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

FRANK F. FASI
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March 6, 1987

KK/DGP 1/87-205
87/CO-2

Mr. Fred J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Final Environmental Impact Statement (FEIS)
Waiawa Development - The Gentry Companies
Tax Map Keys 9-6-04: por. 1; 9-4-06: por. 10

We have determined that the above is an acceptable Final Environmental Impact Statement document for the proposed project. This determination in no way implies a favorable recommendation on the applicant's request for any approvals required by the Department of General Planning.

There are a number of concerns that must be addressed by subsequent zoning and other permit processes. These concerns are included in the acceptance report which is attached.

There are many changes to a project that could trigger a requirement for a supplemental or new EIS. Two such changes are worth mentioning in this instance since certain assumptions were made in the subject EIS relating to traffic which may significantly understate the traffic impacts of this project. They are as follows:

1. A decrease in the number of retirement oriented dwelling units with an increase in other dwelling units may trigger a requirement for a supplemental EIS to discuss traffic impact.

2. Should the increase in population permitted at Waiawa significantly increase the normally projected population for Leeward Oahu, a supplemental EIS may be required to discuss traffic impact.

If you have any questions, please contact Keith Kurahashi of my staff at 527-6051.

Sincerely,

Donald Clegg

DONALD A. CLEGG
Chief Planning Officer

Attach.

cc: ✓OEQC
Mr. Tosh Hosoda, The Gentry Companies
Department of Land Utilization

DEPARTMENT OF GENERAL PLANNING (DGP)
87/CO-2

ACCEPTANCE REPORT: CHAPTER 343, HRS
ENVIRONMENTAL IMPACT STATEMENT (EIS)
WAIAWA DEVELOPMENT PLAN AMENDMENT
THE GENTRY COMPANIES
WAIAWA, OAHU, HAWAII
TAX MAP KEY 9-6-04: POR. 1;
9-4-06: POR. 10

A. Background

The proposed Waiawa Development is the first increment of the total master planned Waiawa community. This first increment is the subject of a City and County of Honolulu Development Plan Amendment Review and consists of 1,395 acres. The project site is presently designated Agriculture on the Central Oahu Development Plan Land Use Map. This increment will be developed as a self-contained, planned community. The total Waiawa Master Plan community will consist of approximately 2,500 acres.

The project site was used for agricultural purposes since the turn of the century. Since 1983, however, the site has been fallowed by the Oahu Sugar Company.

The development includes single-family detached residential units, low density and medium density apartments, retail commercial spaces, commercial/industrial areas, two 18-hole golf courses, an elementary school, a public park, and preservation areas. The acreages for these uses are as follows:

Residential	727 acres
Apartment-Low Density	82 acres
Apartment-Medium Density	15 acres
Commercial/Industrial	115 acres
Golf Course/Open Space/ School/Parks	393 acres
Major Roadways	63 acres

The proposed development would result in the creation of 7,900 single family and apartment units of which approximately one half (4,000) would be planned for a retirement community.

The proposed project will include roadway, drainage, sewer system, water system, and underground electrical and telephone improvements.

The proposed project will access the highway system at the Waipio Interchange, Kamehameha Highway at Ka Uka Boulevard, Kamehameha Highway at Waipahu Street, and Kamehameha Highway at Waihona Street. Traffic improvements are planned at the Waipio Interchange, the Waipahu Street/Kamehameha Highway intersection, and the Ka Uka Boulevard/Kamehameha Highway intersection.

At full development, the estimated demand for potable water will be approximately 3.3 MGD per day. An additional 1.4 MGD of water will be needed for golf course irrigation. The developer proposes to construct an on-site water source, storage reservoirs and transmission and distribution mains which would be designed and constructed to meet City standards. The system will be turned over to the Board of Water Supply for operation and maintenance upon completion.

The proposed Waiawa development is expected to generate an average daily sewage flow of approximately 3.1 MGD when fully developed. The developer proposes a new 1.5 mile off-site trunk sewer to connect their system to the Pearl City Wastewater Pump Station. Wastewater will then be pumped to the regional sewage treatment plant at Honouliuli for treatment.

The proposed project's site improvements will cost approximately $284 million.

B. Procedures

1. An EIS Preparation Notice, prepared by the applicant's consultant appeared in the "Environmental Quality Commission (EQC) Bulletin" on April 23, 1986. At the request of the applicant, the EIS Preparation Notice was published again on May 23, 1986. 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 June 23, 1986, allowing all parties greater than the required 30-day minimum consultation period. Twenty-one (21) parties submitted written comments during this period, which were responded to in writing by the applicant except for two (2) in which no response was deemed necessary.

3. The Draft EIS was received and distributed by the OEQC on December 5, 1986. The deadline for public review was then set for January 7, 1987.

4. Twenty-seven (27) parties made replies to the Draft EIS. Three (3) of these twenty-seven (27) replies were dated and received after the deadline for public review. The applicant made point-by-point responses to all substantive comments on the twenty-four (24) replies received by the public review deadline, within the 14-day response period.

C. Content

The Final EIS for the proposed Waiawa 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 were considered to be controversial because differing "expert" opinions pertaining to a specific issue were presented by the applicant and a commenting party.

Archaeology

A difference of opinion on the relative significance of the archaeological sites described in the Waiawa Ridge area was presented by the applicant's archaeology consultant and a commenting party.

Air Quality

There was a difference of opinion between the applicant and a commenting party on the causes of carbon monoxide exposure of vehicle occupants and a basis for discussing its relationship to the project.

F. UNRESOLVED ISSUES

We concur with the listing of unresolved issues found on page X-1 of the Final EIS: State Land Use Boundary, Site Acquisition, and Agricultural versus Urban use.

In addition, several issues discussed by the applicant remain unresolved.

An issue that shall be resolved prior to approval of the applicant's development plan amendment request is its inconsistency with the population distribution policies in the General Plan. An amendment to the General Plan is currently in process.

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. The project will require new water source system approval from the State Department of Health, increased water allocations within the Pearl Harbor Groundwater Control Area from the Board of Land and Natural Resources and Board of Water Supply approval of a water master plan. The developer has indicated that a study is underway at the request of the U.S. Navy to determine the impact to the recharge area for the Waiawa Shaft. This study, being conducted by the Water Resources Center at the University of Hawaii with the cooperation of the Board of Water Supply, may provide pertinent information to be considered in the decision making of these approving agencies.

4. Approval of a mitigation plan to minimize impact on the groundwater recharge quality and quantity from the Department of Land Utilization through consultation with the Department of Health. Again the study mentioned in Item 2 above may be helpful in the decision making process.

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

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

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

8. A park and recreation plan approved by the Department of Parks and Recreation.

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 in no way implies a favorable recommendation on the applicant's request for any approvals required by the Department of General Planning.

Donald Clegg

DONALD A. CLEGG
Chief Planning Officer

OA
364

Environmental Impact Statement

Development Plan Amendment

WAIAWA

by GENTRY

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

DATE DUE

~~Feb. 22, 1999~~
~~Mar. 8, 1999~~
~~Mar. 22, 99~~
~~Apr 5 99~~
~~Apr 12 99~~
~~May 25, 1999~~
~~July 16, 1999~~
~~April 17, 2001~~
May 7, 2001

FINAL
ENVIRONMENTAL IMPACT STATEMENT
For the Proposed
WAIAWA DEVELOPMENT

Waiawa, Central Oahu, Hawaii

January 1987

Submitted pursuant to Chapter 343, Hawaii Revised Statutes,
Environmental Impact Statement Regulations

F. J. Rodriguez, President
Environmental Communications, Inc.
Environmental Consultants for
The Gentry Companies

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— SUMMARY

I. SUMMARY

CHAPTER 343, HRS
ENVIRONMENTAL IMPACT STATEMENT (EIS)

Action:	Applicant
Project Name:	Waiawa Development
Project Description:	The applicant proposes to develop 1,395 acres of land at Waiawa, Central Oahu. Residential, Low Density Apartment, Medium Density Apartment, Commercial/Industrial, Park, Golf Course and Roadway. The applicant proposes to create a master-planned community which offers residential, apartment, commercial and light industrial uses with two 18-hole golf courses extending through the site. These changes would permit development of 7,900 single family and apartment units. About one half (4,000) of these units will be programmed for a retirement community. Changes for the subject 1,395 acres represent the first increment of the Waiawa Master Plan. When completed, the Waiawa community will total approximately 2,500 acres.
Area:	1,395 acres
Project Location:	Waiawa, between Waiawa Gulch and the H-2 Freeway, Central Oahu.
Tax Map Key:	9-4-06: por. 10 and 9-6-04: por. 1
Present Use:	Vacant and grazing

State Land Use:	Agriculture
Development Plan Designation:	Agriculture, Residential and Commercial/ Industrial
Zoning:	AG-1, Restricted Agriculture
Proposing Applicant:	The Gentry Companies P.O. Box 295 Honolulu, Hi 96809
Landowner:	Bernice P. Bishop Estate
Accepting Authority:	Department of General Planning 650 South King Street Honolulu, Hawaii 96813

= PURPOSE

II. PURPOSE

This Environmental Impact Statement is prepared pursuant to Chapter 343 Hawaii Revised Statutes and in accordance with the City and County of Honolulu's Department of General Planning Development Plan regulations. This document will also be used as an exhibit in the State Land Use Commission Hearings and subsequent zoning requests.

The initial action required for this project involves a Development Plan amendment of Agriculture and Preservation lands to Urban useage. The document will be reviewed by the City and County Department of General Planning.

PROJECT DESCRIPTION
STATEMENT OF OBJECTIVES

III. PROJECT DESCRIPTION AND STATEMENT OF OBJECTIVES

A. Project Location

The 1,395 acre project site is located on the Waiawa plain of Central Oahu between Waiawa Gulch and the H-2 Freeway (Figure 1). The site is roughly triangular in shape with it's apex directed southerly at the Waiawa Interchange. The Gentry and Crestview communities lie to the west of Waiawa and the 63 acre Pearl City Industrial Park is adjacent to the east. More specifically, the project is identified as TMK: 9-4-06: por. 10 and 9-6-04: por. 1. The lands to be developed are currently vacant and fallowed by Oahu Sugar. Portions of the site are used for minor cattle grazing use. The fee land owner is the Bernice P. Bishop Estate.

B. Project Description

The proposed Waiawa Development Plan represents the first increment of the total masterplanned Waiawa community. This first increment, which is the subject of City and County of Honolulu Development Plan Review, will consist of 1,395 acres that can stand alone as a self-contained, planned community. When completed, the total Waiawa Master Plan community will total approximately 2,500 acres.

Project features would include: residential uses with single family detached units, low density and medium density apartments; retail commercial spaces as well as commercial/industrial areas; two 18-hole golf courses extending throughout the site; and open spaces throughout the area. The acreages for these uses are listed in Table 1.

The proposed development would result in the creation of 7,900 single family and apartment units (Table 2). Approximately one half (4,000) of these units would be programmed for a retirement community which would be a central feature of the overall development.

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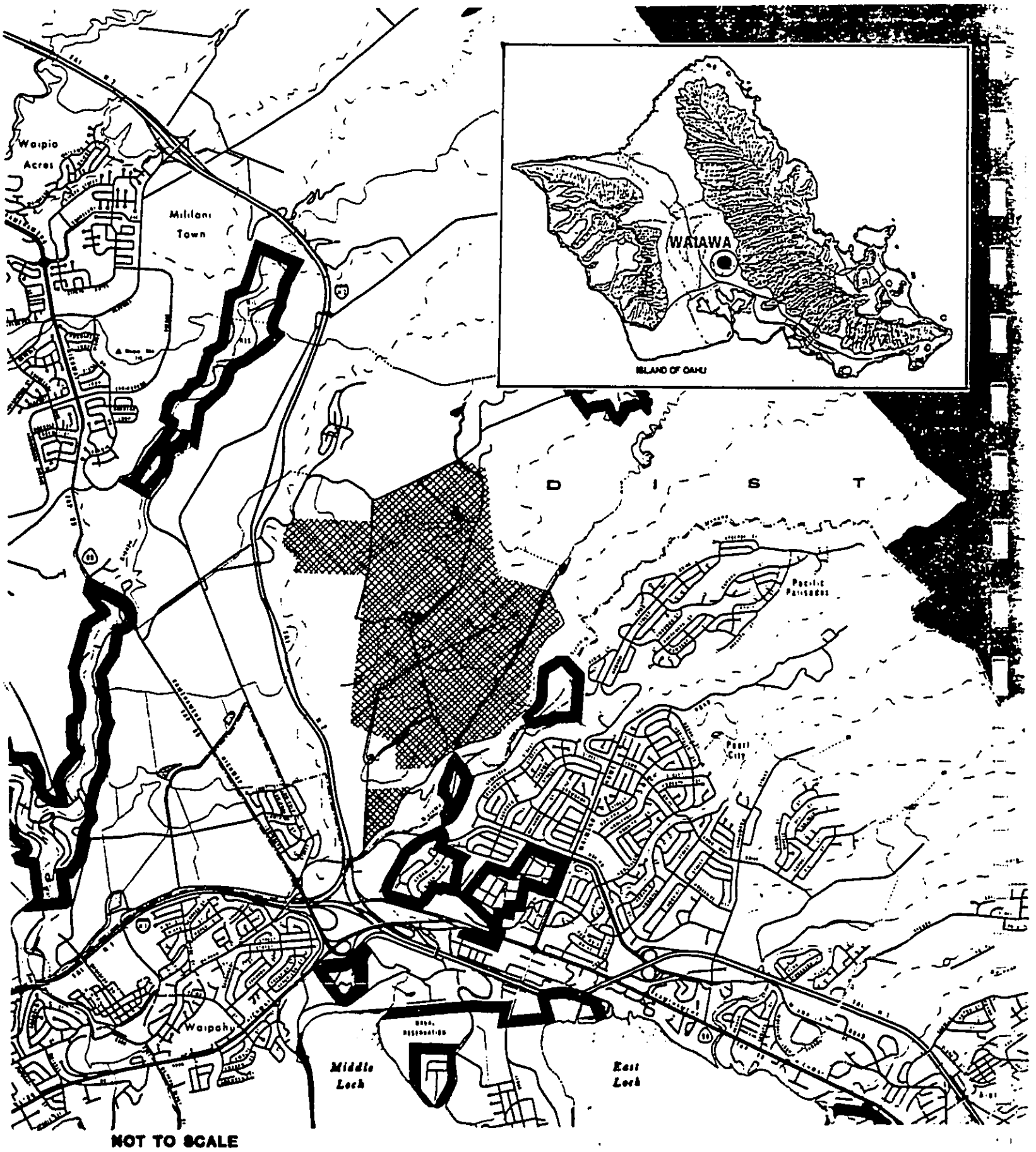


Figure 1
Waiawa Project Location Map

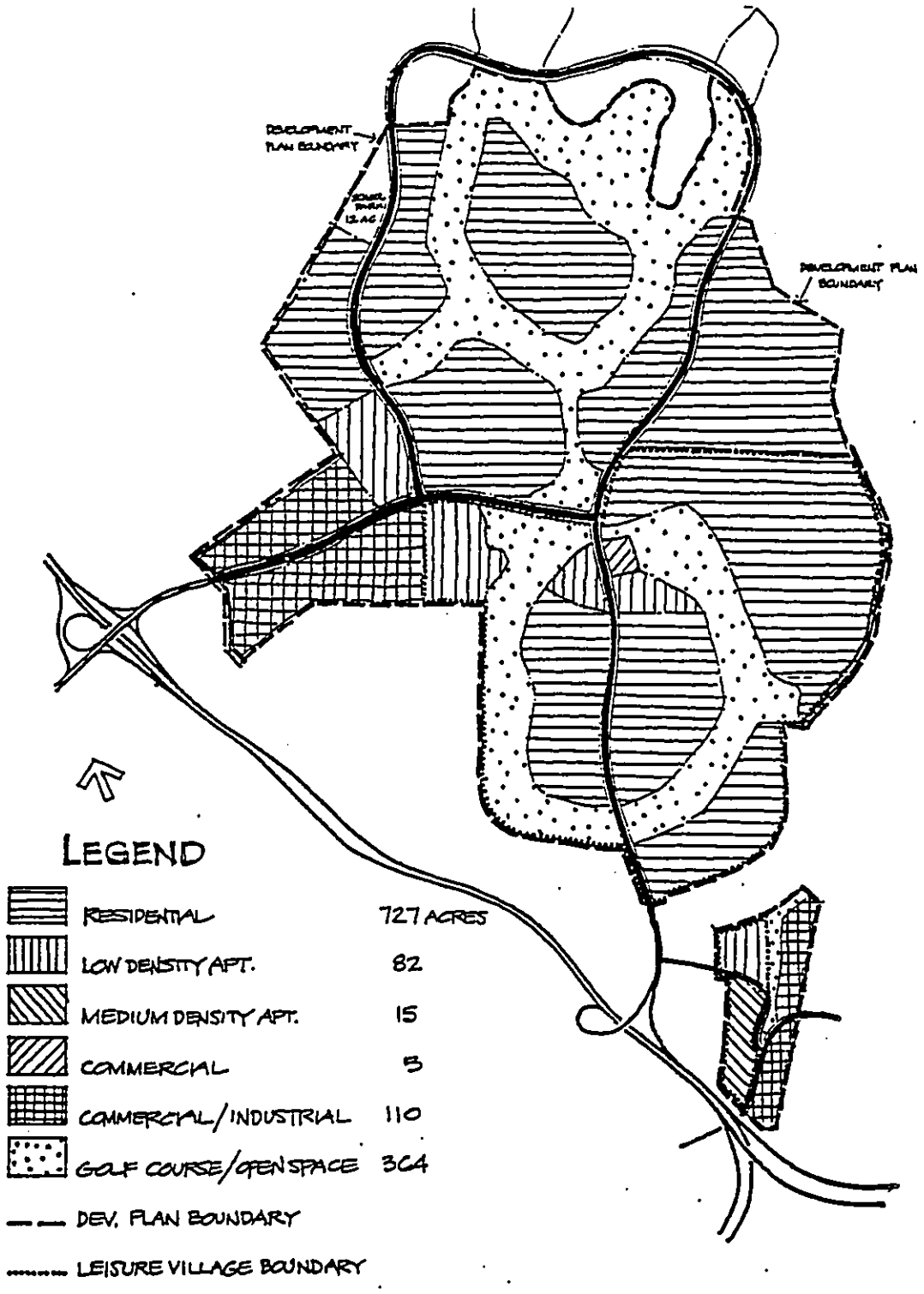


Figure 2
Site Plan

Waiawa

Table 1

ACREAGE SUMMARY

Land Use	Acreage for Development Plan
Residential	727
Apartment-Low Density	82
Apartment-Medium Density	15
Commercial/Industrial	115
Golf Courses/Open Space /School/Parks	393
Major Roadways	63
TOTAL ACREAGE	1395

Table 2

HOUSING DENSITY

Acreage/Use	Density	Total Units
727/Single Family Detached	8 units/acre	5,800
82/Apartment-Low Density	20 units/acre	1,650
15/Apartment-Medium Density	30 units/acre	450
		7,900

C. Statement of Objectives

The proposed project represents the first increment of the overall master planned Waiawa Development Plan. As the first increment of the proposed master plan, the project will include all types of land uses representative and catalytic in developing an independent and identifiable community.

The project will offer living, employment, education, recreation, and shopping facilities all within the project bounds. The project is sited on a highly desireable area with good views and an overall atmosphere of spaciousness. Two golf courses will serve as a central open space feature of the development plan.

A unique feature of the project will be the planned "retirement community" located on project. This community within a community will offer a variety of activities and will be geared towards "empty nesters" and retirees who seek a desireable and active environment typically not found within Hawaii.

D. Development Timetable and Phasing

A conservative 5-year phasing plan has been prepared by the developer (Table 3) for the first increment of the Waiawa Development Plan. By the end of the fifth year, 30 acres of commercial and industrial property will have been developed, with approximately 1,000 single family detached dwellings on 150 acres, and 500 multi-family units on 35 acres. Two golf courses representing approximately 360 acres will have also been developed along with the necessary club houses and other community type uses. The retirement oriented housing will include 800 single family detached/attached housing units on 100 acres and 300 multi-family low density apartment units on 15 acres. Actual buildout of the commercial/industrial, residential and apartment units will occur over 10 years.

Table 3
DEVELOPMENT PHASE ONE

YEAR	DESCRIPTION	NET ACREAGE (Approximate)
1	Extension Ka Uka Boulevard	
	200 units single family detached residential	30 acres
	100 units multi-family low density apartments	5 acres
	Sewer trunk line	
	Water system with source storage	
2	Championship golf course (private/public)	220 acres
	Retirement Area golf course	133 acres
	200 single family (retirement)	25 acres
	200 units single family detached	30 acres
	100 units multi-family	5 acres
	Main Loop road extension	
3	Commercial/industrial	15 acres
	200 units single family detached	30 acres
	100 units multi-family	5 acres
	200 residential (retirement)	25 acres
	100 multi-family (retirement)	5 acres
4	Commercial/industrial	15 acres
	200 units single family detached	30 acres
	100 units multi-family	5 acres
	200 single family (retirement)	25 acres
	100 multi-family (retirement)	5 acres
5	Commercial/industrial	10 acres
	100 units multi-family	5 acres
	200 units single family detached	30 acres
	200 single family (retirement)	25 acres
	100 units multi-family (retirement)	5 acres

E. Funding

The total construction costs for structures and direct site improvements for the first increment Development Plan Amendment area are esimated to be $284 million. The cost projection does not include land values, anticipated financing costs, general corporate overhead costs or property and income taxes. The project will be developed primarily at the developer's expense.

F. Historical Perspective

The project site was used for agricultural purposes since the turn of the century. Since 1983, the site has been fallowed by Oahu Sugar Company.

IV ALTERNATIVES CONSIDERED

IV. ALTERNATIVES CONSIDERED

A. No Action

This alternative would result in no action being implemented. The impact of this alternative would be that the project site would remain as is. Eventually, weeds and grasses would cover the vacant portions of the site while grazing uses might continue. However, this use would generally be inconsistent with the surrounding residential developments.

This alternative was not found to be viable because its non-use would render the properties useless to the landowner and the tremendous waste of valuable land adjacent to highly urbanized areas would not provide any benefit to the surrounding communities or the State at large. In addition, No-Action would represent a blow to rational long-term land planning. City and State governments would also suffer from opportunity costs associated with losses of potential employment, tax revenues, and housing supply.

Conversely, development of the site would constitute an irretrievable use of land and would preclude any other uses for the site.

B. Active Agricultural Use

The subject lands have the agronomic potential to be productive agricultural lands. However, due to market parameters, the declining importance of the sugar industry, and the availability of similar lands on Oahu, placing the subject lands in an urban use will not have a significant impact on the agricultural sector of Honolulu County or the State. Lands of similar quality and economic potential are currently lying fallow and there are sufficient lands available to meet current and projected future agricultural needs. If these lands were to remain in agriculture, their most likely use would be for grazing and grazing is an activity that returns very little per acre.

< AFFECTED ENVIRONMENT

V. THE AFFECTED ENVIRONMENT

A. Geographical Characteristics

1. Topography

The project site lies on a gently sloping area of the Waiawa Plateau at elevations ranging from approximately 550 feet on the northern portion of the property to 200 feet above mean sea level at the southern end. There are several gulch areas with steeper slopes running through the site. The eastern end of the project site is delineated by the Waiawa Gulch and Stream. Slopes bordering the gulch are relatively steep, but level off along the bottom areas.

2. Geology

The proposed project area is located on the southern slope of the Schofield Plateau. This plateau was built up by many successive lava flows originating from the Koolau shield volcano. This rock unit is made up of firm to very hard volcanic rocks which form bedrock in the proposed project area and vicinity. The soils in this area are typically residual, derived from the weathering of basic igneous rock.

3. Soils

There are four major soil associations found on the project site including the watershed area. These are the Lualualei-Fill Land-Ewa association near Pearl Harbor; the Helemano-Wahiawa association, the rough mountainous land-Kapaa association; and finally, the Rock-land-stony steep association at the crest of the Koolau Mountain range.

The project site contains portions of at least the first three associations and is defined as:

a. Lualualei-Fill land-Ewa association: consists of deep, nearly level to moderately sloping, well-drained soils that have a fine textured or moderately fine textured subsoil and is primarily located on the coastal plains.

b. Helemano-Wahiawa association consists of deep, nearly level to moderately sloping, well-drained soils that have a fine-textured subsoil is mainly situated in the upland sectors.

c. Rough mountainous land-Kapaa association is characterized by very steep land comprised of gulches and narrow ridges that form numerous deep drainageways which are made up of well-drained soils that have a fine textured or moderately textured subsoil.

4. Climate

The mean rainfall at Waiawa is approximately 30 to 40 inches per year. The months of May through October are normally dry.

Temperature ranges on the project are consistent with similar areas of medium to higher elevations and are subject to the cooling effects of the North-northeast trade winds. Estimated annual temperature ranges of 66-84 degrees are considered typical for this site.

B. Hydrological Characteristics

1. Groundwater

The two major geological features of the Waiawa Ridge area are the extensive permeable lavas and the coastal sedimentary caprock. Together, these two features provide southern Oahu as well as Waiawa Ridge with a good source of basalt water that is high in quality.

The principal source of fresh basal groundwater in southern Oahu is rainfall in the Koolau Mountain range. Recharge in the rainy highlands is through the mantle of soil and weathered rock. Percolation also occurs in stream channels that have thin permeable alluvium; in fact, Waiawa Stream as well as other Pearl Harbor streams are perennial in the high elevation rain forests. However, as these streams pass through the middle reaches of the watershed area, they become intermittent due to percolation loss due to the thin layering of alluvium soils and weathered rock.

2. Drainage

Drainage from the project site is part of the 26.4 square mile Waiawa watershed into the middle loch of Pearl Harbor via the Waiawa Stream. As discussed in the Soils section, the flow of onsite drainage that moves via the Waiawa Stream is not considered to be significant due to the fact that the areas with the highest rainfall coincide with the areas that have the highest rate of percolation. Uses that had been in practice for this project site also created difficulties for estimating drainage and runoff coefficients since so much water was either pumped or imported for sugar cane cultivation.

3. Flood Insurance Study Designation

According to the Flood Insurance Study for the City and County of Honolulu prepared by the Federal Insurance Administration (FIA) in September 1980, most of the Waiawa Development will occur in zone designations C and D. These are areas of minimal flooding and areas of undetermined, but possible, flood hazards, respectively.

The portion of the project site along Waiawa Stream has been designated as Zone A, an area of 100-year flooding with base flood elevations and flood hazard factors not determined.

4. Coastal Zone

The project site lies outside the designated shoreline and tsunami inundation zone. No direct coastal impacts are expected from the project and no Hawaii Coastal Zone Management Program permits are expected to be required.

5. Wetlands

No wetlands are found on the project site and no Corps of Engineers Wetland permits are expected to be required.

C. Biological Characteristics

1. Flora

The majority of the project area is covered by abandoned canefields. These former cane lands have more or less gentle slopes. Around the canefields is exotic perimeter vegetation composed largely of grass and shrub species. The gulches which dissect the fields support large blocks of forestry plantings and dense shrubbery growth.

The vegetation types in the area are dominated by introduced or exotic species. The study area has been so completely disturbed by past activities such as sugar cane cultivation that no trace of any native vegetation types remain today. Of the 149 species inventoried during this survey, 137 (92%) are introducted, 9 (6%) are native (2 endemic, 7 indigenous), and 3 (2%) of Polynesian origin. No rare, threatened or endangered species were found on the site.

2. Fauna

Due to the existing agricultural use of the project site insects, avifauna, and mammals populating the site are largely exotic in nature, and not considered rare or endangered species. Various common bird species, such as the barred dove (Gopelia striata), lace-necked dove (Streptopelia chirensis chirensis), common mynah (Actidotheres t. tristis), Japanese White-eye (Zosterops Japonica Japonica) and red-crested Cardinals (Paroaria coronata) may frequent the site.

Pests such as the house mouse (Mus musculus), Polynesia rat (Rattus exulans hawaiiensis), and Indian mongoose (Herpestes auropunctatus auropunctatus) are also likely to be at the project site.

D. Archaeological Characteristics

An archaeological reconnaissance was conducted for the project site with a preceeding literature search as follows.

1. Literature Search

Published information on the area is scarce. McAllister (1933: 105) mentions only one site in the vicinity, and that was in Waiawa Gulch immediately outside the project area on the southeast:

> "Site 121. Puoiki heiau, at the juncture of Manana and Waiawa gulches.
>
> "The heiau crowned the top of a small oval knoll which is about 50 feet high by 100 feet wide and 200 feet long. The Sides of the knoll are perpendicular except for a steep and narrow neck on the mountain side. During the ceremonies the people are said to have been at the foot of the knoll and surrounding the heiau. There are no remains."

Handy (1940:81) refers briefly to taro cultivation in Manana gulch:

> "This narrow ahupua'a was called Manana-iki in its lower portion and Manana-nui in the mountains where it broadens and includes Manana Stream, which flows into Waiawa. There were a few terraces seaward, irrigated by Waiawa Stream."

A reconnaissance survey of the entire project area was conducted in February, 1986. Exposures of partially-buried terrace retaining walls were found in the bottoms of three of the gulches, and a basalt adze was found on the surface of one of the adjacent slopes. One of the retaining wall locations, reported as Site 1469, was found on the site.

2. Survey Results

Four sites were recorded and given numbers according to the State of Hawaii Historic Preservation Office system.

Site 1469 consists of two parallel boulder alignments at the bottom of a gulch at the north end of the survey area. One of the alignments measures 8.9 meters in length, 1.4 meters in width, and stands to a height of 50 centimeters. The second alignment measures 28.3 meters in length, 80 centimeters in width, and up to 70 centimeters in height. No midden remains were found on the surface, but a test trench through one of the alignments revealed the presence of a glass bottle beneath

one of the boulders, thereby dating the site. It was concluded that the site was built by either the sugar company or the pineapple company to channelize the streamflow.

Site 1470 is a historic dump on the slopes of a gulch at the north end of the survey area, covering an area about 60 meters in diameter. Remains consist primarily of whole and fragmentary bottles and broken metal vessels. The bottle evidence suggests that the site was in use around the beginning of the present century. It was concluded that this was the dump area for the people using nearby Site 1471.

Site 1471 is an area marked on a 1922 War Department map as "Cannery," and includes a stone terrace retaining wall measuring 21 meters in length and standing between one and two meters in height. Historic refuse scattered around the feature includes a bath tub, glass bottles, ceramic plates and bowls, metal pipes and pots, and wooden timbers. The vicinity of the site has clearly been bulldozed since February 1974, when an aerial photograph shows several structures still standing at that time.

Site 1472 is an area measuring about 50 by 200 meters, located on a bluff overlooking a gulch near the center of the survey area. It consists of a light scatter of broken glass and the bulldozed remains of several vehicles and houses. An aerial photograph taken in January of 1977 indicates at least seven structures present, while a USGS Orthophotoquad shows that these had been bulldozed by January of 1978. It is likely that these structures were part of Oahu Sugar Company's operations in the area.

3. Test Pit Results

Thirty-six test pits were excavated in the bottom of one of

the gulches at the north end of the survey area to determine whether there were any buried archaeological deposits present. The possibility was considered because there at first sight appeared to be thick sedimentation in most of the gulches. The test pits were excavated by using a gas-powered six-inch diameter auger to initially loosen the soil and a pick and shovel to complete the task. The test pits ranged in size from 30 by 30 centimeters to 60 by 60 centimeters, and in depth from 10 to 40 centimeters. What was revealed was a fairly consistent upper layer of relatively loose, culturally sterile alluvium up to 10 centimeters thick, lying on top of a hard saprolitic base. No cultural materials of any kind, not even small charcoal flecks, were observed. Close visual inspection of the steep slopes indicated that the surface exposures in those areas consisted of the culturally sterile basal saprolite, and sub-surface testing was not done.

E. Existing Population and Growth Characteristics

The Waiawa-Waipio area has undergone substantial changes during the past twenty years. Growth in the area was primarily accounted for by the advent of the Seaview and Crestview subdivisions located south of the project site and Mililani to the north. Between 1970 and 1980 the Waiawa-Waipio census area experienced 177% population growth for a total of 12,783. From 1980 to 1984 an additional 95% population growth was recorded. These changes indicate the growth potential for the area. Over the next decade substantial urbanized growth should be expected, especially in view of local policies which target the area for major growth.

F. Existing Traffic Conditions

The H-2 freeway, along the west boundary of the project area, provides a direct link between Pearl City/Waipahu and Wahiawa. Analysis using Highway Capacity Manual methods indicate that existing

highway levels of service are at Level of Service B, a condition of stable flow with a slight reduction in speed, during both the AM and PM peak hours.

Ka Uka Boulevard intersects Kamehameha Highway in a T-intersection. Westbound traffic on Ka Uka Boulevard is controlled by stop signs; separate lanes are provided for left and right turn traffic. A separate left turn lane is provided for southbound traffic on Kamehameha Highway desiring to turn onto Ka Uka Boulevard. Level of Service E, volumes of near or at capacity, is experienced by Ka Uka Boulevard left turn traffic in both peak hours.

Waipahu Street, a collector route through Waipahu town, forms a T-intersection at its junction with Kamehameha Highway, north of Waiawa Interchange. In the vicinity of the Waipahu Street intersection, Kamehameha Highway is a four-lane divided highway and separate turn lanes are provided at the intersection. Analysis of the intersection using a State Highways Division estimate of existing traffic and the Critical Movement Analysis (Planning Application) for signalized intersections show under capacity conditions during the peak hours.

Waihona Street is the major collector road serving the Pearl City Industrial Park. Waihona Street meets Kamehameha Highway in a T-intersection. Two-way traffic is permitted along Kamehameha Highway between the Farrington Highway junction near Pearl City and the vicinity of Waihona Street. However, west of Waihona Street, Kamehameha Highway becomes one-way in the westbound direction and functions as on-ramps to the H-1 and H-2 freeways.

G. Ambient Air Quality

A summary of air pollutant measurements from State of Hawaii long term monitoring stations located nearest to the project is presented in Appendix I. Data from several different sampling stations are included in the tabulation.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

The sampling station for particulates and sulfur dioxide is located in Pearl City, about two miles east southeast of the project area. The monitoring of sulfur dioxide in Pearl City was discontinued in 1984 and 1985 measurements are from the Barbers Point station located about six miles southwest of the project.

Until September 1979, and after June 1983, carbon monoxide monitoring was conducted at the Department of Health building at Punchbowl and Beretania Streets in urban Honolulu. This site is about 12 miles southeast of the project. During 1981 carbon monoxide was measured at Fort DeRussy in Waikiki (13 miles southeast of the project), and in 1982 carbon monoxide was monitored at Leahi Hospital in Kaimuki, about 15 miles southeast of the project.

Ozone levels were also measured at the Department of Health building in urban Honolulu until December 1980, when the monitor was relocated to Sand Island (about 10 miles southeast of the project site). During 1981 nitrogen dioxide was also monitored at the Sand Island location, but all nitrogen dioxide monitoring has since been discontinued. Lead measurements are from Liliha Street in Kalihi, about 11 miles southeast of the project site.

From the data evaluated, it appears that State of Hawaii ambient air quality standards for particulates, sulfur dioxide, nitrogen dioxide, and lead are currently being met at nearest monitoring stations to the project area.

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 once or twice 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 periods of rush hour traffic. Carbon monoxide would thus be the pollutant most likely to cause difficulty in meeting allowable State of Hawaii AQS as a result of new residential development on Oahu.

There are power plants and other potential sources of industrial pollutants along the central portion of the leeward coast in the vicinity of the project site, but the generally low readings of particulates and sulfur dioxide at the Pearl City monitoring station just to the east of the project indicate that these sources are not likely to cause any air pollution problems at Waiawa. Likewise sugar cane cultivation to the north and west could generate some particulates and carbon monoxide when fields are burned at harvest (about once every two years for any given fields), but the consistently low readings of particulates at Pearl City indicate that this source is not likely to present any significant air pollution problems either.

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

H. Ambient Traffic Noise Conditions

The existing traffic noise environment along the H-2 Freeway Right-of-Way in the area of the project is in the "Significant Exposure, Normally Unacceptable" category, with traffic noise at 70 Ldn along the Right-of-Way. However, existing noise sensitive developments on the west side of the freeway are either at large setback distances from the freeway or shielded from the freeway is the location of the proposed Waiawa Development, and the area is currently undeveloped. Traffic noise from H-2 Freeway is below 60 Ldn at

residential communities west of the freeway, and generally below 55 Ldn. Existing traffic noise levels along the freeway are in the "Acceptable, Moderate Exposure" and "Unconditionally Acceptable, Minimal Exposure" categories.

I. Infrastructure and Utilities

The entire project site is currently undeveloped with the exception of abandoned Oahu Sugar wells, therefore, no infrastructure or utilities currently service the site. Existing utilities and infrastructure connections are available outside of the site and will be utilized wherever possible. Hawaiian Electric Company easements near the project site are shown in Figure 3.

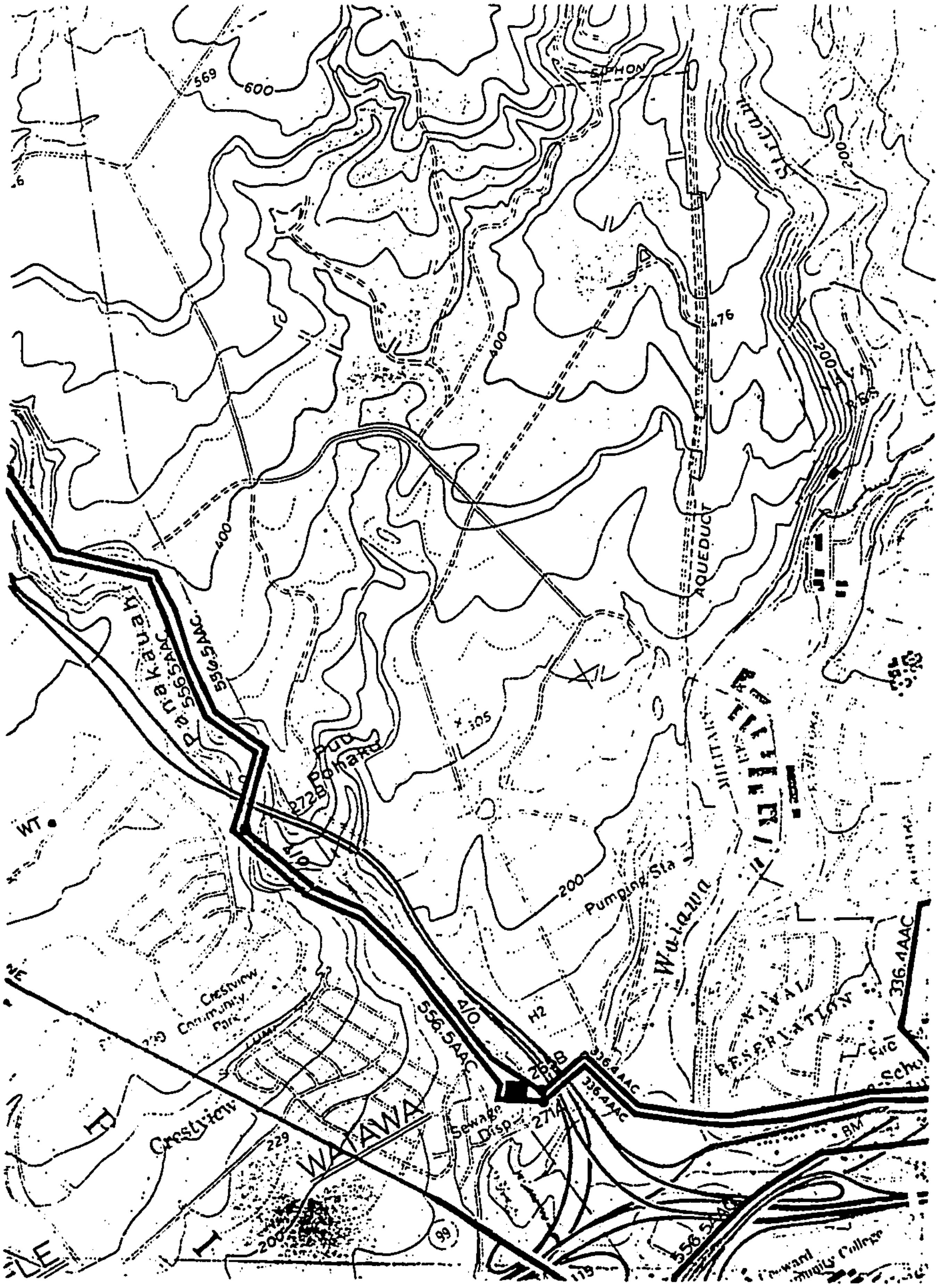


Figure 3

Waiawa HECO Easement Map

RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

VI. RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

A. Federal

No Federal plans or programs directly affect development of the proposed residential project.

B. State

1. Hawaii State Plan

The Hawaii State Plan consists of a series of broad goals objectives and policies which act as guidelines for the growth and development of the State. In general, the proposed project is consistent with the overall intent of the State Plan. The overall theme of the Hawaii State Plan is:

- Individual and family self-sufficiency
- Social and economic mobility
- Community or social well-being

Specifically, the Hawaii State Plan details objectives and policies in the various areas such as population, the economy, physical environment, facility systems, socio-cultural advancement and fiscal management. The Waiawa project is consistent with many of the goals and policies of the Hawaii State Plan and has been designed to facilitate its objectives.

SEC. 226-11 Objectives and policies for the physical environment - land-based, shoreline, and marine resources.

The project site currently consists of fallowed agricultural land. The proposed project will provide a productive use of the project site and this use is felt to be consistent with the surrounding developments. Impacts on other resources are expected to be negligable.

SEC. 226-13 Objectives and policies for the physical environment-land, air, and water quality.

Air quality will be impacted from the additional vehicular traffic generated by the project. This impact, as reported in the air quality study, was generally not found to be significant. Water quality impacts will be minimal since a planned drainage system will be implemented to address project needs. Sedimentation basins will be utilized to mitigate project related runoff.

SEC. 226-15 Objectives and policies for facility systems-solid and liquid wastes.

A wastewater plan has been developed which would utilize the regional Honouliuli treatment plant for processing and disposal. No wastes will be injected into the ground. Solid wastes will be collected and disposed of by the City and County of Honolulu and private refuse collection services.

These measures are expected to meet the objectives and policies of this section.

SEC. 226-17 Objectives and policies for facilities systems-transportation.

The proposed project will produce additional vehicular traffic which will impact the current traffic patterns. Mitigation measures which may alleviate some of these impacts are discussed in Section VII. Traffic is a major concern of the

project, however, the other positive benefits of the project are felt to offset this impact.

SEC. 226-18 Objectives and policies for facilities systems-energy /telecommunications.

Energy conservation will be practiced in the development of the project through the use of solar heating and the use of air conditioning only where necessary. Energy self-sufficiency will be practiced whenever possible.

SEC. 226-19 Objectives and policies for socio-cultural advancement-housing.

The proposed project will be consistent with the objectives and policies of this section through its' creation of a variety of housing types and costs to suit the needs of a large portion of the housing market. Additionally, the integral planning for a retirement village and an overall community integration concept lend a cohesive and desireable environment which would offer significant opportunity to Hawaii's housing market. The project is well suited for residential development within a clean and scenic area. The project would serve as urban infill yet remain separately identifiable by its topographic boundaries.

SEC. 226-20 Objectives and policies for socio-cultural advancement-health.

The proposed project will be well serviced in addressing individual health needs. The leisure village will feature well planned health service facilities which should serve the entire community. Special attention will also be paid in designing residential units which will address special needs that might be required. The abundance of recreational facilities will further promote "wellness" through physical and mental health.

Waiawa will provide safe and healthy resources as required by all governmental laws and regulations.

SEC. 226-25 Objectives and policies for socio-cultural advancement-culture.

The diversity of residential types and costs along with the recreational, business, commercial and employment centers within the Waiawa community should foster an open sense of cohesiveness with diversity.

The area was not found to contain any significant archaeological remains nor was it found to be particularly significant historically.

SEC. 226-26 Objectives and policies for socio-cultural advancement-public safety.

The addition of a fire station as well as additional police service should promote public safety and promote a sense of security.

SEC. 226-104 Population growth and land resources priority guidelines. (b)(9)(10) Priority guidelines for regional growth distribution and land resource utilization.

The Waiawa Gentry development presents offsetting goals with the scope of this guideline. Development in Ewa and Central Oahu is currently being promoted to alleviate congestion within Eastern and Urban Honolulu, however, this redirection often occurs at the expense of important agricultural lands. The agricultural economics study conducted for this project suggested that although the project lands involved are agriculturally significant, actually productivity through agriculturally viable uses is low. Urban useage is considered an acceptable use

when the scope, planning, and socio-economic benefits of the proposed project are considered.

The project site was not determined to be environmentally critical in the area of archaeology, flora, and fauna. Any environmental impacts occuring as a result of the development will be mitigated where possible. Development of the site will result in the permanent loss of open space as it exists, however, the project will be very open through its use of two integrated golfcourses and various park and green spaces. The project is not expected to adversely affect any critical resources in the area.

SEC. 226-106 Affordable housing. Priority guidelines for the *provision of affordable housing*.

The proposed project will provide a diversity of housing types within a spectrum of costs. Affordable housing is planned for the development and a commitment between the developer and the City and County of Honolulu will be negotiated in a timely manner.

2. State Functional Plans

The Hawaii State Plan has been prepared for use as the primary planning tool in directing the planning process for Hawaii's long and short-term goals. By setting the overall theme and directive, functional plans were created as extensions of the State Plan. These functional plans specify objectives, policies, and implementing actions to address these concerns. These plans were reviewed to determine their relationship to the

proposed project. These plans are reviewed and evaluated below.

a. State Education Plan and State Higher Education Plan

This plan relates to educational functions, respective school systems, growth and goals. Office procedure (records in a computer system), target groups, personnal developments, and school sites are discussed. As related to the proposed project, demand for educational facilities will be increased; however, existing facilities are expected to accommodate the initial increase. As development continues a school site will be provided to serve the needs of the communities residents.

b. State Housing Plan

The Waiawa project will contribute significantly to the State's housing inventory in offering a broad range of unit types at varying costs. These units will include medium and low density, single family detached, and unique retirement homes, all in a planned, integrated community. Affordable housing is planned for the development and will be negotiated with the appropriate authorities in a timely manner.

The project is designed to take into account the physical setting, including visual and aesthetic amenities. Its location provides easy access to public facilities and services.

c. State Health Plan

The primary purpose of the State Health Plan is to serve as a guide for State and County agencies and the private

sector in outlining environment related and health care objectives for Hawaii.

The State Health Plan focuses primarily on public health programs under the jurisdiction of the State Health Department.

As the State Health Plan relates to the proposed project, health and medical care facilities (emergency and routine) are located within the immediate area and are expected to accommodate the additional population of the project. Additionally, a health care center is planned for the retirement community which should serve the needs of the community at large.

Environmental concerns covered in the State Health Plan have been addressed in the air and noise quality studies and utilities sections of this document. Utility impacts such as sewerage and drainage, as it affects water quality, are expected to create only minor impacts that are normal for projects of this nature. Mitigation of these impacts are the responsibility of the developer and will be addressed as necessary. No toxic waste impacts are expected on the ground water supply.

Air and noise quality impacts, as reported in their respective studies, are also minor in nature.

d. State Conservation Lands Plan

This relates to conservation lands and does not address this project site.

e. State Agriculture Plan

The Hawaii State Plan states its two primary objectives as 1) increased viability in the sugar and pineapple industries, and 2) continued growth and development of diversified agriculture throughout the State.

The Waiawa site, which is currently fallow, will be permanently lost from the State's agricultural land inventory, however, the agronomic feasibility of maintaining these lands in active agricultural production is marginal.

f. State Historic Preservation Plan

The Historic Preservation Plan, reviews the procedures and identifies areas where archaeological salvaging or preservation are desireable. Procedures for developments include preparing an archaeological survey, preserving sites considered of value, and coordination of salvaging and preservation with the State Historic Sites Office. In this regard, the project has complied with these procedures and no significant historic sites were found on the uncultivated portions of the site. None are likely to be found on the fallowed land since it was extensively cultivated for many years.

g. State Transportation Plan

The general objectives of this plan are outlined in these two statements:

> An integrated multi-modal transportation system which services statewide needs relating to the efficient, safe, and convenient movement of people and goods.

> A statewide transportation system supportive of planned growth objectives throughout the state.

Although the State Transportation Plan does not single out the project for any specific highway development or improvement policies and actions, the development will increase vehicular traffic in the general area. For this reason, an extensive traffic study has been conducted and mitigative measures recommended. These measures, which include roadway modifications are presented in an effort to meet the general objectives of the Plan.

Additionally, the Department of Transportation recognizes the rapid growth in the project area and subsequently, several projects are currently being planned or implemented to accommodate the needs of the area.

h. State Recreation Plan

The State Recreation Plan reviews the demands and actions that need to be taken to fulfill existing and future recreational demands. The proposed Waiawa development will be consistant in this plan with its extensive and integral open and park spaces. Two eighteen hole golf courses are also a major amenity in this development.

i. State Energy Plan

The Hawaii State Plan defines two major energy objectives:

> Dependable, efficient, and economical Statewide energy systems capable of supporting the needs of the people; and

Increased energy self-sufficiency for Hawaii.

Specific information on projects do not relate to or address the project site. Other policies and objectives are broad and relate to energy conservation and use of energy sources other than fossil fuels.

Energy conservation methods will be investigated for use in the project pertaining to the latest energy savings devices and installations which should result in some cost reduction as well as being conservation actions.

j. State Tourism Plan

This plan relates to tourism actions and does not address or relate directly with this project.

k. State Water Resources Development Plan

The primary objectives of the State Water Resources Development Plan are:

Regulations of the development and use of water to assure supplies for the future;

Development of water resources to meet municipal, agricultural, and industrial requirements, and the reduction of flood damage; and

Preservation of water-related ecological, recreational, and aesthetic values and the quality of water resources.

This plan acknowledges that municipal water supply service is primarily a County function. To this extent, the developer has coordinated with the Board of Water Supply

in addressing the project's water needs. The proposed water system development for the project is not expected to be of any significant impact.

Water quality impacts in the area are expected to be minimal and in conformance with the objectives of the Plan.

3. State Land Use

The project site is currently designated for Agriculture on the State Land Use Boundary Map. The proposed project will petition the State Land Use Commission for a boundary change which will redesignate the site for Urban use.

4. H.R.S. Chapter 205-A Coastal Zone Management

The Project site is not designated as a special management area for which a permit is required pursuant to H.R.S. Chapter 205-A. However, the project site is within an area controlled by the CZMA and is, therefore, subject to H.R.S. Chapter 205-A's objectives and policies.

C. City

1. City and County of Honolulu General Plan

The General Plan of Honolulu is a twofold document which: one, is a statement of the long-range social, economic, environmental, and design objectives for Oahu; and two, is a statement of the broad policies which are necessary to meet the objectives of the Plan.

The plan lists nine areas of concern; population; economic activity; the natural environment; housing; transportation and

utilities; physical development and urban design; public safety; health and education; and culture and recreation. These items are addressed in the context of this document. Population guidelines for the District are currently under review by the Department of General Planning.

2. Development Plan

The parcel is currently designated for Agriculture on the Development Plan Land Use Map. The project is currently under review for a Development Plan Amendment which would allow urban use of the site.

3. Zoning

The site is currently designated AG-1, Restricted Agriculture. Zoning for the planned urban uses of the site will be requested at the appropriate time.

VII ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

VII. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

Impacts of the proposed project can be viewed in the short-and long-term. Short-term impacts, beneficial and adverse, generally result from construction-related activities. Consequently, these impacts should last no longer than the duration of the construction. Long-term impacts, beneficial and adverse result from the implementation and operation of the proposed project.

A. Impact on Geographical Characteristics

1. Topography

Impact on the physical terrain of the proposed parcels of land will result from site grading. However, this grading will be limited to typical site preparation work. Cutting and filling will be kept to a minimum.

Prior to beginning of any grading operation it will be necessary to strip all existing vegetation from areas to be developed. The material exposed after the stripping operation may be used for engineered fill. After stripping, slab and pavement, sub grades, and areas to receive engineered fill should be excavated of any and all loose soils.

To minimize the occurrence of soil erosion, temporary soil erosion and sediment control measures will be designed and implemented during the construction phase in accordance with Chapter 23, Grading, Soil Erosion, and Sediment Control, Revised Ordinances of Honolulu, 1978, as amended; the City & County of Honolulu's Grading, Grubbing, and Stockpiling Ordinance No. 3968, 1972; and the USDA Soil Conservation Services Erosion and Sediment Control Guide for Hawaii, 1981.

2. Geology

No impacts are expected on the geology of the area, therefore, no mitigative measures should be required.

3. Soils

Impact on the soil will result from introduction of soil conditioners and EPA approved fertilizers, pesticides, and herbicides. These conditioners will enhance the grassing and landscaping of the project site. The introduction of such chemicals, however, will not adversely affect the soil.

Project development will not alter soil characteristics, but soils on site will determine procedures and techniques in construction of structures, paving and utilities. No mitigative measures should be required for soils impact.

4. Climate

No impacts are expected on the climate of the area.

B. Impact on Hydrological Characteristics

Associated with urban development projects are alterations in surface water runoff resulting from increasing the area of impervious surfaces, through development of roof tops, roadways and other finished surfaces.

Interest in these runoff changes is generally a result of concern over two factors; public safety and environmental impact. The first factor requires the identification of changes in peak discharge rates, the magnitudes of which are necessary for designing adequate drainage structures to prevent flooding, while the second concern requires identification of the changes in total runoff volume, as

well as sediment, nutrient, and other constituent loads, and the effects these will have on the ecosystem of the natural resource serving as the "sink." It is this second concern, environmental impact resulting from increased runoff volume and sediment and nutrient loads, and its probable effect on subsequent receiving waters (coastal) that is under study.

1. Surface Water Runoff Quantity

The estimated storm water runoff and constituent changes due to the proposed Waiawa Development Project are shown in Table 4. The values presented, it must be emphasized, are for comparative purposes only, and are not intended to be representative of the accuracy implied by the practice of reporting results to one decimal place. This was done primarily for convenience of calculations and balancing.

The changes shown in Table 4 are those occurring only within the separate areas of the 1,395-acre proposed project. No attempt was made to compare these changes with contributions from the entire 26.4 sq. mi. Waiawa watershed area which would significantly negate apparent changes caused by the land use change within the project site.

Over the 1,395 acres that are planned to be developed by the project, 7 separate soil series are encountered, each of which has additional sub-classifications. Also included are less than 10 acres each of soil designated as "fill" and "rockland," which were placed in the previously discussed Class B soils. The soils of the property were segregated according to the procedure discussed in the Methodology section into 92% being Class "B" and 8% being Class "C." There were no Class A or D soils indicated on the soil maps (Foote et al., 1972). The storm water runoffs for various designated intensity and duration storms along with different curve numbers for the separate

land use and soil classification were determined according to the procedures outlined in the Methodology section.

As can be readily observed in Table 4, the storm water runoff volume for the 1 yr, 1-hr duration storm for post (full) development conditions is about 68 times greater than pre-developed (1986) conditions; however, as the storm duration and recurrence interval increases, this difference reduces down to approximately 1.4 greater for the 100-yr 24-hr storm. At higher rainfall intensities and durations, soil saturation increases, thus more runoff occurs. The relatively large discrepancy between the pre-and-post storm water runoff condition is because of the soils within the project are notably "well-drained" types.

As would be generally expected, the greatest calculated incremental storm runoff volume resulted from the 100-year storm with a 24-hour duration, as shown in Table 4. These values (acre-ft/event) represent a volume of water and should not be confused with peak discharge rates which represent the maximum volume of storm water runoff discharged per unit of time (e.g., cfs). Peak discharge rates are required for engineering design or proposed drainage facilities and ascertaining the capacity of existing facilities while total runoff volume provides a more realistic estimate of impact on water quality. Calculated peak discharge rates and the resulting flooded area for the streams within the project boundaries are usually determined from the City and County of Honolulu's drainage standards procedure.

2. Surface Water Runoff Quality

Besides the changes in the volume of storm water runoff, the quality of the various constituents being transported is of equal, if not more importance. However, estimates of water

TABLE 4

Estimated Storm Water Runoff and Constituent Changes due to the Proposed Waiawa Development Project, Southern Oahu

Storm[a]			Storm Water Runoff												
			Hydraulic			Nitrogen[b]			Phosphorus[b]			Suspended Solids[b]			
			Development			Development			Development			Development			
Duration	Recurrence Interval	Quantity	1986	Full	△	1986	Full	△	1986	Full	△	1986	Full	△
hr	yr	in.	AF/event	AF/event	AF/event	lb/event	lb/event	lb/event	lb/event	lb/event	lb/event	ton/event	ton/event	ton/event
1	1	1.45	1.0	67.5	+ 66.5	2.2	112.3	+110.1	0.2	96.9	+ 96.7	0.99	20.15	+ 19.16
1	5	2.2	11.7	125.9	+114.2	24.4	214.0	+189.6	2.5	183.0	+ 180.5	11.09	38.29	+ 27.20
1	10	2.5	19.5	150.8	+131.3	40.9	257.7	+216.8	4.2	219.6	+ 215.4	18.58	46.06	+ 27.48
1	25	3.0	36.3	193.5	+157.2	76.1	332.9	+256.8	7.9	282.7	+ 274.8	34.59	59.40	+ 24.81
1	50	3.3	48.4	219.5	+171.1	101.3	379.2	+277.9	10.5	321.3	+ 310.8	46.04	67.53	+ 21.49
1	100	3.7	66.4	254.9	+188.5	139.0	442.3	+303.3	14.4	373.7	+ 359.3	63.18	78.65	+ 15.47
24	1	3.6	61.7	246.3	+184.6	129.2	426.6	+297.4	13.4	360.8	+ 347.4	58.71	75.94	+ 17.23
24	5	7.1	278.3	569.4	+291.1	582.9	1012.6	+429.7	60.6	840.0	+ 779.4	264.97	177.57	- 87.40
24	10	9.7	486.2	817.3	+331.1	1018.3	1468.8	+450.5	105.8	1208.1	+1102.3	462.86	255.72	-207.14
24	25	11.0	596.8	942.4	+345.6	1249.9	1699.9	+450.0	129.9	1394.0	+1264.1	568.12	295.19	-272.93
24	50	12.0	684.3	1038.9	+354.6	1433.2	1878.7	+445.5	148.9	1537.3	+1388.4	651.45	325.62	-325.83
24	100	14.0	864.4	1232.6	+368.2	1810.5	2238.2	+427.7	188.1	1825.1	+1637.0	822.94	386.79	-436.15

a) From U.S. Weather Bureau "Rainfall Frequency Atlas of the Hawaiian Islands" (1962).

b) Refer to Table 3.

Revised
January 23, 1986 - 1247 acres

quality constituents resulting from significant storm water runoff that occurs at the most, only a few times a year, is very perplexing, especially since information on this subject essentially only became avilable at both the local and national level in the 1970's.

The summation of nitrogen, phosphorus, and suspended solids loads from both present 1986 and projected (full) residential development for storms of 1- and 24-hr. duration at recurrent intervals of 1-, 5-, 10-, 25-, 50-, and 100-years are shown in Table 4. The incremental changes per storm event for the present and projected development conditions for the various duration and recurrence interval storms indicate that from the least to the greatest amount of rainfall: nitrogen and phosphorus increases and suspended solids increases for the low intensity and duration storms and decrease at the higher intensity and duration storms.

The seemingly high nitrogen and phosphorus values of Table 4 have to be compared with the previous land use of the area, the greater than 1000 acres of sugarcane, which received for a two-year cycle, 300 to 500 lb. each of nitrogen and phosphorus over the first 8 months of the culture cycle. Storm runoff during or shortly after fertilization events undoubtedly had a high concentration of both nitrogen and phosphorus.

It must be emphasized that the constituent values are only for comparative purposes, and should not be taken as absolute values.

The hydrologic and water quality aspects of the surface water runoff were only considered for the present and projected conditions. However, increases in constituent loads will undoubtedly result from construction activities, especially if a significant storm occurs during the interim period between

earth moving operations and soil stabilization completion. The impact of construction activities can be minimized by adhering to strict erosion control measures.

Other water quality constituents of general concern include biocides and heavy metals. Typically, the biocides in general use tend to break down more readily in comparison to the more long lasting types of a few years ago; consequently, except for agricultural runoff, the types and concentrations are usually considered insignificant. On the other hand heavy metals do apparently increase somewhat as a result of urbanization, and with the type of commercial and business ventures encountered. However, the possible long-term effect, if any, that the apparently slightly increased heavy metals have upon the biological life of the receiving waters (Waiawa Stream and the Middle Loch of Pearl Harbor) at the concentrations expected is presently undefined.

3. Storm Drainage

Storm water runoff from the project area is presently collected by the existing natural ditches and streams located in ravines and gulches. These flows eventually converge at several points into Waiawa Stream at the southern end of the site which transports the collected runoff into the Middle Loch of Pearl Harbor. The development of Waiawa will increase the quantity of surface runoff flowing into Waiawa Stream. Retention facilities will be designed and placed throughout the site to control the amount of discharge from the project area. Some of these retention basins will be located within the planned golf courses as sediment ponds and "water hazards."

C. Impact on Biological Characteristics

1. Flora

Development will take place principally on the lands now occupied by abandoned canefields. The vegetation in these areas is composed almost exclusively of non-native or introduced species. The few native species found during this survey are widespread throughout the islands. Some like 'uhaloa (Waltheria indica var. americana), yellow wood sorrel (Oxalis corniculata), and popolo (Solanum nigrum) are considered weedy. Others like the 'akia Wikstroemia sp.) and kilau (Pteridium aquilinum var. decompositum) are found in similar environments throughout the islands; these plants are also usually found on steepy sloping areas not planned for development. No plants considered rare, threatened or endangered by the State or Federal governments (Fosberg and Herbst 1975, U.S. Fish and Wildlife Service 1980) were found. The proposed development will have no significant impact on the total island populations of the plant species found during the survey.

As the project is developed, extensive landscaping will be implemented with ornamental plants and trees.

2. Fauna

No rare, endangered or threatened species were found on the project site. Grading and grubbing activities will undoubtedly force certain wildlife to relocate to adjacent areas. However, in some instances they will return to the project site for food and shelter, thereby further minimizing any adverse impacts to them.

D. Impact on Archaeological Characteristics

Four sites were recorded during the archaeological survey of the proposed location of a golf course at Waiawa Ridge. All are of recent historic age and associated with Oahu Sugar Company's cultivation of the surrounding fields. They are of no archaeological value, and it is the archaeologist's opinion that construction may proceed without the necessity for further archaeological research at these sites. In the event that any archaeological finds are made during construction, construction will be stopped and the State Historic Preservation Officer notified.

E. Waiawa Population Forecast

The Waiawa market area can be expected to capture a larger share of the County's future population and housing growth than it has historically. Several factors account for this potential growth with the primary indicators being: government initiated planning for Central Oahu; the availability of vacant lands; and the industrial inventory build-up occuring in the project area.

As stated earlier, the 1984 population of 12,783 represented 95% growth over 1980. Beyond this existing population, Waiawa is expected to increase the population by approximately 18,873 new residents. These population figures was derived from the unit count and mix utilizing a derived number per household multiplier.

F. Impact on Traffic Conditions

The proposed project will access the highway system at three locations: the Waipio Interchange, Kamehameha Highway at Waipahu Street, and Waihona Street.

The proposed Waiawa project is expected to affect traffic conditions in the region by redistributing travel demands. The State's traffic

assignment, which assumed no development at Waiawa, was based on a rate of development in the area north and west of the Waiawa Interchange consistent with population projections. The State's traffic assignment was therefore adjusted to reflect the inclusion of development at Waiawa in the area.

The methodology of simply adding the project's traffic demand to the traffic assignment for the without-project case would not apply in this case, as it would result in double counting of many trips. More importantly, it would incorrectly indicate that the proposed project would increase population beyond the adopted population guidelines for the region.

For the with-project assignment, an estimate of non-project related traffic was developed. Peak hour traffic volumes for year 2002 were calculated for H-1 (west of Waiawa Interchange) and for H-2 (north of Waipio Interchange) by interpolating the State Highways Division's estimates for traffic in 1998 and 2008 without the Waiawa development. With the Waiawa traffic demand on H-2, these volumes were adjusted so that the total traffic demand into the Waiawa Interchange would remain constant in year 2002 with or without the Waiawa project. The with-project traffic assignment developed using this algorithm reflects consistent population levels for Central and Leeward Oahu.

Because Kamehameha Highway serves as a collector-distributor for the adjoining land uses, a simple addition of the project's traffic to other traffic was used; not correcting for double counting will have a minor effect since project traffic will only be a small portion of the total traffic on Kamehameha Highway.

The Waiawa Development's significant traffic impacts are expected to occur at the Waipio Interchange and at the Kamehameha Highway intersections with Ka Uka Boulevard and with Waipahu Street. Only minor impacts are expected at the Waihona Street connection because of the low traffic volumes in the area.

1. Waipio Interchange

A diamond interchange will not have sufficient capacity to serve the Waiawa Development. Analyses of ramp capacities indicate that the additional capacity provided by a second southbound on-ramp lane would be needed immediately upon development of the Waiawa project; however, the capacity of the two-lane ramp would be exceeded with the first 2-1/2 years of development at Waiawa.

A double-lane loop ramp serving Waiawa to H-2 (southbound) traffic would increase the capacity of Waipio Interchange. Additional right-of-way would be required in the northwest quadrant of the interchange, and relocation of the proposed off-ramp from Wahiawa will be necessary.

A revised layout of the proposed interchange, in addition to providing for a loop ramp, includes:

- A realignment of the Ka Uka Boulevard Extension east of H-2 to minimize the bridge length necessary to cross Panaikauahi Gulch.

- An indirect on-ramp northbound so that access to Mililani Memorial Park can be maintained.

- Widening of the bridge over H-2 to 80 feet to provide adequate width for 6 lanes across the freeway.

- A two-lane off-ramp (northbound) from Honolulu to serve the afternoon peak hour volumes.

- Multiple turn lanes to accommodate the high traffic volumes expected at the intersection of the northbound off-ramp with Ka Uka Boulevard.

Ramp analyses indicate that the critical demand volumes at full development will exceed the interchange's capacities by year 1998. At full development, AM Peak Hour traffic demand from the Waiawa project to H-2 southbound will need to be reduced by 310 vehicles per hour (vph) or 15%. In the PM Peak Hour, northbound off-ramp demand volume exceeds capacity by 360 vph, or 18% of the Waiawa demand (see following section, "Mitigation Measures").

The high volume of left turns from the northbound off-ramp to Ka Uka Boulevard (westbound) in the PM Peak Hour creates a heavy demand on the signalized intersection at that location. The Critical Movement Analysis for signalized intersection indicates that three left turn lanes from the off-ramp will be needed.

The single-lane ramps on the north side of Waipio Interchange will provide adequate service for the projected demand volumes.

2. Kamehameha Highway Intersections

The Waiawa Development will increase turn volumes at two locations along Kamehameha Highway, at Ka Uka Boulevard and at Waipahu Street. At both locations, near-capacity conditions are expected with or without the Waiawa traffic during future peak hours.

The analysis of future conditions without the Waiawa project assumed only minimal improvements at these intersections. Right turn volumes were considered non-critical and signalization of the Ka Uka Boulevard/Kamehameha Highway intersection would be necessary. With the Waiawa traffic, a second left turn lane from Ka Uka Boulevard to Kamehameha Highway (southbound) would be needed to avoid over-capacity conditions.

The proposed connection from the project at Waipahu Street will create a cross-intersection. New turn lanes will be needed from Kamehameha Highway as well as a separate eastbound through lane on Waipahu Street. Two lanes in each direction should be provided on the new road.

3. Mitigation Measures

The traffic generated by the proposed project will require multiple-lane ramps at Waipio Interchange and other improvements at the Kamehameha Highway intersections. At Waipio Interchange, however, projected demand volumes would still exceed capacities.

Possible reassignment of the project's traffic demands to the other access points was evaluated. Reassignment would mean that users would travel on less desired paths to reach their destinations. While this action is not unusual, the reassignment indicated that major capacity constraints would occur at other locations, such as Waiawa Interchange.

An additional interchange with H-2 or new ramps into Waiawa Interchange would be other options to reducing demand volumes at Waipio Interchange. However, constraints due to interchange spacing, ramp design, and traffic service limit the opportunities available: no adequate location could be found for additional ramps.

A program to reduce traffic by encouraging high occupancy vehicle (HOV) use would have the potential to reduce traffic demands. The project traffic demand forecast was developed using observed existing traffic patterns; if a change in the pattern of use can be achieved, a reduction of traffic demand would follow. Table 8 shows a program which could reduce the traffic generated by the Waiawa Development to a level which can be served by the proposed improvements.

G. Impact on Air Quality

1. Direct Air Quality Impact of Project Construction

During the site preparation and construction phases of this project it is inevitable that a certain amount of fugitive dust will be generated. Field measurements of such emissions from apartment and shopping center construction projects has yielded an estimated emission rate of 1.2 tons of dust per acre of construction per month of activity.

One major generator of fugitive dust is heavy construction equipment moving over unpaved roadways. This problem can be substantially mitigated by completing and paving roadways and parking areas as early in the development process as possible.

Heavy equipment at construction sites 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 impact of pollutant emissions from construction equipment should be minor compared to levels generated on major roadways nearby.

2. Air Quality Impact of Increased Energy Utilization

For residential use alone this project could require about 530 billion BTU of energy per year at the power plant, or about 90,000 barrels of oil if the demand were to be met totally by burning fuel oil. Energy use for commercial and industrial purposes could conceivably double this amount.

The major impact of burning fuel oil to meet this new energy demand will be increased levels of sulfur dioxide and particulates in the vicinity of existing power plants, primarily the Kahe Power Plant on the Waianae coast.

New energy requirements could be reduced substantially by the installation of solar water heating on all units at the time of construction. It is also possible that the new demand could be met by means other than burning fuel oil. Generation of electrical energy by wind power and by using ocean thermal energy conversion are two such posibilities.

3. Indirect Air Quality Impact of Increased Traffic

Once construction is completed the proposed project is not in itself likely to constitute a major direct source of air pollutants. By serving as an attraction for increased motor vehicle traffic in the area, however, the project must be considered to be a significant 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, effective January 1, 1986, the Federal Environmental Protection Agency has revised the allowable lead amount in gasoline to 0.1 grams per gallon. At the beginning of 1985 the standard was 1.1 grams per gallon. The EPA is also advocating a total ban on lead in gasoline to take effect as early as 1988.

Federal control regulations also call for increased efficiency in removing carbon monoxide and nitrogen dioxide from vehicle exhausts. By 2000 carbon monoxide emissions from the vehicle fleet then operating should be little more than half the amounts now emitted.

4. Mitigative Measures

Once completed, the proposed Waiawa Development is expected to have little direct impact on the air quality of the surrounding region. Indirect long term impacts in the form of increased air pollutant emmissions from power plants serving new residences in the project area can be mitigated somewhat by planning and implementing solar energy design features to the maximum extent possible.

Other indirect long term air quality impacts are expected in those areas where traffic congestion can potentially be worsened by the addition of vehicles traveling to and from the proposed project. Project planners can do very little to reduce the emission levels of individual vehicles, but the Traffic Impact Assessment Report for the project describes several proposed or planned roadway improvements that could significantly increase highway traffic capacity and facilitate entry and exit from the proposed development with a minimum of increased traffic congestion. The key to viable access and acceptable air quality impact regarding this project will be redesign of the planned Waipio Interchange on the H-2 Freeway to accommodate traffic from the Waiawa side of the freeway.

This study indicates that currently proposed mitigative measures for traffic congestion in the project area should be sufficient to meet existing air quality requirements and no further air pollution mitigation measures are proposed. It is noted, however, that tall, dense vegetation can provide some

screening of residential areas from larger airborne particulates generated along roadways and near construction areas. It is thus recommended that wherever possible such vegetative cover be included in landscaping plans with plantings occuring as early in the development process as practicable.

H. Impact on Noise Environment

1. Impacts Along H-2 Freeway

Predictions of Year 2002 traffic noise levels were made using the traffic volume predictions. Future traffic noise levels were calculated with and without the project generated traffic. Project traffic on Kamehameha Highway at the proposed connection will be less than 10 percent of the total non-project traffic. Traffic noise level increases along Kamehameha Highway and attributable to project traffic are therefore anticipated to be less than 0.5 dB, and are predicted to be insignificant by the Year 2002 planning period.

The total (project and non-project) increases in traffic noise levels along H-2 Freeway are predicted to be approximately 3.3 dB (or Ldn unit), with 17 and 83 percent of the increase associated with project and non-project traffic, respectively.

Table 5 presents the existing and Year 2002 traffic noise levels at a reference distance of 100 Ft. from the center of the inbound and outbound lanes of H-2 Freeway north and south of the proposed Waipio Interchange. Traffic noise levels represent project plus non-project Ldn at the 2002 planning year. As indicated in Table 5, minimal changes in project plus non-project traffic noise are predicted to the north of the project. If the project is implemented, traffic noise levels north of the proposed Waipio Interchange are predicted to decrease. South of the interchange, non-project traffic are

TABLE 5

PROJECT AND NON-PROJECT TRAFFIC NOISE INCREASES

LOCATION	1985 LDN	----YEAR 2002 LDN---- W/O PROJECT	W PROJECT	PROJECT INCREASE
H-2 Freeway North of Waipio Interchange:				
H-2 (Outbound) to North	67.3	69.0	67.7	(1.3)
H-2 (Inbound) from North	68.6	69.6	68.2	(1.3)
H-2 Freeway South of Waipio Interchange:				
H-2 (Outbound) from South	67.3	70.2	70.8	0.6
H-2 (Inbound) to South	68.6	70.7	71.6	0.9

Note: Ldn values calculated at 100 Ft from all roadways' centerlines

predicted to cause significant increases in traffic noise of 2.5 dB by the Year 2002, and project traffic are predicted to add an additional 0.8 dB.

2. Impacts Along Interior Roadways

Future traffic noise levels along the major interior streets of the proposed development were also evaluated for the Year 2002 time period. A worst case traffic volume of approximately 2,903 VPH is projected during the AM peak hour on the Ka Uka Boulevard extension. Under these conditions, and at an anticipated average speed of 35 MPH, traffic noise levels along the boulevard should not exceed 67 Ldn at 50 Ft. setback distance from the roadway centerline. Setback distance to the 65 Ldn contour from the centerline of this roadway is 66 Ft.

3. Possible Mitigation Measures

Possible noise mitigation measures which would minimize noise impacts from roadway traffic noise include measures such as: the use of buffer zones of sufficient depth; construction of sound attenuation berms or walls where adequate setbacks cannot be achieved; incorporating sound attenuating window design features in upper-story homes which cannot be shielded by sound attenuating barriers; and air conditioning affected spaces. The applicability of each mitigation measure depends upon other considerations besides noise, such as economic cost, aesthetics, and technical feasibility.

