entering the treatment plant are 72,500 gpd. With an additional 20,000 gpd from the clubhouse, it would appear that the Paalaa Kai WWTP is capable of handling waste flows from the clubhouse.

In discussions with personnel of the Division of Wastewater Management (DWM), Department of Public Works, City and County of Honolulu, it was indicated that certain components of the solids treatment process are not capable of handling any additional waste flows. Specifically, an assessment by Belt, Collins & Associates indicated that an aerobic digestion unit and the sand drying beds at the Paalaa Kai WWTP are not adequate to accommodate any additional flows (see Appendix B). The report indicates that solids concentration from the underflow of the final clarifier is the problem. Solids concentration of the waste activated sludge from the hopper of the final clarifier is 7,000 mg/l, compared to the design estimate of 10,000 mg/l.

In order for the Paalaa Kai WWTP to accept waste flows from the proposed Waialua Golf Course, the following facilities must be constructed:

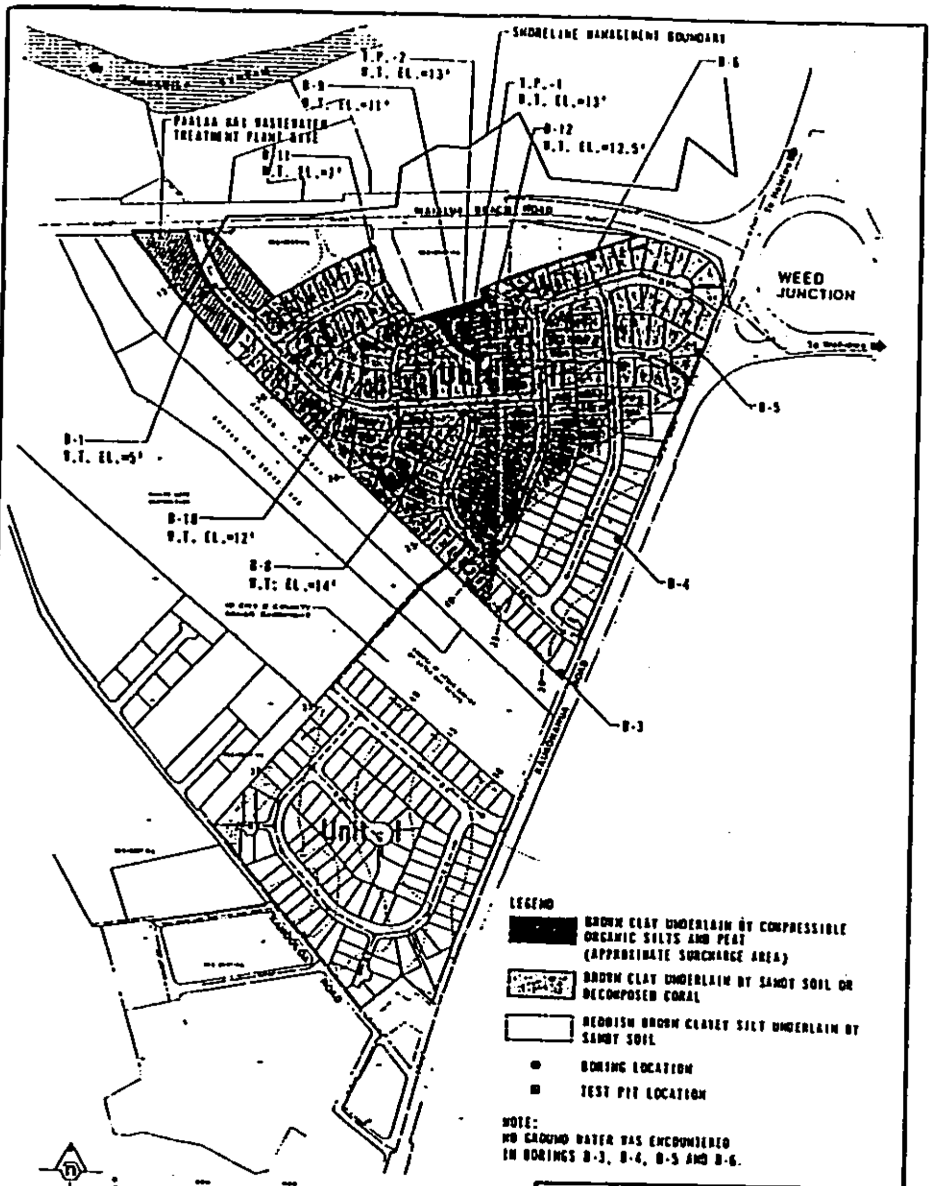

FIGURE 4

PAALAA KAI HOUSING DEVELOPMENT LAYOUT

1. Aerobic digestion unit. Additional aerobic digestion capacity of 3,100 cf is required. An aerobic digestion tank, air blower building, and necessary appurtenances will be required. A typical layout of the aerobic digestion unit is shown on Figure 5. A typical layout of the air blower building is shown on Figure 6. Design data are shown in Table 1. Modification to the existing sludge pump room will be required (see Figure 7).

2. Sand drying beds. There are currently four compartments, each 54 feet by 20 feet. It is proposed to construct one additional sand bed compartment. Based on the design criteria of 3.5 square feet per capita (ref: Belt, Collins & Assoc., Engineering Report, Paalaa Kai Sewer Improvements, Waialua, Oahu, Hawaii, February 1981), 700 square feet of sand bed area are required to accommodate waste flows from the proposed golf course. The construction of an additional sand bed compartment would be adequate.

Siting of Facilities

The siting of the aerobic digester, air blower building, sand bed, and appurtenances is shown on Figure 8.

IMPACTS AND MITIGATION MEASURES

The major impact of the additional flows from the golf course to the treatment plant would be directed at the solids treatment and handling system. Certain unit processes of the solids treatment and handling system are currently operating at design capacity. Additional flows to the Paalaa Kai WWTP would overtax these facilities, resulting in unstabilized and odorous sludge.

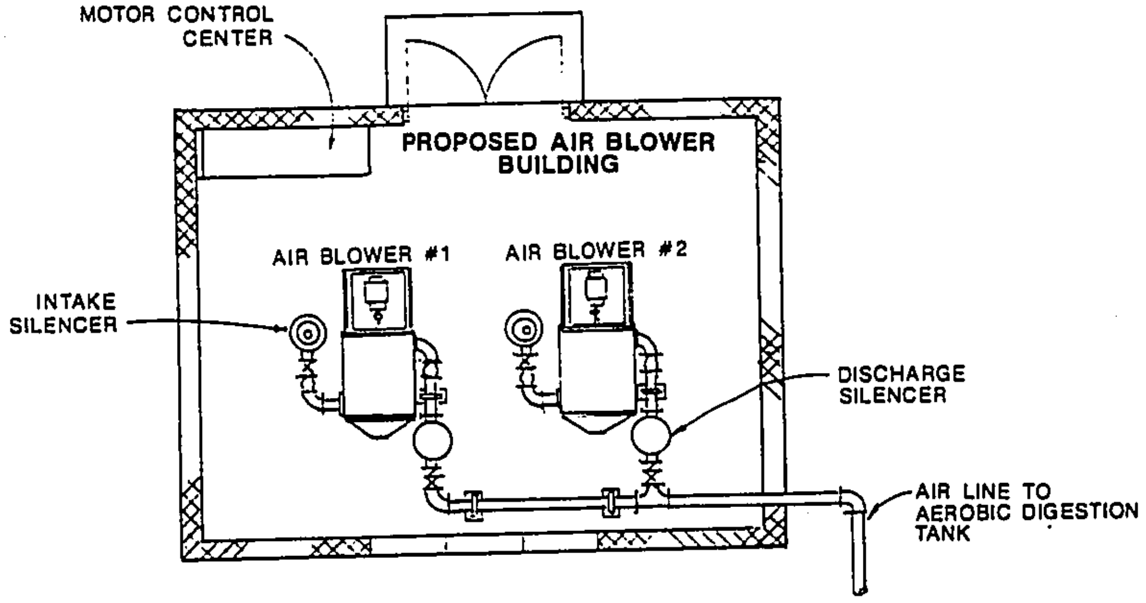

FIGURE 6

AIR BLOWER BUILDING

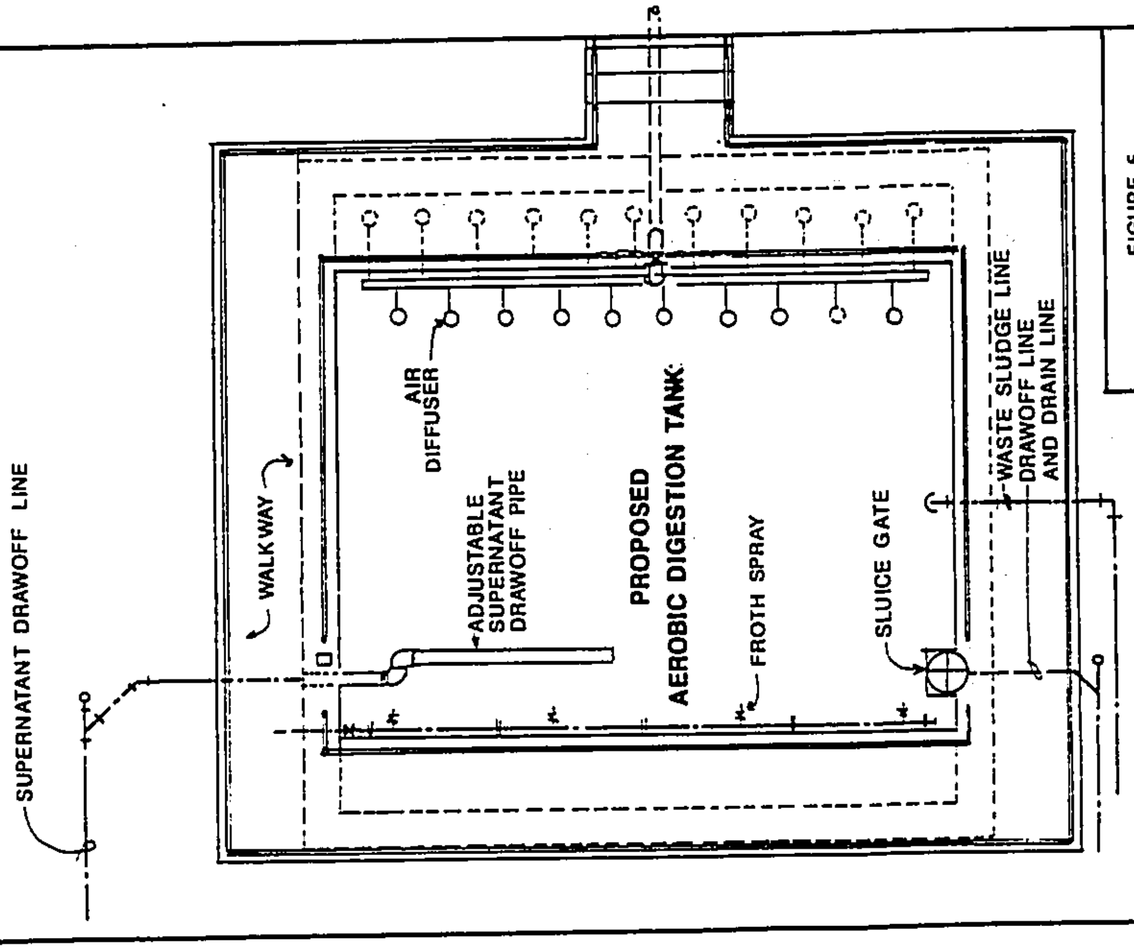

FIGURE 5

AEROBIC DIGESTION TANK

TABLE 1

DESIGN DATA FOR AEROBIC DIGESTER

Amount of Volatile Waste Activated Sludge	105 lbs/day*
Amount of Waste Activated Sludge	117 lbs/day*
Concentration of Waste Activated Sludge	7,000 mg/l**
Design Detention Time	24.4 days*
Required Volume of Digester Unit	57,600 gallons
Available Digester Volume	34,300 gallons
Volume of Additional Digester Volume Required	23,300 gallons
Air Requirement (use 30 cfm/1,000 cf tank volume)	Say 100 cfm

* Obtained from Belt, Collins & Associates' report, "Engineering Report, Paalaa Kai Sewer Improvements, Waialua, Oahu, Hawaii," February 1981.

** Personal communications with Division of Wastewater Management, Department of Public Works, City and County of Honolulu, November 1987.

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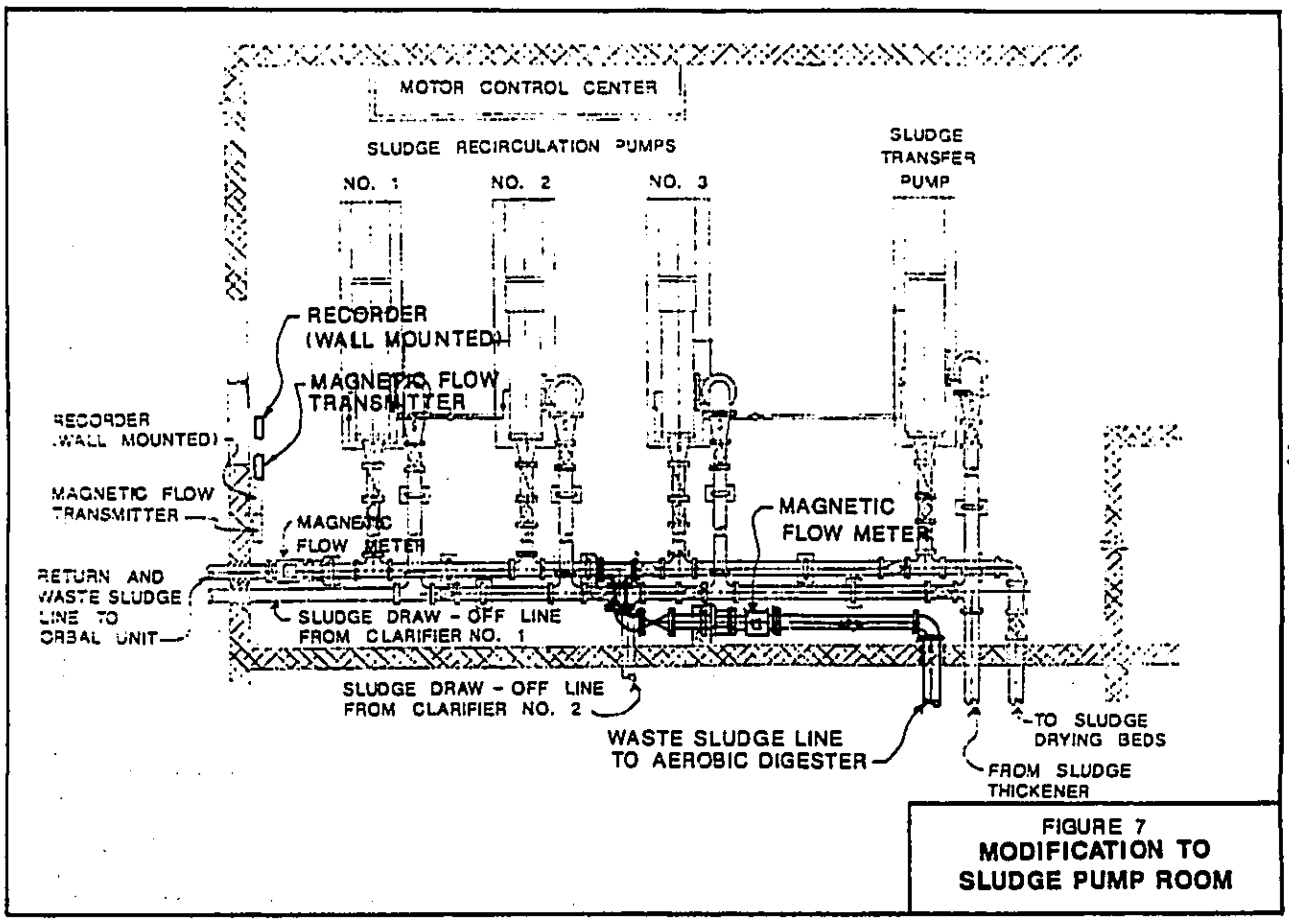

FIGURE 7
MODIFICATION TO SLUDGE PUMP ROOM

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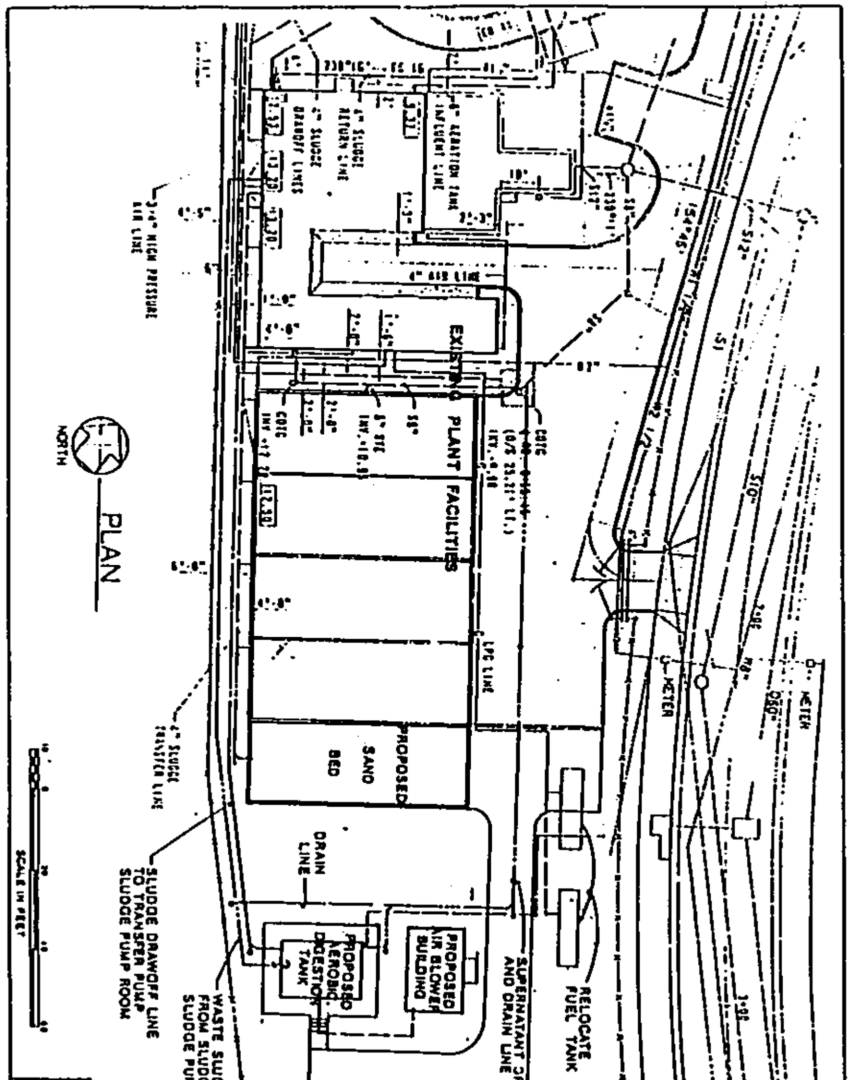

FIGURE 8
SITING OF
PLANT FACILITIES

The proposed expansion of the solids treatment and handling system would eliminate the problem of overtaxing of the treatment process.

With regard to other unit processes and effluent disposal systems, there should be no significant impact on effluent quality or odors since the facility is designed to handle the incremental flows from the golf course.

Short-term impacts would be construction-related. During the construction of the aerobic digester and the air blower building, dust, noise, and traffic disruption would be noticeable.

Traffic would be affected primarily by trucks and heavy equipment entering and leaving the plant site, while dust and noise would occur from construction activities.

These impacts can be mitigated by implementing a watering program for dust control, regulating the hours of construction to minimize the impact of noise on adjacent neighbors, and scheduling construction traffic during off-peak hours.

A P P E N D I X   A

DESIGN DATA FOR THE UNIT PROCESSES

FOR THE PAALAA KAI WWTP

APPENDIX A

Treatment Plant Design Flows

Average Flow (one pump on condition)	144,000 gpd (100 gpm)
Peak Flow (two pumps on at high speed condition)	650,000 gpd (451 gpm)

Sewage Lift Pump

Number of Units	3
Type	Vertical Centrifugal
Motor	Dual Speed, TEFC
Capacity (each pump)	
@ Low Speed (900 rpm)	100 gpm @ 16.5' TDH
@ High Speed (1200 rpm)	200 gpm @ 18.5' TDH

BOD5 Load

Average per Capita	0.19 lbs/day
Plant Design BOD_5 Load	274 lbs/day
Anticipated BOD_5 Load	233 lbs/day
Average Concentration	228 mg/l

Suspended Solids Loads

Average per Capita	0.16 lbs/day
Plant Design SS Load	231 lbs/day
Anticipated SS Load	196 lbs/day
Average Concentration	192 mg/l

Grit Chamber

Number of Chambers	Two
Average Velocity through Grit Chamber (one chamber)	1 fps
Detention Time (one chamber)	10 seconds
Grit Storage Capacity (one chamber)	1.67 cu ft
Anticipated Grit Removal	0.065 cf/day

Comminutor

Number of Units	Two
Capacity, Each Unit	700,000 gpd

Blower

Number of Units	Two
Type	Centrifugal
Capacity, Each Unit	180 cfm @ 6 psi

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Aeration Tank

	Average Flow	Peak Flow
Mode of Operation	Conventional Activated Sludge	
Number of Channels	Two	
Depth	4.0 ft	4.1 ft
Volume Channel No. 1	51,300 gal	52,600 gal
Volume Channel No. 2	41,200 gal	42,200 gal
Total Volume (2 channels)	92,500 gal	94,800 gal
Detention Time	15.5 hrs	3.8 hrs
BOD_5 Loading Rate	274 lbs/day	
Volumetric BOD_5 Loading Rate	22.1 lbs BOD_5/day/1000 cu ft	
Design MLSS Concentration	2,000 mg/l	
Design MLSS Concentration (70% of MLSS)	1,400 mg/l	
Design Organic Loading	0.18 lbs BOD_5/day/lb MLSS	
Mean Cell Residence Time (sludge age)	14.7 days	
Average Air Requirement	20.5 lbs O_2/hr	
Maximum Aeration Capacity	38.6 lbs O_2/hr	

Clarifier

	Average Flow	Peak Flow
Number of Clarifiers	Two	
Surface Area (each clarifier)	320 SF	
Sidewall Water Depth	8.0 ft	8.1 ft
Sidewall Depth at Center	8.8 ft	8.9 ft
Total Volume (two clarifiers)	40,000 gal	40,400 gal
Detention Time	6.7 hrs	1.5 hrs
Surface Overflow Rate	225 GPSFD	960 GPSFD
Weir Length per Clarifier	62.8 ft	
Weir Overflow Rate	1,136 GPFD	4,770 GPFD

Sludge Recirculation Pumps

Number of Units	Three
Type	Progressing Cavity
Drive	Mechanical Variable Speed
Capacity, Each Pump	20 to 50 gpm
Pipe Size	4-inch
Velocity at Maximum Pump Rate	1.3 ft/sec

Scum Pumps

Number of Units	Two
Type	Submersible
Capacity, Each Pump @ 6.5' TDH	20 gpm
Total Tank Volume	270 gal
Anticipated Flow Rate	1.0 gpm
Time for One Complete Pumping Cycle	34 minutes

Filter Feed Pumps

Number of Units	Three (one as packaged standby)
Type	Submersible
Capacity, Each Pump (excess bypassed to chlorine tank)	100 gpm
Total Tank Volume (below overflow pipe)	1,500 gal

Chlorine Contact Tank

	Average Flow	Peak Flow
Chlorine Dosage	8 mg/l	8 mg/l
Chlorine Demand	9.6 lbs/day	43.4 lbs/day
Water Depth	7.7 ft	8.1 ft
Volume	6,400 gal	6,800 gal
Detention Time	64.3 min	15.0 min

Tertiary Filter

Number of Units	One
Number of Filtering Cells	Two
Filter Area (each cell)	56.25 sq ft
Total Filter Area	112.5 sq ft
Capacity, Each Cell (@ 2 gpm/sf)	112.5 gpm
Total Capacity	225 gpm
Filter Media	0.45 mm quartz sand
Air Required for Air Mix Operation	56 cfm @ 2 psi
Backwash Operation	
Backwash Rate	12 gpm/sf
Duration of Backwash	3.5 minutes
Number of Backwash Pumps	Two
Capacity, Each Pump (7.5 HP)	675 gpm
Clearwell Volume	4,750 gal
Mudwell Volume	5,250 gal
Number of Mudwell Pumps	Two
Capacity, Each Pump (1/2 HP)	16 gpm
Compressor Capacity	1.4 scfm @ 100 psi

Irrigation Pumps

Number of Units	Two
Type	Submersible
Capacity (each pump)	50 gpm @ 50 psi
Control	Irrigation Controller
Wet Well Volume (below overflow pipe)	2,300 gal
Detention Time @ Ave. Flow	23 minutes

Exfiltration Well

Number of Wells	As required to attain a flow capacity of 900 gpm	
Average Depth Below Water Table	38 ft	
Casing Diameter	4 inches	
Approximate Depth	40 - 48 inches	
Well Maintenance Equipment		
Air Compressor	10 scfm @ 100 psi	
Pump, Portable	100 gpm @ 20 ft TDH	
Backwash Period	30 minutes	

Aerobic Digester

	Channel #1	Channel #2
Operation of Channels	Parallel	
Sludge Wasting Rate	117 lbs/day	
Average Waste Sludge Volume	1,400 gal/day	
Design Digester Sludge Concentration	1.0 percent	
Normal Water Depth	4.0 feet	
Volume	18,900 gal	15,400 gal
Solids Capacity	1,580 lbs	1,280 lbs
Expected Performance	40% VSS Removal	
Estimated Period to Fill Channel	13.5 days	10.9 days
Detention Time	13.5 days	10.9 days
Digester Sludge Age	13.5 days	10.9 days
Total Sludge Age	27.0 days	21.8 days
Minimum Air Required, Each Channel	4.0 lbs O_2/hour	
Type of Aeration	Mechanical (rotating disks)	
Number of Disks, Each Channel	Four	
Oxygenation Capacity, Each Disk	2.0 lbs O_2/hour	
Aeration Capacity, Each Channel	8.0 lbs O_2/hour	
Volume per Person	3.7 cfpc	
Digested Sludge Concentration	0.72 percent	

Sludge Thickener

Type	Gravity
Effective Volume	9,400 gal
Solids Concentration from Digester Following Decanting	1.4 percent
Expected Performance	50% volume reduction
Solids Concentration to Drying Bed	2.8 percent
Average Sludge Wasting Rate to Beds	78.4 lbs/day
Frequency Sludge Wasted to Beds	2 weeks

Sludge Transfer Pump

Number of Units	One
Type	Progressing Cavity
Drive	Mechanical Variable Speed
Capacity	60 - 175 gpm
Pipe Size	4 inches
Velocity at Maximum Pump Rate	4.5 ft/sec
Velocity at Average Pump Rate	2.6 ft/sec @ 100 gpm
Velocity at Minimum Pump Rate	1.5 ft/sec

Sludge Drying Bed

Number of Compartments	Four
Area (per compartment)	1,080 sf
Normal Sludge Depth	8 inches
Maximum Volume (each compartment)	724 cu ft (5,415 gal)
Total Capacity	2,896 cu ft
Area per Person	3.5 SFPC
Sludge Cake Disposal Site	Kapaa Landfill
Anticipated Drying Time	3 - 4 weeks
Dried Sludge Quantity per Bed	2,500 lbs @ 40% solids
Required Sludge Drying Bed Cleaning Frequency	2 - 4 weeks

APPENDIX B

ASSESSMENT OF PAALAA KAI WWTP

WAIALUA, OAHU, HAWAII

BY BELT, COLLINS & ASSOCIATES

AUGUST 1985

BELT, COLLINS & ASSOCIATES
Engineering • Planning
Landscape Architecture

August 8, 1985
85-1431

Division of Wastewater Management
Department of Public Works
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Attention: Mr. Jerry Kami

Gentlemen:

Assessment of Paalaa Kai WWTP
Waialua, Oahu, Hawaii

Transmitted herewith for your review, comment, and approval is our evaluation and assessment of the Paalaa Kai Wastewater Treatment Plant performance. The facility was designed to handle the anticipated wastewater flow generated from the Paalaa Kai Subdivision of 144,000 gallons per day. The average flow to the plant is presently only 72,500 gallons, or one-half of the design flow. Our assessment of Paalaa Kai indicates that good quality effluent is produced and the liquid treatment process has the capacity to handle increased flows. Based on the present mode of operation, however, the solids treatment processes (primarily the aerobic digester) are not capable of handling any additional wastes.