The construction of sound attenuation walls or berms is a standard mitigation measure, particularly for single-story homes. However, wall height requirements become excessive (in the order of 10-plus Ft.) when multi-story residences are involved in traffic noise mitigation efforts. For this reason, the use of walls or berms as a traffic noise mitigation measure is generally limited to ground-floor residential units.

Where none of the above mitigation measures are feasible, the remaining options are air conditioning the affected residential spaces or sound-treating the ventilation openings (windows). The use of air conditioning within residences is not common in Hawaii, and is not generally considered a practical option for subdivision residences. The use of sound-treated windows has been applied at selected mid-rise structures in Hawaii for the purpose of meeting FHA/HUD noise standards, and is a possible noise mitigation option for any new home of the project.

I. Impact on Infrastructure and Utilities

1. Water System

When fully developed, the estimated demand for potable water would be approximately 3.3 million gallons of water per average day, with an additional 1.4 million gallons per day estimated for golf course irrigation.

There are no municipal water facilities in the Waiawa project area. Therefore, the project proposal is to construct onsite the required water source storage reservoirs, and transmission and distributions mains. The system would be designed and constructed to meet City standards. Upon completion, the system will be turned over to the Board of Water Supply for operation and maintenance.

2. Sewage Treatment and Disposal

Fully developed, Waiawa is expected to generate an average daily sewage flow of approximately 3.1 MGD. Connections to the Pearl City Wastewater Pump Station will be required which will involve a new off-site trunk sewer about 1.5 miles in length. The preliminary alignment follows Waihona Street; Kamehameha Highway; and proposed easements to the pump

station. Wastewater is then pumped to the regional plant at Honouliuli for treatment and discharged into the Pacific Ocean off the Ewa Coast.

3. Electrical and Telephone Service

Both the Hawaiian Telephone Company and Hawaiian Electric Company can provide adequate underground services for the development at Waiawa. Existing electrical facilities on the site may require relocation.

The technical data as to size and capacity of additional sub-stations for the Waiawa project will be provided to Community Planning, Inc. for their future use and reference. We will also include this information in Paragraph VII 1.3 as revised.

4. Solid Waste Collection and Disposal

The development will be served by City & County of Honolulu and private refuse collection services. Refuse is disposed at the Waipahu Incinerator.

J. Public Facilities and Services

1. Police and Fire Protection

Police and fire services appear adequate to serve the development. Police facilities are located in Pearl City on Waimano Home Road, approximately two (2) miles from the project site. The Waipahu and Pearl City Fire Stations, as well as the Navy Fire Station and the proposed City Fire Station at Gentry-Waipio, are located within the project area. The Fire Department recommends that a site for future station plans within the Waiawa project be considered. This will be discussed at the time of zoning.

2. Health Care Facilities

Waipahu, Pearl City, Mililani Town, and Pearl Ridge adequately and conveniently provide all the necessary health care services to meet the needs of the residents of Waiawa. In addition, health care facilities will be incorporated into the design of the retirement community.

3. Educational Facilities

Initially, until the development generates a sufficient number of K-6 students, the residents at Waiawa will be served by the Kanoelani and Pearl City Elementary Schools. Higher grade students will attend the Waipahu and Highlands Intermediate Schools and the Waipahu and Pearl City High Schools. Higher educational opportunities are available at Leeward Community College and West Oahu College.

Elementary public school sites are planned to accommodate the students of the project site.

State library services are provided at the Pearl City Regional, Mililani and Waipahu Libraries, located within a 2-mile radius of the project site. Library and other community-type services will be considered in the design of the town center site.

4. Parks, Recreation and Open Space

The Waiawa Plan includes over 393 acres in park, recreation and open space use. Two (2) golf courses are planned, and several neighborhood parks, including school/park sites, are provided to meet the leisure needs of the residents.

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

≡ IRREVERSIBLE/IRRETRIEVABLE COMMITMENTS OF RESOURCES

VIII. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY AND IRREVERSIBLE/IRRETRIEVABLE COMMITMENTS OF RESOURCES

It is anticipated that the construction of the proposed project will commit the necessary construction materials and human resources (in the form of planning, designing, engineering, construction labor, landscaping, and personnel for the sales, management, services offices, and maintenance functions). Some of the construction materials could be reused if and when the structures are demolished; however, at the present time and state of our economy, it is felt that the reuse of much of these materials is not practical. Labor expended for this development is not retrievable. However, labor will be compensated during the various stages of the project by the developer, commercial businesses, and the building's management.

The appearance of the project site will be altered from its present open vacant appearance to that of a completed planned residential community. The development will be highly visible but visually integrated with the surrounding areas.

Air and noise quality will be adversely affected by this proposed project, but will remain in compliance with State standards. While ambient air and noise quality in the area is relatively good, however, the proposed development will result in greater number of vehicles going to and from the project areas, resulting in vehicular pollution emissions.

The project development will result in a commitment of land for a long-term period. Once low and medium density residential uses are established, it is unlikely that the land will be reverted to a lower usage in the long-term future. Commitment of land for these purposes will likely foreclose certain future use options of the land.

The project development will, in the short- and long-term result in residential uses which will likely benefit future homeowners, the landowner and private businesses.

XI PROBABLE ADVERSE ENVIRONMENTAL EFFECTS

IX. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The following adverse environmental effects (both short- and long-term) cannot be avoided.

(1) Agricultural use of the land will be lost.

(2) The site-clearing and construction work will result in temporary fugitive dust, some disruption to traffic, and noise.

(3) Traffic will increase from the number of additional cars utilized by residents of the proposed development. Additional impacts asso-cated with increased traffic include potential air and noise quality deterioration.

(4) The need for utility services will increase.

(5) The need for public services for fire and police protection, schools, and public recreational facilities will increase slightly.

(6) Solid waste and sewage generated by the project will increase the need for disposal and treatment and will increase total local waste output.

X SUMMARY OF UNRESOLVED ISSUES

X. SUMMARY OF UNRESOLVED ISSUES

A. State Land Use Boundary

The project site is currently designated for Agriculture use by the State Land Use Commission. A petition for boundary amendment will be filed with the Commission to have the site designated for urban land use. Until this petition is filed and the land use change is granted, the project site will remain as an agricultural area.

B. Site Aquisition

The project site is currently owned by Bishop Estate which has been leasing the site for sugarcane acreage. Negotiations between the developer and the present landowner are currently on-going and no final purchase terms have been resolved at this time.

C. Agricultural Use vs Urban Use

The significance of the subject lands as part of the agricultural resources of the State of Hawaii can be evaluated by examining the potential uses of the land. These uses are determined by three sets of factors: (1) the physical, agronomic and environmental characteristics of the land; (2) economic variables such as the existence and location of markets for goods that can be feasibly produced on the land, the cost of inputs required to grow the goods, and the supply of similar products from other sources; and (3) the current and future demand of agricultural producers for land having the physical, environmental, agronomic, and economic characteristics of the subject lands.

A detailed description of the factors affecting the agronomic potential of the subject parcels is given in the accompanying report by Yukio Nakagawa, "The Agricultural Production Potential of the

Lands in the Waiawa Revised Development Plan by Gentry -- Island of Oahu."

The agricultural significance of the subject lands can be examined in terms of the total amount of existing lands of similar quality. The subject lands constitute a very small percentage of such lands. The subject lands are less than 2 percent of the "Prime" lands on Oahu and 0.6 percent of such lands Statewide. The acreage in question appears slightly more significant when viewed as a percentage of the lands currently being used for crop production. Currently 41,600 acres are being used for crop production on Oahu. This would increase by more than 2 percent if the subject lands were to return to production.

Agricultural lands similar to Waiawa are not scarce. Such lands are found throughout the State. As of 1984, 266,000 acres in Hawaii were used for crop production (including sugarcane and pineapple). This is 58,800 acres less than were used for crop production in 1969. Since 1967, the total acreage used for crop production on Oahu has decreased by 17,700 acres to the current level of 41,600 acres (as of 1984).

It is not the availability of land that is limiting the expansion of the crops, but rather the size of the market for locally produced crops. The de facto population of the entire State is only slightly more than a million persons and in the principal market area (Oahu), the de facto population is only 825,000 persons. This is a very small market and it does not require substantial acreage to supply such a market, particularly when many popular foods either require temperate climatic conditions not found in Hawaii or can be produced more profitably elsewhere and imported for less than it costs to produce them locally.

The subject lands have the agronomic potential to be productive

agricultural lands. However, due to market parameters, the declining importance of the sugar industry, and the availability of similar lands on Oahu, placing the subject lands in an urban use will not have a significant impact on the agricultural sector of Honolulu County or the State. Lands of similar quality and economic potential are currently lying fallow and there are sufficient lands available to meet current and projected future agricultural needs. If these lands were to remain in agriculture, their most likely use would be for grazing and grazing is an activity that returns very little per acre.

☒ PARTIES CONSULTED

XI. ORGANIZATIONS AND AGENCIES CONSULTED DURING THE EIS PREPARATION NOTICE COMMENT PERIOD

City & County	Date of Comment	Date Comment Received	Date of Response
Board of Water Supply	6/09/86	6/10/86	7/16/86
Honolulu Fire Department	6/23/86	6/24/86	7/16/86
Department of General Planning	6/05/86	6/09/86	7/16/86
Department of Housing & Community Development	6/09/86	6/16/86	7/16/86
Department of Land Utilization	-	-	-
Department of Parks & Recreation	6/10/86	6/16/86	7/16/86
Honolulu Police Department	5/29/86	6/03/86	7/16/86
Department of Public Works	6/04/86	6/06/86	7/16/86
Department of Transportation Services	5/30/86	6/03/86	7/16/86
Office of Human Resources	-	-	-
State of Hawaii			
Department of Accounting & General Services, Div. of Public Works	5/30/86	6/03/86	7/16/86
Department of Agriculture	6/23/86	6/24/86	7/16/86
Department of Education	6/06/86	6/12/86	7/16/86
Department of Health	6/20/86	6/24/86	7/16/86
Department of Social Services & Housing	-	-	-
Department of Transportation	6/26/86	6/30/86	
Department of Land & Natural Resources	-	-	-
Department of Planning & Economic Development	5/21/86	5/28/86	7/16/86
Office of Environmental Quality Control	6/09/86	6/12/86	7/16/86
University of Hawaii			
Environmental Center	-	-	-
Water Resources Research Center	6/12/86	6/17/86	7/16/86

Organizations and Agencies Consulted (Continued)

Federal	Date of Comment	Date Comment Received	Date of Response
U.S. Army Corps of Engineers	-	-	-
U.S. Fish and Wildlife Service	5/27/86	5/28/86	7/16/86
U.S. Department of Agriculture, Soil Conservation Service	6/19/86	6/20/86	7/16/86
U.S. Pacific Division Naval Facilities Engineering Command	6/20/86	6/24/86	7/16/86
U.S. Army Engineering Division Real Estate Branch	-	-	-
Department of the Army Directorate of Facilities Engineering	5/21/86	5/22/86	NRN
Community Organizations			
Pearl City Neighborhood Board No. 21	-	-	-
Waipahu Neighborhood Board No. 22	-	-	-
Mililani Neighborhood Board No. 25	-	-	-
Wahiawa Neighborhood Board No. 26	-	-	-
Waipahu 2000 Community Council	-	-	-
Life of the Land	6/17/86	6/23/86	7/16/86
Sierra Club	-	-	-
Waipahu Community Association	-	-	-
Waipahu Businessmen Association	-	-	-
District Superintendent Leeward District	-	-	-
Pearl City Community Association	-	-	-
Pacific Palisades Community Association	-	-	-
Crestview Community Association	-	-	-
Manana Community Association	-	-	-
Castle & Cooke, Inc.	6/02/86	6/03/86	NRN

*NRN: No Response Needed

XII EIS PREPARATION NOTICE COMMENTS

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843

June 9, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Subject: Your Letter of May 22, 1986 on the Environmental Impact Statement Preparation Notice for the Proposed Waiawa Ridge Project, TMK: 9-4-06: Por. 10 and 9-6-04: Por. 1

Thank you for consulting with us on the proposed master-planned community at Waiawa.

As indicated in the assessment, the developer will be required to do the following:

1. Install the water system improvements inclusive of source, reservoir, transmission and distribution lines to serve the project. Obtain a permitted use for the proposed source.

2. Obtain Department of Health's approval for the new water source and system.

3. Submit a water master plan with supporting hydraulic calculations of the water system improvements for our review and approval.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

FOR KAZU HAYASHIDA
Manager and Chief Engineer

JUN 10 1986

Pure Water . . . man's greatest need . . . use it wisely

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ,
PRESIDENT

July 16, 1986

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City & County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

We are in receipt of your agency's comments dated June 9, 1986 on the proposed Waiawa Ridge development. We respond in the following:

The applicant developer's engineering consultant, Community Planning, Inc. will be developing a Water Master Plan for the total project and in the process will be in contact with your staff on the phased implementation of this master planned development. Please be assured that all required improvements will be provided for agency review at the State and City level during the following months.

Thank you for your initial comments and we look forward to your review of the draft EIS. Thank you for your continuing concern.

Very truly yours,

F. J. Rodrigues

FJR:ls

1148 FORT STREET MALL, SUITE 208 • P. O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 531-4361

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

June 23, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriquez:

SUBJECT: EIS PREPARATION NOTICE (EISPN)
WAIAWA RIDGE PROJECT

Thank you for the opportunity to comment on the subject project. We have reviewed the material sent us and comment as follows:

1. Due to topographical considerations, estimated response times for existing fire protection units at Pearl City, Waiau and Waipahu Fire Stations will exceed nationally accepted standards of three to five minutes for residential areas of this nature. Response time from the proposed Waikele Fire Station is expected to be excessive also. Because of this and the projected size of the development, we will request the developer to provide a fire station site within the Waiawa project. The site should be a minimum of 25,000 square feet.

2. The Honolulu Fire Department foresees the need in the Waiawa project for an additional engine company consisting of 15 personnel (5 on duty, 24 hours daily) and an additional ladder company consisting of 28 personnel (6 on duty, 24 hours daily). Also, the Waiawa area may be a suitable location for a Battalion Headquarters, housing three battalion chiefs, three chiefs' aides and a sedan.

3. The inclusion of a new fire station in Waiawa will result in additional capital improvement and operating costs to the City and the developer will be requested to assist in reducing those costs.

Should you have any questions, please contact Battalion Chief Kenneth Word at 943-3838.

Sincerely,

FRANK K. KAHOOHANOHANO
Fire Chief

FKK:KAW:sb

JUN 24 1986

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

July 16, 1986

Chief Frank K. Kahoohanohano
Honolulu Fire Department
City & County of Honolulu
1455 S. Beretania Street, Room 305
Honolulu, Hawaii 96814

Dear Chief Kahoohanohano:

We are in receipt of your department's comments dated June 23, 1986 on the proposed Waiawa Ridge development and we respond in the following:

1. The request for a fire station site to be located on the Waiawa Ridge development has been provided to the applicant developer for his review. There will be discussion on this request in the draft EIS and it is most likely that in view of the phasing schedule to be provided, the availability of fire station site will be included as the demand factor based on occupancy is reached.

2. We recognize the need for advanced planning due to CIP restraints and appreciate the identification of the fire station personnel required for Waiawa Ridge.

3. Costs that will accrue to the City as a result of the Waiawa Ridge development will be absorbed on a phased basis due to the length of the planning and construction time necessary before occupancy by residents. Assistance in cost sharing can be a discussion item at later stages of land use policy changes such as Zoning.

Thank you for your comments and we look forward to your review and comments on the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

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

WL/DGP 5/86-8619

June 5, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

This is in response to your request for comments on the Environmental Impact Statement Preparation Notice for the proposed Waiawa Ridge development.

The following points should be addressed in the preparation of the Draft Environmental Impact Statement:

1. Vehicular Access and Traffic

   The applicant's "Traffic Impact Assessment" recommends various improvements and studies. The impacts of these improvements and studies should be assessed with input from the State Department of Transportation because of the projected reduced levels of service surrounding the proposed Waiawa Ridge development.

2. Sewage Treatment and Disposal

   The availability of capacity at Honouliuli in context with other project demands should be reviewed by the City Department of Public Works as well as the alignment and adequacy of the proposed intercept.

3. Water System

   The proposed development should be reviewed by the Department of Land and Natural Resources and the Board of Water Supply with regard to its cumulative impact on the water resources when considered with the Development Plan's existing designations.

JUN 9 1986

4. Drainage System

   The Waiawa development will increase the quantity of surface runoff flowing into Waiawa Stream which has a history of flooding its banks. The drainage plan should be reviewed by the City Department of Public Works.

5. Public Schools

   The Department of Education should review the plans for the proposed development with regard to adequacy of school facilities.

6. Parks, Recreation and Open Space

   The plans for the proposed golf courses, botanical garden and neighborhood parks should be reviewed by the City Department of Parks and Recreation.

7. Other Public Facilities

   Agencies responsible for solid waste collection and disposal, electric, telephone, police, fire and health care services should be contacted to determine the ability to support Waiawa Ridge as well as other planned development in Central Oahu.

8. Social and Economic Characteristics

   A social impact study and a market analysis to justify the 110 acres of Commercial/Industrial Mixed uses should be prepared to support the proposed development.

9. Environmental Characteristics

   A. Agriculture: The Department of Agriculture should be contacted for their input on loss of "prime" agricultural land.

   B. Environmental Quality: Air quality and noise level issues need to be discussed at greater length, including the total impact from surrounding areas.

10. Flora, Fauna, Archaeological and Historic Resources

An intensive survey of the site will be required to protect any rare or endangered plants or animals and to preserve any archaeological or historic sites or remains.

Thank you for giving us an opportunity to comment on this matter.

Sincerely,

Donald Clegg

DONALD A. CLEGG
Chief Planning Officer

F J RODRIGUEZ
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

July 16, 1986

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:

We are in receipt of your department's comments dated June 5, 1986 on the proposed Waiawa Ridge development. We respond in the following:

1. Traffic will be discussed in extensive detail in a Traffic study currently under preparation by the applicant developer's consultant, Parsons, Brinckerhoff, Quade & Douglas. This study will be appended to the draft EIS and will be reviewed by the Department of Transportation, State of Hawaii.

2. All sewerage impacts will be described in the appropriate sections and will be technically addressed by the retained engineering consultant, Community Planning, Inc. There will be extensive discussions on this subject and the phased schedule of development will permit an orderly process of review and comment by the City Department of Public Works.

3. Potable water availability will aso be under the purview of Community Planning, Inc. and they will be providing to the extent practicable, the potable water demands that are based on a phased schedule of project implementation. Both the State Department of Land & Natural Resources and the Board of Water Supply will have primary responsibility for review and comment.

4. Drainage will be reviewed by the Drainage Section, Division of Engineering Department of Public Works and their initial request is that a Drainage Master Plan be developed and provided to their office for review and comment.

5. The Department of Education has requested further and more specific data on project planning so that they can evaluate and determine the educational requirements anticipated for a project of this size and scope. This data will be provided to them in the draft EIS to the extent practicable.

6. Recreational lands within the Waiawa Ridge master plan will be provided to the Department of Parks & Recreation so that compliance with the Park Dedication Ordinance can be met.

7. Agencies listed in this category will be reviewing the draft EIS and will have the opportunity to comment during this EIS Preparation Notice and also during the draft EIS.

8. Recent actions by the City Council on the Central Oahu Development Plan reduced the applicant's acreage for Commercial/Industrial Mixed uses to 20 acres. It is the developer's current position that this relatively minor amount of acreage will be developed on the current ability of the Market place to absorb this reduced acreage, thus not requiring a specific study.

9a. There is currently under way, an Agricultural Economics study by Evaluation Research Consultants that will discuss in detail the alternative crops that are agronomically and economically feasible on the Walawa Ridge site.

9b. Air Quality and Noise impact studies are also being developed for use in the draft EIS and their contents will be provided to the State Department of Health for their review and comment. These are being prepared by Barry D. Root (Air) and Y. Ebisu & Associates (Noise).

10. Studies on Flora, Fauna and Archaeological & Historical Resources are also being developed for review and comment in the draft EIS. Flora has been completed by Char & Associates, Fauna by Dr. Andrew J. Berger, Ph.D, and Archaeological/Historical by Chiniago, Inc.

Very truly yours,

F. J. Rodrigues

FJR:ls

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4191

FRANK F. FASI
MAYOR

ALVIN K.H. PANG
DIRECTOR

June 9, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Subject: EIS Preparation Notice for the Proposed Waiawa Ridge Project
Waiawa, Oahu

Tax Map Keys:	9-4-06: Portion of 10 9-6-04: Portion of 1
Area:	1,242± Acres
Existing Land Use:	Vacant
Development Plan:	Agriculture
Zoning Map:	AG-1 Restricted Agriculture
State Land Use:	Agriculture
Land Owner:	Bishop Estate
Applicant:	The Gentry Companies
Proposal:	Redesignate 1,242 acres of land from agriculture to residential, low density apartment, medium density apartment, commercial/industrial, golf course and roadway. These changes would permit 7,900 single family and apartment units. 4,000 of these units will be programmed for a retirement community.

Thank you for the opportunity to review and comment on the EIS preparation notice for the proposed development at Waiawa Ridge, Waiawa, Oahu.

The location of the subject proposal is consistent with the locational element of the Housing Assistance Plan and the Waiawa Ridge project (Census Tract 89.03) has been identified as a suggested location for the development of government-assisted housing projects.

The proposed development of residential units in the agricultural district of the State Land Use District Map has been reviewed by the Department of Housing and Community Development. The Department is mandated to provide housing units for low- and moderate-income families on Oahu. We note that a zoning change is needed, and in accordance with the current Departmental policy, we wish to request that at least ten (10) percent of all residential developments to be set aside for these groups. This request applies to all zone changes, cluster and planned development-housing applications. Such a requirement is a reasonable means of recapturing the economic benefit conferred by favorable land use allocations and distributing that benefit for the general public benefit.

If you have any questions, please contact Mr. James Miyagi of our Housing Division at 523-4264, who will assist the developer in formulating a program to provide these units.

Sincerely,

ALVIN K. H. PANG

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ
PRESIDENT

July 16, 1986

Mr. Alvin K.H. Pang, Director
Department of Housing and Community
Development
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Pang:

We are in receipt of your department's comments dated June 9, 1986 on the proposed Waiawa Ridge project. We respond in the following:

The request for at least 10% of all residential units developed to be set aside for low and moderate income families has been forwarded to the developer for their information. The draft EIS will describe the methods to be used to meet this request and the phasing schedule to be provided in the draft EIS document will outline the planned implementation of the total project and the portions of the development that will be used for your agency's requirements.

We look forward to your review and comments on the draft EIS; thank you for your continuing concern.

Very truly yours,

F. J. Rodrigues

FJR:ls

1148 FORT STREET MALL, SUITE 200 • P. O. BOX 830 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-2361

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

TOM T. NEKOTA
DIRECTOR

June 10, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Subject: Environmental Impact Statement Preparation Notice
Waiawa Ridge Development - Waiawa
Tax Map Key 9-4-06 and 9-6-04

We have reviewed the Environmental Impact Statement Preparation Notice for the proposed Waiawa Ridge Development and make the following comments and recommendations:

The size of the proposed Waiawa Ridge Development will have a significant impact on our public parks facilities in the subject area. It is important that adequate parks be provided to serve the development's recreational needs and to comply with the City's Park Dedication Ordinance requirements.

The project's recreational assessment in the preparation notice does not provide our department with sufficient information to adequately comment on the proposed development. Although the preparation notice states that parks recreation and open space plans are available for our department to review, any assessment will be inadequate without a thorough review of proposed recreational amenities. We recommend that contact be made with our department to discuss these plans as soon as possible. Coordination with our department is necessary to determine the number, type, size, and location of public parks required to serve a project this size. These parks must meet City standards and park dedication requirements.

Please have the applicant contact Mr. Jason Yuen of our Advance Planning Section at 527-6315 to discuss the project's recreational needs and park requirements.

Sincerely,

Tom Nekota

TOM T. NEKOTA, Director

TTN:ei

JUN 16 1986

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ,
PRESIDENT

July 16, 1986

Mr. Tom T. Nekota, Director
Department of Parks and Recreation
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Nekota:

We are in receipt of your department's comments dated June 10, 1986 on the proposed Waiawa Ridge development. We respond in the following:

Compliance with the City's Park Dedication Ordinance is foremost in the developer's plans for the Land Use Policy change process. There will be an extensive discussions with your staff as to the ability of the project to meet the Ordinance's requirements.

The draft EIS will outline in detail to the extent practicable, the planned recreational uses anticipated for this master planned project. Also, the phased implementation of the total development will lend itself to detailed scheduling with your agency to insure that compliance will be provided to your office's satisfaction.

Thank you for your initial comments and we look forward to your review of the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

FRANK F. FASI
MAYOR

OUR REFERENCE EC-EC

May 29, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

The Honolulu Police Department has no comment at this time in regard to the proposed Waiawa Ridge Project but we do wish to be consulted during the preparation of the Environmental Impact Statement.

Thank you for keeping us informed of this project.

Sincerely,

DOUGLAS G. GIBB
Chief of Police

JUN 3 1986

ENVIRONMENTAL
COMMUNICATIONS
INC.

F J RODRIGUEZ.
PRESIDENT

July 16, 1986

Chief Douglas G. Gibb
Honolulu Police Department
City & County of Honolulu
1455 South Beretania Street
Honolulu, Hawaii 96814

Dear Chief Gibb:

We are in receipt of your department's initial comments dated May 29, 1986 on the proposed Waiawa Ridge development. We appreciate your continuing concern and look forward to your comments on the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

1148 FORT STREET MALL, SUITE 300 • P.O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-8361

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

FRANK F. FASI
MAYOR

RUSSELL L. SMITH, JR.
DIRECTOR AND CHIEF ENGINEER

ENV 86-121

June 4, 1986

Mr. Fred Rodriguez
President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Re: EISPN for Waiawa Ridge Project, Ewa District
(Tax Map Key: 9-4-6: Por. 10, 9-6-4: Por. 1)

In response to your letter dated May 22, 1986, regarding the subject project, we submit the following comments.

1. A drainage master plan should be prepared and submitted to the Drainage Section, Division of Engineering, for review and approval.

2. The proposed project was not included as part of the Honouliuli sewer system or part of the Waipahu drainage subdistrict during the construction of the Honouliuli WWTP and Waipahu WWPS. There are no additional capacities at the treatment plant and pump station, and both facilities will have to be expanded before the proposed development can be served.

Very truly yours,

RUSSELL L. SMITH, JR.
Director and Chief Engineer

JUN 6 1986

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ
PRESIDENT

July 16, 1986

Mr. Russell L. Smith Jr.
Director and Chief Engineer
Department of Public Works
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Smith:

We are in receipt of your department's comments dated June 4, 1986 on the proposed Waiawa Ridge development and we respond in the following:

1. The applicant developer's retained engineering consultant, Community Planning, Inc. will be developing a Drainage Master Plan for review by the Drainage Section, Division of Engineering. We plan to provide to the extent practicable, data from this preliminary planning effort in the draft EIS.

2. We acknowledge that the Honouliuli Sewage Treatment Plant was not designed and constructed with the Waiawa Ridge project in mind. Community Planning Inc. will be meeting with Wastewater Management staff to discuss this aspect of urban development and the phased development schedule should permit an orderly plan of expansion at Honouliuli for this project.

Thank you for your initial comments and we look forward to your comments on the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

1148 FORT STREET MALL, SUITE 208 • P.O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-6361

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. MAGALON, JR.
DEPUTY DIRECTOR

TE-2711
PL 1.0326

May 30, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodrigues:

Subject: EIS Preparation Notice for Waiawa Ridge Project
TMK: 9-4-06: Por. 10
9-4-04: Por. 1

This is in response to your letter of May 22, 1986 for comments on the above project.

We recommend that a traffic impact study be incorporated in the EIS.

The traffic study should address the following transportation concerns:

1. The amount of traffic to be generated by the project and its impact on the surrounding streets. A capacity analysis for the critical intersections near the project is necessary for the a.m. and p.m. peak hours.

2. The traffic impact of the project on the arterial system that will be affected.

3. The need for street improvements on the surrounding street system to support the proposed use.

4. The impact of the project on public bus transportation.

We appreciate this opportunity to review and comment on the project.

Sincerely,

for JOHN E. HIRTEN

JUN 3 1986

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ
PRESIDENT

July 16, 1986

Mr. John E. Hirten, Director
Department of Transportation Services
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Hirten:

We are in receipt of your department's comments dated May 30, 1986 on the proposed Waiawa Ridge development and we respond in the following:

A traffic study is being conducted by the applicant developer's retained consultant, Parsons, Brinckerhoff, Quade & Douglas. This study will be appended to the draft EIS and excerpts will be provided in the appropriate impact sections relating to Traffic and its' impacts. Your initial comments have been provided to the consultant for their information and guidance.

Thank you for your initial comments and we look forward to hearing from your department on the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
DIVISION OF PUBLIC WORKS
P. O. BOX 119, HONOLULU, HAWAII 96810

HIDEO MURAKAMI
COMPTROLLER

MIKE N. TOMINAGA
DEPUTY COMPTROLLER

LETTER NO (P)1527.6

MAY 30 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Subject: Waiawa Ridge EIS

We would appreciate being placed on the list of those who wish to be consulted during the preparation of the EIS.

The attached map shows the northern boundary of your development as abutting an access road (shown in yellow) leading to the 200-bed, minimum security Waiawa Correctional Facility being developed. Since this is the only access to the facility, there will be constant use by State vehicles, visitors' private vehicles, and delivery vehicles. This fact should be addressed in the EIS.

Should there be any questions, please contact Mr. Cedric Takamoto of the Planning Branch at 548-5460.

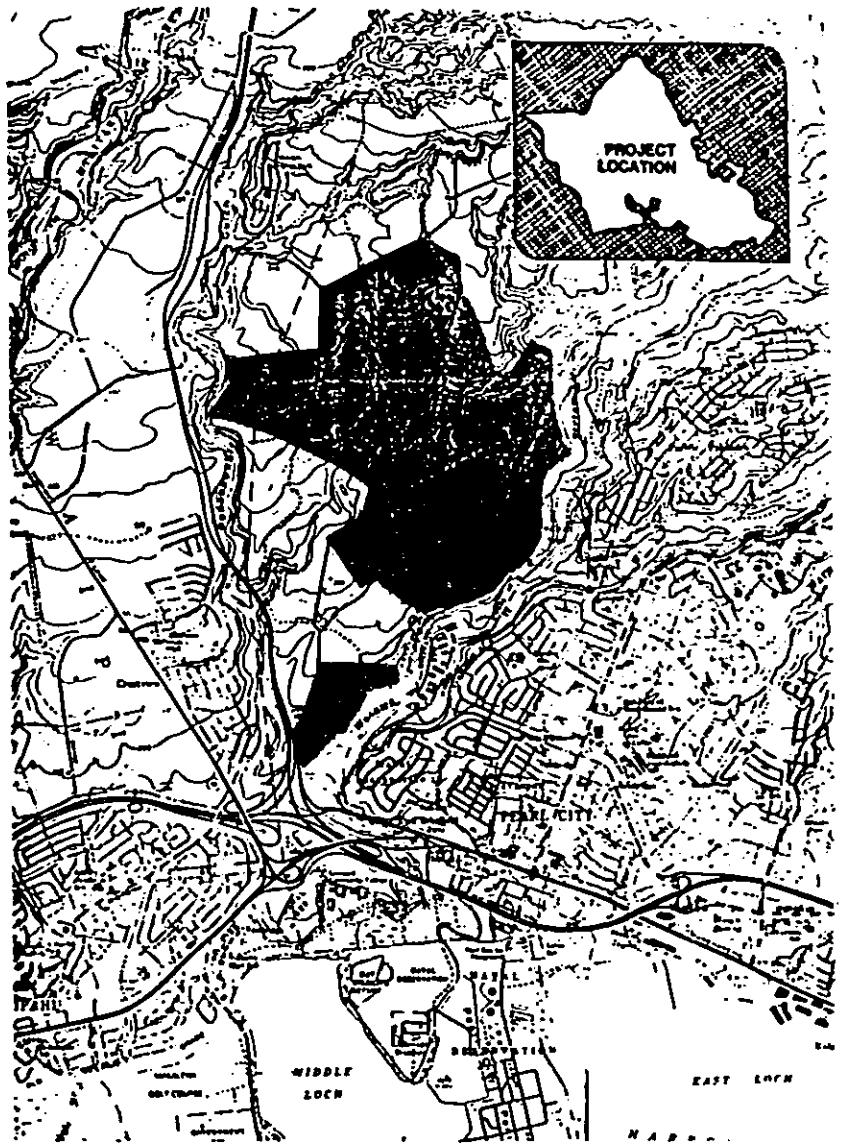
Very truly yours,

T. Tominaga

TEUANE TOMINAGA
State Public Works Engineer

CT:jnt
Attachment
cc: Mr. Ted Sakai w/attachment

JUN 3 1986



NOT TO SCALE

WAIAWA DEVELOPMENT PLAN AMENDMENT AREA
FIGURE 1

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ
PRESIDENT

July 16, 1986

Mr. Teuane Tominaga
State Public Works Engineer
Department of Accounting and General
Services, Division of Public
Works
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Tominaga:

We are in receipt of your comments dated May 30, 1986 on the proposed Waiawa Ridge development and we respond in the following:

The close proximity of the minimum security correctional facility to the northern boundary of the Waiawa Ridge project has been provided to the developer for their review and information. Further, the concerns expressed by your department will be discussed to the extent practicable in the draft EIS; it should be noted that the phasing schedule is such that there is the opportunity for some discussion between the developer and your department to determine the impacts that could accrue from this potential problem area.

We appreciate your calling it to our attention.

Very truly yours,

F. J. Rodriguez

FJR:ls

1188 FORT STREET MALL, SUITE 200 • P. O. BOX 936 • HONOLULU, HAWAII 96808 • TELEPHONE (808) 531-1308

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRPERSON, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

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

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

June 23, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Amendment to the Central Oahu Development Plan; Waiawa Ridge Project
The Gentry Companies Waiawa, Central Oahu
TMK 9-4-06: por. 10 and 9-6-04: por. 1
1,242 acres

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

According to the EISPN, the applicant is seeking to amend the Central Oahu Development Plan to accommodate the development of the 1,242-acre first increment of a proposed 2,827-acre master-planned community.

SOIL CLASSIFICATIONS

The subject parcels outside of the gulches are classified "Prime" (approximately 800 acres) and "Other Important" (approximately 200 acres) according to the Agricultural Lands of Importance to the State of Hawaii (ALISH) system. The gulch areas are not classified according to the ALISH system.

The Soil Conservation Service Soil Survey identifies the predominant soil series as (1) Wahiawa (WaA, WaB, WaC) with 0 to 15 percent slopes which is used for sugarcane and pineapple, (2) Lahaina (LaA, LaB, LaC, LaC3) with 0 to 15 percent slopes which is used for sugarcane and pineapple, (3) Manana (MpB, MpC, MpD2, MoD2) with 3 to 25 percent slopes which is used for sugarcane and pineapple, (4) Molokai (MuB, MuD) with 3 to 25 percent slopes which is used for sugarcane, pineapple and pasture, and (5) rock land and Helemano (rRK and HLMG) that are found in the gullied areas on the subject parcels. It appears that the majority of these soil types have crop capability classifications that range from I to IIIe, if irrigated (soils with few limitations that restrict their use to soils with severe erosion hazard if cultivated and not protected).

JUN 24 1986

The project sites have Land Study Bureau Overall Productivity Ratings of "A", "B", "C" and "E" (within gulches and streams). By this method of classification, the "A"-, "B"- and "C"-rated soils have good to very good productivity potential for most agricultural uses.

LAND EVALUATION AND SITE ASSESSMENT COMMISSION

The Hawaii State Constitution requires the State to provide standards and criteria to conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands. The Constitution also provides for the identification of "important agricultural lands". Once identified, these lands may be reclassified or rezoned only after meeting the criteria established by the State Legislature and approved by a two-thirds vote of the body responsible for the reclassification or rezoning action.

The Land Evaluation and Site Assessment (LESA) Commission was assigned the task of identifying and recommending, for adoption by the Legislature, a system to identify important agricultural lands (IAL). The recommendations of the Commission, if approved by the Legislature, would carry out the Constitutional mandate to protect important agricultural lands.

From the illustrative maps (1:24,000 scale) which apply the IAL methodology as part of the work of the LESA Commission, the project sites (excluding the areas within gulches) are within the illustrative "Important Agricultural Land" (IAL) boundary as defined by the LESA Commission ("A Report on the State of Hawaii Land Evaluation and Site Assessment System", February 1986). The IAL are lands capable of producing high agricultural yields, lands which produce commodities for export and local consumption, lands not currently in production but needed to attain desired projected levels of agricultural activities and income, and lands designated by public policies as important agricultural lands resulting from some unique quality, setting or use.

The project site has Land Evaluation (LE) ratings of 96, 94, 92, 90, 88, 85, 84, 82, 74, 66, 60, 59 and 52. Approximately one-half of the project sites have LE ratings of 80 or more, which is on a scale of 12 to 96 (Land Evaluation Data with Weighted LE Rating - Oahu; Exhibit A; LESA Commission Report). Briefly, the LE ratings represent the physical characteristics of the soil resources of Hawaii. The LE ratings are a composite of the Soil Conservation Service Soil Survey,

Land Study Bureau Detailed Land Classification, and the Agricultural Lands of Importance to the State of Hawaii system. The Site Assessment (SA) factors or criteria which express the relative quality of a site or area based upon its non-physical characteristics, indicate the agricultural viability of a parcel, site or area.

Although the LESA Commission Report and corresponding legislative bill were not acted upon by the Legislature this past Session, the Department of Agriculture believes that the definition and identification of "important agricultural lands" by the methodology proposed by the LESA Commission provides the most comprehensive and rational indication of the relative importance of agricultural lands in the State.

OTHER ISSUES

The Environmental Impact Statement should include discussion on the following issues:

- the impact on agriculture resulting from the withdrawal of 4.5 million gallons of water per day from the Pearl Harbor Groundwater Control Area for the project's domestic consumption;
- the relationship of the proposal to existing and proposed urban development in the Central Oahu and Ewa Development Plan areas;
- the relationship and conformance of the project to the State Agriculture Functional Plan, and especially to the following:

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

  Implementing Action B(5)(c): 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 economic impact on the State attributable to the irrevocable loss of prime agricultural lands;
- the potential of establishing viable alternative agricultural uses on the project site;
- a description of the "minor cattle grazing use" on the properties.

Thank you for the opportunity to comment.

Sincerely,

Jack K. Suwa

JACK K. SUWA
Chairman, Board of Agriculture

cc: OEQC

F. J. RODRIGUEZ,
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

July 16, 1986

Mr. Jack K. Suwa
Chairperson, Board of Agriculture
Department of Agriculture
State of Hawaii
1428 So. King Street
Honolulu, Hawaii 96814-2512

Dear Mr. Suwa:

We are in receipt of your comments dated June 23, 1986 on the proposed Waiawa Ridge development and we will be preparing responses to the concerns expressed in the draft EIS. The technical aspects of the agricultural impacts will be reviewed and discussed by Evaluation Research Consultants (Dr. Peter V. Garrod, Ph.D) who is preparing a technical study on this project. He is being assisted by Yukio Nakagawa for the alternative crops that can agronomically be grown on the project site.

Thank you for your comments and we look forward to your review and comments on the draft EIS.

Very truly yours,

F. J. Rodrigues

FJR:ls

1140 PORT STREET MALL, SUITE 360 • P. O. BOX 838 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-8391

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

June 6, 1986

Mr. Fred Rodrigues, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodrigues:

SUBJECT: EIS Preparation Notice for the Proposed Waiawa Ridge Project

In response to the subject matter, my staff contacted Mr. Taeyong Kim, EIS Analysis for the Environmental Communication, Inc., for more information on the housing project.

Mr. Kim stated that information such as number of units by type, approximate market price range, etc., were not available because of the preliminary status of the project at this time.

We are interested in the project from the standpoint of enrollment impact but we would like to reserve our comments until such time when more housing information becomes available.

Should you have any questions, please call Mr. Richard Inouye at 737-4743.

Sincerely,

Francis M. Hatanaka
Superintendent

FMH:jl

cc OBS
W. Araki, Leeward Dist.

JUN 12 1986

FRANCIS M. HATANAKA
SUPERINTENDENT

F. J. RODRIGUEZ,
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

July 16, 1986

Mr. Francis M. Hatanaka, Superintendent
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Mr. Hatanaka:

We are in receipt of your department's comments dated June 6, 1986 on the proposed Waiawa Ridge development. We respond in the following:

We regret the unavailability of detailed information for your staff at the time they contacted our office. Please be assured that we will be providing to the extent practicable, the extent of data your department will require to evaluate the enrollment impact in the draft EIS. I hope that upon receipt of the draft EIS, a more definitive statement can be made by your office and staff. We regret any inconvenience our earlier discussions may have caused and we look forward to hearing from you on the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:la

AN AF[illegible]IVE AC[illegible]ID EQU[illegible]PORTU[illegible]PLOYI[illegible]

[illegible] FORT STREET MALL, SUITE 300 • P. O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-4391

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

LESLIE S. MATSUBARA
DIRECTOR OF HEALTH

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

In reply, please refer to:
EPHSD

June 20, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Subject: Environmental Impact Statement (EIS) Preparation Notice for the Proposed Waiawa Ridge Project

Thank you for allowing us to review and comment on the subject EIS preparation notice. We provide the following comments:

Drinking Water

The proposed Waiawa Ridge Project will be located in the recharge area for the Waiawa Shaft, the major source serving the United States Navy's Pearl Harbor Water System. This source has already been shown through scientific studies to be affected by irrigation recharge of the proposed ridge area by brackish waters. In addition, the source has registered low level contamination by the chemicals dibromochloropropane (DBCP) and trichloropropane (TCP) which has led to the application for listing of this source on the National Priorities List (for Superfund Clean-up). The Waiawa Shaft is clearly susceptible to contamination. This fact, coupled with the importance of this source as a source of potable water serving a major water system, require that no activity be allowed in the recharge area which may further contaminate the Shaft. In view of the intense application of termaticides and other chemicals in residential developments, our Drinking Water Program strongly opposes the subject project and strongly recommend that the project area be maintained as a conservation watershed area.

Noise

The following concerns must be addressed when preparing the EIS for the proposed project.

1. Due to the integration of various land uses, noise emanating from commercial, light industrial and recreational activities, may adversely affect adjacent residential areas. Mitigative measures must be incorporated to reduce noise impacts.

2. Stationary equipment such as air-conditioning units, 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.

JUN 24 1986

3. Noise emanating from the existing Pearl City Industrial Park may seriously affect future residents of the proposed Waiawa Ridge project.

4. Military aircraft operations should also be considered as another source of noise which may impact residents of the proposed project.

5. Residences should be designed and built to maximize the containment of noise. This is especially pertinent to attached units, lots with reduced rear and side yard distances to the property line, and units utilizing zero lot line.

6. The location of residential units should be planned so that the noise impact from the H-2 freeway will be minimized.

7. Construction activities 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 regulations.

   b. Construction equipment and on-site 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 regulations and conditions issued with the permit.

8. 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.

Sincerely yours,

LESLIE S. MATSUBARA
Director of Health

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

July 16, 1986

Mr. Leslie S. Matsubara, Director
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Matsubara:

We are in receipt of your department's comments dated June 20, 1986 on the proposed Waiawa Ridge development. We respond in the following:

1. Drinking Water

The concerns expressed by the Drinking Water Program on the possible contamination of the groundwater aquifer and more specifically, the United States Navy's Pearl Harbor Water Program will be the subject of comment by Dr. Gordon L. Dugan, Ph.D who will be preparing the technical work for Ground Water contamination with Dr. John Hylin, Ph.D. Dugan will also be commenting on the Surface Runoff/Drainage aspects of Waiawa Ridge.

2. Noise

Y. Ebisu & Associates will be preparing a Noise Impacts study for use in the draft EIS and the points mentioned in your comments are being forwarded to him for his use. We recognize that certain of the concerns expressed in your comments are to be resolved in project siting, design of residential units, and by compliance with Noise regulations by construction related activities. All efforts to meet the applicable Noise code and standards will be provided at Waiawa Ridge.

Thank you for your comments and we look forward to your comments on the draft EIS.

Very truly yours,

F. J. Rodrigues

F. J. Rodrigues

FJR:la

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

WAYNE J. YAMASAKI
DIRECTOR

DEPUTY DIRECTORS
JONATHAN K. SHIMADA, Ph.D.
WALTER T.M. HO
CHERYL D. SOON
ADAM D. VINCENT

STP 8/4415

June 26, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

EIS Preparation Notice
Waiawa Ridge Development, Oahu

We have the following comments to offer on the subject EIS preparation notice:

1. A Traffic Impact Analysis Report (TIAR) should be prepared and made available early to allow adequate time for the Highways Division to review and comment.

2. The TIAR should also address the impacts of the project's connection to our highways and evaluate the downstream impacts on the highway system.

3. Any improvements required as a result of the project should be made at the cost of the developer and made a condition for any land use approval.

4. The proposed Waipio Interchange is not being designed to accommodate the traffic impacts generated by the Waiawa Ridge Development.

5. The drainage study for the development should assess the impacts on our existing structures. This study should also be submitted for our review.

6. An air quality analysis should be conducted and made part of the EIS.

We appreciate this opportunity to provide comments.

Very truly yours,

JUN 30 1986

Wayne J. Yamasaki
Director of Transportation

F. J. RODRIGUEZ
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

July 16, 1986

Mr. Wayne J. Yamasaki, Director
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Yamasaki:

We are in receipt of your department's comments dated June 26, 1986 on the proposed Waiawa Ridge project. We note that the comments were received June 30, 1986, beyond the June 23, 1986 EIS Preparation Notice deadline.

1. There is a Traffic Impact Analysis Report (TIAR) under preparation by Parsons, Brinckerhoff, Quade & Douglas, Inc. and it will be provided to your staff for review and comment within the Draft EIS.

2. Impacts on the downstream traffic flow and connections to the highway system will be covered to the extent practicable by the traffic consultant.

3. The applicant/developer has been advised of your department's position regarding any improvements required being paid by the developer.

4. Design capacity for the proposed Waiawa Interchange will be reviewed by the Traffic consultant and recommendations will be offered on how best the Interchange and the proposed project can relate.

5. A Drainage study is being prepared by Community Planning, Inc. and appropriate sections will be included in the Draft EIS.

6. Barry D. Root is preparing an Air Quality Study which will also be included in the Draft EIS for review and comment.

Thank you for your initial comments and we look forward to hearing from your department on the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

1148 FORT STREET MALL, SUITE 208 • P. O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-8361

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

LAMAKAU BUILDING, 250 SOUTH KING ST, HONOLULU, HAWAII
MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII 96804

Ref. No. P-4194

May 21, 1986

Mr. Fred Rodriguez
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

SUBJECT: EIS Preparation Notice for the Waiawa Ridge Development, Oahu

We have reviewed the subject preparation notice and offer the following comments.

1. Considering the traffic concerns produced by current development proposals in Central Oahu and Ewa areas, the draft EIS should thoroughly discuss the off-site as well as on-site impacts of the additional vehicular traffic resulting from the proposed development.

2. The cumulative impact of land use changes from agricultural to urban uses in Central Oahu may have significant implications for the sustainable yield of the ground water resource in the area. The draft EIS should discuss not only the water requirements of the proposed development, but also the cumulative effect of the land use changes on the water resources of the Pearl Harbor Basin.

3. The majority of the proposed development area is Prime Agricultural Land under the State of Hawaii Agricultural Lands of Importance classification system. In addition, the Draft Land Evaluation and Site Assessment Commission maps designate this area as Important Agricultural Lands. The draft EIS should thoroughly discuss possible alternative agricultural uses as well as impacts of irrevocable loss of this agricultural resource.

4. Possible flood hazards and pollution from increased run-off due to development of this area should be discussed.

5. Because of Oahu's continuing need for affordable housing, the draft EIS should discuss the types of housing units which would be available, including price ranges and the ability of persons of low, moderate and gap-group income levels to qualify for the proposed housing.

6. The proposed retirement community will encompass over half of the development units. The draft EIS should include an analysis of the need and market acceptance for such a community as well as the types of public and private services and facilities which will be required for a retirement community of this size.

   Alternative uses of the area designated for the retirement community and accompanying impacts should also be addressed. Service requirements for a retirement community would be uniquely different from other alternative uses i.e., transportation, recreation, health care, and schools.

7. The draft EIS should list the permits required for the proposed development and the timeframe for development.

8. In addition, the EIS should address how the proposed development will meet the appropriate objectives and policies and priority guidelines of the Hawaii State Plan and the policies and implementing actions of the applicable Functional Plans.

9. The proposed development of a planned community also has the potential to impact valuable coastal ecosystems. Of particular concern is the sedimentation of coastal and riverine ecosystems from inland erosion and runoff, the effects of new water withdrawals and reduced rainwater percolation on local groundwater resources, and changes in marine ecosystems and offshore water quality from the additional municipal waste that may be discharged from the Honouliuli Sewage Treatment Plant.

The draft EIS should address these concerns in detail. Thank you for the opportunity to review and comment on the subject preparation notice.

Very truly yours,

Murray E. Towill

Kent M. Keith

cc: Office of Environmental Quality Control

MAY 28 1986

F. J. RODRIGUEZ.
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

July 16, 1986

Mr. Kent M. Keith, Director
Department of Planning and
Economic Development
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Keith:

We are in receipt of your department's comments dated May 21, 1986 on the proposed Waiawa Ridge project and we respond in the following:

1. Traffic will be fully discussed in the draft EIS and the retained consultant firm of Parsons, Brinckerhoff, Quade, and Douglas, Inc. is developing a comprehensive traffic study for the Waiawa Ridge development. This work is being coordinated with the State Department of Transportation and also the Department of Transportation Services, City & County of Honolulu.

2. The subject of sustainable yield from the Pearl Harbor Ground Water Control Area will be reviewed and discussed in terms of comparable usage in an urban mode from the historical agricultural usage. Water requirements for the proposed project will be provided in terms of total requirement as well as phased demand based on occupancy.

3. A study on the agricultural economics will be provided in the draft EIS and this work will deal with agronomically feasible alternative crops and also the impacts attributable to the loss of this acreage.

4. There will be a discussion on the impacts from the surface water runoff in a study being developed for the draft EIS. Impacts as well as the study will be be included for review in the draft document.

5. To the extent possible at this early decision making stage, the description of the housing units will be provided by the developer in his market study that will describe the unit mix, the anticipated market that he is providing the units for, and how the market can qualify to purchase in Waiawa Ridge.

6. This specialized segment of the proposed development will also be described in the draft EIS. The needs and demands of this retirement community will be based on comparable markets on the Mainland and also on the ability of the local market to absorb this type of residential unit. Ancillary services will be covered to the extent practicable.

7. All approvals will be listed as a content requirement of the EIS process.

8. References to the Hawaii State Plan and applicable Functional Plans will be covered in all appropriate references of compliance.

1148 FORT STREET MALL, SUITE 200 • P. O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-6361

9. Impacts to coastal ecosystems will be discussed to the extent appropriate and there will be a study on the impacts of surface water runoff provided in the draft EIS. Additional sewage that will be processed at the Honouliuli Treatment Plant has been reviewed and approved during the design stages of that project by the State and Federal government. Any additional expansion will be covered by the Department of Public Works, City & County of Honolulu at the time of expansion design.

Thank you for your comments and we look forward to your review of the draft EIS document.

Very truly yours,

F. J. Rodriguez

F. J. Rodriguez

FJR:ls

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 South King Street, #115
HONOLULU, HAWAII 96813

LETITIA N. UYEHARA
DIRECTOR

TELEPHONE NO.
548-6915

June 9, 1986

Mr. Fred J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Subject: Waiawa Ridge Project Preparation Notice

We offer the following comments to the Waiawa Ridge preparation notice.

1. Several large developments are planned for the Ewa area that will utilize the Honouliuli sewage treatment plant bringing the plant to capacity in a few short years. Since the planning areas have been changed dramatically from the mid-1970's, it should be made very clear if this project is part of the original Honouliuli facilities plan. If not, is the Department of Public Works handling applications on a first come, first serve basis or other criteria?

2. Water in the Pearl Harbor Basin is at a critically low level and the development of new wells are being limited. We suggest that appropriate approvals be obtained to withdraw water from the Pearl Harbor Basin before a draft EIS is prepared.

Thank you for allowing us the opportunity to review this preparation notice.

Sincerely,

Letitia N. Uyehara

Letitia N. Uyehara
Director

F. J. RODRIGUEZ,
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

July 16, 1986

Ms. Letitia N. Uyehara, Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, #115
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

We are in receipt of your office's comments dated June 9, 1986 on the proposed Waiawa Ridge development. We respond in the following:

1. The Honouliuli sewage treatment plant which serves users from Haiawa to West Beach and from Mililani to Ewa, has a treatment capacity of 25 million gallons of sewage per day. Current usage is at 17 MGD. The Waiawa project would add 3.5 gallons per day at full development. The City plans to expand in stages the plant's capacity to meet the demand currently under review in the Central Oahu Development Plan process.

2. We share your concerns over the critical nature of the Pearl Harbor Ground Water Control Area and have been working very closely with the Board of Water Supply who is directly responsible for the effective management of the water that will be distributed under their management. It would seem inappropriate to request and obtain water use approvals for lands that had not been urbanized under the existing system of land use policy change, i.e. State Land Use Commission, City Development Plan Amendment, and City Zoning.

Thank you for your initial comments and we look forward to hearing from your office on the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

JUN 12 1986

1148 FORT STREET MALL, SUITE 200 • P.O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-2427

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

12 June 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Subject: Environmental Impact Statement Preparation Notice, The Gentry Companies, Waiawa, between Waiawa Gulch and Stream, TMK 9-4-06: por 10 and 9-6-04: por.1., May 1986

We have reviewed the subject EISPN and offer the following comment. The proposed project is in the immediate vicinity of the U.S. Navy's Waiawa water well. The possible consequences of this project on that well needs to be addressed specifically as well as the effects on the quality and quantity of recharge to the basal aquifer.

Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi
EIS Coordinator

ETM:JM

JUN 17 1986

AN EQUAL OPPORTUNITY EMPLOYER

ENVIRONMENTAL COMMUNICATIONS INC.

F. J. RODRIGUEZ, PRESIDENT

July 16, 1986

Mr. Edwin T. Murabayashi
EIS Coordinator
University of Hawaii at Manoa
Water Resources Research Center
Holmes Hall 283
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Murabayashi:

We are in receipt of your office's comments on the proposed Waiawa Ridge development and we respond in the following:

Sources of potable water for the project has not been finalized at this early planning stage by either DLNR or the Board of Water Supply. If the source is to come from existing onsite wells, the impacts that could accrue from this project's development and the close proximity of the U.S. Navy's Waiawa water well will be discussed in the draft EIS. Quality and quantity of recharge is to be covered by Dr. Gordon L. Dugan who will provide the data for use in the EIS. Dugan states at this stage that current practices of sugar cultivation are such that drip irrigation has drastically reduced the percolation capability of agricultural land usage.

Thank you for your comments and we look forward to your review of the Draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

1146 FORT STREET MALL, SUITE 200 • P. O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-8361

United States Department of the Interior

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

ES
Room 6307

MAY 27 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Re: Extension of Environmental Impact Statement Preparation Notice, Waiawa Ridge Project, Oahu, Hawaii

Dear Mr. Rodriguez:

The Service recommends that the EIS for the proposed action include a discussion of the following:

a. Source and volume of municipal water supplies for the proposed development. If new sources must be developed, discuss the impacts of such development upon streamflow.

b. Identify the projected volume of storm water runoff and its discharge locations and receiving waters. Discuss the impacts of dissolved and particulate pollutants in this runoff (petrochemicals, sediments, biocides, and heavy metals) upon biological resources of receiving waters.

c. Evaluate the loss of terrestrial wildlife habitats due to project construction and its ecological significance.

We appreciate this opportunity to comment.

Sincerely yours,

for Charles R. Kramer

Ernest Kosaka
Project Leader
Office of Environmental Services

cc: NMFS - WPPO
HDF&W
HDAR
EPA, San Francisco

ENVIRONMENTAL COMMUNICATIONS INC.

F J RODRIGUEZ
PRESIDENT

July 16, 1986

Mr. Ernest Kosaka
Project Leader
Office of Environmental Services
United States Department of the Interior
Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kosaka:

We are in receipt of your agency's comments dated May 27, 1986 and we respond in the following:

1. Municipal water supply for Waiawa Ridge will be described in the draft EIS in accordance with the requirements of the Department of Land & Natural Resources, State of Hawaii and the Board of Water Supply, City & County of Honolulu. As you know, the availability of potable water for consumption by the proposed project will be at the discretion of both agencies.

2. Dr. Gordon L. Dugan, Ph.D will discuss in his study, the impacts of the surface water runoff aspects of the proposed project. Please be assured also that all drainage from the development of Waiawa Ridge will be in accordance with applicable drainage standards as prescribed by the City & County of Honolulu and the State of Hawaii.

3. The loss of terrestrial wildlife habitat will be discussed in the draft EIS also and while the principal use of the site was in cultivated sugar cane, there will be a discussion on the terrestrial flora and fauna affected by the development.

Thank you for your continuing concern and we look forward to the comments on the draft EIS as we continue the review process.

Very truly yours,

F. J. Rodriguez

FJR:ls

CONSERVE AMERICA'S ENERGY

MAY 28 1986

Save Energy and You Serve America!

1188 FORT STREET MALL, SUITE 200 • P. O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-2361

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P. O. BOX 50004
HONOLULU, HAWAII
96850

June 19, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, HI 96809

Dear Mr. Rodriguez:

Subject: EIS Preparation Notice for Waiawa Ridge Project
Waiawa, Oahu, Hawaii

We have no comments to offer, but would appreciate the opportunity to review the draft environmental impact statement on this project when it is completed.

Thank you for the opportunity to review the document.

Sincerely,

RICHARD N. DUNCAN
State Conservationist

NO RESPONSE NEEDED

JUN 20 1986

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

IN REPLY REFER TO
5090
Ser 002(09P2)/4628

20 JUN 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

ENVIRONMENTAL IMPACT STATEMENT (EIS)
PREPARATION NOTICE, WAIAWA RIDGE PROJECT
(GENTRY) BISHOP ESTATE PROPERTY

The EIS Preparation Notice forwarded with your letter of May 23, 1986 has been reviewed and the following comments are provided for your consideration:

a. The proposed redesignation of 1,242 acres of land from Agriculture to Residential, Low Density Apartment, Medium Density Apartment, Commercial/ Industrial, Park (Golf Course), and Roadway should take into consideration the presence of a Navy water shaft under Waiawa Ridge.

b. The EIS should address the impact the residential development will have on the Navy's primary water source for Pearl Harbor, the Waiawa tunnel. The agricultural fields above our water tunnel comprise the major recharge area. Development (paved roads, houses) will surely reduce the amount of water infiltrating into the ground. Development will also probably affect the quality of the water (chemically and bacteriologically). The EIS should include responses to these questions:

1. Will there be a reduction in ground water levels because of a reduction in recharge due to the residential building?

2. Will the water supply become contaminated by trace contaminents due to the application of pesticides and fertilizers by individual residents?

3. The Navy has a concern that siltation means poorer water quality and more frequent dredging requirements. Will this development cause a more rapid siltation of Middle Loch?

Thank you for the opportunity of providing these questions.

Sincerely,

P. O'CONNOR
Captain, U. S. Navy
Chief of Staff

JUN 24 1986

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ,
PRESIDENT

July 16, 1986

Captain P. O'Connor
Chief of Staff
Department of the Navy
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020

Dear Captain O'Connor:

We are in receipt of the comments dated June 20, 1986 on the proposed Waiawa Ridge development and respond in the following:

1. Reduction in ground water recharge due to urban land usage versus agricultural cultivation will be discussed in the draft EIS. It is a reasonable assumption that urban usage will permit less recharge than agricultural usage, but the tradeoff can be expressed in reduced siltation and chemical contamination.

2. Contamination of ground water by pesticides and fertilizers used by individual residents would seem less likely since quantities involved are much lower than the commercial levels used by Sugar and Pineapple. It should also be pointed out that the types of pesticides and fertilizers used commercially by individual homeowners are EPA approved, biodegradable in content, and short term in usage.

3. Siltation due to surface runoff from an urban land usage is generally speaking, limited to the construction phase of any large scale development. Today's grading ordinances prohibit mass acreage from being cleared and graded without mitigative sources such as grassing and mulching immediately after clearing and mass excavation. Both the State and City & County have stringent requirements in regard to surface runoff quality and quantity.

Thank you for your comments and we look forward to your comments and review of the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
DUNNING HALL
FORT SHAFTER, HAWAII 96858-5000

21 MAY 1986

REPLY TO ATTENTION OF
Directorate of Facilities Engineering

Mr. Fred Rodriguez
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

US Army Support Command, Hawaii would appreciate being consulted during the preparation of the Environmental Impact Statement for the Central Oahu Development Plan Amendment Application from Agriculture to Various Uses at Waiawa Ridge, Oahu (TMK: 9-4-6:10 and 9-6-4:1).

If we may be of assistance, please contact the Environmental Management Office at 655-0694.

Sincerely,

Joseph S. Wasielewski
Colonel, Corps of Engineers
Director of Facilities
Engineering

MAY 22 1986

WAIPAHU 2000 COMMUNITY COUNCIL

June 17, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96813

Dear Mr. Rodgriguez:

Subject: Comments on Waiawa Ridge Project
EIS Preparation Notice, As Circulated.

This responds to your letter dated May 22, 1986, informing our Community Council that our comments on the Waiawa Ridge Project (hereinafter "project") should be sent to you by June 23, 1986. On behalf of our Community Council we present the following comments:

As you may already know, the City Council recently decided (May 19th P&ZC meeting) to allocate an additional 1100 housing units development capacity for the Central Oahu Development Plan area under the existing General Plan accordingly: Village Park Expansion - 500 units; Waiawa Ridge Project - 300 units; and Mililani Town Expansion - 300 units. Also, at its May 19th meeting, the P&ZC voted 8-0-1 to recommend denial of a CPO-initiated GP amendment which proposed replacing the existing West Beach-Makakilo Secondary Urban Center in Ewa with a single "Secondary Growth Area" encompassing both the Ewa and Central Oahu DP areas. The P&ZC felt that the amendment lacked adequate supporting study of its impacts on water, agricultural lands and other areas of planning concern.

Simultaneously, the P&ZC recommended City Coucil adoption of a Resolution (Reso. No. 86-201, as amended) directing that:

1. An immediate processing of a 5-year, comprehensive review of the Oahu General Plan commence;

2. In that comprehensive review, consideration be given to including the Waipahu area between Waiawa (H-1) Interchange and Kunia Road within the GP's Primary Urban Center;

3. Resolution No. 86-201, as amended, be forwarded to the Department of General Planning for processing and consideration in the 5-year review; and

4. The DGP, in processing the 5-year review, evaluate the impacts of proposed General Plan amendments on transportation facilities, sewers, water resources, the loss of prime agricultural land, and future development pressures on Central Oahu.

On May 28, 1986, the City Council voted 7-2 to adopt Reso. No. 86-201, as amended. (Reso. No. 86-201, as amended, is attached for your information.)

The project proposes amendments to the Central Oahu DP to allow the immediate redesignation of 1,242 acres of fallow agricultural land at Waiawa Ridge, Central Oahu, from Agriculture to various urban DP land classifications in implementation of the first increment of a Waiawa Master Plan. The redesignations would facilitate the development of 7,900 single family and apartment units and increase the Central Oahu population by 8,580 persons over the next 5 years and by approximately 24,000 persons upon full development of the 2,827-acre Master Plan. The project's EIS Preparation Notice states that a GP amendment to permit the project's anticipated population has been requested, impliedly recognizing that the project does not conform to the GP's population guidelines for Central Oahu.

In order to accommodate the project's anticipated 24,000 persons, most of the future population growth for Oahu under the GP's islandwide, year 2005 projected population of 954,500 persons would have to be assigned only to the project. If this were to occur, additional population development capacity from Ewa and/or the Primary Urban Center would have to be re-assigned only to the project, with the added result that other major pending developments in Ewa and Central Oahu will not be able to fit within the GP's population guidelines without an increase to the projected islandwide population for Oahu. If this were to occur after Waipahu is included within the PUC in accordance with Reso. No. 86-201, Waiawa would take up most of the 28,000 additional population capacity released to Central Oahu by including Waipahu within the PUC, again, virtually forclosing the development of other, pending Central Oahu projects without increases to Oahu's projected year-2005 population.

94-229 Waipahu Depot Road • Room No. 206 • Waipahu, Hawaii 96797

It is difficult for our Community Council to support the project given the above-described impacts on planned islandwide population growth and distribution and absent definitive information on its effects on water supply; existing and projected capacities of the Honouliuli Sewage Treatment Plant; the development of the Ewa Second City, Village Park, Mililani Town, Waikele; economic revitalization and growth in Waipahu; and, of course, regional traffic flows and transportation systems. If the project hinders or prevent the development of other projects (public and private) which will contribute positively towards Waipahu revitalization, our Community Council probably will not support it. We lack sufficient information at this time to determine whether the project will have such effects.

Moreover, in recent month our Community Council has been especially interested in the formulation of a comprehensive GP amendment which prescribes greater growth for Central Oahu, particularly in Waipahu, in a rational, defensive manner. Also, the inclusion of Waipahu within the PUC as suggested in Reso. No. 86-201 would greatly help Waipahu attain its goals. If the project hinders or prevents formulation of that Central Oahu GP amendment or, in the alternative, inclusion of Waipahu within the PUC, our Community Council probably will not support it. Again, we lack sufficient information to make such determinations.

Philosophically, we concur with the position of the City Council and DGP that a comprehensive review of regional growth distribution and direction policies in the GP needs to be done first and used as the bases for evaluating the merits of each major pending development proposal. We also think that it's important to avoid piecemeal reviews at the GP level in favor of a wholistic review of regional and islandwide planning needs, conditions and trends. Such a review avoids the kind of inter-project conflicts described above by enabling a review of the comparative merits, problems and impacts of all development proposals.

Based on the above considerations, please be advised that the Waipahu 2000 Community Council cannot support the Waiawa Ridge Project at this time.

Very truly yours,

C.O. ANDY ANDERSON
President

Copy: Board of Directors.
cc: Department of General Planning.
Mr. Tosh Hosoda.

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

No. 86-201
(Amended)

RESOLUTION

RELATING TO THE GENERAL PLAN OF THE CITY AND COUNTY OF HONOLULU.

WHEREAS, Section 5-403(a) of the Revised Charter of the City and County of Honolulu provides for the preparation of revisions to the General Plan every five years: and

WHEREAS, the changing needs and character of the people and communities of Oahu require a reevaluation of the direction and manner of growth most desirable for our citizens: and

WHEREAS, the community of Waipahu is now part of a continuous urban development from downtown Honolulu to Kunia Road; and

WHEREAS, community groups in Waipahu have expressed a desire for further development within their community, and major changes to the General Plan should be made in the context of a comprehensive, five-year, islandwide review: now, therefore,

BE IT RESOLVED by the Council of the City and County of Honolulu that in compliance with Section 5-412 of the Revised Charter, Resolution No. 238, Draft No. 2 (adopted in 1977), a comprehensive five-year review of the Oahu General Plan be processed immediately; and

BE IT FURTHER RESOLVED by the Council of the City and County of Honolulu that in the comprehensive review of the General Plan, consideration shall be given to including in the Primary Urban Center the lands of Waipahu from the Waiawa Interchange area to Kunia Road; and

BE IT FURTHER RESOLVED by the Council of the City and County that this resolution be transmitted to the Department of General Planning for processing and consideration in the comprehensive five-year review; and

BE IT FURTHER RESOLVED that in its processing of the five-year review, the Department of General Planning include evaluations of the impacts of the proposed amendments on transportation facilities, sewers, water resources, the loss of prime agricultural land, and the future development pressures on Central Oahu; and

RESOLUTION

BE IT FURTHER RESOLVED that the Chief Planning Officer's recommendations for the five-year review be completed by January 1, 1987, and the findings and recommendations be transmitted to the Planning Commission; and

BE IT FINALLY RESOLVED that this Resolution shall take effect upon its approval.

INTRODUCED BY:

Councilmembers

DATE OF INTRODUCTION:

MAY 28 1986
Honolulu, Hawaii

(OCS/052787/gw)

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

I hereby certify that the foregoing RESOLUTION was adopted by the COUNCIL OF THE CITY AND COUNTY OF HONOLULU on the date and by the vote indicated to the right.

ATTEST:

RAYMOND K. PUA
CITY CLERK

MARILYN BORNHORST
CHAIR AND PRESIDING OFFICER

Dated MAY 28 1986

ADOPTED MEETING HELD MAY 28 1986	AYE	NO	A/E
DOO	X		
FAWCETT	X		
GRABE		X	
KAHANU	X		
YIM	X		
MIKE	X		
MORGADO		X	
NARVAES	X		
BORNHORST	X		

Reference: CC 237

Report No. CHR-34

Resolution No. 86-201

F. J. RODRIGUEZ.
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

July 16, 1986

Mr. C.O. Andy Anderson, President
Waipahu 2000 Community Council
94-229 Waipahu Depot Road, Room 206
Waipahu, Hawaii 96797

Dear Mr. Anderson:

We are in receipt of your organization's comments dated June 17, 1986 on the proposed Walawa Ridge development and we respond in the following:

The single most important comment that is made by your group is that in using a worst case scenario, Walawa Ridge could from your point of view, take nearly all of the year 2005 projected population for the Central Oahu Development Plan area. While this can be of serious concern to other projects under planning and consideration at this time, we should not lose track of the fact that these population guidelines are merely that, guidelines and not mandatory controls. The other aspect that should not be overlooked is that as a project the size of Walawa Ridge proceeds through the lengthy land use policy change process, the request for change is for 1242 acres and government will review and decide on the ability of many factors (Traffic, Water, Sewage, Schools, Fire & Police, etc.) to carry a project of this size over the many years that it will take to implement.

Finally, the market place will make the final determination as to whether or not Walawa Ridge will proceed as planned, or whether a reduced project will result due to the market's inability to absorb the product being planned for sale. The undetermined status of external factors such as interest rates, competitive projects, and carrying capacity of utilities could also have impact on Walawa Ridge.

We would request that the Waipahu 2000 Community Council review the draft EIS and provide input through their comments before closing all doors to support of this project. We appreciate your comments and look forward to your review of the draft EIS.

Very truly yours,

F. J. Rodriguez

FJR:ls

CASTLE & COOKE, INC.

P. O. BOX 2990 • HONOLULU, HAWAII 96802-2990
TELEPHONE (808) 548-6611
TELEX 7430017

June 2, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Environmental Impact Statement Preparation
Waiawa Ridge Project

Castle & Cooke wishes to be consulted during the preparation of the EIS for the Waiawa Ridge project. I will be the contact person for our company.

Very truly yours,

George Yim, President
CASTLE & COOKE LAND COMPANY

JUN 3 1986

FINANCIAL PLAZA OF THE PACIFIC
130 MERCHANT STREET, HONOLULU, HAWAII 96813

F. J. RODRIGUEZ
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

July 16, 1986

Mr. George Yim, President
Castle & Cooke Land Company
P.O. Box 2990
Honolulu, Hawaii 96802-2990

Dear Mr. Yim:

We acknowledge your request of June 2, 1986 to be a consulted party on the proposed Waiawa Ridge development. Please advise us if there is anything that we can provide in the draft EIS that would be of specific interest.

Thank you for your continuing interest.

Very truly yours,

F. J. Rodriguez

FJR:ls

1148 FORT STREET MALL, SUITE 208 • P.O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-4361

CASTLE & COOKE, INC.
P. O. BOX 2990 • HONOLULU, HAWAII 96802-2990
TELEPHONE (808) 548-6611 TELEX 7430017

F. J. RODRIGUEZ
PRESIDENT

ENVIRONMENTAL COMMUNICATIONS INC.

June 2, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Environmental Impact Statement Preparation
Waiawa Ridge Project

Castle & Cooke wishes to be consulted during the preparation of the EIS for the Waiawa Ridge project. I will be the contact person for our company.

Very truly yours,

George Yim, President
CASTLE & COOKE LAND COMPANY

JUN 3 1986

FINANCIAL PLAZA OF THE PACIFIC
130 MERCHANT STREET, HONOLULU, HAWAII 96813

July 16, 1986

Mr. George Yim, President
Castle & Cooke Land Company
P.O. Box 2990
Honolulu, Hawaii 96802-2990

Dear Mr. Yim:

We acknowledge your request of June 2, 1986 to be a consulted party on the proposed Waiawa Ridge development. Please advise us if there is anything that we can provide in the draft EIS that would be of specific interest.

Thank you for your continuing interest.

Very truly yours,

F. J. Rodriguez

FJR:ls

1146 FORT STREET MALL, SUITE 200 • P.O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-4361

XIII DRAFT EIS COMMENTS AND RESPONSES

XIII. COMMENTS RECEIVED FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) PERIOD

ORGANIZATIONS	Date of Comment	Date Comment Received	Response to Comments
State			
OEQC	----	----	----
Department of Agriculture	1/06/87	1/08/87	1/21/87
Department of Accounting & General Services	*1/14/87	1/16/87	----
Department of Defense	12/30/86	1/02/87	1/21/87
Department of Education	12/06/86	12/29/86	1/21/87
Department of Health	1/06/87	1/08/87	1/21/87
Department of Land and Natural Resources	----	----	----
Department of Planning and Economic Development	1/07/87	1/08/87	1/21/87
Department of Social Services and Housing	1/05/87	1/06/87	1/21/87
Department of Transportation	----	----	----
State Energy Office	12/05/86	12/11/86	NRN
University of Hawaii			
Environmental Center	1/07/87	1/08/87	1/21/87
Water Resources Research Center	1/07/87	1/08/87	1/21/87
Federal			
Department of the Army	----	----	----
Department of the Navy	1/07/87	1/08/87	1/21/87
U.S. Army Corps of Engineers	12/31/86	1/07/87	1/21/87
U.S. Fish and Wildlife Service	12/18/86	12/22/86	NRN
U.S. Geological Survey	12/10/86	12/12/86	1/21/87
City & County of Honolulu			
Board of Water Supply	12/26/86	12/30/86	1/21/87
Building Department	12/19/86	12/30/86	NRN
Department of Housing and Community Development	1/08/87	12/12/87	1/21/87
Department of General Planning	1/09/87	1/12/87	1/21/87
Department of Land Utilization	----	----	----
Department of Parks and Recreation	12/15/86	12/22/86	1/21/87
Department of Public Works	12/22/86	12/31/86	1/21/87
Department of Transportation Services	*1/09/87	1/16/87	----
Fire Department	1/12/87	1/14/87	NRN
Police Department	12/17/86	12/22/86	1/21/87

Comments Received (Continued)

ORGANIZATIONS/AGENCIES	Date of Comment	Date Comment Received	Response to Comment
Private Organizations/Agencies			
American Lung Association	1/07/87	1/08/87	1/21/87
Hawaiian Electric Company	1/06/87	1/08/87	1/21/87
Waipahu Neighborhood Board #22	----	----	----
Pearl City Neighborhood #21	----	----	----
Hawaii's Thousand Friends	1/06/87	1/08/87	1/21/87

* COMMENT RECEIVED AFTER DEADLINE DATE
NRN: NO RESPONSE NEEDED

JOHN D. WAIHEE
GOVERNOR

SUZANNE D. PETERSON
CHAIRPERSON, BOARD OF AGRICULTURE

TADASHI TOJO
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

January 6, 1987

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
Amendment to Central Oahu Development Plan
Waiawa Development
The Gentry Companies
TMK: 9-4-06: por. 10
9-6-04: por. 1 Waiawa, Oahu
Area: 1,395 acres

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

Appendices A and B of the DEIS contain the soils information referred to in our letter of June 23, 1986, to Mr. [illegible]d Rodriguez concerning the EIS Preparation Notice (EISPN) (DEIS, Section XII).