We trust our assessment is acceptable. Should you have any questions, please feel free to call us.

Very truly yours,

Cary K. Kondo

Cary K. Kondo

CKK:lf

Enclosure

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Australia Level 2, First Floor, 19 Grosvenor Street, Neutral Bay Sydney NSW 2089 Telephone 908 1188

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ASSESSMENT OF PAALAA KAI WASTEWATER TREATMENT PLANT

At the present time, the performance of each of the unit processes is at an acceptable level. The following assessment is therefore focused on determining the ultimate capacity of each unit. Each of the units has been evaluated on the basis of its performance during the process reliability phase of the plant start-up.

Aerated Surge Tank

Under present conditions, this unit performs well, producing an output flow of 72,500 gallons per day (gpd). At this flow rate, only one of the two available tanks is in use. Operation of the two tanks should therefore double the overall capacity of the unit.

Activated Sludge Tank

The activated sludge process presently utilizes only one of the two available aeration channels. This single channel handles an inflow of 72,500 gpd with a return sludge flow of 45,400 gpd. Maintaining present hydraulic, BOD & SS loadings with both channels in operation, the unit would have a capacity of 130,650 gpd or a capacity for approximately 80% more additional flow.

Final Clarifier

To meet present operating requirements, only one of the two available clarifiers is in use. Maintaining present loading conditions for future flows, the operation of two tanks will have an ultimate capacity of 145,000 gpd.

Tertiary Filter

The filter presently operates well and is backwashed once a day. It is anticipated that this filter will have the capacity to handle any additional future flows. The higher future loading rate, however, will require more frequent backwashing intervals to maintain present removal rates.

Chlorine Contact Tank

The existing chlorine contact tank has the capacity to handle an average flow of 144,000 gpd.

Exfiltration Wells

Existing wells have a capacity to handle disposal of 900 gpm of effluent. The wells should continue to obtain the present disposal rate, barring the discharge of lower quality effluent into the well (which may result in premature clogging of the well).

Aerobic Digester

At present, both of the available aerobic digester channels are in operation. Under present operations, the contents of one of the two channels is dumped into the thickener approximately once every two weeks. The low solids concentration of the influent into this unit and in poor settleability is probably the main factors limiting the ability of the digester to handle additional flows. Continuation of the present mode of operation (no changes to any of the preceding treatment units) would result in even poorer performance of this unit at the higher future loading rates. Therefore, the aerobic digester has no excess capacity.

Gravity Thickener

Performance data for this unit indicates that the thickener is capable of achieving a high percentage of solids concentration. At the present time, however, it is not capable of meeting expected SS concentrations. This is due to the low SS concentration initially introduced to the unit. If unit process operations are modified to increase the solids concentration into this unit, it is expected that the unit will operate adequately at present and future flows.

Sand Drying Bed

Plant records indicate that thickened sludge is presently discharged onto the drying bed as many as 3 to 4 times a month. Under these conditions, the four existing drying beds will not be adequate to handle additional future flows.

Summary

The assessed capacity of each of the unit processes is summarized on the following table. As noted on this table and the preceding discussion, the performance of the plant is limited by the performance of the solids handling units from the aerobic digester. It should be noted, however, that the assessment made here was based on the premise that the hydraulic loading characteristics remain unchanged in the future. Modification in the operation of the unit processes preceding the solids handling portion of the treatment plant (e.g., by changing the hydraulic loading rates) may improve the capacity of the solids handling system.

Design Capacity vs. Assessed Future Capacity of Unit Processes at the Paalaa Kai WWTP

Unit	Unit	CAPACITY Design	Present	Assessed	Present Excess
Aerated Surge Tank	gpd	144,000	72,400	144,800	72,400
Activated Sludge	gpd	144,000	72,400	130,650	58,250
Final Clarifier	gpd	144,000	72,400	145,000	72,600
Tertiary Filter	gpd	144,000	72,400	144,800+	72,400+
Chlorine Contact Tank	gpd	144,000	72,400	144,000+	71,600+
Exfiltration Wells	gpm	900	900	900	900
Aerobic Digester	lb ss/day	117	70	70	0
Gravity Thickener	lb ss/day	79	60	60	0
Sludge Drying Bed	lb ss/day	78.4	59.8	59.8	0

APPENDIX F

WATER SUPPLY REPORT
FOR THE
PROPOSED WAIALUA GOLF COURSE

WATER SUPPLY REPORT

FOR THE

PROPOSED WAIALUA GOLF COURSE

WAIALUA, OAHU, HAWAII

Prepared for:

Oceanic Properties, Inc.
Honolulu, Hawaii

Prepared by:

Engineering Concepts, Inc.
250 Ward Avenue
Honolulu, Hawaii 96814

March 1988

CONTENTS

TABLES

FIGURES

INTRODUCTION

Oceanic Properties, Inc. is proposing the construction of an 18-hole golf course in the vicinity of Waialua Town. The proposed golf course will be situated generally between Weed Circle and Thompson Corner and mauka of Kaukonahua Road. A major portion of the land is currently used for sugar cane production, with the rest of the site relatively unaltered in the gully area created by Poamoho Stream (see Figure 1).

The objective of this report is to present the necessary facilities planning and preliminary engineering documentation for the water system at the proposed Waialua Golf Course. This report addresses both the domestic and irrigation water needs of the proposed project. Specifically, this report addresses the following:

1. Background information on the proposed project
2. Water resources in the area
3. Existing infrastructure
4. Projected water demand and proposed water system
5. Impacts and mitigation of the proposed water system

The proposed domestic water system will be constructed to the City and County of Honolulu Board of Water Supply (BWS) standards and is intended to be dedicated to the BWS for operation and maintenance. The proposed irrigation system will remain privately owned and operated.

PROJECT BACKGROUND

Site Characteristics

Topographically, the site has two distinct areas. The Poamoho Stream section drops from an elevation of 175 feet on the upper

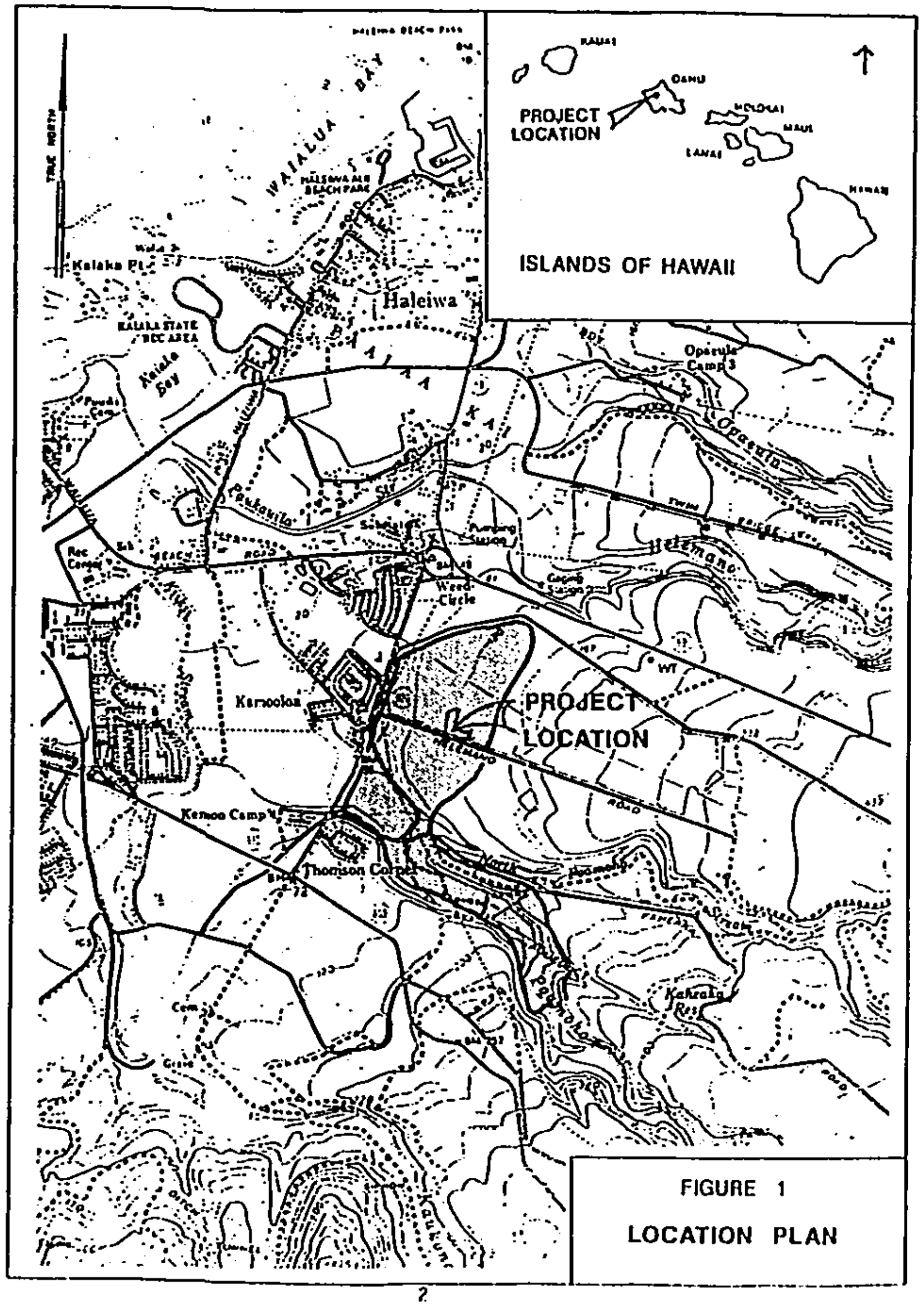


FIGURE 1
LOCATION PLAN

reaches of the stream to a 20-foot elevation at Kaukonahua Road on the west. Within the meandering stream, the slopes along the stream embankments range from 10 to 30 percent. The northwestern part of the project site is a gentle plateau with a ground slope from 0 to 10 percent. The elevation within this gentle ground slope ranges between an elevation of 150 feet on the east and 55 feet at the juncture with Kaukonahua Road.

Proposed Project

The proposed Waialua Golf Course will consist of an 18-hole golf course, driving range, equipment building, and clubhouse. The clubhouse will be situated on the plateau area at an elevation of ±110 feet, while the driving range and equipment building will be constructed in the gully area of Poamoho Stream (see Figure 2).

Land Use and Zoning Designation

The proposed golf course site is presently designated an agricultural district by the State Land Use Commission. Oceanic Properties, Inc. has recently submitted an application for a development plan amendment to change the county land use classification from agricultural to parks and recreation.

WATER RESOURCES

Water resources in the project vicinity include both surface water and groundwater (see Figures 3 and 4).

Surface Water

Poamoho Stream and North Poamoho Stream traverse the project site. The confluence of the two streams is located in a flood plain within the project site. Poamoho Stream is a tributary of Kiikii Stream, which discharges into Kaiaka Bay. The State of

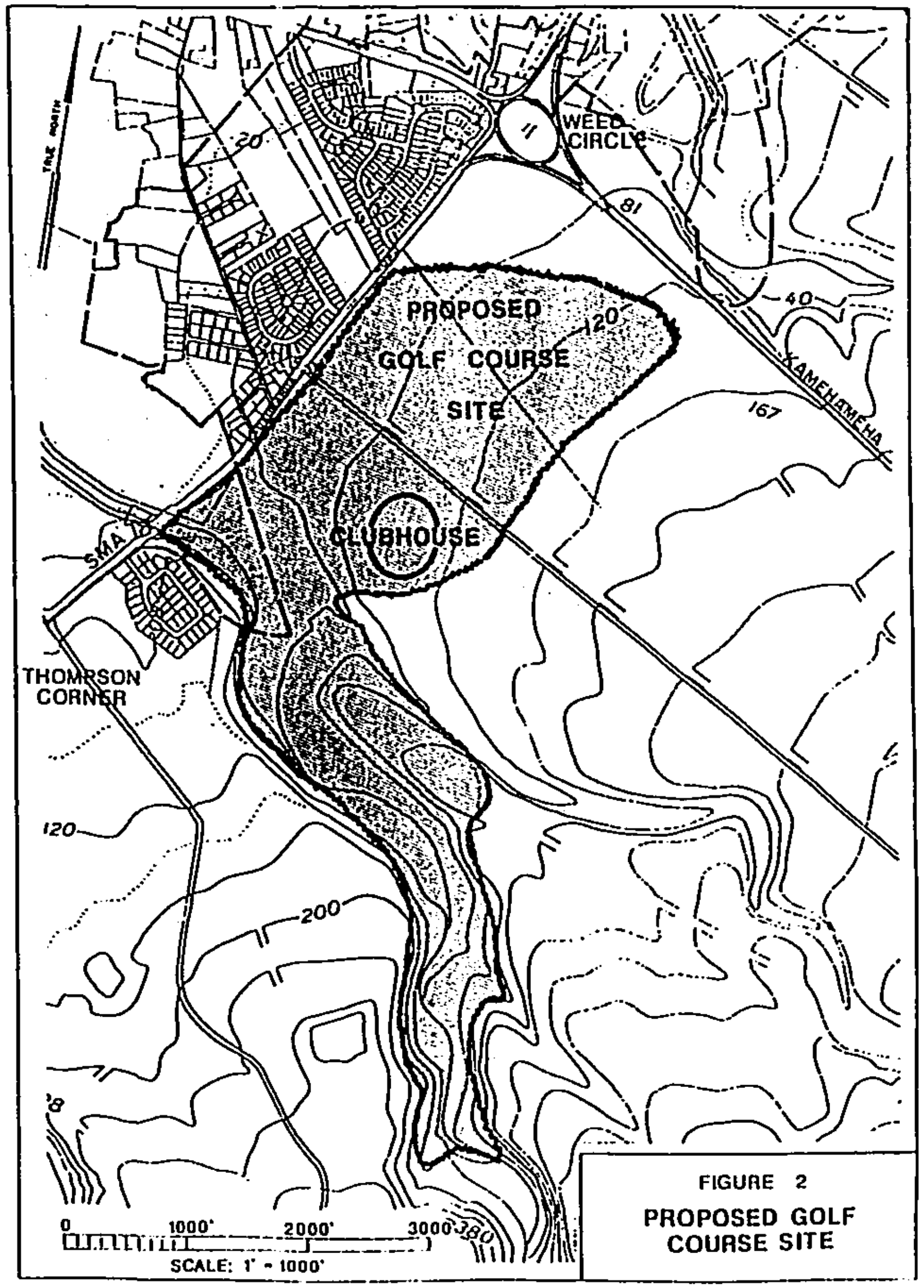
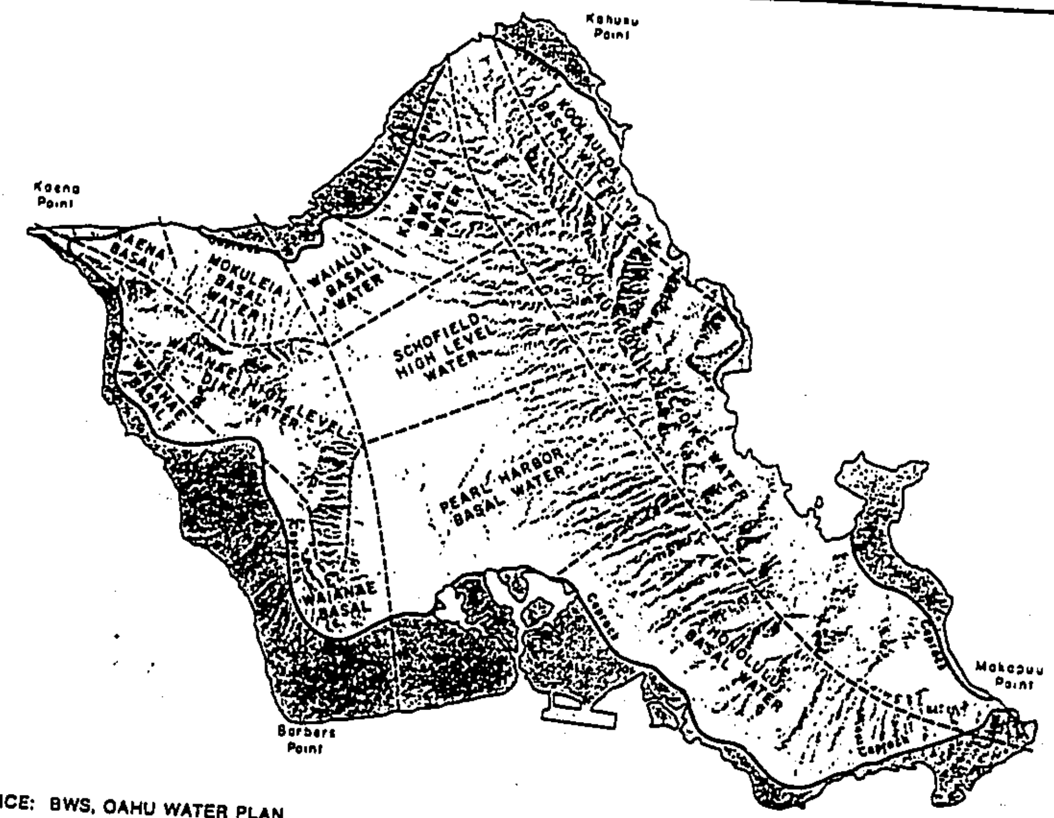


FIGURE 2
PROPOSED GOLF COURSE SITE



SOURCE: BWS, OAHU WATER PLAN,
4th EDITION, JULY 1982, PG. 10

FIGURE 4
GROUND WATER BODIES ISLAND OF OAHU

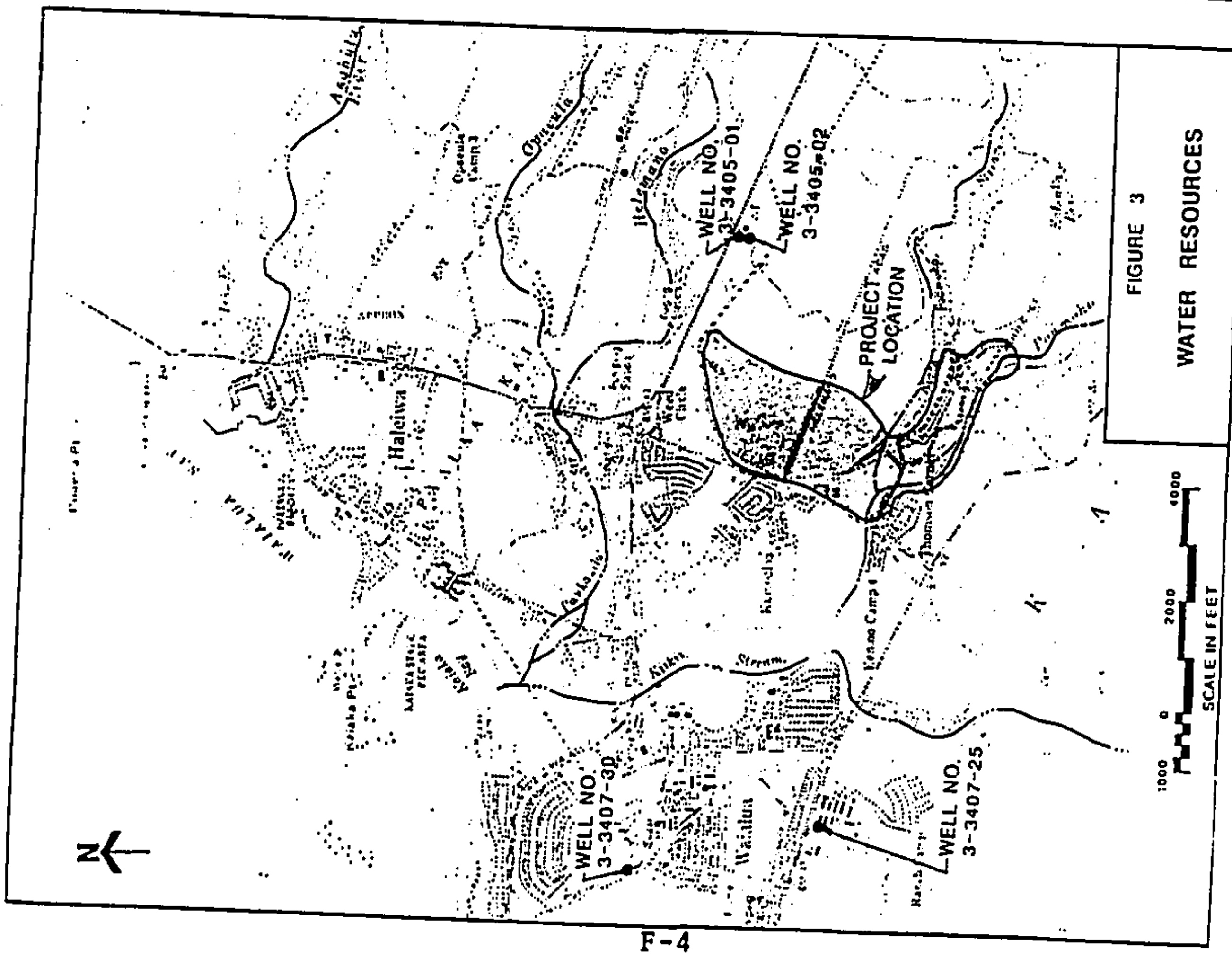


FIGURE 3
WATER RESOURCES

Hawaii Department of Health's Title 11 Regulations, Chapter 37-A, Water Quality Standards, states Kaiaka Bay is a Class A embayment. Kiikii Stream is designated as a Class 2 perennial stream and estuary, and Poamoho Stream is a Class 2 perennial stream.

Per Chapter 37-A, classification of the water uses of Class 2 and Class A waters is as follows:

> "CLASS 2 - It is the objective of this class of waters that their use for recreational purposes, propagation of fish and other aquatic life and agricultural and industrial water supply be protected.
>
> The uses to be protected in this class of waters are all uses compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters. Such waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new industrial or sewage discharges will be permitted within estuaries.
>
> CLASS A - It is the objective of this class of waters that their use for recreational purposes and aesthetic enjoyment be protected.
>
> Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife and with recreation in and on these waters. Such waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for this class. No new industrial or sewage discharges will be permitted within embayments."