The DEIS does not specifically address the following three concerns found in our comments on the EISPN:

- the impact on agriculture resulting from the withdrawal of 4.5 million gallons of water per day from the Pearl Harbor Ground Water Control Area for the project's domestic consumption;

- the relationship of the proposal to existing and proposed urban development in the Central Oahu and Ewa Development Plan areas; and

- the relationship and conformance of the project to the State Agriculture Functional Plan, and especially to the following:

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

JAN 0 8 1987

Implementing Action B(5)(c): 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 DEIS (pages X-2 and X-3) and Appendix A point out that the project site has the "...agronomic potential to be productive agricultural lands. However, the existence of an excess of lands suitable for crop production, relatively high water costs, limited size of the local market and the difficulties in developing crops for export indicate that the urbanization of the subject property "...will not have a significant impact on the agricultural sector of Honolulu County or the State".

We understand from Appendix A (page 7) and our own observations that the Waiahole Ditch runs in an east-west direction approximately one-half mile to the north of the project site. According to our information, areas utilizing water from the Ditch for irrigation purposes include approximately 691 acres of Oahu Sugar Company sugarcane fields north of Village Park in Kunia which is proposed for development, and 269 acres of Dole Wahiawa Plantation pineapple fields, proposed for the Waiola Estates housing project. These developments could conceivably free some quantity of relatively low-cost water for agricultural use in the Waiawa area.

It is difficult at best to predict the future of agriculture in the Central Oahu area, much less the State. The economic returns to private landowners from alternative non-agricultural uses of the land under current economic conditions would almost invariably be superior to the returns from agriculture. The economic decisions of individual landowners, to put agricultural land to "higher and better" use may, however, have significant cumulative adverse effects upon the State's total agricultural production, especially if adverse economic events make the importing of food an increasingly expensive proposition. In considering the need to retain agricultural lands in their agricultural designation, the State must consider such economic and other conditions and events beyond the scope and time frame of private landowners' plans. The broader interests of society must be considered.

There is need to maintain an adequate land area for agricultural activities which are presently considered non-viable or marginal, but which may in the future be the equivalent of macadamia nuts today. Examples include the pending cultivation of cacao on former Puna Sugar Company lands and coffee on Molokai. The State will be unable to provide for these new export-oriented agricultural commodities unless we protect the irreplaceable land resource today from land use decisions that heavily discount or do not consider such future possibilities. The DEIS has not addressed this broader issue in depth.

Thank you for the opportunity to comment.

Suzanne D. Peterson

SUZANNE D. PETERSON
Chairperson, Board of Agriculture

cc: Environmental Communications, Inc.
LUC
DPED
DLU
OEQC

F. J. RODRIGUEZ
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

January 21, 1987

Ms. Suzanne D. Peterson, Chairperson
Department of Agriculture
1428 South King Street
Honolulu, Hawaii 96814-2512

Dear Ms. Peterson:

We are in receipt of your department's comments dated January 6, 1987 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and the consultant for their review and we respond in the following:

1. The three main subjects that are listed as not being fully addressed in the DEIS are contained in the document albeit in a form that may not be fully acceptable to certain reviewers. We will discuss them specifically with references from the DEIS where appropriate.

   a) There are no specific references that pertain to the removal of 4.5 MGD of water from the Pearl Harbor Ground Water Control Area and the resulting impacts to Agriculture. In the total review process of land use policy amendments that remain for this project, the impacts of water transfer from Agriculture to Urban use will be reviewed by the agency responsible for this function, Department of Land & Natural Resources, and also the City Board of Water Supply. Determinations by these agencies on the availability of surplus water, as determined by surpluses from declining agricultural uses, curtails evaluation of impacts on the proposed transfer of water use. Our inability to evaluate impacts on the proposed transfer of water use is due to the determinations by these agencies on availability of surplus water as they determine it surplus by declining agricultural uses.

   b) Section VI (pp. VI-1 through VI-8) covers the Relationship to Plans, Policies, and Controls. Discussions in these pages do not cover the relationship of the project to State Plans to the extent desired by agencies vested with the responsibility of land stewardship such as your office. This is made more difficult by the vacating of land parcels such as Waiawa, Village Park, and Mililani Mauka by the agricultural tenants/landowners.

We cannot dispute the physical proximity of the Waiahole Ditch and the theoretical availability of this irrigation water source for agricultural use in the Waiawa area. Unfortunately, as this water becomes surplus, the DLNR administers the beneficial use of this water on an island wide basis for Agriculture and Urban customers.

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We would agree that there is a need for a long-term plan for the agricultural resources of the State. If indeed the broader interests of society must be considered in the overall long-term future planning for Hawaii, then the State must come forward with a viable plan that will insure that lands of prime and significant value be preserved. They must be preserved, however, with an attendant marketing plan that is realistic and comprehensive with attention paid to the entire gamut of society: Farmer, Retailer, Consumer.

We do not oppose the preservation of agricultural lands, but feel strongly that this is a function more suited to government, not the developer. The developer will continue to seek lands that are developable at a minimum of cost that are conveniently within the metropolitan district so that costs for infrastructure in relation to attractive settings for residential neighborhoods can be realized. In many instances, these are unfortunately agricultural lands that are designated Prime for the very same reasons. Those statements in the DEIS are based on the projected requirements for agricultural lands found in the LESA report published by your agency and as such, incorporate the available information on projected demands for agricultural lands.

The broader picture for the future of Agriculture in the State is at best, uncertain at this time. The Gentry Companies do not oppose the position of the Department of Agriculture, but feel strongly that decision makers in government need to address the situation and support the long-term survival with definitive action.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD HONOLULU HAWAII 96816-4495

LL.8

HIENG

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:

EIS - Waiawa by Gentry, Waiawa, Oahu

A review of the above subject EIS forwarded by the Office of Environmental Quality Control letter dated December 5, 1986 indicates problems may arise when the Waiawa Community is established. Complaints would probably concern noise and air pollution resulting from the Hawaii Army National Guard, as other shops engage in light industrial activities. In addition to the weekday activities, the Hawaii Army National Guard performs inactive duty training (IDT) on the weekends. Since the IDT commences in the early morning hours, noise from this activity may impact the adjacent residential community.

Thank you for allowing this opportunity to comment. Should you have any questions, please contact LTC Wayne Tomoyasu, our Facilities Management Officer, at 735-3522.

Yours truly,

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

cc: Mr. P. J. Rodriguez, Pres.
(Environmental Communications, Inc.)

JAN 02 1987

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ
PRESIDENT

January 21, 1987

Major Jerry M. Matsuda
Department of Defense
Hawaii Air National Guard
Office of the Adjutant General
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Dear Major Matsuda:

We are in receipt of your comments dated December 30, 1986 on the proposed Waiawa by Gentry project. The comments have been reviewed by the applicant and we respond as follows:

The final determination for the various land uses being planned have not been at this early planning stage, been completed as to location and proximity to your planned activities. It is appropriate that early decision makers can avail themselves of these future uses being considered, so that, potentially incompatible uses can be designed to reduce the impacts of noise and air pollution to the best degree practicable.

Analysis of the Findings of No Significant Impact (FONSI) Environmental Assessment recently prepared by the U.S. Army Support Command, Hawaii on the proposed Waiawa Training Area indicate the types of activities being planned and the applicant has indicated that they will be monitoring the progress of this application and will coordinate both their project and your future proposed uses with your designated staff advisor, Col. Wayne Tomoyasu.

Thank you for your comments and we look forward to working with your office on this dual use of land at Waiawa.

Very truly yours,

F. J. Rodriguez

FJR:ls

1146 FORT STREET MALL, SUITE 200 • P. O. BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-8391

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT
KAMAMANU BUILDING, 250 SOUTH KING ST, HONOLULU HAWAII
MAILING ADDRESS: P.O. BOX 2359 HONOLULU, HAWAII 96804 • TELEPHONE 548-3250 HOPED

John Waihee
Roger A. Ulveling
MURRAY E. TOWILL

DIVISIONS
BUSINESS AND INDUSTRY DEVELOPMENT DIVISION
ENERGY DIVISION
FOREIGN TRADE ZONE DIVISION
LAND USE DIVISION
PLANNING DIVISION
RESEARCH AND ECONOMIC ANALYSIS DIVISION
OFFICES
ADMINISTRATIVE SERVICES OFFICE
INFORMATION OFFICE

Ref. No. P-5689

January 7, 1987

The Honorable Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: DEIS for the Waiawa Development, Waiawa, Oahu

We have reviewed the subject Draft Environmental Impact Statement (DEIS) and have the following comments.

Scope of DEIS

The DEIS covers the first increment (1,395 acres) of the Waiawa Master Plan. Fully developed, the Waiawa community will total approximately 2,500 acres. However, the DEIS does not address the demands and impacts of the total development. There is no indication in the text or on maps as to when and where subsequent increments are planned. Even though this first increment may be intended to be independent of further development, it can be evaluated more accurately if a perspective of the total development is provided. Under the Hawaii Coastal Zone Management (CZM) law's policies for managing development, the short- and long-term impacts of proposed coastal developments are to be communicated early in their life cycle.

There are elements of the first increment that will serve subsequent phases, such as sewers, water supply, and roads. Infrastructure capacities must be evaluated in terms of the total development. The intent to prepare supplemental EIS's should not be allowed since we believe the current document is inadequate to serve as a generic or programmatic EIS.

The preparer's response to DPED comments of May 21, 1986, on the EIS Preparation Notice relative to ecosystem impacts are inadequate. The ecosystem concerns identified in item 9 of our comments were not addressed in the DEIS or in the preparer's response.

JAN 0 8 1987

Project Location Map and Site Plan

The DEIS's Figure 1 (Project Location Map) and Figure 2 (Site Plan) do not correspond. The cross-hatched area in Figure 1 does not match up with Figure 2. In addition, the areas outlined in solid lines in Figure 1 are not explained. The DEIS should present the project's location on a clearly understandable map.

Subsequent maps, such as those used for soils and archaeological areas, should utilize a similar base map to enhance reviewer's analysis of the project and its impacts.

Surface Water Runoff

The Middle Loch of Pearl Harbor is the receiving waters for the project's surface water runoff via Waiawa Stream. Pearl Harbor is a valuable estuarine ecosystem with several associated wetlands, including a National Wildlife Refuge on the Pearl City Peninsula in the Middle Loch of Pearl Harbor. A second unit of the National Wildlife Refuge is located along the west shore of West Loch. Pearl Harbor itself serves as an estuarine nursery for several species of fish.

The assessment and discussion of surface water runoff characteristics (pp. VII-3 and 4, and Append. C) are based on a project area of 1,247 acres and not on 1,395 acres as proposed. Even though the calculations and figures are intended for comparative purposes only, analysis of the additional 148 acres is warranted and should be presented in the Final EIS.

The DEIS assumes that biocide concentrations in runoff are "usually considered insignificant." (p. VII-7) This may be true in terms of immediate impacts or one-time occurrences, but the adverse long-term effects associated with bioaccumulation of biocides may be very significant. As for heavy metals, the DEIS only states that the long-term effect of the concentrations expected is presently undefined (p. VII-7). It is unclear what "undefined" means or refers to. Furthermore, there is no discussion on the effects of increased nitrogen and phosphorous loads and sedimentation from increased runoff of suspended solids on coastal ecosystems.

The project site presently contains well-drained soils (pp. V-1, 2) which allow for rapid percolation of surface water. Development of the site will increase the impervious surface area. Waiawa Stream and its borders are within the Flood Insurance Rate Map (FIRM) Zone A and Flood Fringe. These designations place it within the 100-year flood hazard area. The increased quantity and flow rate of runoff may contribute adversely to the Waiawa flood hazard potential by making it more susceptible to flooding. This should be fully discussed in the Final EIS.

In addition, Section VI.B of the Final EIS should discuss concerns pertaining to runoff and flood hazards as part of an overall review of the project's relationship to Section 226-11 and 13, HRS, Physical Environment, Hawaii State Plan.

Ground Water Supply and Quality

There is no discussion in the DEIS about the Pearl Harbor Ground Water Control Area (GWCA). It is our understanding that the demand for water from this supply source is near its mean maximum sustainable yield of 225 million gallons a day (mgd). A Ground Water Use Permit from the Department of Land and Natural Resources will be required to obtain water supply from this source. This is a key issue because water supply is critical and should be a prerequisite to development. The impacts associated with water supply as it relates to the Pearl Harbor GWCA should be discussed in the Final EIS. (p. V-3, p. V-20)

In view of the comments provided by the State Department of Health (DOH) (6/20/86) and the Department of the Navy, Pearl Harbor (6/20/86) regarding the contamination of the Navy's water source, the Waiawa shaft, a full study of the potential problem is warranted. Results of the study and proposed mitigation measures should be included in the Final EIS because there is no mention of this matter in the DEIS. Furthermore, Environmental Communications responded to the DOH that the contamination of ground water will be the subject of comment by Gordon L. Dugan, Ph.D. and John Hylin, Ph.D. However, there is no such study or discussion in the DEIS.

Further, in light of the concerns regarding ground water supply and quality, the Final EIS should address the project's relationship to Hawaii State Plan objectives and policies 226-19(b)(5), 226-20(a)(2); Priority Guidelines 226-104(b)(9), 226-104(b)(10); and State Health Functional Plan objective A.

Sewage Disposal

According to the City and County of Honolulu Department of Public Works (letter dated 6/4/86) the proposed project was not included as part of the Honouliuli sewer system or part of the Waipahu drainage subdistrict during construction of the Honouliuli and Waipahu sewer facilities. Consequently, there are no additional capacities at either facility. Expansion of the present facilities is required to accommodate the development. It is important that this be disclosed and discussed in the text of the DEIS under the appropriate section (p. VII-20) in order to facilitate planning and evaluation of the project. Also funding responsibility for the required expansion of sewage facilities should be indentified. Capacities should be based on the total Waiawa Development (2,500 acres) and not just the first increment (1,395 acres).

The sewage situation should also be discussed in Section VI in relation to the objectives and policies of the Hawaii State Plan - Facility Systems (Section 226-15, HRS) and the State Health Functional Plan objective A.

Archaeological Resources

The archaeological survey was conducted for only one of the proposed golf course rights-of-way. This is inadequate because it represents just a small portion of the first increment development area. The two proposed golf courses involve only 353 acres of the 1,395 project area. Since the archaeological survey was conducted for only one of the golf courses, the survey area is insignificant in relation to the project area. The archaeological report (Append. F) concludes that construction may proceed without the necessity for further archaeological research at the four sites investigated. This clearance should not be applied to the entire project area. The discussion of this matter in the DEIS (p. VII-9) is misleading in that the impression is given that no further surveys are necessary for the rest of the project area.

The maps in the archaeological report depicting the surveyed areas and findings should be compatible with the DEIS's project location map or site plan to enable reviewers to better locate the resource areas within the project boundaries.

Archaeological concerns should also be addressed in the State Historical Preservation Plan section on p. VI-4. The Final EIS should discuss the proposed project in relation to the objectives and policies of the Hawaii State Plan - Socio-Cultural Advancement (Section 226-25, HRS).

Wildlife

The DEIS fails to disclose that the Pearl Harbor Middle Loch contains a National Wildlife Refuge on the Pearl City Peninsula near the mouth of Waiawa Stream. This is significant because the surface water runoff from the project site will be deposited near the refuge via Waiawa Stream. The impacts on the refuge and mitigation measures should be disclosed in the Final EIS.

According to Appendix E, "Terrestrial Vertebrate Animals of Waiawa Ridge, Environmental Assessment" by Andrew J. Berger, "there is one endangered Hawaiian bird that could occur in the general region of the project site: The Hawaiian owl or Pueo." (p. 3) Mr. Berger states that he did not see any Pueo during his two days of field work in the project area, nor did he find any published records of the owl's occurrence in the area. Such a statement does not confirm that the owl does not occur in or frequent the area for feeding or habitat.

Fire Facilities

Under the Public Facilities and Services section (p. VII-21) fire protection facilities are presented as adequate. However, according to the Honolulu Fire Department (6/23/86) an additional fire station will be required within the Waiawa project because existing facilities would not be able to meet nationally accepted standards for answering a fire call. The Final EIS should be corrected to reflect this situation.

Correctional Facility

There is no discussion regarding the project's close proximity to the minimum security Waiawa Correctional Facility as pointed out by the State Department of Accounting and General Services (DAGS). In response to DAGS, the DEIS states that the potential impacts associated with the correctional facility can be discussed between the developer and DAGS at a later date. This is contrary to the purpose of the EIS process. Any impacts, known or potential, should be disclosed in the EIS.

Energy Conservation

The DEIS campaigns for energy saving devices, i.e., solar water heating. Yet, under the noise impacts section, the solution offered to mitigate traffic noise is the use of sound attenuating window designs and air conditioning. This solution would negate the energy savings benefits of the solar energy devices proposed.

Traffic

The DEIS has not addressed the downstream impacts of the project's vehicular traffic on the H-1 Freeway. This item should be addressed in the Final EIS because of the magnitude of the subject project.

The Final EIS should identify who will be financially responsible for constructing and providing the improvements recommended in the Traffic Impact Assessment Report (TIAR). This includes multiple improvements to the Waipio Interchange and associated ramps, upgrading of traffic signals, development of a transportation terminal, and connections to Kamehameha Highway.

The "Social Impact Analysis for the Proposed Gentry Waiawa Project" states that "use of private transportation to work is very high within the Waiawa tract with 93.5% of all employees utilizing private vehicles and only 2.9% using public transportation. These figures are noticeable higher than the Honolulu County figures at 76.4% and 10% respectively." In light of these statements, the EIS should discuss how the developer intends to change the pattern of vehicle use to achieve the Traffic Demand Reduction Program (Table 8, TIAR), whereby a 15% shift to car pools and a 10% shift to Express bus would be needed to reduce traffic demand to a level which can be served by the proposed developments. The Final EIS should also identify alternatives, should the Traffic Demand Reduction Program be unsuccessful, and identify who will be financially responsible for the alternatives.

Section VI of the Final EIS should discuss these traffic questions in relation to the objectives and policies of the Hawaii State Plan - Facility Systems (Section 226-17, HRS) and the State Transportation Functional Plan objectives A and C.

Housing Needs

The Final EIS should discuss the differences in their operations between the retirement residences (Arcadia and Pohai Nani) and the Waiawa retirement community. The Final EIS should also address the need and market acceptance for a retirement community. The DEIS inadequately addresses this point.

The affordability of conventional and retirement housing should be considered in relation to the objectives and policies of the Hawaii State Plan - Socio-Cultural Advancement (Section 226-19, HRS), Priority Guidelines - Affordable Housing (Section 226-106, HRS) and State Housing Functional Plan objective A.

Hawaii State Plan

Section VI of the Final EIS should discuss previously mentioned concerns regarding the wildlife refuge, endangered species, fire protection facilities, correctional facilities and energy conservation as part of an overall review of the project's relationship to Section 226-11, 18 and 26, HRS.

The Final EIS should examine the proposed project in relation to Priority Guidelines - Population Growth and Land Resources (Section 226-104(b), HRS) to address this area of statewide concern. For your information, amendments to the Objectives, Policies and Priority Guidelines of the Hawaii State Plan were signed into law as Act 276 by the Governor on May 29, 1986, and the Hawaii State Plan, as amended, should be utilized in your review.

In conclusion, we feel the DEIS does not adequately fulfill the requirements of the State EIS regulations pursuant to Chapter 343, HRS, for the reasons stated above. All of our recommendations should be incorporated into the Final EIS. Without full disclosure of the potential impacts this development proposal cannot be accurately evaluated. We request the opportunity to review the Final EIS for this project.

Sincerely,

Roger A. Ulveling

cc: Mr. F. J. Rodriguez
Environmental Communications, Inc.
Office of Environmental Quality Control

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ,
PRESIDENT

January 21, 1987

Mr. Roger A. Ulveling, Director
Department of Planning and
Economic Development
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Ulveling:

We are in receipt of your department's comments dated January 7, 1987 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and the technical consultants for their review and we respond as follows:

Scope of DEIS

It was not intended to depict the DEIS as a generic or programmatic EIS. The DEIS as prepared and filed is to comply with the City & County Department of General Planning's requirements for an amendment to the Development Land Use Map. On the basis of the DGP instructions, the amendment was limited to the 1395 acres described in the DEIS. The applicant/developer is fully cognizant of the benefits that can accrue from preparing and filing a total and comprehensive EIS for the full 2500 acres, but is limited unfortunately to the 1395 acres application as mandated by the DGP. We would note at this point that there is filed and in circulation, an EISPN for a 515 acre parcel that is contiguous to the 1395 acres being reviewed in this DEIS, but this EISPN identifies the EISPN as a "planning" document to identify the impacts of lands to be developed within a 10-10-10 year planning schedule. We regret any inconvenience that this imposed procedure may cause to DPED.

Project Location Map and Site Plan

It is our sincere hope that we can provide on behalf of the client applicant, improved mapping for future land use review purposes. We do acknowledge the inconsistency of the maps and will make every effort to improve in this vital aspect of land use plan documentation.

Surface Water Runoff (Dr. Gordon L. Dugan, Ph.D)

The potential effects on down stream receiving waters as a result of the project is complex at best, but the U.S. Navy's Biological study of Pearl Harbor in the early 1970's concluded that: the heavy metal burden in Pearl Harbor* was below the level of concern (even though several heavy metal discharges to Pearl Harbor- since eliminated - existed at that time), and that the major detriment to marine environment appeared to be silt. As presented in the DEIS, the suspended solids load is estimated to increase for the lower intensity storms (1-hour), and the 1 year interval 24-hour storms, and decrease substantially for the higher level 24-hour storms. Thus, overall the sediment load is calculated to decrease significantly when the proposed project is completed. Although, not usually 100% effective for the higher intensity storms, sedimentation basins, if properly designed and maintained, should significantly reduce, if not contain, the incremental lower level sediment producing storms. Consequently, the suspended solids load to Pearl Harbor from this area should be noteably reduced with the completion of the project.

Site improvements will increase impervious surfaces when compared to prior agricultural uses. Sediment basins are being designed as part of the golf course plan to function as water hazards and detention basins. At the present time, there is historical record of serious flooding at Waiawa Stream; there are no plans to improve these conditions since it is not part of the project site. The Drainage Master Plan will be designed and submitted to the Department of Public Works, Drainage Division for their review and approval. All improvements will be designed and built to City & County Code. Section VI.B will reflect revisions pertaining to Section 226-11 and 13, HRS, Physical Environment, Hawaii State Plan.

Ground Water Supply and Quality

The Pearl Harbor Ground Water Control Area (PHGWCA) has been acknowledged, for several years, as having its groundwater withdrawal being nearly equal to its long-term sustainable yields; therefore, groundwater pumpage in this area has to be controlled. Nevertheless, the PHGWCA exports water, thus, it is not necessarily a question of where a proposed project is located but rather where the potable water originates. The issue can be complex and is best answered by or through the Board of Water Supply.

There have been numerous hydrologic studies conducted in Central Oahu in addition to water quality studies and monitoring. The Navy's Waiawa tunnel, a sizable supplier of water for Navy operations has been proven to be sensitive to the quality of applied irrigation water which recharges its aquifer, as shown

*Evans, E.C. III, et al. 1972. "A Proximate Biological Survey of Pearl Harbor, Oahu," No. NUP, TP290, Naval Undersea Research and Development Center, San Diego, Calif.

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in a recent U.S. Geological Survey study reported by Paul R. Eyre,* Report No. 83-4097. However, this study involved using chloride as a tracer (in irrigation water) applied in concentrations in the 100's mg/l (ppm), a concentration measurement one-million times higher then the ppt units used for EDB and DBCP. In addition, chloride is a "conservative" element, which makes it a long-term accepted tracer in water, since it is essentially unaffected in percolation through the soil column to the groundwater aquifer, whereas, the volatile organic compounds can be readily volatilized and adsorpted to the soil properties; thus, chlorides and volatile organic compounds are not comparable.

The State Health Department's concern over the potential for termitecides reaching the underlying aquifer is understandable; however, the bottom line is that to date there apparently has been no evidence of this happening. The reasons for its non-detection is probably some combination of the relatively low amounts being applied, its frequency of application, the volatile nature of the product, its adsorption properties to the soil, and the lack of a large quantity of water to drive the non-volatilized and unadsorpted chemical to the aquifer, since its applied to and around buildings. If the application of termitecides is a real hazard to the aquifer, strong consideration should be given to terminating its use over Oahu's potable groundwater aquifers. Otherwise, the removal of volatile organic compounds can be conducted by some means of volatilization and/or adsorption by activated carbon. At present granular activated carbon treatment is being used or will be used to treat the up to 10 wells with > 20 ppt of EDB and/or DBCP in Central Oahu to less than the detectable limit.

Section VI will be revised to reflect the project's relationship to Hawaii State Plan objectives and policies 226-19(b) (5), 226-20(a) (2); Priority Guidelines 226-104 (b) (9), 226-104(b) (10); and State Health Functional Plan objective A.

Sewage Disposal

Comments from the Department of Public Works on the DEIS advised that sewage from this project would be directed to the Pearl City Waste water Pump Station since the ultimate capacity of the Pearl City Sewer System is able to accommodate the Waiawa flows. The re-routing of the off-site sewer trunk main is noted on the revised page VII-20 of the Final EIS.

Regarding wastewater treatment, the developer proposes to use whatever capacities is available at the time of project implementation. If present capacity at Honouliuli WWTP is exhausted, it is our understanding that the Department of Public Works will expand the plant capacity to accommodate further growth.

*Eyre, Paul R. 1983. "The Effects of Pumpage, Irrigation Return, and Regional Ground-water Flow on the Water Quality at Waiawa Tunnel Oahu, Hawaii." U.S. Geological Survey, Water-Resources Investigations Report 83-4097. Open-File Services Section, Western Distribution Branch, U.S. Geological Survey, Box 25425, Federal Center, Lakewood, Colorado 80225.

Negotiations as to a fair share pro-rata share would be conducted with the City to assure proper allocation of expansion costs at Honouliuli WWTP. The sewage situation will be discussed in the revised Section VI in relation to the objectives and policies of the Hawaii State Plan - Facility Systems (Section 226-15, HRS) and the State Health Functional Plan objective A.

Archaeological Resources

The archaeological study (Appendix F) erroneously identifies the survey area as one golf course when in fact, the intensive study was done on both proposed golf course sites. This is confirmed by comparing the golf course alignments on Figure 2, Site Plan, and the Figure 2 Map of the Project area as contained in Appendix F. It is shown in two roughly circular patterns with topographical markings that range from 650' to 250', top to bottom. We regret the misunderstanding and will correct the Final EIS, Appendix F.

Archaeological concerns will also be revised in Section VI on p. VI-4. This will include the relationship to the objectives and policies of the Hawaii State Plan - Socio-Cultural Advancement (Section 226-25, HRS).

Wildlife

The existence of the Pearl Harbor Middle Loch National Wildlife Refuge on the Pearl City Peninsula is acknowledged. Failure to identify this Refuge in the DEIS was because it is not within the project boundaries. It should be pointed out that with the transition from Agriculture to Urban, the sediment loading will decrease with the detention basins in place and the Drainage System designed to accommodate the increased amount of impervious surface area. Dr. Andrew J. Berger, Ph.D. responds to the comment on the Hawaiian owl or Pueo: "it is true that my statement on the Pueo does not confirm that the owl does not ever occur in 'or frequent' the project region. However, if an investigator would make observations on the project site from dawn to dark for a period of three or four weeks without seeing an owl, would that serve as confirmation?. More important is the question on the possible impacts of development on the behavior of the owl. I believe that the impacts would be minimal even if owls sometime occur in the area. Part of my reason for the belief is that the Pueo in its range in Hawaii, is found in open grassland (e.g. the grazing land along the western part of the Saddle Road on Hawaii), in forested areas, and often in towns (Berger, 1981, Hawaiian Birdlife, page 88). If the Pueo is often found in towns, the proposed development should have no adverse impacts on whatever owls should visit the area. At the same time, there is no available evidence to confirm that the Pueo does occur on the project site."

Fire Facilities

The Final EIS will be revised (p. VII-21) to reflect the requirement of an additional fire station within the project site to meet increased fire protection requirements.

Correctional Facility

The developer has indicated in their discussions with DAGS that there is a clear understanding of the minimum security Waiawa Correctional Facility's location adjacent to the proposed project. Final determination as to how this condition will affect each entity is subject to future discussions as how a site plan would need to be revised (if necessary to meet DAGS' concerns). There was no intent made to subvert the EIS process; we regret any misunderstanding if this was the impression made.

Energy Conservation

We would disagree that the energy savings achieved on solar water heating would be negated by air conditioning installation to attenuate traffic noise impacts. There would be a diminished return on total overall savings, but it is difficult to state that one would negate the other benefit.

Traffic

The traffic study focused on the proposed project's connections to the highway network, rather than on the overall impact to the regional system, for several reasons. The discussion of traffic impacts is based on information such as historical records, other traffic studies, and population and employment projections.

Market studies have shown that additional residential units in Central Oahu are needed. Traffic increases can be expected whether or not this specific project is developed. The proposed mixed uses in the project are expected to generate lower peak hour, peak direction traffic demands than a development consisting of all residential units; e.g., 2,600 vehicle trips are expected out of the proposed project in the morning peak hour, compared to 3,900 trips that a similar-sized, residential only, development could produce.

The regional traffic impacts of development in Central and Leeward Oahu have been addressed in other studies, many of which use either historical data or guidelines contained in land use plans. These studies indicate that increases in highway traffic demands are expected to occur on all of the major corridors leading into downtown Honolulu. The State Department of Transportation (SDOT), the agency responsible for the major roadway facilities between Central Oahu and downtown Honolulu, is presently widening the H-1 Freeway between Waiawa and Halawa Interchanges.

The SDOT is also proposing to develop a ridesharing program and to designate high occupancy vehicle (HOV) lanes on H-1. In an earlier review of proposed developments in Central and Leeward Oahu, SDOT had indicated that the rate of growth in traffic volumes from this region is not expected to be greatly

affected by the total number of dwelling units being proposed; the traffic assignments used in their planning indicate that their construction and HOV programs will enable the system to carry the demands. Because the HOV program has not yet been implemented, reliance on SDOT's programs to accommodate the Waiawa Ridge project could be considered speculative.

The traffic study evaluated conditions at the project's proposed connections to the highway facilities assuming that existing travel patterns continue. The "worst case" evaluated in the traffic report identified the potential impact of the project and is provided for system planning, which remains a responsibility of the agency. An estimate of the changes needed in travel patterns is included in the traffic report to illustrate possible goals for the HOV program. Ultimately, increases in roadway capacity and improved mass transportation will be necessary to handle the increasing traffic demands between Central Oahu and downtown Honolulu, but until such time that these major projects are planned and programmed by the appropriate agencies, traffic impacts as described in the Draft EIS can be expected.

Section VI will be revised to identify the traffic impacts in relationship to the objectives and policies of the Hawaii State Plan - Facility Systems (Section 226-17, HRS) and the State Transportation Functional Plan objectives A and C.

Housing Needs

The applicant has described the Retirement Village community as Leisure Village communities since the resident makeup consists of active seniors who actively pursue a full schedule of physical activities and are financially able to live comfortably in a community designed to provide their specific needs, i.e. security, active recreational facilities (golf, tennis, swimming) convenient shopping, and comfortable residential units. This is found on the Mainland U.S. in California, Arizona, Florida, and North Carolina. Hawaii has particular appeal due to the temperate climate, and availability of active recreational facilities. These Leisure Village complexes are considered "clean industries" since they create demand for goods and services, do not compete for peak traffic time, do not require added school capacity, and often bring expertise not available in many instances.

Market acceptance is still to be determined, but the Economic Research Associates study conducted for the Gentry Companies in 1985 indicated that there was excellent potential for this type of residential units in Hawaii. Applicability of these housing units to the objectives and policies of the Hawaii State Plan - Socio-Cultural Advancement (Section 226-19, HRS), Priority Guidelines-Affordable Housing (Section 226-106, HRS) and State Housing Functional Plan objective A will be provided in Section VI.

Hawaii State Plan

Section VI will be revised to reflect the revisions and changes requested

throughout the DPED comments. In addition, wherever appropriate, we will provide specific references to the State Plan and the Policies and Priority Guidelines in the specific sections of Section VI.

In conclusion, we regret that your department did not find our document acceptable; we will provide to the extent practicable, all requested revisions and changes.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

John Waihee
Governor

FRANCIS M. HATANAKA
Superintendent

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

December 16, 1986

Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King St.
Honolulu, Hi 96813

Dear Mr. Clegg:

SUBJECT: Waiawa by Gentry - EIS

Our review of the proposed Waiawa development indicates that it may generate the following additional enrollment.

Students Projected		
Schools	Grades	Approximate Enrollment
-------	K-6	500-900
Highlands Intermediate	7-8	180-220
Pearl City High	9-12	330-350

Highlands Intermediate and Pearl City High are now operating at capacity and may require budgeting and construction of additional classrooms.

An elementary school site will need to be identified within the development to accommodate the grades K-6 students. The Department of Education has contacted the developer of this need.

Should there be any questions, please call Mr. Richard Inouye at 737-4743.

Sincerely,

Francis M. Hatanaka
Superintendent

FMH:dk (WO)

cc Mr. F.J. Rodriguez
OBS

DEC 29 1986

F. J. RODRIGUEZ,
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

January 21, 1987

Mr. Charles Toguchi, Superintendent
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Mr. Toguchi:

We are in receipt of your comments dated December 16, 1986 on the proposed Waiawa by Gentry project. These comments have been reviewed by the applicant and we respond as follows:

1. It is acknowledged as to the current condition at Highlands Intermediate School and Pearl City High School. The future capacity demands that could require additional classrooms will be coordinated with your staff in advance of the requirements.

2. The applicant has acknowledged the need to identify an elementary school site within the project to accommodate the needs for grades K-6 students. This site is identified on Figure 2 (School/Park Site) as 12 acres.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

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John D. Waihee

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GENERAL PLANNING
C & C HONOLULU

STATE OF HAWAII
DEPARTMENT OF SOCIAL SERVICES AND HOUSING
HAWAII HOUSING AUTHORITY
P. O. BOX 17907
HONOLULU, HAWAII 96817

RUSSELL N. FUKUMOTO
EXECUTIVE DIRECTOR

IN REPLY REFER

TO:

87:PLNG/13

January 5, 1987

Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (EIS) for the Proposed Waiawa Development

We have reviewed the dEIS for the proposed project and offer the following comments:

1. Over half of the units in the proposed project are targeted for sale to "retirement" households. Yet, it is not known whether a market for a retirement community of this type exists. For example, how many of the state's elderly households are interested in and able to purchase and maintain a new home in the proposed community? What is the price range for the various unit types in the retirement community? What are the proposed maintenance and association fees?

2. How many of the proposed units will be affordable to lower-and moderate-income and gap group households? What types of units and at what price range will these "affordable" housing units be offered?

Thank you for the opportunity to review and comment on the draft EIS. Should you have any questions, please contact Colette Sakoda of my staff at 848-3226.

Sincerely,

RUSSELL N. FUKUMOTO
Executive Director

cc: Mr. F. J. Rodriguez, President
Environmental Communications, Inc.

JAN 07 1987

F. J. RODRIGUEZ.
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

January 21, 1987

Mr. Russell N. Fukumoto
Executive Director
Hawaii Housing Authority
Department of Social Services
and Housing
P.O. Box 17907
Honolulu, Hawaii 96817

Dear Mr. Fukumoto:

We are in receipt of your comments dated January 5, 1987 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant for their review and we respond as follows:

1. The applicant had Economic Research Associates (who has been responsible for a number of retirement community market/economic analysis) prepare a study in December, 1985 on the general market of early retired communities on the Mainland U.S. This study was commissioned to determine what constituted the early retirement village concept for active retirees. It was concluded that for the most part, the early retiree was seeking an active retirement life near their existing home with many amenities to add to their leisure. Facilities include golfing, tennis, swimming, crafts and other activities.

   Since many of Hawaii's elderly and retired citizens are already living here, it is not considered a prime market, but there will be some interest expressed by local citizens.

   Price range for these units is speculative at this early stage of planning, but with fee purchase of residential units of comparable square footage ranging from $120,000 to $175,000. This proposed retirement village is considered middle and upper middle income housing, particularly since the residents will be retired. It is too early to determine maintenance and association fees at this time.

2. Final determination for the affordable and moderate income and gap group housing units is not available since the entire master plan program is scheduled over a period of 7-10 years and the marketing program of unit mix and type will be subject to the market variables. If 1986 dollar costs per square foot of finished residential dwelling units are used, the costs for a typical residential unit of 1200 s.f. would be $125.00 per s.f. for a

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total of $ 150,000. This part of the total planning effort is still being determined and will be available as the project continues through the State and City planning process.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

John Waihee
GOVERNOR OF HAWAII

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

LESLIE S. MATSUBARA
DIRECTOR OF HEALTH

In reply, please refer to:
EPHSD

January 6, 1987

MEMORANDUM

To: Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning, City & County of Honolulu

From: Director of Health

Subject: Draft Environmental Impact Statement for Waiawa Development, Waiawa, Central Oahu, Hawaii

Thank you for the opportunity to comment on the subject project. We provide the following comments:

Drinking Water

On June 20 and August 11, the Department of Health expressed concerns about negative impacts on Waiawa Shaft due to the Waiawa Ridge Development. The proposed Waiawa Ridge Project would be located in the recharge area for the Waiawa Shaft, the major source serving the United States Navy's Pearl Harbor Water System. This source has already been shown through scientific studies to be affected by irrigation recharge of the proposed ridge area by brackish waters. In addition, the source has registered low level contamination by the chemicals dibromochloropropane (DBCP) and trichloropropane (TCP) which has led to the application for listing of this source on the National Priorities List (for Superfund Clean-up). The Waiawa Shaft is clearly susceptible to contamination. This fact, coupled with the importance of this source as a source of potable water serving a major water system, require that no activity be allowed in the recharge area which may further contaminate the Shaft.

The Drinking Water Program strongly recommends that the EIS adequately address all aspects (including potential contaminating activities, contaminants involved, probability for contamination, mitigating methods to be used, liability in the event of contamination, and corrective actions) of chemicals and other sources of potential contamination from residential developments at the proposed site. In the event that such an assessment does not adequately address these potential groundwater contamination concerns, or in the event that the proposed activity would adversely impact the groundwater in a manner that cannot be adequately resolved, the Drinking Water Program would strongly recommend that the project area be maintained as a conservation watershed area.

JAN 08 1987

The Draft Environmental Impact Statement does not address these concerns. The potential for contamination of such a vital resource as Waiawa Shaft is too critical to be ignored. The concerns expressed by the Drinking Water Program on the possible contamination of the groundwater aquifer must be considered before this project proceeds.

Noise

Previous comments were made in June, 1986 to the EIS Preparation Notice concerning problems that are anticipated to be associated with the project. The applicant must address these concerns such as noise from adjacent commercial-industrial facilities and recreational activities, and develop plans to mitigate these problems. The applicant must state in the final EIS that the construction stage of the project will comply with the provisions of Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu.

LESLIE S. MATSUBARA

cc: Mr. F. J. Rodriguez

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ
PRESIDENT

January 21, 1987

Dr. John Lewin, Director
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Lewin:

We are in receipt of your department's comments dated January 6, 1987 on the proposed Waiawa by Gentry project. We have provided the comments to the applicant and the consultants for their review and we respond in the following:

Drinking Water - Dr. Gordon L. Dugan, Ph.D.

There have been numerous hydrologic studies conducted in Central Oahu in addition to water quality studies and monitoring. The Navy's Waiawa tunnel, a sizable supplier of water for Navy operations has been proven to be sensitive to the quality of applied irrigation water which recharges its aquifer, as shown in a recent U.S. Geological Survey study reported by Paul R. Eyre, Report No. 83-4097. However, this study involved using chloride as a tracer (in irrigation water) applied in concentrations in the 100's mg/l (ppm), a concentration measurement one-million times higher than the ppt units used for EDB and DBCP. In addition, chloride is a "conservative" element, which makes it a long-term accepted tracer in water, since it is essentially unaffected in percolation through the soil column to the groundwater aquifer, whereas, the volatile organic compounds can be readily volatilized and adsorpted to the soil properties; thus, chlorides and volatile organic compounds are not comparable.

The State Health Department's concern over the potential for termitecides reaching the underlying aquifer is understandable; however, the bottom line is that to date there apparently has been no evidence of this happening. The reasons for its non-detection is probably some combination of the relatively low amounts being

* Eyre, Paul R. 1983. "The Effects of Pumpage, Irrigation Return, and Regional Ground-water Flow on the Water Quality at Waiawa Tunnel, Oahu, Hawaii." U.S. Geological Survey, Water-Resources Investigations Report 83-4097. Open-File Services Section, Western Distribution Branch, U.S. Geological survey, Box 25425, Federal Center, Lakewood, Colorado, 80225.

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applied, its frequency of application, the volatile nature of the product, its adsorption properties to the soil, and the lack of a large quantity of water to drive the non-volatilized and unadsorpted chemical to the aquifer, since its applied to and around buildings. If the application of termitecides is a real hazard to the aquifer, strong consideration should be given to terminating its use over Oahu's potable groundwater aquifers. Otherwise, the removal of volatile organic compounds can be conducted by some means of volatilization and/or adsorption by activated carbon. At present, granular activated carbon treatment is being used or will be used to treat the up to 10 wells with > 20 ppt of EDB and/or DBCP in Central Oahu to less than the detectable limit.

Noise - Y. Ebisu & Associates

The comments made in the EISPN in June, 1986 were reviewed by Mr. Ebisu and his response is provided in the following:

Para. 1 to 3: Risks of adverse noise impacts from mixed land uses and stationary equipment will be minimized by compliance with Title 11, Administrative Rules Chapter 43, Community Noise Control for Oahu. Also, siting of commercial, light industrial, and recreational activities will make maximum use of the buffer space and separation from noise sensitive residential areas. The existing industrial park will be integrated with similar commercial/light industrial areas of the Waiawa Development.

Para. 4: Noise from military aircraft flying over the development is not expected to exceed 55 Ldn, and minimal risks of adverse health and welfare effects are expected.

Para. 5: Residences can be designed and built to maximize the containment of noise, and minimize risks of noise impacts at adjoining residences. However, under conditions of natural ventilation with opened windows, total containment of noise is not practical. Therefore, design considerations will be given to minimizing these impacts wherever practical, and where required (such as by FHA/HUD Construction Standards).

Para. 6: Noise and mitigation measures relating to H-2 Freeway are addressed in my traffic noise study.

Para. 7 & 8: Compliance with these rules are mandatory, and the EIS should indicate that Chapters 42 and 43 will be complied with.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

John Waihee

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

LESLIE S. MATSUBARA
DIRECTOR OF HEALTH

In reply, please refer to
EPHSD

January 13, 1987

MEMORANDUM

To: Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning, City & County of Honolulu

From: Director of Health

Subject: Draft Environmental Impact Statement for the Proposed Waiawa Development at Central Oahu

The following was inadvertently omitted from our comments of January 6, 1987. They should be addressed in the environmental impact statement (EIS):

Air Pollution

The air quality assessment for this EIS did note that previous air pollution modeling studies of that portion of the H-1 Freeway leading from the proposed project to urban Honolulu has indicated severe peak hour congestion along the freeway segment between Waiawa and Halawa interchanges that could result in exceedance of the State ambient air quality standards for carbon monoxide. Traffic from the proposed project would only exacerbate the situation.

LESLIE S. MATSUBARA

cc: Mr. F. J. Rodriguez ✓

RECEIVED AFTER DEADLINE

JAN 16 1987

12/8/86

GEORGE R. ARIYOSHI
GOVERNOR

LETITIA R. UYEHARA
DIRECTOR
TELEPHONE NO.
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 South King Street, Room 115
HONOLULU, HAWAII 96813

December 5, 1986

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: Waiawa by Gentry

LOCATION: Waiawa, Central Oahu, 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
Department of General Planning
City and County of Honolulu
650 S. King Street
Honolulu, HI 96813

Please send a copy of your reply to the proposing party:

✓ Mr. F. J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, HI 96809

Your comments must be received or postmarked by: January 7, 1987.

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.

12/9/86
No comments.
Energy Division

NO RESPONSE NEEDED

DEC 11 1986

(P)1007.7

JAN 14 1987

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement
Waiawa by Gentry

We have reviewed the subject EIS and have noted the following:

1. The 200-bed minimum security Waiawa Correctional Facility (WCF) is located on TMK 9-6-5:11 in close proximity to the subject development and the correctional facility's access road abuts the northern boundary of the subject development. Therefore, the potential impacts to the existing Waiawa Correctional Facility and WCF roadway should be addressed.

2. The proposed elementary school should be sited in a location central to the proposed development for several reasons:

   a. The perimeter location will increase the bussing cost.

   b. Placing the school on the opposite side of the "to work" traffic flow will increase the traffic on the development's roadways.

   c. It apparently will be in the area of the last stages of development. However, the school will probably be required in an earlier stage.

JAN 16 1987

Should there be any questions, please have your staff contact Mr. Edmund Morimoto of the Planning Branch at 548-5742.

Very truly yours,

J. Tominaga

TEUANE TOMINAGA
State Public Works Engineer

EM:jnt
cc: Mr. Ted Sakai
Mr. Vernon Honda
Mr. F. J. Rodriguez

RECEIVED AFTER DEADLINE

University of Hawaii at Manoa

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

January 7, 1987
RE:0455

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
Waiawa by Gentry
Waiawa, Oahu

The above cited document addresses the potential environmental impacts related to the proposed development of 1,395 acres of land at Waiawa, Central Oahu, to create a master-planned community offering residential, apartment, commercial and light industrial uses with two 18-hole golf courses extending through the site. This review was prepared with the assistance of Paul Ekern, Soils and Agronomy; Michael Graves, Anthropology; Jon Matsuoka, Social Work; Frank Peterson, Geology and Geophysics; and Walington Yee, Environmental Center.

General Comments

The Draft EIS for this project is significantly deficient in its responsibility to several issues critical to the evaluation of the environmental consequences of this project. Perhaps the most serious of which is the lack of discussion of the impacts to water quality and quantity in the region. Other topics of concern included the discussion of archaeological features in the area, the lack of substantive discussion of the social impacts likely to occur and the conclusions reached in the traffic analysis. Specific concerns are addressed below.

Hydrology

In general, hydrological issues are inadequately discussed. There is a lack of information and detail concerning adverse impacts and mitigation measures with regard to water sources, supplies, and quality. With a project of this size demanding substantial water use and its location in the Pearl Harbor region where severe water restrictions already apply it is essential that a thorough discussion of water supply alternatives be included in the Final EIS.

Specific comments:

Page VII-2, an adverse hydrological impact is implied but the effects on the reduction in groundwater recharge that will result from increased surface runoff are not described.

Page VII-4, an important issue in assessing surface water quality is the effect of increased concentrations of the various constitutents being transported on the receiving waters, ie. Waiawa Stream and Middle Loch of Pearl Harbor. Concentration estimates are given (albeit with a substantial hedge factor) but nothing is given on downstream quality effects.

Page VII-7, the same comments as above apply for how excess surface runoff will be handled downstream off-site.

Page IX-1, additional adverse environmental effects not listed include the deterioration of surface water quality, and decrease in groundwater recharge. Since both these effects are likely to be long term ie. permanent and irreversible for the life of the project, absence of their discussion in the Draft EIS is particularly significant.

Archaeology

The reconnaissance of the project area disclosed four archaeological sites, all assigned to the Historic Period and apparently associated with the operation of the Oahu Sugar Company. These sites were described in the EIS as having no archaeological value, however, the rationale for this conclusion is not given. Sites may have quite different types of value, ie. significance, such as cultural, interpretive, or research. As presently drafted the statement indicates that, presumably in each category, the sites are not considered significant. Is this correct? It would be more informative if the Final EIS specified the criteria used in evaluating the significance of the site and that in each category, cultural, interpretive, or research, the archaeological significance is lacking.

It should be noted that historic sites dating prior to World War II may be of some research interest. Cited is evidence of agricultural, residential, and manufacturing components of large scale farming activities found during the survey. However, no summary of possible historic era use of the Waiawa area was provided, although clearly since 1908 the Oahu Sugar Company has been a major influence in the region.

In order to assess the research potential of the historic sites on Waiawa Ridge it would be advantageous to complete more background work on the recent history (post 1870) of Oahu, with emphasis on the development of commercial agriculture.

We note that there are no maps for any of the sites located during the survey. The inventory of associated artifacts is not adequately listed and should include a description of how the aritfacts were dated to the present century. At minimum, the manufacturing marks or description of the specific artifacts that permit such dating should be included in the report.

Social Impact Analyses

The text of the Draft EIS, Chapter VII, lacks any discussion of the social impacts that will result from the proposed project. The information presented in Appendix G provides certain pertinent descriptive background information about the Waiawa area but almost no attempt at evaluation of the data in terms of the social and cultural impacts of the project. Because this project is such a large development and will result in significant societal changes to the Waiawa community, we urge that a full evaluation of the social impacts be prepared and submitted for review prior to acceptance of the Final EIS.

Traffic

Due to the holiday schedule and other commitments, our usual traffic specialists were unavailable to assist in this review. However, a few comments are offered for your consideration. There appears to be no discussion of the effects of the added townbound traffic on the existing H-1 traffic to and through downtown Honolulu. Since the peak hours traffic on H-1 must frequently be at Level of Service E or F, the addition of more vehicles will surely create a significant impact on the existing traffic flow. Some estimates of the effects of this added volume on the level of service and the duration of the peak flows entering and leaving Honolulu should be addressed in the Final EIS.

We appreciate the opportunity to comment on this document and look forward to your response.

Yours truly,

Jacquelin N. Miller
Acting Associate Director

cc OEQC
F. J. Rodriquez
Stephen Lau
Michael Graves
Jon Matsuoka
Walington Yee

F J RODRIGUEZ,
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

January 21, 1987

Mrs. Jacquelin N. Miller
Acting Associate Director
Environmental Center
University of Hawaii at Manoa
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Mrs. Miller:

We are in receipt of your office's comments dated January 7, 1987 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and the technical consultants and we respond in the following:

General Comments

The three major concerns as expressed in this section are to be addressed in the revised Final EIS (FEIS). We will address to the best ability of the consultants, the adequate responses to these specific comments.

Hydrology (Dr. Gordon L. Dugan, Ph.D.)

The Pearl Harbor Ground Water Control Area (PHGWCA) has been acknowledged, for several years, as having its groundwater withdrawal being nearly equal to its long-term sustainable yields; therefore, groundwater pumpage in this area has to be controlled. Nevertheless, the PHGWCA exports water, thus, it is not necessarily a question of where a proposed project is located, but rather where the potable water originates. The issue can be complex and best answered by or through the Board of Water Supply.

As indicated in the DEIS, there will be a reduction in the groundwater recharge potential with the completion of the proposed project, however, this is a complex subject as increased runoff from one area may result in increased recharge in a downstream area. In addition, the proposed project is planning to include sedimentation basins (not listed in DEIS) to contain and/or reduce storm runoff, which should promote groundwater recharge.

The potential effects on down stream receiving waters as a result of the project is complex at best, but the U.S. Navy's Biological study of Pearl Harbor in the early 1970's concluded that: the heavy metal burden in Pearl Harbor was below the level of concern (even though several heavy metal sources discharged to Pearl Harbor-since eliminated existed at this time); and that the major

* Evans, E.C. III, et al. 1972. "A Proximate Biological Survey of Pearl Harbor Oahu," No. NUP, TP290, Naval Undersea Research and Development Center, San Diego, Calif.

1146 FORT STREET MALL, SUITE 200 • P O BOX 536 • HONOLULU HAWAII 96809 • TELEPHONE (808) 521-8391

detriment to marine environment appeared to be silt. As presented in the DEIS, the suspended solids load is estimated to increase for the lower intensity storms (1-hour), and the 1-year interval 24-hour storms, and decrease substantially for the higher level 24-hour storms. Thus, overall, the sediment load is calculated to decrease significantly when the proposed project is completed. Although not usually 100% effective for the higher intensity storms, sedimentation basins, if properly designed and maintained, should significantly reduce, if not contain, the incremental lower level sediment producing storms. Consequently, the suspended solids load to Pearl Harbor from this area should be noteably reduced with the completion of the project.

Archaeology

The stated difference of opinion held by your reviewers on the relative significance of the sites described on the Waiawa Ridge area by Chiniago, Inc. should be kept in perspective in that Barrera's statement "they are of no archaeological value" is based on his professional opinion as an archaeologist. Cultural anthropologists may differ with his opinion and may feel that values in fields of cultural, interpretive, or research areas are significant. It is unfortunate that these criteria were not employed in the evaluation process.

Barrera's search of the literature and his field investigations indicated to him that the sites listed in his study were essentially dump sites of Oahu Sugar Co. operations at the various locations on Waiawa Ridge. To quantify that Oahu Sugar Company has been a major influence in the region for the past 80 years can be confirmed by checking historical records at the Oahu Sugar Company offices, or with the Amfac, Inc. offices.

Barrera's response to your comments of January 7, 1987 for the Waiawa Ridge project are as follows:

Our golf course survey did in fact cover the locations of two golf courses, not just one as was inadvertently implied in the report, and it is true that we do not consider the four sites recorded to be significant on the basis of cultural, interpretive or research values.

The test trench at Site 1469 (two alignments) demonstrated a lack of excavatable materials, thus ruling out research significance. The site would be of no interest whatsoever as part of an interpretive scheme, and it clearly has no cultural or religious importance.

Site 1470 by its very nature (a historic dump) has no cultural or religious significance. It clearly would be of no value in an interpretive scheme, and collection of the bottles and other rubbish from the site would add nothing to our understanding of human utilization of the area that could not be gained by direct informant interviews.

Site 1471 (bulldozed former cannery location) has no cultural or religious significance. It has no interpretive value because of its poor condition, as well as the existence of much better examples of pineapple canning operations. Research potential is also virtually nil, as much more information could be gotten by interviewing former workers and residents of the parcel than by collecting their refuse.

Site 1472 (bulldozed houses and vehicles) has no interpretive value, because nothing remains intact. It has no cultural or religious value, and its research values lies only in what might be learned from former residents and workers.

The maps listed in Barrera's study (Appendix F) are not to scale, but do provide a reviewer with a direction of the sites' locations. We regret that they are not to scale and more detailed.

Social Impact Analyses

The noted lack of discussion or analysis on the potential impacts on the Central Oahu District from the implementation of the Waiawa Ridge project is intentional. As stated in the report contained in Appendix G, the use of quantitative data was done to evaluate the area's existing social characteristics. It was felt that the evaluation of baseline data would establish the foundation of a starting point; it would not, however, serve as a fair or accurate measure of determining social and cultural impacts and change resulting from the introduction of a new development.

To put this into more current perspective, imagine if you will, the time twenty years ago when Mililani Town was first presented to the State Land Use Commission. In the subsequent period, there has developed at Mililani Town, a self-contained community, with schools, parks, shopping center, fire, police, and emergency medical services, a golf course, and of course the residential sectors. At this time, one can evaluate the impacts and interaction between Mililani and Wahiawa Town. To have attempted to do so at the time of presentation to the Land Use Commission would have been speculative at best. To have attempted a study of this magnitude before a Final EIS would be accepted would be impossible.

It is agreed that the proposed Waiawa project is a significantly large project and will have social and cultural impacts within the Central Oahu District. The quantitative data contained in Appendix G was not intended to provide the anticipated impacts as suggested by the reviewer.

Traffic

A discussion of existing congestion on the highway system between the project and downtown Honolulu will be included in the revised traffic report. Future conditions, however, have been addressed in other studies, many of which use either historical data or guidelines contained in land use plans. These studies

indicate that increases in highway traffic demands are expected to occur on all major corridors leading into downtown Honolulu. The State Department of Transportation (SDOT), the agency responsible for the major roadway facilities between Central Oahu and downtown Honolulu, is presently widening the H-1 Freeway between Waiawa and Halawa Interchanges.

Traffic increases can be expected whether or not this specific project is developed. The proposed mixed uses in the project are expected to generate lower peak hour, peak direction traffic demands than a development consisting of all residential units; e.g., 2,600 vehicle trips are expected out of the proposed project in the morning peak hour, compared to 3,900 trips that a similar sized, residential only, development could produce.

The "downstream" impacts of this project are being addressed by the appropriate agency. The SDOT, in an earlier review of proposed developments in Central and Leeward Oahu, had indicated that the expected rate of growth in the area is independent of the total number of dwelling units being proposed; their traffic assignments show an increase in morning peak hour traffic demand of approximately 60 percent between 1985 and 2008.

The Draft EIS evaluated traffic conditions at the proposed project's connections to the highway facilities within the context of SDOT's plans and identified the improvements which would be needed to accommodate the project as well as locations where traffic congestion could be expected.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

7 January 1987

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:

SUBJECT: Draft Environmental Impact Statement for the Proposed Waiawa Development, Waiawa, Central Oahu, Hawaii, December 1986

We have reviewed the subject DEIS and offer the following comments:

1. P. IV-1, para. B.

> "Lands of similar quality and economic potential are currently lying fallow and there are sufficient lands available to meet current and projected future agricultural needs. If these lands were to remain in agriculture, their most likely use would be for grazing...."

This EIS contains a number of these broad conclusive statements which are not referenced or documented. Appendix A discusses these things to some extent, but again offer no real references or documents to ascertain their validity. When these statements are made, they do need references or the author's own bonofide research data to substantiate them.

2. In our response to the Environmental Impact Statement Preparation Notice (EISPN) June 12, 1986, we stated:

> "The proposed project is in the immediate vicinity of the U.S. Navy's Waiawa water well. The possible consequences of this project on that well needs to be addressed specifically as well as the effects on the quality and quality of recharge to the basal aquifer."

This concern was also expressed by the Department of Health and the Department of the Navy in their response to the EISPN, but the DEIS has failed to address it.

3. Appendix A, "Impact on Agriculture of the Proposed Waiawa Development", p. 16 Forage Crop Production:

> "...Both the dairies and the feedlot are located too far from Waiawa to make Waiawa an optimal location for forage production."

Why Waiawa would need to be an "optimal" location for viable forage production to take place is misleading. A "satisfactory" location is sufficient for many endeavors. It is not mentioned but pineapple greenchop was transported long distances from the fields to these very same feedlots and dairies for many years. Its use was discontinued because of heptachlor contamination which had been applied during pineapple operations. Therefore, transportation distance would not of itself remove Waiawa from being a viable forage production area as the above quotation implies.

Thank you for the opportunity to comment. This material was reviewed by WRRC personnel.

Sincerely,

Edwin T. Murabayashi

Edwin T. Murabayashi
EIS Coordinator

ETM:jm

cc: P.J. Rodriguez
Env. Com., Inc.

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

January 21, 1987

Mr. Edwin T. Murabayashi
EIS Coordinator
Water Resources Research Center
University of Hawaii
Holmes Hall 283
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Murabayashi:

We are in receipt of your comments dated January 7, 1987 on the proposed Walawa by Gentry project. The comments have been provided to the applicant and the technical consultants and we respond as follows:

1. P. IV-1 para. B This sentence is documented in the agricultural impact section, Appendix A., "Impact on Agriculture of the proposed Walawa Development" and is based on the projected demands for agricultural lands contained in the LESA Report. The second sentence is a conclusion based on what has become common knowledge to anyone involved in agriculture. In Hawaii, there are four primary uses for agricultural land: sugar cane production; pineapple production; crop, seed, and horticultural production; and livestock production. Livestock production, grazing, has the lowest returns of the four activities. When the sugar, pineapple, and crop production activities are not profitable, the only alternative agricultural use for substantial parcels of land is grazing." (Peter V. Garrod, Ph.D.)

2. As indicated in the DEIS, there will be a reduction in the groundwater recharge potential with the completion of the proposed project, however, this is a complex subject as increased runoff from one area may result in an increased recharge in a downstream area. In addition, the proposed project is planning to include sedimentation basins (not listed in DEIS) to contain and/or reduce storm runoff, which should promote groundwater recharge.

   As a general statement, there should be a lower quantity of pesticides and fertilizers applied per unit residential area than was experienced with the previous agricultural operations. To date, there is apparently no evidence of residential pesticides and fertilizers contaminating groundwater supplies.

   As presented in the DEIS, the sediment (suspended solids) load resulting from the completion of the proposed project is estimated to increase for the lower intensity storms (1-hour) and the 1-year recurrence 24-hour storms, and decrease substantially for the higher level 24-hour storms. Thus, overall, the sediment load is calculated to decrease significantly

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when the proposed project is completed. Although not usually 100% effective for the higher intensity storms, sedimentation basins, if properly designed and maintained, should significantly reduce, if not contain, the incremental lower level sediment producing storms. (Gordon L. Dugan)

3. We agree that "optimal" is too strong a condition. Perhaps the word should be changed to "viable." The point here is that forage production would be most profitable when located close to the end users. Given that it has not proven to be an economically viable enterprise in locations proximate to the feedlots and dairies, it is very unlikely that it will be a viable activity in the Walawa fields.

   Pineapple greenchop was a by-product of pineapple production, thus, for it to be a viable activity, the value to users had only to cover the greenchop harvesting and hauling costs. Forage, on the other hand, would have to be sold at price sufficient to cover all the production, harvesting, and transportation costs. To date, the only operation to come close to doing this was the now defunct corn operation on the North Shore. (Peter V. Garrod)

Yours very truly,

F. J. Rodriguez

F. J. Rodriguez

FJR:ls

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

REPLY TO ATTENTION OF:

RECEIVED
87 JAN 7 PM 2:47

December 31, 1986

DEPT. OF
GENERAL PLANNING
C & C HONOLULU

Mr. Donald A. Clegg, Director
Department of General Planning
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Thank you for the opportunity to review and comment on the draft EIS for Waiawa by Gentry, Waiawa, Ewa, Oahu. The following comments are offered:

a. Any placement of fill material or construction of drainage structures below the ordinary high water mark of Waiawa Stream would require a Department of the Army permit. The drainage design drawing should be forwarded to the Operations Branch (telephone: 438-9258) for review.

b. According to the Flood Insurance Rate Map, the project area is located in a Zone C designation, which is an area not considered in the regulatory flood plain area. Therefore, flood proofing requirements are not mandatory.

Sincerely,

Kisuk Chung
Chief, Engineering Division

JAN 07 1987

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

January 21, 1987

Mr. Kisuk Cheung
Chief, Engineering Division
Department of the Army
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Cheung:

We are in receipt of your comments dated December 31, 1986 on the proposed Walawa by Gentry project. The comments have been provided to the applicant and his civil engineering consultant, Community Planning, Inc. for their review and future use. We respond as follows:

a. Drainage design drawings will be made available at the appropriate time in the project's implementation schedule, which will be after Land Use Commission and Zoning processing have commenced.

b. It is acknowledged that Zone C designation is appropriate for the project site.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

1146 FORT STREET MALL, SUITE 208 • P. O. BOX 538 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-6361

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

IN REPLY REFER TO
11010
Ser 002(09P2)/6727

07 JAN 1987

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 (EIS) FOR THE PROPOSED WAIAWA DEVELOPMENT, WAIAWA, CENTRAL OAHU, HAWAII DECEMBER 1986

The subject draft EIS has been provided by the State of Hawaii Office of Environmental Quality Control by transmittal of December 5, 1986 for review and comment. The U.S. Navy is submitting comments primarily on the question of water resources, originally raised in the Navy letter of June 20, 1986 on the EIS preparation notice. The consultant has failed to carry into the EIS the points raised by Navy and acknowledged by his letter reply of July 16, 1986.

Although the consultation letters by the State Department of Health, the Water Resources Research Center of the University of Hawaii, the U.S. Fish and Wildlife Service, in addition to Navy, all pointed out that the EIS should address ground water and the Waiawa shaft, the author has failed to do so. For the Navy this is a significant omission. As the Waiawa Tunnel is the Navy's primary water source for Pearl Harbor, the EIS must address the impact of the residential development upon this source.

As pointed out in the Navy letter of June 20, 1986, the agricultural fields above our water tunnel comprise the major recharge area. Development (paved roads, houses) will surely reduce the amount of water infiltrating into the ground. Development will also probably affect the quality of the water (chemically and bacteriologically). In the earlier letter, Navy asked that these three questions be addressed in the EIS:

1. Will there be a reduction in ground water levels because of a reduction in recharge due to the residential building?

2. Will the water supply become contaminated by trace contaminents due to the application of pesticides and fertilizers by individual residents?

3. The Navy has a concern that siltation means poorer water quality and more frequent dredging requirements. Will this development cause a more rapid siltation of Middle Loch?

JAN 08 1987

Until these questions are answered by the EIS, the Navy will consider it to be lacking on this important question. In addition to these primary concerns, the following off-site issues have come to our attention. These comments are provided for your further consideration:

4. The traffic study, despite its discussion of the State Traffic Plan and rates of development north and west of the proposed project, fails to recognize or admit that H-1 Diamond Head traffic lanes already suffer from congestion every morning. There is much discussion on traffic flow through existing and proposed interchanges but nothing on the capacity of the freeways themselves.

5. The impacts on infrastructures section very briefly mentions impacts on electrical, sewage, telephone and solid waste disposal in most general terms. There is no discussion on existing and future capacities to support the proposed development. In his letter response to the Environmental Quality Council comment, the developer did make brief reference to the capacity of the Honouliuli sewage treatment plant, but it was not addressed within the body of the EIS and is of significant concern.

In revising the EIS, Navy asks that primary attention be given to items 1-3 cited above. Items 4-5 are for further consideration.

The U.S. Navy looks forward to receiving a copy of the final subject EIS. Mr. Bill Liu of this command is the U.S. Navy point of contact and can be reached at 471-3703.

Sincerely,

T. C. CRANE
Captain, CEC, U.S. Navy
Facilities Engineer
By direction of the Commander

Enclosures

Copy to:
Mr. F. J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, HI, 96809

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ,
PRESIDENT

January 21, 1987

Captain T.C. Crane
Facilities Engineer
Department of the Navy
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020

Dear Captain Crane:

We are in receipt of your office's comments dated January 7, 1987 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and the retained consultants and we respond as follows:

1. As indicated in the DEIS, there will be a reduction in the groundwater recharge potential with the completion of the proposed project, however, this is a complex subject as increased runoff from one area may result in increased recharge in a downstream area. In addition, the proposed project is planning to include sedimentation basins (not listed in DEIS) to contain and/or reduce storm runoff, which should promote groundwater recharge.

2. As a general statement, there should be a lower quantity of pesticides and fertilizers applied per unit residential area than was experienced with the previous agricultual operations. To date, there is apparently no evidence of residential pesticides and fertilizers contaminating groundwater supplies.

3. As presented in the DEIS, the sediment (suspended solids) loads resulting after the completion of the proposed project is estimated to increase for the lower intensity storms (1-hour) and the 1-year recurrence 24-hour storms, and decrease substantially for the higher level 24-hour storms. Thus, overall, the sediment load is calculated to decrease significantly when the proposed project is completed. Although, not usually 100% effective for the higher intensity storms sedimentation basins, if properly designed and maintained, should significantly reduce, if not contain, the incremental lower level sediment producing storms. (Gordon L. Dugan)

4. A discussion of existing congestion on the highway system between the project and downtown Honolulu will be included in the revised traffic report. Future conditions, however, have been addressed in other studies, many of which use either historical data or guidelines contained in land use plans. These studies indicate that increases in highway traffic demands are expected to occur on all major corridors leading into

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downtown Honolulu. The State Department of Transportation (SDOT), the agency responsible for the major roadway facilities between Central and Leeward Oahu, had indicated that the expected rate of growth in the area is independent of the total number of dwelling units being proposed; the traffic assignments used in their planning show an increase in morning peak hour traffic demand of approximately 60 percent between 1985 and 2008.

The Draft EIS evaluated traffic conditions at the proposed project's connections to the highway facilities within the context of SDOT's plans and identified the improvements which would be needed to accommodate the project as well as locations where traffic congestion could be expected. (Julian Ng, Parsons Brinckerhoff Quade & Douglas, Inc.)

5. As requested by DPW, the wastewater from Waiawa will be directed to the Pearl City Wastewater Pump Station since the ultimate capacity of the Pearl City Sewer System is able to accommodate the Waiawa flows.

Regarding wastewater treatment, the developer proposes to use whatever capacity is available at the time of project implementation. If present capacity at Honouliuli WWTP is exhausted, it is our understanding that DPW will expand the plant to accommodate further growth. If so, the developer proposes to pay their proportionate share or assessment as may be established by the City.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

United States Department of the Interior

GEOLOGICAL SURVEY

Water Resources Division
P.O. Box 50166
Honolulu, Hawaii 96850

December 10, 1986

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Subject: Draft Environmental Impact Statement for Waiawa by Gentry, dated December 1986

Dear Mr. Clegg:

We have examined the subject Environmental Impact Statement prepared by Environmental Communications, Inc., for the Gentry Companies and have the following comments on the Statement.

The Statement should address the possible effects of the project on the quality and quantities of the ground water in the area. Interest in this element of the environment is shown by two letters included in the Statement that were sent to Environmental Communications, Inc., in response to an EIS Preparation Notice. A letter from the Commander, U.S. Naval Base, Pearl Harbor, stated the need for consideration of the effect that the project might have on the supply and quality of water at the Waiawa tunnel, which is a principal source for Pearl Harbor. The other letter, from the Water Resources Research Center, University of Hawaii, pointed out the need to consider the Navy's Waiawa source as well as the more general questions of effects of the project on the basal aquifer underlying the area.

The present Statement has only a brief, generalized description of ground water in central Oahu without comment on the impact of development on quality or quantity. A large body of information on ground water in southern and central Oahu is contained in reports and data releases issued

DEC 12 1986

by several agencies, including the Honolulu Board of Water Supply, the State Department of Land and Natural Resources, the Water Resources Research Center, and the U.S. Geological Survey.

Sincerely,

Dan A. Davis
Acting District Chief

Copy to: F.J. Rodriquez, Pres.
Environmental Communications, Inc.

ENVIRONMENTAL
COMMUNICATIONS
INC.

F J RODRIGUEZ
PRESIDENT

January 21, 1987

Mr. Dan A. Davis
Acting District Chief
U.S. Department of the Interior
Geological Survey
Water Resources Division
P.O. Box 50166
Honolulu, Hawaii 96850

Dear Mr. Davis:

We are in receipt of your comments dated December 10, 1986 on the proposed Waiawa Ridge development. The comments were provided to the retained consultant on groundwater runoff and drainage, Gordon L. Dugan, Ph.D. and his prepared response is provided in the following:

The concern for the quality and quantity of groundwater within the Pearl Harbor Groundwater Basin, the largest in the State, is well founded. This concern is based on the amount being pumped out in comparison to the natural recharge; the nearly complete conversion by the sugarcane industry from ridge and furrow irrigation (which results in approximately 50% recharge to the groundwater basin) to drip irrigation, which provides very little, if any, groundwater recharge; and the discovery of the volatile organic compounds EDB, and DBCP in up to 10 wells in Central Oahu.

It is accepted that DBCP is the result of its application to pineapple land to control nematodes; however, the use of DBCP for pineapple culturing on Oahu was curtailed in 1977. EDB was also used for nematode control in pineapple fields (its' use was terminated for this practice in 1984), but it is also a product of leaded and aviation fuels. There is strong evidence that the wells with detected EDB may have been the result of recorded aviation fuel spills from the nearby military fuel pipeline. The U.S. Environmental Protection Agency has not established limits in drinking water for EDB and DBCP; however, the State Department of Health has set interim limits of 20 ppt for these chemicals, which are essentially at the detectable limit, the lowest in the nation. California for example set standards of 50 ppt and 1000 ppt, respectively, for EDB and DBCP.

The highest average concentrations of EDB and DBCP for the 10 Oahu wells, which had concentrations of > 20 ppt and were closed, with one exception (which had an accidental spill of 495 gal. approximately 60 ft from the well head) were generally < 100 ppt.

There have been numerous hydrologic studies conducted in Central Oahu in addition to water quality studies and monitoring. The Navy's Waiawa shaft, a

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sizable supplier of water for Navy operations has been proven to be sensitive to the quality of applied irrigation water which recharges its aquifer, as shown in a recent U.S. Geological Survey study reported by Paul R. Eyre, Report No. 83-4097. However, this study involved using chloride as a tracer (in irrigation water) applied in concentrations in the 100's mg/l (ppm), a concentration measurement one-million times higher then the ppt units used for EDB and DBCP. In addition, chloride is a "conservative" element, which makes it a long-term accepted tracer in water, since it is essentially unaffected in percolation through the soil column to the groundwater aquifer, whereas, the volatile organic compounds can be readily volatilized and adsorpted to the soil properties; thus, chlorides and volatile organic compounds are not comparable.

The State Health Department's concern over the potential for termitecides reaching the underlying aquifer is understandable; however, the bottom line is that to date there apparently has been no evidence of this happening. The reasons for its non-detection is probably some combination of the relatively low amounts being applied, its frequency of application, the volatile nature of the product, its adsorption properties to the soil, and the lack of a large quantity of water to drive the non-volatilized and unadsorpted chemical to the aquifer, since its applied to and around buildings. If the application of termitecides is a real hazard to the aquifer, strong consideration should be given to terminating its use over Oahu's potable groundwater aquifers. Otherwise, the removal of volatile organic compounds can be conducted by some means of volatilization and/or adsorption by activated carbon. At present granular activated carbon treatment is being used or will be used to treat the up to 10 wells with > 20 ppt of EDB and/or DBCP in Central Oahu to less than the detectable limit.

We appreciate your comments and continuing concern and hope that we have responded adequately. Thank you for your review.

Very truly yours,

F. J. Rodriguez

FJR:ls

United States Department of the Interior

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

ES
Room 6307

DEC 18 1986

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, Waiawa by Gentry, Central Oahu, Hawaii

Dear Mr. Clegg:

We have reviewed the subject Environmental Impact Statement (EIS) and have no additional comments to offer at this time.

We appreciate this opportunity to comment.

Sincerely yours,

Ernest Kosaka

Ernest Kosaka
Project Leader
Office of Environmental Services

cc: Environmental Communications, Inc.

NO RESPONSE NEEDED

CONSERVE AMERICA'S ENERGY

DEC 22 1986

Save Energy and You Serve America!

cc: F. J. Rodriguez

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. BOX 50004
HONOLULU, HAWAII
96850

January 6, 1987

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:

Subject: Draft EIS - Waiawa Development Plan Amendment (by Gentry)
Waiawa, Central Oahu, Hawaii

We reviewed the subject draft environmental impact statement and have no comments to offer.

Thank you for the opportunity to review the document.

Sincerely,

ACTING
RICHARD N. DUNCAN
State Conservationist

cc:
Mr. F. J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, HI 96809

NO RESPONSE NEEDED

JAN 0 8 1987

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

December 26, 1986

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE PROPOSED WAIAWA DEVELOPMENT, TMK: 9-4-06: POR. 10 and 9-6-04: POR. 1

Thank you for the opportunity to review the Environmental Impact Statement for the proposed Waiawa development. We offer the following comments:

1. A water master plan should be submitted for our review and approval.

2. The Waiawa area is part of the Pearl Harbor Ground Water Control Area which is controlled by the State Department of Land and Natural Resources (DLNR). Therefore, permission to drill wells and withdraw water from the ground water basin (permitted use) must be obtained from DLNR and coordinated with the Board of Water Supply.

If you have any questions, please contact Lawrence Whang at 527-6138.

KAZU HAYASHIDA

cc: Mr. F.J. Rodriguez,
President

DEC 30 1986

F. J. RODRIGUEZ
PRESIDENT

ENVIRONMENTAL
COMMUNICATIONS
INC.

January 21, 1987

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
630 South Beretania
Honolulu, Hawaii 96843

Dear Mr. Hayashida:

We are in receipt of your comments dated December 26, 1986 on the proposed Waiawa By Gentry project. These comments have been reviewed by the applicant and the retained engineering consultant and we respond as follows:

1. The project master plan for water storage and transmission will be provided to your agency upon its' completion for your review and approval. Due to the general nature of the project plan at the present time, this master plan has not been finalized.

2. All required approvals to develop potable water source within the Pearl Harbor Ground Water Control Area will be prepared and processed prior to implementation of the project. The coordination with the Department of Land & Natural Resources and your agency will be conducted on a timely basis.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

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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

WL/DGP 12/86-10508

January 9, 1987

Mr. Fred J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

This is in response to your request for comments regarding the Waiawa Ridge Draft Environmental Impact Statement (EIS).

In reviewing the Draft EIS for Waiawa Ridge, it was noted that the traffic study did not include the transportation improvements being considered by the State Department of Transportation (DOT) and its overall impact on the Central Oahu transportation system. The Transportation Implementation Program, the Ride Sharing Program, and DOT's legislative package should be considered in the Traffic Impact Study to see what effect these proposed improvements would have on the Waiawa Ridge project.

Thank you for giving us an opportunity to comment on this project.

Sincerely,

Donald Clegg

DONALD A. CLEGG
Chief Planning Officer

JAN 09 1987

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

January 21, 1987

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
650 South King Street
Honolulu, Hawaii 96804

Dear Mr. Clegg:

We are in receipt of your comments dated January 9, 1987 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and the retained traffic engineering firm, Parsons Brinckerhoff Quade & Douglas, Inc. and we respond as follows:

The traffic study focused on the proposed project's connections to the highway network, rather than on the overall impact to the regional system, for several reasons. The discussion of traffic impacts is based on information such as historical records, other traffic studies, and population and employment projections.

Market studies have shown that additional residential units in Central Oahu are needed. Traffic increases can be expected whether or not this specific project is developed. The proposed mixed uses in the project are expected to generate lower peak hour, peak direction traffic demands than a development consisting of all residential units; e.g., 2,600 vehicle trips are expected out of the proposed project in the morning peak hour, compared to 3,900 trips that a similar-sized, residential only, development could produce.

The regional traffic impacts of development in Central and Leeward Oahu have been addressed in other studies, many of which use either historical data or guidelines contained in land use plans. These studies indicate that increases in highway traffic demands are expected to occur on all of the major corridors leading into downtown Honolulu. The State Department of Transportation (SDOT), the agency responsible for the major roadway facilities between Central Oahu and downtown Honolulu, is presently widening the H-1 Freeway between Waiawa and Halawa Interchanges.

The SDOT is also proposing to develop a ridesharing program and to designate high occupancy vehicle (HOV) lanes on H-1. In an earlier review of proposed developments in Central and Leeward Oahu, SDOT had indicated that the rate of growth in traffic volumes from this region is not expected to be greatly affected by the total number of dwelling units being proposed; the traffic assignments used in their planning indicate that their construction and HOV programs will enable the system to carry the demands. Because the HOV program has not yet been implemented, reliance on SDOT's programs to accommodate the Waiawa Ridge project could be considered speculative.

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The traffic study evaluated conditions at the project's proposed connections to the highway facilities assuming that existing travel patterns continue. The "worst case" evaluated in the traffic report identified the potential impact of the project and is provided for system planning, which remains a responsibility of the agency. An estimate of the changes needed in travel patterns is included in the traffic report to illustrate possible goals for the HOV program. Ultimately, increases in roadway capacity and improved mass transportation will be necessary to handle the increasing traffic demands between Central Oahu and downtown Honolulu, but until such time that these major projects are planned and programmed by the appropriate agencies, traffic impacts as described in the Draft EIS can be expected.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

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

MICHAEL M. H. MOON
DIRECTOR

ROBERT MIYASATO
DEPUTY DIRECTOR

January 8, 1987

MEMORANDUM

TO: Donald A. Clegg, Chief Planning Officer

FROM: Mike Moon

SUBJECT: Draft Environmental Impact Statement for the Proposed Waiawa Development
Waiawa, Central Oahu, Hawaii

We appreciate the opportunity to review and comment upon the draft Environmental Impact Statement (EIS) for the proposed Waiawa development.

As mentioned in our previous correspondence regarding this project, the Department's primary concern relates to the provision of housing opportunities for a range of income groups. The draft EIS does not identify the anticipated price ranges of the proposed dwelling units or the target income groups from which prospective buyers are expected to come. Without this information, which would facilitate an analysis of the affordability of the dwelling units, and given the scale of the proposed development, the Department's current policy would be to request, at the time of rezoning, that: (1) a minimum of ten percent of the units be set aside at prices affordable to low- and moderate-income households; or (2) that the developer contribute in kind toward the development of such housing. However, this policy is presently under review. The developer will be notified of any changes which may be adopted.

The Department also recommends that the EIS address in further detail the feasibility of developing the proposed retirement community. We question the need for and marketability of this project in light of its substantial scale of 4,000 units and the proposed development of a similar community of approximately 1,400 units in the proposed Hililani-Mauka community.

Thank you for the opportunity to provide these comments.

Robert Miyasato
for MIKE MOON

cc: Mr. F. J. Rodriguez

JAN 12 1987

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

January 21, 1987

Mr. Mike Moon, Director
Department of Housing and
Community Development
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Moon:

We are in receipt of your agency's comments dated January 8, 1987 on the proposed Walawa by Gentry project. The comments have been provided to the applicant and we respond as follows:

1. The request for 10% of the project's units to be set aside at the time of rezoning is reasonable and that the developer/applicant will be in contact with your staff to work on the details and number of units involved. As you can appreciate, the final determination at this point in time, is difficult to state since the project is still undergoing review in the Development Plan Annual Review. There will also be a review at the State Land Use Commission stage later this year.

2. The marketability and need for the Retirement Village units being proposed has been studied by Economic Research Associates in a study conducted in 1985. The study supports the concept of a retirement village and pending further analysis of the economics of the retirement village development costs, there can be a viable market for this age group resident.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

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HONOLULU FIRE DEPARTMENT
1455 S. Beretania Street, Room 309
Honolulu, Hawaii 96814

January 12, 1987

TO : DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM : FRANK K. KAHOOHANOHANO, FIRE CHIEF

SUBJECT: EIS - WAIAWA BY GENTRY

We have reviewed the subject EIS and have no additional comments to those in Section XII of the EIS.

Should you have any questions, please contact Battalion Chief Kenneth Word at 943-3838.

FRANK K. KAHOOHANOHANO
Fire Chief

FKK/KAW:sb

cc: Fred Rodriguez
Environmental Communications, Inc.

NO RESPONSE NEEDED

JAN 14 1987

FB 86-1059

December 19, 1986

TO: MR. DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: HERBERT K. MURAOKA
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: DRAFT EIS
WAIAWA DEVELOPMENT
TMK: 9-4-06:POR. 10 AND 9-6-04:POR. 1

We have reviewed the draft EIS for the Waiawa Development and have no comments.

Thank you for the opportunity to review the draft EIS.

Herbert K. Muraoka

HERBERT K. MURAOKA
Director and Building Superintendent

cc: Emily J. Harada
Environmental Commun., Inc.

DEC 30 1986

NO RESPONSE NEEDED

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

TE-7588
PL1.0525

January 9, 1987

MEMORANDUM

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: JOHN E. HIRTEN, DIRECTOR

SUBJECT: WAIAWA DEVELOPMENT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
TMK: 9-4-06: POR. 10
9-4-04: POR. 1

This is in response to OEQC's letter of December 5, 1986.

We have reviewed the EIS, in particular the Traffic Impact Assessment Report for the subject project and have the following comments:

1. The impacts of projected traffic at ultimate completion along the proposed internal roadway system should be assessed and should be used as the basis to determine appropriate roadway widths of all major internal streets;

2. The method of determining the proportion of internal trips of 30% and 50% during the a.m. and p.m. peak hours, respectively, at the tenth year of the project's development should be verified and based on comparative internal trip rates of other similar developments;

3. The developer presently projects that over half or approximately 4,150 of the 7,900 dwelling units will be used for retirement housing. Due to the relative changes in the housing market, a traffic scheme should be analyzed where only a minimal number of dwelling units is set aside for retirement housing;

4. A more definitive layout of the internal roadway system should be provided and major intersections should be analyzed to determine the need for traffic signals;

5. A schematic layout of intersections with either new or modified traffic signals should be provided.

We appreciate this opportunity to comment on this project.

If you have any questions, please contact Kenneth Hirata of my staff at 527-5009.

JOHN E. HIRTEN

cc: Mr. Pred Rodriguez

RECEIVED AFTER DEADLINE

JAN 16 1987

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

TOM T. NEKOTA
DIRECTOR

December 15, 1986

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: TOM T. NEKOTA, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS)
WAIAWA DEVELOPMENT
TAX MAP KEY 9-4-06 AHD 9-6-04

We have reviewed the Environmental Impact Statement for the proposed Waiawa Development and make the following comments and recommendation.

The recreational needs and mitigative proposals for the Waiawa Development have not been adequately addressed in the report. The concerns which we expressed in our review of the project's EIS Preparation Notice have not been taken into account. The number, type, size and location of public parks have yet to be discussed with our department so that adequate parks, facilities and programs can be provided to serve a project of this size.

Should you have any questions, please call Mr. Jason Yuen of our Advance Planning Section at 527-6315.

Tom Nekota

TOM T. NEKOTA, Director

TTN:ei

Attach.

cc: Mr. F. J. Rodriguez, Environmental Communications, Inc.
The Gentry Companies

DEC 22 1986

ENVIRONMENTAL
COMMUNICATIONS
INC.

F J RODRIGUEZ
PRESIDENT

January 21, 1987

Mr. Hiram Kamaka, Director
Department of Parks and Recreation
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Kamaka:

We are in receipt of your comments dated December 15, 1986 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and we respond as follows:

The applicant/developer has submitted to your department, their Preliminary ... ster Plan for your staff review to determine compliance with the Park Dedication Ordinance. They have also advised that they will continue to maintain contact and work with your staff on the project as it proceeds through the Land Use Policy change process.

The applicant contact is Mr. Tosh Hosoda, Project Manager for Gentry Pacific, Ltd. He can be reached at 671-6421.

Thank you for your comments and continuing interest.

Very truly yours,

F. J. Rodriguez

FJR:ls

1146 FORT STREET MALL, SUITE 209 • P O BOX 536 • HONOLULU, HAWAII 96809 • TELEPHONE (808) 521-5361

ENV 86-262

December 22, 1986

MEMORANDUM

TO: MR. DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: RUSSELL L. SMITH, JR., DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: DRAFT EIS ON WAIAWA BY GENTRY
(TAX MAP KEY: 9-4-06, POR. OF 10 AND
9-6-04: POR. OF 1)

We have reviewed the subject draft EIS and have the following comments.

1. There is no discussion on the effects of the proposed development on existing flooding problems on Waiawa Stream. What mitigative measures will be implemented to alleviate the present areas of flooding?

2. Stormwater detention ponds are being proposed to reduce the peak runoff flows into Waiawa Stream. We assume that the developer will be responsible for the operation and maintenance of these ponds.

3. A drainage report on the entire development has not been received by the Drainage Section, Division of Engineering, for comments and approval.

4. The acreage proposed for residential and low density apartment areas in Table 1 is inconsistent with those shown in Table 2 and Figure 2. In addition, the acreage proposed for commercial/industrial developments differs from the acreage shown in Figure 2.

5. There is no breakdown of how the wastewater flows of 3.5 mgd were derived. The number of people in the service areas, the amount of flows generated by commercial and industrial uses are not given. The amount of wastewater generated 3.5 (mgd) should always be less than the estimated demand for potable water (3.3 mgd, page VII-20)..

DEC 31 1986

6. As stated in our letter of June 4, 1986 (ENV 86-121), the proposed Waiawa development was not included in any of the tributary areas of the Honouliuli sewerage district. Directing wastewater flows to the Waipahu sewer system will jeopardize the ultimate capacity of that system especially since all of Mililani Town-Waipio acres wastewater flows are currently being discharged into Waipahu WWPS. The entire wastewater flows should be directed to Pearl City WWPS since the ultimate capacity of the Pearl City sewer system is able to accommodate the Waiawa flows.

7. The availability of treatment capacity at the Honouliuli WWTP was not discussed in the Draft EIS. The daily average wastewater flows in 1985 ranged from 17.04 to 18.67 mgd with an average of 18.30 mgd. Since all of the flows from Mililani-Waipio acres are now treated at the Honouliuli WWTP, the daily average flows should be approaching 19 mgd at the present time. If the entire tributary areas of the 25-mgd Honouliuli WWTP were sewered and connected to the plant, the present average daily flows into the plant would exceed 23 mgd.

for RUSSELL L. SMITH, JR.
Director and Chief Engineer

bcc: Division of Engineering
Division of Wastewater Management
✓ Environmental Communications, Inc. (Fred Rodriguez)

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ,
PRESIDENT

January 21, 1987

Mr. Russell L. Smith, Jr.
Director and Chief Engineer
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Smith:

We are in receipt of your department's comments dated December 22, 1986 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and the civil engineering consultant, Community Planning, Inc. and we respond as follows:

1. Existing flooding problems at Waiawa Stream will not be discussed in the Final EIS. The problems that are at the stream are not in the project site, therefore, there will be no mitigative measures made by the applicant. The drainage master plan which is presently in design, will address the surface runoff/drainage attributable to the project, and will be designed to meet City standards.

2. Stormwater detention ponds will be designed and incorporated into the golf course plans as dual function water hazards and detention basins. As such, they will be an integral part of the golf course and will be maintained by the applicant.

3. The Drainage Master plan for the project is being reviewed by the engineering consultant and the applicant and will be provided prior to implementation of the project. Final land use changes have not been approved at this early date, and on that basis, the Drainage Master Plan has not been completed.

4. The discrepancies in Table 1 has been revised to comply with Table 2 and Figure 2. Thank you for calling this to our attention.

5. Attached is a summary of the wastewater generated based on City standards. Of course, the persons per unit for the retirement community are anticipated occupancies since the City standards do not include that land use. The updated total wastewater flow from Waiawa Development is 3.1 MGD and, therefore, noted on the attached page VII-20 of the draft EIS.

6. As requested by DPW, the wastewater from Waiawa will be directed to the Pearl City Wastewater Pump Station since the ultimate capacity of the Pearl City Sewer System is able to accommodate the Waiawa flows. The rerouting of the off-site sewer trunk main is noted on the revised page VII-20 of the Final EIS.

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7. Regarding wastewater treatment, the developer proposes to use whatever capacity is available at the time of project implementation. If present capacity at Honouliuli WWTP is exhausted, it is our understanding that DPW will expand the plant to accommodate further growth.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

Attachment

January 7, 1987

WAIAWA DEVELOPMENT
SUMMARY
WASTEWATER GENERATED

Conventional Residential

3210 homes x 80 gpd x 4 pph = 1,027,200 gpd = 1.027 MGD

Conventional Apartment

540 units x 80 gpd x 2.8 ppu = 120,960 gpd = 0.121 MGD

Retirement Residential

2600 homes x 80 gpd x 2.5 pph = 520,000 gpd = 0.520 MGD

Retirement Apartment

1550 units x 80 gpd x 2 ppu = 248,000 gpd = 0.248 MGD

Commercial/Industrial

110 Ac. x 10,000 gad = 1,100,000 gpd = 1.100 MGD

Neighborhood Business

5 Ac. x 4,000 gad = 20,000 gpd = 0.020 MGD

Elementary School

500 students x 25 gpcd = 12,500 gpd = 0.013 MGD

3.049 MGD

USE 3.1 MGD

Wastewater Generation Criteria

1. Average daily per capita flow = 80 gallons per day (gpd)

2. Densities of residential and apartment occupancies are as follows:

   a. Conventional Residential - 4 persons per home (pph)
   b. Conventional Apartment - 2.8 persons per unit (ppu)
   c. Retirement Residential - 2.5 pph
   d. Retirement Apartment - 2 ppu

3. Average daily flows of:

   a. Commercial/Industrial - 10,000 gal. per acre per day (gad)
   b. Neighborhood Business - 4,000 gad
   c. Elementary School - 25 gal. per capita per day (gpcd)

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814 • AREA CODE (808) 548-2111

FRANK F. FASI
MAYOR

DOUGLAS G. GIBB
CHIEF

WARREN FERREIRA
DEPUTY CHIEF

OUR REFERENCE DI-LK

December 17, 1986

TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE PROPOSED WAIAWA DEVELOPMENT, WAIAWA, CENTRAL OAHU, HAWAII

While a development as large as the proposed Waiawa Development Project would result in increased calls for police service, and would add extensively to our patrol area, we are prepared to provide police services for the area, assuming that necessary resources are made available to us.

It should be noted here that the Honolulu Police Department is not in favor of residential development that has the potential of adding significantly increased vehicular traffic to the present roads connecting Central Oahu to Honolulu proper. We believe that significant increases of traffic will negatively impact traffic safety if development is encouraged prior to an increase in road capacity and improved mass transportation between the development area and Honolulu.

The Draft EIS submitted does not address the impact of the proposed project in conjunction with all other planned and proposed developments on the present thoroughfare leading into Honolulu from Central Oahu. Instead, it focuses on the impact of increased vehicular traffic generated by the project and recognizes that it will adversely affect traffic in the immediate area of the development:

> "Possible reassignment of the project's traffic demands to the other access points was evaluated...reassignment indicated that major capacity contraints would occur at other locations."

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> "At Waipio Interchange, however, projected demand volumes (by the project) would still exceed capacities."
>
> "However, constraints due to interchange spacing, ramp design, and traffic service limit the opportunities available: no adequate location could be found for additional ramps."

In reviewing future material on the proposed Waiawa Development, it would be desirable to have some indication of the downstream impact of the project on our highway system.

DOUGLAS G. GIBB
Chief of Police

cc: Mr. F. J. Rodriguez

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

January 21, 1987

Chief Douglas G. Gibb
Police Department
City & County of Honolulu
1455 South Beretania Street
Honolulu, Hawaii 96814

Dear Chief Gibb:

We are in receipt of your department's comments dated December 17, 1986 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and the retained traffic planner, and we respond as follows:

The regional traffic impacts of development in Central and Leeward Oahu have been addressed in other studies, many of which use either historical data or guidelines contained in land use plans. These studies indicate that increases in highway traffic demands are expected to occur on all major corridors leading into downtown Honolulu. The State Department of Transportation (SDOT), the agency responsible for the major roadway facilities between Central Oahu and downtown Honolulu, is presently widening the H-1 Freeway between Waiawa and Halawa Interchanges.

Market studies have shown that additional residential units in Central Oahu are needed. Traffic increases can be expected whether or not this specific project is developed. The proposed mixed uses in the project are expected to generate lower peak hour, peak direction traffic demands than a development consisting of all residential units; e.g., 2,600 vehicle trips are expected out of the proposed project in the morning peak hour, compared to 3,900 trips that a similar-sized, residential only, development could produce.

The "downstream" impacts of this project are being addressed by the appropriate agency. The SDOT, in an earlier review of proposed developments in Central and Leeward Oahu, had indicated that the expected rate of population growth in this region is independent of the total number of dwelling units being proposed. The traffic assignments used in their planning, however, do show an increase in morning peak hour traffic demand of approximately 60 percent between 1985 and 2008.

The Draft EIS evaluated traffic conditions at the proposed project's connections to the highway facilities within the context of SDOT's plans and identified the improvements which would be needed to accommodate the project as well as locations where traffic congestion could be expected. In the "worst case" evaluated, encouragement of the use of high occupancy vehicles could mitigate traffic demands which exceed available capacities. Increases in roadway capacity

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and improved mass transportation are necessary to handle the increasing traffic demands between Central Oahu and downtown Honolulu, but until such time that these major projects are planned and programmed by the appropriate agencies, traffic impacts as described in the Draft EIS can be expected.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

245 North Kukui Street, Honolulu, Hawaii 96717, Telephone (808) 537-5966

AMERICAN LUNG ASSOCIATION of Hawaii
The Christmas Seal People®

January 7, 1987

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 EIS for Waiawa by Gentry

We have reviewed the subject EIS with particular attention to those sections addressing traffic and air quality impacts and have the following comments to offer.

The air quality impacts section (pp. VII-14 - VII-17) fails to mention air quality problems identified in previous air quality impact studies done for that same area. The Final EIS (October, 1979) for the Gentry Waipio development directly across Kamehameha Highway from the proposed Waiola project indicated possible violations of both state and federal carbon monoxide standards. More recently, the PRU Application for the proposed Dole Kipapa Cannery (1986), also indicated possible violations of both federal and state carbon monoxide standards in the vicinity of Ka Uka Boulevard which appears to serve the Waiola Estates site.

The air quality impact analysis (Appendix I) itself deserves some comment. The relatively low carbon monoxide levels reported in the study appear questionable in light of the serious traffic congestion problems reported in the traffic analysis (Appendix H). With volume/capacity ratios as high as 0.95 and service levels E and F on some traffic lanes, one would anticipate higher CO levels along those roadways. Some possible explanations for the seemingly low predictions are:

- CO levels were predicted at only one receptor point in the vicinity of each intersection or ramp. An array of receptors around the intersections would have revealed the range of CO levels in the area and perhaps indicated higher maximum values.

- A superceded mobile emission factor model (MOBILE2) was used instead of the updated MOBILE3 model. This would contribute to low predictions.

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- the EPA persistance factor for estimating 8-hour CO levels (0.6) was incorrectly adjusted down to 0.5. If the 0.6 factor had been applied to the already low 1-hour CO levels, it would have indicated violations of the State's 8-hour standard.

- an outdated EPA publication (reference 3, 1975) was used instead of the revised 1978 publication.

One final comment pertains to carbon monoxide exposure of vehicle occupants. The EIS makes no mention of the increased exposure of drivers and passengers to carbon monoxide as they sit in their vehicles proceeding slowly towards Honolulu. The additional traffic to be contributed by the proposed project will increase this exposure which is significantly higher than ambient levels because of the proximity of the people to the sources. We have measured 1-hour CO levels within commuting vehicles on Oahu which are frequently above the state standard and have even exceeded the federal health standard.

The reviewers of this EIS and especially the residents of Central Oahu who will have to endure the traffic volumes and carbon monoxide levels should be made well aware of the impacts associated with each additional increment of development such as the project in question. As written, the EIS does not provide this awareness.

Sincerely yours,

James W. Morrow
Director
Environmental Health

JWM:ct
L8702

cc: Mr. P. J. Rodriguez
OEQC
UH-Environmental Center

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ
PRESIDENT

January 21, 1987

Mr. James W. Morrow, Director
Environmental Health
American Lung Association of Hawaii
245 North Kukui Street
Honolulu, Hawaii 96717

Dear Mr. Morrow:

We are in receipt of your comments dated January 7, 1987 on the proposed Waiawa by Gentry project. These comments have been provided to the applicant and the air quality consultant for their review and we respond in the following:

1. Barry D. Root has revised the Air Quality Assessment in Appendix I and the revised data is presented in the Final EIS. Also, corrections have been made to pp. VII-16 to reflect the revised values for the impacts anticipated by the year 2000. All revisions and changes have been made with the latest available methodology (MOBILE 3 model). Revisions to the Peak Hour Carbon Monoxide Analysis are reflected in Table 3, page 17 of the revised Root study. It should be noted that these results have been tabulated using three sites.

2. Regarding the comment on carbon monoxide exposure to vehicle occupants, Root responds as follows:

   The carbon monoxide exposure of vehicle occupants is not addressed in the study for many reasons. While there can be no argument that very high levels of carbon monoxide can be found inside automobiles and that these high levels ought to be of concern to vehicle occupants, there is no established methodology to link these levels to the projected outdoor carbon monoxide levels indirectly associated with a particular proposed project. The amount of carbon monoxide inside a vehicle is related to many factors: (1) the number of smokers in the vehicle; (2) whether the windows are rolled up or down; (3) whether the vehicles has air conditioning or the degree of effectiveness of whatever ventilating system it has; (4) the vehicle's state of disrepair and numerous other vehicular design features; and finally (5) the quality of the outdoor air through which the vehicle is passing. It can be persuasively argued that the quality of outdoor air through which any given vehicle is passing is most strongly related to how much carbon monoxide the vehicle immediately in front of the vehicle in question is emitting. It is possible to get trapped in traffic behind a major polluter almost anywhere on Oahu and most of the other factors listed above have nothing to do with whether a given

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real estate project is undertaken or not. Thus, there would appear to be no rational basis for discussing carbon monoxide levels inside vehicles as a part of the Environmental Impact Statement for any particular project.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

HAWAII'S THOUSAND FRIENDS

Ke aloha o ko kākou 'āina, 'O ia ka mana kū pa'a. Pānoanoa ka 'āina, Mānoanoa ka po'e.
The Love of our land, is the power for us to stand fast. Rare is the land, many are the people.

January 6, 1987

Mr. Donald A. Clegg, Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawai'i 96813

Re: Proposed "Waiawa by Gentry" project at Waiawa, Central O'ahu

Dear Mr. Clegg:

We were sorry not to be a consulted party in the development of the EIS for the above referenced project; please add Hawaii's Thousand Friends to your list of organizations to be consulted for changes to the Development Plans and General Plans.

We strongly urge denial for any changes in the Development Plans that would accommodate this project. As presented, "Waiawa by Gentry" represents:

1. another unconstitutional assault on Oahu's prime agricultural lands,
2. another challenge to the integrity of Oahu's General Plans and Development Plans, which seek to direct growth to the Ewa plain, not to Central O'ahu,
3. another potentially dangerous impact to the recharge area for the Waiawa Shaft serving the U. S. Navy's Pearl Harbor Water System (strongly opposed by the Department of Health),
4. another threat to the fiscal and social health of the residents of the City and County of Honolulu who would have to fund much of the infrastructure necessary to make such a project feasible, and
5. yet another example of a development which seeks profits solely for the benefit of landowner and/or developer without filling resident needs for affordable housing.

In addition, we believe the EIS to be inadequate in its responses to consulted parties' questions concerning cumulative impacts (which extend far beyond the subject area) for a master-planned project of which this is only the first increment; for water development and protection; for traffic, noise and air quality; for examining agricultural potentials and opportunities which include our visitor market; and for a more accurate examination of the cultural significance of the lands in question.

We are appalled that a "retirement community" for an in-migrant population (contravening both state and county planning) is being proposed for our small island, and which would further escalate land values and prices for homes already too costly for our own people.

On further review, additional comments will be submitted.

Sincerely,

Muriel B. Seto

Muriel B. Seto,
Executive Director

cc: Mr. J. J. Rodriguez, President
Environmental Communications, Inc.

JAN 0 8 1987

941 River Street Suite 202 Honolulu, Hawai'i 96817 (808) 538-1296

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

January 21, 1987

Mrs. Muriel B. Seto
Executive Director
Hawaii's Thousand Friends
941 River Street, Suite 202
Honolulu, Hawaii 96817

Dear Mrs. Seto:

We are in receipt of your group's comments dated January 6, 1987 on the proposed Waiawa by Gentry project. The comments have been reviewed by the applicant and we respond in the following:

1. We are not clear as to the constitutionality of the "assult" on Oahu's prime agricultural lands. The subject lands have been fallowed by the lessee since 1983 and the landowner, has entered into negotiations with the Gentry Companies to provide a Development Master Plan which can realize incomes needed to support the Kamehameha Schools.

2. There is no intended damage to the integrity of Oahu's General and Development Plans since the legislative process of amendment to these Plans is being sought through due process. The Plans remain intact as formulated and the legislative process will be served through public hearings to be held at the Planning Commission and City Council.

3. A study is underway at the request of the U.S. Navy to determine the real impacts to the recharge area for the Waiawa Shaft. This study is being conducted by the Water Resources Research Center at the University of Hawaii with the cooperation of the Board of Water Supply. The results of this work will determine the real impacts and the answers to many questions that have been raised on this subject.

4. All infrastructure requirements necessary to service this project will be provided by the applicant developer either in pro-rata sharing of necessary improvements, or through the tax revenues that would accrue from the development of this project. This is a traditional method of funding that has been in practice for many years.

5. Economic gain that results from the development of projects like Waiawa are beneficial to the community and State in that development dollars are vital to the maintenance of a healthy local economy. The risks that developers take to gain profits are often more than the gains realized; at that point, should the proposed project be delayed or fail, the developer can not seek relief or assistance from other sources but must bear the economic burden alone.

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There is included in the Draft EIS, studies conducted on the various subjects of water development and protection, traffic, air and noise impacts, and agricultural economics.

These studies have described the various aspects of the proposed project and how the impacts that can result from the project's implementation will affect the site. In addition, impacts that could result from the project are also discussed in terms of economic gain and benefits on a cost benefit basis, using alternative crop types as the comparison.

Finally, retirement communities as a potential industry, have potential as a clean industry which can benefit the local economy tremendously in terms of reduced requirements for schools, decreases traffic impacts, and increased demands for consumer goods and services that would be comparable to the tourist industry. We regret that your organization does not view this in that light.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

F. J. Rodriguez

FJR:ls

HAWAIIAN ELECTRIC COMPANY, INC. - PO BOX 2750 - HONOLULU, HI 96840-000'

ENV 2-1
NV/G

HEI

Brenner Munger, Ph.D., P.E.
Manager
Environmental Department
(808) 548-6880

January 6, 1987

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:

Subject: Environmental Impact Statement (EIS) for Waiawa Development

We have reviewed the subject document and provide the following comments:

1. Paragraph VII I.3 which is found on Page VII-21 of the EIS, should be modified to include the following items.

   a. We have attached maps (see Enclosures 1 to 3) that show our existing substation and transmission facilities in the area. The overhead lines are carried by perpetual easements and some sections of the overhead lines still have relocation clauses that have not been executed to date. In addition other sections of our overhead lines could also require relocations at the developer's expense, and

   b. The project will require four (4) 46/12.47, 12.5 MVA unit substations and three (3) 46 KV circuits to serve the unit substations. At the outset, the new load can be served by Waiawa and Waipio Substations. However, the installation date of the new substation with the first 46/12.47 KV, 12.5 MWA transformer unit will depend upon how quickly the area develops.

JAN 0 8 1987

2. The above subject may be in close proximity of existing HECO 138kv overhead transmission lines. These facilities will remain energized during construction. The following HECO Notes are to be included as part of the final construction plans.

   a. 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 not less than a 13'-0" clearance for his equipment while working close to and/or under the overhead facilities.

   b. The contractor is to comply with the directions of the State of Hawaii Occupational Safety and Health Law (DOSH).

   c. 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 it from damage.

   d. Should it become necessary, any work required to relocate HECO facilities be done by HECO. The contractor shall be responsible for all costs and coordination.

   e. The contractor shall be liable for any damages to HECO's facilities.

   f. The contractor shall report any damages to HECO's facilities to the HECO Trouble Dispatch at phone no. 548-7961.

   g. A minimum of 30'-0" shall be maintained between HECO's overhead conductors and the final grade of the development.

   h. Service roads and/or access trails leading to and from HECO's facilities may not be altered and/or disturbed.

Sincerely,

Brenner H. Munger

Enclosures
cc: Mr. F. J. Rodriguez, President
Environmental Communications, Inc.

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUEZ.
PRESIDENT

January 21, 1987

Dr. Brenner Munger, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 2750
Honolulu, Hawaii 96840-0001

Dear Dr. Munger:

We are in receipt of your comments dated January 6, 1987 on the proposed Waiawa by Gentry project. The comments have been provided to the applicant and the retained civil engineering firm Community Planning, Inc. and we respond as follows:

1.a. The enclosures provided by your office provide valuable information to the electrical subconsultant to Commmunity Planning, Inc. At the appropriate time, contact will be made with HEI on the location and possible relocation of the existing overhead lines. As you are aware, the lengthy land use policy change process remaining (2-3 years) preclude any immediate decision on the relocation of these overhead lines.

b. The technical data as to size and capacity of additional substations for the Waiawa project will be provided to Community Planning, Inc. for their future use and reference. We will also include this information in Paragraph VII 1.3 as revised.

2. The HECO notes to be included as part of the final construction plans will also be provided to the electrical subconsultant for his reference at the appropriate time.

We have taken the liberty of splicing the three maps together to indicate the location of HEI transmission lines on the Waiawa site since this is most germane to the Final EIS. The actual maps will as we have stated earlier, be provided to Community Planning, Inc. for their files and future use.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR:ls

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EVALUATION RESEARCH CONSULTANTS

Impact on Agriculture of the Proposed Waiawa Development

August 1, 1986

APPENDIX A

Impact on Agriculture of the Proposed Waiawa Development

August 1, 1986

prepared by

Evaluation Research Consultants
826 19th Avenue
Honolulu, Hawaii 96816

for

Environmental Communications, Inc.

Impact on Agriculture of the Proposed Waiawa Development

The proposed Waiawa development involves two parcels totaling 1,242 acres located on the Leeward side of Oahu roughly between the H2 freeway and Pearl City/Pacific Palisades. The lands are currently fallow, but previous to 1982, the land was used for sugarcane production.

The significance of the subject lands as part of the agricultural resources of the State of Hawaii can be evaluated by examining the potential uses of the land. These uses are determined by three sets of factors: (1) the physical, agronomic and environmental characteristics of the land; (2) economic variables such as the existence and location of markets for goods that can be feasibly produced on the land, the cost of inputs required to grow the goods, and the supply of similar products from other sources; and (3) the current and future demand of agricultural producers for land having the physical, environmental, agronomic, and economic characteristics of the subject lands.

A detailed description of the factors affecting the agronomic potential of the subject parcels is given in the accompanying report by Yukio Nakagawa, "The Agricultural Production Potential of the Lands in the Waiawa Revised Development Plan by Gentry -- Island of Oahu." Briefly, the subject parcels consist of fairly flat to gently and moderately sloping terrain ranging in elevation between 100 to 650 feet; the prevailing winds are brisk to gentle, averaging 5 mph from the northeast; the area is exposed to long hours of direct sunlight for the greater portion of the year; and averages between 26 and 43 inches of rain per year depending on elevation. Supplemental irrigation is required for most shallow rooted crops. The location is important in that it is near the major market in the State.

The agricultural potential of the subject lands can be examined in

terms of several different indices of productivity compiled by the State of Hawaii and Federal agencies. The majority of the subject lands, approximately 965 acres, are designated "Prime Agricultural Lands" by State of Hawaii Department of Agriculture. Another 180 acres are classified as "Other Important Agricultural Lands" and the remaining 97 acres are not suitable for agriculture.

The "Prime" designation means that the property has all the physical and climatic conditions which permit sustained high yields under economically advantageous operating conditions. Such lands are characterized by high yields with relatively low costs and little risk of damage to the physical environment. The category of "Other Important Lands" exhibits production problems such as flooding, erosion, etc. that require greater production costs, such as more drainage, more fertilizers, etc., and result in reduced yields.

The majority of the prime lands, an estimated 800 acres, were given a productivity rating of "A" by the Land Study Bureau. This is the highest rating. The remainder were given a productivity rating of "B". These latter lands were generally the steeper portions (slopes between 11 and 20 percent) of the parcel. These lands are well suited for the production of sugarcane, pineapple, orchards, vegetables, and forage. The crop capability classifications assigned by the Soil Conservation Service range between I to IIIe if the lands are irrigated. These rating imply that the parcel contains soils that range from soils with few limitations to soils subject to severe erosion hazard if not protected. In terms of the proposed Land Evaluation Site Assessment Classification the subject lands have Land Evaluation (LE) ratings ranging between 15 to 96, with approximately half the site receiving a LE rating of 80 or higher (letter from Jack K. Suwa, Chairman, Board of Agriculture to Fred Rodriquez, Environmental Communications, Inc., June 23, 1986). The LE ratings vary between 12 and 96, the implication being that the higher the rating, the greater the production potential of the parcel.

The LE ratings provide a summary of all the productivity ratings. In fact, the LE rating is a weighted average of five different productivity indices, including the three discussed above. The rating for the Waiawa lands indicate that when irrigated the land has productive potential. However, the production potential varies widely within the parcels. About three-quarters of the site is definitely good land, capable of producing high yields with relatively low costs and little risk of damage to the physical environment if appropriate cultural practices are followed.

The agricultural significance of the subject lands can be examined in terms of the total amount of existing lands of similar quality. The subject lands constitute a very small percentage of such lands. The subject lands are less than 2 percent of the "Prime" lands on Oahu and 0.6 percent of such lands Statewide. The acreage in question appears slightly more significant when viewed as a percentage of the lands currently being used for crop production. Currently 41,600 acres are being used for crop production on Oahu (Table 1.) This would increase by more than 2 percent if the subject lands were to returned to production.

Agricultural lands similar to Waiawa are not scarce. Such lands are found throughout the State. As of 1984, 266,000 acres in Hawaii were used for crop production (including sugarcane and pineapple). This is 58,600 acres less than were used for crop production in 1969. See Table 1. Since 1967, the total acreage used for crop production on Oahu has decreased by 17,700 acres to the current level of 41,600 acres (as of 1984). The data in Table 1 are graphically displayed in Figures 1 and 2.

Table 1. Acreage Used for Crop Production in Hawaii and on Oahu, 1961 - 1984 (in thousands of acres)

Year	State				Oahu			
	Sugar-cane	Pine-apple	Other Crops	All Crops	Sugar-cane	Pine-apple	Other Crops	All Crops
1961	227.0	74.0	15.2	316.2	34.2	22.0	2.4	58.6
1962	228.9	72.0	14.9	315.8	35.2	21.7	2.2	59.1
1963	231.3	69.0	14.5	314.8	35.8	21.5	1.9	59.2
1964	233.1	65.0	15.6	313.7	35.8	18.5	1.9	56.2
1965	233.6	65.0	16.4	315.0	36.0	19.0	1.9	56.9
1966	235.4	65.0	18.1	318.5	36.5	19.0	2.3	57.8
1967	237.2	65.0	19.4	321.6	37.8	19.7	1.8	59.3
1968	238.9	65.0	19.5	323.4	38.1	18.8	1.8	58.7
1969	241.4	64.0	19.4	324.8	37.5	18.8	1.7	58.0
1970	237.9	64.0	19.4	321.3	35.5	17.4	1.7	54.6
1971	232.1	60.9	22.9	315.9	32.4	17.4	2.0	51.8
1972	229.6	58.1	22.0	309.7	32.7	15.5	2.2	50.4
1973	226.1	57.5	25.0	308.6	32.7	15.5	3.0	51.2
1974	224.2	55.0	24.4	303.6	33.5	15.5	2.9	51.9
1975	221.4	50.0	26.7	298.1	34.3	15.5	3.2	53.0
1976	221.6	48.0	26.4	296.0	34.3	15.5	4.8	54.6
1977	220.7	45.0	27.4	293.1	34.2	13.0	3.5	50.7
1978	220.7	43.0	27.7	291.4	34.0	12.0	3.1	49.1
1979	218.8	44.0	28.0	290.8	33.6	12.0	3.5	49.1
1980	217.7	43.0	30.7	291.4	33.1	11.5	3.3	47.9
1981	216.1	41.0	33.2	290.3	32.7	11.0	3.4	47.1
1982	204.8	36.0	38.0	278.8	29.2	11.5	2.6	43.3
1983	194.3	36.0	41.2	271.5	27.2	11.5	3.6	42.3
1984	188.4	35.0	42.6	266.0	26.4	11.8	3.4	41.6

Source: Statistics of Hawaiian Agriculture, Hawaii Agricultural Reporting Service, various issues.

Even after subtracting the past conversions of crop land to urban usages and the projected increases in agricultural land use on Oahu in the year 2015 based on the projections in the LESA commission report, there are over 12,000 acres of land suitable for crop production not currently in production on Oahu (see Table 2). If more sugarcane lands become fallow, this number will increase.

Potential Alternative Agricultural Uses

Based on the physical, agronomic, and environmental characteristics of the subject parcel previously discussed, in combination with the history of crop production in Hawaii, the following 24 vegetable crops and 8 fruit and

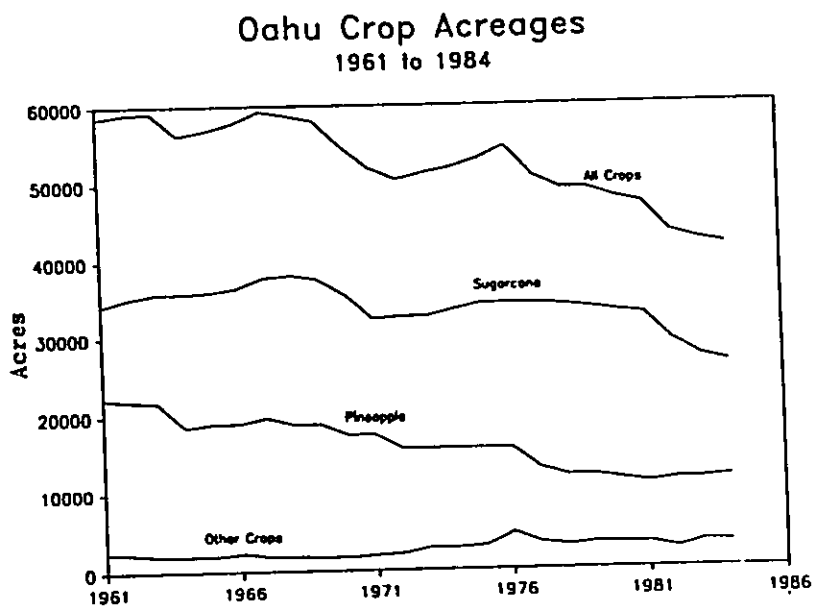

Figure 1

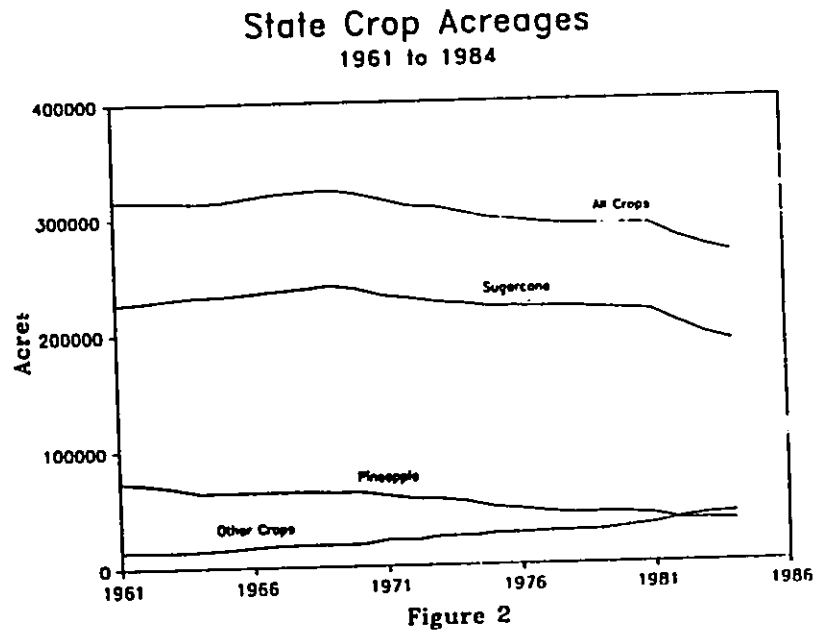

Figure 2

Table 2. Supply and Availability of Crop Lands

	State	Oahu	Neighbor Islands
Acreage Released from Crops	58,800	17,700	41,100
Converted to Urban Use[1]	5,700	3,800	1,900
Available	53,100	13,900	39,200
Projected Increase in Ag. Demand for Land[2]			
Year			
1990	6,423	-350	6,773
1995	14,089	453	13,636
2000	20,177	643	19,533
2005	26,396	834	25,562
2015	39,241	1,219	38,022

[1] Oahu total includes: Mililani 1,800 acres; Waipio Gentry 600 acres; H-2 50 acres; Waikele 400 acres; West Beach 300 acres; Miscellaneous 550 acres. Sugarcane withdrawals for the Pearl City area were largely compensated for by new plantings and are therefore excluded. State total is an estimate based on urbanization trends on the Neighbor Islands.

[2] Based on projected production goals in the LESA Commission Report, February 1986. The base year is 1983. The 1990 and 1995 acreages are taken from the LESA report. The data for 2000 to 2015 are based on the rate of increase implicit in Tables 2 and 3 of the LESA report. The increase in acreage reported above includes the projected increase in all agricultural land use (not just crops), except aquaculture. The most promising aquaculture activities are either brackish or saltwater systems, and these are not appropriate uses for good cropland, particularly if the lands overlay freshwater reserves.

nut crops can be considered to have agronomic potential in the Waiawa area: bittermelon, broccoli, bulb onion, cucumbers, daikon, dasheen, edible ginger root, edible podded peas, eggplant, green peppers, green or snap beans, green onions, green peppers, lettuce (semi-head types only), mustard cabbage (Kai Choy), red radish, oriental gourds, potato, pumpkin and winter squashes, summer squash, sweet potatoes, sweet corn, taro (upland varieties), tomatoes, watermelon, avocado, bananas, guavas, limes, yellow passion fruit, macadamia nuts, papaya, and pineapple. Forage, horticulture, and seed production are also agronomically possible. However, agronomic potential (the crop will grow) and economic potential

(the crop can be grown for a profit) are not the same. Some of the crops listed have been tried and found to be unprofitable, either because of high production costs, lack of markets, or the availability of less expensive imports. Also, some of the crops that can be grown in the Waiawa area could be grown elsewhere in the State more profitably.

Waiawa has some advantages in the production of fruit and vegetables relative to other areas in the State. The primary advantage is that it is close to the principal market in Hawaii and to transportation links to overseas markets.

There are factors, however, which limit the economic potential of Waiawa for the production of fruit and vegetables. One is the cost and supply of water. Under existing conditions, the most readily available supply of water is from the Oahu Sugar Company. Given that the cost of water is one the primary cost factors limiting the profitability of sugarcane production of Oahu, it is unlikely that this water would be made available, and if it was available, it would be expensive. There are wells on the property, but these wells are not on the Pearl Harbor Ground Water Control Area permitted use list. Also, the Waiahole ditch passes through the property inland of the proposed development. However, the ditch water is currently being used by Oahu Sugar Company and Castle and Cooke, Inc. Most crops require about 5 acre feet of water per year, although some, such as daikon and perennial crops, require more. Based on the estimated costs of delivering water to lands diverted from sugarcane production, it is estimated that delivery costs alone could exceed 500 dollars an acre and could be more at the higher elevations. The alternative source of water is the City and County of Honolulu. If water were purchased from the City and County under current agricultural rates, 5 acre feet would cost $1,126, and this does not include delivery to the field.

Another set of factors limiting the growth of diversified agriculture relate to the size of the local market and the difficulties the State has experienced in developing crops for export. These factors are discussed below.

Evaluation of Potential Fruit and Vegetable Crops for Waiawa

Crops produced in Hawaii can readily be separated into two groups -- those that are produced for export and those that are produced for local consumption. In terms of crops that have export potential, papaya, guava, passion fruit, macadamia nuts, edible ginger root, and pineapple can all be produced on lands similar to the subject lands. However, pineapple, papaya and edible ginger root are the only ones likely to economically feasible on the subject lands. Papaya production will only be feasible if the problems with mosaic virus can be overcome. Papaya is currently being grown on the Ewa plains near Campbell Industrial Park and on fallowed sugarcane lands in Palehua on a trial basis.

Producers of edible ginger root in Hawaii have been quite successful in marketing their product on the mainland. However, it does not take many acres of ginger to satisfy the existing the market. In 1984, over 5 million pounds were produced on 135 acres, of which an estimated 3.5 to 4 million pounds were marketed overseas. Currently, it would not take many more acres to saturate the mainland market during the season when Hawaii produced ginger is available, and the most likely area for expanded planting is on the Big Island where the great majority of the current production is located.

Pineapple is the most feasible export crop for the subject lands. After twenty years of declining pineapple acreage, plantings began to show a slight increase on Oahu in 1982 (see Figure 1). The increased visibility of the pineapple industry has been attributed to several factors, including

increases in efficiency in field operations, declines in foreign competition, and the success the Hawaii industry has achieved in marketing fresh pineapple (First Hawaiian Bank, Economic Indicators). Currently Del Monte is expanding its plantings on Molokai and Dole's production on Lanai is expected to increase as more land is converted to drip irrigation. Increased planting on Oahu, if any, are likely to occur on lands that were once in pineapple, then converted to sugarcane when the industry reduced its acreage during the 1960's and 70's, and are currently out or being taken out of sugar production.

Passion fruit is uneconomical to produce because of the high cost of installing trellises. The market for guava is beginning to grow. However, it is still too soon to recommend increases in commercial planting. Also, any increases in plantings are more likely to occur proximate to existing plantings in order to take advantage of existing processing facilities. Macadamia nuts can be produced more profitably elsewhere in the State. Production in Waiawa would require irrigation and the nuts would have to be shipped off-island for processing or a processing facility would have to be constructed.

Several vegetable crops which are imported in great quantities are not climatically suited for production in Waiawa because they require cool temperatures for good quality and profitable yields. The following crops would be unsuitable for that reason: chinese head cabbage, head cabbage, carrots, cauliflower, celery, head lettuce, romaine lettuce, and during most of the year, potatoes. The good storage, long-day and medium-day length onions are also not suitable because they require longer day lengths for proper growth and curing. The high incidence of insect and disease infestations limit the feasibility of producing summer squash and melons except for zucchini and watermelon.

The fruit and vegetable crops which show some potential for commercial production in the Waiawa area are listed in Table 3. Also given in Table 3 are the quantities of the product or similar products sold in the Honolulu wholesale market in 1985. These quantities provide a crude estimate of the current demand for these products. The estimates are crude because the data for Honolulu are for aggregates of similar products. For example, all types of bulb onions are listed as "dry onions" and both oriental and American types of cucumbers are listed as "cucumbers." These quantities thus will overestimate the demand for local products since local products are not identical to all imports.

The next three columns of Table 3 provide information on market conditions that can be used to estimate the potential demand for increased production of the crops. The third column lists the percentage of the goods sold in the Honolulu market which are supplied from in State sources. When local production already supplies the entire market, any increase in production via additional planting will have two immediate effects: (1) the price of the product will fall, making it less profitable or unprofitable to produce; and (2) production elsewhere in the State will decline. That is, there will be a shift in production patterns from regions currently producing the crop to new regions. The total impact of the new planting would be a decrease in the profitability of existing operations and a resulting reduction in scale and a shift in production to the new plantings. The following crops listed in Table 3 fall into this category: eggplant (long), green or snap beans, semi-head lettuce, daikon, dasheen, ginger root (edible), oriental squash, radishes, bittermelon, and cabbage (kai choy).

TABLE 3
Agronomically Feasible Crops

Crop	Honolulu Demand (1,000 pounds)	Percent of Demand Met by Local Production	Maximum Percent of Monthly Local Demand Met by Local Products	Number of Months When Local Products Exceeds 70% of the Market
Crops for the Local Market				
Avocados	1,684	59	77	2
Bananas: Apple	616	100	100	12
Bluefield	91	100	100	12
Chinese	14,505	25	43	0
Beans, Green	804	86	100	9
Bittermelon	97	96	100	11
Broccoli	4,447	8	16	0
Cabbage, Kai Choy	768	96	100	11
Corn, Sweet	485	29	100	4
Cucumbers	3,715	57	87	6
Daikon	1,488	97	100	12
Dasheens	163	94	100	10
Eggplant: Long	496	99	100	12
Round	384	71	92	8
Lettuce, Semi-head	1,321	100	100	12
Limes	554	6	19	0
Onions: Dry	13,007	5	16	0
Green	829	77	92	8
Peas, Chinese	303	5	18	0
Peppers, Sweet	2,540	37	64	0
Potatos, Table	20,941	0	1	0
Pumpkins	1,128	10	100	5
Radishes	178	98	100	12
Squash: Oriental	465	84	100	12
Italian	1,806	47	89	3
Sweetpotatoes	1,804	67	96	6
Taro	1,197	15	23	0
Tomatoes	13,356	29	47	0
Watermelon	9,546	78	99	7
Crops for Local and Export Markets				
Ginger Root	1,348	80	100	8
Pineapples	34,130	100	100	12
Papayas	10,579	100	100	12

Source: Honolulu Arrivals: Fresh Fruits and Vegetables, 1985, Market News Service, Hawaii State Department of Agriculture, April 1986.

For several crops, the impact of new plantings will be similar to the above scenario even if local production is not currently satisfying the local market. For example, crops like tomatoes and some types of cucumbers can only be produced for a profit if they are marketed in the "off-season" when less expensive imports from the mainland and Mexico are not available. Other crops can only be economically produced during certain times of the year. The demand for some products is seasonal also. One example would be pumpkins. Local production satisfies the market except in the month of October. The orange gourds used for Jack-O-Lanterns are different from the pumpkins produced locally and the demand for these is met almost entirely by imports.

An indication of the seasonality of crops and potential demand for new plantings can be obtained by examining the market supply of local production relative to imports on a monthly basis. The fourth column of Table 3 gives the percentage of supply in Honolulu of the aggregate product group during the month when local production represents the largest percentage of supply, and the fifth column gives the number of months when local supply exceeds 70 percent of total market supply in Honolulu. Whenever local supply is greater than about 70 percent of market demand, any increase in supply from local sources can be expected to affect prices downward. Whenever local production or demand is seasonal and current production provides over seventy percent of demand for some months this is an indication that increases in local production will start to depress prices. This price decrease will make the new planting a less attractive enterprise and reduce the earning for all plantings of the crop -- both the existing and new plantings. Sweet potatoes, green onions, pumpkins, and avocados are crops which are currently imported in significant quantities. However, increases in planting of these crops would be expected to depress

market prices.

The three crops listed in Table 3 with the largest demands in the Honolulu market are tomatoes, dry onions, and potatoes. Most of the demand for these products is currently met by imports. This, however, does not necessarily imply that there is a substantial potential for expanded local production of these products. Potato production has been tried on Oahu and found to be unprofitable and thus this is not a likely crop for future expansion.

The demand datum listed for dry onions includes several different varieties of onions. Most of the onions currently imported are the medium and long day varieties and are priced below what it would cost to produce bulb onions in Hawaii. The demand for locally produced onions, which must have a higher price in order to be profitable, is limited. The potential for increased acreages of bulb onions is therefore limited.

Tomatoes can be a very profitable crop when marketed during the times when imports from the mainland and Mexico are scarce. However, when imports are plentiful and cheap, it is difficult to produce them competitively in Hawaii. Thus, there is some room for expansion in the production of tomatoes. However, the crop would have to be managed so as to produce during the late fall and winter. This is not the best agronomic time to grow tomatoes in Hawaii so yields will be low.

The crops for which there is a potential demand for increased acreage and which can be produced in a region with the physical, agronomic, and climatic characteristics of Waiewa are listed in Table 4. The second column gives the amount of additional acreage required to meet the entire Honolulu demand for the broad product group. However, for the reasons stated above, meeting such demand is not likely to be economically viable. The figures in the third column take into account the mix of products

contained within each product group, the seasonality of local production and demand, and the availability of low-priced competing products from sources outside the State during portions of the year. These numbers represent estimates of the number of acres that could be planted to the respective crop without significantly depressing prices in the local market.

Table 4. Feasible Crops for Expanded Plantings

Crop	Number of Acres Required to Meet 100 Percent of Honolulu Demand for Product Group	Number of Acres of New Plantings Estimated to be Economically Feasible
Avocados	116	0
Bananas, Chinese	543	398
Broccoli	185	80
Cucumbers	32	17
Eggplant, Round	4	1
Limes	54	43
Onions, Bulb	475	5
Onions, Green	7	1
Peas, Chinese	22	17
Peppers, Sweet	53	36
Potatoes, Table	1,632	0
Squash, Italian	38	24
Sweetpotatoes	22	9
Taro	83	10
Tomatoes	187	20
Watermelons	106	106
Total		766
Total net of bananas		368

The potential acreage for taro was reduced since the apparent market demand is for wetland and dryland types and only the dryland types are feasible on the Waiawa lands. Currently, there is little or no potential for expanded avocado production. Supplies on the mainland have increased dramatically and prices have declined drastically. Also, the U.S.D.A. animal and plant health inspection service (APHIS) no longer permits the export of Hawaii produced-avocados to Alaska.

From the viewpoint of the market, there is definitely a potential for increased production of bananas in the State. However, there are better places to produce bananas than Waiawa. Banana production in areas such as Waiawa would require irrigation. Production costs would be substantially less in areas such as Waimanalo (Oahu), the Puna and Hilo regions of the Big Island, and on parts of Kauai. Excluding bananas, the total potential demand for new plantings of crops suitable for lands similar to those in Waiawa is 368 acres.

Lands such as Waiawa, however, are not only suitable for the production of fruits and vegetables. They also could be used for the production of floral and nursery products, the production of seed, the production of forage crops and livestock uses.

Floral and Nursery Products

The floral and nursery industry in Hawaii has been expanding rapidly during the recent years. This industry, however, produces a large volume of highly valued products from a very small land area and does not require large acreages. The average size of all floral and nursery operations in the State is under three acres. For these crops, climate is typically more important in choosing a site than land quality. Current expansion of this industry is limited only by market availability and management capability, not by the availability of land. Also, several of the Agricultural Parks being developed make specific provisions for nurseries.

Seed Production

Lands such as Waiawa are suitable for the production of seed for crops such as corn if adequate irrigation water is available. The demand for land for the production of seed corn and other seeds tends to fluctuate depending on climatic conditions elsewhere in the world. It is difficult to plan on a long term demand for such a use and it appears that sufficient

lands are available to meet current levels of demand.

Forage Crop Production

Large amounts of grains are imported into the State as livestock feeds. The production of feed grains has not proven to be economically viable in Hawaii. However, the production of forage crops for green chop has potential. Corn for green chop has been produced on the North Shore of Oahu. The principal potential market for the green chop and other forage crops on Oahu is the dairy industry. However, if forage could be produced cheaply enough, the feedlot in Campbell Industrial Park is also a potential user.

The level and nearly level portions of lands such as Waiawa are well-suited for the production of forage crops if sufficient amounts of low-cost water are available. However, the production of forage for green chop on Waiawa is not likely to be an economically viable activity because of its location. Due to the fact that forage for green chop is a very bulky product and thus expensive to transport, most commercial forage operations are on lands adjacent to the place where it will be used. The current and potential users of green chop are the feedlot at Barber's Point and the dairies in Waianae and on the North Shore. Both the dairies and the feedlot are located too far from Waiawa to make Waiawa an optimal location for forage production.

Livestock

The fields in Waiawa could be used for the production of livestock. The production of swine and poultry, however, do not require large acreages and would not be limited if the Waiawa lands were not available. The lands could also be used for grazing. In fact, some of the upper portions are currently fenced for grazing. However, grazing is a very extensive use of land and returns per acre are very low. The beef industry in Hawaii has

been relatively stagnant during the past decade and is having a hard time competing with imported meat. Also, with the new feedlot and processing facilities in Hamakua, any likely expansion in the beef industry is most likely to occur on the island of Hawaii.

Conclusion

It is not the availability of land that is limiting the expansion of the crops listed in Tables 3 and 4, but rather the size of the market for locally produced crops. The de facto population of the entire State is only slightly more than a million persons and in the principal market area (Oahu), the de facto population is only 825,000 persons. This is a very small market and it does not require substantial acreage to supply such a market, particularly when many popular foods either require temperate climatic conditions not found in Hawaii or can be produced more profitably elsewhere and imported for less than it costs to produce them locally.

The subject lands have the agronomic potential to be productive agricultural lands. However, due to market parameters, the declining importance of the sugar industry, and the availability of similar lands on Oahu, placing the subject lands in an urban use will not have a significant impact on the agricultural sector of Honolulu County or the State. Lands of similar quality and economic potential are currently lying fallow and there are sufficient lands available to meet current and projected future agricultural needs. If these lands were to remain in agriculture, their most likely use would be for grazing and grazing is an activity that returns very little per acre.

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YUKIO NAKAGAWA REPORT

The Agricultural Production Potential of Lands in the Waiawa Revised Development Plan by Gentry, Island of Oahu

July 15, 1986

APPENDIX B

above the pan and moderate below. Runoff is slow and the erosion hazard is slight on the MoB soil. The runoff is rapid and erosion hazard is severe on the MoD2 soil. Runoff is slow and the erosion hazard is slight on the MpB and MpC soils. Runoff is rapid and erosion hazard is severe on the MpD2 soil.

Soil of the Helemano series is found on the site in the Puu Pohaku gulch and a lesser gully to the northwest as Helemano silty clay, 30 to 90 percent slopes (HLMG). This soil is on the sides of V-shaped gulches. The surface layer of this soil is dark reddish-brown silty clay. The subsoil is dark reddish-brown and dark-red silty clay that has subangular blocky structure. The soil is neutral in the surface layer and neutral to slightly acid in the subsoil. Permeability is moderately rapid. Runoff is medium to very rapid and the erosion hazard is severe to very severe.

Soil of the Kawaihapai series is also found on the eastern boundry as Kawaihapai stony clay loam, 2 to 6 percent slopes (KlaB). The surface layer of this soil is dark-brown clay loam with enough stones to hinder cultivation. The next layer in dark-brown stratified sandy loam with a stony and gravelly substratum. The soil is neutral in reaction throughout the profile. Permeability is moderate, runoff is slow and the erosion hazard is slight.

The eastern boundary of the site is bordered by Rockland (rRK) where exposed rock covers 25 to 90 percent of the surface. The rock outcrops and very shallow soils are the main characteristics. The rock outcrops are mainly basalt and andesite. This land type is nearly level to very steep.

A small amount of fill land (Fd) is found on the site adjacent to the western side of the gulch. This land type consists mostly of areas filled

with bagasse and slurry from sugar mills. A few areas are filled with material from dredging and from soil excavations. Generally, these materials are dumped and spread over marshes, low-lying areas along the coastal flats, coral sand, or areas shallow to bedrock.

The entire site was previously cultivated to sugar cane with some areas used as pasture lands for beef animals. Alternate agricultural uses of this site is possible only with the availability of low cost irrigation water, the selection of the best adapted crop enterprises to fit the climatic and soil conditions, the satisfactory marketability of crops produced and with adequate management skills to successfully operate the enterprises.

Livestock production enterprises except for dairy and beef animal pasture use is not adviseable because of the manure odor and noise problems which are not compatible with the residential developments to the south and southwest of the site.

Alternate agronomic crop uses on this site are the production of Papaya, bananas, guava, macadamia nut, livestock forage, corn for genetic material and seeds and fresh market vegetables, flowers and ornamental plants.

The fairly level lands designated prime agricultural lands with slopes of 0 to 10 percent are suitable for the cultivation of selected vegetables, fruits, forage, corn, flowers, ornamentals and greenhouse floral and nursery crops. The liberal use of fertilizers and other soil amendments and the correct use of pesticide chemicals to control weeds, insects, and diseases will become necessary for most crop production.

On the steeper portions of the site designated prime and other important agricultural lands with slopes of 10 to 25 percent, the land workability is difficult because of the slope. These lands are not suitable for fast

maturing and shallow rooted vegetable and floral crops because of the erosion hazard but should be suitable for contoured plantings of perennial floral and ornamental crops such as Red Ginger, Bird of Paradise, Heliconia, Plumeria and other orchard type crops such as Limes, Macadamia Nuts, Guava, Banana, Passion Fruit, Mangoes, Litchi and Avacado. With the recent approval by the Federal government of the use of irradiation to control fruit and melon flies the export potential of Hawaiian grown fruits and some vegetables may become a reality in the near future.

TABLE 1

Wind speeds (miles/Hour) at Waipio
from November 1958 to October 1959

	Miles/Hour						
Month	0-0400	0400-0800	0800-1200	1200-1600	1600-2000	2000-2400	Monthly 24 hrs. Average
1958							
Nov.	4.2	4.1	5.3	8.5	5.7	4.0	5.3
Dec.	3.3	3.4	5.2	7.4	4.3	4.3	4.5
1959							
Jan.	2.8	2.7	3.9	7.4	4.6	3.0	4.1
Feb.	3.8	3.7	6.4	8.9	6.1	3.9	5.5
Mar.	4.8	3.9	7.9	10.0	6.7	4.9	6.4
April	3.2	2.9	6.2	8.7	5.6	3.5	5.0
May	3.0	3.0	6.8	9.0	6.1	3.2	5.2
June	2.7	2.8	7.0	9.1	6.8	3.1	5.3
July	3.1	3.0	6.9	9.2	6.9	3.3	5.4
Aug.	3.2	3.2	6.9	9.4	6.6	3.5	5.5
Sept.	2.8	2.5	6.5	8.2	5.2	2.6	4.6
Oct.	2.3	2.4	4.6	7.0	3.9	2.0	3.7

12M-4:00a.m.	4am-8am	8am-12N	12N-4pm	4pm-8pm	8pm-12M	Annual 24 hrs. Average
3.3	3.1	6.1	8.6	5.7	3.4	5.0

TABLE 2

EWA PLANTATION 741

MEAN TEMPERATURE

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	ANNUAL
1951	72.4	71.2	72.4	73.8	75.6	76.5	78.8	79.0	78.5	77.6	75.6	73.2	75.4
1952	71.5	71.6	72.7	72.7	73.2	76.4	77.4	78.0	77.0	76.5	75.7	72.9	74.6
1953	71.2	72.1	73.0	73.9	76.6	77.5	78.4	79.0	77.1	76.7	74.4	72.2	75.2
1954	70.8	71.9	71.0	74.0	74.7	77.9	77.8	79.5	78.7	77.5	75.8	72.8	75.2
1955	71.3	70.6	69.9	74.0	74.9	75.8	77.0	76.2	76.0	75.3	74.2	73.0	74.0
1956	72.7	71.7	73.3	73.5	75.2	76.4	77.5	78.5	77.8	77.0	74.8	72.6	75.1
1957	71.9	69.8	70.8	73.4	74.7	77.3	78.7	79.1	78.3	77.9	76.3	73.2	75.1
1958	70.2	70.5	69.6	73.0	75.0	77.5	77.8	79.2	79.0	76.3	73.9	71.2	74.4
1959	71.1	70.7	73.7	73.9	76.2	78.1	79.0	79.2	79.1	77.2	75.5	73.4	75.6
1960	71.6	70.9	72.2	74.0	76.2	77.7	78.4	79.2	78.5	77.8	75.6	73.1	75.4
Period	71.5	71.1	71.9	73.6	75.2	77.1	78.1	78.7	78.0	77.0	75.2	72.8	75.0
Years	10	10	10	10	10	10	10	10	10	10	10	10	
Record	70.4	70.5	71.3	72.8	74.5	76.4	77.4	78.0	77.5	76.2	74.0	72.0	74.3
Years	55	55	55	55	55	55	55	55	55	55	55	55	
Normal	71.0	70.9	71.8	73.1	74.9	76.8	77.7	78.3	77.6	76.6	74.5	72.5	74.6

TABLE 3

MAUNALU 750 STATION
TOTAL PRECIPITATION

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	ANNUAL	% OF NORMAL
1951	3.82	4.40	17.95	1.85	.43	.14	.45	.97	1.44	6.89	.46	5.48	44.28	167.2
1952	4.16	.32	1.99	.47	.39	.09	.22	.03	.26	4.38	1.39	1.02	14.72	55.6
1953	1.19	2.23	2.34	2.60	.10	.21	.17	.09	.03	1.50	.57	2.61	13.64	51.5
1954	1.39	3.54	3.11	4.34	.30	.18	2.03	.63	.51	1.30	12.47	4.98	34.78	131.3
1955	3.56	13.55	6.00	.82	.89	.05	.43	1.43	.71	.70	2.84	8.64	39.62	149.6
1956	8.84	3.63	1.43	.48	2.05	.36	.17	.83	1.02	1.88	4.79	5.38	30.86	116.5
1957	14.56	1.59	.15	1.56	.79	.25	.62	.90	.16	.16	4.20	4.31	29.25	110.5
1958	.57	1.64	12.31	.34	.34	.64	.84	4.48	.45	3.56	.22	1.72	27.11	102.4
1959	3.40	2.92	.33	.77	.27	.28	.34	2.94	.31	.32	2.11	.87	14.86	56.1
1960	.71	1.48	1.54	.12	3.55	.43	.52	.65	.59	1.43	1.34	3.14	15.50	58.5
10YRS	4.22	3.53	4.72	1.34	.91	.26	.58	1.30	.55	2.21	3.04	3.82	26.48	
YEARS	10	10	10	10	10	10	10	10	10	10	10	10		
RECORD	3.65	3.49	3.26	1.72	1.21	.65	.55	1.03	1.10	1.91	2.49	3.99	25.25	
YEARS	62	63	63	63	63	63	61	64	64	64	64	64		
NORMAL	4.16	3.69	3.18	1.88	1.20	.60	.67	1.23	1.08	2.34	2.56	3.54	26.13	
1978	1.06	.57	1.06	3.58	3.31	1.60	.12	1.11	.32	10.05	.60	1.69	25.07	95.1
1979	2.92	8.88	.36	.75	1.13	1.38	.15	.12	.41	1.43	.20	1.49	19.22	72.9
1980	12.25	3.08	2.56	1.11	1.03	1.65	.64	.30	1.70	.66	.46	4.43	29.87	113.3
1981	.75	1.48	.83	.26	.63	.21	.33	1.28	.31	1.38	1.85	4.77	14.08	53.4
1982	12.18	3.20	5.90	2.94	.27	1.68	.63	1.87	.85	8.42	3.44	3.72	45.10	171.2
1983	.45	.02	.26	1.05	.92	.39	.71	.43	.89	.38	.28	1.35	7.13	27.1
1984	.36	1.10	1.27	1.69	.35	.11	.29	.05	.33	2.67	2.60	4.46	15.28	58.0
NORMAL	5.0	2.71	3.20	1.88	1.20	.36	.76	.92	.84	2.04	3.35	4.09	26.35	

TABLE 4

Waiawa (675) 24 year Record (1905-1935)

Annual Rainfall Data in Inches

Maximum	Upper quartile	Median	Lower quartile	Minimum
81.8	56.6	42.9	38.2	23.9

Monthly Rainfall Data in Inches

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Max.	23.9	22.4	13.5	12.7	7.2	8.9	6.1	5.9	9.9	9.5	14.2	25.2
Med.	4.5	2.2	4.6	2.7	2.3	2.5	2.9	2.4	3.0	3.0	3.8	5.8
Min.	0.8	0.2	1.1	0.8	0.3	1.2	0.5	1.2	0.7	0.9	0.6	0.7

VEGETABLES

Cultivation of vegetable crops should be restricted to land of 0 to 10 percent slopes, except for untrellised vine crops which could utilize lands with slopes up to 15 percent. Windbreak plantings, soil conservation practices, an adequate supplemental irrigation water supply and production, management and marketing skills are essential to the successful operation of any vegetable production venture. Greenhouse production of vegetable crops is not economically feasible at the site because of the climatic conditions which induces high temperature and humidity conditions within the greenhouses. Cooling of the greenhouses by the fan and wet-pad method (evaporation method) is not satisfactory because of the relatively high humidity conditions throughout most of the year. The high cost of gas and electric power also prohibits the use of air conditioning cooling method for the greenhouses.

The following outline lists the crops most commonly adapted to this area for commercial production with data on their yield per acre, total water requirements, adapted cultivars, crop occupancy of land, possible number of crops that can be grown per year, and in many cases the estimated gross return per acre per crop.

The basic reference used in obtaining the yield per acre and farm price figures is, "The Statistics of Hawaiian Agriculture 1984, prepared by the Hawaii Agricultural Reporting Service in July 1985. The Oahu yield per acre and farm prices used are the average of the five years 1980 through 1984. Water requirements are based on sprinkler and furrow methods of irrigation. With the use of the drip method of irrigation, the water requirements could be reduced approximately 50 to 60 percent of the total

amounts for each crop.

The following types of vegetable crops would be adapted for production in this area:

1. CUCUMBERS (Trellised culture up to 8 percent slopes, untrellised culture 8 to 15 percent slopes.)

   Optimum pH range - 5.5 to 6.8
   Cultivars: Burpees hybrid, Progress, Sweet Slice and others. Long fruited oriental types not suitable for untrellised culture because of deformed fruit formation.
   Water requirement - 18 acre inches (486,000 qals.) per crop.
   Average length of crop - 110 days
   Possible number of crops/acre/year = 3
   Average yield/acre/crop - 13,340 lbs.
   Estimated gross return/acre/crop @34.8¢/lb. = $4,642.32

2. EGGPLANT

   Optimum pH range - 5.5 to 6.8
   Cultivars: Waimanalo Long, Florida Market and others
   Water requirement - 30 acre inches (815,000 gals.) per crop
   Average length of crop - 160 days.
   Possible number of crops/acre/year = 2
   Average yield/acre/crop - 20,055 lbs. long types; 26,740 lbs. round and oblong types.
   Estimated gross return/acre/crop @50.1¢/lb. long types - $10,647.55
   Estimated gross return/acre/crop @40¢/lb. round and oblong types = $10,696.00.

3. GREEN PEPPERS

   Optimum pH range - 5.5 to 6.8
   Cultivars: Keystone Resistant Giant, Emerald Giant, and others.
   Water requirement - 30 acre inches (815,000 gals.) per crop
   Average length of crop - 150 days
   Possible number of crop/acre/year = 2
   Average yield/acre/crop - 14,500 lbs.
   Estimated gross return/acre/crop @53.2¢/lb. = $7,714.00

4. TOMATO

   Optimum pH range - 5.5 to 6.8
   Cultivars: Hybrids N-101, N-52 under pruned and staked culture; open pollinated HES 8228 unpruned and unstaked culture.
   Water requirement - 30 acre inches (815,000 gals.) per crop.