Groundwater

Groundwater located in the Waialua-Haleiwa area is found in dike-free Koolau lava flows. Rainfall in the Koolau mountain range maintains and recharges the groundwater lens. Thick alluvial fill and weathered basalt in the Anahulu River Valley

separate the Waialua-Haleiwa lens from the Kawailoa groundwater lens. In general, groundwater in the Waialua-Haleiwa lens flows toward the sea, and a small portion flows northwest to the Kawailoa lens. Seaward flows are confined by thick caprock that has developed near the shore.

Groundwater quality can be characterized by analysis of samples from wells in the area. Table 1 contains water quality data stated in the USGS Water Data Report for 1985 for four wells near the project site.

Waialua Sugar Company conducts monthly testing on its wells. Table 2 includes recent data from pump station no. 10 (well numbers 3306-01 to 3306-12) located within the proposed golf course site.

EXISTING INFRASTRUCTURE

Two distinct water systems are operated in the vicinity of the project site by the Board of Water Supply and Waialua Sugar Company. The BWS system provides municipal and fire protection water service to the surrounding community, while Waialua Sugar Co. operates its system primarily for irrigation.

BWS System

The BWS has two reservoir/well sites servicing the Waialua-Haleiwa areas. The Haleiwa site has two wells, with pumps rated at 700 gpm each with a 230-foot head, and a 1.0 million gallon (MG) reservoir, with a 225-foot spillway elevation.

The Waialua site consists of two wells (well numbers 3-3405-01 and 3-3405-02) with 1,500 gpm pumping capacity and 235-foot head. The wells supply water to a 1.5 MG reservoir with a spillway elevation of 225 feet located along Kamehameha Highway. A 20-inch main transports water from the reservoir to the Waialua and Haleiwa communities for distribution.

TABLE 1

GROUNDWATER QUALITY

Well Number	Specific Conductance (us/cm)	Temp (°C)	Dissolved Chloride (mg/l as Cl)
3-3405-01	450	22.0	---
3-3405-02	530	22.5	94
3-3407-25	2,300	23.0	630
3-3407-30	5,500	24.5	1,600

TABLE 2

WAIALUA SUGAR CO. GROUNDWATER

QUALITY AT PUMP STATION NO. 10

Date	Pump	Alkalinity (ppm)	Hardness (ppm)	Chloride (ppm)
Aug 5, 1987	200 hp - low lift	68	140	184
Sep 28, 1987	200 hp - low lift	67	144	186
Oct 26, 1987	350 hp - high lift	66	280	310
Nov 2, 1987	200 hp - low lift	66	124	168

An 8-inch water line that branches off of the 20-inch main is located adjacent to the project site along Kaukonahua Road. The 8-inch line services the Paalaa Kai subdivision located west of the project site. Currently, the 8-inch line is looped around the subdivision, connecting to a 16-inch line along Waialua Beach Road.

The existing BWS system is illustrated on Figure 5. There are no existing BWS water lines located within the project site.

<u>Waialua Sugar Co. System</u>

The plantation irrigation system is divided into high level and low level service areas. In general, sugar cane fields in the vicinity of the project site are irrigated by water from pump station no. 10. The wells are located in the Poamoho Stream Valley within the project site. High lift water from pump station no. 10 is pumped to Helemano 4 reservoir and is used to irrigate fields makai of the 180-foot elevation. Fields mauka of the 180-foot elevation are irrigated with water from Wahiawa reservoir. Water from Wahiawa reservoir has been used to supplement water from Kaheaka reservoir to irrigate the lower fields during years of high rainfall.

Pump station no. 10 presently has three pumps on line: two high lift and one low lift. A second low lift pump was recently abandoned. The two high lift pumps, each rated at 4 MGD, discharge into an outlet box near Kaheaka reservoir. The water is transported north by gravity to Helemano 4 and other reservoirs. The low lift pump (4 MGD) discharges into an outlet box and flows to Helemano 2 reservoir. The well capacity at pump station no. 10 is 12 MGD; thus, all three pumps can operate at once.

Currently, the sugar cane fields within the project site are in drip irrigation. To prevent drip lines from clogging, water is

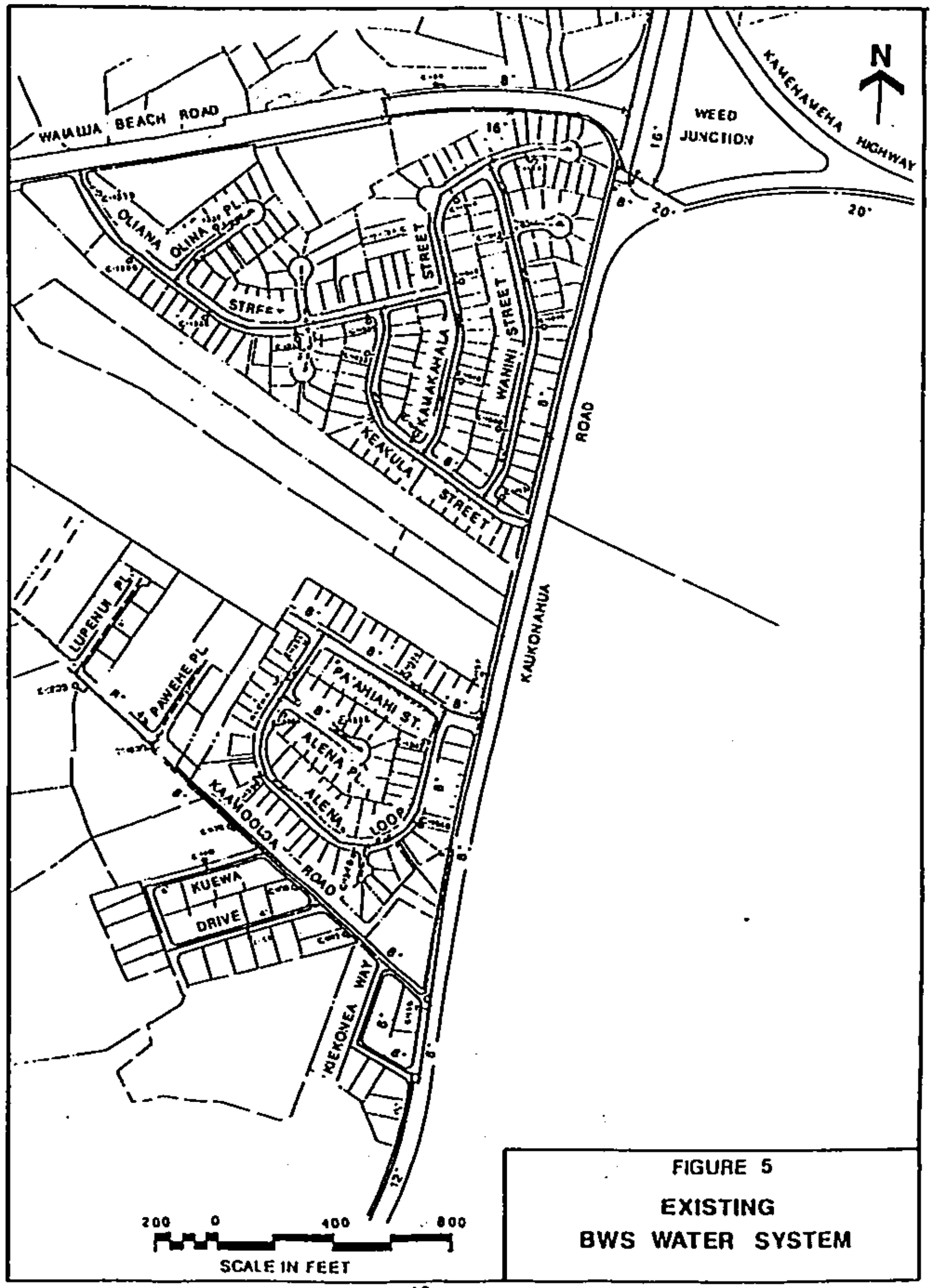


FIGURE 5
EXISTING
BWS WATER SYSTEM

filtered before application to the fields. Figure 6 illustrates major components of the existing irrigation system in operation at the site.

PROJECTED WATER DEMAND

The projected domestic water demand, based on the BWS Water System Standards, is 20,000 gpd. This value was based on the water demand rate for resort areas of 4,000 gallons per acre over an approximate 5-acre clubhouse and maintenance facility site.

The projected water demand for fire protection is 2,000 gpm over a two-hour duration. This was also based on the Water System Standards for fire flow rate for schools, small shopping centers, neighborhood businesses, and hotels.

Irrigation requirements are based on a rate of 1.5 inches per week over 100 acres of land. The 100 acres includes the area occupied by tees, greens, and fairways on a typical golf course in Hawaii. This translates to a projected annual irrigation demand of 0.58 MGD.

PROPOSED WATER SYSTEM

Potable Water

Connection to the existing BWS water system is the proposed method of meeting domestic and fire protection demands at the site. There is adequate capacity at the existing Waialua reservoir and wells to meet projected water demands from the proposed golf course. However, the capacity of the existing 8-inch water line along Kaukonahua Road is insufficient to provide the required fire protection rate. To increase the capacity of the Kaukonahua line, a 12-inch main will be installed along

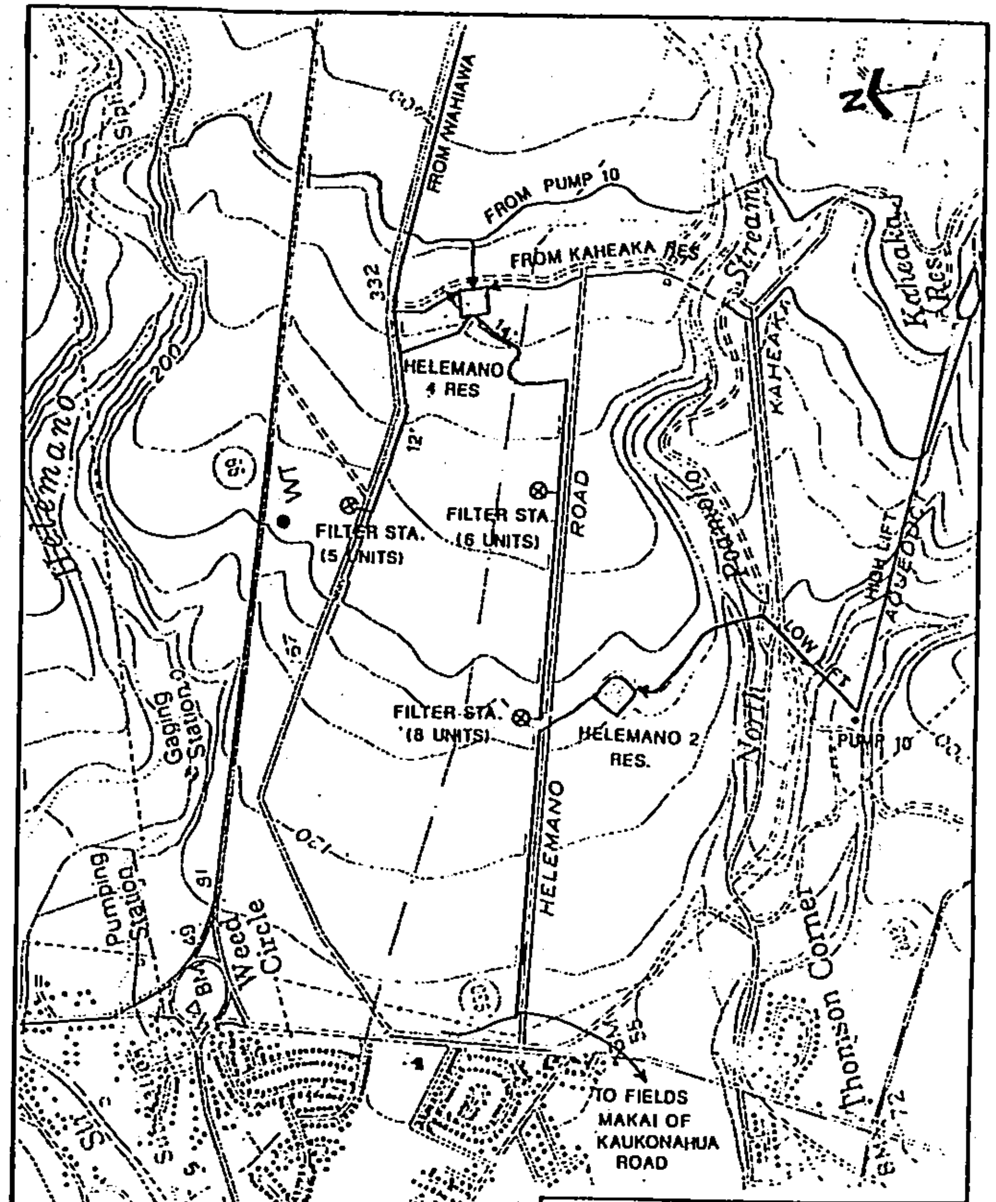


FIGURE 6
EXISTING WAIALUA SUGAR CO.
IRRIGATION SYSTEM

Kaukonahua Road parallel to the existing 8-inch line. Approximately 1,900 linear feet will be required to span from the vicinity of Kiekonea Way toward Weed Junction to Keakula Street. The proposed water system improvements are illustrated on Figure 7.

Potable water to the clubhouse will require a 12-inch line off of the proposed 12-inch main along Kaukonahua Road. A smaller water line will tap off the 12-inch clubhouse line to service restrooms in the maintenance building.

Irrigation Water

Irrigation water for the site can be supplied by the Waialua Sugar Co. irrigation system. The 14-inch pipe line along Helemano Road can be tapped at a point upstream of the 8-unit filter station to divert a small portion of the water to a storage pond within the golf course. Approximate locations of the storage pond and supply line are shown on Figure 8. A pond capacity of 2 to 3 million gallons will be sufficient to store irrigation water for three to five days.

IMPACTS AND MITIGATION

Positive impacts expected from the golf course development are--

1. Lower demand for irrigation water.

2. Increased capacity of the BWS distribution system within the area of Kaukonahua Road.

Change in land use from sugar cane to golf course will decrease water demand for irrigation purposes from 0.92 MGD to 0.58 MGD, a 37 percent reduction in irrigation demand at the site.

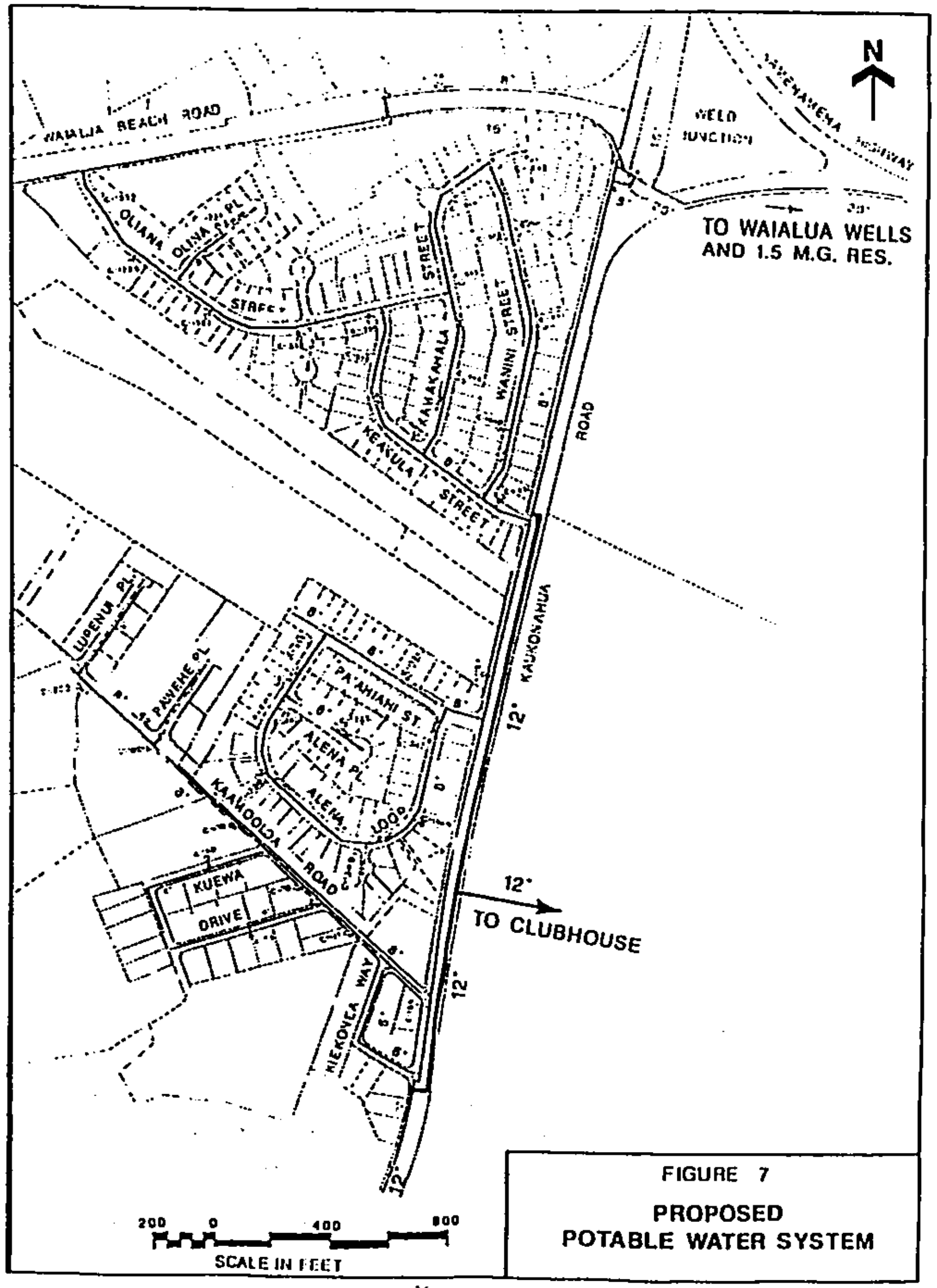


FIGURE 7
PROPOSED
POTABLE WATER SYSTEM

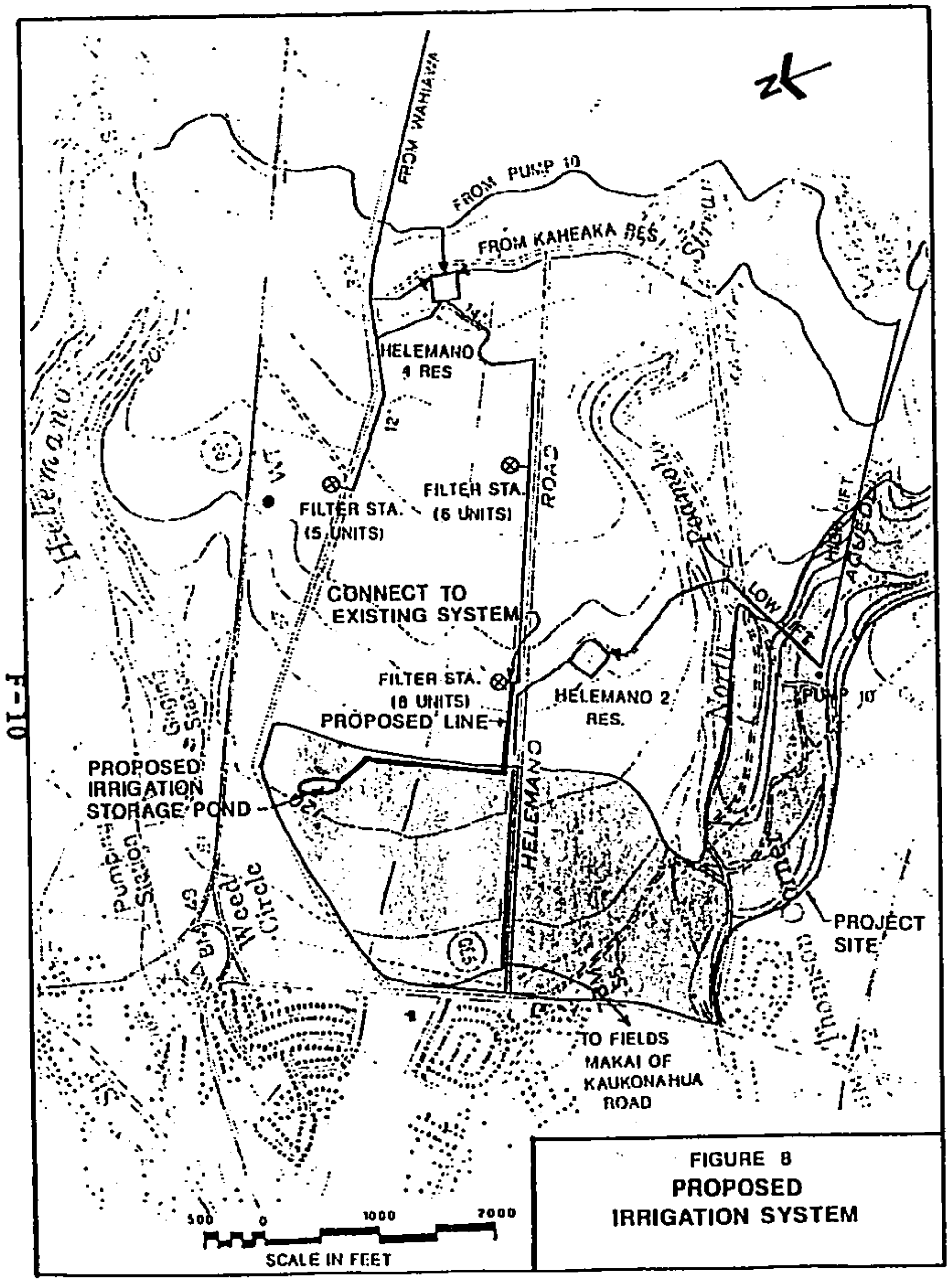


FIGURE 8
PROPOSED
IRRIGATION SYSTEM

The noncaprock areas of southern Oahu have rainfall patterns and soils similar to the project site. Thus, an estimate of groundwater recharge before and after development can be calculated based on Water Balance of the Pearl Harbor-Honolulu Basin, Hawaii, 1946-1975 by T.W. Giambelluca (1983).

Source/Depletion	Existing Conditions	After Golf Course Development
Average Rainfall	+32 in/yr	+32 in/yr
Irrigation	+85 in/yr	+78 in/yr
Runoff	-2.7 in/yr	-6.4 in/yr
Evapotranspiration	-53 in/yr	-37 in/yr
Groundwater Recharge	+61 in/yr	+67 in/yr

Calculations indicate a slight increase in recharge after development of the golf course; thus, groundwater supplies should not be adversely impacted.

Addition of the 12-inch water line along Kaukonahua Road will increase the capacity of the BWS distribution system. Future developments along Kaukonahua Road may benefit from the increased capacity.

Negative impacts due to development of the golf course are--

1. Increased demand on the BWS system.

2. Short-term construction impacts along Kaukonahua road during installation of the 12-inch line.

The BWS reports in its Oahu Water Plan (4th edition) that sustainable capacity of the Waialua wells was 2.00 MGD, with actual use of 1.67 MGD in 1980. The golf course will require an additional 0.02 MGD from the BWS system. Limitations of the BWS water system are due to infrastructure rather than source. Thus, negative impacts on the physical environment from a properly designed and operated water system should be negligible.

Construction impacts due to installation of a 12-inch line along Kaukonahua Road will be short-term. Impacts can be mitigated by limiting construction to off-peak traffic hours.

APPENDIX A

BOARD OF WATER SUPPLY LETTER

OF NOVEMBER 24, 1987

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843

NOV 30 1987

November 24, 1987

Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Dear Mr. Ishizaki:

Subject: Your Letter of November 5, 1987 Concerning the Availability of Water for the Proposed Waialua Golf Course

Thank you for your letter concerning the proposed golf course in the Waialua-Haleiwa area.

Our existing water system can accommodate the domestic demand for the golf course. The availability of water will be determined when the building permit application is submitted for our review and approval. If your development plan requires action by the City Department of Land Utilization, the plan should be approved by that department before we take action on the proposed development. If domestic water is made available, the applicant will be required to pay our Water System Facilities Charges for source-transmission and daily storage.

The property is located in the "No-Pass" zone where ground disposal of wastewater is not permitted. Therefore, all sewage disposal plans should be coordinated with the Sanitation Branch of the State Department of Health.

The developer will have to install the following improvements in order to provide the 2,000 gpd flow at the clubhouse as required by the Fire Department:

1. Install approximately 1,900 l.f. of 12" main along Kaukonahua Road from the vicinity of Kiekonea Way toward Weed Junction.

2. Install 12" main (private) from Kaukonahua Road to the clubhouse.

If you have any questions, please contact Albert Koga at 527-6123.

Very truly yours,

Kazu Hayashida

KAZU HAYASHIDA
Manager and Chief Engineer

APPENDIX G

MARKET STUDY FOR A WAIALUA GOLF COURSE

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MARKET STUDY FOR A WAIALUA GOLF COURSE

Waialua, Oahu, Hawaii

December 1987

MARKET STUDY FOR A WAIALUA GOLF COURSE

Waialua, Oahu, Hawaii

Prepared for:
Oceanic Properties, Inc.

Prepared by:
Helber, Hastert & Kimura, Planners

December 1987

CONTENTS

TABLES

FIGURES

I. INTRODUCTION AND SUMMARY

1.1 Purpose

Oceanic Properties, Inc. plans to construct an 18-hole golf course on approximately 214 acres of land in the vicinity of Waialua Town, Oahu. Current development plans call for the course to open in 1991. The purpose of this study is to assess the projected need for a course at the Waialua site c. 1991 in order to determine whether sufficient market demand will exist to suppport such an operation.

1.2 Methodology

The magnitude of need for a golf course at the Waialua site is estimated by comparing the current and projected supply of golf courses with the existing and projected demand for rounds of golf play. The existing supply and projected development of courses within each of three identified market areas encompassing the island of Oahu is examined first. The market demand analysis is then presented with population projections for each of the three market areas discussed first. Participation rates are then applied to the population projections to derive projected demand for rounds of golf play. Projected demand for rounds of golf play are then translated into demand for 18-hole golf courses. Finally, estimates of the projected demand obtained in the demand analysis are then compared to estimates of projected supply to determine the overall magnitude of need.

1.3 Summary of Significant Findings

Existing and projected market demand for rounds of golf play was found to exceed existing and projected supply of golf courses on Oahu over the projection period, 1985-2000. Demand for rounds of golf within the primary market area (in which the proposed Waialua course is located) currently exceeds supply by a factor of 2:1. This trend is expected to continue through 1991.

In summary, the findings of this market study indicate that sufficient market demand exists to support the opening of an 18-hole daily-fee golf course at the Waialua site in 1991, as currently proposed by Oceanic Properties, Inc.

II. SUPPLY ANALYSIS

2.1 Introduction

This section of the report examines the existing and projected supply of golf courses within the City and County of Honolulu. The section begins with an overview of existing golf course statistics relative to the island of Oahu. This is followed by the identification of specific market areas and a discussion of the location of existing golf courses relative to the site of the proposed Waialua course. The projected development of courses is then discussed with particular attention to which courses will be in operation by 1991 - the year the proposed Waialua course is planned to become operational.

2.2 Overview

In 1986, Oahu had a total of 28 golf courses, approximately 50 percent of the statewide total of 57 courses. Of the 28 courses, 11 (39 percent) are operated on a daily-fee basis, 4 (14 percent) are municipal courses, 4 (14 percent) are private country clubs and the balance of 9 (32 percent) are armed forces courses operated for the benefit of the armed services. Oahu is home to 4 of the State's 5 private country clubs, 11 of the State's 16 daily-fee courses (excluding resort courses), 3 of the State's 20 resort courses, 4 of the State's 7 municipal courses, and all of the State's armed forces courses.[1]

Based on a standard of resident population per golf course hole, Oahu ranks a distant fourth to the other three Counties (Kauai: 475; Oahu: 1,715: Maui: 396: Hawaii: 567). After excluding those courses not available for public play on a regular basis (i.e., Armed Forces courses and private country clubs), Oahu falls further behind the rest of the State (Kauai: 475, Oahu: 3,124, Maui: 415, Hawaii: 567).

2.3 Identification of Market Areas

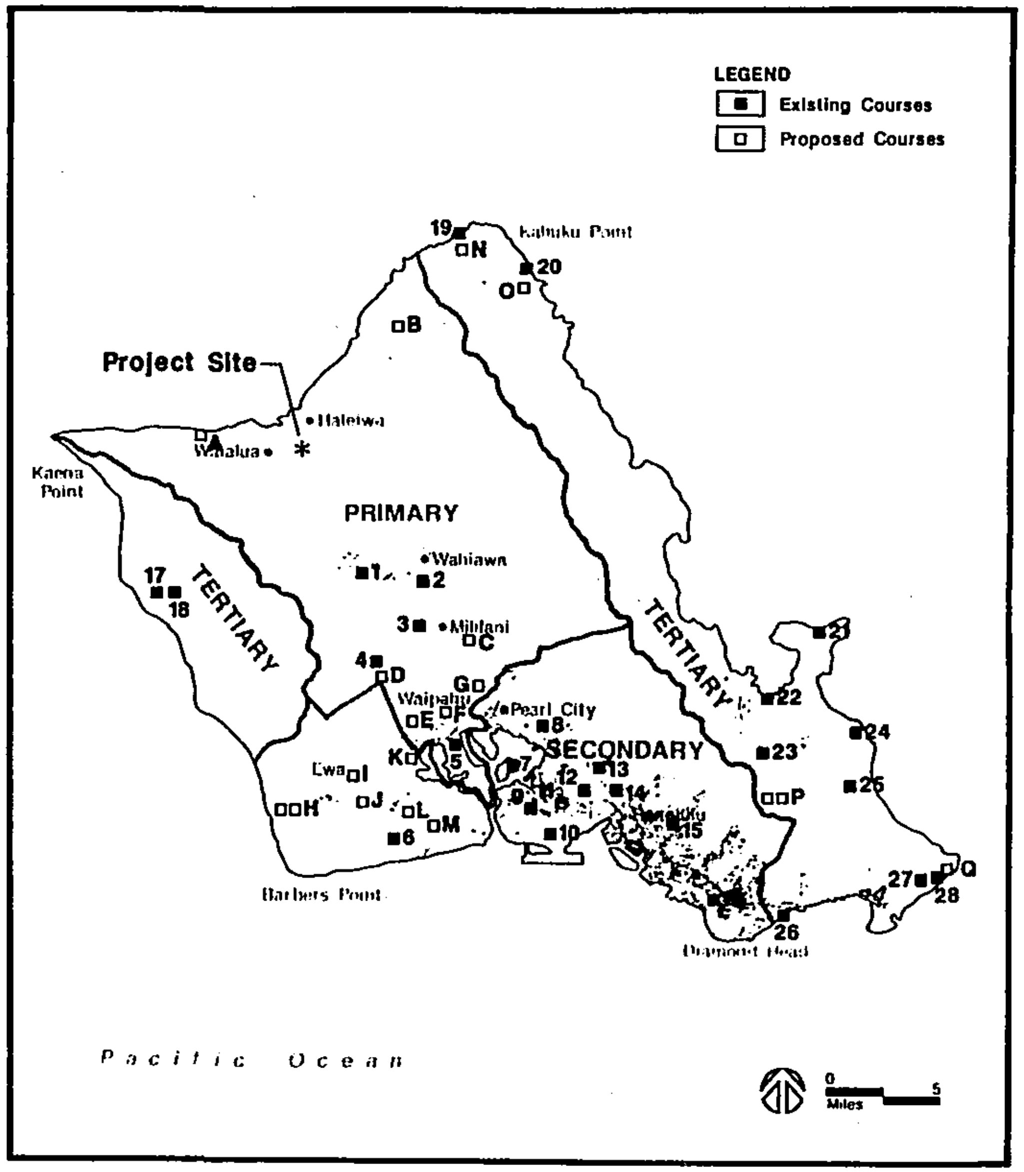
Because proximity to golf courses is a major component of market share (i.e., the closer a golf course is to a given population group, the greater its potential market share, other things being equal), existing and proposed courses are identified relative to distinct market areas in order to quantify this locational effect. The island of Oahu was divided into three market areas: a primary market area from which the majority of the demand is expected to be generated; a secondary market area from which some market support is expected; and, a tertiary area which is not expected to significantly influence market demand. A brief description of each of the market areas is presented below (additional information on each of the market areas is provided in Section 3.2 following).

Primary Market Area. The primary market area encompasses the North Shore and Central Oahu Development Plan areas (Figure 1).[2] Major communities located within the primary market area include: Waipahu, Mililani, Wahiawa, Haleiwa and Waialua. A total of five golf courses (all 18-hole, regulation courses) are currently located within the primary market area: two of which are military courses (Kalakaua and Leilehua); two are public daily-fee courses (Hawaii Country Club and Mililani Golf Club); and, one is a municipal course (Ted Makalena). (See Table 1 for numeric reference to Figure 1).

Secondary Market Area. The secondary market area includes the Ewa and Primary Urban Center Development Plan areas. This area supports a total of eleven golf courses at the present time, including six military courses (two of which are nine-holes only), two public daily-fee courses, two private clubs, and one municipal course.

Tertiary Market Area. The remainder of the island has been classified within the tertiary market area encompassing the Waianae, Koolaupoko, Koolauloa and East Honolulu Development Plan areas. The tertiary market supports a total of twelve

1. DPED 1986, Table 348
2. As identified by the Department of General Planning, City and County of Honolulu.



Waialua Golf Course Market Study, Oahu, Hawaii

FIGURE 1

EXISTING AND PROPOSED GOLF COURSES BY MARKET AREA

Oceanic Properties, Inc.

HELBER, HASTERT & KIMURA

courses at the present time including one military course, three resort courses, four public daily-fee courses, two municipal courses and two private country clubs.

2.4 Existing Golf Courses

As noted above, Oahu supports a total of 28 golf courses: 19 civilian and 9 military. The courses are listed in Table 1 by market area and type of operation, location, year opened, number of holes, and length of course. The number associated with each course is keyed to Figure 1 illustrating the physical location of each of these courses. As can be seen from Table 1, the last course to be opened on Oahu was the private Honolulu International Country Club in Salt Lake - ten years ago. The last daily-fee course to be opened was the Hawaii Kai championship course in 1973 - 14 years ago.

Table 1: EXISTING GOLF COURSES BY MARKET AREA: 1987

COURSE NAME	LOCATION	TYPE	YEAR OPENED	SIZE
Primary Market Area				
1.* Kalakaua G. S.	Schofield	Military	1918	18
2. Leilehua G.C.	Schofield	Military	1949	18
3. Mililani G. C.	Mililani	Daily-fee	1967	18
4. Hawaii C. C.	Kunia	Daily-fee	1957	18
5. Ted Makalena G. C.	Waipio	Municipal	1971	18
Secondary Market Area				
6. NAS Barbers Point G. C.	Ewa	Military	1966	18
7. Ford Island G. C.	Ford Island	Military	1962	9
8. Pearl C. C.	Aiea	Daily-fee	1967	18
9. Hickam G. C.	Hickam AFB	Military	1966	18
10. Hickam G. C.	Hickam AFB	Military	1966	9
11. Navy Marine G. C.	Aliamanu	Military	1948	18
12. Honolulu International C. C.	Salt Lake	Private	1977	18
13. Moanalua G. C.	Moanalua	Daily-fee	1898	9
14. Fort Shafter G. C.	Fort Shafter	Military	1919	9
15. Oahu C. C.	Nuuanu	Private	1906	18
16. Ala Wai G. C.	Honolulu	Municipal	1931	18
Tertiary Market Area				
17. Makaha G. C. (West)	Makaha	Resort	1966	18
18. Makaha G. C. (East)	Makaha	Resort	1969	18
19. Turtle Bay C. C.	Kahuku	Resort	1972	18
20. Kahuku G. C.	Kahuku	Municipal	1937	9
21. Kaneohe Klipper	Kaneohe MCAS	Military	1949	18
22. Bay View G. C.	Kaneohe	Daily-fee	1963	18
23. Pali G. C.	Kaneohe	Municipal	1953	18
24. Mid-Pacific C. C.	Lanikai	Private	1927	18
25. Olomana Golf Links	Waimanalo	Daily-fee	1968	18

Table 1: EXISTING GOLF COURSES BY MARKET AREA: 1987 (continued)

COURSE NAME	LOCATION	TYPE	YEAR OPENED	SIZE
Tertiary Market Area (Cont'd)				
26. Waialae C. C.	Kahala	Private	1927	18
27. Hawaii Kai (Executive)	Hawaii Kai	Daily-fee	1962	18
28. Hawaii Kai (Regulation)	Hawaii Kai	Daily-fee	1973	18

(* Number in left-most column is keyed to Figure 1)

Source: Gee 1984

2.5 Proposed Golf Courses

A number of golf courses are proposed for Oahu over the next ten year period. A brief summary of each of the proposed developments is presented below with special attention to the probability of the particular course to be operational by 1991, the year the proposed Waialua course is scheduled to open.

It should be noted that due to the recognized shortage of golf courses on Oahu (and, perhaps more importantly, the favorable exchange rates between the American Dollar and the Japanese Yen), there is a flurry of golf course proposals currently being discussed, some with merit and others without. A recent communication with the Director of the Department of Land Utilization indicated his department is aware of some 35 proposed courses in varying stages of implementation. Many are still at the initial talking stage, with little or no potential for commencing to the design and permit processing stage. Only those course proposals that can position themselves to take advantage of the current undersupply can be reasonably assured successful market support. The review conducted for this study identified a total of 17 proposed courses which have a medium to high probability of being constructed by 1997. Although some of the specific course proposals identified below may be delayed or cancelled, it is felt that the selection is reasonably representative of the number, type and location of courses expected to be developed over the next ten year period. Much of the information collected for this section was obtained through secondary sources. Estimates of the projected course opening dates represent, for the most part, the informed opinion of Helber, Hastert & Kimura, Planners.

Primary Market Area

A total of 7 courses (all 18-hole) are planned for the primary market area over the next ten year period (not including the proposed Waialua course, the subject of this market study). However, only one (Waikele) of these is expected to be operational by 1991.

A. **Mokuleia.** Japanese investors have recently acquired Northwestern Mutual Life Insurance Co.'s interest in the proposed Mokuleia Resort. The project area still requires State Land Use Commission, General Plan, Development Plan and zoning changes before work on the resort can commence. The specific development timetable is uncertain at this time. For the purposes of this study, it was assumed that one 18-hole resort course would be in operation by 1992.

B. **Obayashi.** A Japanese group is proposing to construct an 18-hole daily-fee course along with associated residential uses in the Pupukea Highlands area of the North Shore. They are currently requesting rezoning from Ag-1 to Country. It is estimated that the course will be opened for play by 1993.

C. **Kipapa.** A private group is looking into the possibility of developing a golf course on the floor of Kipapa Gulch on a site previously identified by the City and County for a municipal course. This course is expected to become operational in 1995.

D. **Nihon Kai.** A group of Japanese investors has acquired an interest in land currently under lease to the Oahu Sugar Company (through 1996) for purposes of constructing a golf course. The course is expected to be in operation by 1997.

E. **Village Park.** An 18-hole course is being planned as part of the Village Park residential community expansion. The site has received Urban Districting although Development Plan and Zoning changes will be held up pending a resolution of the current City Council moratorium on residential construction in Central Oahu. The course is expected to be operational by 1995.

F. **Waikele.** Amfac Properties, the developer of the Waikele residential community, have plans to develop an 18-hole private daily-fee golf course. It is estimated that this course will be in operation by 1991.

G. **Waiawa.** Developers of the Waiawa Ridge residential community are currently planning a total of 36 holes of golf, 18-holes of which may be operated as a private country club with the second 18-holes operated as a private daily-fee course. It is uncertain at this time when or if these courses will be developed due to County General Plan restrictions on residential development within the Central Oahu Development Plan area. For purposes of this study, one course is expected to be in operation by 1995.

Table 2: PROPOSED GOLF COURSES BY MARKET AREA

	COURSE NAME	LOCATION	TYPE	ESTIMATED OPENING	SIZE
	Primary Market Area				
A.*	Mokuleia	Mokuleia	Daily-fee	1992	18
B.	Obayashi	Pupukea	Daily-fee	1993	18
C.	Kipapa	Kipapa	Public	1995	18
D.	Nihon Kai	Kunia	Private	1997	18
E.	Village Park	Waipahu	Daily-fee	1995	18
F.	Waikele	Waipahu	Daily-fee	1991	18
G.	Waiawa	Waiawa	Daily-fee	1995	18

Table 2: PROPOSED GOLF COURSES BY MARKET AREA (continued)

	COURSE NAME	LOCATION	TYPE	ESTIMATED OPENING	SIZE
	Secondary Market Area				
H.	Ko Olina	Ewa	Resort	1990	18
I.	Makakilo	Ewa	Daily-fee	1995	18
J.	Kapolei Village	Ewa	Municipal	1991	18
K.	West Loch	Ewa	Municipal	1990	18
L.	Gentry Ewa	Ewa	Daily-fee	1990	18
M.	Meyers Corp.	Ewa	Daily-fee	1991	27
	Tertiary Market Area				
N.	Turtle Bay	Kahuku	Resort	1993	18
O.	Kahuku	Kahuku	Municipal	1993	9
P.	Royal Hawaiian C.C.	Maunawili	Daily-fee	1990	18
Q.	Queens Beach	Hawaii Kai	Daily-fee	1995	18

(* Letter in left-most column is keyed to Figure I)

Source: Helber, Hastert & Kimura, Planners

Secondary Market Area

A total of 6 courses (5 18-hole, 1 27-hole) are expected to become operational within the secondary market area within the next ten year period. Five of these (1 resort course, 2 municipal courses and 2 daily-fee courses) are expected to be operational by 1991.

H. **Ko Olina.** The proposed Ko Olina resort in Leeward Oahu has plans to develop a total of 36-holes of golf. The first 18-holes are currently under construction and are estimated to be operational by 1990. Based on the experiences of other major resorts around the State, it is probable that the second 18-hole course could come on line by 1995.

I. **Makakilo.** Finance Factors, developers of the Makakilo residential community in Leeward Oahu, is exploring the possibility of constructing an 18-hole golf course at Makakilo. This course could be operational by 1995.

J. **Kapolei Village.** The State Housing Finance and Development Corporation plans to develop an 18-hole regulation course adjacent to its planned residential community near Makakilo. Current plans are for the course to be operational by 1991.

K. **West Loch.** This is an 18-hole municipal course currently being proposed by the City and County of Honolulu as part of a planned affordable residential community. The course is currently programmed for opening in 1990.

L. Gentry Ewa. The Gentry Companies are proposing an 18-hole golf course as part of their Soda Creek residential project adjacent to Fort Weaver Road in Ewa. Current plans are for the course to be operational in 1990.

M. Meyers Corp. A Japanese group is proposing the development of an 27-hole regulation course near Ewa Beach. A request to rezone the site from Ag-1 to Ag-2 is currently being considered by the Honolulu Planning Commission. It is expected that this course will be operation by 1991.

Tertiary Market Area

A total of 4 courses (all 18-hole with the possible exception of the City's Kahuku course which could be a 9-hole expansion to the existing 9-hole course) are expected to be opened within the next ten year period. One of these (a daily-fee course) is expected to be operational by 1991.

N. Turtle Bay. Current development plans for the expansion of the Turtle Bay Hilton resort complex at Kahuku call for an additional 18-hole resort course. It is expected that this course will be operational by 1993.

O. Kahuku. The City and County of Honolulu is in the process of deciding whether to expand the existing 9-hole Kahuku municipal course to 18-holes or to close the course and develop a new 18-hole municipal course mauka of Kamehameha Highway. It is assumed that the Kahuku area will be served by an 18-hole municipal course by 1993.

P. Royal Hawaiian Country Club. Japanese investors plan to build two regulation-sized 18-hole daily-fee golf courses in the Maunawili area of Windward Oahu within the next ten years. It is estimated that one course will be operational by 1990 with the second course opened by 1995.

Q. Queens Beach. Downzoning of a portion of the Hawaii Kai residential community to golf course and related uses may stimulate the development of a third 18-hole course (the second regulation course) at the Hawaii Kai development. For purposes of this report, the course is expected to become operational by 1995.

2.6 Summary

A total of 17 courses which were determined to have a medium to high probability of development over the next ten year period were identified. Seven of these courses are located within the primary market area. Of these, only one (Waikele) is expected to be operational by 1991. A total of six courses are proposed for the secondary market area - all of which are located in Ewa. Five of the six courses (Ko Olina, Kapolei Village, West Loch, Gentry and Meyers) are expected to be operational by 1991. A total of four courses are proposed for the tertiary market area, one of which (Royal Hawaiian C. C.) is expected to be operational by 1991.

Based on the above survey, a total of seven 18-hole courses are scheduled to be operational by 1991, the year that the proposed Waialua course is opened. Table 3 presents the number of expected courses by market area which are scheduled to be

operational in 1991. Primary market area courses [3] are expected to increase from the current three to four by 1991. Secondary market area courses are expected to double from five courses in 1987 to ten courses in 1991. Tertiary market area courses are expected to increase from the current eleven courses to twelve courses in 1991.

Table 3: EXISTING AND PROPOSED GOLF COURSES BY MARKET AREA: 1991

Market Area	Existing Courses *	Proposed Courses **	Total
Primary	3	1	4
Secondary	5	5	10
Tertiary	11	1	12
Total	19	7	26

(* Exclusive of armed forces courses)
(** Not including the proposed Waialua course)

Source: Tables 1 and 2

III. MARKET DEMAND ANALYSIS

3.1 Introduction

The recreational demand for golf course play is a complex function of a number of variables including: the type of golf course (regulation vs. short course, number of holes, degree of difficulty, location, price, waiting time and quality of service) and socio-demographic variables of the market area under consideration (population growth, income, age, recreational preferences, ethnicity, etc). For the purposes of this study, it was felt that participation rates determined by survey questionnaire used in conjunction with population projections by market areas (participation rate approach) would yield the most satisfactory proxy for the determinants of demand discussed above. In the analysis below, a discussion of the market areas and associated population growth projections is first presented. The derivation of the participation rate is then reviewed and applied to the population projections. Estimated demand for daily rounds of golf play are then projected along with the associated number of golf courses required to accommodate the estimated demand.

3.2 Identification of Market Area Populations

Market demand is directly influenced by population growth, and the proximity of the projected growth to the proposed golf course site. To determine population growth effects, the island of Oahu was divided into three market areas as discussed in the preceding Section: a primary market area from which the majority of the demand is expected to be generated; a secondary market area from which some market support is expected; and, a tertiary area which is not expected to influence

3. Exclusive of armed forces courses.

market demands (refer to Figure 1). A brief description of each of the market areas and their associated population projections is presented below followed by a discussion of the impact of the Armed Forces community on the demand for rounds of golf.

Primary Market Area. The primary market area encompasses the North Shore and Central Oahu Development Plan areas. Major communities located within the primary market area, and their distance from and approximate commute time to the proposed golf course site are: Waipahu (23 miles, 31 minutes), Mililani (11.5 miles, 15 minutes), Wahiawa (8 miles, 11 minutes), Haleiwa (1 mile, 5 minutes) and Waialua (1 mile, 5 minutes). Population growth within the primary market area is expected increase at a slightly faster rate than the secondary, tertiary and islandwide areas with an annual compound growth rate of 0.92 percent for the 1985-2000 period. Resident population was estimated at 131,039 in 1985 [4] and is expected to grow to 150,291 by 2000 (Table 4).

Secondary Market Area. The secondary market area includes the Ewa and Primary Urban Center Development Plan areas. The closest community to the proposed golf course site is Pearl City located approximately 23 miles and 31 minutes away. The most distant community is Waikiki, located some 36 miles away. Population growth within the secondary market area is expected to increase at 0.89 percent per year between 1985 and 2000, a slightly slower rate than the primary market area, but still faster than the islandwide rate. Population in 1985 was estimated at 477,046 and is expected to grow to 544,734 by 2000.

Table 4: RESIDENT POPULATION PROJECTIONS BY MARKET AREA: 1985-2000

Market Area	1985	1990	1995	2000	Annual Compound Growth Rate 1985-2000
Primary	131,039	137,860	142,681	150,291	0.92%
Secondary	477,046	505,386	531,999	544,734	0.89%
Tertiary	207,215	216,054	222,220	230,675	0.72%
Total	815,300	859,300	896,900	925,700	0.85%

Source: Development Plan Status Review, (Vol. I), March 1, 1987 (Table IV-19, p. 71), HH&K tabulations

Tertiary Market Area. The remainder of the island has been classified within the tertiary market area which includes Windward Oahu, East Honolulu, and the Waianae Coast. Due to the distance of the proposed project from these areas and the many alternative and more proximate golf course alternatives available, negligible market support is expected from residents residing in the tertiary market area. Population in this area is expected to grow at a relatively slow 0.072 percent annual compound rate. 1985 population is estimated at 207,215 and is expected to increase to 230,675 by 2000.

4. DGP 1987, p. 71

3.2.1 Shortcomings of the Market Area Approach

As noted earlier, locational and population factors play an important role in determining projected demand for golf courses. Those living in a particular market area are more likely to support a golf course located in the same market area than one outside the market area, other things being equal. The actual demand for a particular golf course follows typical gravity model principles: the propensity to support golf course "a" over golf course "b" is inversely related to the time distance (and other variables) between the prospective golfer and the two courses. For example, the propensity for the golfer to frequent course "a" decreases with increased distance to course "a" other things being equal. Conversely, the propensity for the prospective golfer to frequent course "b" increases with decreased distance to the course "b." The use of simplified market areas, as used in this report, somewhat belies the complexity of the observed market phenomenon. A major flaw being the inability of the market area approach to predict the demands of those residing at or near the borders of the individual market areas. To reduce the potentially misleading results of estimating demand by individual market areas, the islandwide demand figures are also tracked. In this manner, the only potential error in the analysis can be attributable to the distributional demand effects, not the aggregate islandwide demand. In interpreting the demand figures presented in this section, it is important to bear in mind that the accuracy of the islandwide demand figures is probably much greater than the individual market area estimates.

3.2.2 Impact of Armed Forces

The Armed Forces community on Oahu (technically considered a component of the residential community) forms a significant part of the resident population base. As of July 1, 1985, there were 121,670 military personnel and dependents living on Oahu - representing approximately 15 percent of the resident population.[5] Members of the armed forces and their dependents are eligible to play golf on any one of the military's 9 golf courses. Six of these courses are 18-hole par-72 regulation-sized courses - some of which have been referred to as "...the best in the State." If one assumes the same golf participation rate within the Armed Forces community as in the civilian/resident community (two percent), approximately 2,433 members of the armed forces (and dependents) would be likely to play golf on the "Demand Day." Using a capacity of 300 rounds of play per day opened, [6] it would appear that the average capacity of the nine armed forces courses is approximately 2,700 rounds per day - sufficient capacity to accommodate the estimated user population. Because of the available capacity of the military courses, their overall playability, and the subsidized rate structure, it is assumed that Armed Forces golf players are not part of the same market segment supporting public or private, civilian courses. Corollarily, because civilian players are only allowed to play on the Armed Forces courses as invited guests or in tournament play; civilian players can not be considered part of the market segment supporting Armed Forces courses. Therefore,

5. DPED 1985, Table 206
6. See related discussion on average rounds of play per course in Section 3.3.2

it is desirable to extract the military component of the overall resident population base to arrive at a truer picture for the demand for civilian courses.[7]

For the purposes of this study, armed forces personnel and dependants are assumed to be distributed throughout the island in proportion to resident population in each of the market areas (ie: 16 percent of the resident population resides in the primary market area, therefore, 16 percent of the armed forces and dependants population is assumed to reside in the primary market area). Table 5 presents an adjusted version of Table 4 indicating estimated resident population net of armed forces personnel and dependants.