Average length of crop - 150 days.
Possible number of crop/acre/year = 2
Average yield/acre/crop = 22,040 lbs.
Estimated gross return/acre/crop @47.1¢/lb. = $10,380.84

5. LETTUCE (Semi-head types only)

Optimum pH range - 6.0 to 6.8
Cultivars: Manoa (Green Mignonette) year round and Anuenue from October through April only.
Water requirement - 20 acre inches (540,000 gals.) per crop.
Average length of crop - 55 to 65 days.
Possible number of crops/acre/year = 6 for Manoa; 3 for Anuenue.
Average yield/acre/crop = 14,780 lbs.
Estimated gross return/acre/crop @35.2¢/lb. = $5,202.56

6. SWEET POTATOES

Optimum pH range - 5.0 to 6.8
Cultivars - Baking types: Kona-B, Iliula, Onolena and Centennial; Dry types: Waimanalo Red and others.
Water requirement - 30 acre inches (815,000 gals.) per crop.
Average length of crop - 150 days.
Possible number of crops/acre/year = 2
Average yield/acre/crop - 11,300 lbs.
Estimated gross return/acre/crop @32.4¢/lb. = $3,661.20

7. SWEET CORN (fresh market)

Optimum pH range - 5.5 to 6.8
Cultivars: Hawaiian Supersweet No. 10 hybrid and Supersweet No. 9 open pollinated (not adapted to machine harvesting).
Water requirement - 20 acre inches (540,000 gals.) per crop.
Average length of crop - 80 to 100 days.
Possible number of crops/acre/year = 3
Average yield/acre/crop - 3,420 lbs.
Estimated gross return/acre/crop @31.5¢/lb. = $1,077.30

8. GREEN or SNAP BEANS

Optimum pH range - 5.5 to 6.8
Cultivars - Pole types: Manoa Wonder or Hawaiian Wonder
Bush types: Green Crop
Water requirement - 20 acre inches (540,000 gals.) per crop for pole types; 18 acre inches (486,000 gals.) per crop for bush type.
Average length of crop: 90 to 120 days for pole types; 75 to 90 days for bush type.
Average yield/acre/crop - Pole types = 9,820 lbs.
Bush type = 7,660 lbs.
Estimated gross return/acre/crop @74.5¢/lb. for Pole types = $7,315.90; @66.2¢/lb. for bush type = $5,070.92

9. GREEN ONIONS

Optimum pH range - 6.0 to 6.8
Cultivar: Hawaiian bunching types propagated by sets.
Water requirement - 20 acre inches (540,000 gals.) per crop.
Average length of crop - 90 to 100 days.
Possible number of crops/acre/year = 3
Average yield/acre/crop - 8,180 lbs.
Estimated gross return/acre/crop @74.8¢/lb. = $6,118.64

10. DAIKON

Optimum pH range - 5.5 to 6.8
Cultivar: Chinese Half-long and Everest hybrid
Water requirement - 18 acre inches (486,000 gals.) per crop.
Average length of crop - 60 to 70 days.
Possible number of crops/acre/year - 5 crops.
Average yield/acre/crop - 15,280 lbs.
Estimated gross return/acre/crop @21.3¢/lb. = $3,254.64

11. EDIBLE GINGER ROOT

Optimum pH range - 5.5 to 6.8
Cultivar: Chinese ginger
Water requirement - 60 acre inches (1,620,000 gals.) per crop.
Average length of crop - 12 to 14 months.
Possible number of crops/acre/year - 3/4 to 1 crop
(Planting time October through March)
Average yield/acre/crop - 38,140 lbs.
Estimated gross return/acre/crop @67.2¢/lb. = $25,630.08

12. RED RADISH

Optimum pH range - 5.5 to 6.8
Cultivars: Early Scarlet Globe, Cherry Belle, and others.
Water requirement - 12 acre inches (324,000 gals.) per crop.
Average length of crop - 25 to 30 days.
Possible number of crops/acre/year = 12 crops.
Average yield/acre/crop - 10,440 lbs.
Estimated gross return/acre/crop @33.4¢/lb. = $3,486.96

13. DASHEEN

Optimum pH range - 5.5 to 6.8
Cultivars: Araimo, Tsurunoko and others.
Water requirement - 50 acre inches (1,350,000 gals.) per crop.
Average length of crop - 8 to 10 months.
Possible number of crops/acre/year - 1 crop.

Average yield/acre/crop - 24,660 lbs.
Estimated gross return/acre/crop @56.1¢/lb. = $13,834.26

14. TARO (Upland or non-paddy culture)

Optimum pH range - 5.5 to 6.8
Cultivars: Lehua, Piko Kea, Piko Uaua, and Piko Uliuli.
Water requirement - 60 acre inches (1,620,000 gals.) per crop.
Average length of crop - 12 to 14 months.
Possible number of crops/acre/year - 3/4 to 1 crop.
Average yield/acre/crop - 10,970 lbs.
Estimated gross return/acre/crop @22.4¢/lb. = $2,457.28

15. EDIBLE PODDED PEAS (Chinese Peas) Trellise required.

Optimum pH range - 6.0 to 6.8
Cultivar: Manoa Sugar (Powdery mildew resistant)
Water requirement - 20 acre inches (540,000 gals.) per crop.
Average length of crop - 100 to 120 days.
Possible number of crops/acre/year - 3 crops.
Average yield/acre/crop - 4,820 lbs.
Estimated gross return/acre/crop @$1.91/lb. = $9,206.20

16. ORIENTAL GOURDS (Untrellised culture)

Optimum pH range - 5.5 to 6.8
Cultivars: White flowered gourd - Yuugao (club shaped fruit);
Wax gourd (Togan) - Okinawa, Kurokawa and others.
Water requirement - 30 acre inches (815,000 gals.) per crop.
Average length of crop - 160 to 180 days.
Possible number of crops/acre/year - 2 crops.
Average yield/acre/crop - 13,960 lbs.
Estimated gross return/acre/crop @21.3¢/lb. = $2,973.48

17. BITTER MELON (trellised culture)

Optimum pH range - 5.5 to 6.8
Cultivars: Medium and long fruited types.
Water requirement - 30 acre inches (815,000 gals.) per crop.
Average length of crop - 160 to 180 days.
Possible number of crops/acre/year - 2 crops.
Average yield/acre/crop - 13,000 lbs.
Estimated gross return/acre/crop @68.8¢/lb. = $8,957.00

18. PUMPKIN and WINTER SQUASHES

Optimum pH range - 5.5 to 6.8
Cultivars - Pumpkin: Small Sugar, Jack O'Lantern and Big Tom.

Winter squashes: Butternut, Table Queen, Royal Acorn.
Tetsukabuto and other Japanese hybrids.
Water requirement - 30 acre inches (815,000 gals.) per crop.
Average length of crop - 160 to 180 days.
Possible number of crops/acre/year - 2 crops.
Average yield/acre/crop - 13,220 lbs.
Estimated gross return/acre/crop @22.7¢/lb. = $3,000.94

19. SUMMER SQUASH

Optimum pH range - 5.5 to 6.8
Cultivar: Black Zucchini and other zucchini type hybrids.
Water requirement - 18 acre inches (486,000 gals.) per crop.
Average length of crop - 110 days
Possible number of crops/acre/year - 3 crops.
Average yield/acre/crop - 11,680 lbs.
Estimated gross return/acre/crop @36.1¢/lb. =$4,216.48

20. WATERMELON

Optimum pH range - 5.5 to 6.8
Cultivars: Crimson Sweet, Glory Hybrid and others.
Water requirements - 30 acre inches (815,000 gals.) per crop.
Average length of crop - 150 days.
Possible number of crops/acre/year - 2 crops but market demand and price favors 1 crop/year. Highest prices obtained for fruits harvested in March to April.
Average yield/acre/crop - 10,600 lbs.
Estimated gross return/acre/crop @26.8¢/lb. = $2,840.80

21. BULB ONION

Optimum pH range - 6.0 to 6.8
Cultivars: Yellow Granex Hybrid, Early Texas Grano 502, Excel 986, and Awahia (pungent type).
Water requirement - 30 acre inches (815,000 gals.) per crop.
Average length of crop - 160 days (seed to harvest).
Possible number of crops/acre/year - 1 crop seeded from September through February.
Average yield/acre/crop - 12,400 lbs.
Estimated gross return/acre/crop @55.1¢/lb. = $6,832.40

22. POTATO (Spud)

Optimum pH range - 5.0 to 6.8
(pH range of 5.0 to 5.5 advisable for scab susceptible cultivars.)
Cultivars: Kennebec, Red Pontiac, Bliss Triumph.
Water requirement - 30 acre inches (815,000 gals.) per crop.

Average length of crop - 120 to 140 days.
Possible number of crops/acre/year - 1 crop grown between November and March.
Average yield/acre/crop - 12,500 lbs. (Last available data in 1977.)
Estimated gross return/acre/crop @19.8¢/lb. = $2,475.00
Commercial production of potatoes discontinued since 1977 because of low yields and high production costs. This crop is better suited for temperate zone climates.

23. MUSTARD CABBAGE

Optimum pH range - 6.0 to 6.8
Cultivars: Kai Choy strains
Water requirement - 20 acre inches (540,000 gals.) per crop.
Average length of crop - 50 to 60 days.
Possible number of crops/acre/year - 6 crops.
Average yield/acre/crop - 11,140 lbs.
Estimated gross return/acre/crop @31.0¢/lb. = $3,453.40

24. BROCCOLI

Optimum pH range - 6.0 to 6.8
Cultivars - Hybrids: Green Comet, Green Duke, Bonanza, and Premium Crop.
Water requirement - 24 acre inches (648,000 gals.) per crop.
Average length of crop - 75 to 85 days for central head harvest only.
Possible number of crops/acre/year - 4 crops.
Average yield/acre/crop - 10,080 lbs.
Estimated gross return/acre/crop @35.4¢/lb. = $3,568.32

The following vegetable crops which are imported in great quantities are not climatically suitable for production on this site because of their cool temperature requirements for good quality and yields: Chinese Head Cabbage, Head Cabbage, Carrot, Cauliflower, Celery, Head Lettuce, Romaine Lettuce, and Potato during most of the year. The relatively good storage, long-day and medium-day length onions are also not suitable because of their requirements for longer day length periods for proper bulb formation and curing.

The production of summer squashes and most of the melons except Zucchini and Watermelon are not suitable to the area because of the high incidence of insect and disease infestations that cause severe reduction in yields to increase the production cost and make it economically unfeasible to compete with the imports.

FRUIT CROPS

Commercial production of the following fruit crops is suited to the soil and climate of this area:

1. PAPAYA - 3 years crop cycle (field planting to end of harvest)

   Optimum pH range - 5.5 to 6.8
   Cultivars: Waimanalo X-77, Sunrise, and others adapted to the area.
   Water requirement - 60 acre inches (1,620,000 gals.) per year for 3 years.
   Average length of crop - 3 years.
   Possible number of crops/acre/year - 1/3
   Average acre yield per crop in 3 years = 49,000 lbs.
   (first year - 4,000 lbs., 2nd year - 25,000 lbs., 3rd year - 20,000 lbs.
   Estimated gross return/acre/crop @34.7¢/lb. = $17,003.00
   Estimated gross return/acre/year = $5,667.67

2. BANANAS

   Optimum pH range - 5.0 to 6.8
   Cultivars: Williams hybrid, Valery, Taiwan and Brazilian
   Water requirement - 60 acre inches/year (1,620,000 gals.)
   Length of crop - 10 years.
   Possible number of crops/acre/year - 1/10
   Average yield/acre/crop in 10 years (1st year no harvest):
   Brazilian - 4,740 lbs./year x 9 = 42,660 lbs.
   Williams and others - 12,450 lbs./year x 9 = 112,050 lbs.
   Estimated gross return/acre/crop in 10 years:
   Brazilian - 42,660 lbs. @35¢/lb. = $14,931.00
   Williams and others - 112,050 lbs. @23.3¢/lb. = $26,107.65
   Estimated gross return/acre/year for 10 years:
   Brazilian - $14,931.00 divided by 10 = $1,493.10
   Williams and others - $26,107.65 divided by 10 = $2,610.77

3. GUAVA (for processing)

   Optimum pH range - 5.5 to 7.0
   Cultivar: B-30 or others with good processing qualities
   Water requirement - 60 acre inches/year (1,620,000 gals.) per year.
   Length of crop - 25 to 30 years with proper pruning and other good cultural practice.
   Possible number of crops/acre - 1 planting every 25 to 30 years.

   Possible number of harvest/year:
   First harvest begins after three years of field planting of seedlings, grafted plants, or rooted cuttings - 8 to 16 months old.
   One yearly harvest during Summer to Fall months from 3 to 30 years.
   Average yield/acre/year - 5,000 lbs. first harvest at 3 years, 10,000 lbs. second harvest at 4 years, and 15,000 lbs. from fifth year on.
   Estimated gross return/acre/year @10¢/lb.:
   5,000 lbs. @10¢/lb. = $500.00 first harvest at 3 years.
   10,000 lbs. @10¢/lb. = $1,000.00 second harvest at 4 years.
   15,000 lbs. @10¢/lb. = $1,500.00 third harvest after 5 years to end of crop at 25 to 30 years.

   Large scale production of guava is not advisable until the export market for the processed products is substantially increased.

4. YELLOW PASSION FRUIT

   This crop requires a trellis system for the crawling vines for good fruit production but the cost of construction of an adequate trellis system is too high for profitable returns for this crop. The planting and use of the fast growing Haole Koa varieties grown in hedge rows could be tried as a low cost trellis system.

   Optimum pH range - 5.5 to 6.8
   Cultivar: Yellow Passion Fruit (Passiflora edulis var. flavicarpa)
   Water requirement - 60 acre inches/year (1,620,000 gals.)
   Length of crop - Four to five years with proper pruning and other good cultural practices.
   Possible number of crops/acre - one every 5 years.
   Possible number of harvest/year - Main crop in late Summer with possible smaller crop in Winter.
   Average yield/acre/crop - 20,000 lbs. first year and 12,000 lbs./year during the next 3 to 4 years.
   Estimated gross return/acre/year @11.2¢/lb. = $2,240.00 the first year and $1,344.00 for the next 3 to 4 years.

5. LIMES (Green fleshed varieties only)

   Optimum pH range - 5.5 to7.0
   Cultivars: Mexican, Florida Seedless, Tahitian and others.
   Water requirement - 60 acre inches/year (1,620,000 gals.)
   Possible number of crops/acre - One planting every 15 years.
   Spacing between trees - 15 x 15 ft. (193 trees/acre.)
   Average estimated yield and gross return/acre - First harvest in third year after field planting of grafted plants 12 to 18 months old.

First harvest at 3 years - 5 lbs./tree x 193 trees = 965 lbs./acre x 25¢/lb. = $241.25/acre.
Second harvest at 4 years - 15 lbs./tree x 193 trees = 2,895 lbs./acre x 25¢/lb. = $723.75/acre.
Third harvest at 5 years - 25 lbs./tree x 193 trees = 4,825 lbs./acre x 25¢/lb. = $1,206.25/acre
Fourth harvest at 6 years - 40 lbs./tree x 193 trees = 7,720 lbs./acre x 25¢/lb. = $1,930.00/acre
Fifth harvest at 7 years on to 15 years -50 lbs./tree x 193 trees = 9,650 lbs./acre @25¢/lb. = $2,412.50/acre

Commercial production of other citrus fruits is not economically feasible because of climatic conditions which favor the production of poor quality fruits.

6. AVOCADO

This crop should be adapted to the soil and climatic condition of this area if grown under irrigation. Cultivars with low and sprawling type of growth habit will be easier to harvest, but will require more area per tree thus reducing the tree population and yield per acre.

Optimum pH range - 5.0 to 7.0
Cultivars: Beardslee (9-11), Panchoy (3-7), Kahaluu (10-11), Nabal (3-7), Sharwil (3-5), Murashige (4-8), Fuerte (11-4), and Hayes (3-5).

NOTE: The numbers in parentheses indicate approximate months of year fruits come into harvest.

Water requirement - 60 acre inches/year (1,620,000 gals.)
Length of crop - 30 years plus
Possible number of crops/acre - 1 planting every 31 years.
Possible number of harvest/year - First harvest in 4 to 5 years from field planting of budded or grafted plants 12 to 18 months old. Once a year harvest thereafter.
Average estimated yield and gross return/acre/year with 35 trees planted 35 ft.x 35 ft.
First harvest at 5 years - 30 lbs./tree x 35 trees = 1,050 lbs. @25¢/lb. = $262.50/acre.
Second harvest at 6 years - 50 lbs./tree x 35 trees = 1,750 lbs. @25¢/lb. = $437.50/acre.
Third harvest at 7 years - 75 lbs./tree x 35 trees = 2,625 lbs. @ 25¢/lb. = $656.25/acre
Fourth harvest at 8 years - 150 lbs./tree x 35 trees = 5,250 lbs. @25¢/lb. = $1,312.50/acre.
Fifth harvest at 9 years - 200 lbs./tree x 35 trees = 7,000 lbs. @25¢/lb. = $1,750.00/acre, and remaining harvests up to 30 years.

7. MACADAMIA NUTS

The climatic conditions and soil are suitable for the production of this crop but irrigation water will be required in most years to supplement the low to moderate average rainfall of 26.35 inches per year in the lower portion of the site and 42.9 inches in the upper portion of the site. An average of at least 60 inches of rainfall uniformly distributed over the year is recommended for this crop under unirrigated conditions. The cost of the supplemental irrigation required in this area may make the production of this crop economically unfeasible in competition with those grown under unirrigated conditions.

8. PINEAPPLE

This crop is well suited for production in the upper portion of the site. The acid soil and average annual rainfall of 42.9 inches are favorable for the production of this crop for fresh market sale. Supplemental irrigation may become necessary during the drier months of the year.

Production of pineapples for the fresh market in competition with Dole and Del Monte may be economically unfeasible for new growers of this crop.

FLORAL CROPS

The climate, soil, and the close location of this area to the Honolulu market makes this area ideal for the production of certain floral and ornamental crops.

1. ANTHURIUMS for cut flowers

Grown under 75% saran shade-cloth house and planted in cinder and wood shavings. Replanted once in 5 years.

Cultivars: Good flower producers of popular flower (spathe) colors.
Water requirement - 60 acre inches/year (1,620,000 gals.) per acre.
Developing cost of one acre, 75% shade, saran shade-cloth house with 25,000 plants grown in cinders plus wood shaving media = $42,000.00
Average acre yield in 5 years - 54,166 dozen flowers.
(First year - none, 2nd to 5th year - 6.5 marketable flowers/plant.
Estimated gross return in 5 years @2.50/dozen = $135,415.00
Estimated gross return/year = $27,083.00
Estimated production, harvesting, and marketing cost @85% of gross - $23,020.55
Estimated net return/acre/year = $4,062.45

NOTE: Yield and cost figures adaped from "A Cost Study of Anthurium Production, Island of Hawaii 1974", by H.D. Marutani and Warren Ikeda, CES Farm Management series, Vol.2, No. 2, University of Hawaii, July 1975.

In 1984, Oahu produced and marketed 80,000 dozen bunches of cut anthurium flowers valued at $276,000.00 out of a state total of 2,335,000 dozen bunches valued at $7,351,000.00 produced mostly on the island of Hawaii.

2. DENDROBIUM ORCHID for cut flower production under 30% saran shade-cloth house.

Cultivars: Louis Bleriot and Jacqueline Thomas: Uniwai Blush, Uniwai Supreme and Uniwai Pearl.
Water requirement - 60 acre inches/year (1,620,000 gals.) per acre.
Capital investment for one acre = $127,000.00. Including: site improvement, fencing, shade house, 1,000 sq. ft. multipurpose building, benches, automatic PVC irrigation system, panel truck, miscellaneous tools and 25,000 three year old plants of the cultivars listed above.
Estimated average yield/acre/year - 278,314 floral spikes (23,192.9 dozens).
Estimated gross return/acre/year @3.00/dozen = $69,578.40
Estimated gross return/acre/year @2.50/dozen = $57,982.00
Estimated gross return/acre/year @2.5¢/flower for lei heads (at 8 flowers per spike x 278,314 spikes = 2,226,516 flowers) = $55,162.80
Estimated cost of operation/year - $54,000.00 (including interest on investment).
Estimated net return/acre/year @3.00/dozen = $15,576.40
Estimated net return/acre/year @2.50/dozen = $3,982.00
Estimated net return/acre/year @2.5¢/flower = $1,662.80

NOTE: Yield and cost figures adapted from "The Economics of Growing Dendrobium on Oahu for Mainland Export", by S.G. Camp, III and P.F. Philipp, Department Paper 37, HAES - University of Hawaii, March 1976.

In 1984, seventy one dendrobium farms statewide produced and marketed 208,000 dozen sprays valued at $1,278,000.00. Thirty seven farms also marketed 10,500,000 flowers for leis valued at $314,000.00. The Oahu farms marketed 162,000 dozen sprays valued at $1,001,000.00 and 6,500,000 flower heads valued at $190,000.00.

3. PLUMERIA for lei flowers

The soil and climate in this area is suitable for this purpose. Cultivars which produce blossom with thick and rigid petals such as the common yellow, Gold and Puu Kahea should be planted on the contour at a spacing of 15 ft. x 15 ft. for 193 trees to an acre. Rooted terminal cuttings about 12 inches in height should start producing saleable flowers in 3 years with good production from 5 years. One planting should last for 25 to 30 years. Production data per tree and per acre are not available. According to the "Statistics of Hawaii Agriculture 1984, there were 17 plumeria farmers in the state that produced 25,400,000 flowers valued at $484,000.00. The Oahu production was 9,400,000 flowers valued at $154,000.00.

4. CHRYSANTHEMUM cut flower production of pompom types.

This crop is adapted for production in this area on lands with slopes from 0 to 10 percent. This crop can be produced the year round with the choice of the proper cultivars responding to artificial light treatments and other good cultural practices.

The 1984 "Statistics of Hawaiian Agriculture", gives the following

data for this crop: Statewide 14 farms produced and marketed 457,000 bunches of flowers with a wholesale value of $690,000.00. The Oahu farms produced and marketed 315,000 bunches valued at $440,000.00.

The large flowered (standard) chrysanthemum for cut flower production in this area is not economically feasible because of less favorable climatic conditions as compared to the competing area of Kula, Maui.

5. CARNATION for lei flower production is possible in this area.

   Optimum pH range - 6.5 to 7.0
   Cultivars: Common pink, Uniwai Pink, Scania (red), White Elegance, BGA Twinkle (white with red stripes) and Elegance.
   Water requirement - 40 acre inches/year (1,086,160 gals.)
   Average length of crop - 18 months
   Possible number of crops/acre/year - 1 crop every 2 years.
   Average yield/acre/crop with 65,000 plants/acre - 1,016,250 flower heads.
   Estimated gross return/acre/crop @2.5¢/flower = $25,406.25
   Estimated gross return/acre/year @2.5¢/flower = $12,703.13

   In 1984, twenty farms statewide produced and marketed 33,600,000 flowers valued at $1,112,000.00. The island of Maui produced 32,000,000 flowers valued at $1,065,000.00. Hawaii, Kauai and Oahu produced 1,600,000 flowers valued at $47,000.00.

6. Other lei flower production suitable in this area:

   a. PIKAKE - The soil and relatively warm and dry climate of the lower area is suitable for the production of this crop for lei flowers.

      In 1984, 15 farms all on the island of Oahu produced and marketed 110,000 strands of lei valued at $160,000.00.

   b. TUBEROSE - The climate and soil of this area is suitable for the production of this crop for lei flower production.

      In 1984, 6 farms produced and marketed 28,000,000 flowers valued at $720,000.00 at wholesale. During the last 5 years (1980 to 1984) the average flower production was 27,200,000 flowers valued at $642,400.00 at wholesale.

   c. VANDA JOAQUIM - The climate is suitable for the production of this crop grown in wood shavings and fertilized with poultry manure and with adequate irrigation.

      The cuttings are planted in 36 inch beds with 6 rows at 6 inch

spacing and plants in rows at 4 inch spacing with aisles 36 inches wide between beds. Total plant population at 128,150 plants/acre. Flower production the year round but peak flowering during late Spring to early Summer months.

Estimated production/acre/year = 2,000,000 flowers 8 - 10 months after planting.
Estimated gross return/acre/year @1.5¢/flower = $30,000.00.
Estimated cost of planting material @25¢/foot = 128,150 x 0.25 = $32,037.50.
One planting every 5 - 6 years.

In 1984, twenty eight farms produced and marketed 28,000,000 flowers statewide at a wholesale value of $1,090,000.00.

The island of Hawaii produced 24,000,000 flowers valued at $950,000.00. Oahu and Kauai produced the remaining 4,000,000 flowers valued at $140,000.00.

7. Cut flower production of BIRD OF PARADISE and RED GINGER is suited to the soil and climate of this area. "The Statistics of Hawaiian Agriculture, 1984" gives the following data on these crops:

   a. BIRD OF PARADISE as cut flowers were produced statewide on 50 farms marketing a total of 51,000 dozens of flowers at a wholesale value of $186,000.00.

      Yield per acre and other production data are not avilable for this crop.

   b. RED GINGER as cut flowers were produced on 60 farms statewide with 82,000 dozens of flowers marketed at wholesale value of $267,000.00. The farms on Oahu produced and marketed 53,000 dozens at a value of $178,000.00.

      Production data are not available for this crop.

8. Plant nursery for the production of potted plants and landscape plants grown under plastic or fiber glass greenhouses, shade-cloth houses or field grown.

   The climate in this area is suitable for the production of selected potted plants under plastic, fiberglass or shade-cloth houses on land of not more than 10 percent slope. Windbreaks plantings of suitable trees and shrubs should be planted for protection against strong winds.

   Potted plants of the following crops could be raised:

   a. CHRYSANTHEMUMS of the small flowered varieties that respond to light and dwarfing chemicals can be grown. The "1984 Statistics

of Hawaiian Agriculture" lists 10 farms statewide produced and marketed 278,000 pots of flowers valued at $957,000.00 wholesale. A few farms on Oahu produced and marketed 81,000 pots of flowers valued at $265,000.00.

Cost of production data are not avilable for this crop.

b. ORCHIDS of the Vanda, Cattleya and Dendrobium type to be sold in 2 to 4 inch pots ready to bloom or in bloom could be grown in appropriate greenhouses. In 1984, eighty four dendrobium orchid nurseries statewide produced and marketed 208,000 pots valued at $854,000.00. Seventy one orchid nurseries statewide produced and marketed 375,000 pots of other orchids (excluding dendrobium types) at a wholesale value of $1,836,000.00. The orchid nurseries on Oahu produced and marketed 473,000 pots of orchids of all types valued at $1,838,000.00.

Cost of production data are not available for these crops.

c. Foliage plants such as: Ferns, dieffenbachias, aglaonema, sindapsus, philodendrons, monstera, Calatheas, begonias, maranthas, syngoniums, Colored Tis, dracaenas, and others that are adapted to tropical and subtropical climates could also be grown. These plants are usually marketed in pots from 3 to 6 inches in size for indoor and patio uses. In 1984, eighty five plant nurseries statewide produced and marketed $14,050,000.00 worth of these potted plants. The Oahu plant nurseries produced and marketed $9,100,000.00 worth of potted foliage plants.

Cost of production data are not available for these crops.

d. Potted POINSETTIAS for Christmas market.
This crop can be grown in this area with adequate Winter storm protection and proper cultural practices.

In 1984*, twenty nine plant nurseries statewide produced and marketed 139,000 pots of poinsettias valued at $453,000.00 wholesale. The Oahu plant nurseries produced and marketed 95,000 pots valued at $277,000.00.

NOTE: * from "Statistics of Hawaiian Agriculture - 1984"

9. Plant nursery field production of potted plants, shrubs and trees for use in landscape plantings.

The climate and soil in this area is suitable for the production of most of the plants, shrubs and trees grown locally for landscaping use. The potted plant production should be limited to areas with slopes less than 10 percent. The shrubs and trees for landscape use could be planted on lands with steeper slopes in contoured plantings to minimize soil erosion problems. Adequate, low cost irrigation water must be available even for this purpose.

Potted flowering and ornamental plants that can be produced under field conditions in this area are: Bougainvillea, Bromeliads, Roses, Mock Orange, Plumeria, Gardenia, Hibiscus, Azalea, Geranium, Panax, Globe Amaranth, Marigold, Gazania, Oleander, Allamanda, Bird of Paradise, Coleus, Sansevierias, Euphorbia Splendens, Lantana, Crotons, Pittosporum, Podocarpus, Natal Plum, Nandina, Pandanus, small palms (Raphis, Areca, Kentia) and other plants that are adapted to tropical and subtropical conditions.

Potted fruit and nut trees propagated by means of budding, grafting, airlayering, divisions, cuttings and seeds could also be produced in this area. Mangoes, Avocados, Limes, Lemons, Navel Oranges, Tangerines, Tangelos, Kumquats, Calamondin, Grapefruits, Pummelos, Litchi, Longan, Soursop, Custard Apple, Sugar Apple, Cherimoya, Jaboticaba, Surinam Cherry, Acerola Cherry, Macadamia nut, Guiana Chestnut, Otaheite Gooseberry, Ceylon Gooseberry, Star apple, Carambola, Breadfruit, Figs, Bananas, Guavas, Passion Fruit, Papaya, and dwarf coconut are some of the fruit and nut trees that could be grown.

Shrubs and trees usually grown in the ground to be sold for landscape plantings and which are adapted to the soil and climate of this area are:

The purple and yellow strawberry guavas (Psidium cattleianum Sab. and P. cattleianum f. Lucidum Deg.), Crape Myrtles (Lagerstroemia indica L. L. speciosa ((L.)) pers), Copey (Clusia rosea Jacq.), Kamani (Calophyllum inophyllum L.), Arabian coffee (Coffea arabica L.), Rainbow shower (Cassia Javanica X C. fistula), Pink-and-white shower (Cassia javanica L.), Golden shower (Cassia fistula L.), Candle bush (Cassia alata L.), Royal poinsiana (Delonix regia ((Bojeo)) Raf.), Pride of Barbados (Caesalpinia pulcherrima ((L.)) Sw.), St. Thomas tree (Bauhinia monandra Kurz.), Formosa koa (Acacia confusa merr.), Red Bottle Brush (Callistemon lanceolatus D. C.), Paper bark (Melaluca Leucadendron L.), Allspice (Pimenta dioica ((L.)) Merr.), Buttercup tree (Cochlospermum vitifolium ((Willd.)) Spreng.), Lipstick plant (Bixa orellana L.), Sago palms (Cycas circinalis L. and cycas revoluta Thunb.), Italian Cypress (Cypressus sempervirens L. var. stricta Ait),

Gold tree (Tabebuia donelli-smithii Rose), Jacaranda (Jacaranda acutifolia Humb. and Bonpl.), Fern tree (Filicium decipiens Miq.), Coconut palm (cocos nucifera L.), Macarthur palm (Ptychosperina macarthurii ((Wendl)) Nicholas), Manila palm (Veitchia merrillii ((Becc)) H.E. Moore), Royal palm (Roystonea regia ((HBK)) Cook), Areca palm (Chrysalidocarpus lutescens ((Bory)) Wendl.), Bottle palm (mascarena lagenicaulis Bailey), Blue lantan palm (Latania loddigesii Mart.), Chinese fan palm (Livistona chinensis ((Jacq.)) R. Br.), and Bamboo palm (Raphis excelsa ((Thunb.)) Henry).

In 1984*, forty two plant nurseries statewide produced and marketed $915,000.00 worth of ornamentals and trees for landscape purposes. In the 5 year period of 1980 to 1984, an average of 52 nurseries produced and marketed $836,600.00 worth of landscaping trees and shrubs.

NOTE: * From "Statistics of Hawaiian Agriculture, 1984"

SEED PRODUCTION

The soil, climate and location of this area is suitable for seed corn production operations of nursery, observation, and seed increase plantings if supplemental irrigation water is available. The location of this site close to the airport and harbor facilities will eliminate the extra cost of trans-shipment to and from the presently operating farms on Molokai, Maui and Kauai.

According to the "1984 Statistics of Hawaiian Agriculture", six seed corn farms used 840 acres of land: 385 acres for nursery, 140 acres for observation, and 315 acres for seed increase plantings in 1984 with 570,000 lbs. of seed produced, harvested and shipped to the mainland at an estimated value of $4,750,000.00. A gross return of $5,654.76 per acre for the 840 acres used for seed corn operations.

GREEN CHOP ROUGHAGE PRODUCTION

The production of green chop roughage of corn and sorghum under irrigation is possible in this area on lands up to 10 percent slopes. The short hauling distance from this area to the feedlot at Campbell Industrial Park and the dairies in Waianae makes this site well suited for this enterprise if other similar agricultural lands are not available closer to the prospective markets.

The "Statistics of Hawaiian Agriculture - 1984" shows that 8,993 acres were used to produce 20,900 tons of pineapple, corn, and sorghum roughage feed valued at $912,000.00.

1. CORN for green chop roughage
   - Optimum pH range - 5.5 to 6.8
   - Cultivars: Any forage types adapted to Hawaiian growing conditions.
   - Water requirement - 18 acre inches (486,000 gals.) per crop.
   - Average length of crop - 80 to 90 days
   - Possible number of crops/acre/year - 3
   - Estimated yield/acre/crop - 30 tons green chop
   - Estimated gross return/acre/crop @$20/ton = $600.00
   - Estimated gross return/acre/year - 3 x $600.00 = $1,800.00

2. SORGHUM for green chop roughage
   - Optimum pH range - 5.5 to 6.8
   - Cultivars: Any forage types adapted to Hawaiian growing conditions.
   - Water requirement - 18 acre inches (486,000 gals.) per crop
   - Average length of crop - 90 to 100 days.
   - Possible number of crops/acre/year - 3 (plant crop and 2 ratoons)
   - Estimated yield/acre/crop - 25 tons for plant crop and 20 tons each ratoon.
   - Estimated gross return/acre/year @$20.00/ton and 65 tons = $1,300.00.

FEED GRAIN PRODUCTION

The soil and climate of this area is suitable for the production of corn and sorghum for feed grain if supplemental irrigation water is available, but the limited gently sloping land areas for machine harvesting operation will make this type of enterprise economically unfeasible.

CATTLE OPERATION

The upper portion of the site in question with an average annual rainfall of approximately 42.9 inches should be suitable for unirrigated pasture use. The lower portion of the site with an average annual rainfall of approximately 26.35 inches could be used for irrigated pasture with a fertilized grass-legume (Sudan and Haole Koa) mixture if supplemental irrigation water is available for use during the drier months of the year. Under this system, 3 to 4 heads of cattle could be supported on an acre. Dairy heifers and dry cows from the dairies in Waianae could be raised under this system at a monthly per head charge of $12.00 to $24.00.

TREES AND SHRUBS FOR WINDBREAK PLANTINGS

The following trees and shrubs should be adapted to the area in question for windbreak plantings:

1. BRISBANE BOXWOOD (Tristanea conferta R. Br.)

   An upright, low branching, dense tree capable of fast growth up to 100 ft. in 10 years. It is adapted to the various soil and rainfall conditions found in Hawaii. This tree has a strong and massive root system and a good regrowth and low branching habit. It is propagated by seeds. Spacing recommended is 10 to 15 feet between trees. A row of these trees can be seen growing alongside the entry road to the Waimanalo Agricultural Experimental Farm, University of Hawaii.

2. JAVA PLUM (Eugenia cumini Lam.)

   A dense, medium-sized tree with glossy-green lanceolate leaves, and one of the better windbreak trees to use in Hawaii in single or double row plantings. This tree is a fast grower capable of reaching 70 ft. in 10 years. It is an efficient grower under adverse soil and weather conditions below 1,500 ft. elevation. Propagation is by seeds. Spacing recommended is 5 to 10 ft. between trees.

3. NORFOLK ISLAND PINE (Araucaria excelsa ((Lamb)) R. Br.)

   A relatively fast growing tree with a good regrowth habit. This tree is very resistant to salt sprays and adapted to a wide range of soil and climatic conditions from sea level up to 3,000 ft. elevation. This tree is also grown and harvested for Christmas trees. Propagation is by seeds. Spacing between plants is 10 to 15 ft.

4. SHORT-LEAF IRONWOOD (Casurina equistofolia L.)

   A rapid growing tree which can attain heights of 100 ft. in 10 years. This tree grows well in all types of soil and even tolerates brackish and alkaline soils. It also tolerates salt sprays and is drought resistant. The root system is massive but does not propagate new plants from root runners like the long-leaf ironwood. Propagation is by seeds. Spacing between plants should be 5 to 10 ft.

5. SMALL CONE IRONWOOD (Casuarina cunninghamiana L.)

   A fast growing tree reaching 70 to 80 ft. in height and very wind resistant. It is quite similar to the short-leaf ironwood but with shorter and finer needles. The tree grows well on soils of poor fertility and is drought and salt tolerant. Propagation is by seeds. (It does not propagate by root runners.) Spacing between plants should be 5 to 10 ft.

6. KOA HAOLE (Leucaena leucocethala ((Lam.)) de wit.)

   A hardy, fast growing, drought tolerant leguminous shrub that can grow to a height of 15 to 20 ft. Adapted to a wide range of soil and climatic conditions below 1,500 ft. elevation. Plants should be planted in rows spaced 3 to 5 ft. apart in double or triple rows. The faster and taller growing K-8 and other strains are recommended over the common wild types. Propagation is by scarified seeds. A windbreak planting of Koa Haole can be seen at the Waimanalo Agricultural Experiment Station.

7. RED HIBISCUS (Hibiscus rosa-sinensis L.) and Coral Hybrid hibiscus (probably Hibiscus schizopeltus ((Mast)) Hook f. X Hibiscus Cameronii Knowles and Westcott)

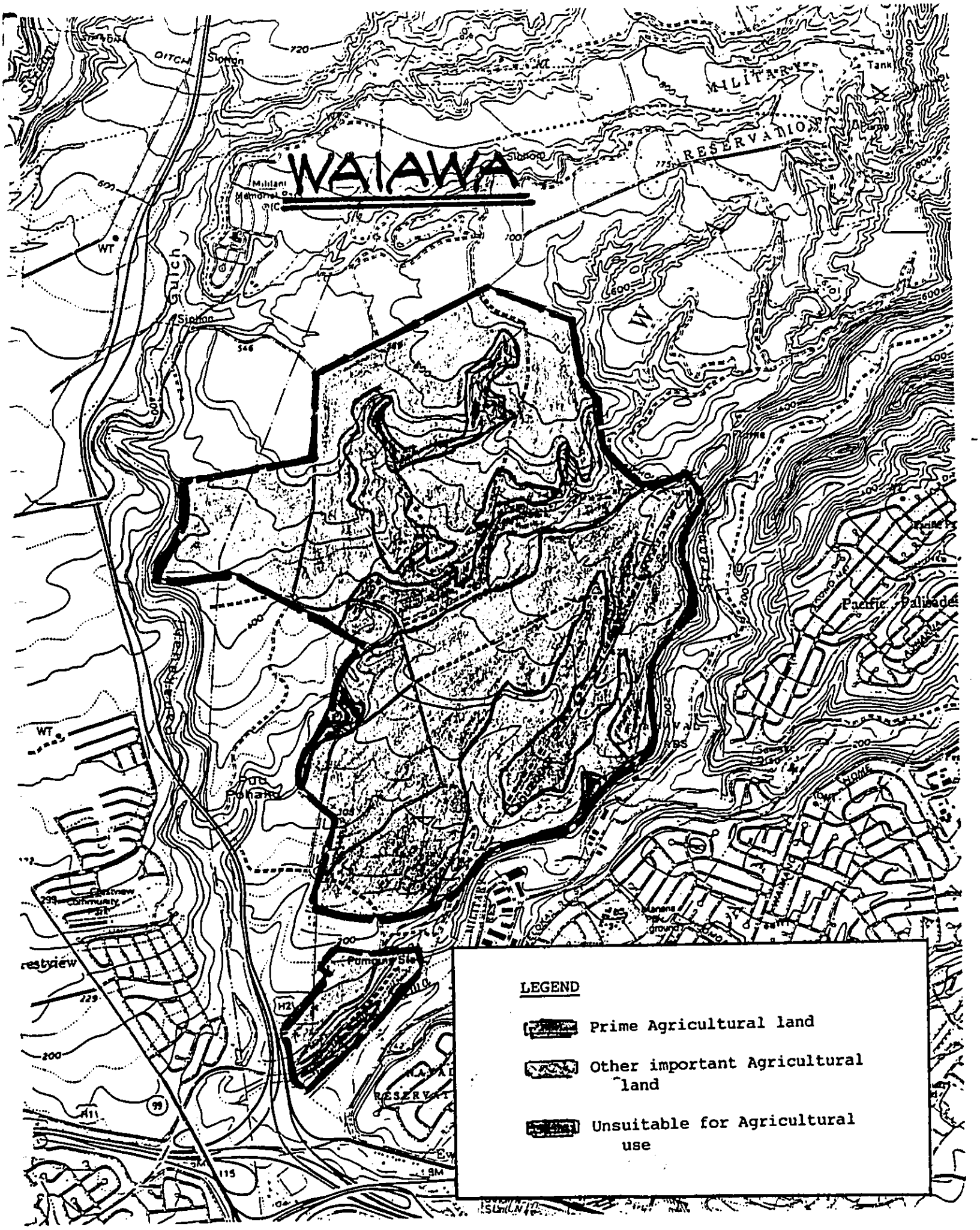
   These Hibiscus are adapted to wide range of soil and climatic conditions from sea level to about 4,000 ft. elevation. The plants are fast growing attaining heights of 15 to 20 ft. Propagated by cuttings. Recommended spacing between plants is 2 ft. and staggered in double row plantings.

8. PANAX (Nothopanax guilfoylei Merr.)

   This is one of the best plants to use as a space saving windbreak hedge. The plant is relatively fast growing and has wide range of adaptability. The plants can be pruned and trained to any desired height up to 15 ft. The caney stems growing from the original stem cutting form a dense hedge often 6 stems deep or 1½ ft. wide. In training the plants to serve as a wind barrier, the long stems are cut at various heights above ground. Full regrowths from these cuttings make this plant effective as a windbreak for small crops. Propagation is by cuttings. Spacing recommended is 1 ft. apart and staggered in double rows.

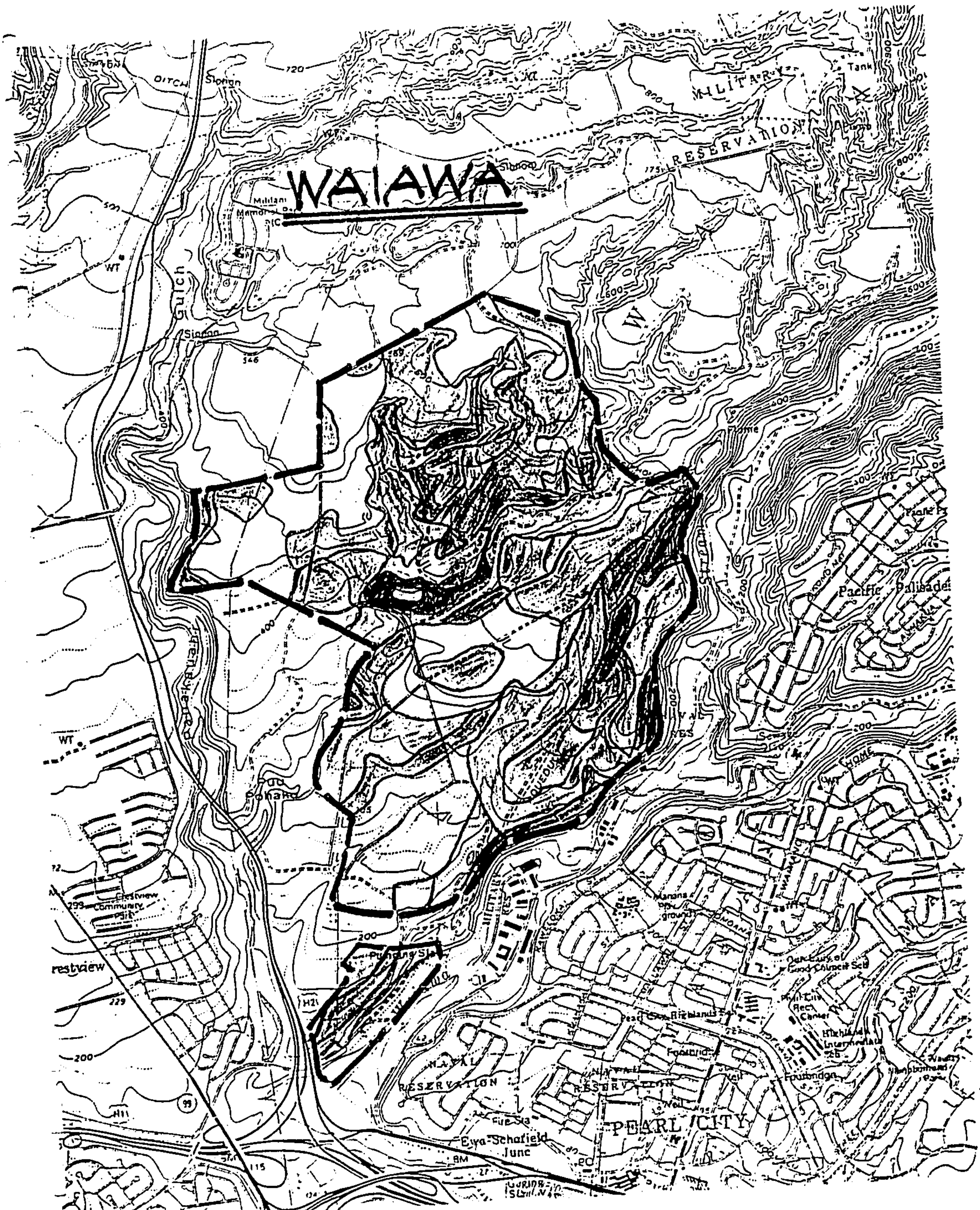
9. SUGAR CANE (Saccharum officinarum L.)

   The sugar cane is fast growing and well adapted to a wide range of soil and climatic conditions up to about 3,000 ft. elevation. The plants grow in clumps and attain a height of 8 to 10 ft. This


WAIAWA
LEGEND
Prime Agricultural land
Other important Agricultural land
Unsuitable for Agricultural use

KEY TO SOILS FOUND ON REVISED DEVELOPMENT SITE

WaA	Wahiawa silty clay, 0 to 3 percent slopes
WaB	Wahiawa silty clay, 3 to 8 percent slopes
WaC	Wahiawa silty clay, 8 to 15 percent slopes
LaA	Lahaina silty clay, 0 to 3 percent slopes
LaB	Lahaina silty clay, 3 to 7 percent slopes
LaC	Lahaina silty clay, 7 to 15 percent slopes
LaC3	Lahaina silty clay, 7 to 15 percent slopes, severely eroded
MpB	Manana silty clay, 3 to 8 percent slopes
MpC	Manana silty clay, 8 to 15 percent slopes
MpD	Manana silty clay, 15 to 25 percent slopes
MpD2	Manana silty clay, 12 to 25 percent slopes, eroded
MoD2	Manana silty clay loam, 12 to 25 percent slopes, eroded
MuB	Molokai silty clay loam, 3 to 7 percent slopes
MuC	Molokai silty clay loam, 7 to 15 percent slopes
MuD	Molokai silty clay loam, 15 to 25 percent slopes
Eab	Ewa silty clay loam 3 to 6 percent slopes
KlaB	Kawaihopai stony clay loam, 2 to 6 percent slopes
HLMG	Helemano silty clay, 30 to 90 percent slopes
Fd	Filled land
rRK	Rock land
Reservoir	


WAIAWA
MILITARY
RESERVATION
DITCH
Siphon
Gulch
Mililani Memorial Park
Tank
Home
Pacific Palisades
Crestview Community Park
restview
Pumping Sta
NAVAL
RESERVATION
PEARL CITY
Fire Sta
Ewa-Schofield Junc
BM
Pearl City Highlands Sch
Pearl City Rec Center
Highlands Intermediate Sch
Our Lady of Good Counsel Sch
720
800
600
400
200
H21
H1
99
115

plant makes a good outside-row or in-field windbreak plantings. Propagation is by cuttings. Spacing recommended is 2 - 3 ft. between plants in a single row.

10. BLUE VITEX (vitex trifolia L. var. variegata Hold.)

An aromatic shrub, very hardy, 8 to 10 ft. high with dense drooping branches. The shrub is salt and drought tolerant and adapted up to 1,500 ft. elevation. The plant makes a good in-field or outside-row windbreak planting along with ironwood or other trees. Propagation is by cuttings. Recommended spacing is 2 to 3 feet between plants in a single row planting.

NOTE: The foregoing information on windbreak trees and shrubs was adapted from "Trees and Shrubs for Windbreaks in Hawaii" by G.T. Shigeura and Wade W. McCall, Cooperative Extension Service Circular 447, College of Tropical Agriculture, University of Hawaii, February 1979.

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16. "Central Oahu Land Use Study - Agriculture", Agro Industrial Associates, Inc., February, 1973.

17. Temperature and Precipitation Records from U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

YUKIO NAKAGAWA

RESUME

Education and Degree:

University of Hawaii, B.S. in Agriculture, 1940
University of Hawaii, 17 graduate credits after 1940

Work Experiences:

1. Retired as a statewide specialist in Horticulture, Cooperative Extension Service, College of Tropical Agriculture, University of Hawaii after 30 years of service.

   Duties performed were: Training of county agents and farmers in the efficient production of vegetable and melon crops by the use of improved technology developed through research. As agricultural chemicals coordinator for the Hawaii Extension Service, developed and conducted educational programs on the safe use, storage and disposal of pesticide and other chemicals for farmers and the general public with the cooperation of the county agents and home economists of the Extension Service, representatives of chemical companies, garden shops and Departments of Agriculture and Health.

   U.H. employment: September 1941 - September 1951 and January 1953 - August 1973.

2. Worked as field representative for Pacific Chemical and Fertilizer Company (now Brewer Chemical) from October 1951 to December 1952 promoting and selling agricultural chemicals to farmers and home owners through dealers.

Selected Out-of-State Consulting

October 1960 - October 1961	Arab Development Society of Jericho, Jordan, sponsored by the Ford Foundation.
January 1964	American Samoa and Western Samoa Departments of Agriculture
October 1965	Koror, Palau for the East-West Center (EWC) and Trust Territory Department of Agriculture.

May 1966	Okinawa for U.S. Army Pacific Civil Affairs Department.
July 1967	Guadalcanal, British Solomon Islands for EWC and South Pacific Commission.
September 1968	Portvila, New Hebrides for EWC and South Pacific Commission.
May 1969	Guam, Saipan, Tinian, and Rota for the Guam Department of Agriculture and the Trust Territory Department of Agriculture.
January - March 1971	Chiengmai University Multiple cropping project for Ford Foundation.
July 1971	Nuku'alofa, Tonga for South Pacific Commission.
January 1974	Conducted a workshop on the safe and effective use of pesticide chemicals for staff members of the American Samoa Department of Agriculture.
May 1974	Agricultural Industry Environmental Impact of Tinian, Northern Marianas for USAF Hickam Airbase, Oahu, Hawaii
August 1974 and December 1976	Reviewed and edited Volume I - Teachers Manual "Tropical Horticulture for Secondary Schools and Volume II - "Horticultural Training Manual for Micronesia," both prepared by Rev. Edward A. Sourcie, S.M. of Ponape Agricultural and Trade School for the Department of Education, Trust Territory of the Pacific Islands.

In-State Activities

1975 to 1980	Director of Kahuku Agricultural Company, grower and processor of guava passion fruit, banana and papaya.

January 1978	Agricultural Potential of Waikane Land, Oahu.
July - August	Instructor in 8 weeks non-credit course in Home Vegetable Growing at Windward Community College, Kaneohe, Oahu.
November 1979	Agricultural Production Potential of Lands in the Kohala Estates Development Phase II Project.
December 1980	The Agricultural Production Potential of Lands in the Phase I Development Plan of the Proposed Waimanalo Agricultural Park.
November 1981	The Agricultural Production Potential of Lands in the Kamooalii, Kapalai, and Luluku areas of Kaneohe.
July 1982	The Agricultural Production Potential of Lands in the Waiahole area (Marks Estate).
March 1984	The Agricultural Production Potential of the Lands at the Waikele Project site, Island of Oahu.
April 1985	The Agricultural Production Potential of Lands in the Kohala Estates Development Phase II Project (Expanded)

Publication Summary

Sixty-two Extension Service, University of Hawaii circulars, leaflets, production cost notes on vegetable and melon crops between 1953 - 1973.

Gaviota Farm and Garden Guide, a 500-page manual prepared for Brewer Chemical Corporation in January, 1975.

Public Service in Agriculture

1. Served on State of Hawaii Advisory pesticide Committee during 1972-73. Appointed by Governor and confirmed by Senate, January 1973.
2. Served as member of United States Department of Agriculture Western Regional "Task Force on Tropical Agricultural Research," 1976.
3. Instructor in home vegetable and fruit production at Lyon Arboretum Association.

GORDON L. DUGAN

Environmental Aspects of Storm Water Runoff
Waiawa Development Project
Southern Oahu, Hawaii

Revised February 1986

APPENDIX C

ENVIRONMENTAL ASPECTS OF STORM WATER RUNOFF

Waiawa Development Project
Southern Oahu, Hawaii

Revised
February 1986

by

GORDON L. DUGAN
Environmental Consultant

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February 1, 1986

MEMORANDUM:

TO: F. J. Rodriguez, President
Environmental Communications, Inc.

FROM: Gordon L. Dugan, Ph.D.

SUBJ: Report of the Environmental Aspects of Storm Water Runoff for the Waiava Development Project, Southern Oahu, Hawaii

Contained herewith is the report outlining the environmental aspects of storm water runoff for the proposed Waiava Development Project, located in Southern Oahu as revised on January 23, 1986.

Please advise me of any questions concerning this report.

Enclosure

INTRODUCTION

The proposed Waiava Development Project, located in southern Oahu, as shown in Figure 1, is situated in the 26.4 sq. mi. Waiava watershed, which extends from the Middle Loch of Pearl Harbor to the crest of the Koolau Mountain Range. This watershed is one of the largest on Oahu and is the major portion of the nearly 90 sq. mi. area that drains into Pearl Harbor. Several streams drain the watershed, however, they all converge at several points into Waiava Stream before it flows under Kamehameha Highway and into the Middle Loch of Pearl Harbor.

A USGS stream gaging station (#16216000) located on Waiava Stream near the intersection of Farrington and Kamehameha Highways has been in operation since June 1952. Waiava Stream follows a course slightly to the east of the proposed project.

The proposed project's designated land use areas of approximately 1,250 acres, presented in Table 1, extend for a distance of nearly 3 miles, from elevations of nearly 15 ft to approxiamtely 650 ft above mean sea level. The average annual rainfall within the project area ranges from about 33 in. to approximately 60 in. (Division of Water and Land Development, 1982). The project borders Pearl City to the east and the communities of Waipio and Crestview to the west. The Middle Loch of Pearl Harbor is about 0.8 of a mile to the south of the project and the nearby Kamehameha Highway and H-2 Freeway could provide easy access to the proposed project.

The proposed project was designed on an open space concept so that small areas of various land uses along with pedestrian, jogging and bicycle pathways are separated from major vehicular traffic routes.

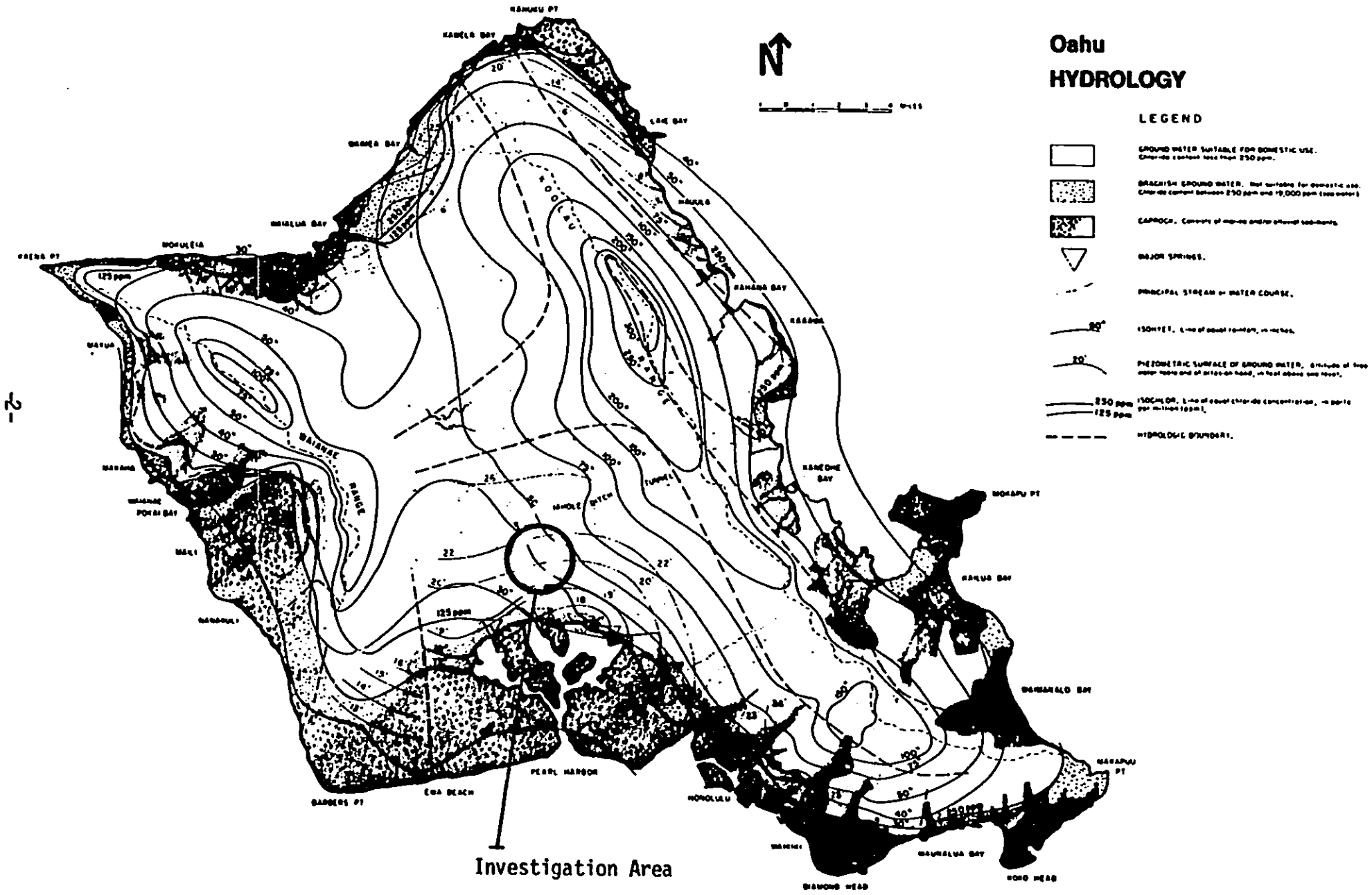

Figure 1. Hydrologic and Geologic Characteristics of Oahu

(Source: "2020 Plan," Board of Water Supply, City and County of Honolulu, pg 13, 1971)

TABLE 1

Land Use Designation for the Proposed Waiawa Development Project, Southern Oahu, Hawaii

Land Use	Total Area -acres-
Residential	782
Apartments-low density	75
Commercial/Industrial	115
Golf Courses	225
Major Arterial Roadway	50
Total	1247

The property is presently designated as Agricultural on both the Development Plan for the City and County of Honolulu and the State Land Use Map. A major portion of the project's designated areas was being cultivated for sugarcane by Oahu Sugar Company, however, because of economic reasons the fields have been pulled out of production with the last harvest completed in 1983. Presently these fields are overgrown with sugarcane stalks and California grass, with the remainder of the site, which was not conducive to sugarcane culturing (generally too steep) being characterized by ridges and gulches with vegetation consisting primarily of scrub growth and koa haole. A portion of the gulches will be used for a regulation 18-hole golf course.

The natural drainage patterns within the project area have been changed somewhat by various irrigation faculties; however, the majority of these were abandoned when sugarcane cultivation in the area ceased in 1983.

Three out of the four major soil associations in the Waiawa watershed are located within the project boundaries, although the lower one, Lualualei-Fill Land-Ewa Association, is only included in a small portion of the project. In general, the lower half of the project is characterized by the Helemano-Wahiawa Association while the approximate upper half is known as the Rough Mountainous Land-Kapaa Association. All three Associations are known as being "well-drained" soils (Foote et al., 1972). The individual soil series within the project and their relationship to storm-water runoff will be discussed in a subsequent section of the report.

Associated with a development project such as is being herein proposed are alterations in surface water runoff resulting from modifying the existing ground conditions. Interest in these runoff changes is generally

a result of concern over two factors — one, public safety, and two, environmental impact. The first factor requires the identification of changes in peak discharge rates, the magnitudes of which are necessary for designing adequate drainage structures to prevent flooding, while the second concern requires identification of changes in total runoff volume, as well as sediment, nutrient, and other constituent loads, and the effects these will have on the ecosystem of the natural resource serving as the "sink." It is this second concern, environmental impact resulting from increased runoff volume and sediment and nutrient loads, and its probable effect on subsequent receiving waters (Waiawa Stream which discharges into the Middle Loch of Pearl Harbor) that is under study in the present investigation as herein reported.

PURPOSE AND SCOPE

The purpose of this study is to evaluate the environmental impact of the proposed Waiawa Development Project as it relates to surface water runoff. From and assembledge of baseline hydrologic and water quality data, an estimate of the existing and projected volume and quality characteristics of surface water runoff will be made, along with an assessment of the environmental impact resulting from this runoff, in the form of written comments. Determination, extent, and alleviation recommendations of potential flood plain considerations are not included in this section of the report.

METHODOLOGY

The methodology used in this study consisted of assembling, analyzing, and interpreting existing data from federal, state, and county agencies as well as from on-site surveys of field conditions.

Inasmuch as the scope of work consisted of estimating the alterations in volume and quality of surface water runoff resulting from the proposed project, it was necessary to identify those factors that affect runoff generation and runoff quality for both pre-and post-development conditions.

Methods currently available to estimate the surface water runoff volume from a specific storm event requires the determination of reasonable rainfall-runoff coefficients for varying magnitude and duration storm, and for different land management, vegetation, soil, and soil moisture conditions, to name but a few hydrologic factors. In most practical situations, it is not considered feasible, due to the numerous influencing factors, to determine varying rainfall-runoff coefficients; rather, it is more practical for design and evaluation purposes to use a single coefficient for a particular land-use over a given rainfall-intensity range. However, in order to circumvent a major portion of the unavoidable error created by using a constant rainfall-runoff coefficient, a method developed by the Hawaii Environmental Simulation Laboratory (HESL) of the University of Hawaii, was utilized to determine representative storm water volumes under varying conditions (Lopez, 1974; Lopez and Dugan, 1978).

The HESL method is based on an incorporation of U.S. Soil Conservation Service (SCS) data and U.S. Weather Bureau data from the "Rainfall-Frequency Atlas of the Hawaiian Islands" (1962). The SCS data involves the use of soil maps (Foote et al., 1972) and SCS-derived curve numbers obtained from empirical data, including precipitation, soil and changing soil moisture conditions, and vegetative cover information from the classification of thousands of soils throughout the nation. These soils were classified into four groups, labeled A, B, C, and D, with Class A having the highest water intake rates and Class D soils the lowest. These curve numbers, modified

for Hawaiian conditions, pertain only to non-urban conditions. For urban conditions, the HESL method utilized information published by Miller and Viessman (1973).

Once the increase in surface water runoff volume had been established, it was necessary to determine the runoff quality for pre- and post-development conditions.

The quality parameters of stormwater runoff considered the most representative to identify potential changes under different land management practices (i.e. pre-and-post development conditions) are: total nitrogen; total phosphorus; and suspended solids (sediments).

The U.S. Geological Survey (USGS) in conjunction with its national stream flow gaging program periodically collects and analyzes samples from selected stream; Waiawa Stream, of which has been included (USGS, 1960-1984). Unfortunately, for the present study, the USGS program only analyzes for nitrate-nitrogen (rather than for total nitrogen which also includes organic, ammonia, and the nitrite forms) and does not conduct analyses for phosphorus.

To circumvent the problem of determining representative nitrogen and phosphorus values in surface runoff from Waiawa Watershed, for comparative purposes, nitrogen and phosphorus values of 3.0 and 0.3 lb/ acre-yr, respectively, were selected to represent pre-project (1985) development conditions. These values were derived from a compilation of data relating to nutrient outputs from rural and agricultural lands throughout the nation that was reported by Loehr (1972). To convert the output loads to concentration values for the Waiawa Watershed, the average annual flow rate up through 1984 of 33.3 cfs (24,130 acre-ft/yr) (USGS, 1984), together with the selected nitrogen and phosphorus outputs over the 26.4 sq. mi. watershed, produced average annual concentration values of 0.77 mg/L and 0.08 mg/L respectively (rounding-off to the nearest one-hundredth).

Suspended solids data has been collected and reported by USGS through its suspended sediment sampling program (USGS, 1971), which includes Waiawa Stream. A portion of this data in addition to what was then reported as unpublished USGS suspended sediment data was statistically analyzed by the Oahu Water Quality Program (OWQP) Study (Dept. of Public Works, 1971) and reported in 1971 that an output value of 23,200 tons/yr represented the best estimate of the suspended sediment output from Waiawa Watershed.

As would be expected it was also reported by the OWQP that suspended sediment output tended to increase with increasing flow. This adds credence to the theory that runoff from a few major storms contain the major portion of the suspended sediment from watersheds on Oahu. In addition to suspended sediment being carried by the stream a smaller portion is carried by bed load; however, the estimated quantity has received only a limited amount of attention on Oahu, thus, an estimate of its quantity is not practical at this time. The best estimate of 23,200 tons/yr of suspended sediment from Waiawa Watershed at an average annual flow of 33.3 cfs would produce a suspended solids concentration of nearly 700 mg/L. Therefore 700 mg/L was selected as representing pre-project development conditions.

Quality data for stormwater runoff from developed areas are sparse, both locally and nationally. Loehr (1974) compiled urban stormwater runoff quality data collected from throughout the United States, as well as from a few international locations. As expected, the data are diverse. Locally, Fujiwara (1973) reported urban water quality data collected from storm drains in different land use drainage areas of Honolulu (residential, commercial and industrial), as shown in Table 2. These values compare favorably with similar situations from the continental U.S.

For the present study, the results of the Honolulu residential area for

TABLE 2

Representative Storm Water Quality Data for Honolulu[a] (Fujiwara, 1973)

	Residential[b]	Commercial[c]	Industrial[d]
Total solids	511	278	246
Suspended Solids	252	142	12
COD	142	209	40
BOD	10	19	7
Dissolved Oxygen	7.1	5.7	6.7
No_3-N	0.211	0.045	1.1
TKN	0.381	0.272	2.70
Total P	0.57	0.53	2.17
Ortho P	0.27	0.19	1.27
Grease	2.8	1919	2.2
Lead	0.407	0.987	1.657
Chromium	0.013	0.021	0.013
Zinc	0.512	0.792	0.729
Copper	0.036	0.036	0.021
Iron	0.377	0.295	0.049
Total Coliform	83,300	33,500	11,500
Fecal Coliform	1,965	463	580
Fecal Strep	6,393	7,900	7,350

[a] All units in mg/l except total coliform, fecal coliform and fecal strep which are listed as No./100 ml

[b] Storm water samples collected on Aupuni Street near Nuhelewai Stream

[c] Storm water samples collected at Beretanic Street between Maunakea and River Streets

[d] Storm water samples collected near Iwilei and Pacific Streets

nitrogen, phosphorus, and suspended solids of 0.60, 0.57, and 250 mg/L, respectively, were used for the proposed project's residential and low density apartment areas; and respectively 0.32, 0.53, and 145 mg/L, from the Honolulu commercial area of Table 2 were used for the project's Commercial/ Industrial areas. Attention is likewise drawn to the heavy metal content of residential and commercial areas, presented in Table 2, especially with respect to iron, chromium, copper, lead, and zinc.

Inasmuch as golf courses use fertilizers that contain a high amount of nitrogen to enhance the green color of the grass, a higher amount of nitrogen would be expected in the runoff if a major storm occurred a short time after fertilizers were applied; however, fertilizer applications are usually curtailed during the normal winter rainy season. The developed grassed areas are expected to be interspersed among the natural vegetation, thus resulting in a buffer area which would undoubtably take up a significant quantity of excess nutrients, if they should occur. Nevertheless, the total nitrogen concentration for conservative reasons is assumed to be double that reported for the residential area runoff, (Fujiwara, 1973) or 1.2 mg/L and also include the entire golf course designated area, even though a portion will be left relatively natural and unfertilized.

The concentrations of nitrogen, phosphorus, and suspended solids in stormwater runoff from the Botanical Garden area are assumed to be the same as from undeveloped conditions, i.e. 0.60, 0.57, and 250 mg/L respectively.

An investigative study of street runoff, collected in storm collection boxes in Manoa Valley, Honolulu, under various land uses, was conducted and reported by the Pollution Investigation and Enforcement Branch of the State Department of Health (1980). The stormwater runoff quality from the streets in residential area was utilized to represent that of the present project. The values are 1.41, 0.11, and 75 mg/L respectively, for nitrogen, phosphorus,

and suspended solids.

The aforementioned stormwater runoff constituent concentrations for nitrogen, phosphorus, and suspended solids from pre-development (1985) and the various land uses of post-development are presented in Table 3. The suspended solids concentration values of Table 3 were rounded-off to the nearest 5 mg/L. Applying these concentrations to the pre-and-post runoff volumes, the projected sediment and nutrient loads from the project site could then be estimated.

SURFACE WATER RUNOFF ALTERATIONS

Quantity

The estimated storm water runoff and constituent changes due to the proposed Waiawa Development Project are shown in Table 4. The values presented, it must be emphasized, are for comparative purposes only, and are not intended to be representative of the accuracy implied by the practice of reporting results to one decimal place. This was done primarily for convenience of calculations and balancing.

The changes shown in Table 4 are those occurring only within the separate areas of the 1,247-acre proposed project. No attempt was made to compare these changes with contributions from the entire 26.4 sq. mi. Waiawa watershed area which would significantly negage apparent changes caused by the land use change within the project site.

Over the 1,247 acres that are planned to be developed by the project, 7 separate soil series are encountered, each of which has additional subclassifications. Also included are less than 10 acres each of soil designated as "fill" and "rockland," which were placed in the previously discussed Class B soils. The soils of the property were segregated according to the procedure discussed in the Methodology section into 92% being Class "B" and

TABLE 3

Quality Constituent Values of Storm Water Runoff
for Pre-and-Post Development Conditions,
Waiawa Development, Southern Oahu

Land Use	Area -acres-	Nitrogen mg/L	Phosphorus mg/L	Suspended Solids mg/L
PRE-DEVELOPMENT (1986)				
Brush[a/]	1247	0.77[b/]	0.08[c/]	700[d/]
POST-DEVELOPMENT				
Residential[e/]	782	0.60	0.57	250
Apartments[e/]	-75	0.60	0.57	250
Commercial[f/]/Industrial	115	0.32	0.53	145
Golf Courses[g/]				
"B" Soils	-161	1.2	0.57	250
"C" Soils	-64	1.2	0.57	250
Arterial Roadway[h/]	-50	1.41	0.11	75
Total Area	1247			

a) Primarily abandoned sugarcane fields, scrub brush, and koa haole.

b) Based on an average annual flow of 33.3 cfs (24,130 acre-ft/yr) for Waiawa Stream —1952 to 1984— (USGS, 1984) from its 26.4 sq. mi watershed and average nitrogen outputs of 3.0 lb/acre-yr (Loehr, 1972).

c) Based on 10% of the nitrogen value.

d) Based on the reported average suspended sediment output of 23,200 ton/yr (Dept. of Public Works, 1971) from Waiawa Watershed, and the average annual flow of Waiawa Stream —1952 to 1984—(USGS, 1984) of 33.3 cfs.

e) Constituent values of storm water from Honolulu residential area (Fujiwara, 1973)

f) Constituent values of storm water from Honolulu commercial area (Fujiwara, 1973)

g) Constituent values assumed the same as storm water quality from Honolulu residential areas except that the nitrogen concentration was doubled.

h) Constituent values from street gutters draining Honolulu residential area (Dept. of Health).

TABLE 4

Estimated Storm Water Runoff and Constituent Changes due to the Proposed Waiawa Development Project, Southern Oahu

Storm[a]			Storm Water Runoff												
			Hydraulic			Nitrogen[b]			Phosphorus[b]			Suspended Solids[b]		
			Development			Development			Development			Development		
Duration	Recurrence Interval	Quantity	1986	Full	Δ	1986	Full	Δ	1986	Full	Δ	1986	Full	Δ
hr	yr	in.	AF/event	AF/event	AF/event	lb/event	lb/event	lb/event	lb/event	lb/event	lb/event	ton/event	ton/event	ton/event
1	1	1.45	1.0	67.5	+ 66.5	2.2	112.3	+110.1	0.2	96.9	+ 96.7	0.99	20.15	+ 19.16
1	5	2.2	11.7	125.9	+114.2	24.4	214.0	+189.6	2.5	183.0	+ 180.5	11.09	38.29	+ 27.20
1	10	2.5	19.5	150.8	+131.3	40.9	257.7	+216.8	4.2	219.6	+ 215.4	18.58	46.06	+ 27.48
1	25	3.0	36.3	193.5	+157.2	76.1	332.9	+256.8	7.9	282.7	+ 274.8	34.59	59.40	+ 24.81
1	50	3.3	48.4	219.5	+171.1	101.3	379.2	+277.9	10.5	321.3	+ 310.8	46.04	67.53	+ 21.49
1	100	3.7	66.4	254.9	+188.5	139.0	442.3	+303.3	14.4	373.7	+ 359.3	63.18	78.65	+ 15.47
24	1	3.6	61.7	246.3	+184.6	129.2	426.6	+297.4	13.4	360.8	+ 347.4	58.71	75.94	+ 17.23
24	5	7.1	278.3	569.4	+291.1	582.9	1012.6	+429.7	60.6	840.0	+ 779.4	264.97	177.57	- 87.40
24	10	9.7	486.2	817.3	+331.1	1018.3	1468.8	+450.5	105.8	1208.1	+1102.3	462.86	255.72	-207.14
24	25	11.0	596.8	942.4	+345.6	1249.9	1699.9	+450.0	129.9	1394.0	+1264.1	568.12	295.19	-272.93
24	50	12.0	684.3	1038.9	+354.6	1433.2	1878.7	+445.5	148.9	1537.3	+1388.4	651.45	325.62	-325.83
24	100	14.0	864.4	1232.6	+368.2	1810.5	2238.2	+427.7	188.1	1825.1	+1637.0	822.94	386.79	-436.15

a) From U.S. Weather Bureau "Rainfall Frequency Atlas of the Hawaiian Islands" (1962).

b) Refer to Table 3.