Table 5: ADJUSTED* POPULATION PROJECTIONS BY MARKET AREA: 1985-2000

Market Area	1985	1990	1995	2000	Annual Compound Growth Rate 1985-2000
Primary	111,484	118,340	123,325	130,537	1.06%
Secondary	405,855	433,827	459,830	473,137	1.03%
Tertiary	176,292	185,462	192,074	200,356	0.86%
Total	693,630	737,630	775,230	804,030	0.99%

(* Net of armed forces and dependents)

Source: Table 4, HH&K Tabulations

As noted, the revised demand projections presented in Table 5 have removed the Armed Forces component from the resident population base. The elimination of this relatively stable population component from the resident population has the effect of decreasing the absolute levels of population found in Table 4 while increasing the growth rate within the remaining population component (i.e., 1.06% per year growth rate within the primary market area without the military component vs. 0.92% per year with the military component). This will increase the rate growth in the demand for golf course play.

3.3 Market Demand Projections

3.3.1 Participation Rate Approach

This approach to determine market demand utilizes peak-day participation rates provided by surveys performed for the State Recreation Plan [8] as a basis for estimating demand. A brief discussion of the Functional Plan survey methodology and findings is presented below.

Resident households and visitor parties were surveyed by the State Recreation Plan Demand Survey regarding their participation in outdoor recreational events in

7. Armed forces and dependent population assumed to remain stable at 1985 levels throughout the projection period.
8. DLNR 1980

September and October 1978. Twenty major types of outdoor recreation activities were identified in the survey, including golf. Households participating in the survey were asked (among other questions) "Has any member of the household [played] golf in the last week?" If the answer to this question was yes, the respondent was then asked what day or days were involved, what the location of the course was and whether the course was public or privately operated. The visitor survey asked the same questions of visitor parties.

The results from these surveys were then analyzed to determine a "Peak Week Day Rate" and a "Peak Weekend Rate" of participation for each recreational activity. These are conceptual days on which participation is at its peak. The "Demand Day" is derived from the higher of the Peak Week Day and the Peak Weekend rates.[9] The final outcome of the demand analysis was the calculation of participation in each of the 20 recreational activities on the "Demand Day" adjusted to the base year of 1980. The "Demand Day" is simply the day on which the most resident and visitor participation in recreation occurs. Information on participation was developed at the overall State level, at the county level and by numerous planning areas within each of the counties.

The results of the demand survey concluded that a total of 11,714 residents and visitors played golf on the island of Oahu on the "Demand Day", 1980.[10] Of this, approximately 11,281 persons (approximately 2 percent of resident population - including Armed Forces) were local residents of Oahu and 433 persons (approximately 1 percent of Oahu's average daily visitor census) were visitors.

As noted, the demand day represents a peak demand period in the year, not an average or a minimum. Because of Oahu courses' year-round playability and associated lack of significant fluctuations in seasonal play (± 10% variance from mean), the demand day statistic is felt to represent a suitable metric for estimating demand.[11]

3.3.2 Demand Projections

Daily Demand for Golf. The resident participation rate identified in Section 3.3.1 is applied to market area population projections discussed in Section 3.2 to determine the daily demand for rounds of golf play for each market area. A number of assumptions are made with regard to projecting historical participation rates over future population growth, the most notable of which concern the stability of recreational preferences and other socio-demographic variables discussed previously such as changes in disposable income. Other implicit assumptions concern the stability in the golf course facility itself over the projection period (i.e., changes in method of play, advances in equipment technology, etc.). The basic assumption made here is that in the near term (the term of the projection period, 1985 - 2000) these shifts will remain relatively stable and hence be insignificant.

9. Ibid. p. 30
10. Ibid. p. 67
11. See related discussion on an average daily play in Section 3.3.2

Daily Golf Course Capacity. To determine the number of courses required to satisfy the projected demand, it was necessary to identify a daily capacity figure for the average golf course. This is somewhat problematic because of the great range in capacity of Oahu courses. For example, municipal courses are generally "faster" courses which permit a greater number of players to play each day. The Ala Wai Golf Course maintained by the City and County of Honolulu Department of Parks and Recreation experienced 198,656 rounds of play during the 1986-1987 Fiscal Year, an increase of 0.5 percent from the previous year. [12] Assuming 360 days of operation, this equates to a daily play of 547 rounds. (It should be noted that the Ala Wai course is recognized as one of the world's most busiest courses.) The average daily rounds of play for the three regulation-size municipal courses in the 1986-1987 Fiscal Year was 468 rounds per day (426 rounds not including the Ala Wai Course). An analysis of annual rounds of play at ten regulation-size daily fee courses on Oahu during 1985 indicated an average of 72,900 rounds per year or approximately 202 rounds per day (Range: 111 at Sheraton Makaha to 278 at Olomana). [13] For purposes of this study, average play per course is estimated at 300 rounds per day. The daily demand for rounds of golf shown in Table 6 are adjusted by the average daily play per course discussed above to determine the number of golf courses required to satisfy the demand for golf course rounds of play.

Table 6: RESIDENT DEMAND BY MARKET AREA: 1985-2000

	1985		1990		1995		2000	
Market Area	Rounds per Day	Equivalent Golf Courses	Rounds per Day	Equivalent Golf Courses	Rounds per Day	Equivalent Golf Courses	Rounds per Day	Equivalent Golf Courses
Primary	2,230	7	2,367	8	2,467	8	2,611	9
Secondary	8,117	27	8,677	29	9,197	31	9,463	32
Tertiary	3,526	12	3,709	12	3,841	13	4,007	13
Total	13,873	45	14,753	49	15,506	52	16,081	54

(Numbers may not sum due to rounding)

Source: HH&K Tabulations

Based on resident population alone (net of armed forces and dependants), the primary market area appears able to support a total of 8 golf courses through 1990, increasing to 9 courses by 2000. The island of Oahu was able to support 46 courses in 1985 rising to 54 courses in 2000.

As noted, the demand day statistic represents a peak demand period in the year, not an average or minimum. A calculation was made to estimate the difference between the predicted demand day rounds of golf play and the average daily rounds of golf play during the base year of 1985. A total of 14,554 daily rounds were projected for the demand day compared with a total of 5,378 average rounds in 1985 - average vs.

12. Office of the Mayor 1987, p. 229
13. Nakaleon, Levander and Whitney 1986, p. 4

demand day differ by a factor of 2.7 times. Due to the lack of significant seasonality in golf play, the difference in these two measurements can only be explained by a significant latent demand for golf play. If more courses were available, more people would participate in the sport.

3.3.3 Impact of Visitors

On the average day, Oahu's resident population is complimented by a significant number of transient visitors. In 1985, the average daily visitor census was 68,100 visitors. [14] This is projected to rise to 92,500 in 2000 amounting to an annual compound rate of growth in excess of 2 percent (compared to 0.85 percent in the resident population). Because of the influence of visitors on the demand for golf play, the rate of increase in overall demand for golf play on Oahu is greater than that experienced in the resident population alone (the rate of growth in the average daily visitor census being greater than the rate of growth in the resident population). As noted above, the State Recreational Functional Plan survey found that approximately 1 percent of the transient visitor population will play golf on Oahu during the "demand day." This equates to 681 visitor players in 1985 increasing to 925 visitor players in 2000. At a rate of 300 rounds per day per course, this translates to the need for 2 additional courses in 1985 rising to 3 courses in 2000.

To estimate the effect of transient demand within the three market areas, the projected average daily census was distributed in proportion to the adjusted resident population within each market area. The distribution indicated a marginal impact on demand within the primary area. The greatest impact was in the secondary market area where sufficient demand exists in 1985 to support 2 courses.

It should be noted that the continuing trend of an ever increasing proportion of eastbound visitors (from Japan and other Asian countries) within the average daily visitor census coupled with the eastbound visitor's recognized demand for golf course facilities, indicates that the visitor participation rate initially established in the 1978 Functional Plan survey will probably tend to undercount the actual daily use of golf course facilities.

3.4 Summary

The total projected demand for golf courses represents the sum of the adjusted resident demand (net of armed forces and dependants) and the visitor population. Table 8 presents this summary information. The numbers shown in the right columns represent both 1990 and 1995 estimated demand figures.

14. DPED 1984, p. 5

Table 7: TOTAL DEMAND BY MARKET AREA: 1990-1995

Market Area	Projected Demand for Golf Courses 1990	1995
Primary	8	9
Secondary	31	32
Tertiary	13	14
Total	52	55

(Numbers may not sum due to rounding)

Source: HH&K Tabulations

As expected, the demand for courses is directly related to projected population levels within each of the three market areas. As noted earlier, the use of market areas to identify market demands tends to oversimplify the complex interrelationships between market areas. Indeed, courses constructed within one market area will satisfy the needs of some golfers in another market area. The analysis indicates that on the "demand day" in 1991 (the day of peak participation), approximately 53 public courses on Oahu will be required to satisfy the recreational needs of Oahu's golfers. These figures are based on a number of assumptions, most notably, the rate of participation and the capacity of the proposed courses. If participation in golf increases, as national trends indicate, the figures represented here will tend to understate demand. If, on the other hand, the average capacity of the future courses increases (i.e., such as from the introduction of new technology to decrease the amount of time per round or design changes resulting in shortened courses), the figures will tend to overestimate demand.[15]

IV. CORRELATION

A comparison of the existing and projected demand for golfing facilities and the existing an projected supply of golf course facilities can now be made. Table 8 summarizes information found in Tables 3 and 7. As can be seen, Oahu appears to be underserved by golf courses by a factor of 2:1. The projections indicate the need for twice as many courses on the demand day in 1991 as are planned for construction. It is readily apparent from Table 9 that there is a demonstrable need for additional golf courses on Oahu beyond that which is currently planned for construction.

15. For example, if average rounds per course were increased from the current 300 daily rounds to, say, 350 rounds per day, a total of 7 courses would be needed within the primary market area and a total of 44-47 courses required islandwide during the 1990-1995 period.

Table 8: PROJECTED NEED FOR GOLF COURSES BY MARKET AREA: 1991

Market Area	Projected Demand for Golf Courses 1990-1995	Projected Supply of Golf Courses by 1991	Projected Need for Golf Courses
Primary	8-9	4	4-5
Secondary	31-32	10	21-22
Tertiary	13-14	12	1-2
Total	52-55	26	26-29

(Numbers may not sum due to rounding)

Source: Tables 3 and 7

Notwithstanding the caveats discussed regarding predicting demands at the less-than-islandwide level, it appears that the secondary market area (including Ewa and the Primary Urban Center) will experience the greatest unmet demand - almost three times as many courses will be required to meet the "demand day" needs of 1991 than will have been constructed. The primary market area which includes the proposed Waialua golf course site, appears to be underserved by almost a factor of 2:1; 4-5 additional courses could be supported within this area. The tertiary market area appears to be the most adequately served market with a 1991 demand day shortfall of 1-2 courses. In light of the indicated need, it can be reasonably assumed that a sufficient market exists to support the operation of a public daily-fee golf course operation at the Waialua site.

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APPENDIX H

TRAFFIC IMPACT REPORT
WAIALUA GOLF COURSE

TRAFFIC IMPACT REPORT
WAIALUA GOLF COURSE

Prepared for: Oceanic Properties, Inc.

Honolulu, Hawaii

Prepared by: Parsons Brinckerhoff Quade & Douglas, Inc.

Honolulu, Hawaii

Date: January 6, 1988

INTRODUCTION

Oceanic Properties, Inc. has proposed to develop an eighteen-hole golf course near Waialua, on the north shore of Oahu (Figure 1). The proposed project would be located east of Kaukonahua Road between its intersections with Farrington Highway (Thomson Corner) and Kamehameha Highway (Weed Circle). The property is presently used for sugar cane production, except for the gully area near Poamoho Stream.

The Highway Capacity Manual[1] analysis for unsignalized intersections was used to identify traffic conditions. The analysis evaluates gaps in the major street traffic flow and calculates capacities available for left turns from the major street across oncoming traffic and for left and right turns onto the highway from the minor street. The analysis determines the level of service from the reserve of capacity, which is the capacity less the demand volume for each controlled movement. Table 1 shows the criteria for levels of service for unsignalized intersections.

Table 1
LEVEL OF SERVICE CRITERIA (UNSIGNALIZED INTERSECTIONS)

Reserve of Capacity	Level of Service	Expected Delay to Controlled Movement
400	A	Little or no delays
300 - 399	B	Short traffic delays
200 - 299	C	Average traffic delays
100 - 199	D	Long traffic delays
0 - 99	E	Very long traffic delays
less than 0	F	Demand exceeds capacity; extreme delays

[1]Transportation Research Board, Highway Capacity Manual, Special Report 209, 1985.

EXISTING CONDITIONS

Kamehameha Highway, Waialua Beach Road, Farrington Highway and Kaukonahua Road are the major roads linking the Waialua area to other parts of the island. In the vicinity of the project, these roads are all two-way roads with one lane in each direction.

At Thomson Corner, which is south of the project, a T-intersection is formed by Farrington Highway and Kaukonahua Road. The major east-west road, named Kaukonahua Road to the east and Farrington Highway to the west, connects Wahiawa to Waialua and Mokuleia. Kaukonahua Road is the minor leg to the north, connecting Thomson Corner to Weed Circle. All approaches to the intersection have single lanes shared by all movements. The minor north leg is stop-controlled.

Weed Circle is a traffic rotary situated approximately one mile north of Thomson Corner. Other roadways served by the rotary are Kamehameha Highway to the north (Haleiwa) and east (Wahiawa) and Waialua Beach Road to the west. Traffic entering the rotary from Kamehameha Highway is given the right-of-way; traffic already in the rotary must yield to westbound Kamehameha Highway traffic from Wahiawa and stop for southbound Kamehameha Highway traffic from Haleiwa. Entrance into Weed Circle from Waialua Beach Road and Kaukonahua Road are yield-controlled. Speed limit within the rotary is 25 miles per hour (mph).

Kaukonahua Road between Weed Circle and Thomson Corner has a posted speed limit of 35 mph. Keakula Street, Paahihi Street, Kaamooloa Road, and Hukilau Loop serve residential areas and form T-intersections along Kaukonahua Road. The minor street approaches are stop-controlled with a single lane for left and right turns, while Kaukonahua Road approaches are single shared turn-through lanes.

Present Waialua Sugar Company cane haul operations

Cane-haul and other agricultrual roads also intersect the public road system. A cane-haul crossing of Kaukonahua Road occurs just north of Hukilau Loop; the cane-haul road network to the east can also be accessed at several other locations along Kaukonahua Road. An agricultural road proceeds south from Thomson Corner. These roadways have minimal traffic volumes, and have only seasonal use.

Traffic Conditions

Kaukonahua Road in the vicinity of the proposed project serves local traffic generated by residents of the area, other Waialua traffic, commuters traveling between Oahu's North Shore and Central Oahu, and other vehicles visiting the area. The highest traffic volumes occur during weekday afternoons (PM Peak Hour) and in early afternoons on weekends.

Traffic counts taken by the State Highways Division[2] were evaluated to estimate existing (1988) weekday traffic volumes. Counts taken at Thomson Corner have not varied significantly between 1976 and 1985, as shown in Table 2. Existing weekday traffic volumes, therefore, were estimated using the latest available count, taken in November 1985.

The highest hourly traffic at Thomson Corner was recorded between 4:00 PM and 5:00 PM, during which time 900 vehicles were counted at the intersection. The analysis of the unsignalized intersection, using the volumes from the traffic assignment shown in Figure 2, gives Level of Service (LOS) A for traffic turning left from eastbound Farrington Highway into Kaukonahua Road, and LOS B for traffic stopped on the southbound approach of Kaukonahua Road.

Between Thomson Corner and Weed Circle, Kauhonahua Road carries approximately 540 vehicles per hour (vph) during the PM Peak Hour. This volume is approximately 30 percent of the roadway's capacity. Evaluation of each of the T-intersections along this segment of road shows LOS A for all intersection movements.

State Highways Division traffic counts at Weed Circle show increasing traffic; between August 1982 and February 1985, daily entering traffic increased 23 percent. The increase, however, has occured primarily on the Kamehameha Highway legs of the junction (Table 3). Based on these counts, the 1988 traffic at Weed Circle is estimated to be 22,150 vehicles per day. Figure 3 shows the traffic assignment for Weed Circle.

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[2]State of Hawaii, Department of Transportation, Highways Division.

Table 2

TRAFFIC COUNT HISTORY

Thomson Corner

Date of Count	Entering traffic (vpd)
June 1976	7,883
April 1977	8,325
March 1978	8,671
August 1979	8,530
August 1981	7,641
August 1982	9,829
August 1983	9,442
September 1984	8,911
November 1985	8,887

vpd = vehicles per day

Source: State of Hawaii, Department of Transportation, Highways Division

Table 3

TRAFFIC COUNT HISTORY

Weed Circle

	Entering traffic (vpd)			
	August 1982	August 1983	September 1984	February 1985
East (Kamehameha Hwy.)	3,670	3,969	4,860	5,516
North (Kamehameha Hwy.)	6,585	7,163	6,868	7,964
West (Waialua Beach Rd.)	2,621	2,925	2,880	2,895
South (Kaukonahua Rd.)	2,628	2,666	2,509	2,729
Total entering	15,504	16,723	17,117	19,104

vpd = vehicles per day

Source: State of Hawaii, Department of Transportation, Highways Division

Each merge location within Weed Circle was analyzed as an unsignalized intersection. Rotary traffic that stops or yields to Kamehameha Highway traffic would experience LOS C or average delays; northbound Kaukonahua Road traffic yielding to rotary traffic would be LOS A while LOS B describes the Waialua Beach Road entry.

Weekend conditions were evaluated using traffic counts and field observations made in 1986 as part of a traffic study[3] for proposed development in Mokuleia. The weekend peak hour is expected to occur on Sunday, between 1:15 p.m. and 2:15 p.m. Weekend traffic volumes were estimated to increase at rates of one percent per year at Thomson Corner and two percent per year at Weed Circle.

The unsignalized intersection analyses of the weekend traffic assignments shown in Figures 2 and 3 show delays for some movements at both Thomson Corner and Weed Circle. Although LOS A describes the Farrington Highway-to-Kaukonahua Road left turn at Thomson Corner, southbound Kaukonahua Road traffic has LOS D. At each T-intersection along Kaukonahua Road between Thomson Corner and Weed Circle, weekend peak hour conditions are described by LOS A.

At Weed Circle, rotary traffic yielding to the high volume of traffic on Kamehameha Highway from Wahiawa experiences very long delays, or LOS E. Rotary traffic stopped for Kamehameha Highway traffic from Haleiwa has LOS C; the other yield-controlled junctions operate at LOS A.

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[3]Parsons Brinckerhoff Quade & Douglas, Inc. Traffic Impact Report, Mokuleia, May 1986.

FUTURE CONDITIONS

The State Highways Division has programmed the Haleiwa Bypass Road project[4] for completion by the end of 1992. The project will construct a two-lane highway bypassing Haleiwa town and connecting to Kamehameha Highway east of Weed Circle and north of Haleiwa. The project is expected to reduce traffic on Kamehameha Highway in Haleiwa, including Weed Circle.

With or without the proposed golf course, increases in traffic volumes in the North Shore area are expected. Although the proposed golf course is expected to be completed and in use by 1991, future conditions in 1993, without the Haleiwa Bypass Road, were evaluated to identify the project's potential traffic impact.

Weekday traffic volumes along Kaukonahua Road are not expected to change without development of the golf course. Traffic conditions at intersections would be similar to existing conditions since no roadway improvements are planned. The expected one percent per year increase in weekend traffic will have only minimal effect on traffic conditions; levels of service along Kaukonahua Road would not change.

At Weed Circle, however, traffic volumes are expected to increase considerably. Weekday traffic is projected to increase to 27,750 vpd, with peak hour volumes increasing proportionately. Weekend peak hour traffic is also expected to increase, at a rate of two percent per year. Figures 4 and 5 show traffic assignments for 1993 without the proposed project.

The analyses indicate that PM Peak Hour conditions at Weed Circle would deteriorate slightly, falling to LOS B for traffic entering from Kaukonahua Road and to LOS D for rotary traffic waiting for gaps in the westbound Kamehameha Highway traffic from Wahiawa. Weekend conditions would have greater change, with traffic demand exceeding capacity at the rotary/westbound Kamehameha Highway junction.

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[4]State of Hawaii, Department of Transportation, Highways Division. (per telephone conversation with H. Tao, Design Services Section)

Proposed Project

The proposed project is an eighteen-hole golf course with a driving range and clubhouse. The traffic generated by the project is estimated from the total area of the site, or 214 acres, as shown in Table 4. Traffic generated during the weekend peak hour was assumed to be divided equally between entering and exiting.

Table 4

TRAFFIC GENERATION

	Trip Rate*	Traffic Generated
Average Weekday	6.9	1,480
PM Peak Hour - In	0.08	17
Out	0.31	66
Weekend Peak Hour	0.64	137

* Source: Institute of Transportation Engineers, Trip Generation (Third Edition).

Existing traffic volumes in the area were used to distribute project generated traffic. Table 5 shows the assignments of project traffic. Figures 6, 7, and 8 show future traffic assignments with the project. Project traffic was assumed to be part of the growth of traffic in the weekend peak hour, during which most trip purposes are recreational in nature. In the weekday PM peak hour, however, the project traffic was added to the other traffic in the area, since the other traffic included many diverse trip purposes.

Project Impacts

The proposed project will have minimal impacts when compared to future conditions without the project. At the southbound Kaukonahua Road approach to Thomson Corner, delays are expected to increase, with LOS E describing future weekend conditions with the project. Other levels of service during both peak hours at Thomson Corner and at Weed Circle would not change (Table 6).

Table 5

TRAFFIC DISTRIBUTION

Roadway	PM Peak Hour from project	PM Peak Hour to project	Weekend Peak Hour from project	Weekend Peak Hour to project
Kamehameha Highway				
East (Wahiawa)	16	4	13	20
North (Haleiwa)	31	8	23	18
Kaukonahua Road				
East (Wahiawa)	4	2	8	14
Local	4	1	5	5
Farrington Highway				
West	6	1	12	6
Waialua Beach Road				
West	5	1	7	5
Total	66	17	68	68

Table 6
TRAFFIC ANALYSES FINDINGS

Location/Peak Hour	Existing (1988) Reserve	Existing (1988) LOS	Future (1991) without project Reserve	Future (1991) without project LOS	Future (1991) with project Reserve	Future (1991) with project LOS
THOMSON CORNER						
Farrington Highway-EB left turn						
Weekday PM Peak Hour	629	A	629	A	626	A
Weekend Peak Hour	520	A	493	A	484	A
Kaukonahua Rd-SB (stop)						
Weekday PM Peak Hour	310	B	310	B	302	B
Weekend Peak Hour	152	D	112	D	91	E
PROJECT ACCESS ROAD						
Kaukonahua Road-SB left turn						
Weekday PM Peak Hour	-	-	-	-	856	A
Weekend Peak Hour	-	-	-	-	798	A
Project Road-WB (stop)						
Weekday PM Peak Hour	-	-	-	-	616	A
Weekend Peak Hour	-	-	-	-	501	A
WEED CIRCLE						
Rotary WB at SB Kamehameha Hwy.(stop)						
Weekday PM Peak Hour	225	C	179	D	167	D
Weekend Peak Hour	246	C	183	D	157	D
Waialua Beach Road at rotary (yield)						
Weekday PM Peak Hour	388	B	265	C	256	C
Weekend Peak Hour	455	A	384	B	367	B
Kaukonahua Road at rotary (yield)						
Weekday PM Peak Hour	414	A	257	C	200	C
Weekend Peak Hour	530	A	455	A	424	A
Rotary NB at EB Kamehameha Hwy. (yield)						
Weekday PM Peak Hour	238	C	58	E	15	E
Weekend Peak Hour	89	E	-4	F	-31	F

Notes: Reserve = reserve capacity from unsignalized intersection analysis
LOS = Level of Service, SB = southbound
NB = northbound, EB = eastbound, WB = westbound

Along Kaukonahua Road, high levels of service will describe conditions at all intersections, including the project access road. An evaluation (Harmelink[5]) of the left turn volumes at the project access road indicate that a separate left turn lane into the project would not be warranted.

The LOS F findings for rotary traffic at the merge with westbound Kamehameha Highway traffic during the weekend peak hour indicate that demand volumes would exceed theoretical capacity. This condition will be mitigated by the diversion of Kamehameha Highway traffic onto the Haleiwa Bypass Road, which is expected to be completed in 1992. Prior to opening of the new bypass, long delays could be expected for weekend peak hour traffic which yield to westbound Kamehameha Highway traffic from Wahiawa.

Cane-haul operations will also be affected by development of the golf course. Alternative plans are being considered and coordinated with Waialua Sugar Company; the existing crossing near Hukilau Loop is expected to be maintained.

[5]Harmelink, M.D. "Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections." Highway Reasearch Record No. 211, 1967, pp. 1-18.

CONCLUSIONS AND RECOMMENDATIONS

Traffic volumes in the Waialua area are expected to increase with or without the proposed golf course. The golf course, however, will not have a significant impact to traffic conditions in either the weekday afternoon peak hour or the weekend peak hour. The proposed project road, intersecting with Kaukonahua Road at a T-intersection, would provide adequate access for the golf course. A stop sign control for traffic exiting the golf course should be provided.

The analysis indicates that weekend peak hour traffic demand could exceed capacity at Weed Circle by year 1993. Completion of the Haleiwa Bypass Road in 1992, as programmed, is recommended.

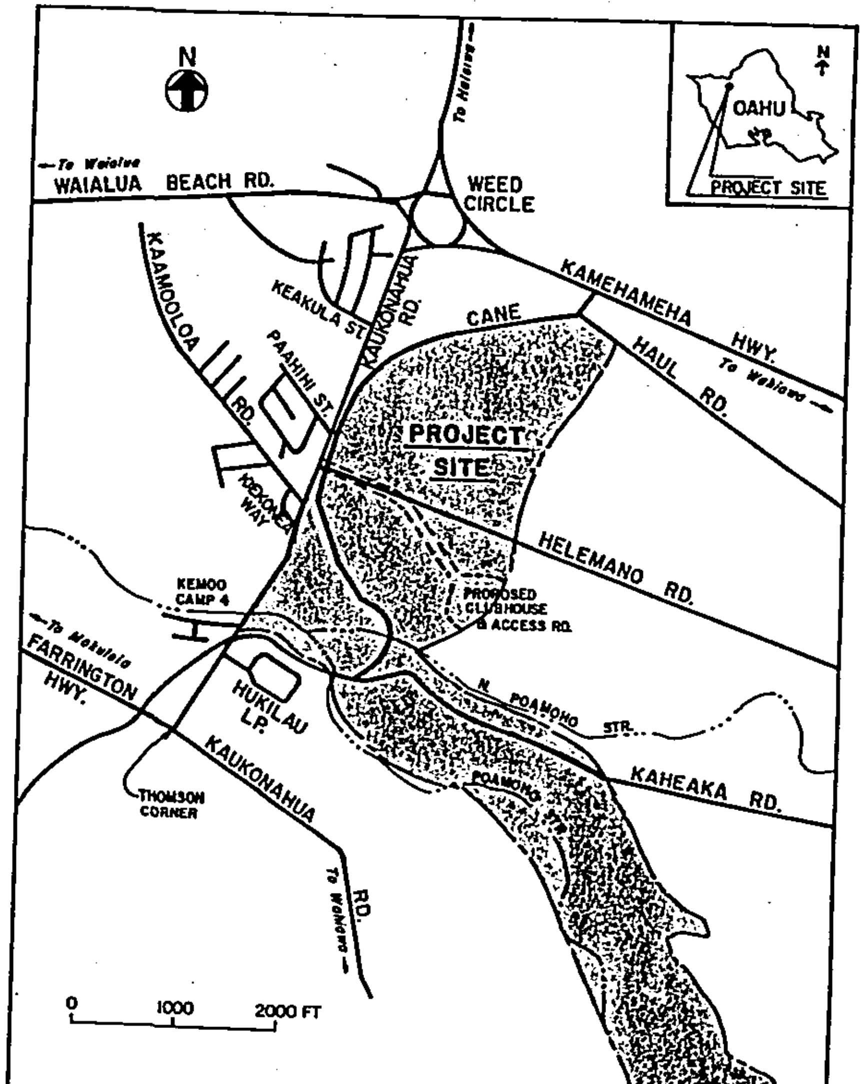

FIGURE 1
LOCATION MAP

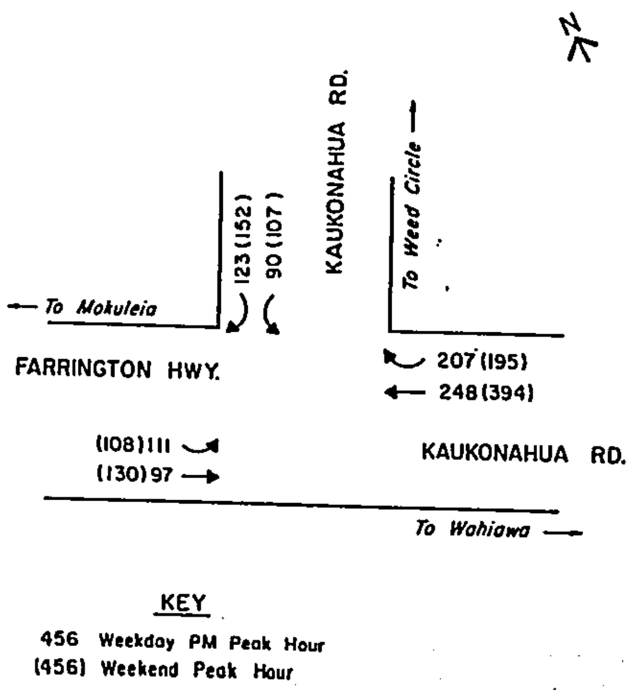

FIGURE 2
TRAFFIC ASSIGNMENT
EXISTING (1988) CONDITIONS
THOMSON CORNER

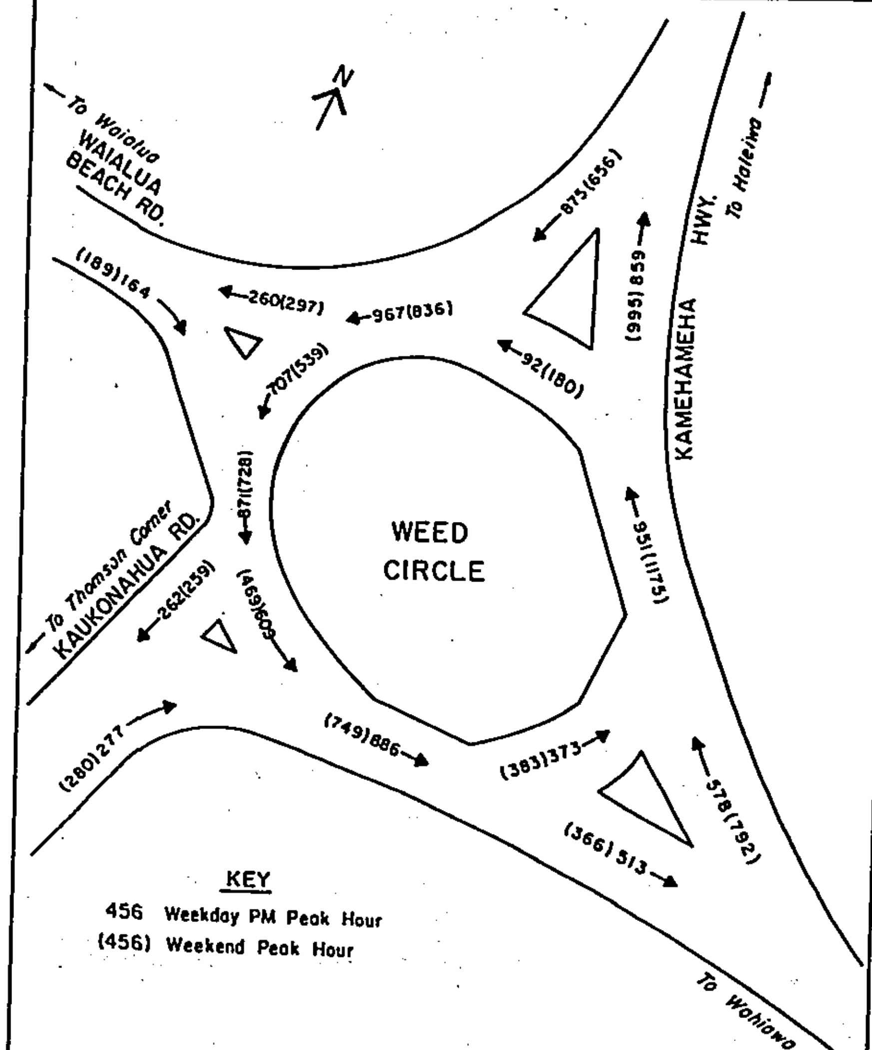

FIGURE 3
TRAFFIC ASSIGNMENT
EXISTING (1988) CONDITIONS

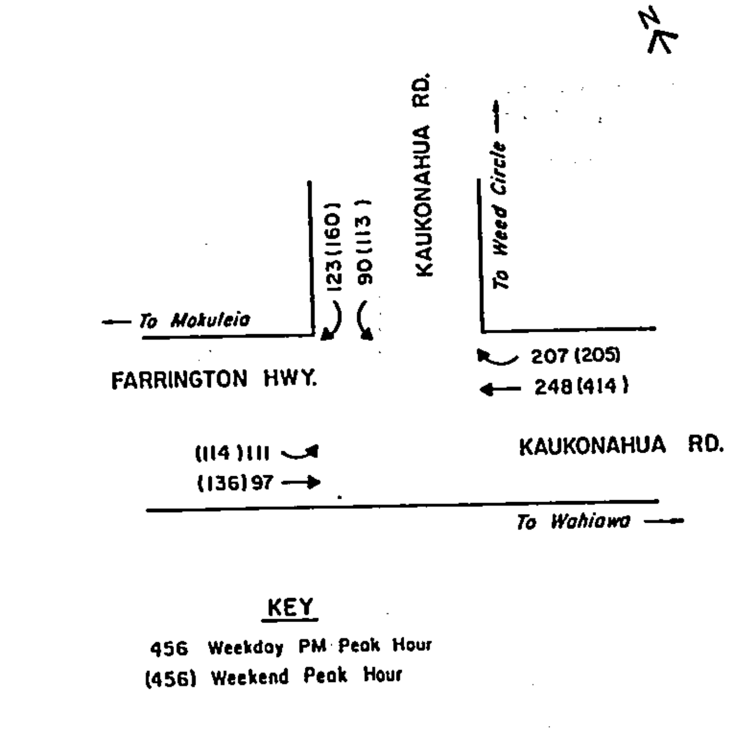

FIGURE 4
TRAFFIC ASSIGNMENT
FUTURE (1993) WITHOUT PROJECT
THOMSON CORNER

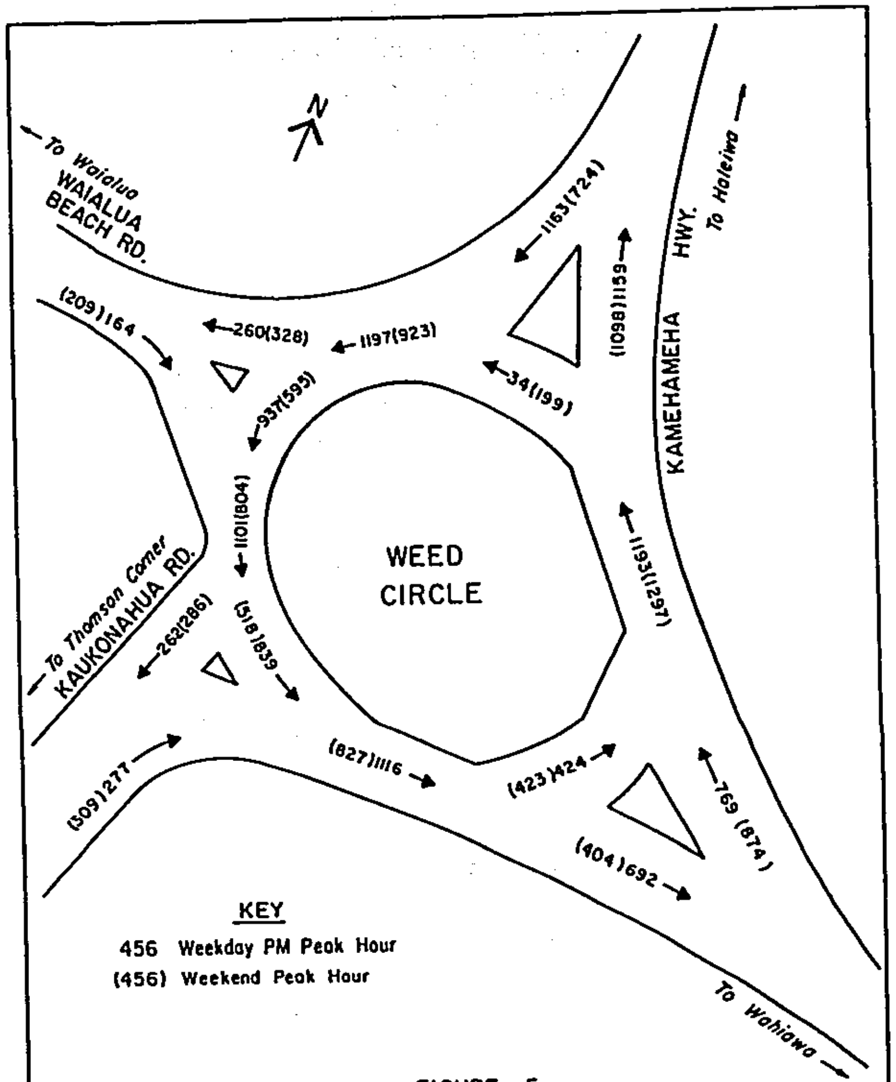

FIGURE 5
TRAFFIC ASSIGNMENT
FUTURE (1993) WITHOUT PROJECT

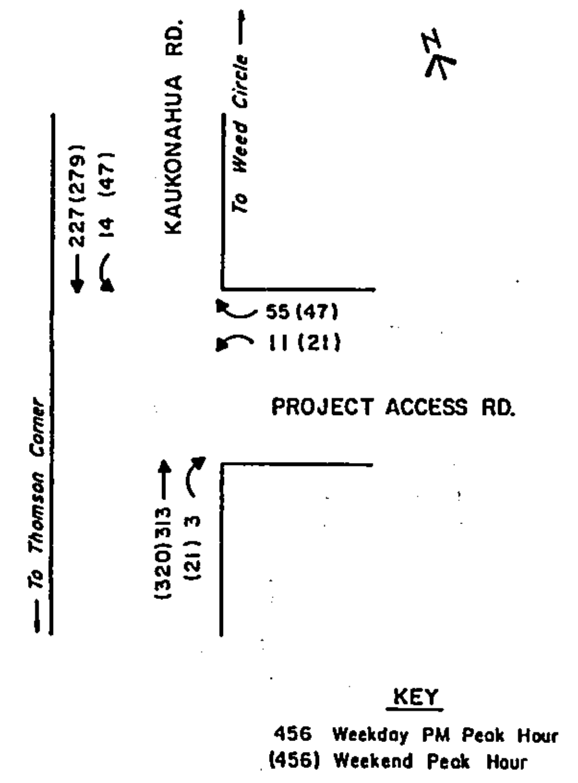

FIGURE 6
TRAFFIC ASSIGNMENT
FUTURE (1993) AT PROJECT ACCESS RD.

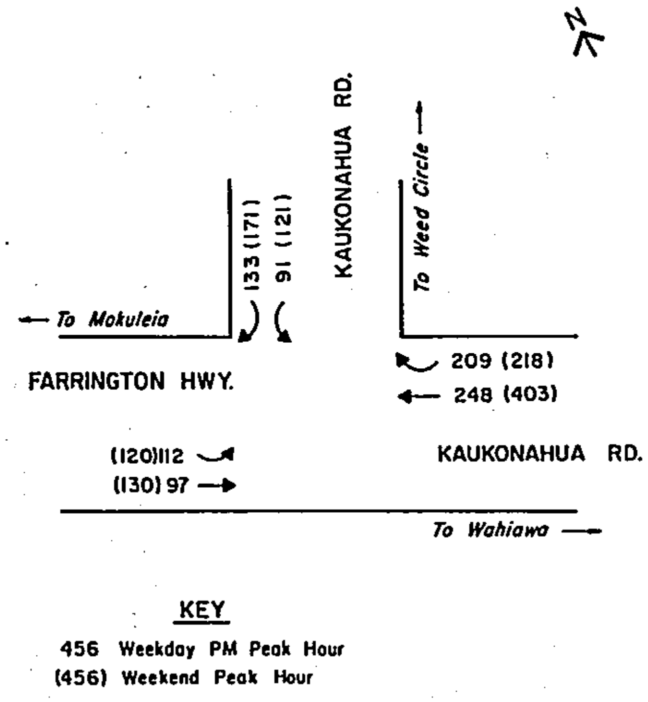

FIGURE 7
TRAFFIC ASSIGNMENT
FUTURE (1993) WITH PROJECT
THOMSON CORNER

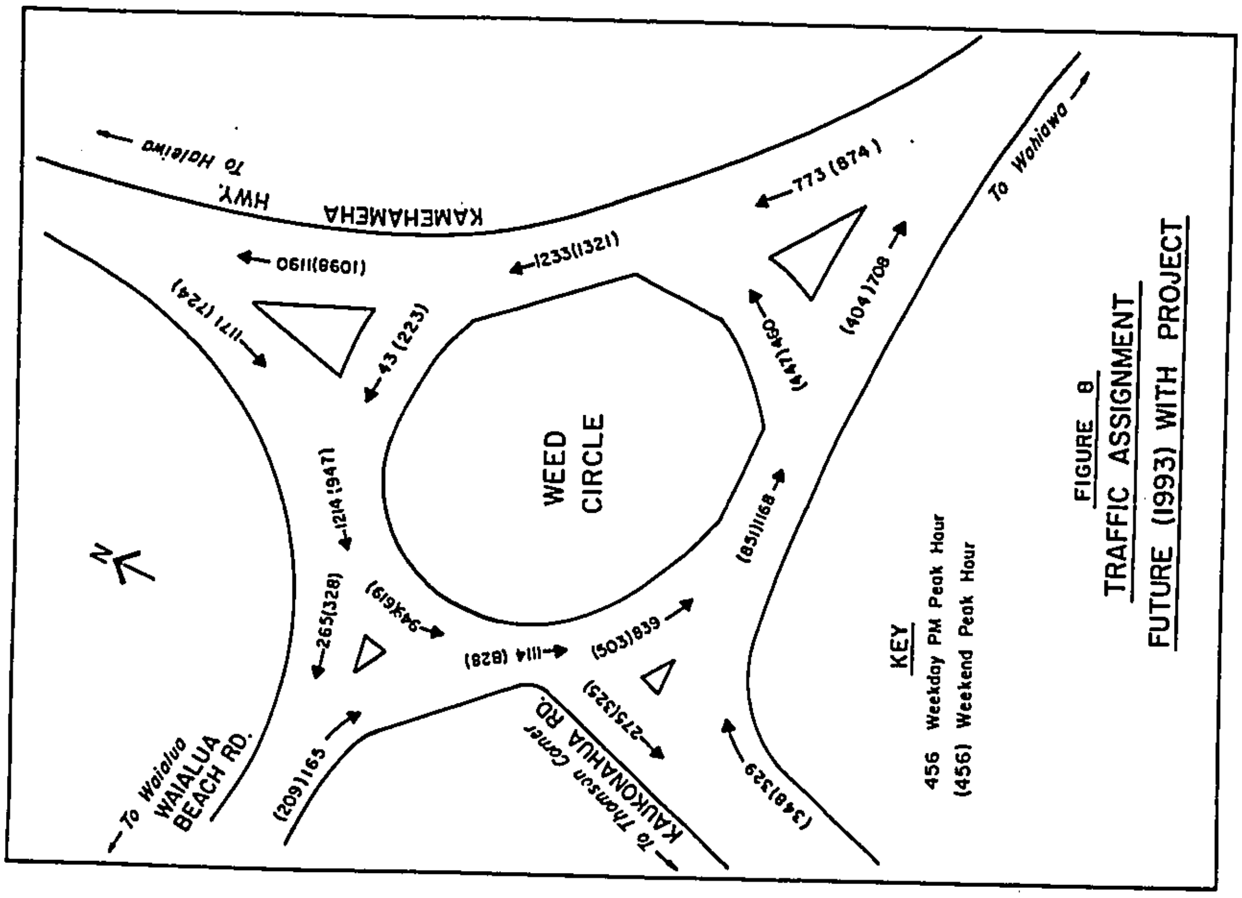

FIGURE 8
TRAFFIC ASSIGNMENT
FUTURE (1993) WITH PROJECT

APPENDIX I

AIR QUALITY STUDY
FOR THE
PROPOSED WAIALUA GOLF COURSE

AIR QUALITY STUDY

FOR THE

PROPOSED WAIALUA GOLF COURSE

WAIALUA, OAHU, HAWAII

Prepared by

Barry D. Root
Kaneohe, Hawaii

December 31, 1987

TABLE OF CONTENTS

1. PROJECT DESCRIPTION

Oceanic Properties, Inc. has proposed to develop an eighteen-hole golf course with associated driving range and clubhouse near Waialua, Oahu, as shown in Figure 1. Most of the property is presently used for sugar cane production. Roadway access to the site will be via direct connection to Kaukonahua Road, which leads to intersections with Kamehameha Highway at Weed Circle and with Farrington Highway at Thomson Corner. The project is expected to be completed by 1993.

The purpose of this study is to evaluate and describe existing ambient air quality in the project area and to estimate the potential air quality impact that could result from construction of the Waialua Golf Course as proposed.

2. AIR QUALITY STANDARDS

State of Hawaii and National Ambient Air Quality Standards (AQS) have been established for six classes of pollutants as shown in Table 1. An AQS is a pollutant concentration not to be exceeded over a specified sampling period which varies for each pollutant depending upon the type of exposure necessary to cause adverse effects. Each of the regulated pollutants has the potential to cause some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration.

National AQS have been divided into primary and secondary levels. Primary AQS are designed to prevent adverse health impacts while secondary AQS refer to welfare impacts such as decreased visibility, diminished comfort levels, damage to vegetation, animals or property, or a reduction in the overall aesthetic quality of the atmosphere. State of Hawaii AQS have been set at a single level which is in some cases significantly more stringent than the lowest comparable national limit. In particular, the State of Hawaii one hour standard for carbon monoxide is four times more stringent than the National standard.

Table 1 shows allowable AQS in micrograms and milligrams per cubic meter for comparative purposes, but the modeling technique used in this study produces carbon monoxide concentration values in parts per million (ppm). The State of Hawaii AQS for carbon monoxide for the 1-hour and 8-hour periods are 9 and 4.5 ppm, respectively, while the National AQS for the same time periods are 35 and 9 ppm.

National AQS are based on 40 CFR Part 50, while State of Hawaii AQS are set in Chapter 11-59, Hawaii Administrative Rules. This chapter was amended in 1986 to make Hawaii AQS for particulates and sulfur dioxide essentially the same as National limits. It has been proposed in various forums that the State of Hawaii relax its carbon monoxide standards to National levels, but at present there are no indications that such a change is being considered.

3. PRESENT AIR QUALITY

There are no ambient air quality monitoring stations within the immediate vicinity of Waialua. Under prevailing trade wind conditions there is no industrial activity upwind for thousands of miles and it is reasonable to assume that present air quality is quite good.

The only significant sources of man-made air pollution in the area are motor vehicles traveling on nearby roadways and surgar cane growing and harvesting activities. Fugitive dust from cane cultivation and smoke from field burning at harvest time could create periodic high levels of particulates in the project area, but these activities are infrequent enough to present only a minor annoyance to area residents.

Natural air pollutant producers which could affect Waialua air quality include the ocean (sea spray), plants (aero-allergens), dust, and perhaps a distant volcanic eruption on the island of Hawaii. Concentrations of pollutants from these kinds of sources should be fairly uniform for most Oahu locations.

The nearest long term air pollution monitoring station to the project site is located in Pearl City, about 15 miles to the southeast. At present only particulates are measured at Pearl City, but until 1986 sulfur dioxide was also monitored there. For both pollutants, measured values for the past several years have been far below allowable air quality limits.

Oahu-wide air pollution monitoring data indicates that State of Hawaii ambient air quality standards for particulates, sulfur dioxide, nitrogen dioxide, and lead are currently being met at most locations.

On the other hand, carbon monoxide and ozone readings from urban Honolulu indicate that allowable State of Hawaii standards for these vehicle-related air pollutants are being violated at a rate of about one to three times a year. Ozone is an indicator of the formation of photochemical pollutants in the air, a condition which tends to develop if the air mass over the islands has been fairly stable with little wind flow for a period stretching over several days.

Concentrations of carbon monoxide are more directly related to vehicular emissions and tend to be highest during peak hour traffic conditions. Carbon monoxide would thus be the pollutant most likely to cause difficulty in meeting allowable Air Quality Standards as a result of new project development on Oahu.

4. DIRECT AIR QUALITY IMPACT OF PROJECT CONSTRUCTION

There will be two types of air quality impact resulting directly from construction of the proposed Wailua Golf Course: fugitive dust emissions from grading and dirt moving activities as well as construction-related vehicles moving over unpaved surfaces and air pollutant exhaust emissions from mobile and non-mobile construction equipment.

Construction of a golf course is likely to require significant alteration to the existing topography. Grading and other dirt-moving activity will thus present the potential for substantial emission of fugitive dust. The quantitative rate of emission for this type of site preparation is virtually impossible to estimate, however, and will vary daily depending on the amount of activity and the moisture content of exposed soil in work areas.

Construction equipment will also emit some air pollutants in the form of engine exhausts. The largest equipment is usually diesel-powered. Carbon monoxide emissions from large diesel engines are generally about equal to those from a single automobile, but nitrogen dioxide emissions from this type of engine can be quite high. Fortunately, nitrogen dioxide emissions from other sources in the area should be relatively low and the overall air quality impact of emissions from construction equipment should be insignificant compared to emission levels from roadways nearby.