Revised
January 23, 1986 - 1247 acres

28Z being Class "C." There were no Class A or D soils indicated on the soil maps (Foote et al., 1972). The storm water runoffs for various designated intensity and duration storms along with different curve numbers for the separate land use and soil classification were determined according to the procedures outlined in the Methodology section.

As can be readily observed in Table 4, the storm water runoff volume for the 1 yr, 1-hr duration storm for post (full) development conditions is about 68 times greater than pre-developed (1986) conditions; however, as the storm duration and recurrence interval increases, this difference reduces down to approximately 1.4 greater for the 100-yr 24-hr storm. At higher rainfall intensities and durations, soil saturation increases, thus more runoff occurs. The relatively large discrepancy between the pre-and-post storm water runoff condition is because of the soils within the project area are notably "well-drained" types.

As would be generally expected, the greatest calculated incremental storm runoff volume resulted from the 100-year storm with a 24-hour duration, as shown in Table 4. These values (acre-ft/event) represent a volume of water and should not be confused with peak discharge rates which represent the maximum volume of storm water runoff discharged per unit of time (e.g., cfs). Peak discharge rates are required for engineering design or proposed drainage facilities and ascertaining the capacity of existing facilities, while total runoff volume provides a more realistic estimate of impact on water quality. Calculated peak discharge rates and the resulting flooded area for the streams within the project boundaries are usually determined from the City and County of Honolulu's drainage standards procedure.

Quality

Besides the changes in volume of storm water runoff, the quality of the various constituents being transported is of equal, if not more importance. However, estimates of water quality constituents resulting from significant

storm water runoff that occurs at the most, only a few times a year, is very perplexing, especially since information on this subject essentially only became available at both the local and national level in the 1970's.

The summation of nitrogen, phosphorus, and suspended solids loads from both present 1986 and projected (full) residential development for storms of 1- and 24-hr. duration at recurrent intervals of 1-, 5-, 10-, 25-, 50-, and 100-years are shown in Table 4. The incremental changes per storm event for the present and projected development conditions for the various duration and recurrence interval storms indicate that from the least to the greatest amount of rainfall: nitrogen and phosphorus increases and suspended solids increases for the low intensity and duration storms and decrease at the higher intensity and duration storms.

The seemingly high nitrogen and phosphorus values of Table 4 have to be compared with the previous land use of the area, the greater than 1000 acres of sugarcane, which received for a two-year cycle, 300 to 500 lb each of nitrogen and phosphorus over the first 8 months of the culture cycle. Storm runoff during or shortly after fertilization events undoubtedly had a high concentration of both nitrogen and phosphorus.

It must be emphasized that the constituent values are only for comparative purposes, and should not be taken as absolute values.

The hydrologic and water quality aspects of the surface water runoff were only considered for the present and projected conditions. However, increases in constituent loads will undoubtedly result from construction activities, especially if a significant storm occurs during the interim period between earth moving operations and soil stabilization completion. The impact of construction activities can be minimized by adhering to strict erosion control measures.

Other water quality constituents of general concern include biocides and heavy metals. Typically, the biocides in general use tend to break down more readily in comparison to the more long lasting types of a few years ago; consequently, except for agricultural runoff, the types and concentrations are usually considered insignificant. On the other hand heavy metals do apparently increase somewhat as a result of urbanization, and with the type of commercial and business ventures encountered. However, the possible long-term effect, if any, that the apparently slightly increased heavy metals have upon the biological life of the receiving waters (Waiawa Stream and the Middle Loch of Pearl Harbor) at the concentations expected is presently undefined.

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WINONA P. CHAR & ASSOCIATES

Botanical Reconnaissance of the Proposed Gentry
Waiawa Project, Island of Oahu

December 1985

APPENDIX D

BOTANICAL RECONNAISSANCE OF THE PROPOSED
GENTRY WAIAWA PROJECT, ISLAND OF O'AHU

Winona P. Char & Associates

for

Environmental Communications, Inc.

December 1985

BOTANICAL RECONNAISSANCE OF THE PROPOSED
GENTRY WAIAWA PROJECT, ISLAND OF O'AHU

INTRODUCTION

A botanical reconnaissance of the proposed Waiawa project was conducted in December 1985. The area proposed for development covers roughly 2405 acres and consists primarily of abandoned sugar canefields. Three golf courses are planned for the gulches which run through the canefields. The deeply dissected lands mauka of the project area and the Waiawa Gulch lands were not inspected as present development plans do not include these areas.

A general walk-through survey method was employed to ascertain the impact of the proposed development on the flora of the project area. Notes were made on the major vegetation types and plant species observed during this survey. Plants which could not be positively identified were collected for later determination in the laboratory and herbarium. A total of three man-days were required to gather the technical data contained in this report.

VEGETATION TYPES

The majority of the study area is covered by abandoned canefields. These former cane lands have more or less gentle slopes. Around the canefields is a perimeter vegetation composed largely of grass and shrub species. The gulches which dissect the fields support large blocks of forestry plantings and dense shrubbery growth.

The vegetation types on the study are dominated by introduced or exotic species. The study area has been so completely disturbed by past activities such as sugar cane cultivation that no trace of any native vegetation types remain today. Of the 149 species inventoried during this survey, 137 (92%) are introduced, 9 (6%) are native (2 endemic, 7 indigenous), and 3 (2%) of Polynesian origin.

Three vegetation types are recognized in the study area and are discussed below.

1. Abandoned Canefields

This vegetation type covers the largest portion of the study area and development will take place principally on these abandoned fields. Sugar cane (Saccharum officinarum) was once cultivated in extensive fields on the more or less gently sloping lands within the study area. A network of accompanying irrigation ditches and cane-haul roads criss-crosses these fields.

The sugar cane found in these fields now consists of complex interspecific hybrids which can not maintain themselves if no longer under cultivation. The different fields were abandoned over a period of time, and as a result, are in various stages of "weediness." In the more recently abandoned fields, the sugar cane cover may be 90 to 95% with the weedy species occurring mainly on the edges of the fields. In fields abandoned earlier, the vegetation consists of a mixture of cane and various weedy herb and shrub species. Frequently observed weed species include pua-lele (Emilia fosbergii), pluchea (Pluchea odorata), Guinea grass (Panicum maximum), Spanish clover (Desmodium canum), and indigo (Indigofera suffruticosa). Many of these weedy species are associated with cultivated areas and once the pressures of cultivation, i.e., periodic plowing, weeding, herbicide treatment, etc., are removed, their populations increase wildly.

The fields which were abandoned first now support a grassland composed of Guinea grass with scattered trees and shrubs. These include pluchea, indigo, butterfly bush (Buddleja asiatica), Java plum (Syzygium cuminii), albizia (Albizia falcataria), and guava (Psidium guajava). One large patch of this grassland is fenced and used for grazing. Young plants of Guinea grass are palatable and considered a good forage grass. The scattered sugar cane found in the grassland also provide additional forage.

Most sugar cane land was probably occupied by mixed lowland native forest or something similar to it, in the past, some of it may have been composed of 'ohi'a, Metrosideros collina ssp. (Fosberg 1972). Today no remnants of this lowland forest remain in these cane lands of the study area.

2. Perimeter Vegetation

Adjacent to the canefields, usually along the perimeter roads next to the gulches, the vegetation was infrequently maintained - - mechanically cleared or treated with herbicide. The vegetation in these areas are commonly composed of weedy sub-shrubs such as pluchea, various species of Stachytarpheta, indigo, etc., and taller shrubs such as Christmas berry (Schinum terebinthifolius) and guava. A dense mat of grasses is found between the scattered shrubs. Californiagrass (Brachiaria mutica) and Guinea grass are the most abundant species; occasionally Natal red top (Rhynchelytrum repens) or molassesgrass (Melinis minutiflora) may be found.

Plantings of introduced trees such as albizia and an assortment of Eucalyptus and Casuarina species are also found in the perimeter vegetation. Young trees of albizia are also frequently seen in the abandoned cane lands.

3. Gulch Vegetation

Only a cursory survey was made of the gulch areas as most of the major development will be focused on the abandoned cane lands.

The gulch vegetation usually consists of large blocks of forestry plantings composed of species such as Eucalyptus and Casuarina interspersed among rather dense thickets of Christmas berry, guava, and strawberry guava (Psidium cattleianum). In some areas, the vegetation may consist of open scrub and on the slopes of the broader gulches, Andropogon virginicus grasslands with scattered shrubs are frequently encountered.

DISCUSSION AND RECOMMENDATIONS

Development will take place principally on the lands now occupied by abandoned canefields. The vegetation in these areas is composed almost exclusively of non-native or introduced species. The few native species found during this survey are widespread throughout the islands. Some like 'uhaloa (Waltheria indica var. americana), yellow wood sorrel (Oxalis corniculata), and popolo (Solanum nigrum) are considered weedy. Others like the 'akia (Wikstroemia sp.) and kilau (Pteridium aquilinum var. decompositum) are found in similar environments throughout the islands; these plants are also usually found on steeply sloping areas not planned for development.

No plants considered rare, threatened or endangered by the State or Federal governments (Fosberg and Herbst 1975, U.S. Fish and Wildlife Service 1980) were found.

The proposed development will have no significant impact on the total island populations of the plant species found during this survey.

Of some concern is the loss of soil which may result once the vegetative cover is removed, especially on sloping areas. These areas should be grassed over as soon as possible to prevent soil loss through wind and water.

PLANT SPECIES CHECKLIST - Waiawa Project, O'ahu.

Families are arranged alphabetically within each of three groups: Ferns and Fern Allies, Monocotyledons, and Dicotyledons. Taxonomy and nomenclature of the Ferns and Fern Allies follow Lamoureux's unpublished checklist of Hawaiian ferns; taxonomy and nomenclature of the flowering plants (Moncotyledons and Dicotyledons) follow St. John (1973) except where more recently accepted names are listed. Hawaiian names used in the checklist are in accordance with Porter (1972) or St. John (1973).

For each species the following information is provided:

1. Scientific name with author citation.
2. Common English or Hawaiian name, when known.
3. Biogeographic status of the species. The following symbols are used:
   - E = endemic = native to the Hawaiian Islands only, not occurring naturally elsewhere.
   - I = indigenous = native to the Hawaiian Islands and also to one or more other geographic areas.
   - P = Polynesian = plants of Polynesian introduction; all those plants brought by the Polynesian immigrants prior to contact with the Western world.
   - X = exotic or introduced = not native to the Hawaiian Islands; brought here intentionally or accidentally by man after Western contact.

4. Vegetation types. Three major vegetation types are recognized in the study area and are discussed in detail in the report. Within each of the vegetation type columns, the presence (+) or absence (-) of each species stet.

1 = Abandoned Canefields

2 = Perimeter Vegetation

3 = Gulch Vegetation

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PLANT SPECIES CHECKLIST - WAIAWA PROJECT, O'AHU

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
FERNS AND FERN ALLIES					
BLECHNACEAE					
Blechnum occidentale L.	blechnum	X	-	+	+
GLEICHENIACEAE					
Dicranopteris linearis (Burm.) Underw.	'uluhe	I	-	-	+
HYPOLEPIDACEAE					
Pteridium aquilinum var. decompositum (Gaud.) Tryon	kilau	E	-	-	+
LINDSAEACEAE					
Sphenomeris chinensis (L.) Maxon	pala'a	I	-	+	+
NEPHROLEPIDACEAE					
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	swordfern	X	-	+	+
POLYPODIACEAE					
Phymatosorus scolopendria (Burm.) Pic.-Ser.	lau'ae	X	-	-	+
PSILOTACEAE					
Psilotum nudum (L.) Beauv.	moa	I	-	-	+
THELYPTERIDACEAE					
Christella dentata (Forsk.) Brownsey & Jermy	downy woodfern	X	-	+	+
Christella parasitica (L.) Levl.	downy woodfern	X	-	+	+

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
MONOCOTYLEDONS					
ARACEAE					
Syngonium podophyllum Schott.	syngonium	X	-	-	+
COMMELINACEAE					
Commelina benghalensis L.	hairy honohono	X	-	+	+
Commelina diffusa Burm. f.	honohono	X	+	+	+
CYPERACEAE					
Cyperus rotundus L.	nut grass, kili'o'opu	X	+	-	-
GRAMINEAE					
Andropogon virginicus L.	broomsedge	X	+	+	+
Bambusa sp.	bamboo	X	-	-	+
Brachiaria mutica (Forsk.) Stapf.	Californiagrass	X	+	+	+
Brachiaria subquadripara (Trin.) Hitchc.		X	-	-	+
Cenchrus echinatus L.	common sandbur, 'ume'alu	X	+	-	-
Chloris divaricata R. Br.	stargrass	X	+	-	-
Chloris inflata Link	swollen fingergrass	X	+	+	-
Chloris virgata Sw.	feather fingergrass	X	+	-	-
Cynodon dactylon (L.) Pers.	Burmuda grass, manienie	X	+	+	-
Digitaria fuscescens (Presl) Henr.	creeping kukaipua'a	X	+	+	-
Digitaria horizontalis Willd.		X	+	+	-
Digitaria timorensis (Kunth) Balansa		X	+	+	-
Digitaria violascens Link	kukaipua'a-uka	X	+	-	-
Eleusine indica (L.) Gaertn.	wiregrass, manienie-ali'i	X	+	-	-

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
Melinis minutiflora Beauv.	**molassesgrass**	X	+	+	+
Oplismenus hirtellus (L.) Beauv.	basketgrass, honohono-kukui	X	-	-	+
Panicum maximum Jacq.	Guinea grass	X	+	+	+
Paspalum conjugatum Berg.	Hilo grass, mau'u Hilo	X	+	+	+
Paspalum dilatatum Poir.	Dallis grass	X	+	+	-
Paspalum fimbriatum HBK.	fimbriate paspalum	X	-	+	-
Paspalum orbiculare Forst. f.	ricegrass, mau'u laiki	X	+	+	-
Paspalum urvillei Steud.	Vaseygrass	X	+	-	-
Pennisetum sp.	feathergrass	X	+	+	-
Rhynchelytrum repens (Willd.) C. E. Hubb.	Natal redtop	X	+	+	+
Saccharum officinarum L.	sugar cane, ko	P/X	+	-	-
Setaria glauca (L.) Beauv.	yellow foxtail	X	+	+	+
Sorghum halepense (L.) Pers.	Johnsongrass	X	+	-	-
Sporobolus africanus (Poir.) Robyns & Tournay	African dropseed	X	+	-	-
Tricachne insularis (L.) Nees	sour grass	X	+	-	-
LILIACEAE					
Cordyline terminalis (L.) Kunth	ti, ki	P	-	-	+
Sansevieria trifasciata Prain	bowstring hemp	X	-	-	+
ORCHIDACEAE					
Spathoglottis plicata Bl.		X	-	-	+
PALMAE					
Cocos nucifera L.	coconut, niu	P	-	-	+

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
DICOTYLEDONS					
ACANTHACEAE					
Asystasia gangetica (L.) T. Anders.	asystasia, Chinese violet	X	-	+	-
Ruellia graecizans Backer	scarlet ruellia	X	-	-	+
AMARANTHACEAE					
Amaranthus spinosus L.	spiny amaranth, pakai-kuku	X	+	-	-
ANACARDIACEAE					
Mangifera indica L.	mango, manako	X	-	-	+
Schinus terebinthifolius Raddi	Christmas berry, wile-laiki	X	-	+	+
BASELLACEAE					
Boussingaultia gracilis Miers f. pseudobaselloides Hauman	Madeira vine, 'uala-hupe	X	+	+	-
BIGNONIACEAE					
Spathodea campanulata Beauv.	African tulip tree	X	-	+	+
CASUARINACEAE					
Casuarina equisetifolia Stickm.	common ironwood	X	-	+	+
Casuarina stricta Dryand.	longleaf ironwood	X	+	+	+
Casuarina spp.	ironwood	X	-	+	+

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
COMPOSITAE					
Ageratum conyzoides L.	ageratum, maile hohono	X	+	+	-
Bidens pilosa L. var. pilosa	Spanish needle, beggar's tick, ko'oko'olau	X	+	+	-
Bidens pilosa var. minor (Bl.) Sherff		X	+	+	-
Crassocephalum crepidioides (Benth.) S. Moore	crassocephalum	X	+	+	-
Emilia fosbergii Nichol.	pua-lele	X	+	+	-
Erigeron bonariensis L.	hairy horseweed, ilioha	X	+	+	-
Erigeron canadensis L.	Canada fleabane	X	+	-	-
Eupitorium riparium Regel	pamakani	X	-	+	-
Pluchea indica (L.) Less.	Indian pluchea	X	+	-	-
Pluchea odorata (L.) Cass.	pluchea, sour bush	X	+	+	-
Sonchus oleraceus L.	sowthistle, pua-lele	X	+	-	-
Synedrella nodiflora (L.) Gaertn.	synedrella	X	-	-	+
Tridax procumbens L.	coatbuttons	X	+	-	-
Vernonia cinerea (L.) Less.	ironweed	X	+	+	+
Wedelia trilobata (L.) Hitchc.	wedelia	X	-	+	-
CONVOLVULACEAE					
Ipomoea triloba L.	little bell	X	+	+	-
Merremia tuberosa (L.) Rendle	woodrose	X	-	-	+
CRASSULACEAE					
Kalanchoe pinnata (Lam.) Pers.	air plant, 'oliwa-ku-kahakai	X	-	-	+
CRUCIFERAE					
Lepidium sp.	peppergrass	X	-	+	-

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
CUCURBITACEAE					
Momordica charantia L.	balsam apple, bitter gourd	X	+	+	+
EUPHORBIACEAE					
Euphorbia geniculata Ortega	wild spurge, kaliko	X	+	+	-
Euphorbia glomerifera (Millsp.) L. C. Wheeler	spurge	X	+	+	-
Euphorbia heterophylla var. cyathophora (Murr.) Griseb.	Mexican fire plant, false poinsettia	X	+	+	-
Euphorbia hirta L.	hairy spurge, koko-kahiki	X	+	+	-
Macaranga tanarius (Stickm.) Muell.-Arg.	macaranga	X	-	-	+
Phyllanthus debilis Klein ex Willd.	phyllanthus weed	X	+	+	-
Ricinus communis L.	castor bean, koli	X	-	-	+
LAURACEAE					
Persea americana Mill.	avocado	X	-	-	+
LEGUMINOSAE					
Albizia falcataria (L.) Fosb.	albizia	X	+	+	+
Cassia floribunda Cav.	kalamona	X	+	-	-
Cassia lechenaultiana DC.	partridge pea, lauki	X	+	+	+
Cassia occidentalis L.	coffee senna, 'auko'i	X	-	+	+
Crotalaria incana L.	fuzzy rattlepod, kukai-hoki	X	+	+	-
Crotalaria pallida Ait.	mucronate rattlepod	X	+	+	-
Desmanthus virgatus (L.) Willd.	virgate mimosa	X	-	+	+
Desmodium canum (Gmel.) Schinz. & Thell.	Spanish clover, ka'imi	X	+	+	+

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
Desmodium triflorum (L.) DC.	three-flowered beggar-weed	X	+	-	-
Indigofera suffruticosa Mill.	indigo, 'iniko	X	+	+	+
Leucaena leucocephala (Lam.) de Wit	koa-haole, ekoa	X	+	+	+
Medicago polymorpha L.	bur clover	X	+	-	-
Mimosa pudica var. unijuga (Duchass. & Walp.) Griseb.	sensitive plant, pua-hilahila	X	+	+	-
Phaseolus lathyroides L.	cow pea, wild bush bean	X	+	-	-
Phaseolus limensis Macf. (cultivar)	spotted lima bean	X	+	-	-
Pithecellobium dulce (Roxb.) Benth.	'opiuma	X	+	+	-
LOGANIACEAE					
Buddleja asiatica Lour.	butterfly bush, dogtail, huelo-'ilio	X	+	+	-
LYTHRACEAE					
Cuphea carthagenensis (Jacq.) Macbride	cuphea, puakamoli	X	-	+	-
MALVACEAE					
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	X	+	-	-
Malvastrum coromandelianum (L.) Garcke	false mallow, hauuoi	X	+	-	-
Sida rhombifolia L.	Cuba jute	X	+	-	-
Sida spinosa L.	prickly sida	X	+	+	-
MELASTOMATACEAE					
Clidemia hirta (L.) D. Don	clidemia, Koster's curse	X	-	+	+

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
MORACEAE					
Ficus microcarpa L. f.	Chinese banyan	X	-	-	+
Ficus rubiginosa Desf.	Port Jackson fig	X	-	-	+
MYRTACEAE					
Eucalyptus citriodora Hook.	lemon-scented gum	X	-	+	+
Eucalyptus globulus Labill.	blue-gum	X	-	-	+
Eucalyptus robusta Sm.	swamp mahogany	X	-	-	+
Eucalyptus spp.	eucalyptus, gum tree	X	-	+	+
Psidium cattleianum Sabine	strawberry guava	X	-	+	+
Psidium guajava L.	yellow guava, guava	X	+	+	+
Syzygium cuminii (L.) Skeels	Java plum, palama	X	+	+	+
NYCTAGINACEAE					
Bougainvillea glabra Choisy (cultivars)	bougainvillea hybrids	X	-	+	-
Bougainvillea spectabilis Willd.	purple bougainvillea	X	-	+	-
OXALIDACEAE					
Oxalis corniculata L.	yellow wood sorrel, 'ihi	I	+	+	-
Oxalis martiana Zucc.	pink wood sorrel, 'ihi pehu	X	+	+	-
PASSIFLORACEAE					
Passiflora edulis f. flavicarpa Deg.	yellow liliko'i	X	-	-	+
Passiflora foetida L.	scarlet-fruited passion-flower, pohapoha	X	+	-	-
Passiflora laurifolia L.	yellow granadilla	X	+	+	+
Passiflora suberosa L.	huehue-haole	X	-	-	+

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
PIPERACEAE					
Peperomia leptostachya H. & A.	'ala'ala-wai-nui	I	-	-	+
PLANTAGINACEAE					
Plantago lanceolata L.	narrow-leaved plantain	X	+	-	-
Plantago major L.	common plantain, laukahi	X	+	+	-
PORTULACACEAE					
Portulaca oleracea L.	common purslane, pigweed, 'ihi	X	+	-	-
PROTEACEAE					
Grevillea robusta A. Cunn.	silkoak, 'oka-kalika	X	-	-	+
Macadamia ternifolia var. integrifolia (Maiden & Betche) Maiden & Betche	macadamia nut, macnut	X	-	+	-
RUBIACEAE					
Paedaeria foetida L.	maile-pilau	X	-	-	+
Spermococe assurgens R. & P.	buttonweed	X	+	-	-
SAPOTACEAE					
Chrysophyllum oliviforme L.	satin leaf, caimitillo	X	-	-	+
SOLANACEAE					
Capsicum annuum L.	red pepper, chili pepper, nioi	X	-	-	+
Solanum nigrum L.	popolo	I	+	-	-
Solanum seaforthianum Andr.	blue potato vine	X	-	-	+
Solanum sodomeum L.	apple-of-Peru	X	-	-	+
STERCULIACEAE					
Waltheria indica var. americana (L.) R. Br. ex Hosaka	'uhaloa, hi'aloa	I	+	+	-

SCIENTIFIC NAME	COMMON NAME	STATUS	VEGETATION TYPES 1	2	3
THYMELIAEACEAE					
Wikstroemia sp.	'akia	E	-	+	+
TILIACEAE					
Heliocarpus popayaensis HBK.	white moho	X	-	-	+
Triumfettia triloba (L.) Jacq.	burbush	X	-	-	+
ULMACEAE					
Trema orientalis (L.) Bl.	gunpowder tree	X	-	-	+
UMBELLIFERAE					
Apium tenuifolium (Moench) Thell. ex Hegi	fir-leaved celery	X	+	-	-
Centella asiatica (L.) Urban	Asiatic pennywort, pohekula	X	+	+	-
Daucus pusillus Michx.	wild carrot	X	+	-	-
VERBENACEAE					
Lantana camara L.	lantana, lakana	X	-	+	+
Stachytarpheta australis Mold.	Cayenne vervain	X	+	+	-
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain, owi, oi	X	+	+	+
Stachytarpheta urticaefolia (Salisb.) Sims	urticate-leaved vervain	X	+	+	-
Verbena litoralis HBK.	weed verbena, ha'uowi	X	+	+	-

ANDREW J. BERGER

Terrestrial Vertebrate Animals of Waiawa Ridge,
Environmental Assessment

November 30, 1986

APPENDIX E

November 30, 1985

Mr. F. J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, HI 96809

Dear Fred:

Here is my report "Terrestrial Vertebrate Animals of Waiawa Ridge, Environmental Assessment."

If you have any questions or suggestions,please call me: 262-8325.

Sincerely,

Andrew J. Berger
1349 Kainui Drive
Kailua, HI 96734.

DEC 2 1985

Terrestrial Vertebrate Animals
of Waiawa Ridge, Environmental Assessment

By Andrew J. Berger

This study and report was done in accordance with agreement (dated November 14, 1985) with F. J. Rodriguez, President of Environmental Communications, Inc. My field studies were done on November 20 and 21, 1985.

The Habitat

The entire region has been drastically disturbed for more than 100 years. There is no semblance of any endemic ecosystem in the vicinity of the area. As pointed out in the "Property and Land Use Concept" statement: "Of the 1,500 acres within this property, approximately 1,350 acres, formerly in cane, has topography with grades less than a ten percent." The fallow cane fields have a number of introduced grasses and weeds. The ridges and gulches support a fairly dense vegetation of such exotic plants as eucalyptus, ironwood (Casuarina), octopus tree, and Christmas berry trees.

Amphibians and Reptiles

There are no endemic amphibians or land reptiles in the Hawaiian Islands. All, therefore, have been introduced (either intentionally or accidentally) by man. None are endangered or threatened species and none are of any significance for an environmental impact assessment.

1. Amphibians

Four species of frogs have been introduced to the island of

Oahu: the green and black poison-arrow frog (Dendrobates auratus), the bullfrog (Rana catesbeiana), the wrinkled frog (Rana rugosa), and the giant neotropical toad (Bufo marinus). The four species generally occupy different habitats, and none are of any concern in an environmental impact assessment (Munsaker and Breese, 1967).

II. Reptiles

1. Blind snake, Typhlina bramina

"This small, secretive snake was apparently introduced from the Philippines in the dirt surrounding plants that were brought in for landscaping the campus of the Kamehemeha Boys School in Honolulu. It was first found there in January 1930" (Oliver and Shaw, 1933). These blind worm-like snakes are rarely seen until they are flooded from underground burrows by heavy rain or unless one looks for them under branches and other debris on the ground. These harmless snakes are of no significance for an environmental impact assessment. They now are found on all of the main islands (McKeown, 1978).

2. Skinks and Geckos

Eleven species of skinks (family Scincidae) and geckos (family Gekkonidae) occur on Oahu. All are foreign to the islands, all are insect eaters, and all adapt well to both urban and rural areas.

The Birds

Three groups of birds are found in the Hawaiian Islands: 1. endemic, 2, indigenous, and 3, introduced or alien birds.

I. Endemic Birds

These are birds that are unique to the Hawaiian Islands; they occur naturally no place else in the world. Many of these endemic birds are classified as endangered or threatened with extinction by the U.S. Fish and Wildlife Service and by the State Division of Forestry and Wildlife. Most of these endangered species are forest birds, few of them still exist on Oahu, and there is no suitable habitat on or near the project site.

Four species of endangered Hawaiian waterbirds do occur on Oahu: Koloa or Hawaiian duck (Anas wyvilliana), Hawaiian gallinule or 'Alae 'Ula (Gallinule chloropus sandvicensis), Hawaiian coot or 'Alae Ke'oke'O (Fulica americana alai), and the Hawaiian stilt or Ae'O (Himantopus mexicanus knudseni). There is, however, no suitable habitat for these waterbirds on the project area (see, Challenberger, 1977; Walker et al., 1978).

There is one endangered Hawaiian bird that could occur in the general region of the project site: the Hawaiian owl or Pueo (Asio flammeus sandwichensis). This subspecies of the North American short-eared owl is considered to be endangered on Oahu by the State Division of Forestry and Wildlife, although not by the U.S. Fish and Wildlife Service.

This owl differs from most other owls in its diurnal habits, so that, where present, it frequently is seen soaring during daylight hours. I did not see any Pueo during my two days of field work, nor could I find any published records of the owls' occurence in this area.

II. Indigenous Birds

These are species that occur naturally in Hawaii but whose total reange includes other parts of the Pacific Basin. These birds are native to the Hawaiian Islands but are not unique to them. In this category are 22 species of sea birds, the Hawaiian Black-crowned night heron (Nycticorax n. hoactli), and a number of migratory species that spend their winter or nonbreeding period in the islands. I did not see any night herons and there is no suitable habitat for them on the project site.

The only winter resident that one would expect to find in this habitat is the golden plover (Pluvialis dominica fulva), and I saw several in the old cane-haul roads. In Hawaii these "shorebirds" winter from sea level to elevations as great as 10,000 feet on the island of Hawaii. The birds frequent lawns in residential areas, golf courses, weedy pastures, open areas in the mountains, and mud flats along the coasts. The project site does not provide habitat for the other winter residents.

III. Introduced Birds

More than 170 species of alien birds have been intentionally released in the Hawaiian Islands since about 1800 (Berger, 1981). Approximately 50 species have established breeding populations in the islands. Several species have proven to be highly detrimental to agriculture. The folowing species occur on and adjacent to the Waiawa land.

I. Order Ciconiiformes

A. Family Ardeidae, herons and egrets

1. Cattle Egret, Bubulcus ibis

This egret was imported to Hawaii from Florida to aid

"in the battle to control house flies, horn flies, and other flies that damage hides and cause lower weight gains in cattle" (Breese, 1959). A number of cattle egrets were released on Oahi in 1959 and 22 additional birds were released in 1961. Thistle (1962) reported that the population of cattle egrets exceeded 150 birds by July of 1962. Some 700 egrets were counted on Oahu during July 1983 by personnel of the State Division of Forestry and Wildlife. I saw a half dozen egrets in flight over the fallow cane fields.

II. Order Galliformes

B. Family Phasianidae, pheasants, quail, and partridges

2. Ring-necked Pheasant, Phasianus colchicus

According to Caum (1933), this Asian pheasant probably was introduced to the islands in 1865 "probably by Dr. Hillebrand." It also has been imported a number of times since "through dealers in the United States as well as from the territorial game farm on Oahu" (Schwartz and Schwartz, 1949). It now is not a very successful species on Oahu. Hunters killed 235 birds during the 1960-1961 hunting season, but only one bird was reported during the 1983-1984 season (Saito, 1984). I heard one bird call from the power line area near the fence for the Waiawa Correctional Facility.

III. Order Columbiformes

C. Family Columbidae, pigeons and doves

3. Spotted or Lace-necked Dove, Streptopelia c. chinensis

This Asian dove was introduced to the Hawaiian Islands

at an early date; the exact date is unrecorded, but the birds are said to have been common on Oahu by 1879 (Caum, 1933). It is now common to abundant on all of the main islands in the chain, and is classfied as a gamebird in Hawaii. It occurs in areas where the rainfall exceeds 100 inches a year, but the highest densities are found in drier areas where the alien kiawe and koa haole are dominant plants. Schwartz and Schwartz (1949), for example, found densities as great as 200 birds per square mile on Molokai. The diet was found to consist of 77 percent weed seeds and about 23 percent fruits; animal matter was "almost negligible." Tapeworm parasitism, however, was heavy, thus indicating that the small amount of animal material eaten by the doves was important in contracting the worm parasites. The spotted dove is common in residential and open areas throughout the Waiawa region.

4. Barred Dove or Zebra Dove, Geopelia striata

This dove was introduced to the islands from Australia sometime after 1932 (Bryan, 1958). Barred Doves also prefer drier areas where weed seeds are abundant. Schwartz and Schwartz (1949) reported densities as great as 400 to 800 birds per square mile on Oahu (e.g., Barber's Point to Hakaha) less than 25 years after the birds had been released on the island. The diet consists of about 97 percent weed seeds and otherplant materials; the 3 percent animal matter includes several species of beetles, weevils, and wireworm larvae. This small dove also is considered to be a gamebird in Hawaii. It is very common in all parts of the Waiawa area.

IV. Order Strigiformes

D. Family Tytonidae, Barn Owls.

5. Barn Owl, Tyto alba pratincola

Barn Owls differ from other owls in that they have a heart-shaped facial disc of feathers, hence the name of "monkey-faced owl." Barn Owls were first released on Oahu in 1959. Like the mongoose much earlier, the owls were introduced with the hope that they would prey upon rats in the sugarcane fields of the islands. Few studies of the food habits of the Barn Owl have been conducted in Hawaii, but one study on the island of Hawaii revealed that about 90 percent of the food consisted of house mice (Tomich, 1971). Byrd and Telfer (1980) reported that Barn Owls had killed more than 100 seabirds and their chicks on Kauai and Kaula islands. These owls are nocturnal in habits and I did not see any during my daytime field work. However, a guard at the entrance to the Waiawa Correctional Facility told me that he had seen "whitish" owls perched on the fence at dusk. These light-breasted birds certainly were Barn Owls.

V. Order Passeriformes

E. Family Alaudidae, Larks

6. Skylark, Alauda arvensis

The first Skylarks were brought to Hawaii from England in 1865; other birds were brought to Hawaii from New Zealand (where that had been introduced from England in 1864) in 1870. Henshaw (1904) wrote that the introduction of the Skylark to Oahu had been "a great success," and that some birds had been released on the windward side of Hawaii. Skylarks were fairly common in suitable habitat on Oahu 20 years ago, but have become increasingly uncommon

as the years have passed. Robert L. Pyle saw two skylarks on the Waipio Peninsula and two others near Walker Bay during 1976 (Elepaio, 37:9); six birds were counted during the 1984 Honolulu Christmas Bird Count of the Hawaii Audubon Society (Pyle, 1985). I was pleasantly surprised to find several birds in their flight song in the "pasture land" during the morning of November 21, 1985.

F. Family Timaliidae, babblers and laughing-thrushes

7. Melodious Laughing-thrush, Garrulax canorus

This bird is a member of the babbler family even though it has long been called the Chinese thrush or Hwa-Mei in Hawaii. The species is native to the Yangtze Valley in China and southward into Laos, and it occurs in Formosa. The birds were brought to Hawaii as cage birds during the last century. "A number obtained their freedom at the time of the great fire in the Oriental quarter in Honolulu in 1900, and took to the hills behind the city" (Caum, 1933). Birds later were imported and released on the other islands. These are shy birds that have a loud, clear song, so that they more often are heard rather than seen. This laughing-thrush was generally distributed in the heavily vegetated gulches of the area.

G. Family Pycnonotidae, Bulbuls

8. Red-vented Bulbul, Pycnonotus cafer

Although all members of this Old-world family are listed as "prohibited entry" by the State Quarantine Division of the Department of Agriculture, two species are now well established on Oahu.

The history of the spread of this species since the mid-1960s has been discussed by Berger (1975a, 1981). Bulbuls are a scourge

to both fruit and flower growers. The birds eat buds, flowers, and ripe fruits of all kinds. I saw several flocks of 15 to 20 bulbuls in the fallow cane fields and the dirt roads in the project area.

H. Family Turdidae, Thrushes and Bluebirds

9. Shama, Copsychus malabarica

Shama is the Indian name for this thrush, which is native to India, Nepal, Burma, Malaysia, and throughout Indochina. The Hui Manu imported Shamas in 1940 and released them in Nuuanu Valley "and at some homes in the 2400 block on Makiki Heights road" (Harpham, 1953). The Shama is now common on both the windward and leeward slopes of the Koolau mountains. The birds prefer lush vegetation and inhabit the gulches of the region.

I. Family Sylviidae, Old-world Warblers

10. Japanese Bush Warbler, Cettia diphone cantans

This species was introduced to Oahu by the Territorial Board of Agriculture and Forestry in 1929 and "several times after that by the Hui Manu and by private individuals" (Caum, 1933). The Japanese name is Uguisu. These are shy and secretive birds, typically inhabiting areas with dense undergrowth. In the project area, however, the birds were singing throughout the fallow sugarcane fields. Berger (1975b) summarized the history and distribution of this species on Oahu. The song period apparently lasts from November through mid-July, and the birds were in full song on November 20 and 21, 1985.

J. Family Zosteropidae, White-eyes and Silver-eyes

11. Japanese White-eye, Zosterops japonicus

Long a favorite cage bird in the Orient, this species was first imported for release from Japan by the Territorial Board of Agriculture and Forestry in 1929 (Caum, 1933). Later importations were made by the Hui Manu. The Japanese name is Mejiro, and Mejiro clubs held singing competitions with these birds. The white-eye has been a remarkably successful introduction and this species undoubtedly is the most abundant song bird in the Hawaiian Islands. It occurs from sea level to 10,000 feet elevation on Hawaii, and it occupies near-desert areas (e.g., Kawaihae) and those with an annual rainfall of more than 300 inches. The white-eye is an abundant species throughout the Waiawa region.

K. Family Sturnidae, Mynas and Starlings

12. Common Indian Myna, Acridotheres tristis

This myna is native to Sri Lanka, India, Nepal, and adjacent regions. It "was introduced from India in 1865 by Dr. William Hillebrand to combat the plague of army worms that was ravaging the pasture lands of the islands. . . reported to be abundant in Honolulu by 1879, it now is extremely common throughout the Territory" (Caum, 1933). The Myna continues to be very common on Oahu and it occurs in the vicinity of man and his buildings, on golf courses, and throughout the Waiawa region.

L. Family Ploceidae, Weaverbirds and their Allies

13. Spotted Munia or Ricebird, Lonchura punctulata

This munia has a wide distribution in Sri Lanka, India, Nepal, Burma, and southward into Malaysia and the Indo-Chinese subregion, and in the Philippines. The species was introduced

to Oahu by Dr. Hillebrand about 1865. Caum wrote that this species feeds "on the seeds of weeds and grasses and does considerable damage to green rice." Although rice is no longer grown in Hawaii, this munia continues to be a pest for certain agricultural crops (see explanation under House Finch). Ricebirds are highly gregarious and flocks of 75 or more birds are not uncommon. They are a prolific species and I have found nests throughout the year. Ricebirds are not inhabitants of forests or dense thickets but are found wherever there are weed seeds in open spaces: for example, pastures, golf courses, along dirt roads and cane haul roads, weedy fields, and fallow sugarcane fields. Therefore, the Ricebird is an abundant species in the project area.

14. Black-headed Munia, Lonchura malacca atricapilla

This race of the Black-headed Munia is native to northeastern India, Burma, and northwestern Yunnan. There are nine other races that range from the Philippines to Java. This species also is known in the pet-store trade as the Chestnut Mannikin, Black-headed Nun, Black-hooded Nun, and Black-headed Mannikin. Birds apparently were first imported as cage birds from Asia between 1936 and 1941. The species was first reported breeding in the wild by Udvardy (1960), who observed 10 adults and 15 juvenile birds near West Loch, Pearl Harbor, on April 26, 1959. Ord (1967) reported that the species was abundant "in open grassy areas around Middle and West Lochs of Pearl Harbor." I observed flocks of this munia along the edges of cane fields in the West Beach area during November 1973, and flocks were

observed in Mililani Town in February 1977. The species has continued to expand its range on Oahu and I saw several small flocks in the fallow cane fields.

15. House Sparrow, Passer domesticus

Incorrectly called the English Sparrow (it has a wide distribution in Europe and Asia as well as in Britain), this sparrow was first imported to Oahu in 1871, when nine birds were brought in from New Zealand (where they had previously been introduced from England). Caum (1933) wrote that "the species was reported to be numerous in Honolulu in 1879." The House Sparrow became a serious pest in North America and many thousands of dollars were spent in attempts to control the population. This sparrow apparently never became a pest in in Hawaii. The birds eat grain, seeds, and insects and their larvae. The House Sparrow typically is found in the vicinity of man and his buildings but they also forage in outlying areas, and I found them along the dirt roads throughout the fallow cane fields.

N. Family Fringillidae

16. Yellow-faced Grassquit, Tiaris olivacea

This finch is native to the Atlantic slope of Mexico southward through Central America to western Columbia and Venezuela, and Puerto Rico, Cuba, Hispaniola, Jamaica, and other islands. We have no information on the introduction of this species to Oahu. It was first reported by Douglas Roselle, who found several birds at Pacific Palisades during August 1974

(Elepaio, 35:65). "At least 6 birds" were seen in this area on October 29, 1978 (Elepaio, 38:106). By 1979 this grassquit had spread to the Kipapa trail (Stemmerman, 1981). Although I did not happen to see this species, it undoubtedly occurs in the region of the project site.

17. Red-crested Cardinal, Paroaria coronata

This species has long been called the Brazilian Cardinal in Hawaii, but its native range also includes Paraguay, Uruguay, and parts of Bolivia and Argentina. The species was released several times between 1928 and 1931 (Caum, 1933). The Red-crested Cardinal is very common on Oahu and I found several flocks of between 15 and 20 birds along the edges of the fallow cane fields.

18. Cardinal, Cardinalis cardinalis

This North American bird also is called the Kentucky Cardinal, Virginia Cardinal, and the Redbird. Its native range is the eastern part of North America east of the plains and northward into Ontario. The Cardinal was released on several occasions between 1929 and 1931 (Caum, 1933). It now is common in residential and rural areas but is uncommon in the fallow cane fields.

19. House Finch, Carpodacus mexicanus frontalis

The House Finch was introduced to Hawaii from California "prior to 1870, probably from San Francisco" (Caum, 1933). The House Finch now is an abundant species on all of the islands, and probably is the second most common song bird in the islands. Although they sometimes eat ripe papaya and other soft fruits

(thus the colloquial name of "Papayabird"), the species is predominantly a seed-eater. House Finches and Spotted Munias caused great damage to experimental sorghum crops on Kauai and Hawaii during 1971 and 1972. A report by the Senate Committee on Ecology, Environment, and Recreation said that "ricebirds and linnets [House Finches] caused a 30 to 50 percent loss in the sorghum fields at Kilauea on Kauai last year. . . . seed-eating birds at Kohala ate 50 tons of sorghum grain in a 30-acre experimental field that was supposed to produce 60 tons" (Honolulu Advertiser, March 14, 1972, p. B-2). House Finches were singing throughout the project area.

Mammals

I. Endemic Mammals

The only endemic land mammal in the Hawaiian Islands is the Hawaiian bat (Lasiurus cinereus semotus), a subspecies of the North American hoary bat. The Hawaiian bat is found primarily on the islands of Kauai and Hawaii (Tomich, 1969; Kramer, 1971; Ten Bruggencate, 1983). I know of no evidence that there is a resident population on the island of Oahu.

II. Introduced Mammals

All of the introduced species of mammals in Hawaii have proven highly detrimental to man, his buildings, products, and agricultural crops and/or to the native forests and their animal life. None is an endangered species and none is of concern as far as detrimental effects resulting from the proposed project. It would, in fact, be a great boon to the islands if it were possible to exterminate all of them.

With the possible exception of the house mouse (Mus musculus), all of the smaller alien mammals prey on birds, their eggs, or nestlings. These small mammals include the roof rat (Rattus rattus), Polynesian rat (Rattus exulans), the Norway rat (Rattus norvegicus), and the small Indian mongoose (Herpestes auropunctatus), as well as the feral cat (Felis catus) and feral dog (Canis familiaris). Because all of these mammals are serious pests, I did not set traplines in order to sample the nocturnal rodents. It is reasonable to assume that all of these rodents occur in the project area (Tomich, 1969; Kramer, 1971).

The feral pig (Sus scrofa) inhabits the valley and gulch floors in the general Waiawa region, but it is of no concern for an impact statement because of the serious destruction that they cause to the forests of Hawaii (Mueller-Dombois et al., 1981).

Summary of Possible Impacts on the Fauna

1. Approximately nine-tenths of the project site consists of former sugarcane land, now fallow and overgrown with alien weed species of plants. In its present condition, the area can be called properly a "waste land." Therefore, the proposed project would have no adverse effects on the alien vegetation. The vegetation of the ridges and gulleys also consists almost entirely of introduced trees, shrubs, vines, and grasses.

2. There are no endemic forest birds in the project area or anywhere near it.

3. There is no suitable habitat for any of the endangered

(thus the colloquial name of "Papayabird"), the species is predominantly a seed-eater. House Finches and Spotted Munias caused great damage to experimental sorghum crops on Kauai and Hawaii during 1971 and 1972. A report by the Senate Committee on Ecology, Environment, and Recreation said that "ricebirds and linnets [House Finches] caused a 30 to 50 percent loss in the sorghum fields at Kilauea on Kauai last year. . . . seed-eating birds at Kohala ate 50 tons of sorghum grain in a 30-acre experimental field that was supposed to produce 60 tons" (Honolulu Advertiser, March 14, 1972, p. B-2). House Finches were singing throughout the project area.

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2. There are no endemic forest birds in the project area or anywhere near it.

3. There is no suitable habitat for any of the endangered

Hawaiian waterbirds.

4. None of the 19 species of introduced or alien birds found in the project area is an endangered species and a number have proven to be serious pests to agriculture in Hawaii. The destruction to sorghum crops by the Spotted Munia and the House Finch already has been mentioned. The doves and the Myna have been implicated in spreading the seeds of such noxious plants as Lantana camara. The Red-vented Bulbul and the Japanese White-eye cause considerable damage to ornamental flowers and to fruit crops (see Keffer, et al., 1976). The barn Owl has been reported to kill birds on Kauai (Byrd and Telfer, 1980). To be sure, some of the introduced bird species apparently cause no damage to crops or to the endemic bird species and their presence provides pleasure to many people. But, developement, including landscaping and the elimination of erosion scars, actually would provide habitat for more of the introduced bird species. Therefore, it seems reasonable to conclude that the presence of these alien bird species is irrelevant to an impact assessment.

5. All of the mammals, land reptiles, and amphibians that occur in the project area are introduced or alien animals. Many of them are predators on birds and several are destructive to agriculture and forest lands and/or to man and his buildings. None of these animals is of any significance in this environmental impact assessment.

6. Because the vegetation in the project area is virtually

all introduced or exotic and because all of the terrestrial vertebrate animals in the region are alien to the islands, there can be no sound biological reason that the proposed project would have any adverse effect on any endemic Hawaiian animal or ecosystem.

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CHINIAGO, INC.

Waiawa Ridge, Oahu: Archaeological Survey of Proposed Golf Course

APPENDIX F

WAIAWA RIDGE, OAHU:
ARCHAEOLOGICAL SURVEY OF PROPOSED GOLF COURSE

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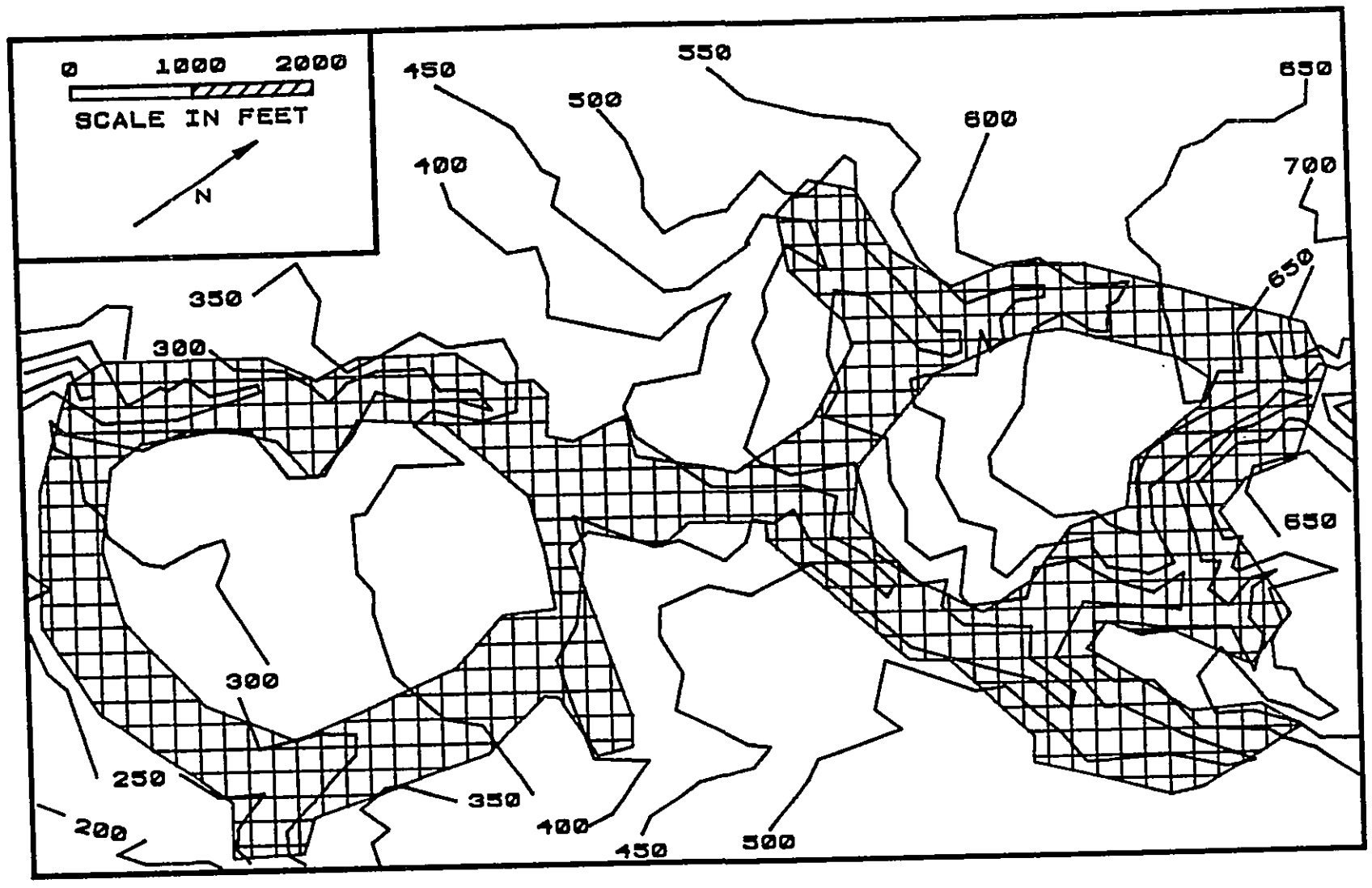

FIGURE 2. MAP OF PROJECT AREA

I. INTRODUCTION

During June and July, 1986, an intensive archaeological survey was conducted along the right-of-way of a proposed golf courses on Waiawa Ridge, central Oahu [Figure 1]. The fieldwork consisted of pedestrian sweeps of the survey area looking for evidence of past utilization [stone walls, midden remains, artifacts, etc.] and the excavation of thirty-six test pits.

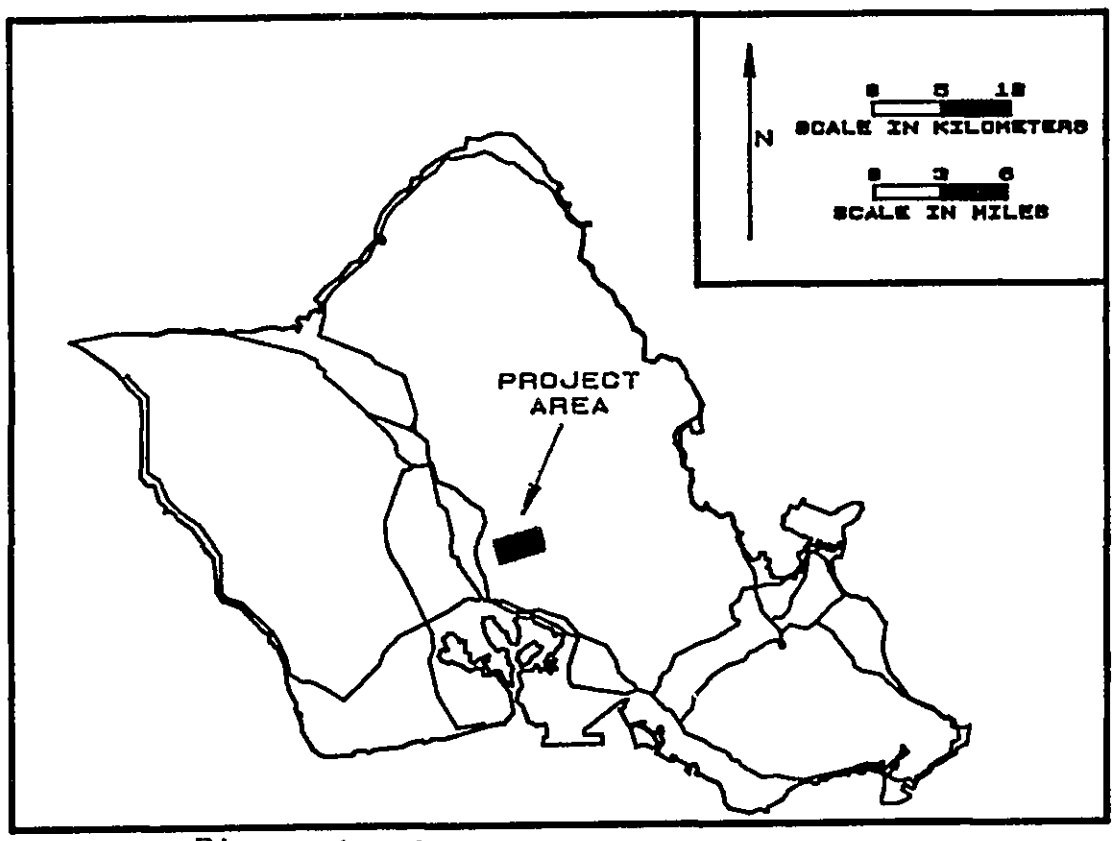

Figure 1. Location of Project Area

II. BACKGROUND

The golf courses are to be part of a proposed residential development of approximately 1242 acres bordered by Pearl City and the Waipio and Crestview subdivisions. The following physical description of the proposed development area is from materials supplied by the client:

> "The land area is composed of a series of gently sloping plateaus, with slopes of 5 to 10 percent. Tributaries of Panakauahi and

Waiawa Gulch meander through the site, generally on a north-south axis, and divide the plateaus into several smaller areas. These gulches provide a natural drainage system through the site and transport storm water runoff from the Koolau Mountains to the Middle Loch of Pearl Harbor. Two major soil associations are found within the project area: the Lualualei-fill land-Ewa association near Pearl Harbor and the Helemano-Wahiawa association. The former association is characterized as deep, nearly level to moderately sloping, well-drained soils that have a fine textured or moderately fine textured subsoil and is primarily located on the coastal plains. The Helemano-Wahiawa association includes the major portion of the site. It is characterized as nearly level to moderately sloping, well-drained soils that have a fine-textured subsoil and is mainly situated on upland areas.

"The average annual precipitation ranges between 25 inches at the lower elevations to about 40 inches in the mauka areas. The elevation ranges between 150 to 885 feet above sea level. Winds are predominantly from the northeast,and the median annual temperature is 82 deg. F. Vegetation on the site consists primarily of scrub growth and koa haole. Approximately 1,860 acres of the site were previously cultivated for sugarcane by Oahu Sugar Company. However, the lands are now fallow since active cultivation ceased after the last harvest in 1983."

Figures 4 through 11, which are views representative of conditions in the survey area, are keyed to Figure 3.

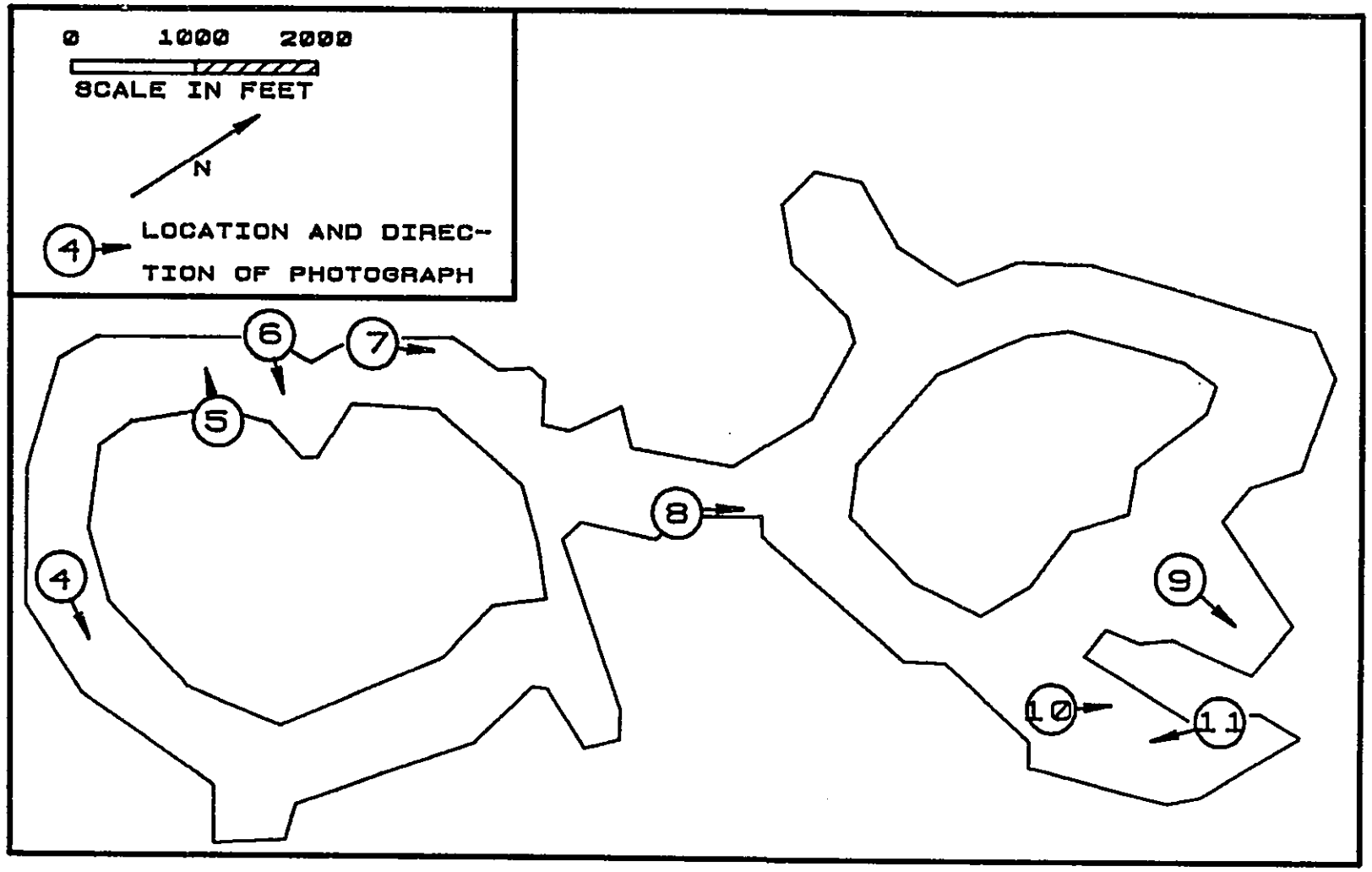

FIGURE 3. LOCATIONS OF PHOTOGRAPHIC FIGURES

Figure 4. View on Plateau, South End of Survey Area

Figure 5. View Across Gulch, Southwest Side of Survey Area

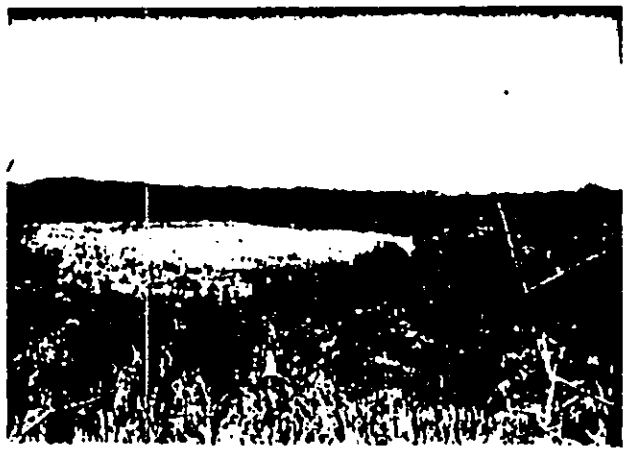

Figure 6. View Across Gulch, Southwest Side of Survey Area

Figure 7. View Up Gulch, Southwest Side of Survey Area

Figure 8. View Up Gulch, Middle of Survey Area

Figure 9. View Up Gulch, North End of Survey Area

Figure 10. View at Bottom of Gulch, North End of Survey Area

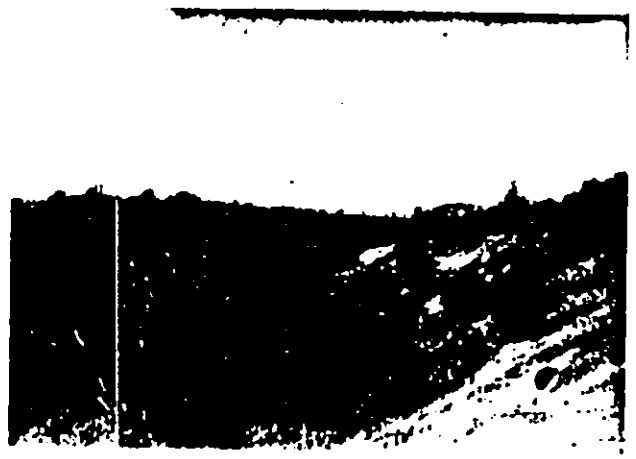

Figure 11. View Down Gulch, North End of Survey Area

III. PREVIOUS RESEARCH

Published information on the area is scarce. McAllister [1933:105] mentions only one site in the vicinity, and that was in Waiawa Gulch immediately outside the project area on the southeast:

> "Site 121. Puoiki heiau, at the juncture of Manana and Waiawa gulches.
>
> "The heiau crowned the top of a small oval knoll which is about 50 feet high by 100 feet wide and 200 feet long. The sides of the knoll are perpendicular except for a steep and narrow neck on the mountain side. During the ceremonies the people are said to have been at the foot of the knoll and surrounding the heiau. There are no remains."

Handy [1940:81] refers briefly to taro cultivation in Manana gulch:

> "This narrow *ahupua'a* was called Manana-iki in its lower portion and Manana-nui in the mountains where it broadens and includes Manana Stream, which flows into Waiawa. There were a few terraces seaward, irrigated by Waiawa Stream."

A reconnaissance survey of the entire project area was conducted by the author in February, 1986. Exposures of partially-buried terrace retaining walls were found in the bottoms of three of the gulches, and a basalt adze was found on the surface of one of the adjacent slopes. One of the retaining wall locations is included in this report as Site 1469; the remaining sites were outside of the present survey area.

IV. SURVEY RESULTS

Four sites were recorded and given numbers according to the State of Hawaii Historic Preservation Office system.

SITE 1469

This site consists of two parallel boulder alignments at the bottom of a gulch at the north end of the survey area [Figures 12 and 13]. One of the alignments

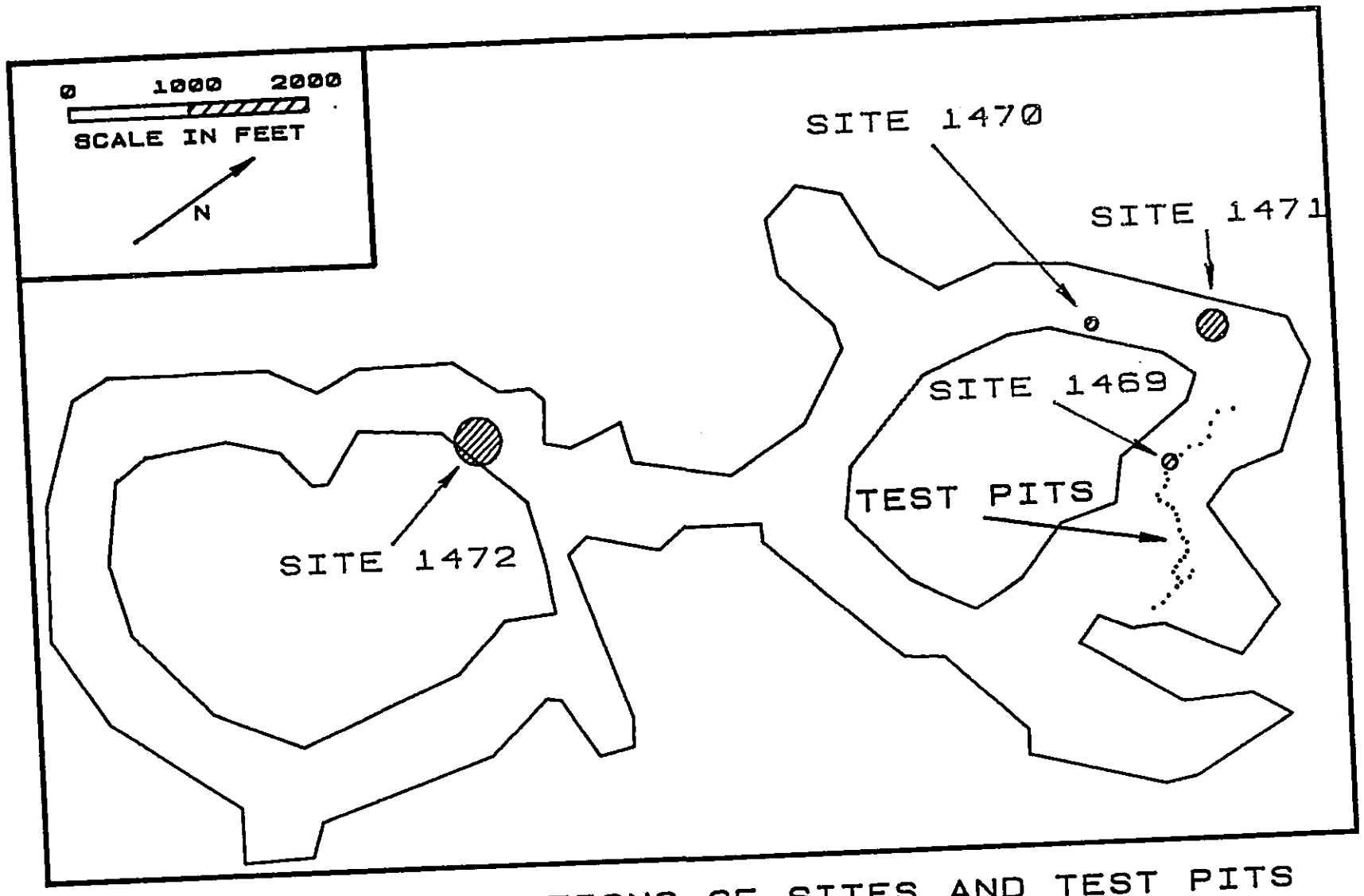

FIGURE 12. LOCATIONS OF SITES AND TEST PITS

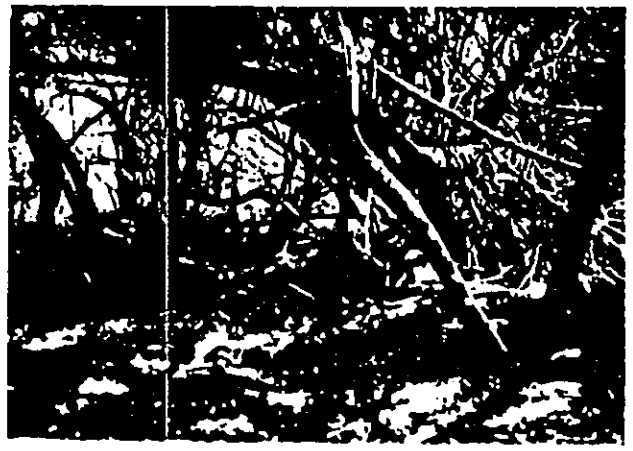

Figure 13. Site 1469, looking Northwest

measures 8.9 meters in length, 1.4 meters in width, and stands to a height of 50 centimeters. The second alignment measures 28.3 meters in length, 80 centimeters in width, and up to 70 centimeters in height. No midden remains were found on the surface, but a test trench (Figure 14) through one of the alignments revealed the presence of a glass bottle beneath one of the boulders, thereby dating the site. It seems most likely that the site was built by either the sugar company or the pineapple company to channelize the streamflow.

Figure 14. Trench at Site 1469, looking East

SITE 1470

This is a historic dump on the slopes of a gulch at the north end of the survey area, covering an area about 60 meters in diameter. Remains consist primarily of whole and fragmentary bottles and broken metal vessels. The bottle evidence suggests that the site was in use around the beginning of the present century. It seems likely that this was the dump area for the people using nearby Site 1471.

Figure 15. Site 1471, looking West

SITE 1471

This is an area marked on a 1922 War Department map as "Cannery," and includes a stone terrace retaining wall measuring 21 meters in length and standing between one and two meters in height (Figure 15). Historic refuse scattered around the feature includes a bath tub, glass bottles, ceramic plates and bowls, metal pipes and pots, and wooden timbers. The vicinity of the site has clearly been bulldozed since February 1974, when an aerial photograph shows several structures still standing at that time.

TRIAD EVALUATIONS

Social Impact Analysis for the Proposed
Gentry Waiawa Project
Waiawa, City & County of Honolulu, Hawaii

August 1986

APPENDIX G

SOCIAL IMPACT ANALYSIS
FOR THE PROPOSED
GENTRY WAIAWA PROJECT
WAIAWA, CITY & COUNTY OF HONOLULU, HAWAII
THE GENTRY COMPANIES

August, 1986

Prepared for
Environmental Communications, Inc.
by
Triad Evaluations

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(Continued)

LIST OF TABLES

I. INTRODUCTION

Identification of social and economic impacts on any given proposed development are subjective at best, however, the need for such analysis are desirable and required under current City planning criteria. In light of such objectives, the identification of potential social impacts of a proposed development upon local residents is best addressed by obtaining a good understanding of the area prior to development. This report is intended to provide objective background data which can serve as a starting point for prognostication of potential social and cultural impacts.

The social impacts of development are listed as demographic, economic, housing, public service, and physical/environmental in Section 10, Social Impacts of Development, in Ordinance 83-6, City and County of Honolulu.

This presentation was developed systematically with the intent of identifying possible impacts based on empirical and quantitative data. Three primary analytical aspects were utilized in formulation of the social impact forecast presented here.

Baseline data for the subject area was recorded through a systematic analysis of available demographic data on socio-economic characteristics in the vicinity. For comparative purposes, Honolulu County statistics were also used as reference mean. From these statistics, conclusions were drawn from the analysis of these findings with respect to demographic concerns outlined in Section 10, Social Impact of Development, Ordinance 83-6, City and County of Honolulu.

The economic aspects of the development were evaluated with respect to the general economic trends which affect the project, as was the housing analysis. Public service evaluation was limited to an overview of existing facilities since public service and facilities planning are usually implemented gradually as needs for specific services arise. Lastly, the physical characteristics of the project were reviewed for any significant impacts resulting from implementation of the project.

II. PROJECT DESCRIPTION

The proposed Waiawa Development is a master planned community consisting of residential, commercial and recreation features set in an area known as Waiawa Ridge.

The site which is located north and east of the existing Waipio Gentry subdivision and industrial park, will consist of 1242 acres utilized as follows:

Land Use	Acreage	Units
Residential	727	5816
Low Density Apartment	82	1640
Medium Density Apartment	15	450
Commercial	5	
Commercial/Industrial	110	
Golf Course	364	
TOTAL	1303 Acres	

Only 1242 acres of the projects' 1303 acres are being applied for during the permitting process since the remaining 61 acres are already in permitted use for the project. Among the features of the proposed development are: 7,906 residential units of mixed densities; commercial and industrial areas; two golfcourses and appurtenant infrastructure. It should be noted that of the total housing units, 4,150 will be developed as a leisure village/retirement community.

Retirement Community		Conventional Housing	
Low Density Apartment	1,100	Low Density Apartment	540
Medium Density Apartment	450	Residential	3,216
Residential	2,600		
	4,150		3,756

The phasing plan for the project is developed around a five year schedule which will include all infrastructure, facilities and operational features. Residential and apartment lands should be completed and occupied within a ten year build-out period.

III. WAIAWA REGIONAL PROFILE: Socio-Economic Characteristics

A. Demographic: Whether the development will:

- Increase or decrease the residential population.
- Increase or decrease the visitor population.
- Change the character or culture of the neighborhood.

The proposed Waiawa Development project site is contained within the U.S. Bureau of the Census, tract number 89.03. This tract is identified as a split tract with a portion belonging to the Waipahu CDP (census designated place, an area of 10,000 or more). The majority of the tract lies within an area categorized as Remainder of Honolulu.

The census tract containing the Waiawa site, 89.03, also includes the Waipiolani Seaview, Crestview and Waipio Gentry developments. A small portion of Waipahu town and the area around Leeward Community College are also included in the tract figures but are also considered a portion of the Waipahu CDP.

For comparative purposes in this report, tracts 89.02, 80.03, 80.06 and 80.05 will be considered as surrounding community areas. These areas contain in part or entirety, Mililani and Waipio, Manana, Pearl City and Pacific Palisades, respectively.

Population:

Population statistics from the Department of Planning and Economic Development for 1984 list Waiawa (tract 89.03) as having a population of 12,783. This represents a 95% increase over the 1980 census figure of 6,566. This increase is primarily attributable to recent development occuring outside of the Waipahu CDP, namely Waipio Gentry. This increase is fairly consistant with the population changes occuring between 1970 and 1980 for the surburban communities in the immediate area.

Table I
Population Growth Within CT 89.03 (Waiawa)

	Waipahu CDP	Remainder in Honolulu County	Total
1970 -	746	1,623	2,369
1980 -	2,382	4,184	6,566 (+177.2%)
1984 -	-	-	12,783* (+94.7%)

* Source: DPED
1970 Census of Housing Block Statistics

These changes are significantly larger than those occuring within Honolulu County which experienced a 20.9% increase between 1970 and 1980 and a subsequent increase of 3.3% between 1980 and 1983.

Table II
Population Growth, Honolulu County and Waiawa

	Honolulu County	Waiawa (CT 89.03)
1970 -	630,528	2,369
1980 -	762,565 (+20.9%)	6,566 (+177.2%)
1983 -	805,300 (+5.6%)	12,783 (+94.7%)

Source: The State of Hawaii Data Book 1985

High growth is not limited to areas within the immediate Waiawa vicinity. Neighboring areas outside of the Waiawa CT are separated by district physical boundaries and are clearly delineated as independent communities, however, they have also exhibited similar growth patterns in some instances.

Table III
Population Growth in Surrounding Areas*

	Manana 80.03	Pearl City 80.05	Pacific Palisades 80.06	Mililani 89.02
1970 -	2,811	7,846	4,349	4,420
1980 -	3,377(+20.1%)	7,465(-5.1%)	5,906(+35.3%)	25,874(+485.4%)
1984 -	6,823(+102%)	7,483(+0.2%)	5,945(+.06%)	30,960(+19.7%)

* Place names are given as area indicators and are not intended to imply totals for the named area or any legal boundaries.

Sources: DPED, The State of Hawaii Data Book 1985

Population increases experienced recently may be attributed to ongoing projects by Lusk Hawaii, Lear Siegler and Mililani Town expansion. Areas within Pearl City and Pacific Palisades experiencing growth stabilization within the past few years are primarily older and more established.