In any case direct air quality impacts from project construction will last only as long as it takes to complete the project and several on-site control measures are available to substantially mitigate the magnitude of these impacts.

Adequate fugitive dust control can usually be accomplished by establishment of a watering program to keep bare-dirt surfaces in work areas from becoming significant dust generators. State of Hawaii Air Pollution Control Regulations (Administrative Rules Chapter 60 of Title 11) 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 parking sites and establishing landscaping as early in the construction process as possible as well as good housekeeping on the jobsite have also proven to be helpful in abating fugitive dust emissions.

In the event that these measures prove to be insufficient it might also be necessary to erect dust-catching barriers to prevent the spread of fugitive dust to residences nearest to the construction site.

5. DIRECT AIR QUALITY IMPACT OF PESTICIDE USE

Once the Wailua Golf Course is completed and in use it will be necessary to regularly apply various pesticides to maintain grass quality. Because of the wide variety of chemicals that could be employed in this regard and the varying necessity for their application it is not possible to present a meaningful quantitative estimate of the potential air quality impact of pesticide use for golf course maintenance.

Allowable ambient air quality standards have not been established for any of the pesticides presently in use even though most of them are required to carry warning or caution labels on their containers. The primary purpose of these labels is to provide occupational safety and health guidance regarding proper handling and application. The primary risk of using these chemicals is thus to the applicator rather than to downwind receptors who would encounter the substances only in greatly diluted form. There are, however, certain precautions that must be followed in order to prevent significant downwind drift from pesticide spraying. Primary among these is the use of a coarse, rather than fine, spray, and application under wind conditions that would not contribute to potential drift toward residental areas.

Some herbicide application presently occurs along the edges of sugar cane fields within the project site, and while the change to golf course use will probably result in an increased use of agricultural chemicals, the potential for significant degradation to overall air quality in the Waialua area from golf course pesticide use is judged to be minimal.

6. INDIRECT AIR QUALITY IMPACT OF INCREASED TRAFFIC CONGESTION

While the proposed Waialua Golf Course cannot be considered to constitute a major direct source of air pollutants, by serving as an attraction for increased motor vehicle traffic in the area the project could be considered to be a potential indirect air pollution source.

Motor vehicles, especially those with gasoline-powered engines, are prodigious emitters of carbon monoxide. Motor vehicles also emit some nitrogen dioxide and those burning fuel which contains lead as an additive contribute some lead particles to the atmosphere as well. The major control measure designed to limit lead emissions is a Federal law requiring the use of unleaded fuel in most new automobiles. As older cars are removed from the vehicle fleet lead emissions should continue to fall. In fact, on January 1, 1986, the Federal Environmental Protection Agency lowered the allowable amount of lead in gasoline to 0.1 gram per gallon. At the beginning of 1985 the standard was 1.1 grams per gallon. The EPA presently advocates a total ban on lead in gasoline. Existing lead controls seem to have produced desired results in the Honolulu area, however, since measured lead levels at the Department of Health building have been below the threshold of detection for current monitoring equipment since early 1986.

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

7. CARBON MONOXIDE DIFFUSION MODELING

In order to evaluate the potential worst case indirect air quality impact of the proposed Waialua Golf Course, a detailed carbon monoxide modeling study was carried out. The study was designed to yield carbon monoxide concentration values which could be compared directly to allowable State and National Ambient Air Quality Standards.

Six critical receptor sites around the periphery of Weed Circle and one site at Thomson Corner were selected for analysis. Locations of these receptor sites are shown on Figure 1.

Computations were made for current weekend peak hour conditions and for 1993 (after project completion). Calculations for 1993 include peak hour traffic scenarios with and without the proposed Waialua Golf Course. Traffic controls around Weed Circle mostly consist of Yield signs with Stop signs at high volume merge points. At Thomson corner the minor leg of the "T" intersection has a stop sign. These controls are not expected to change by 1993.

Using 1986 vehicle registration figures for Oahu, the existing peak hour vehicle mix in the project area is estimated to be 91.9% light duty gasoline-powered vehicles, 4.2% light duty gasoline-powered trucks and vans between 6000 and 8500 pounds, 0.5% heavy duty gasoline-powered vehicles, 0.5% diesel-powered automobiles, 0.1% diesel-powered light duty trucks, 1% diesel-powered trucks and buses, and 1% motorcycles. The same vehicle mix was assumed for 1987 and 2009 emission rate calculations.

Average vehicle speeds were assumed to be 5 mph upstream from Stop and Yield signs and 15 mph downstream from signals or turns. Speeds of 25 mph were assumed for traffic flow in uncongested conditions and 15 mph where traffic flow was relatively more congested. An ambient temperature of 68 degrees F was used for late afternoon peak hour conditions.

Vehicle operating characteristics were computed assuming that 20.6 percent of vehicles equipped with catalytic converters and 20.6 percent of vehicles without catalytic converters would be operating in the "cold start" mode and 27.3 percent of all vehicles would be operating in the hot start mode. The EPA computer model MOBILE3 was run using the above parameters and the low speed option to produce vehicular carbon monoxide emission estimates for each of the years studied. National averages for "mis-fueling" rates were assumed.

The computer model CALINE3 was used to calculate carbon monoxide concentrations at each of the selected critical receptor sites for each scenario studied. Stability category 4 was used for determining diffusion coefficients. This stability category represents the most stable (least favorable) atmospheric condition that would be likely to occur in a suburban area such as this during the daytime. A surface roughness factor of 100 was used with an atmospheric mixing depth of 1000 meters. Seventeen separate links were used to represent the roadway geometry at Weed Circle.

To simulate worst case wind conditions a uniform wind speed of one meter per second was assumed with the worst case wind direction for each site determined by model results. For each receptor site concentrations were computed at a height of 1.5 meters in order to estimate levels that would exist within the normal human breathing zone.

Background contributions of carbon monoxide from sources or distant roadways not directly considered in the analysis were assumed to be zero in order to more clearly indicate projected project-related impact. In fact, background levels at these locations would be very near zero in any case.

Results of the peak hour carbon monoxide study are presented in Table 2. Present peak hour carbon monoxide levels under the worst case assumptions used here are well within allowable State and National AQS. Estimated future values for the 1993 scenario with or without the Waialua Golf Course.

Eight hour carbon monoxide levels are estimated by multiplying the peak hour values by a "meteorological persistence factor" of 0.6 which is recommended in EPA modeling guidelines to account for the fact that average one hour traffic volumes over an eight hour period are lower than peak hour volume and the fact that meteorological dispersion conditions are more variable (and hence more favorable) over an eight hour period than they are for a one hour period. Multiplying projected worst case weekend peak hour carbon monoxide levels by this factor yields the values that are shown in Table 3. Both present and projected eight hour levels are well within allowable limits with or without the planned project.

It is important to note that the worst case conditions studied here have a relatively low probability of occurrence. A steady wind of one meter per second blowing from a single direction for an hour is not very likely. With windspeeds of two meters per second, for example, computed carbon monoxide concentrations would be half the values shown in Table 2. Furthermore, the light wind speeds needed to produce the worst case values shown here would be most likely to occur in conjunction with highly variable wind directions rather than the steady conditions assumed in the calculations.

8. SUMMARY OF IMPACTS AND MITIGATIVE CONSIDERATIONS

A. SHORT TERM

As previously indicated the only significant short term direct adverse air quality impact that the proposed project is likely to create is the emission of fugitive dust during construction. State of Hawaii regulations stipulate the control measures that are to be employed to reduce this type of emissions. Primary control consists of wetting down loose soil areas. An effective watering program can reduce particulate emission levels from construction sites by as much as 50 percent. Other control measures include good housekeeping on the job site, covering the cargoes of open-bodied dirt-hauling trucks, and pavement or landscaping of bare soil areas as quickly as possible. In the case of valid complaints from residents of nearby properties regarding fugitive dust, it might be necessary to erect dust catching barriers during the dusty portion of project construction.

B. LONG TERM

Once completed, the Waialua Golf Course will have little direct impact on ambient air quality in the area. Pesticide use for maintaining fairways and greens should be only a minor consideration. Nor will the project have a significant indirect long term air quality impact since detailed carbon monoxide modeling for the year 1993 (after the project has been completed) indicates that projected worst case levels for both the one and eight hour time periods are well within allowable State of Hawaii and National Ambient Air Quality Standards. For this reason no specific mitigative measures are proposed in this regard. It is worth noting that some traffic mitigation is presently proposed in the form of a bypass route for Haleiwa, but this mitigative measure is not required for implementation of the proposed Wailua Golf Course.

Because the stringent national vehicular emissions reduction program now being pursued is entirely the product of ever changing government regulations, it is always possible that economic conditions or other factors could lead to an early abandonment of this program. If that were to occur, then the projected pollutant levels presented in this study could be too optimistic. On the other hand, this analysis did not consider the possibility that technological innovation may lead to new vehicular power systems that produce few or none of the currently regulated atmospheric pollutants.

REFERENCES

1. U.S. ENVIRONMENTAL PROTECTION AGENCY, User's Guide to MOBILE3: Mobile Source Emissions Model, June, 1984.

2. TRINITY CONSULTANTS, User's Manual for CALINE3, April, 1987.

3. PARSONS BRINCKERHOFF QUADE AND DOUGLAS, INC., Traffic Impact Report Waialua Golf Course, December 10, 1987 DRAFT.

TABLE 1

SUMMARY OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS
(Micrograms per Cubic Meter)

POLLUTANT	SAMPLING PERIOD	AMBIENT AIR QUALITY STANDARDS NATIONAL Primary	Secondary	HAWAII
Particulates	Annual Geometric Mean	75	60	60
	Maximum 24-Hour Average	260	150	150
Sulfur Dioxide	Annual Arithmetic Mean	80	—	80
	Maximum 24-Hour Average	365	—	365
	Maximum 3-Hour Average	1300		1300
Nitrogen Dioxide	Annual Arithmetic Mean	100		70
Ozone	Maximum 1-Hour Average	240		100
Carbon Monoxide	Maximum 8-Hour Average	10		5
	Maximum 1-Hour Average	40		10
Lead	Calendar Quarter	1.5		1.5

Notes: 1. Carbon monoxide standards are in milligrams per cubic meter.
2. National standards based on 40 CFR Part 50; Hawaii standards based on Title 11, Administrative Rules, Chapter 59.

TABLE 2

RESULTS OF PEAK HOUR CARBON MONOXIDE ANALYSIS
(Parts Per Million)

SITE	LOCATION	YEAR/SCENARIO 1987	1993 WITHOUT PROJ	1993 WITH PROJ
1	KAUKONAHUA RD NB AT WEED CIRCLE	1.7	1.7	1.8
2	WEED CIRCLE AT KAM HWY EB	1.9	1.6	1.6
3	KAM HWY WB AT WEED CIRCLE	2.1	1.9	1.9
4	KAM HWY NB TO HALEIWA	2.0	1.9	1.9
5	KAM HWY SB FROM HALEIWA	2.0	1.9	1.9
6	KAUKONAHUA RD SB AT WEED CIRCLE	1.6	1.6	1.6
7	KAUKONAHUA RD A FARRINGTON HWY (THOMSON CORNER)	1.8	1.2	1.3

STATE OF HAWAII AQS: 9
NATIONAL AQS: 35

Notes: See Figure 1 for location of critical receptor sites. See text, Section 7, for models and assumptions used. for producing these estimates.

TABLE 3

RESULTS OF EIGHT HOUR CARBON MONOXIDE ANALYSIS
(Parts Per Million)

SITE	LOCATION	YEAR/SCENARIO 1987	1993 WITHOUT PROJ	1993 WITH PROJ
1	KAUKONAHUA RD NB AT WEED CIRCLE	1.1	1.0	1.1
2	WEED CIRCLE AT KAM HWY EB	1.1	1.0	1.0
3	KAM HWY WB AT WEED CIRCLE	1.3	1.1	1.1
4	KAM HWY NB TO HALEIWA	1.2	1.1	1.1
5	KAM HWY SB FROM HALEIWA	1.2	1.0	1.0
6	KAUKONAHUA RD SB AT WEED CIRCLE	1.0	1.0	1.0
7	KAUKONAHUA RD A FARRINGTON HWY (THOMSON CORNER)	1.1	0.7	0.8

STATE OF HAWAII AQS: 4.5
NATIONAL AQS: 9

Notes: See Figure 1 for location of critical receptor sites. See text, Section 7, for models and assumptions used. for producing these estimates.

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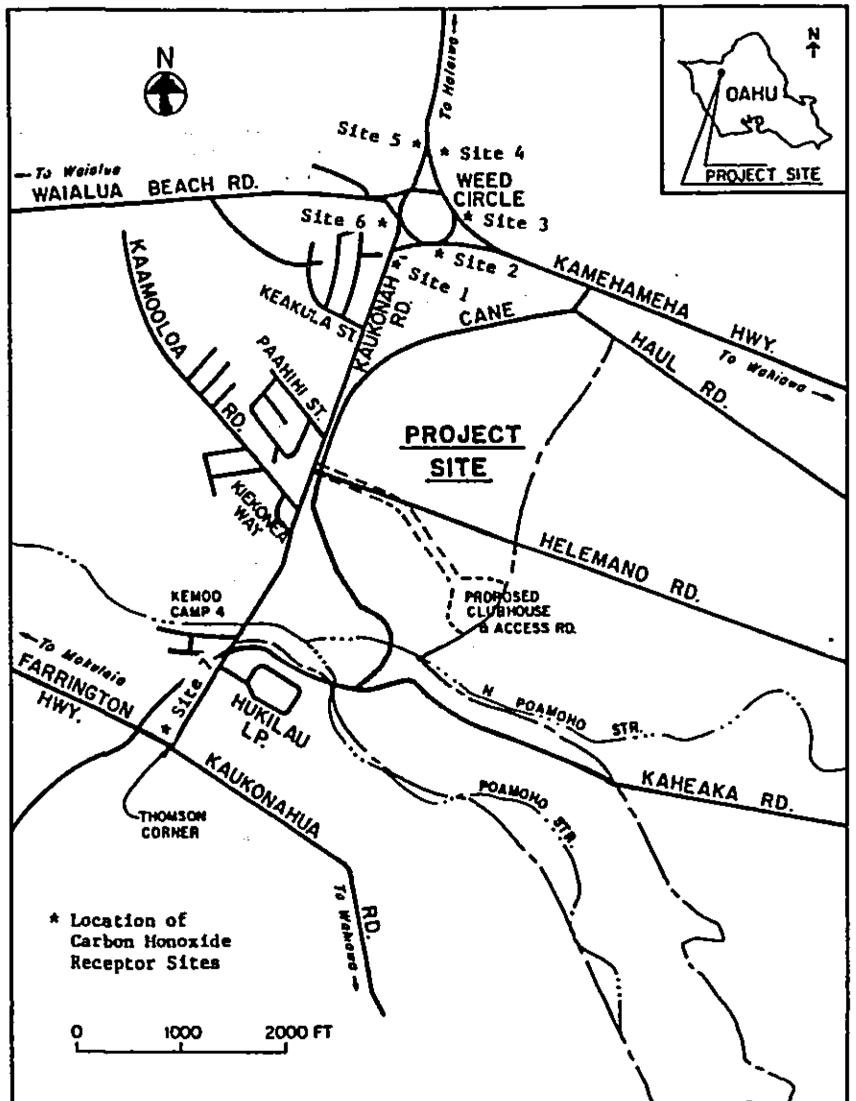

FIGURE 1
LOCATION MAP

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APPENDIX J

NOISE IMPACT EVALUATION
FOR THE
PROPOSED WAIALUA GOLF COURSE

DARBY
& ASSOCIATES
ACOUSTICAL CONSULTANTS

#88-1
January 12, 1988

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

Attention: Mr. Tyrone T. Kusao

Subject: Noise Impact Evaluation for the Proposed Waialua Golf Course, North Shore, Oahu.

Dear Mr. Kusao:

Based on phone conversations with you on December 30, 1987 and January 11, 1988; and information you forwarded to me (reference 1) on December 31, 1987; I provide the following:

1. General Considerations - The proposed golf course site shown in Figure 1 is situated away from noise sensitive locations except for those residential neighborhoods along Kaukonahua Road between Thompson Corner and Weed Circle. No existing residences would be impacted by the new access road which is to be implemented between Kaukonahua Road and the Clubhouse Facility. The Clubhouse, which would be the most intensively used feature in the project, is to be located 1,500 feet from the nearest residence.

The ambient noise levels at the existing residences will be low in consideration of the low traffic volumes on Kaukonahua Road and the few scheduled aircraft operations over the area. At residences away from the Road, the background noise would be dominated by neighborhood self-generated sounds, e.g. occasionally local vehicle movements, lawn mowers, weed wackers, TV's, radios, and sounds from children and animals. Wind blowing in the sugar cane (54 dBA at 20 feet, reference 2) and other foliage may often be the dominant sound.

The existing residents periodically hear the sounds associated with sugar cane planting, tending, and harvesting involving diesel-powered machinery and vehicles as well as aircraft used for spraying (reference 2).

2. Potential Noise Impact from Clubhouse Activities - Noise sources from Clubhouse operations could include kitchen equipment, fans, airconditioning equipment, refrigeration equipment, pool pumps, as well as sound systems

PALI PALMS PLAZA • 970 NO. KALAHEO AVENUE • SUITE A-311
KAILUA, HAWAII 96734 • (808) 254-3318

for announcements and music. The sounds from these sources should not usually be audible to the closest residents 1,500 feet distant in consideration of the sound level that would be acceptable at the Clubhouse and because of the large sound transmission losses involved.

The actual sound transmission losses will depend largely on the topography as well as upon the amount and type of foliage involved in the 1,500 foot distance. A worst case exists if there is (a.) a direct line of sight (i.e. also direct sound transmission) from the noise source to a listener; and (b.) that direct line is at least about nine feet above the ground or foliage. This situation can also be simulated if there is sound refraction, e.g. sound bending over topographic features and foliage caused by a wind gradient with the listener being downwind of the sound source. For this case the sound diminishes six decibels (6 dB) for each doubling of the distance, e.g. 87 dB at 12 feet; 81 dB at 25 feet; 75 dB at 50 feet; and so on to 45 dB at 1,600 feet. Noise sources creating 87 dB at 12 feet would not be considered acceptable to persons at the Clubhouse while 45 dB would probably not be audible in the residential neighborhood 1,600 feet away during the daytime.

Usually sound grazing over grass and sporadic foliage decreases at least 8 dB per double distance. In this case, in order to cause 45 dB at 1,600 feet, the noise source at the Clubhouse would have to produce about 102 dB at 12 feet. Such intense exterior sound levels are not likely to occur at the Clubhouse.

It is to be noted that a wall or berm near an exterior sound source can introduce up to 15 dB additional sound lessening beyond the above considerations. Also, if the sound source is located in an enclosed, airconditioned building, an additional 25 to 35 dB lessening of the noise levels can be achieved with standard construction.

The airconditioning equipment; fans; pool pumps; and any other stationary equipment on the project site will not exceed the allowable noise levels in local noise regulations (references 3 and 4). Public address sound systems and entertainment sounds will not cause "unreasonable" or "excessive" noise as defined in reference 3. The Clubhouse will not be in operation late into the night, but should cease operations by 7 p.m.

3. Ground Maintenance Noise - Noise from equipment associated with ground maintenance activities, including lawn mowers and leaf blowers, could have an adverse impact on surrounding residential neighborhood particularly when the equipment is near the housing. All equipment powered by internal combustion engines will have exhaust mufflers. Schedules will be developed so noisy maintenance operations do not occur near residences before 7 a.m. The noise from ground maintenance operations will not cause "unreasonable" or "excessive" noise as defined in reference 3.

4. Traffic Noise - Reference 1 states that the increase in traffic close to the project will be approximately 15 percent of existing traffic and that the highway level of service is not expected to change. Using this information and the traffic noise prediction model in reference 6, it can be shown that residents in housing along Kaukonahua Road would experience less than one decibel increase in the average traffic noise level. Thus, the increase in traffic noise impact is not considered significant.

5. Noise Impact from Construction - Development of the project site will involve grubbing, grading, and the construction of infrastructure and buildings. The various construction phases of a development project may generate significant amounts of noise; the actual amounts are dependent upon the methods employed during each stage of the process. Typical construction equipment noise ranges in dB(A) are shown on Figure 2. Earthmoving equipment such as bulldozers and diesel powered trucks will probably be the loudest equipment used during construction. Since it is anticipated that noise generated during construction will exceed allowable limits in reference 2, a permit will be obtained from DOH. DOH may grant permits to operate vehicles, construction equipment, power tools, etc. which emit noise levels in excess of the allowable limits. Required permit conditions for construction activities are:

> "No permit shall allow construction activities creating excessive noise...before 7:00 a.m. and after 6:00 p.m. of the same day."
>
> "No permit shall allow construction activities which emit noise in excess of ninety-five db(A)...except between 9:00 a.m. and 5:30 p.m. of the same day."

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

In addition, construction equipment and on-site vehicles or devices requiring an exhaust of gas or air must be equipped with mufflers. Also, construction vehicles using trafficways will satisfy the noise level requirements defined in reference 5.

6. Noise Mitigation Measures - The design of the facility will include noise mitigation measures in the planning of the location and orientation of the airconditioning equipment, exhaust fans, pool pumps, etc., such that local noise regulations (references 3 and 4) will be satisfied.

Sincerely,

Ronald A. Darby

Ronald A. Darby, P.E.

RAD:djs

References: 1. "Application for a Development Plan Amendment and Environmental Assessment for a Proposed Golf Course at Waialua, Oahu", Prepared for Oceanic Properties, Inc. by Tyrone T. Kusao, Inc., October 1987.
2. "Noise from Sugar Operations in Hawaii", Prepared for the Sugar Industry Environmental Standards Committee of the Hawaiian Sugar Planters' Association by Ronald A. Darby, January 22, 1971.
3. "Chapter 43 - Community Noise Control for Oahu", Department of Health, State of Hawaii, Administrative Rules, Title 11, 1981.
4. "Section 3.100, Noise Regulations", Land Use Ordinance, City and County of Honolulu, October 22, 1986.
5. "Chapter 42 - Vehicular Noise Control for Oahu", Department of Health, State of Hawaii, Administrative Rules, Title 11, 1981.
6. "FHWA Highway Traffic Noise Prediction Model", Federal Highway Administration, December 1978.

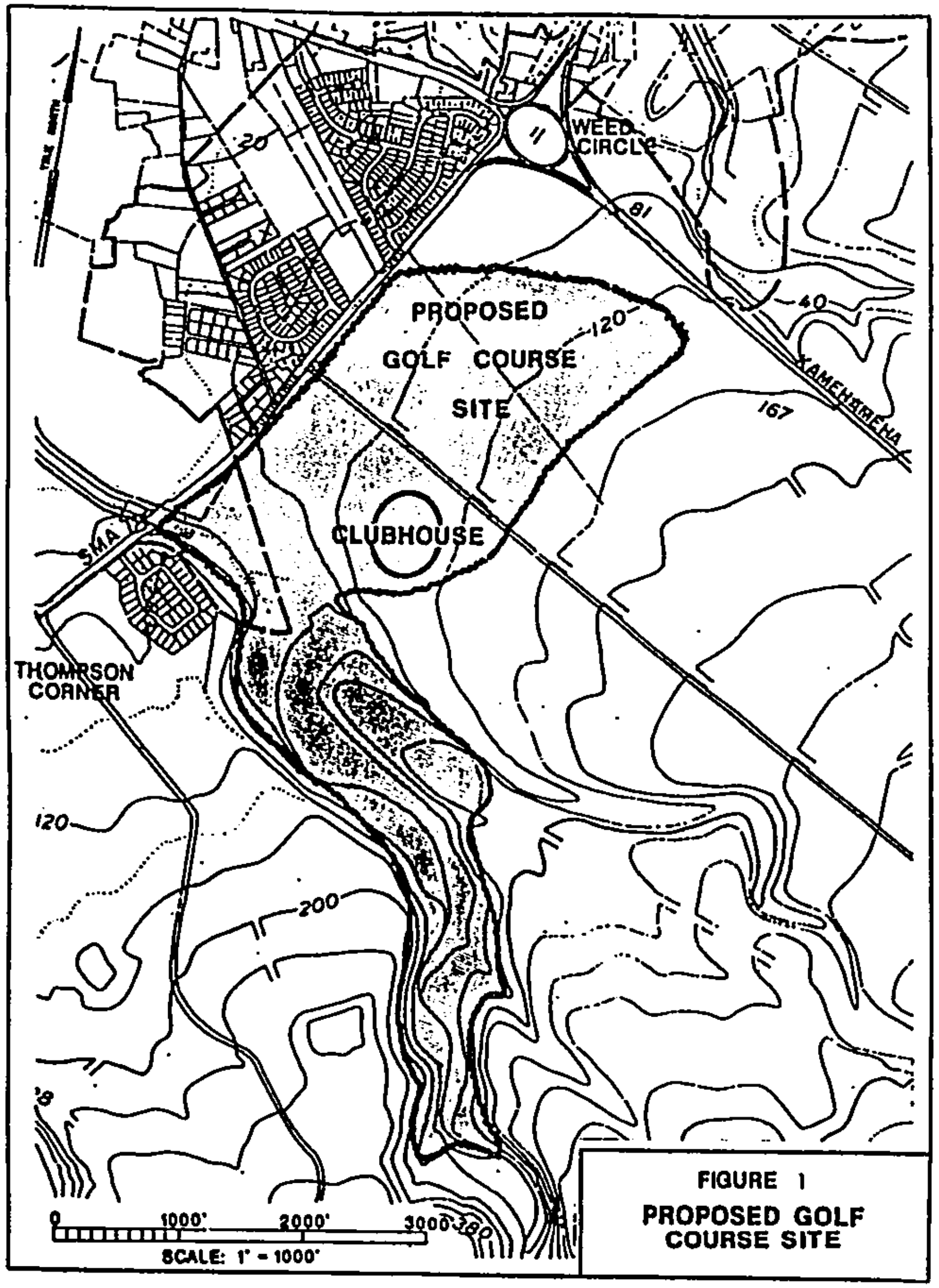
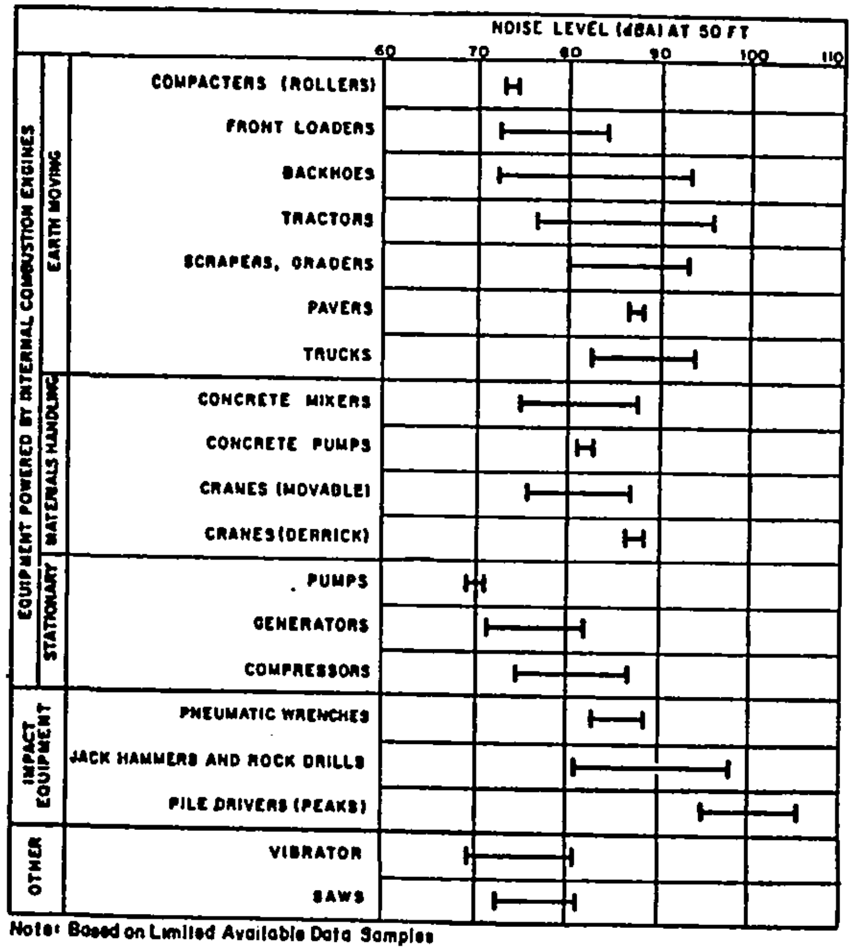


FIGURE 1
PROPOSED GOLF COURSE SITE



Note: Based on Limited Available Data Samples

FIG. 2 CONSTRUCTION EQUIPMENT NOISE RANGES.