Number of Households

Based on the 1980 census population of 6,566, Waiawa had 1,626 households, with a mean of 4 people per household. This compares to a lower mean of 3.3 people per household in Honolulu County and 3.15 for the State. In 1983 the Hawaii State Department of Health estimated the average Honolulu County household to contain 3.16 persons. The existing Waiawa households can also be separated into sub-catagories part of the Waipahu CDP and those in the northern Honolulu County areas.

Table IV

Number of Households 1980

	Honolulu County	Waiawa (CT total)	Waiawa (Waipahu CDP)	Waiawa (Remainder of Honolulu County)
Population	762,565	6,566	2,382	4,184
Number of Households	230,214	1,626	485	1,168
Mean per Households	3.3	4.0	5.2	3.6

Projected Population Increase:

1980 census data indicates Waiawa household sizes as being larger than the Honolulu County average, however, no data is currently available for the number of households formed since 1980. Units surveyed in 1980 consisted primarily of single family detached residences while post 1980 construction included a significant number of higher density units targeted at smaller household sizes. These recent developments are generally expected to lower household size averages because of their mixture of single family detached and higher density uses. Similar mixtures may be found in newer developments such as Mililani which has an average household size of 3.3. However, this may still reflect an average higher than the Waiawa Development will actually contain.

The Waiawa Ridge Plan, will consist of 7,500 residential units which will consist of a mixture of Residential, Low and Medium density units. Approximately 4,150 of these units will be reserved for the Waiawa Leisure Village which is targeted for the retirement community and "empty nesters." These units are expected to contain small household sizes with one or two persons per unit as the norm.

Based upon this information, an average age persons per household figure of 3.3 should be considered a fair coefficient for the conventional units. Analysis of retirement communities suggest that 1.6 members per household is also reasonable regardless of unit type. Similarly, the Department of General Planning utilizes the coefficients of 2.0 for low density apartments, 3.0 for medium density apartments, and 3.3 for residential units. Utilizing all of these ratios, a total population increase of approximately 18,873 persons could be expected from full development of the project.

Table V

Population Projection

Retirement Community		Conventional Housing	
Low Density Apartment		Low Density Apartment	
1,100 @ 1.6 =	1,760	540 @ 3.0 =	1,620
Medium Density Apartment		Residential 3,216 @ 3.3=	10,613
450 @ 1.6 =	720		12,233
Residential @ 1.6 =	4,160		
	6,640		

Total - 18,873

Age:

The Waiawa community is primarily composed of detached dwelling units consisting of nuclear or extended families. The age breakdown wthin the area indicates that the highest percentage of adults fall within the 25 to 44 year age categories. Although the overall distribution is similar to Honolulu County, the Waiawa area does express slightly higher numbers of school age children and teens. A decrease in ages 55 and over is also indicated.

Table VI
Age Groups (1980)

	Honolulu County	Waiawa (89.03)
Under 5	60,154(7.9%)	527(8%)
5-9	56,771(7.4%)	589(9%)
10-14	58,528(7.7%)	684(10.4%)
15-19	69,715(9.1%)	623(9.5%)
20-24	89,371(11.7%)	454(6.9%)
25-34	143,456(18.8%)	1,203(18.3%)
35-44	89,330(11.7%)	1,021(15.5%)
45-54	74,775(9.8%)	720(11%)
55-64	65,097(8.5%)	425(6.5%)
65-74	35,932(4.7%)	198(3%)
75+	19,436(2.5%)	121(1.8%)

Place of Birth:

Waiawa exhibits significant differences in its residents places of birth compared to Honolulu County distributions. As a whole, the Waiawa census tract is predominantly comprised of Hawaii and foreign born people with relatively few mainland born. More descriptively, it should be noted that Honolulu County has half as many foreign born as it does mainland born. The converse is true for Waiawa where foreign born outnumber mainlanders by a ratio of 1.7 to 1.

Further breakdown of the tract into Waipahu CDP and Remainder of Honolulu County sub-tracts indicate clear differences in internal composition. The Waipahu CDP contains a high percentage of foreign born (41.2%) with relatively few mainlanders (6%) which reflects the high percentage of Filipinos residing in Waipahu. The Remainder of Honolulu County sub-tract on the other hand, contains a markedly high percentage of Hawaii born which may indicate the area as a very "local" community.

Table VII
Place of Birth

	Honolulu County	Waiawa CT	Waiawa (Waipahu CDP)	Waiawa (Remainder of Honolulu County)
Hawaii	420,120(55%)	4,018(61%)	1,266(52.8%)	2,752(65.6%)
Mainland	229,234(30%)	958(14.5%)	145(6%)	813(19.4%)
Foreign	113,211(14.8%)	1,615(24.5%)	988(41.2%)	627(15%)

Years of School Completed:

Waiawa shares fairly homogeneous educational characteristics with Honolulu County. Overall highschool education percentages are in line with the County average however, a slight increase of persons with some college education is noted for Waiawa.

Table VIII
Education

	Honolulu County	Waiawa (CT total)	Waiawa (Waipahu CDP)	Waiawa (Remainder of Honolulu County)
% Highschool Graduates	75.6	76.3	62.0	83.3
College 1-3 Years	78,386(18.3%)	868(23.4%)	304(23.8%)	564(23.2%)
College 4 or More Years	93,201(21.7%)	728(19.7%)	171(13.4%)	557(23%)

Labor Force:

The Waiawa population, compared to Honolulu County, has a large percentage of employable age persons. Labor force figures for the whole Waiawa tract show a labor force of 75.8% while the Honolulu County average is held at 69.2%. These figures are also supported by the age characteristics for both study areas (Table VIII).

Waiawa's overall employment rates are comparable with County wide averages, however the split tracts indicate some divergence with the Remainder of Honolulu County area possessing a higher than County average and the Waipahu CDP possessing a lower than County average.

Table IX
Labor Force

	Honolulu County	Waiawa (CT total)	Waiawa (Waipahu CDP)	Waiawa (Remainder of Honolulu County)
Persons 16 Years & Older	574,903	4,603	1,692	2,911
Total Labor Force	397,889(69.2%)	3,488(75.8%)	1,190(70.3%)	2,298(78.9%)
Civilian Labor Force	339,863	3,264	1,132	2,132
Employed	324,113(95.4%)	3,099(94.9%)	1,037(91.6%)	2,062(96.7%)
Unemployed	15,750(4.6%)	165(5%)	95(8.4%)	70(3.3%)

Occupation:

In comparison with Honolulu County, Waiawa's work force shows strength in service and labor occupations while trade and professional service occupations exhibit some underrepresentation. This would suggest that Waiawa has a higher percentage of wage earners than Honolulu County.

The Waiawa community also contains a high percentage of government workers (26.9%) compared to the Honolulu County (22.5%). Conversely, few workers are self-employed (3%) (Table IX).

Income in 1979:

Waiawa exhibits overall higher-than-average affluence with substantially higher median and mean incomes over County wide figures. The majority of households (46.8%) fell into the $20,000-$34,999 range establishing a solid middle class foundation. Marked differences are noted in the lower income brackets with only 15.5% earning under $20,000 in comparison to Honolulu County's 47.3%. Households with incomes over $35,000 are also notably higher in the Waiawa area. Income distribution within the split Waiawa tracts is homogenous.

Median and mean incomes of owner-occupied Waiawa households are similar to Honolulu County figures, however, Waiawa's renter-occupied households show significantly higher incomes than County figures for the same category.

Comparison within Waiawa's split tracts show similarities in income progression but in light of the marked differences in members per household (CDP 5.2, Remainder 3.6), corresponding economic adjustments are expected in actual disposable income (Table X).

Table X
Occupation and Selected Industries

	Honolulu County	Waiawa (CT total)	Waiawa (Waipahu CDP)	Waiawa (Remainder of Honolulu County)
Employed -16 Years & Older	324,113	3,099	1,037	2,062
Managerial, Administrative Specialty	79,934(16.4%)	1,216(16.9%)	256(10.8%)	960(19.8%)
Technical, Sales Administrative Support	109,521(22.4%)	2,038(28.3%)	656(27.6%)	1,382(28.5%)
Service Occupations	56,939(11.7%)	1,140(15.8%)	386(16.3%)	754(15.6%)
Farming, Forestry, Fishing	5,838(1.2%)	17(0.2%)	11(0.5%)	6(0.1%)
Precision, Production, Repair	36,546(7.5%)	486(6.7%)	181(7.6%)	305(6.3%)
Operators, Fabricators, Laborers	35,335(7.2%)	798(11.1%)	392(16.5%)	406(8.4%)
Manufacturing	24,982(5.1%)	267(3.7%)	120(5%)	147(3%)
Wholesale, & Retail Trade	79,644(16.3%)	767(10.6%)	264(11.1%)	503(10.4%)
Professional & Related Svcs.	59,927(12.3%)	485(6.7%)	107(4.5%)	378(7.8%)
Private Wage & Salary Workers	231,719(69.4%)	2,141(67.3%)	786(75.2%)	1,355(63.4%)
Government Workers	75,058(22.5%)	857(26.9%)	240(23%)	617(28.9%)
Local Government Workers	10,583(3.2%)	90(2.8%)	8(0.8%)	82(3.8%)
Self-employed Workers	16,312(4.9%)	94(3%)	11(1.1%)	83(3.9%)

Table XI
Income in 1979

	Honolulu County	Waiawa (CT total)	Waiawa (Waipahu CDP)	Waiawa (Remainder of Honolulu County
Households	230,931	1,651	463	1,188
Less than $10,000	48,065(20.8%)	104(6.3%)	62(13.4%)	42(3.5%)
$10,000-$19,999	61,153(26.5%)	152(9.2%)	36(7.8%)	116(9.8%)
$20,000-$34,999	68,496(29.7%)	772(46.8%)	185(40%)	587(49.4%)
$35,000-$49,999	33,443(14.5%)	419(25.4%)	120(25.9%)	299(25.2%)
$50,000 and More	19,774(8.6%)	204(12.4%)	60(13%)	144(12.1%)
Median Income	$21,077	$31,061	$29,139	$31,495
Mean Income	$25,180	$33,266	$32,319	$33,635
Owner-Occupied Households	115,290	1,392	370	1,022
Median Income	$30,248	$32,386	$32,282	$32,387
Mean Income	$33,693	$34,820	$34,379	$34,980
Renter-Occupied Households	115,641	259	93	166
Median Income	$13,912	$22,932	$20,093	$24,091
Mean Income	$16,693	$24,910	$24,125	$25,350

Housing:

In 1980 1,704 housing units were listed for the Waiawa tract. Since 1980, the area has undergone extensive growth primarily due to development of the Waipio Gentry subdivision. The 1,500 unit development, which is near completion, is the prime factor responsible for population increases between 1980 and 1984 (Table 1). Waipio Gentry, which is comprised of light industrial, commercial, and mixed residential units, is similar to the proposed Waiawa development in character, however, the Waiawa development will also include a golfcourse and luxury homes as well as retirement/leisure village homes.

Home ownership within Waiawa is very high with only 15.7% of 1980's households renting. Compared to Honolulu County's 49.9% home ownership figure, Waiawa's 84.3% appears exceptionally high. It should be noted, however, that Waiawa is comprised primarily of detached single family units with rental apartment units being almost non-existent.

Table XII
Home Ownership and Rental Units

	Honolulu County	Waiawa (CT total)	Waiawa (Waipahu CDP)	Waiawa (Remainder of Honolulu County)
Total Households	230,931	1,651	463	1,188
Owner-Occupied Households	115,290(49.9%)	1,392(84.3%)	370(79.9%)	1,022(86%)
Renter-Occupied Households	115,641(50.1%)	259(15.7%)	93(20.1%)	166(14%)

If a current unit count of approximately 3,200 dwelling units is utilized as a base figure, the addition of 2,600 units would result in a total of 5,800 units for the area. This total figure would be realized over a 10-year build-out plan and does not account for any other development in the area.

Transportation to Work:

Use of private transportation to work is very high within Waiawa tract with 93.5% of all employees utilizing private vehicles and only 2.9% using public transportation. These figures are noticeably higher than Honolulu County figures of 76.4% and 10% respectively. The mean travel time to work is slightly higher than the County mean with a difference of 4 to 5 minutes.

Table XIII
Transportation to Work

	Honolulu County	Waiawa (CT total)	Waiawa (Waipahu CDP)	(Waiawa Remainder)
Private Vehicle	282,479(76.4%)	3,017(93.5%)	974(91.4%)	2,043(94.6%)
Public Transportation	37,042(10%)	95(2.9%)	51(4.8%)	44(2%)
Other*	43,622(11.8%)	77(2.4%)	41(3.8%)	36(1.7%)
Work at Home	6,380(1.7%)	37(1.1%)	-	37(1.7%)
Mean travel time to work, minutes	22.6	27.3	26.8	27.6

* Includes bicycles, walk to work

Schools:

The Waiawa area is currently serviced by three public schools for grade K through 12. These schools are: Kanoelani Elementary for grades K thru 6; Highlands Intermediate for grades 7 thru 9; and Pearl City High School for grade 10 thru 12. Kanoelani was opened within the past 6 years and is located within the Gentry Waipio development while Highlands Intermediate and Pearl City High are both located within Pearl City.

In the Department of Education "Enrollment Projections of the Public Schools in Hawaii 1985-1990" report, a summary of general enrollment trends indicates that State wide enrollment growth is expected after the extensive decline experienced from 1971 to 1982. Enrollment losses were expected for existing schools within the Leeward District, however this should bottom out within the next few years since future enrollment gains are expected with the number of new developments occurring within district.

Table XIV
Waiawa Area School Projections

	(Actual) 1984	(Projected) 1985	1986	1987	1988	1989	1990
Kanoelani Elementary	505	629	729	766	780	800	800
Highlands Intermediate	476	441	437	439	429	415	419
Pearl City High School	2437	2473	2469	2449	2340	2242	2276

These projections do not account for the proposed Waiawa development but do consider those projects under construction or within final planning stages. These projections also indicate that enrollment for currrent and recognized

future residents can be accomodated within existing facilities due to the significant decline experienced over the past decade.

Table XV

Public and Private School Enrollment

	Honolulu County	Waiawa (CT total)	Waiawa (Waipahu CDP)	Waiawa (Remainder of Honolulu County)
Grades K-8 Public	103,958(56.5%)	1,236(63.3%)	464(63%)	772(63.4%)
Grades K-8 Private	19,229(10.4%)	191(9.8%)	53(7.2%)	138(11.3%)
Grades 9-12 Public	51,521(28%)	508(26%)	208(28.2%)	300(24.7%)
Grades 9-12 Private	9,390(5.1%)	19(1%)	12(1.6%)	7(0.6%)

Table XIV figures indicate that Waiawa's student population is similar to Honolulu County's public and private school mix for grades K thru 8. Waiawa's student population for grades 9 thru 12 displays a strong orientation to public schools with 1% attending private schools while 5.1% of Honolulu County's students are enrolled in private high schools.

B. ECONOMIC: Whether the development will affect:

- The rate and pattern of economic growth and development.
- The diversity of employment.
- The availability of jobs.
- The employment wage rate.
- The principal economic activities on Oahu.

Economic evaluations for specific regional activity is fairly limited, and when available, should be carefully utilized in context. Economic trends, which may have impact on a specific area, are generally addressed on a state-wide level. The economic data discussed in this section will primarily address general trends which may have regional impacts and a more detailed discussion of regional employment.

The Bank of Hawaii Annual Economic Report for 1985 estimates that Hawaii's gross state product increased 7% in 1984 to $15.2 billion. This projection allowed for a 4% rise in the general price level, as indicated by the consumer price index during 1984, for a real GSP of 2.9% following a 3.2% rise in 1983. This indicates that 1984 marked the local economy's second year of recovery from the 1981- 1982 recession.

The report further states that:

> "Hawaii's 1983-84 recovery was slower (by almost half) than that of the national economy and, more importantly, very uneven in 1984. The visitor industry was the only sector of the state's economy that experienced significant growth during the year. The increase in that largest source of income for the state offset much of the slack in other sectors and almost single handedly yielded a net increase for the economy as a whole."

This forecast is representative as to the general trend of the economy, however, it does not analyze the mix of jobs, age groups and household income which determine the economic capacity of various segments of the economy.

An analysis of jobs and employment by the Bank of Hawaii indicates that the statewide total of non-agricultural wage and salary jobcount increased 1.5% (6,250 jobs) to 412,450 during 1984.

> "In both absolute numbers and percent terms, the gain in jobs was smaller than in 1983 when new jobs amounted to 6,800. Most of the gain in non-agricultural jobs occurred in trade and services. Government jobs also increased slightly. Sectors that posted losses were construction and manufacturing. Agricultural jobs, which include sugar and pineapple field workers and diversified agriculture, decreased by 400 jobs to a total of 10,800. Jobcount for non-agricultural, self-employed family workers and domestic workers as a group also declined by 350 jobs to a total of 26,750 in 1984. After accounting for all sectoral gains and losses, the total statewide jobcount showed a net increase of 1.2 percent or 5,650 jobs during 1984 compared to 8,100 in 1983.
>
> The number of persons employed in the state increased by 4,000 in 1984 compared to a net rise of 12,000 in 1983. The total civilian labor force of 473,000 showed an increase of only a thousand persons, the smallest gain since 1979."

Employment centers within the project will consist of three commercial and industrial areas totalling 115 acres.

The primary commercial site would be the centrally located 5 acre shopping center. This center would be anchored by a major supermarket chain and would also contain a major discount drug/sundry store and a variety of retail, food and service stores. The primary target market would be the Waiawa population. The secondary market would include Waipio by Gentry with access by freeway overpass. The tertiary market would be surrounding residential and commercial/industrial development. Waiawa Center is not viewed as a potential regional center that would capture a significant market share from other areas.

The 90-acre commercial/industrial mix area off Interstate Highway H-2 is intended to accommodate a wide variety of retail and commercial service establishments, and professional and technical business activities ranging from corporate offices to high technology businesses to appropriate clean light industrial uses.

The 20-acre commercial/industrial mix area next to the proposed lake would be developed primarily with a mix of food services, retail shops, and art and craft activities convenient to the proposed retirement community.

The main 90-acre commercial/industrial complex will possibly be developed as a mixed-use business park with a portion of the area consisting of a mix of low-rise and garden-office buildings. A market analysis conducted by real estate consultants Wendell Brooks, Jr., John Zapotocky and Daniel McFadden, indicates:

> "The need for office space in the Waiawa, Pearl City, Waipahu area will become much more apparent during the next five to ten years. At the present time, there is a surplus of office space in the Central Business District of Honolulu and fringe areas. Oahu's office space market has followed the traditional office development cycle (i.e., shortage, development, over supply and absorption).
>
> Oahu is currently in the absorption phase. The rate of absorption has increased with improvement in the economy commencing in 1982 and 1983.
>
> Future office building demands should occur in the Waiawa region to service the population shift towards Pearl City. This will be increasingly necessary as warehousing and proposed clean industry uses grow in the area in response to increased service needs for the population of the island as a whole and increased emphasis on diversification of the economy.
>
> The remaining portion of the mixed use business park would consist of various uses permitted in light industrial areas (e.g., I-1 Permitted Uses).
>
> The demand for an additional area for light industrial uses will also become apparent as existing light industrial areas are absorbed over the next five years."

The original market analysis for the Waiawa project suggested that an employment factor of 30 jobs per acre could be utilized for the commercial and industrial areas. Based on this ratio, the employment centers for the project should generate approximately 3,450 jobs.

The project's market analysis and economic impact analysis consultants have projected the creation of 3,415 jobs from the development of the project. This total which is similar to the previous projection is detailed below:

Employment Projections

Use	Area	Employment Ratio	Total
Shopping Centers	275,000 s.f.	1/320 s.f.	859
Food Service/ Retail	225,000 s.f.	1/240 s.f.	938
Light Industrial	70 ac	20/acre	1,400
Golf Courses	total		60
Maintenance/ Security	7,900 units	1/50 units	158

Source: John Zapotocky and Decision Analysts Hawaii, Inc.

This is not intended to suggest that all of these jobs will be held by Waiawa or regional residents, however, it reflects the substantial increase in the job market resulting from the project's implementation.

Long term new job opportunities in West and Central Oahu may change the pattern of employment within the region. Several new projects currently underway represent a variety of new and desireable employment sources which should be compatible with the Waiawa project. A partial inventory of these new sources, listed below, was conducted by Chaney, Brooks & Company with John Zapotocky in 1986.

Diversified Agriculture

Opportunities for diverified agricultural operations will increase as lands are released from sugar cultivation and decisions on land use issues are finalized.

Campbell Industrial Park

Campbell Industrial Park is preparing for a large expansion and it is expected to generate substantial new employment at the park.

Gentry Park

Increased demand for industrial space in this area is expected to result in the creation of new jobs as the remaining undeveloped areas of the park are developed.

Hawaii High-Tech Park (Mililani)

The new 250 acre high tech park proposed for the Central Oahu area is currently in the zoning process. It is estimated that 600-900 jobs per year could be created over the next 10 to 15 years beginning in 1988.

Local Service Business

All of the master planned communities being proposed in the Ewa and Central Oahu areas plan to provide for the neighborhood shopping requirements of residents. These facilities will offer employment opportunities.

West Beach Resort

The West Beach Resort development which is expected to be under construction in 1986, is estimated to have the potential of providing approximately 6,000 permanent jobs upon its completion in the next 10 to 20 years.

Kuilima

The Kuilima Resort expansion, while not within the Ewa or Central Oahu area is projected to create approximately 3,500 jobs in the next 10 to 15

years. Given the lack of housing in the North Shore and Koolauloa areas, the small population and housing base which currently exists there, and the lack of limited residential development permitted under the existing General Plan and Development Plan policy for the North Shore, a significant portion of the work force will come from Central Oahu.

Construction

(a) Housing - Whether housing development in Central Oahu continues at its present pace or if most of the development takes places in the Ewa area, there is little doubt that the Ewa and Central Oahu areas will become increasingly important suppliers of housing for the Oahu Market. Thus, an increasing number of construction jobs can be forecast in the area.

(b) Industrial/Commercial - The major influx of population and the plans for regional shopping, office and industrial expansion in the area should improve the prospects for this type of construction.

(c) Resort - Large expenditures for construction of infrastructure and facilities at the proposed West Beach Resort can be expected to begin in 1986 and continue for the next 10 to 15 years (see 8 above).

(d) Public Facilities - Large expenditures can be expected in the area of infrastructure for residential developments that are proposed. In addition, highway improvements, service facilities and other public facilities can be expected as population in the area increases, e.g. a garbage to energy facility is to be built in Ewa.

Government Employment

(a) Barbers Point Harbor - By the year 2000, the harbor is expected to generate approximately 600 jobs while indirectly creating another 1,000 jobs at Campbell Industrial Park.

(b) Miscellaneous - Government service jobs in the area such as schools, police, fire, etc., can be expected to expand with the population.

(c) Second City - Assuming that the second city develops as projected, a government center can be expected to develop as part of the city core.

Based on the list of job opportunities, and the multiplier effect, Zapotocky et al estimated that an excess of 30,000 jobs could be created over the next 20 years. They also stated that it is likely that as the secondary growth area matures into the Second Urban Center, a larger and larger proportion of the job inventory will be filled by workers within the study area.

The following is a summary of the potential jobs that could be created in the area between 1986 and 2005.

Cannery		1,050
Ili Tech		10,000
Waikele Office Park		1,500
Mililani Regional Shopping Center		1,600
West Beach		6,000
Construction		500
Harbor		1,600
Kuilima		3,500
Miscellaneous Jobs		4,300
	Total	30,050

Source: Consulting report for Department of Housing and Community Development. Chaney, Brooks & Company and John Zapotocky, May 8, 1986.

It is expected that a large percentage of West Oahu residents will continue to work at traditional places of employment because of seniority,

vested retirement plans or personal preference. The consultants also suggested that others will choose to work closer to home, and still others living in the Primary Urban Center will choose employment in the Secondary Urban Center. As markets grow, as labor pools grow, and as land cost in the Primary Urban Center increase, decentralization will be increasingly more attractive in much the same way experienced by many mainland cities. This could result in employment patterns changing measurably during the next five to seven years.

C. HOUSING: Whether the development will affect:

- The availability of housing.
- The quality of housing.
- Speculation in land and housing.
- Property values of existing homes.

The Waiawa project, as a master planned, comprehensive community, will provide an extensive mix of housing types. This mix will include single family detached dwellings, low density apartments, and medium density apartments, but one unique feature is the planned retirement community. This retirement community will serve as a "community within a community."

An analysis of the housing market should therefore be divided into two parts; the retirement community, and, the conventional community. Each market exhibits characteristics that are different yet complementary to each other.

Retirement Community

A major component of the Waiawa project will be it's central "Leisure Village." This retirement community is planned as a self-contained neighborhood that would be unique to Hawaii. The Leisure Village, which would consist of 1,100 low density apartments, 450 medium density apartments, and 4,160 single family residential units, would serve retirees interested in both a leisurely and active lifestyle with self-contained activities as golfing, tennis, swimming, exercise rooms, library, game rooms and other meeting facilities. The residents will be 55 years or older, all owner occupants. Design features include security, landscape amenities and maintenance, and health care availability. A combination of townhouses, duplexes, and condominiums is planned with an average household size estimated at 1.6 persons per unit.

Retirement housing on Oahu is currently limited to three privately operated facilities. Two of these retirement communities, Arcadia, and Pohai Nani, were interviewed by Economics Research Associates for the study Development Potential for the Waiawa Leisure Village. A summary of these two developments was presented as follows.

Arcadia

The Arcadia Retirement Residence includes 270 apartments and a 54-bed skilled nursing facility located in a 13-story complex on Punahou Street in Central Honolulu. It is owned and operated by Central Union Church of Honolulu, a non-profit organization.

The Arcadia is a life care contract facility providing housing, meals and general health care services for a one-time entrance fee plus monthly charges which vary by type of apartment and number of occupants.

In order to be placed on the waiting list for Arcadia, a person must be:

- At least 60 years old;
- Ambulatory and in good physical and mental health;
- Capable of adjusting to congregate living; and
- Financially able to meet the facility's financial guidelines.

In addition to housing, meals and health care services, the complex emphasizes provision of independent living in a secure environment. Facilities include: a library, chapel, lounge, and gift shop; private dining rooms for entertaining; a recreation area with shuffleboard, billiards, craft room and work spaces; laundry facilities; and on-site parking for residents.

Pohai Nani

Pohai Nani Good Samaritan Kauhale is one of two retirement centers on Oahu operated by the Good Samaritan Society. Located in Kaneohe on the windward coast of Oahu, Pohai Nani includes a 14-story main building housing 174 apartments, administrative, dining and recreational facilities.

Pohai Nani provides retirement housing, meals, recreation and health care support on a monthly fee basis plus a nominal admission fee which varies by type of residential unit. It is located in a pleasant residential neighborhood and is within a few blocks of a full service hospital.

In order to qualify for admission, an applicant must be at least 55 years of age, in reasonably good health, capable of independent living, and able to adjust to a congregate living environment. A personal financial statement is required before acceptance.

Facilities at Pohai Nani include lounge areas on each floor, an auditorium, and club room for movies, games, etc. There are arts and crafts facilities, hobby shop, a heated swimming pool, library, chapel, and beauty/barber shop.

Comprehensive health care services are provided by an Outpatient Clinic, a Personal Services Unit as residents require more care, and the Kahanaola Convalescent Hospital on the grounds for intermediate care and skilled nursing.

The ERA development report indicated that the Waiawa Leisure Village would provide for a currently unfulfilled market. It was suggested that the demand for these type of accomodations would be strong in its' active retirement concept and its' extensive community planning.

ERA also noted that planning of the Leisure Village should include an abundance of recreational facilities, a good sense of security, and privacy. Design of the unit interior spaces should be on one level with ample storage space and well planned interior facilities. Extra bedrooms for use as a study or visitor accomodations are also expected to be in demand.

Most of the potential Leisure Village buyers will probably own their own homes and should be relatively independent of interest rate fluctuations and external market forces.

Conventional Community

The conventional housing types in Waiawa will include 3,216 residential units and 540 low density apartments units. These units are intended to provide housing to meet the needs of a wide spectrum of income and age groups of Hawaii's diversity of ethnic, social and economic groups.

A variety of residential and apartment unit types are envisioned, including zero-lot-line homes, patio homes, townhouses, duplexes, garden-type apartment units.

The Central and Ewa districts of Oahu are currently experiencing a tremendous amount of activity in the planning and development of new communities, subdivisions, and master plan expansion. North of Waiawa, Mililani Town continues to grow while to the east, the new communities of Waikele and Waiola are in the final planning stages. In light of this recent activity, it can be assumed that Central Oahu is a marketable and desireable area.

This recent activity may be related to the focus on Central Oahu and Ewa as the new targets for directed growth by the City and County of Honolulu. The timeliness of this new growth is also the result of new housing demands allowed by present day real estate economics.

The Housing Market Analysis for Waiawa noted that the westward movement is likely to continue because of the overall shortage of housing which created demand, the high price of housing close to the urban core, and "supply/pull" based on availability.

Waiawa's contribution to the State's housing inventory will be positive in its' diverse offerings, its' thoughtful planning, and the overall nature of establishing an identifiable community.

D. PUBLIC SERVICE: Whether the development will affect:

- Medical facilities.
- Educational facilities.
- Recreational facilities.
- Transportation facilities.
- Police and fire protection.
- Public utilities facilities.

The Waiawa project site is presently undeveloped with no urban uses present. Access to the site is also limited to agricultural service roads and no public access is required for its existing uses. For this reason, there has not been any need for public services on the site.

Existing facilities which serve adjacent subdivisions and nearby communities are expected to accomodate the project's needs during initial construction. However, the scope of the master planned Waiawa community requires extensive facilities planning from its very inception. This need has been recognized throughout the planning process and is an integral part of the master plan.

Medical Facilities

The general project area is well serviced by a number of medical clinics throughout the Central and Leeward districts. Clinics are located in Mililani, Waipahu, Pearl City and Aiea. Additionally, major hospitals are located in Wahiawa and Moanalua.

Demand for these facilities will increase as surrounding communities expand and new communities such as Waikele and Waiola are developed; however, the Waiawa master plan has included its' own medical center. This center which will serve the general community, but more specifically, will be an important amenity to the retirement community.

Past experience of the Department of Education indicates that enrollment can be estimated based on the number of resident households, the type of housing, and the purchase price of such housing.

The Waiawa plan provides a site for an elementary school space should it be required. The school site would be developed when the Waiawa population has generated sufficient students to justify a new school facility.

A number of elementary schools located in Waipahu and Pearl City currently serve the project area. Additional schools are also planned for the proposed Waikele development and Village Park. As the Waiawa project is developed, it is anticipated that the existing outside facilities will be able to absorb Waiawa's school age residents. However, the need for a permanent elementary school facility on site is likely and the developer will plan and coordinate with the Department of Education to address the need.

Intermediate and High Schools in Waipahu and Pearl City should have sufficient capacity to accomodate the increase in middle and upper school levels resulting from the Waiawa community.

Recreation Facilities

Waiawa will include extensive recreational space throughout the community. Two 18-hole golf courses are central features of the project and extensive park and open spaces are also planned. Football, soccer, basketball and tennis facilities may be provided for active uses while an activity/recreation center is also planned as a central amenity for the retirement community.

Recreation facilities outside of the project site are limited and heavily used. However, Waiawa's recreational facilities should be more than adequate to serve its' population and, in fact, are a central feature to the community plan.

Transportation Facilities

The Waiawa project will require additional transportation facilities. Access to site is presently limited to service roads; however, new ingress-egress points are being developed with the projects' transportation plan in coordination with the Department of Transportation. Additional traffic from the project will have impact on Kamehameha Highway and the H-2 freeway.

Public transportation needs will also be increased by the development of Waiawa. Municipal bus service for the project should be provided as the project is phased and developed. The developer will contact the appropriate authorities at the applicable stages of development.

Police and Fire Protection

The need for police and fire protection will increase as the Waiawa project is developed. It is estimated that when fully developed, Waiawa would consist of approximately 19,000 residents. Based on the present Oahu ratio of police employees to population, (2.5 police employees per 1,000 populace), there would be a need for 40 to 50 police employees to cover the area, as well as patrol cars and assorted equipment. This demand for police security would be phased in gradually as the project is developed.

Fire stations are currently in operation in Mililani, Pearl City and Waipahu. An additional station is also planned for the proposed Waikele development. The Honolulu Fire Chief's office has indicated that a station should be planned on-site of the Waiawa project. Planning and coordination with the fire department will continue during project planning.

Public Utilities Facilities

Electricity, telephone, gas, and cable TV, services will be required in addition to the basic infrastructure of the project. These utilities are

expected to be available and coordination between the developer and the appropriate services will be on-going as the project needs are identified. No adverse impacts are expected as a result of these additional requirements.

E. PHYSICAL: ENVIRONMENTAL: Whether the development will affect:

- The natural environment.
- Existing natural monuments, landmarks and scenic views.
- Open Space.
- The aesthetic quality of the area.

The 1,242 acre Waiawa site is located on the Waiawa plain of Central Oahu. Waiawa Gulch lies to the east and the H-2 freeway to the west. The site slopes gently from north to south at elevations from 550 feet down to 200 feet above mean sea level at the southern most end. There are several gulch areas with steeper slopes running through the site.

The site is currently vacant since it was fallowed by Oahu Sugar. Portions of the site are used for minor cattle grazing while the remainder lies untended. Scrub and noxious weeds are found throughout the site with extensive exotic growths in the gulches. No natural monuments, landmarks or archaeological finds are located on the site.

The Waiawa site is relativcly flat and open. Views from the site are excellent over-looking the southern coast of Oahu. The site while, formerly in agricultural use, seems ideally suited for an asthetically pleasing residential development.

The site is physically separated from the eastern developments of Pearl City, Manana, and Pacific Palisades by the Waiawa Stream and Gulch. The western developments of Seaview, Crestview, and Waipio Gentry are also physically separated from Waiawa by the H-2 Freeway and Panakauahi Gulch.

The alterations occuring from agricultural use to urban use will be extensive and largely permanent, however these changes are not necessarily negative.

Views of the Waiawa site are limited because of it's physical separation on the east and west. The view planes of Waiawa along the H-2 Freeway are limited since the makai end is graded below the natural topography of the western end. View impacts from the east are also limited since the Waiawa Gulch serves as a buffer between eastern developments and the Waiawa plain. Mauka views from the H-1 Freeway and Leeward Oahu will not be significantly altered since the Waiawa site is located on an elevated plateau.

No scenic views should be significantly impacted from development of the Waiawa community. Additionally, almost 30 percent of the project site will be devoted to open and recreation space. Extensive landscaping will also be provided to preserve the verdant quality of the site and to enhance the aesthetic quality of the area.

The project site contains no threatened or endangered flora or fauna species. Historically significant resources have also not been found and it is expected that no adversely significant impacts are expected to occur on the natural environment.

IV. CONCLUSIONS

Waiawa presents many interesting facets in its composition and characteristics. Taken as a whole, the Waiawa area, as defined by census tract, appears as an urban fringe community physically divided from higher density suburban communities on the east and south. Closer observation, however, reveals three distinct and separate subcommunities.

Existing Community:

If the area is statistically analyzed in total, Waiawa appears as a homogenous community with socio-economic characteristics similar to other established bedroom communities typical of the 1950-1960 subdivision development period. The community is predominantly comprised of established but young families with household sizes larger than the County wide average. The community is ethnically diverse with more than half of its' residents being Hawaii born and a sizeable portion being foreign born.

Median household incomes for the area are higher than the Countywide average but is also in line with, and representative of, the middle class status that is reflected in other socio/economic indicators. Employment within the area is very high with a large percentage of those employed working as wage earners in service and labor related fields. Most of the families in the area own their homes which is indicative of the non-transient nature of its residents. The community is strongly public school oriented. Summarily and statistically speaking, Waiawa is a very stable young middle-class community with an ethnic diversity.

As stated earlier, however, closer observation of the Waiawa area reveals three clearly identifiable separate subcommunities. Statistically, Waiawa is divided into two sub areas as defined by the Bureau of the Census. A portion of Waiawa falls into a census designated place, namely Waipahu Town, while the remainder (primarily Seaview and Crestview), fall into a remainder category. There are marked differences in these two sub

areas which are important in identifying the true nature of the existing community.

Perhaps the most marked differences lie in the statistics for place of birth and members per household. The Waipahu CDP area within the Waiawa tract consists of a population that is largely foreign born. As a former plantation town, the Waipahu CDP has served as a center of Oahu's Filipino community. This social gravity may account for the strong foreign ethnicity bias within the area. Extended households which are a cultural practice common to the Filipino community probably accounts for the significantly large household sizes (5.2 versus 3.3 for Honolulu County) recorded for the sub-area. The Waiawa area comprised of Crestview and Seaview, on the other hand, is predominantly local born with a smaller average household size of 3.6. In this respect, it is possible to derive a statistical profile of the total community, however, this would not be truly representative of the unique characteristics with the community.

Recent Development:

The Waiawa community has undergone significant change in recent years however, these changes lack statistical data since most occured after the 1980 census. The 95% population growth since 1980 is largely the result of the development of Waipio Gentry. The Waipio Gentry project, which consists of residential and industrial/commercial areas, is indicative of the progression of development in the area. This trend in development is further supported by the scope of the proposed Amfac Waikele, Waiola and Oceanic Mililani Town expansion projects. These self servicing developments are planned as comprehensive, cohesive communities rather than residential only subdivisions. Waipio Gentry's residential areas are primarily comprised of single family detached dwellings catering to established families and townhouse units which address the needs of first time home owners or smaller families.

In this respect, a pattern of development trends can be plotted which

show not only physical and geographic growth but also the conceptual development of Waiawa community expansion. The portion of Waipahu town located within the Waiawa tract was developed earliest from the other Waiawa sub-communities. This area was probably constructed as an extension or rather a fringe area of the urban Waipahu area. Such development is natural and expected from central urban places. Seaview and Crestview, which were developed in the 1960's, represent another trend in development; the subdivision. Such residential subdivisions of tract homes were common place during the rapid expansion period of the construction boom and growth era. Gentry Waipio which represents the latest trend in residential development, is designed much more comprehensively as a total community with planned commercial, recreational, industrial/business, and a diverse mixture of residential accomodations. This concept of internal self-sufficiency establishes a sense of community easier than residential subdivision that must integrate with larger urban areas.

The nature and degree of social changes in a community are dependant upon the type and size of a new development; however, it is important to define the amount of interaction expected between the old and the new. A good example of this is the interaction between the established Seaview and Crestview developments and Gentry Waipio. Prior to the development of Gentry Waipio, Seaview and Crestview depended upon commercial, recreational and education facilities outside of the immediate area but with the development of Gentry Waipio, these support services can now be found nearby in an area that is actually part of the community. This interaction is interesting in that Gentry Waipio was developed with a self-sufficient orientation and this self-sufficient orientation now lends support for interaction from outside communities. This is especially significant in that the Waipio Gentry development almost doubled the population in the area yet was afforded a smooth transition into the existing community.

The Proposed Development:

The proposed Gentry Waiawa project will also significantly add to the population of the Waiawa area. With a projected figure of approximately 18,873 new residents, Gentry Waiawa will significantly increase the existing population. Although this figure represents a substantial increase, it also represents the summation of a 10-year residential build-out period. This expansion rate would be similar to the rate experienced from 1980 to 1984. At this fairly rapid growth rate, social changes have been supportive rather than adverse and development of the comprehensive Waiawa Project should provide even greater support to the surrounding existing communities and may actually have enough social gravity to be the central focal place for the area.

The stability of the surrounding communities within the Waiawa area suggest that there is a good ability to adapt and adjust to change. With a solid middle class residential foundation that is relatively young, the area also presents itself as dynamic and growing. The Waiawa, and Central Oahu areas are already targeted for extensive comprehensive community growth by government as well as private developers. With this in mind, it is apparent that the Waiawa Development can be a key in the urban build up of central Oahu.

A particularly significant feature of the proposed development is it's retirement village orientation which would be unique in Hawaii. Residential projects in the local market do not orient towards the retirement buyer so choices for this type of housing are extremely limited. Waiawa's retirement community on the other hand, would offer a full scale adult community which would meet an existing and unaddressed local need. Additionally, the development of a retirement community in the area will expand the diversity of the Waiawa Development and adjacent communities.

No visitor population changes are expected from the Waiawa Development since it will be a residential community rather than a resort, however development of the retirement community will address the needs of retirement age interstate in-migrants.

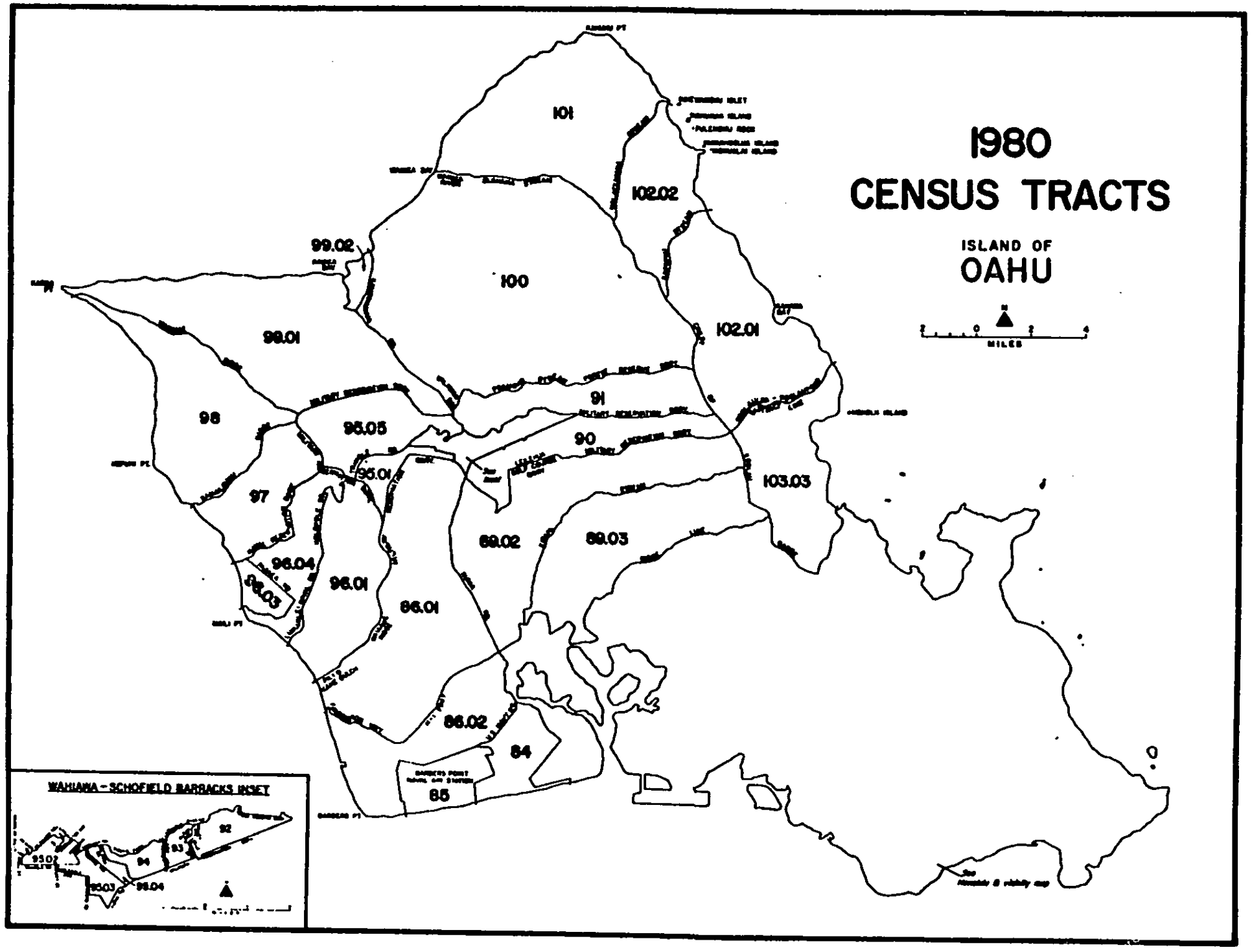
Community Integration:

With the development of the proposed Waiawa project changes will occur on the existing community. However, these changes should not be unexpected since changes of a similar nature have already occured with the development of Gentry Waipio. Gentry Waipio introduced totally new components of community into the existing neighborhood with the addition of industrial and commercial development, higher density multi-family housing and the concept of a community providing for its own needs. Similarly, the proposed development will serve as a continuation of these elements and will also provide additional desirable amenities such as parks, golfcourses, additional commercial and industrial areas, and the retirement village.

Social impacts occuring as a result of this new development should be positive and enhancing to the existing community's lifestyle and quality of life. The addition of well planned community developments into the area will be beneficial with the improvements and facilities they add but perhaps more significantly, they provide a sense of gravity and continuity which should increase a sense of belonging to a larger total community. The developments of Seaview and Crestview, and to some extent, the Waipahu CDP portion of Waiawa tract, were developed to fulfill housing needs of the time but stopped short of providing all the elements required to establish larger, identifiable communities. Rather, Seaview and Crestview are more appropriately identified as subdivisions separated from the large Pearl City and Waipahu communities.

The high rate of home ownership indicates that existing residents have made financial and emotional commitments and are strongly motivated to maintain or enhance their existing lifestyle. With the development of the proposed project, a largely diverse community will be introduced, but a large portion of the mainstream new residents are anticipated to share similar socio-economic characteristics. With similar values and goals, the behavior norms between the existing population and new residents should be consistent.

Evaluated from this context, the proposed Waiawa Development appears to be socially beneficial to both the existing Waiawa community and the Central Oahu area in general. By providing a diverse and exemplary model of a comprehensive community, the Waiawa Development should prove to contain the catalyst which will solidify an even larger sense of community with outlying areas. With this enhancement of lifestyle, the Waiawa Development could be holistically viewed as being greater than the sum of its' parts.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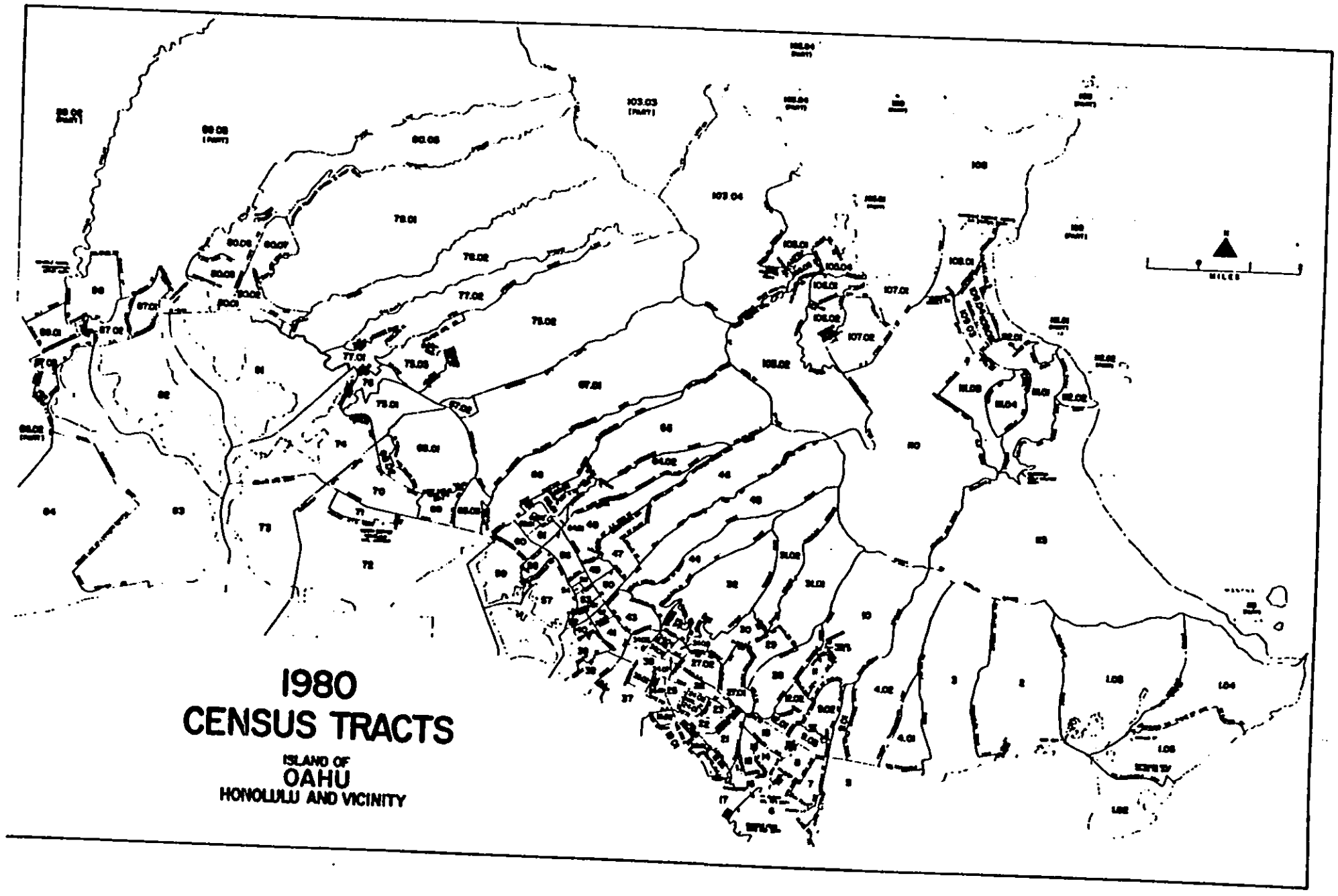
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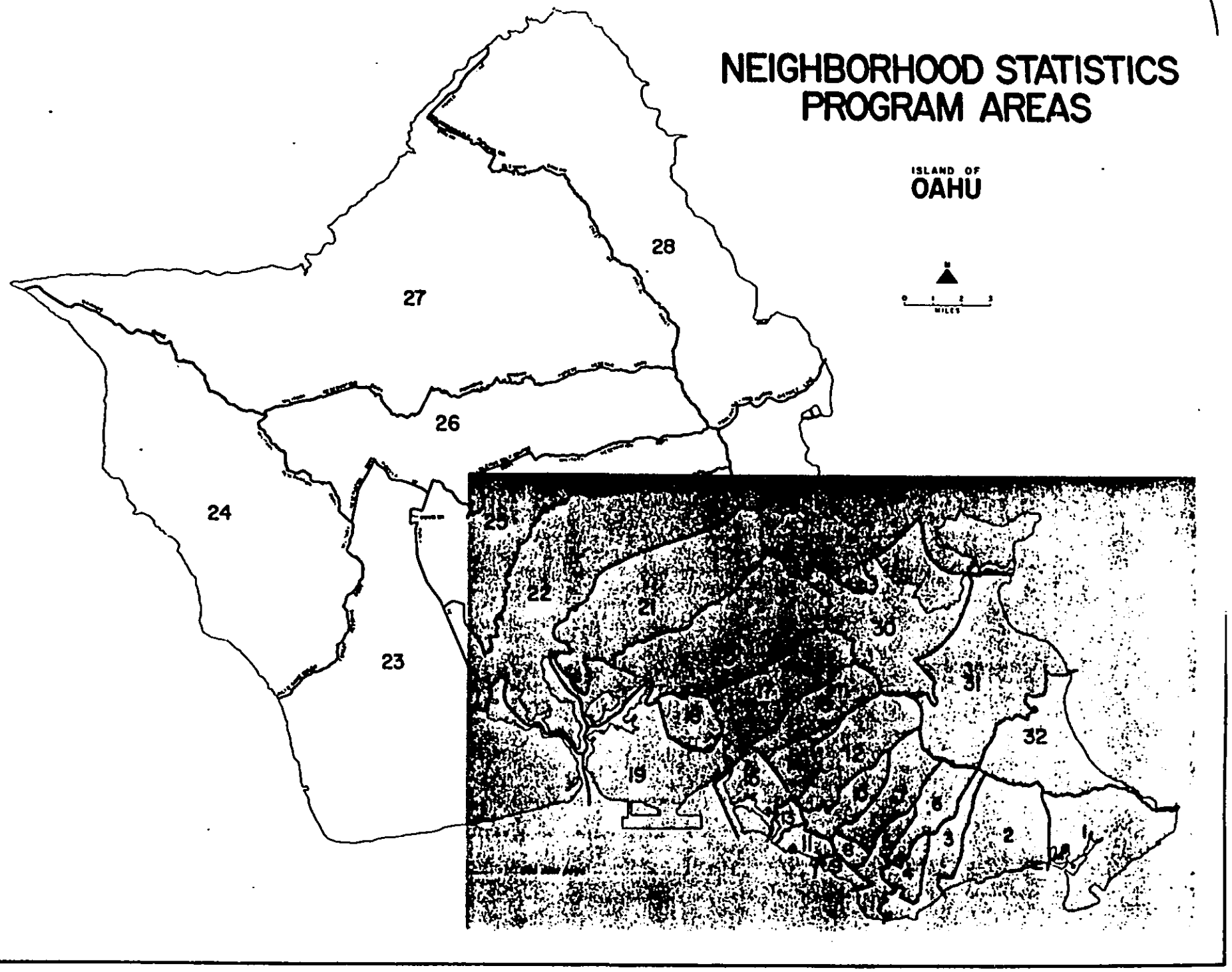

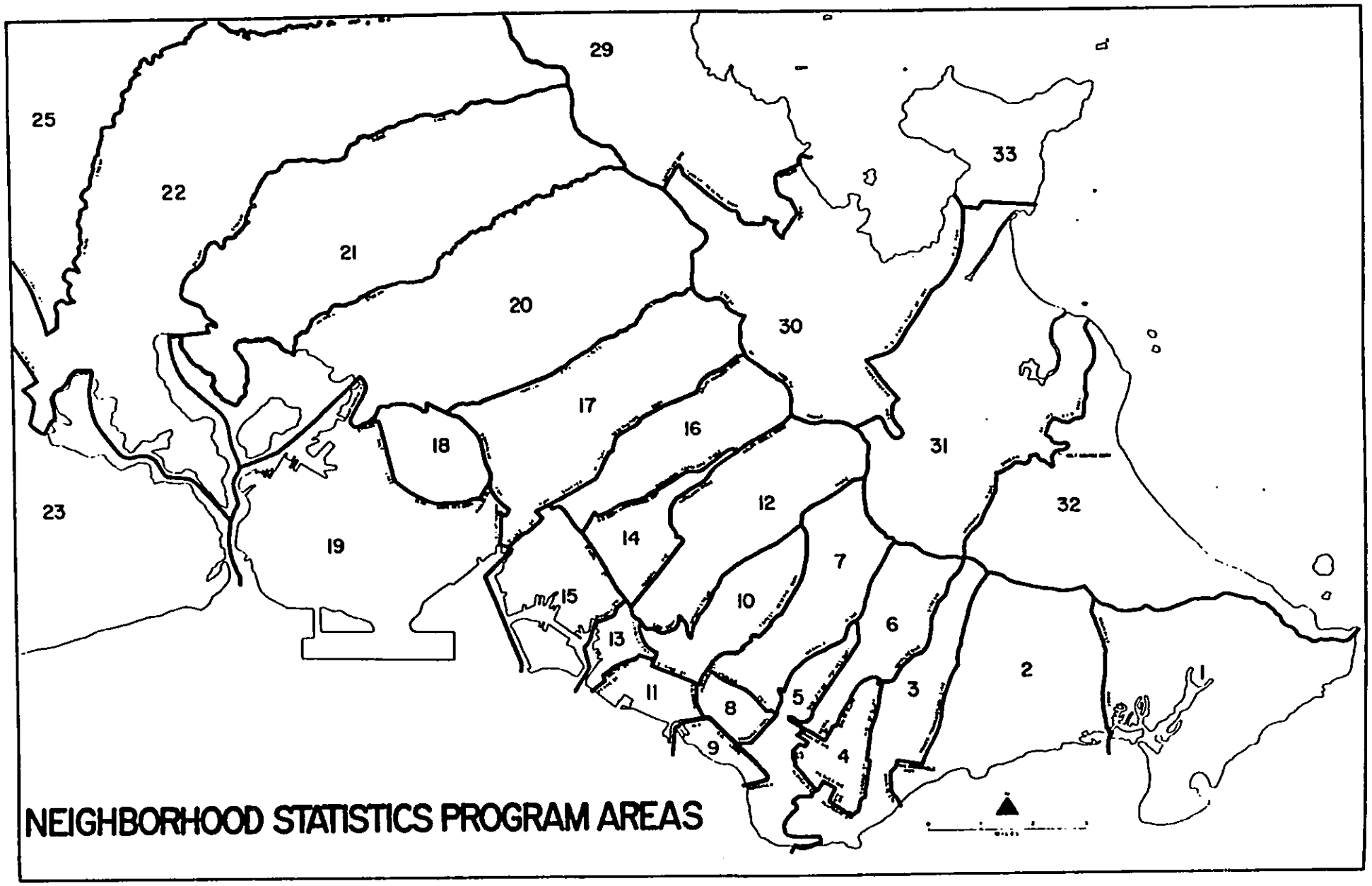
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NEIGHBORHOOD STATISTICS PROGRAM AREAS

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PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.

Traffic Impact Assessment Report
Waiawa Development

July 1986

APPENDIX H

TRAFFIC IMPACT ASSESSMENT REPORT

WAIAWA DEVELOPMENT
WAIAWA, HAWAII

The Gentry Companies

July 1986

Parsons Brinckerhoff

TRAFFIC IMPACT ASSESSMENT REPORT

WAIAWA DEVELOPMENT

JULY 1986

Prepared For: The Gentry Companies

Prepared By: Parsons Brinckerhoff Quade & Douglas, Inc.
Honolulu, Hawaii

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INTRODUCTION

A development plan has been proposed by The Gentry Companies for approximately 2500 acres on Waiawa Ridge in Central Oahu. The plan includes a retirement community, other residential development, commercial areas, a business park, and several golf courses. Development within 15 years will include approximately 1250 acres.

This traffic impact assessment evaluates roadway conditions for expected traffic demands without and with the proposed project for the 15-year development. This assessment identifies the project's effect on the regional traffic demands and evaluates the adequacy of the proposed roadway connections.

EXISTING CONDITIONS

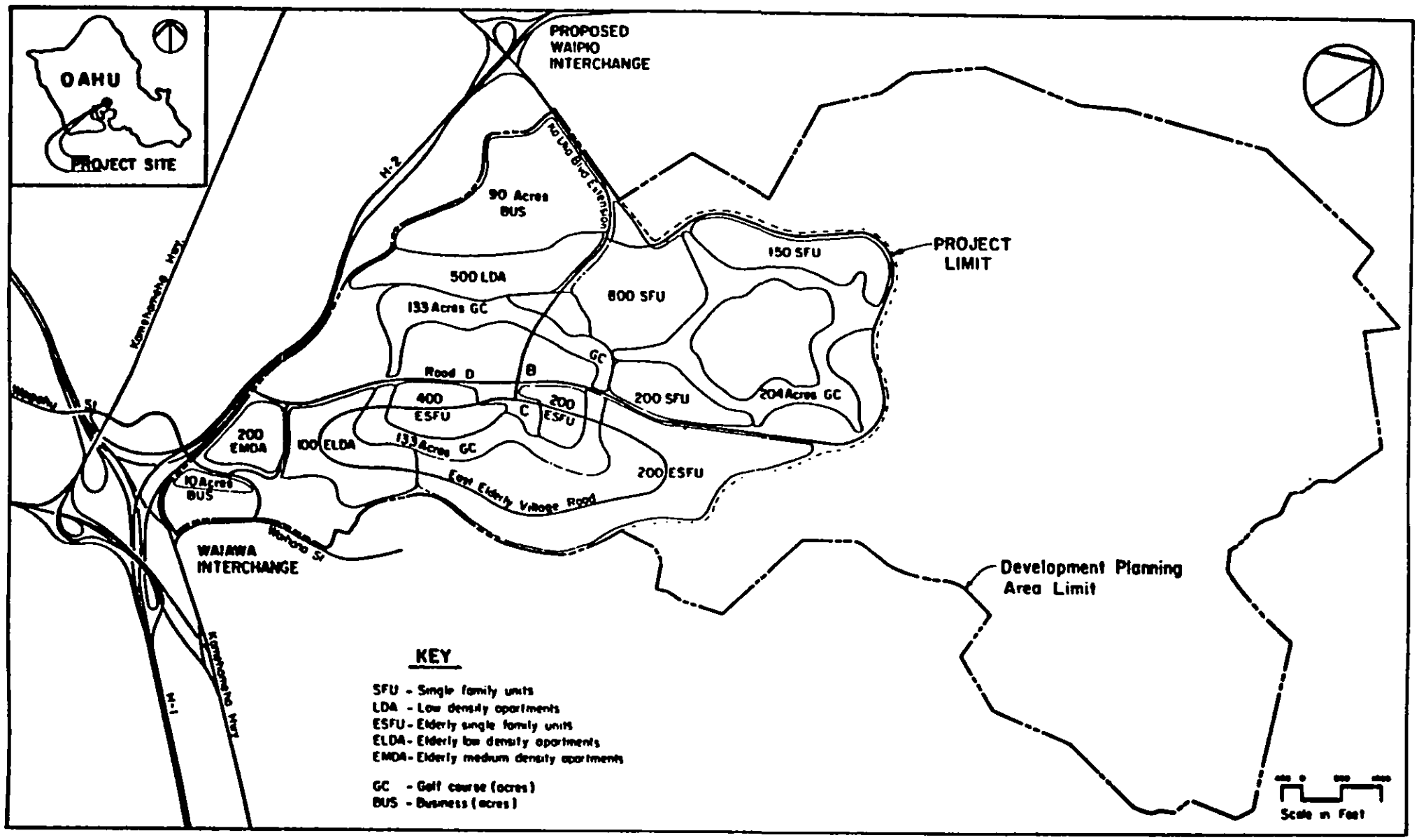
The project site is located between Pearl City and H-2 (Figure 1), and was once used for sugar cane production. The property is presently not used for production. There is no existing public access into the site.

Existing Traffic Conditions

The H-2 freeway, along the west boundary of the project area, provides a direct link between Pearl City/Waipahu and Wahiawa. Table 1 summarizes 1985 machine counts taken by the State Highways Division.[1] Analysis using Highway Capacity Manual[2] methods indicate that existing highway levels of service are at Level of Service B during both the AM and PM peak hours. Levels of Service are defined in the Appendix.

Ka Uka Boulevard intersects Kamehameha Highway in a T-intersection. Westbound traffic on Ka Uka Boulevard is controlled by stop signs; separate lanes are provided for left and right turn traffic. A separate left turn lane is provided for southbound traffic on Kamehameha Highway desiring to turn onto Ka Uka Boulevard. Level of Service E is experienced by Ka Uka Boulevard left turn traffic in both peak hours.

Waipahu Street, a collector route through Waipahu town, forms a T-intersection at its junction with Kamehameha Highway, north of Waiawa Interchange. In the vicinity of the Waipahu Street intersection, Kamehameha Highway is a four-lane divided highway and separate turn lanes are provided at the intersection. Analysis of the intersection using a State Highways Division estimate[3] of existing traffic and the Critical Movement Analysis (Planning Application) for signalized intersections show under capacity conditions during the peak hours.



LOCATION MAP

FIGURE 1

Table 1

EXISTING TRAFFIC

	Southbound	Northbound
H-2 Freeway at Kipapa Bridge		
24-Hour (Weekday, May 1985)	25064	23780
AM Peak Hour (5:45 - 6:45 a.m.)	2816	1232
PM Peak Hour (4:30 - 5:30 p.m.)	1710	2508
Kamehameha Highway at Kipapa Stream		
24-Hour (Weekday, May 1985)	9503	9982
AM Peak Hour (7:00 - 8:00 a.m.)	951	389
PM Peak Hour (4:30 - 5:30 p.m.)	596	967
Kamehameha Highway at Waipahu Street (approach volumes)		
24-Hour (Weekday, April 1984)	15099	20180
AM Peak Hour (7:00 - 8:00 a.m.)	1711	869
PM Peak Hour (4:30 - 5:30 p.m.)	737	2339

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

Waihona Street is the major collector road serving the Pearl City Industrial Park. Waihona Street meets Kamehameha Highway in a T-intersection. Two-way traffic is permitted along Kamehameha Highway between the Farrington Highway junction near Pearl City and the vicinity of Waihona Street. However, west of Waihona Street, Kamehameha Highway becomes one-way in the westbound direction and functions as on-ramps to the H-1 and H-2 freeways.

FUTURE CONDITIONS WITHOUT PROJECT

A new interchange to the H-2 Freeway has been proposed by the State Department of Transportation. Preliminary plans show the Waipio Interchange in a full diamond configuration at the existing Mililani Memorial Park Access Road overpass. Ka Uka Boulevard would be extended from its present terminus near Ukee Street (east intersection) to Waipio Interchange. This interchange is expected to be open for traffic in 1991.

Traffic Conditions

Future traffic demand volumes without the proposed development of the Waiawa Ridge site provide a baseline to compare traffic conditions and to identify impacts. The State Highways Division's peak hour traffic projections[4] for Waipio Interchange and Kamehameha Highway for years 1998 and 2008 were interpolated to derive year 2002 volumes (Figure 2).

Analyses of these demand volumes indicate below capacity conditions if the following improvements are implemented:

- Signalization of the Ka Uka Boulevard intersection with the H-2 off-ramp from Honolulu and the provision of two lanes for left turn traffic from the off-ramp to westbound Ka Uka Boulevard.

- Signalization of the Ka Uka Boulevard intersection with Kamehemeha Highway.

- Separate approach lanes on Waipahu Street (eastbound) at Kamehemeha Highway for traffic desiring to turn right and to turn left.

Levels of Service and volume-to-capacity ratios on the H-2 Freeway are summarized later in this report in Table 5.

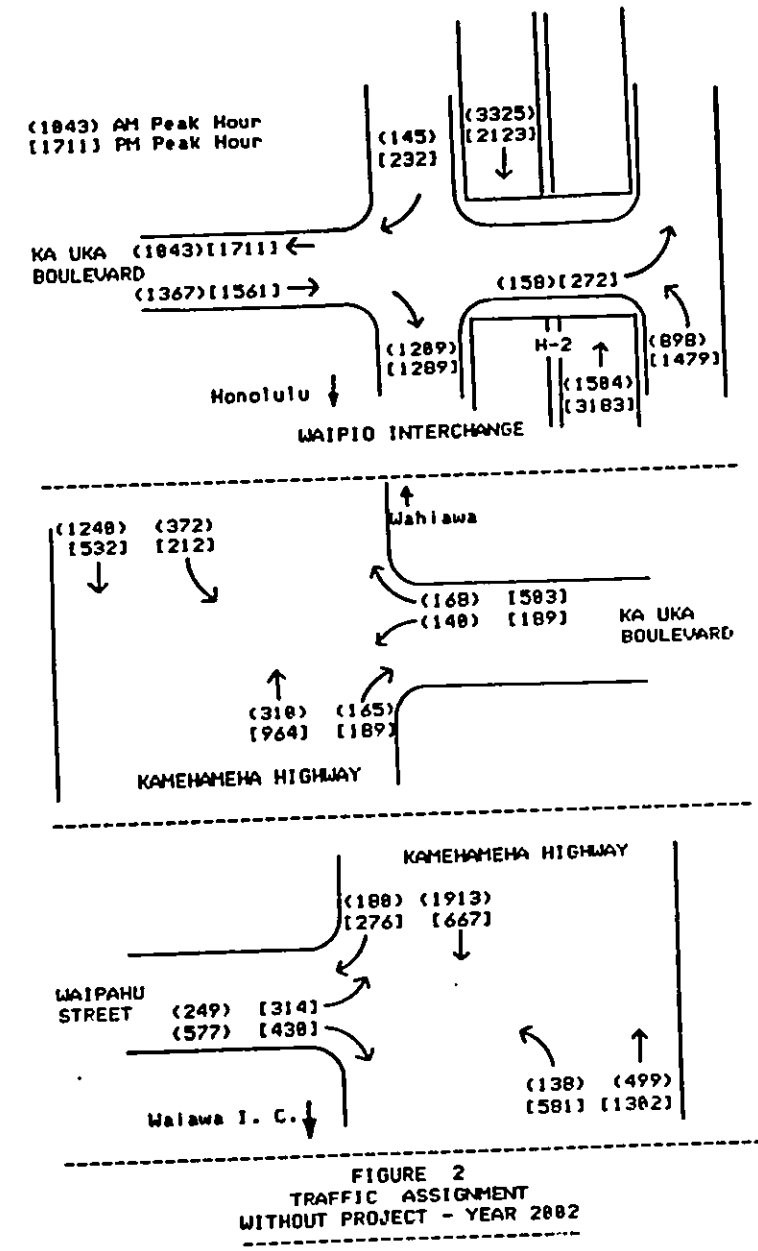


FIGURE 2
TRAFFIC ASSIGNMENT
WITHOUT PROJECT - YEAR 2002

TRAFFIC GENERATION

The traffic impact of the proposed project is determined by evaluating the number of vehicles generated by the project. This additional traffic is assigned onto a future base condition, after which the impacts of the increased traffic demands can be then examined.

The proposed project will be developed over a period of several years. Expected start of development is in 1990 with occupancy of the first residential units in 1991. A development schedule prepared by the Gentry Companies was used to estimate future traffic impacts; the proposed project is programmed to be completed in twelve years.

Trip Generation

The number of vehicle trip ends generated by a project depends on its land uses. The proposed project has several types of land uses which have been categorized as shown in Table 2; the corresponding trip rates and parameters are also provided in this table.

Table 3 summarizes the trip generation at completion of the project. Because of the size and the mixed uses within the project, many trip demands are expected to be met within the project site. The proportions of internal trips are estimated to increase from 6% (AM Peak Hour) and 10% (PM) in the second year of development to 30% (AM) and 50% (PM) in the tenth year, and remain at this level. The net vehicle trips, or external trips, shown in Table 3 account for these internal trips and represent the traffic volumes expected across the project boundaries.

Table 2

TRIP GENERATION RATES

Land Use (Parameter)	Daily (vpd) Enter & Exit	AM Peak Hour (vph) Enter	AM Peak Hour (vph) Exit	PM Peak Hour (vph) Enter	PM Peak Hour (vph) Exit
Residential (dwelling unit)					
Single Family	10.0	0.21	0.55	0.63	0.37
Low Density Apartment	6.1	0.1	0.4	0.47	0.23
Leisure Village - net traffic (dwelling unit)	3.3	0.05	0.22	0.25	0.12
Commercial/Industrial (acre)*	367.8	10.7	5.2	15.5	20.6
Golf Course (per acre)	6.9	0.22	0.05	0.08	0.31

Notes: vpd = vehicles per day
vph = vehicles per hour

* Weighted average of light industrial, industrial park, warehousing, general office building, and retail.

Source: Institute of Transportation Engineers, Trip Generation - Third Edition.

Table 3

TRIP GENERATION

Full Development

Land Use	Total Trip Ends: Daily (vph) Enter & Exit	AM Peak Hour (vph) Enter	AM Peak Hour (vph) Exit	PM Peak Hour (vph) Enter	PM Peak Hour (vph) Exit	Net Trip Ends: AM (vph) Enter	AM (vph) Exit	PM (vph) Enter	PM (vph) Exit
Residential									
3216 Single Family Units	32,160	675	1,769	2,026	1,190	401	1,325	1,103	531
540 Apartments	3,290	54	216	254	124	32	162	139	56
Leisure Village (4150 Units)	13,700	208	913	1,038	498	146	710	565	222
Commercial/Industrial (110 acres)	40,460	1,177	572	1,705	2,266	700	428	929	1,010
Golf Course (210 acres)	1,450	46	11	17	65	33	8	10	30
TOTAL	91,060	2,160	3,481	5,040	4,143	1,312	2,633	2,746	1,849

Notes

vpd = vehicles per day
vph = vehicles per hour

Trip Distribution

The external trips will travel in four major directions to/from the project site: Honolulu, Pearl City, Central Oahu, and Waipahu-Ewa. Estimates of employment and population on the island of Oahu were used as indicators of travel direction. These indicators were weighted according to proportion of residential and non-residential trip ends within the project during each peak period. The trip distribution indicators and factors are shown in Table 4.

Traffic Assignment

Access to the project site would be provided via roadways connected to the proposed Waipio Interchange of the H-2 Freeway, to the intersection of Waipahu Street and Kamehameha Highway, and to Waihona Street. The project traffic was assigned to the access point nearest its trip end location within the project site. The project traffic was then assigned onto the regional system according to which roadway would most directly connect to the desired external trip end location (Figure 3).

Table 4

TRAFFIC DISTRIBUTION

	Honolulu	Pearl City	Central Oahu	Waipahu - Ewa
Indicators				
Employment	0.84	0.02	0.09	0.05
Population	0.69	0.06	0.11	0.15
Traffic Distribution Factors				
AM Peak Hour				
Enter	78%	3%	10%	9%
Exit	83%	2%	9%	6%
PM Peak Hour				
Enter	83%	2%	9%	6%
Exit	81%	3%	9%	7%

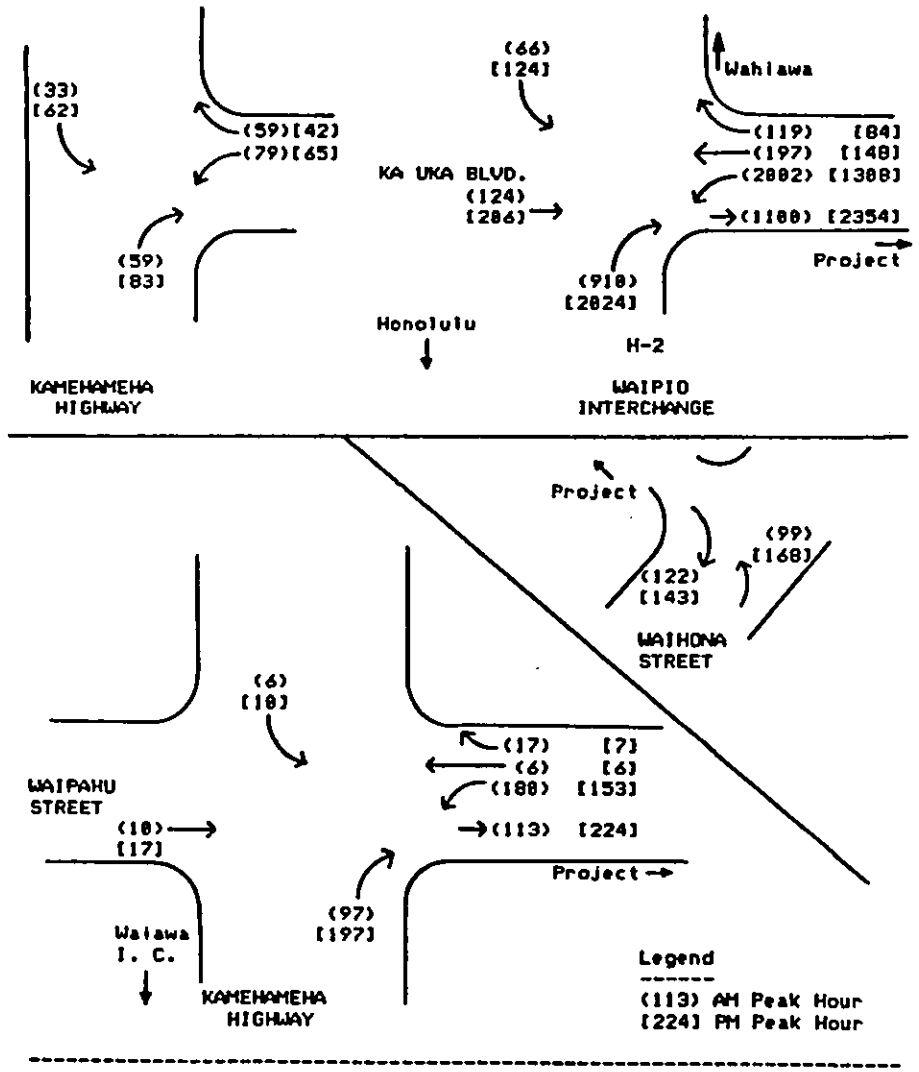


FIGURE 3
PROJECT TRAFFIC ASSIGNMENT
YEAR 2002 (NO MITIGATION)

PROJECT IMPACTS AND RECOMMENDED IMPROVEMENTS

The proposed project will access the highway system at three locations: the Waipio Interchange, Kamehameha Highway at Waipahu Street, and Waihona Street.