APPENDIX K

LETTER FROM WAIALUA SUGAR COMPANY

Waialua Sugar Company, Inc.
P.O. Box 665
Waialua, Hawaii 96791 - 0665

J.H. Hewetson
President & Manager

January 8, 1988

Oceanic Properties, Inc.
P. O. Box 2780
Honolulu, Hawaii 96817

Gentlemen:

This letter is written to clarify Waialua Sugar Company's (WSC) position regarding the acreage required for the proposed golf course in the Weed Junction area.

While the golf course requires 215 acres, only 140 of those acres are currently in cane. The balance represents gulch areas and is not suitable for farming by WSC. The loss of these 75 or so acres of unused land will not have an adverse impact on our operation. The conversion of such gulch land for a golf course or other recreational purposes certainly represents a better utilization of that area.

The 140 cane acres currently in cane is scheduled to be harvested in 1988. However, it is my understanding that you will not require the parcel until sometime in 1990. This will give an additional harvest cycle and will allow Waialua Sugar sufficient time to plan for the orderly withdrawal of this field which will minimize the impact of the production loss on the overall operation. With proper planning, the economic viability of Waialua Sugar will not be greatly affected by removal of this parcel.

Many of our employees are among the large cadre of golfers on the North Shore that would benefit from a golf course in the Waialua area that would be open to the public. Please keep us informed of the progress of the project and any changes to the projected schedule.

Very truly yours,

J. Hewetson

J. H. Hewetson

APPENDIX L

ENVIRONMENTAL IMPACT OF FERTILIZER AND PESTICIDES USE ON THE PROPOSED WAIALUA GOLF COURSE

ENVIRONMENTAL IMPACT OF FERTILIZER AND PESTICIDE USE ON THE PROPOSED WAIALUA GOLF COURSE

A REPORT TO

ENGINEERING CONCEPTS INC.

January 8, 1988

PREPARED BY

Charles L. Murdoch, Ph. D

Richard E. Green, Ph. D.

I. INTRODUCTION

The development of the proposed golf course 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. These chemicals may be subject to movement from the site of application, either by runoff during high intensity storms, or by movement toward groundwater when water infiltration exceeds evapotranspiration (ET). Although the Waialua site is a relatively low-rainfall, high-ET area, high-intensity storms occur occasionally, resulting in runoff through drainage ways to the coast. Irrigation in excess of ET contributes water recharge to groundwater, thus water management is an important determinant in the control of chemical movement.

This report provides an assessment of the anticipated environmental impact of chemicals applied to a golf course at this site based on an analysis of site factors and recommended management practices. In addition, the impact of a golf course with appropriate management is compared with the existing situation (sugarcane culture).

II. APPROACH AND SOURCES OF INFORMATION

Background information on soils, topography, drainage and storm runoff was obtained from published reports and maps. Published data on water balance in nearby areas provided an estimate of groundwater recharge with both sugarcane and turf cover. Irrigation and chemical use in sugarcane was provided by Milton Agader, Harvesting Supervisor of Waialua Plantation. Anticipated use of irrigation and chemicals on the proposed golf course is based on our own estimates.

III. ANALYSIS OF RELEVANT FACTORS WHICH MAY IMPACT ON CHEMICAL MOVEMENT

A. Site factors

1. Geology, soils, topography

The geology of this area is dominated by Koolau basalt in the upland areas and by alluvium derived from basic igneous material in the lowland areas and drainage ways. The soil in the principal upland area north of North Poamoho Stream and east of Kamehameha Highway is Lahaina silty clay, a residual soil which is weathered from basalt (Foote et al., 1972). This soil is well drained and is moderately permeable, with a moderate slope of about 8%. Under normal rainfall intensities, there is little runoff and slight erosion hazard, even when ground cover is sparce. Runoff can be expected to be very slight under turf, except when prolonged, high intensity storms occur. The soils in the low-lying areas south of North Poamoho Stream consist of both

Haleiwa silty clay and Kawahapai stony clay loam. Both of these soils are formed on alluvium from upland soils, are well drained, and are not subject to much runoff or erosion.

2. Climate and hydrology

Monthly median rainfall for the site varies from a low of about 0.8 inches/month during June to September, to a high of about 3.5 inches/month in January, with a median annual rainfall of about 32 inches (Giambelluca, Nullet, and Schroeder, 1986). A water balance presented by Giambelluca (1983) for the non-caprock area of southern Oahu, which has a similar rainfall pattern and similar soils, provides an estimate of recharge from rainfall. Runoff was calculated to be 2.7 inches, while evapotranspiration for irrigated sugarcane is about 53 inches. With annual rainfall of 32 inches and without irrigation, there is a net deficit of about 24. When the contribution of sugarcane irrigation (about 85 inches/year) is considered, the net calculated recharge is 61 inches/year. Thus water movement below the root zone and, consequently the downward movement of fertilizer nitrogen or undesired pesticides, will depend on the extent to which irrigation water exceeds transpiration.

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 these types of turfgrasses 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 iron and aluminum hydroxides which are plentiful in the soil of this location and moves little if any from the site of application. Phosphorus, therefore, 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 N uptake by turfgrasses, however, nitrogen will be used rapidly after

application. Only under conditions where rainfall occurs soon after application of a soluble nitrogen source would there be excessive loss by surface runoff or by leaching below the root zone. This nitrogen movement could be avoided by applying a slow-release nitrogen fertilizer.

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 rates for different areas of a typical 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	1.13
Fairways	50	1.5	8 weeks	10.60
Roughs	30	1.0	3 months	2.60
Total	86			15.18

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 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 (Hartley and Kidd, 1983), as well as those of most chemicals used in turf in Hawaii, are given in Appendix Table 1.

Table 2. A typical pesticide program for golf courses in Hawaii.

Turfgrass area	Area (acres)	Chemical	Frequency	Amt./application	Annual total
I. Herbicides					
A. Greens	3	MSMA	6 times/year	2lb. 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
		33 Plus	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
		33 Plus	3 times/year	1 pint/acre	19 gallons
		metribuzin	2 times/year	0.75 lb. ai./acre	75 lb. ai.

(Table 2, continued)

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.
		diazinon	As needed	5 lb. ai./acre	Approx. 250 lb.ai.
III. Fungicides					
A. Greens	3	metyalaxyl	As needed	1.3 lb. ai./acre	Approx. 25 lb. ai.
		chlorothailonil	As needed	8 lb. ai./acre	Approx. 72 lb. ai.
B. Tees	3	metyalaxyl	As needed	1.3 lb. ai./acre	Approx. 25 lb. ai.
		chlorothailonil	As needed	8 lb. ai./acre	Approx. 72 lb. ai.
C. Fairways (Spot treatments)		chlorothailonil	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 controllers. Many are computer controlled, so that each sprinkler head on the golf course can be adjusted from a computer terminal to apply a selected amount of water on each cycle.

Because golf greens are constructed of sand (or mixes dominated by sand), the water holding capacity is less than for other areas containing soil. For this reason, golf greens must be watered more frequently than other areas.

Typical evapotranspiration rates for well-watered turf in Hawaii range from 0.1 to 0.3 inches per day, depending on temperature, the amount of sunlight, relative humidity, wind speed and the amount of available water in the soil. Soils store approximately 0.5 to 2.5 inches of available water per foot of depth, depending on soil texture. Sands hold less, clays hold more. Irrigation should be applied when about one-half the available water has been used. The effective rooting depth for mown turf is approximately one foot. Therefore, turfgrasses will need to be watered every day to about once a week depending upon the type of soil and the water use rate. Amounts of water applied at each irrigation are about 20,000 gal. for greens and 500,000 gals. for fairways.

Irrigation practices may have a large influence on the movement of soluble nitrogen fertilizers in soils. If excessive irrigation water is applied soon after application of soluble nitrogen sources, the chance for runoff or leaching of nitrogen below the root zone is increased. Because of the high cost of irrigation water, there is little incentive to over-water golf courses. As was previously mentioned, golf course irrigation systems are sophisticated, allowing precise control of the amount of water applied.

IV. POTENTIAL FOR POISONING MIGRATORY BIRDS AND ENDANGERED HAWAIIAN WATERBIRDS WITH PESTICIDES APPLIED TO THE PROPOSED WAIALUA GOLF COURSE

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 diazinon and chlorpyrifos.

Diazinon in particular has come under close scrutiny by the Environmental Protection Agency (EPA) because of kill of migratory waterbirds on golf courses in the northeastern mainland United States. RPAR hearings are presently being held to show cause why all labeled uses of diazinon on turfgrasses should not be cancelled. To the best of our knowledge, the reported bird kills were all associated with very heavy applications of a granular formulation of diazinon, resulting in birds (Canadian geese) picking up granules. Application of proper rates of this pesticide and/or use of a liquid spray might have prevented bird injury in all cases. Diazinon has been used on Hawaii golf courses for more than 20 years (both granular and liquid formulations). As far as we are aware, there have been no reports of bird injury from this pesticide on golf courses in Hawaii. From observations of birds using grassed areas and ponds of golf courses in Hawaii, it appears that golf courses are excellent habitats for birds.

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

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.

Table 3. Half-life and time required for 95% disappearance of eight organic phosphate insecticides in non-sterile sandy loam soil (adapted from Miles,et al 1979)

Insecticide	Half-life (wks.)	Wks. for 95% decomposition
Diazinon	<1	1
Chlorpyrifos	<1	1
Parathion	<1	3
Fensulfothion	<1	4
Chlorfenvinphos	<1	5
Trichloronat	1.5	20
Fonofos	3.0	20
Ethion	7.0	>24

L-4

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. As shown in Appendix Table 1, carbaryl and trichlorfon are less toxic to birds than diazinon or chlorpyrifos. In most cases these insecticides may be substituted for diazinon or chlorpyrifos with little loss of effectiveness. For bermudagrass mite control, however, diazinon has been shown to be much more effective than other insecticides tested.

The labeling of pesticides for particular uses by EPA with strict laws (enforced by the Hawaii Department of Agriculture) for their use are perhaps the best assurance of protection of humans and wildlife. It is impossible to predict what pesticides will be developed in the future. However, all pesticides must be applied in compliance with federal and state laws regulating their use. Hazards to both humans and wild life 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.

V. ENVIRONMENTAL IMPACT OF CHEMICALS APPLIED TO THE PROPOSED GOLF COURSE COMPARED TO THOSE APPLIED TO EXISTING AGRICULTURAL CROPS.

A. Existing conditions

Approximately 142 acres of the proposed development site is presently cropped with sugarcane. The cane is drip irrigated, providing efficient use of applied water, The principal fertilizer nutrients applied are N and K ; water soluble forms are applied through the drip system. According to information provided by Waialua Sugar Company, 350 pounds/acre of N, 100 pounds /acre P_2O_5 and 400 pounds/acre K_2O are applied for each 2-year crop. All fertilizer is applied during the first 10 months of the crop cycle. As mentioned previously, only nitrate (NO_3) is considered a potential pollutant of groundwater, However, there is no evidence that NO_3 levels in the aquifers of Oahu have been seriously impacted by NO_3 leaching from sugarcane fields (Green and Young, 1970). Use of drip irrigation in recent years has probably reduced irrigation recharge to the aquifer, thus reducing the quantity of leached N.

Pesticide use for insect and disease control in sugarcane culture is minimal, since insects are controlled biologically. Fungicide is used only to treat seed pieces before planting (principally Benlate®), thus the quantities applied are small and localized. Only herbicides for weed control are applied to the soil as surface sprays, usually two or three times in the first 6 months after planting. Herbicide practices have not changed substantially in the past 20 years, with the exception of the adoption of the use of glyphosate (Roundup) for in-field post-emergence spot spraying and control of weeds in field boundaries, ditches, and roadsides. The principal pre-emergence herbicides used in the Waialua area are atrazine and ametryn. Typical quantities applied, according to information provided by Waialua Sugar Co., are 8 pounds active ingredient (ai) per acre per crop of ametyrn and 3 to 5 pounds of atrazine.

Studies on Oahu several years ago (Green et al., 1977) indicated that the herbicide diuron was transported from sugarcane and/or pineapple fields to Kaiaka Bay, which receives runoff from the watershed which includes the site of the proposed golf course. While the herbicide could not be detected in water, it was found at low levels in sediments from both the stream and the bay. The quantities of diuron in sediments were thought to be too low to be of environmental consequence. Neither atrazine or ametryn was found in either water or sediments.

In the last two years, atrazine has been detected in some private wells in analyses conducted by the Hawaiian Sugar Planter's Experiment Station. It is not yet known whether atrazine has reached the major potable groundwater sources on Oahu, but where it has been found the levels are very low (parts per trillion). Thus it is probable that both atrazine and fertilizer nitrogen have leached below the root zone with furrow irrigation in the past. As both must be driven to groundwater by excessive application of irrigation water, it is likely that drip irrigation, which provides better water control, has reduced chemical leaching in comparison with furrow irrigation.

B. Proposed golf course

Fertilizer, pesticide and irrigation applications to the proposed golf course have been discussed previously. Golf course management is much more intense than sugarcane management. At first glance it would appear that more fertilizers are being applied to the golf course than to sugarcane because of the higher application rates to turfgrasses. After closer examination, however, it is shown that, because only a small portion of the area is fertilized, total fertilizer use will be similar. If sugarcane culture uses 350 pounds of N per acre for one year of the two-year growing cycle, this results in about 25 tons of N for the 142 acres of the proposed golf course site which is presently in sugarcane for the two-year crop cycle. Golf course culture, as shown in Table 1 above, requires approximately 15.2 tons of N each year. For a two-year period about 30.4 tons of N would be applied in golf course fertilization. However, because the total amount of fertilizer for the two-year sugarcane crop is applied during the first 10 months of the crop, fertilizer applications are much more concentrated and therefore more subject to runoff loss than those of golf courses.

Because the area treated with pesticides on a golf course is small, the total amount of pesticide applied is relatively small also. The pesticides used in golf course management are mostly of very low toxicity (Appendix Table 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.

Turfgrasses are relatively permanent. Once an area is established, it is not cultivated with the associated erosion that occurs when sugarcane fields are cultivated for replanting. In fact, the presence of a large turfed area, such as the proposed golf course, would reduce the sediment load entering the drainage way and eventuallyKaiaka Bay.

While the recent adoption of drip irrigation in most sugarcane production (including that in the area of the proposed golf course) has resulted in more efficient water use, and therefore less recharge of groundwater, sprinkler irrigation of turfgrasses is even more efficient. By proper management of water, there should be minimal recharge because of the evapotranspiration deficit discussed previously.

VI. SUMMARY AND CONCLUSIONS

Analysis of the site and management factors involved in golf course maintenance suggest that it is unlikely that development of the proposed Waialua golf course would pose environmental risks associated with the use of chemical fertilizers and pesticides. The site is a relatively low-rainfall (approximately 32 inches/year) high-ET (approximately 53 inches/year) area with a net ET deficit. There will, therefore, be no recharge of groundwater from

rainfall. Proper irrigation practices will result in minimal recharge of groundwater.

Nitrate would be the only fertilizer element of concern in runoff waters. However, because of the small amount applied at any one application, and the large dilution from water off-site in the surface drainage way, nitrate content of drainage water would be insignificant.

With the exception of herbicides, pesticide applications are normally made only to greens on golf courses. Since greens comprise only approximately 3 acres of a typical golf course, contribution of fungicide and insecticide contamination of surface waters would be small. The herbicides used on golf fairways are primarily MSMA,metribuzin and 33 plus (or other mixtures of 2,4-D, mecoprop and dicamba). These herbicides are rapidly degraded and/or are tightly sorbed on soil colloids and organic matter and have little potential for water contamination.

Upon examination of the entire drainage area feeding Poamoho Stream and tributaries which drain the proposed golf course development site and eventually empty into Kaiaka bay, it is apparent that the site of the proposed golf course represents perhaps less than 1/100 th. of the total drainage area. During intense rainstorms, when runoff occurs, any pesticide and/or nitrate content of drainage water from the proposed golf course site would be sufficiently diluted from runoff upstream that there would be no threat to fish or wildlife in the streams or in Kaiaka bay.

Development of a golf course in the proposed area would likely reduce the sediment load in Poamoho stream. Data of Green et al. (1977) showed that diuron in Kaiaka Bay was associated with sediment. While the levels were not high, sediment was apparently the major source of contamination. Turfed areas would reduce the sediment level because of the permanent nature of turf and the trapping of sediment as it flows through grassed drainage ways.

It is apparent that sugarcane culture has not led to serious contamination of either surface or groundwaters in the site of the proposed golf course, or elsewhere on Oahu. Because of the permanent nature of turfgrass cover, the relatively small area of a golf course to which fertilizers and pesticides are applied, and the nature of the pesticides used in turfgrass management, there is perhaps less likelihood of contamination of waters by chemicals applied in maintenance of a golf course.

VII. RECOMMENDATIONS

Irrigation management is critical to the conclusions reached above. If excessive irrigation water is applied, the likelihood of nitrate movement to groundwater is increased. 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. Excellent discussion of irrigation scheduling can be found in the book Golf Course and Grounds Irrigation and Drainage (Jarret, 1985).

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 well qualified Golf Course Superintendent (preferably a Certified Golf Course Superintendent) be given the responsibility of managing the golf course.

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Appendix Table 1. Properties of pesticides used in turfgrasses in Hawaii.

Pesticide common name	Trade name (s)	Oral LD-50 (mg/kg body wt.)	Toxicity to fish & wildlife	Water solubility	Soil behavior
Herbicides:					
MSMA	WeedHoe etc.	1800	Low	Very soluble	Tightly sorbed
glyphosate	Roundup, Kleenup	150	Mod. to birds, none to fish	Very soluble	Inactivated on soil contact
metribuzin	Sencor	2200	Moderate	122 mg/l	Moves readily, Rapidly degraded
2,4-D	part of mixtures	370-700	High to fish	46 mg/l	Rapidly degraded
mecoprop	ditto	700-1500	Low	0.62 mg/l	Moderately residual
dicamba	ditto	1000-2000	Non toxic to fish	0.08 mg/l	Moderately residual
oryzalin	Surflan	10000	Mod. to birds, toxic to fish	2.5 mg/l	Moderately residual
oxadiazon	Ronstar	8000	Toxic to fish	0.7 mg/l	Half-life 1-6 months
propyzamide	Kerb	5620-8350	Low	15 mg/l	Half-life approx. 1 mo.
simazine	Princep	>5000	Low	5 mg/l	Half-life approx. 2-3 mo.
chlorthal-dimethyl	Dacthal	>3000	Low	0.5 mg/l	Residual activity approx. 3 mo.
bensulide	Betasan, Betamec	770	Mod. to fish	25 mg/l	Tightly sorbed-long residual
parquat dichloride	Ortho Paraquat CL	150	Mod. to birds, none to fish	Readily soluble	Immediate inactivation
benfluralin	Balan	10000	Low to birds, high to fish	<1 ppm	Strongly sorbed
Insecticides					
diazinon	Spectricide	300-850	High	4 mg/l	Readily degraded
chloropyrofos	Dursban	135-163	High	2 mg/l	Slowly degraded, strongly sorbed
bendiocarb	Ficam	40-156	High	40 mg/l	Rapidly degraded
carbaryl	Sevin	400-850	Moderate	<1 ppm	No information
trichlorfon	Dylox	450-630	Moderate	154 g/l	No information
Fungicides					
anilazine	Dyrene	<5000	Low	8 mg/l	Half-life 12 hours
benomyl	Benlate	9590	Low	2 mg/l	Half-life 6-12 mo.
chlorothalonil	Daconil 2787	>10000	Low to birds, mod. to fish	0.6 mg/l	Half-life 1.5-3.0 mo.
iprodione	Chipco 26019 RP	3500	Low	13 mg/l	Rapidly metabolized
mancozeb	Dithane M-45	>8000	Low	practically insoluble	No information
qunitozone	PCNB, Terrachlor	12000	Non-toxic	0.44 mg/l	No information
thiram	Tersan	7500	Low	30 mg/l	Rapidly degraded
triadimefon	Bayleton	568	Low	260 mg/l	Rapidly degraded
metalaxyl	Subdue	669	Non-toxic	7.1 g/l	Rapidly degraded
thiophanate-methyl	Cleary 3336	7500	Low	3.5 mg/l	Rapidly degraded

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dicamba	ditto	1000-2000	Non toxic to fish	0.08 mg/l	Moderately residual
oryzalin	Surflan	10000	Mod. to birds, toxic to fish	2.5 mg/l	Moderately residual
oxadiazon	Ronstar	8000	Toxic to fish	0.7 mg/l	Half-life 1-6 months
propyzamide	Kerb	5620-8350	Low	15 mg/l	Half-life approx. 1 mo.
simazine	Princep	>5000	Low	5 mg/l	Half-life approx. 2-3 mo.
chlorthal-dimethyl	Dacthal	>3000	Low	0.5 mg/l	Residual activity approx. 3 mo.
bensulide	Betasan, Betamec	770	Mod. to fish	25 mg/l	Tightly sorbed-long residual
parquat dichloride	Ortho Paraquat CL	150	Mod. to birds, none to fish	Readily soluble	Immediate inactivation
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Insecticides					
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chloropyrofos	Dursban	135-163	High	2 mg/l	Slowly degraded, strongly sorbed
bendiocarb	Ficam	40-156	High	40 mg/l	Rapidly degraded
carbaryl	Sevin	400-850	Moderate	<1 ppm	No information
trichlorfon	Dylox	450-630	Moderate	154 g/l	No information
Fungicides					
anilazine	Dyrene	<5000	Low	8 mg/l	Half-life 12 hours
benomyl	Benlate	9590	Low	2 mg/l	Half-life 6-12 mo.
chlorothalonil	Daconil 2787	>10000	Low to birds, mod. to fish	0.6 mg/l	Half-life 1.5-3.0 mo.
iprodione	Chipco 26019 RP	3500	Low	13 mg/l	Rapidly metabolized
mancozeb	Dithane M-45	>8000	Low	practically insoluble	No information
qunitozone	PCNB, Terrachlor	12000	Non-toxic	0.44 mg/l	No information
thiram	Tersan	7500	Low	30 mg/l	Rapidly degraded
triadimefon	Bayleton	568	Low	260 mg/l	Rapidly degraded
metalaxyl	Subdue	669	Non-toxic	7.1 g/l	Rapidly degraded
thiophanate-methyl	Cleary 3336	7500	Low	3.5 mg/l	Rapidly degraded