The proposed Waiawa project is expected to affect traffic conditions in the region by redistributing travel demands. The State's traffic assignment, which assumed no development at Waiawa, was based on a rate of development in the area north and west of the Waiawa Interchange consistent with population projections. The State's traffic assignment was therefore adjusted to reflect the inclusion of development at Waiawa in the area.

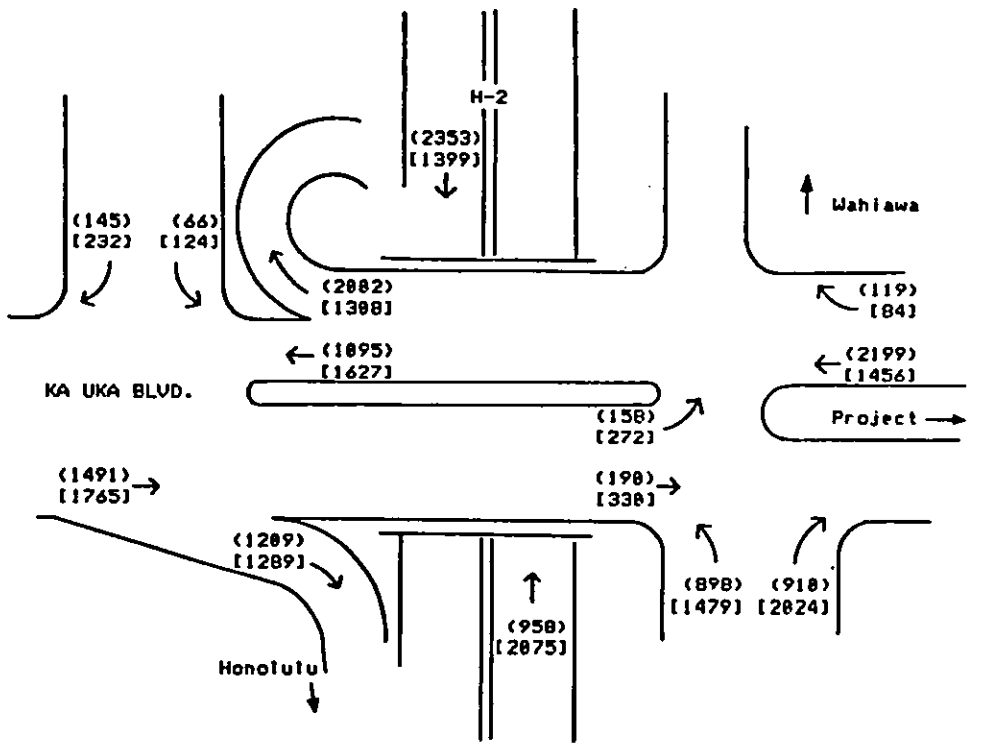
The methodology of simply adding the project's traffic demand to the traffic assignment for the without-project case would not apply in this case, as it would result in double counting of many trips. More importantly, it would incorrectly indicate that the proposed project would increase population beyond the adopted population guidelines for the region.

For the with-project assignment, an estimate of non-project related traffic was developed. Peak hour traffic volumes for year 2002 were calculated for H-1 (west of Waiawa Interchange) and for H-2 (north of Waipio Interchange) by interpolating the State Highways Division's estimates for traffic in 1998 and 2008 without the Waiawa development. With the Waiawa traffic demand on H-2, these volumes were adjusted so that the total traffic demand into the Waiawa Interchange would remain constant in year 2002 with or without the Waiawa project. The with-project traffic assignment developed using this algorithm reflects consistent population levels for Central and Leeward Oahu.

Because Kamehameha Highway serves as a collector-distributor for the adjoining land uses, a simple addition of the project's traffic to other traffic was used; not correcting for double counting will have a minor effect since project traffic will only be a small portion of the total traffic on Kamehameha Highway.

The Waiawa Development's significant traffic impacts are expected to occur at the Waipio Interchange and at the Kamehameha Highway intersections with Ka Uka Boulevard and with Waipahu Stret. Future with-project traffic assignments at these locations are shown in Figures 4 and 5.

Only minor impacts are expected at the Waihona Street connection because of the low traffic volumes in the area.



Legend

(1209) AM Peak Hour
[1289] PM Peak Hour

FIGURE 4
TRAFFIC ASSIGNMENT (WAIPIO INTERCHANGE)
WITH PROJECT - YEAR 2002

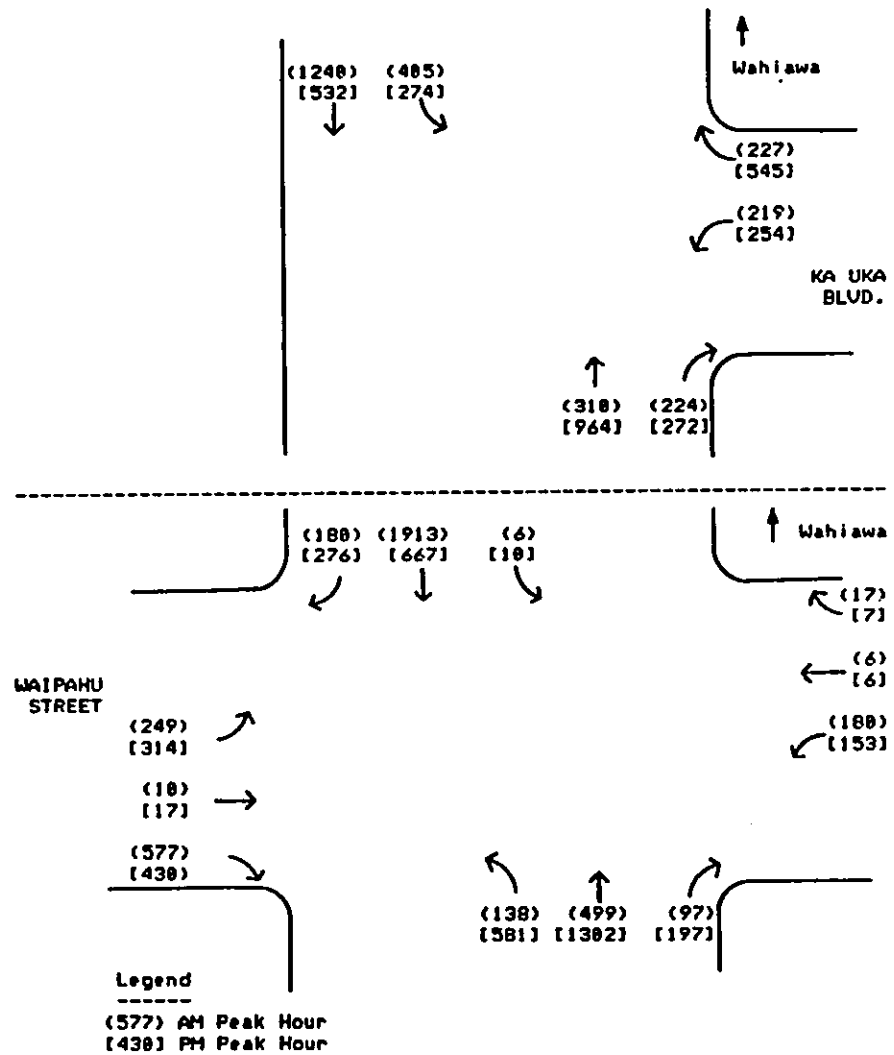


FIGURE 5
TRAFFIC ASSIGNMENT (KAMEHAMEHA HIGHWAY)
WITH PROJECT - YEAR 2002

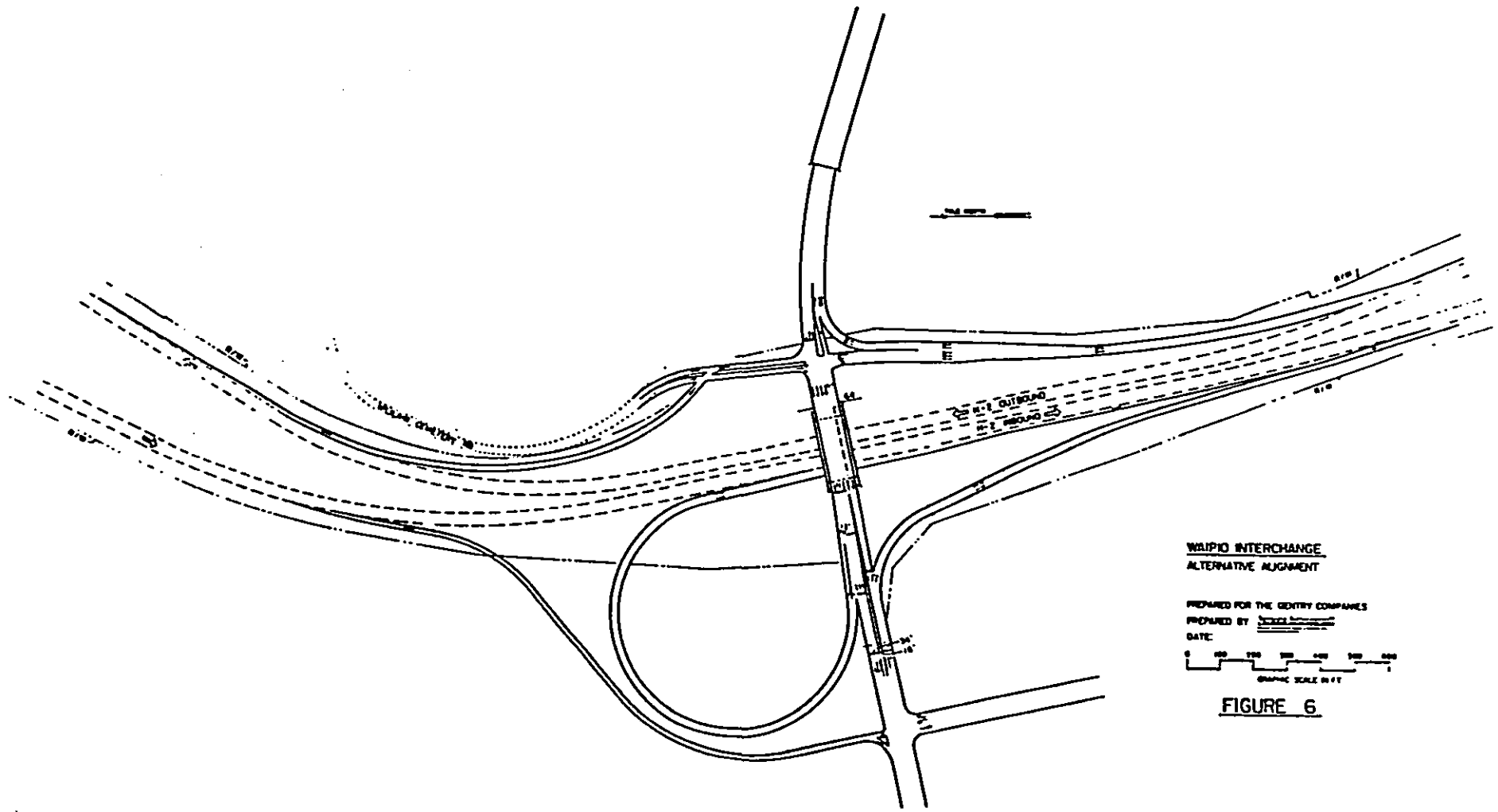
Waipio Interchange

A diamond interchange will not have sufficient capacity to serve the Waiawa Development. Analyses of ramp capacities indicate that the additional capacity provided by a second southbound on-ramp lane would be needed immediately upon development of the Waiawa project; however, the capacity of the two-lane ramp would be exceeded with the first 2-1/2 years of development at Waiawa.

A double-lane loop ramp serving Waiawa to H-2 (southbound) traffic would increase the capacity of Waipio Interchange. Additional right-of-way would be required in the northwest quadrant of the interchange, and relocation of the proposed off-ramp from Wahiawa will be necessary.

A revised layout of the proposed interchange is shown in Figure 6. This layout, in addition to providing the loop ramp, includes:

- A realignment of the Ka Uka Boulevard Extension east of H-2 to minimize the bridge length necessary to cross Panaikauahi Gulch.
- An indirect on-ramp northbound so that access to Mililani Memorial Park can be maintained.
- Widening of the bridge over H-2 to 80 feet to provide adequate width for 6 lanes across the freeway.
- A two-lane off-ramp (northbound) from Honolulu to serve the afternoon peak hour volumes.
- Multiple turn lanes to accommodate the high traffic volumes expected at the intersection of the northbound off-ramp with Ka Uka Boulevard.



WAIPIO INTERCHANGE
ALTERNATIVE ALIGNMENT

PREPARED FOR THE GENTRY COMPANIES
PREPARED BY
DATE:

FIGURE 6

Ramp analyses indicate that the critical demand volumes at full development will exceed the interchange's capacities by year 1998. At full development, AM Peak Hour traffic demand from the Waiawa project to H-2 southbound will need to be reduced by 310 vehicles per hour (vph) or 15%. In the PM Peak Hour, northbound off-ramp demand volume exceeds capacity by 360 vph, or 18% of the Waiawa demand (see following section, "Mitigation Measures").

The high volume of left turns from the northbound off-ramp to Ka Uka Boulevard (westbound) in the PM Peak Hour creates a heavy demand on the signalized intersection at that location. The Critical Movement Analysis for signalized intersection indicates that three left turn lanes from the off-ramp will be needed.

The single-lane ramps on the north side of Waipio Interchange will provide adequate service for the projected demand volumes. Tables 5 and 6 summarize the findings of the analyses of freeway and ramp conditions.

Kamehameha Highway Intersections

The Waiawa Development will increase turn volumes at two locations along Kamehameha Highway, at Ka Uka Boulevard and at Waipahu Street. At both locations, near-capacity conditions are expected with or without the Waiawa traffic during future peak hours.

The analysis of future conditions without the Waiawa project assumed only minimal improvements at these intersections. Right turn volumes were considered non-critical and signalization of the Ka Uka Boulevard/Kamehameha Highway intersection would be necessary. With the Waiawa traffic, a second left turn lane from Ka Uka Boulevard to Kamehameha Highway (southbound) would be needed to avoid over-capacity conditions.

Table 5

H-2 FREEWAY CONDITIONS

	AM Peak Hour				PM Peak Hour			
	Southbound		Northbound		Southbound		Northbound	
	L.S.	V/C	L.S.	V/C	L.S.	V/C	L.S.	V/C
Existing (1985)	B	0.48	B	0.21	B	0.29	B	0.42
Future (2002)								
Without Waiawa Development								
North of Waipio I.C.	C	0.59	B	0.28	B	0.40	C	0.58
South of Waipio I.C.	D	0.77	B	0.41	C	0.58	D	0.79
With Waiawa Development								
North of Waipio I.C.	B	0.44	B	0.21	B	0.30	B	0.41
South of Waipio I.C.	E	0.95	B	0.47	C	0.68	E	0.94

Table 6

RAMP LEVELS OF SERVICE
Waipio Interchange

(Year 2002 - No Mitigation)	AM Peak Hour SB	AM Peak Hour NB	PM Peak Hour SB	PM Peak Hour NB
Without Waiawa Development				
Single-lane Ramps				
North (SB=off, NB=on)	B	A	B	B
South (SB=on, NB=off)	E	C	D	E
Double-lane Ramps				
South (SB=on, NB=off)	D	B	D	C
With Waiawa Developments				
Single-lane Ramps				
North (SB=off, NB=on)	B	A	B	B
South (SB=on, NB=off)	F	D	F	F
Double-lane Ramps				
South (SB=on, NB=off)	F	C	A	F*
With Loop Ramp (SB, on)				
Loop Ramp (WB-to-SB)	F*	--	D	--
Second Ramp (EB-to-SB)	D	--	D	--

NOTES: SB = Southbound EB = Eastbound
NB = Northbound WB = Westbound

*See section, "Mitigation Measures" and Table 8.

The proposed connection from the project at Waipahu Street will create a cross-intersection. New turn lanes will be needed from Kamehameha Highway as well as a separate eastbound through lane on Waipahu Street. Two lanes in each direction should be provided on the new road. The Critical Movement Analysis shows only minor changes in intersection operations (Table 7).

Table 7

KAMEHAMEHA HIGHWAY INTERSECTIONS

	Sum of Critical Movements AM Peak Hour	PM Peak Hour
Without Project (Year 2002)		
Ka Uka Boulevard	1380	1365
Waipahu Street	1344	1229
With Project (Year 2002)		
Ka Uka Boulevard	1350	1365
Waipahu Street	1367	1242

Note: Critical Movement Analysis Planning Application (Levels of Service are not assigned):

Sum of Critical Movements	Condition
0 to 1,200	Under Capacity
1,200 to 1,400	Near Capacity
1,400+	Over Capacity

MITIGATION MEASURES

The traffic generated by the proposed project will require multiple-lane ramps at Waipio Interchange and other improvements at the Kamehameha Highway intersections. At Waipio Interchange, however, projected demand volumes would still exceed capacities.

Possible reassignment of the project's traffic demands to the other access points was evaluated. Reassignment would mean that users would travel on less desired paths to reach their desinations. While this action is not unusual, the reassignment indicated that major capacity constraints would occur at other locations, such as Waiawa Interchange.

An additional interchange with H-2 or new ramps into Waiawa Interchange would be other options to reducing demand volumes at Waipio Interchange. However, constraints due to interchange spacing, ramp design, and traffic service limit the opportunities available: no adequate location could be found for additional ramps.

A program to reduce traffic by encouraging high occupancy vehicle (HOV) use would have the potential to reduce traffic demands. The project traffic demand forecast was developed using observed existing traffic patterns; if a change in the pattern of use can be achieved, a reduction of traffic demand would follow. Table 8 shows a program which could reduce the traffic generated by the Waiawa Development to a level which can be served by the proposed improvements.

Table 8

TRAFFIC DEMAND REDUCTION PROGRAM

	AM Peak Hour	PM Peak Hour
Critical Volume (vehicles/hour)	2002	2024
Location	SB on-ramp (loop)	NB off-ramp
Level of Service [F]	F	F
Estimated vehicle occupancy	1.2	1.2
Person trips	2402	2429
Desired use pattern		
A) No change	75%	80%
Person trips	1802	1943
Vehicle trips	1502	1619
B) Shift to car pools	15%	10%
Person trips	360	243
Vehicle occupancy	3	3
Vehicle trips	120	81
C) Shift to Express bus	10%	10%
Person trips	240	243
Vehicle occupancy	48	48
Vehicle trips	5	5
Total vehicle trips	1627	1704
Reduction in Critical Volume	18.7%	15.8%
Ramp Level of Service	E	E

CONCLUSIONS

The proposed development of Waiawa Ridge will affect traffic conditions along the H-2 Freeway. Modifications to the proposed Waipio Interchange would be needed to accommodate traffic due to development on the Koolau side of H-2.

The proposed project's planned connection to Kamehameha Highway opposite Waipahu Street is not expected to carry high traffic volumes. However, improvements will be necessary to accommodate the fourth leg at the intersection. The minor contribution from the project onto Waihona Street will not adversely affect traffic conditions there.

As a result of this traffic evaluation, the following recommendations are offered:

1. A two-lane loop ramp should be provided in the Waianae-Wahiawa (northwest) quadrant of the proposed Waipio Interchange to serve traffic exiting the Waiawa Ridge area and entering H-2 in the southbound direction.

2. A two-lane off-ramp should be provided from northbound H-2 to Ka Uka Boulevard at the Waipio Interchange.

3. The existing traffic signal at the Waipahu Street and Kamehameha Highway intersection should be upgraded to operate as a fully actuated, eight-phase signal.

4. A transportation terminal should be developed, either within the project site or in nearby developed areas, to encourage increased use of high occupancy vehicles.

REFERENCES

1. State of Hawaii, Department of Transportation, Highways Division, Planning Branch.

2. Transportation Research Board, National Research Council, Special Report 209, Highway Capacity Manual, Washington, D.C., 1985.

3. State of Hawaii, Department of Transportation, Highways Division, Traffic Assignment TA 85-10.

4. State of Hawaii, Department of Transportation, Highways Division, Traffic Assignment TA 85-17.

APPENDIX

The Highway Capacity Manual defines six levels of service, labelled A through F, from the best to worst conditions. Characteristics of each level of service for signalized and unsignalized intersections, ramps, and highways are described below. Level of Service D is considered adequate for design of urban arterials and freeways.

Signalized Intersections

Level of Service A: Drivers operate in a free flow situation with no delays and easy turn movements.

Levels of Service B: This level represents stable conditions; drivers may be slightly restricted in movements; however, no delays exceed one cycle.

Level of Service C: Small back-ups may occur behind turning vehicles, and drivers may experience delays exceeding one cycle. Although movements may be somewhat restricted, they are not objectionable as stable operation continues.

Level of Service D: Drivers experience restrictions which approach instability. Delays may occur during short peaks, however periodic dispersal of queues prevents excessive back-ups.

Level of Service E: This level represents conditions at capacity which serve the most vehicles the intersection is able to accommodate. Long queues and substantial delays occur at capacity.

Level of Service F: Capacity of intersection exceeded. Conditions are jammed and volumes that can be carried are unpredictable. Congestion with excessive delays and very long queues are typical of this service level.

Unsignalized intersections (stop or yield control)

Level of Service A: Little or no delay
Level of Service B: Short traffic delays
Level of Service C: Average traffic delays
Level of Service D: Long traffic delays
Level of Service E: Very long traffic delays at extreme congestion-failure
Level of Service F: Intersection blocked by external causes.

Ramps

Level of Service A: Merge or diverge movements have little effect on freeway flows as drivers operate under unrestricted conditions. Merge movements fill gaps smoothly with only minor speed adjustments; diverge movements experience no or very little turbulence.

Level of Service B: Freeway flows are generally smooth and stable, vehicles not directly involved in merge or diverge movements remain unaffected. Merging vehicles must adjust speed to fill gaps; diverging vehicles operate without significant turbulence.

Level of Service C: Overall speed and density of freeway flow remain stable, but the lane adjacent to the lanes directly involved in merging and diverging movements may be affected by these movements. Both merge lanes must adjust speed to provide smooth merging and minor ramp queueing may occur with large on-ramp volumes. Vehicles may also decrease speeds in diverge areas.

Level of Service D: Several freeway lanes are affected by turbulence from merge and diverge movements. Disruptive queues may form at ramps with large demand volumes. Vehicles in merge lanes must adjust speeds

to avoid conflicts as smooth merging becomes difficult to attain. Vehicles in diverge areas also encounter distinct decreases in speed.

Level of Service E: This service level represents capacity conditions. Vehicles are significantly affected by turbulence, but do not create noticeable freeway queueing. Vehicles not directly involved in ramp movements attempt to avoid the turbulence by moving towards the median lanes. On-ramp queues may be significant and queues may also form in diverge areas. Diverging movements experience a significant decrease in speeds.

Level of Service F: Considerable turbulence is created by ramp movements and vehicles attempting to change lanes to avoid ramp areas. Long delays are encountered in the vicinity of ramp terminals and may possible extend for some distance upstream on the freeway. Merging lanes experience extensive breakdowns as merge movements occur on a stop-and-go basis. Traffic conditions change constantly and vary widely, resulting in unstable conditions with waves of alternatively good and forced flows.

<u>Highways</u>

Level of Service A: A free flow situation with low volumes and high speeds. There is a high level of maneuverability with speeds controlled by driver discretion, speed limits, and physical constraints.

Level of Service B: A condition of stable flow, drivers may experience a slight reduction in operating speeds, but still have a reasonable amount of maneuverability.

Level of Service C: Stable flow continues although drivers may start to feel restricted as speeds and maneuverability become controlled by higher volumes. A satisfactory speed is still obtainable in this service level.

Level of Service D: Changes in operating conditions approach unstable flow. Volume fluctuations and temporary restrictions reduce operating

speeds and maneuverability. Low comfort and convenience can be tolerated for short durations.

Level of Service E: Volumes are near or at capacity of the highway. Operating speeds are less than 30 mph and momentary stoppages may occur in this unstable flow.

Level of Service F: Capacity of highway section exceeded; conditions deteriorate. Forced flow situation with low speeds and unpredictable volumes dropping below capacity. Downstream congestion may cause delays of varying duration. The possibility exists that both speed and volume may drop to zero.

BARRY D. ROOT

Air Quality Assessment for the Proposed
Waiawa Development, Oahu Hawaii

Revised December 22, 1986

APPENDIX I

AIR QUALITY ASSESSMENT

FOR THE

PROPOSED WAIAWA DEVELOPMENT

OAHU, HAWAII

Prepared by

Barry D. Root
Kaneohe, Hawaii

Revised
December 22, 1986

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TABLES

FIGURES

SUMMARY

1. The proposed Waiwa Development involves site preparation and construction of a residential/commercial community on a large parcel of former sugar cane lands east of the H-2 Freeway between the existing Waiawa Interchange and the proposed Waipio Interchange.

2. Present air quality in the project area is estimated to be good since nearby long term monitoring stations have consistently been recording airborne particulate and sulfur dioxide levels that are well within allowable State of Hawaii Air Quality Standards, but particulate and carbon monoxide emissions from nearby sugar cane or pineapple fires do present some potential to degrade air quality in the project area for short periods of time and vehicular emissions during peak period traffic conditions may be creating "hot spots" near congested downstream intersections where carbon monoxide levels could exceed allowable air quality standards under especially unfavorable meteorological dispersion conditions.

3. Except for short term dust emissions during the construction phase of the development, no significant direct air quality impacts are expected. Adequate control measures exist to limit the scope of this impact, but special care will have to be exerted to insure that previously developed residential areas are not subjected to excessive levels of particulate pollution from construction activities.

4. Indirect air quality impacts are expected to result from new demands for electrical energy. This impact is most likely to occur in the vicinity of existing power plants such as the Kahe Plant on the Waianae coast where increased levels of particulates and sulfur dioxide can be expected. Maximum use of solar energy designs in project development can at least partially mitigate the magnitude of this impact. New methods of generating electrical power such as wind or ocean thermal energy conversion may eventually also play a mitigative role in this regard.

5. Increased traffic generated by the proposed Waiawa Development will increase emissions of carbon monoxide and nitrogen dioxide in the project area and along routes leading to urban Honolulu. Detailed carbon monoxide modeling carried out as a part of this study indicates that allowable State of Hawaii standards can be met at the proposed Waipio Interchange, but that these standards are not likely to be met at other critical receptor sites in the vicinity of Waipahu Street and Kamehameha Highway and along the H-1 Freeway between the Waiawa Interchange and the Halawa Interchange.

6. While modeling indicates that future levels of carbon monoxide at these locations are likely to be lower than present values whether traffic from the proposed development is included or not, it is still likely that State of Hawaii standards will be exceeded at these sites unless regional measures to mitigate traffic congestion are employed.

1. PROJECT DESCRIPTION

The proposed Waiawa Development project involves site preparation and construction of a residential and commercial complex on about 1395 acres of a 2500 acre parcel of land located on the east side of the H-2 Freeway in Central Oahu as shown in Figure 1. The existing site was formerly used for sugar cane growing, but it has been taken out of agricultural use by Oahu Sugar Company and is currently fallow with some ground cover for erosion control. The property is dissected in places by steep ridges and gulches which are not suitable for development and will be preserved as green space. The general land use plan for the portion of the property to be developed is also shown in Figure 1.

This assessment covers the first fifteen years of project development, up to the year 2002, by which time 115 acres of commercial and industrial property will have been developed, 3,216 single family detached dwellings and 540 multi-family units will have been completed, two golf courses with associated club houses will have been developed, and a retirement-oriented Leisure Village consisting of 4150 units will have been completed.

Major access points from the project to the existing roadway system are expected to be constructed at the proposed Waipio Interchange to the H-2 Freeway and at the intersection of Waipahu Street and Kamehameha Highway.

The purpose of this study is to describe existing ambient air quality in the project area and to estimate the magnitude of any increase in air pollutant concentrations resulting from actions related to the proposed project.

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 most 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.

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 recently amended (March 25, 1986) to make Hawaii AQS for particulates and sulfur dioxide essentially the same as the most stringent National limits.

3. PRESENT AIR QUALITY

A summary of air pollutant measurements from State of Hawaii long term monitoring stations located nearest to the project is presented in Table 2. Data from several different sampling stations are included in the tabulation.

The sampling station for particulates and sulfur dioxide is located in Pearl City, about two miles east southeast of the project area. The monitoring of sulfur dioxide in Pearl City was discontinued in 1984 and 1985 measurements are from the Barbers Point station located about six miles southwest of the project.

Until September 1979, and after June 1983, carbon monoxide monitoring was conducted at the Department of Health building at Punchbowl and Beretania Streets in urban Honolulu. This site is about 12 miles southeast of the project. During 1981 carbon monoxide was measured at Fort DeRussy in Waikiki (13 miles southeast of the project), and in 1982 carbon monoxide was monitored at Leahi Hospital in Kaimuki, about 15 miles southeast of the project.

Ozone levels were also measured at the Department of Health building in urban Honolulu until December 1980, when the monitor was relocated to Sand Island (about 10 miles southeast of the project site). During 1981 nitrogen dioxide was also monitored at the Sand Island location, but all nitrogen dioxide monitoring has since been discontinued. Lead measurements are from Liliha Street in Kalihi, about 11 miles southeast of the project site.

From the data presented in Table 2 it appears that State of Hawaii ambient air quality standards for particulates, sulfur dioxide, nitrogen dioxide, and lead are currently being met at nearest monitoring stations to the project area.

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 once or twice 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 vehicluar emissions and tend to be highest during periods of rush hour traffic. Carbon monoxide would thus be the pollutant most likely to cause difficulty in meeting allowable State of Hawaii AQS as a result of new residential development on Oahu.

There are power plants and other potential sources of industrial pollutants along the central portion of the leeward coast in the vicinity of the project site, but the generally low readings of particulates and sulfur dioxide at the Pearl City monitoring station just to the east of the project indicate that these sources are not likely to cause any air pollution problems at Waiawa. Likewise sugar cane cultivation to the north and west could generate some particulates and carbon monoxide when fields are burned at harvest (about once every two years for any given field), but the consistently low readings of particulates at Pearl City indicate that this source is not likely to present any significant air pollution problems at Waiawa either.

Finally, natural air pollutant producers which could affect air quality in the Waiawa project area include the ocean (sea spray), plants (aero-allergens), dust, and perhaps a distant volcanic eruption on the Island of Hawaii. Concentrations of air pollutants from these kinds of sources should be fairly uniform for most Oahu locations.

4. DIRECT AIR QUALITY IMPACT OF PROJECT CONSTRUCTION

During the site preparation and construction phases of this project it is inevitable that a certain amount of fugitive dust will be generated. Field measurements of such emissions from apartment and shopping center construction projects has yielded an estimated emission rate of 1.2 tons of dust per acre of construction per month of activity. This figure assumes medium level activity in a semi-arid climate with a moderate soil silt content. Actual emissions of fugitive dust from this project can be expected to vary daily depending upon the amount of activity and the moisture content of exposed soil in work areas.

One major generator of fugitive dust is heavy construction equipment moving over unpaved roadways. This problem can be substantially mitigated by completing and paving roadways and parking areas as early in the development process as possible. Because of the relatively long construction period, some construction will eventually be taking place in close proximity to existing residential areas. Dust control will have to be an item of special concern in all instances where residential areas are downwind from construction sites.

Heavy equipment at construction sites 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 impact of pollutant emissions from construction equipment should be minor compared to levels generated on major roadways nearby.

5. AIR QUALITY IMPACT OF INCREASED ENERGY UTILIZATION

Estimating about 1,800 square feet average size for the 3,216 low density residential units yields a single family floor space of about 6 million square feet. Estimating about 1000 square feet as the average for the 540 apartments and 4150 Leisure Village units yields about 5 million square feet of high density residential units. Energy consumption rates at the power plant for single family residential units with all-electric kitchens and water heaters are about 55,000 BTU per square foot; for similarly equipped apartments the rate is 45,000 BTU per square foot. The total floor space devoted to commercial and industrial use on the 110 acres set aside for those purposes is uncertain at this time, but for air conditioned offices the energy use rate is 350,000 BTU per square foot and for retail establishments the rate is 450,000 BTU per square foot.

For residential use alone this project could require about 530 billion BTU of energy per year at the power plant, or about 90,000 barrels of oil if the demand were to be met totally by burning fuel oil. Energy use for commercial and industrial purposes could conceivably double this amount.

The major impact of burning fuel oil to meet this new energy demand will be increased levels of sulfur dioxide and particulates in the vicinity of existing power plants, primarily the Kahe Power Plant on the Waianae coast.

New energy requirements could be reduced substantially by the installation of solar water heating on all units at the time of construction. It is also possible that the new demand could be met by means other than burning fuel oil. Generation of electrical energy by wind power and by using ocean thermal energy conversion are two such possibilities.

6. INDIRECT AIR QUALITY IMPACT OF INCREASED TRAFFIC

Once construction is completed the proposed project will not in itself constitute a major direct source of air pollutants. By serving as an attraction for increased motor vehicle traffic in the area, however, the project must be considered to be a significant 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, effective January 1, 1986, the Federal Environmental Protection Agency has revised the allowable lead amount in gasoline to 0.1 gram per gallon. At the beginning of 1985 the standard was 1.1 grams per gallon. The EPA is also advocating a total ban on lead in gasoline to take effect as early as 1988.

Federal control regulations also call for increased efficiency in removing carbon monoxide and nitrogen dioxide from vehicle exhausts. By the year 2000 carbon monoxide emissions from the Oahu vehicle fleet then operating should be little more than half the amounts now emitted.

7. CARBON MONOXIDE DIFFUSION MODELING

In order to evaluate the future air quality impact of projected increases in traffic associated with the proposed Waiawa Development in view of the previously described government-mandated decreasing emission rates per vehicle it was necessary to carry out a detailed carbon monoxide modeling study. The study was designed to yield carbon monoxide concentration values which could be compared directly to allowable State and National Ambient Air Quality Standards.

Three critical receptor sites were selected for analysis. Site 1, on the west side of the H-2 Freeway near the proposed new Waipio Interchange was selected for analysis because this interchange is expected to be the main entry/exit point to the completed Waiawa Development. The particular position of site 1 with respect to the freeway was selected because that spot would be most likely to show the greatest level of impact from project-related automobile-generated air pollutants, specifically carbon monoxide, under worst case morning peak hour traffic and meteorological diffusion conditions. The site is at the edge of the freeway right of way because the diffusion model used is not recommended for use within a freeway right of way and there should be no reason for the general public to spend as long as an hour at any particular spot within this right of way.

Site 2, on the west side of Kamehameha Highway near the existing intersection with Waipahu Street, was selected because a new segment of Waipahu Street would be created to provide access to the Waiawa Development at this intersection.

Site 3, on the south side of the H-1 Freeway between the Waiawa and Halawa Interchanges, was selected in order to evaluate the long term cumulative impact of project-related traffic along the main commuter route between Waiawa and urban Honolulu.

The general locations of all three receptor sites are shown in Figure 1. Expected worst case morning peak hour carbon monoxide concentrations at these receptor sites were computed for study years 1986 and 2002. Computations were made for traffic conditions with and without the proposed Waiawa Development using traffic volume predictions for the project.

For site 1, 1986 carbon monoxide estimates are for a point along the H-2 right of way near where the Waipio Interchange would be constructed. For the year 2002, computations for the scenario without Waiwa Developement assume that the Waipio Interchange will have a full diamond configuration, while computations for the scenario with Wiawa Development assume a loop ramp configuration as shown in Figure 2.

Since the traffic study for the project did not include volume estimates for the H-1 Freeway, the following volumes were assumed for carbon monoxide modeling: for 1986 - 2250 vehicles per lane in the peak direction and 850 vehicles per lane in the off peak direction with four lanes in each direction; for 2002 - 2000 vehicles per lane in the peak direction and 680 in the off peak direction with five lanes in each direction. Waiawa Development contributions for the year 2002 add 440 vehicles per lane in the peak direction and 200 vehicles per lane in the off peak direction. These values deliberately overstate the Waiawa contributions by assuming that all Waiawa peak hour morning traffic will use the H-1 Freeway.

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 1986 and 2002 emission rate calculations.

At site 1, traffic on the H-2 Freeway was assumed to move at 35 mph while on-ramp and off-ramp traffic at the Waipio Interchange moved at 5 mph. At site 2, where a signal light would control traffic flow, average vehicle speeds were assumed to be 1 mph upstream from red signals and 15 mph downstream from signals or turns. On the H-1 Freeway average vehicle speeds were assumed to be 10 mph in the peak direction and 35 mph in the off-peak direction. An ambient temperature of 55 degrees F was assumed to simulate a cold winter morning with 20.6 percent of vehicles equipped with catalytic converters and 20.6 percent of vehicles without catalytic converters operating in the "cold start" mode and 27.3 percent of all vehicles operationg in the hot start mode. The EPA computer model MOBILE3 was run using the above parameters to produce vehicular carbon monoxide emission estimates for each of the years studied.

The EPA computer model HIWAY 2 was used to calculate carbon monoxide concentrations at each of the selected critical receptor sites for each scenario studied. Stability category 5 was used for determining diffusion coefficients for sites 1 and 2, while stability category 4 was used for site 3. These stability categories represent the most stable (least favorable) atmospheric conditions that would be likely to occur on a cold, clear, nearly calm winter morning at each of the sites studied.

To simulate worst case wind conditions a uniform wind speed of one meter per second was assumed with the worst case wind direction for sites 1 and 2 from the southeast, and for site 3 from the northeast. For each receptor site concentrations were computed at a height of 1.5 meters to simulate levels that would exist within the normal human breathing zone. For site 1, calculations are for the edge of the H-2 right of way; for sites 2 and 3 computations were performed for a receptor located 10 meters from the edge of the roadway.

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 the impact of project-related traffic at these locations. At site 1, this background contribution should be near zero for 1986 and on the order of 1 milligram per cubic meter for the year 2002; for site 2 the background contribution could be as high as 2 or 3 milligrams per cubic meter for both scenario years because of the complicated profusion of on and off ramps to the H-1 Freeway to the south of the receptor site, and for site 3 morning peak hour concentrations of carbon monoxide at congested intersections along the H-1 corridor probably exceed those levels estimated for the somewhat more freely flowing traffic on the Freeway.

Results of the peak hour carbon monoxide study are presented in Table 3. At sites 2 and 3 existing carbon monoxide concentrations under the worst case conditions studied here are estimated to be substantially in excess of the allowable State of Hawaii one hour carbon monoxide standard.

For site 1, both current and expected worst case carbon monoxide levels with or without the proposed project are within acceptable standards. For site 2, projected concentrations are within the allowable State of Hawaii one hour standard without the project, but in excess of this limit with the project. When likely background contributions are added to these values, however, it is more likely that worst case values would not meet the standard for either scenario. For site 3, all projected values are in excess of the allowable State of Hawaii limit. For sites 2 and 3, projected peak hour values for the year 2002 are better than current levels with or without the proposed project.

All of the computed worst case carbon monoxide concentrations are within the National one hour carbon monoxide limit and it is reasonable to conclude that this standard can easily be met by the proposed project.

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 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 peak hour carbon monoxide levels by this factor yields the values that are shown in Table 4.

For site 1, projected eight hour values are within allowable State and National limits. For site 2, the Hawaii standard is exceeded with or without the proposed project, but the National standard is met for both cases. For site 3, both State and National eight hour limits are estimated to be exceeded under current worst case conditions, but the National standard might be achieved by the year 2002 in the scenario without the proposed project. This conclusion is somewhat suspect, however, since it assumes that peak hour traffic volumes on the H-1 Freeway without the project would be lowered by 440 vehicles per lane in the peak direction and 200 vehicles per lane in the off peak direction if the project were not to be built. In fact, this change in traffic volume is not very likely to happen. Morning peak volume in the year 2002 is more likely to span a time period of two or more hours. While deleting the traffic from this particular project may have some impact regarding the length of the morning rush period, the peak one hour volume will probably remain unchanged. Thus peak one hour carbon monoxide values would also remain unchanged and peak eight hour concentrations with project development would increase by a much smaller factor than that shown in Table 4.

It is also important to note that the worst case conditions studied here have a relatively low probability of occurrence. The wind directions used in the computations occur fairly often, but the wind usually blows from these directions at much higher speeds than one meter per second. With windspeeds of two meters per second, for example, computed carbon monoxide concentrations would be half the values shown in Table 3. 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 here. Prevailing temperatures are generally much warmer than the 55 degrees F used for emission computations. Emissions would be about 10 percent lower for a temperature of 65 degrees F.

The meteorological conditions used in this analysis do have a small probability of occurring, but to put the computations into perspective, this probability is on the order of 0.3 to 1.0 percent (somewhere between one and four morinings a year). Nonetheless, both State of Hawaii and National Ambient Air Quality Standards are values not to be exceeded more than once per year. Comparisons between the values presented in this study and allowable air quality standards are thus considered to be valid.

8. MITIGATIVE MEASURES

A. SHORT TERM

As previously indicated the only 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 and pavement or landscaping of bare soil areas as quickly as possible.

B. LONG TERM

Once completed, the proposed Waiawa Development is expected to have little direct impact on the air quality of the surrounding region. Indirect long term impacts in the form of increased air pollutant emissions from power plants serving new residences in the project area can be mitigated somewhat by planning and implementing solar energy design features to the maximum extent possible.

Other indirect long term air quality impacts are expected in those areas where traffic congestion can potentially be worsened by the addition of vehicles traveling to and from the proposed project. Project planners can do very little to reduce the emission levels of individual vehicles, but the Traffic Impact Assessment Report for the project describes several proposed or planned roadway improvements that could significantly increase highway traffic capacity and facilitate entry and exit from the proposed development with a minimum of increased traffic congestion. The key to viable access and acceptable air quality impact regarding this project will be redesign of the planned Waipio Interchange on the H-2 Freeway to accommodate traffic from the Waiawa side of the freeway.

Carbon monoxide modeling conducted as a part of this study indicates that the proposed improvements to the planned Waipio Interchange will be adequate to ensure compliance with State and National air quality standards near this main access point to and from the project even under worst case traffic and meteorological dispersion conditions.

Carbon monoxide modeling at the intersection of Waipahu Street and Kamehameha Highway and along the H-1 corridor between Waiawa and Halawa Interchanges indicates that State of Hawaii Hawaii standards are currently being exceeded at these locations under worst case conditions. While the modeling also predicts that lower levels can be expected at these sites in future years, projected increases in prevailing and project-related traffic will continue to contribute to potential violations of standards at these "hot spots". Congestion at these sites constitutes a regional traffic problem which will require mitigative measures beyond those that a single project developer can be expected to provide. In the case of this particular project the developer might be required to provide "park and ride" facilities for carpooling or mass transit systems as a part of regional transportation control plans.

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.

For the benefit of future residents of the proposed Waiawa Development it is also noted that tall, dense vegetation can provide some screening of residential areas from larger aiborne particulates generated along roadways and near construction areas. It is thus recommended that wherever possible such vegetative cover be included in landscaping plans with plantings occuring as early in the development process as practicable.

REFERENCES

1. U.S. ENVIRONMENTAL PROTECTION AGENCY, User's Guide to MOBILE3: Mobile Source Emissions Model, June, 1984.

2. U.S. ENVIRONMENTAL PROTECTION AGENCY, User's Guide to HIWAY 2, A Highway Air Pollution Model, May, 1980.

3. U.S. ENVIRONMENTAL PROTECTION AGENCY, Guidelines for Air Quality Maintenance Planning and Analysis, Volume 9: Evaluating Indirect Sources, January, 1975.

4. CALIFORNIA DEPARTMENT OF TRANSPORTATION, Energy and Transportation Systems, December, 1978.

5. PARSONS BRINCKERHOFF, Traffic Impact Assessment Report for the Waiawa Development, July, 1986.

TABLE 1

SUMMARY OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS
(Micrograms per Cubic Meter)

POLLUTANT	SAMPLING PERIOD	AMBIENT AIR QUALITY STANDARDS NATIONAL Primary	NATIONAL 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

SUMMARY OF AIR POLLUTANT MEASUREMENTS AT NEAREST MONITORING STATIONS

POLLUTANT	1979	1980	1981	1982	1983	1984	1985
PARTICULATE MATTER							
No. of Samples	58	60	59	53	55	56	47
Range of Values	20-48	22-93	19-71	19-54	17-57	16-45	16-62
Average Value	33	36	34	31	30	28	35
No. of Times State AQS Exceeded	0	0	0	0	0	0	0
SULFUR DIOXIDE							
No. of Samples	56	52	56	43	49	42	50
Range of Values	<5-63	<5-15	<5-<5	<5-10	<5-<5	<5-<5	<5-25
Averaqe Value	10	5	<5	5	<5	<5	<5
No. of Times State AQS Exceeded	0	0	0	0	0	0	0
CARBON MONOXIDE							
No. of Samples	207		286	311	173	318	342
Range of Values	0-17.3		1.2-13.8	0-4.6	0-8.6	.6-10.9	0-10.4
Average Value	2.9		5.1	1.2	2.3	2.4	1.5
No. of Times State AQS Exceeded	10		13	0	0	1	1
OXIDANT (OZONE)							
No. of Samples	338	295	314	335	349	296	341
Range of Values	10-80	10-84	10-104	0-151	0-123	0-104	8-198
Average Value	39	48	37	32	46	44	43
No. of Times State AQS Exceeded	0	0	1	2	2	1	3
OTHERS:			NITROGEN DIOXIDE			LEAD	
No. of Samples			46			52	58
Range of Values			6-77			.5-.8	0-.5
Average Value			25			0.6	0.3
No. of Times State AQS Exceeded			0			0	0

NOTES: See text for locations of monitoring stations. Carbon monoxide reported in milligrams per cubic meter; other pollutants in micrograms per cubic meter. Carbon monoxide and ozone are daily peak one hour values; lead is quarterly; other pollutant values are for a 24 hour sampling period.

SOURCE: State of Hawaii Department of Health

TABLE 3

RESULTS OF PEAK HOUR CARBON MONOXIDE ANALYSIS
(Milligrams Per Cubic Meter)

SITE 1 (H-2 Freeway at proposed Waipio Interchange)

YEAR	1986	2002
Without Waiawa Development	1.8	5.8
With Waiawa Development		7.2

SITE 2 (Intersection of Waipahu Street and Kamehameha Highway)

Without Waiawa Development	15.4	9.3
With Waiawa Development		12.3

SITE 3 (H-1 Freeway between Waiawa and Halawa Interchanges)

Without Waiawa Development	26.3	14.6
With Waiawa Development		18.0

STATE OF HAWAII AQS:	10
NATIONAL AQS:	40

Notes: See Figure 1 for location of receptor sites.
See text, Section 7, for models and assumptions used for producing these estimates.

TABLE 4

RESULTS OF EIGHT HOUR CARBON MONOXIDE ANALYSIS
(Milligrams Per Cubic Meter)

SITE 1 (H-2 Freeway at proposed Waipio Interchange)

YEAR	1986	2002
Without Waiawa Development	1.1	3.5
With Waiawa Development		4.3

SITE 2 (Intersection of Waipahu Street and Kamehameha Highway)

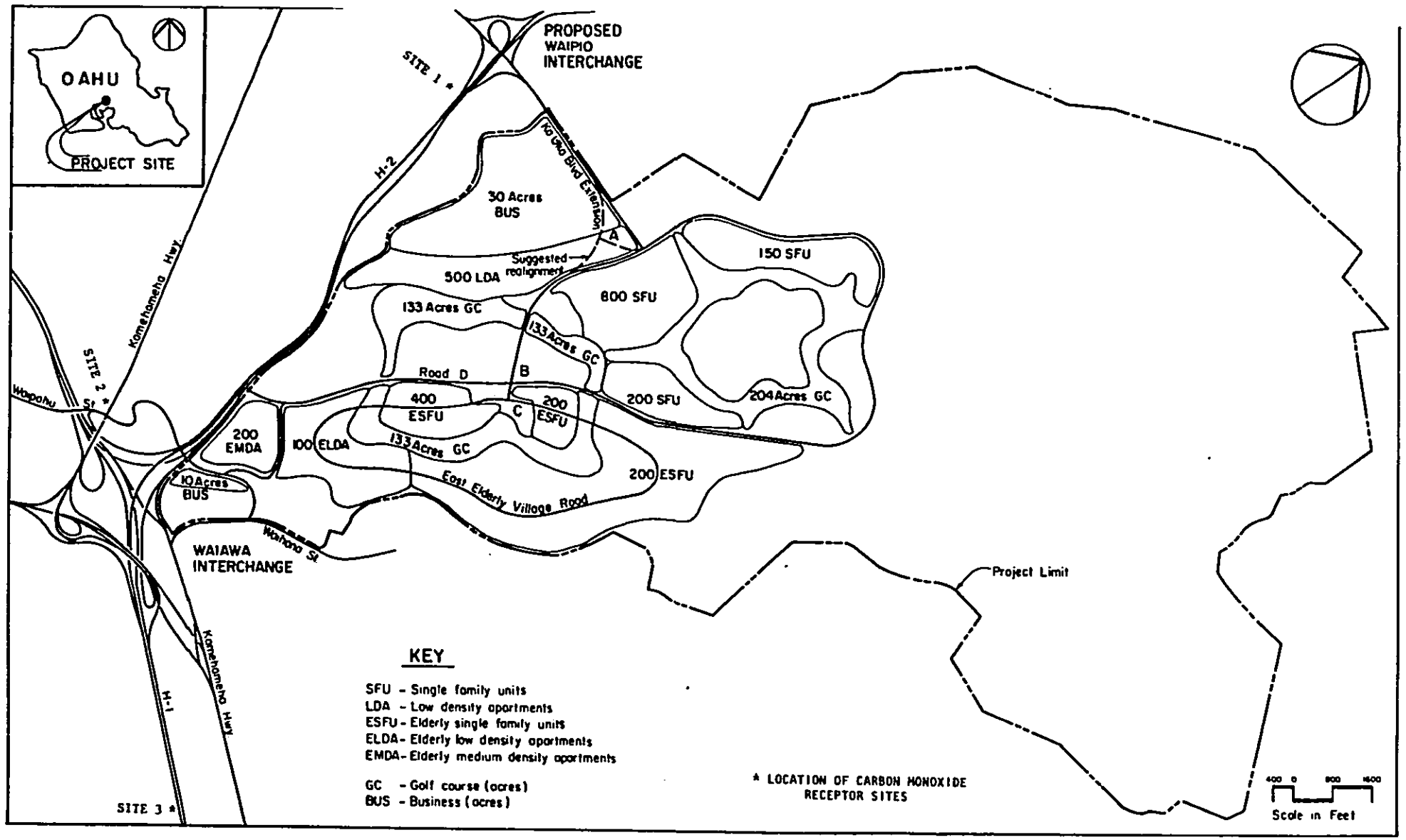
Without Waiawa Development	9.2	5.6
With Waiawa Development		7.4

SITE 3 (H-1 Freeway between Waiawa and Halawa Interchanges)

Without Waiawa Development	15.8	8.8
With Waiawa Development	10.8	

STATE OF HAWAII AQS: 5
NATIONAL AQS: 10

Notes: See Figure 1 for location of receptor sites.
These estimates produced by multiplying peak hour estimates by a "persistence factor" of 0.6.



LOCATION MAP

FIGURE 1

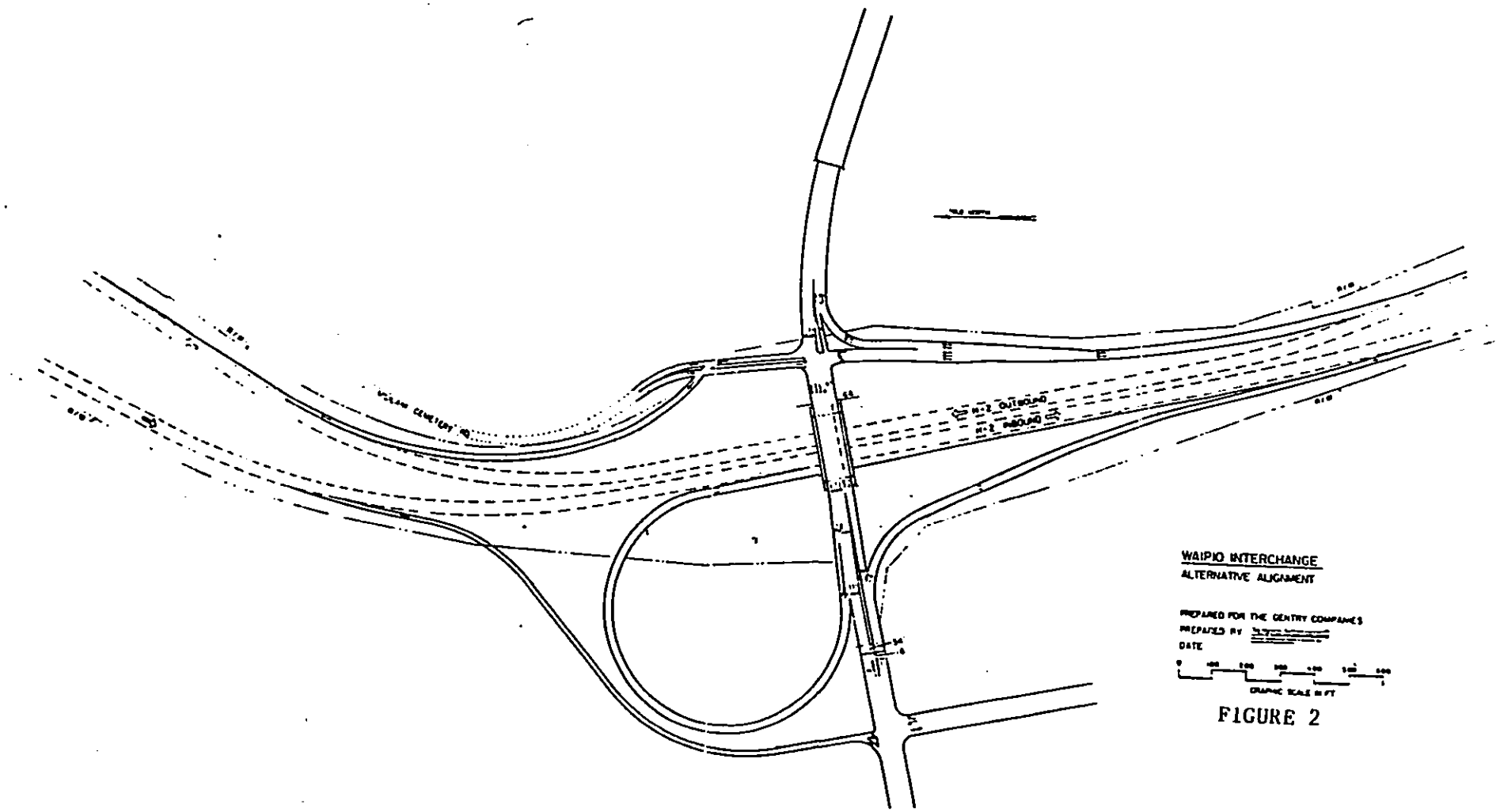

WAIPIO INTERCHANGE
ALTERNATIVE ALIGNMENT
PREPARED FOR THE GENTRY COMPANIES
PREPARED BY
DATE

FIGURE 2

Y. EBISU & ASSOCIATES

Updated Traffic Noise Study for the Proposed
Waiawa Development Plan (Year 2002)

July 1986

APPENDIX J

UPDATED TRAFFIC NOISE STUDY
FOR THE PROPOSED
WAIAWA DEVELOPMENT PLAN
(YEAR 2002)

PREPARED FOR
ENVIRONMENTAL COMMUNICATIONS, INC.

BY
Y. EBISU & ASSOCIATES

JULY, 1986

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I. SUMMARY

An evaluation of existing and Year 1993 traffic noise was performed in an earlier study (see Reference 1), and this current study was performed as a supplement to the first study.

The future traffic noise levels in the vicinity of the proposed Waiawa Development for the Year 2002 planning period were reevaluated for their potential impact on present and future residences. The future traffic noise level increases on Kamehameha Highway and H-2 Freeway were calculated for the Year 2002 planning period. Increases in traffic noise ranging from 0 to 3.3 Ldn (or dB) are predicted to occur between now and the 2002 planning period as a result of project plus non-project traffic. Project-related traffic noise increases on existing roadways are predicted to be in the order of 0.6 to 0.9 Ldn, which are considered minimal to moderate.

Future traffic noise impacts on Waiawa residents can be minimized by the use of buffer zones of adequate depth on the Waiawa side of H-2 Freeway, and along the internal roadways of the development. In order to not preclude federal (FHA/HUD) assistance on the project, it is suggested that minimum setback distances to the future 65 Ldn noise contours be used in siting future residential and apartment units. If these setback distances are not practical, the use of other noise mitigation measures may be applied as required.

Traffic noise impacts on existing residences along Kamehameha Highway are predicted to be insignificant. Along H-2 Freeway, noise impacts are expected to be moderate. Although significant increases in traffic noise levels are predicted as a result of primarily non-project traffic, existing residences should remain in the "Acceptable, Moderate Exposure" and "Unconditionally Acceptable, Minimal Exposure" categories.

II. PURPOSE AND METHODOLOGY

The objectives of this current study were to update the previous traffic noise study (Reference 1), which was performed for the proposed Waiawa Development Plan during the 1993 planning period, and to add additional information on potential traffic noise impacts along the internal roadways of the development. The methodology used in the first noise study was repeated for this current study. New traffic assignments representing full project development by the Year 2002 (Reference 2) were used to update the prior traffic noise predictions along H-2 Freeway and Kamehameha Highway, and were also used to develop future traffic noise predictions along the major internal roadways of the development. Tables and figures developed previously to reflect Year 1993 conditions were repeated to reflect Year 2002 predictions, with the letter "U" added to their numbers to designate the updated predictions.

III. YEAR 2002 TRAFFIC NOISE ENVIRONMENT ALONG H-2 FREEWAY

Predictions of Year 2002 traffic noise levels were made using the traffic volume predictions for the period contained in Reference 2. Future traffic noise levels were calculated with and without the project traffic. By References 1 and 2, project traffic on Kamehameha Highway at the proposed connection will be less than 10 percent of the total non-project traffic. Traffic noise level increases along Kamehameha Highway and attributable to project traffic are therefore anticipated to be less than 0.5 dB, and are predicted to be insignificant by the Year 2002 planning period.

The total (project and non-project) increases in traffic noise levels along H-2 Freeway are predicted to be approximately 3.3 dB (or Ldn unit), with 17 and 83 percent of the increase associated with project and non-project traffic, respectively. The predicted Year 2002 traffic noise contours along H-2 Freeway with the project implemented are shown in FIGURE 5U. Updated noise level vs. distance curves were also constructed at sections thru proposed residential areas bordering the freeway. These curves are shown in FIGURES 7U, 8U, and 9U with the applicable locations of the sections shown in FIGURE 5U. Distances indicated along the horizontal axis in FIGURES 7U, 8U, and 9U apply from the baseline (centerline) of H-2 Freeway. Noise level vs. distance curves for three receptor elevations were computed to depict the dependence on receptor elevations at approximately 5, 10, and 15 FT above ground level, and to show the effects of shielding from the roadway cut.

TABLE 3U presents the predicted increases in the setback distances to the 60, 65, and 70 Ldn traffic noise contours under worst case sound propagation conditions (180 degree field-of-view to the freeway lanes) as a result of project and non-project traffic on H-2 Freeway at Year 2002. Increases in the setback distances to the 65 Ldn contour are predicted to be approximately 5 FT along sections north of the proposed Waipio Interchange, and ap-

proximately 172 FT along sections south of the interchange. Although the distances to the 60 Ldn contour appear to be very large under the worst case propagation conditions, the presence of intervening natural or man-made noise barriers between the receptor and roadway is more probable at the larger setback distances, and actual distances to the 60 Ldn contour are significantly shorter. This shielding effect is evident in the proposed Waiawa Development area (see FIGURE 5U). The future location of the 55 Ldn contour is difficult to determine without prior knowledge of the man-made structures planned within the development, and were not shown in FIGURE 5U.

TABLE 4U presents the existing and Year 2002 traffic noise levels at a reference distance of 100 FT from the center of the inbound and outbound lanes of H-2 Freeway north and south of the proposed Waipio Interchange. Traffic noise levels represent project plus non-project Ldn at the 2002 planning year. As indicated in TABLE 4U, minimal changes in project plus non-project traffic noise are predicted to the north of the project. If the project is implemented, traffic noise levels north of the proposed Waipio Interchange are predicted to decrease. South of the interchange, non-project traffic are predicted to cause significant increases in traffic noise of 2.5 dB by the Year 2002, and project traffic are predicted to add an additional 0.8 dB.

TABLE 4U

PROJECT AND NON-PROJECT TRAFFIC NOISE INCREASES

LOCATION	1985 LDN	----YEAR 2002 LDN----- W/O PROJECT	W PROJECT	PROJECT INCREASE
H-2 Freeway North of Waipio Interchange:				
H-2 (Outbound) to North	67.3	69.0	67.7	(1.3)
H-2 (Inbound) from North	68.6	69.6	68.2	(1.3)
H-2 Freeway South of Waipio Interchange:				
H-2 (Outbound) from South	67.3	70.2	70.8	0.6
H-2 (Inbound) to South	68.6	70.7	71.6	0.9

Note: Ldn values calculated at 100 FT from all roadways' centerlines.

IV. YEAR 2002 TRAFFIC NOISE ENVIRONMENT ALONG INTERIOR ROADWAYS

Future traffic noise levels along the major interior streets of the proposed development were also evaluated for the Year 2002 time period. A worst case traffic volume of approximately 2,903 VPH is projected during the AM peak hour on the Ka Uka Boulevard extension (Reference 2). Under these conditions, and at an anticipated average speed of 35 MPH, traffic noise levels along the boulevard should not exceed 67 Ldn at 50 FT setback distance from the roadway centerline. Setback distance to the 65 Ldn contour from the centerline of this roadway is 66 FT as indicated in TABLE 3U.

For other interior roadways of the project, AM peak hour traffic volumes are expected to be less than 2,903 VPH. Predicted setback distances to the 65 Ldn traffic noise contours for interior roadways with traffic volumes of 2,500, 2,000, 1,500, and 1,000 VPH are also shown in TABLE 3U. As indicated in the table, setback distances of 66 to 33 FT from the roadways' centerlines are required to not exceed 65 Ldn for AM peak hour volumes of 2,500 to 1,000 VPH. If these minimum setback distances from the centerlines of the interior roadways are used when siting residential/apartment buildings within the project, the existing FHA/HUD noise standard of 65 Ldn can be met, and traffic noise impacts from interior traffic will be minimized.

V. DISCUSSION OF FUTURE TRAFFIC NOISE IMPACTS

As indicated previously, differential traffic noise impacts along Kamehameha Highway and attributable to the proposed Waiawa Development are predicted to be less than 0.5 Ldn (or dB), and will be difficult to measure. The proposed Waiawa Development is not anticipated to generate adverse traffic noise impacts along Kamehameha Highway in the Year 2002 planning period.

Because traffic noise along H-2 Freeway to the north of the proposed Waipio Interchange are not expected to increase, adverse traffic noise impacts should not occur in areas to the north of the proposed project.

Along H-2 Freeway between the proposed Waipio Interchange and the existing Waiawa Interchange, significant increases (3.3 Ldn) in total traffic noise levels are predicted by the Year 2002 planning period. Project and non-project traffic will contribute 0.8 and 2.5 Ldn, respectively, to this total increase. Adequate setback distances currently exist to residential areas to the west of H-2 Freeway, and Year 2002 traffic noise levels should remain in the "Acceptable, Moderate Exposure" to "Unconditionally Acceptable, Minimal Exposure" categories.

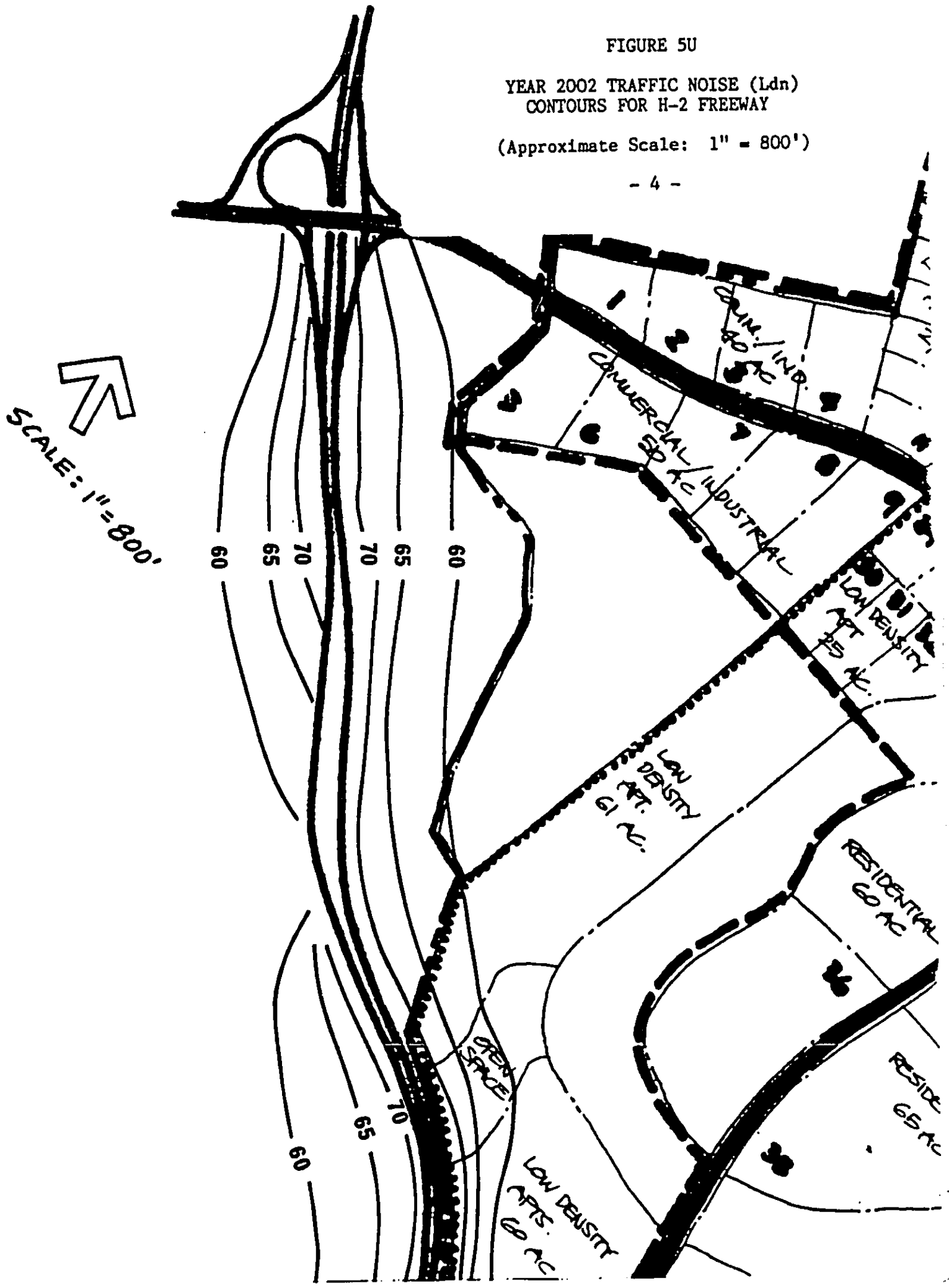
On the Waiawa Development side of the H-2 Freeway, possible noise impacts may occur at the low and medium density apartments at the southwest end of the development (see FIGURE 5U). The extent of the noise impacts will depend upon the setback distances and building elevations planned within these proposed housing areas (see FIGURES 7U, 8U, and 9U). For single-story construction, setback distances from the freeway baseline of 120 to 210 FT are required to not exceed the FHA/HUD standard of 65 Ldn. For multi-story construction, larger setback distances (applicable to the upper floors) of 175 to 250 FT are required.

The majority of the proposed residences of the Waiawa Development will be at sufficient setback distances from H-2 Freeway, such that traffic noise impacts from off-site sources should be negligible. Therefore, it is anticipated that the majority of the Waiawa residential/apartment units will be in the "Acceptable" and "Unconditionally Acceptable" noise exposure categories.

FIGURE 5U

YEAR 2002 TRAFFIC NOISE (Ldn)
CONTOURS FOR H-2 FREEWAY

(Approximate Scale: 1" = 800')



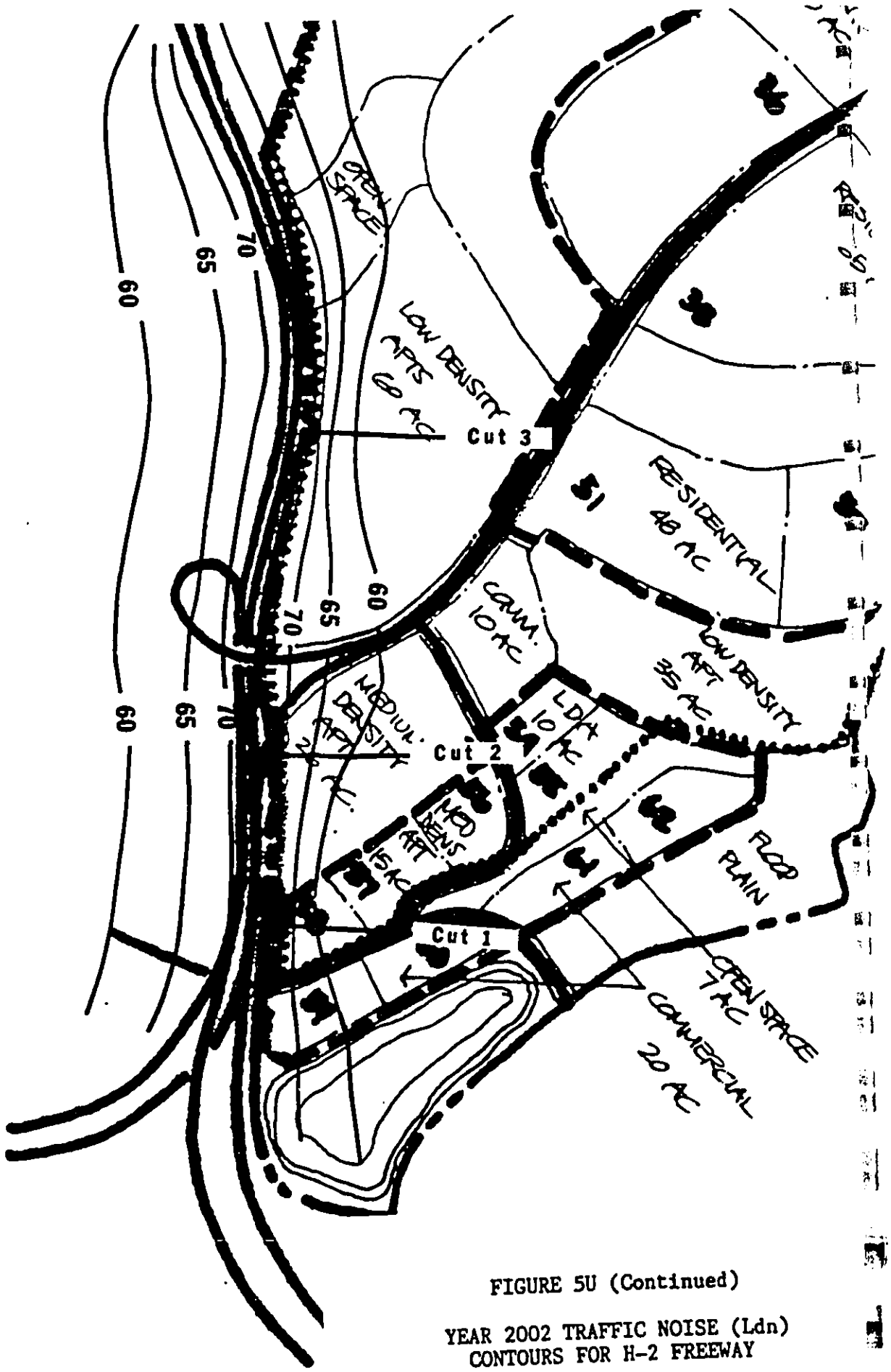


FIGURE 5U (Continued)

YEAR 2002 TRAFFIC NOISE (Ldn)
CONTOURS FOR H-2 FREEWAY

(Approximate Scale: 1" = 800')

VI. POSSIBLE NOISE MITIGATION MEASURES

Possible noise mitigation measures which would minimize noise impacts from roadway traffic noise include measures such as: the use of buffer zones of sufficient depth as indicated in FIGURES 5U, 7U, 8U, and 9U, and TABLE 3U; construction of sound attenuation berms or walls where adequate setbacks cannot be achieved; incorporating sound attenuating window design features in upper-story homes which cannot be shielded by sound attenuating barriers; and air conditioning affected spaces. The applicability of each mitigation measure depends upon other considerations besides noise, such as economic cost, aesthetics, and technical feasibility.

The construction of sound attenuation walls or berms is a standard mitigation measure, particularly for single-story homes. However, wall height requirements become excessive (in the order of 10-plus FT) when multi-story residences are involved in traffic noise mitigation efforts. For this reason, the use of walls or berms as a traffic noise mitigation measure is generally limited to ground-floor residential units.

Where none of the above mitigation measures are feasible, the remaining options are air conditioning the affected residential spaces or sound-treating the ventilation openings (windows). The use of air conditioning within residences is not common in Hawaii, and is not generally considered a practical option for subdivision residences. The use of sound-treated windows has been applied at selected mid-rise structures in Hawaii for the purpose of meeting FHA/HUD noise standards, and is a possible noise mitigation option for any new home of the project.

A. REFERENCES

(1) Y. Ebisu & Associates, "Traffic Noise Study for the Proposed Waiawa Development Plan," January, 1986.

(2) Parsons Brinckerhoff Quade & Douglas, Inc., "Year 2002 Waiawa Traffic Projections," July 19, 1986.

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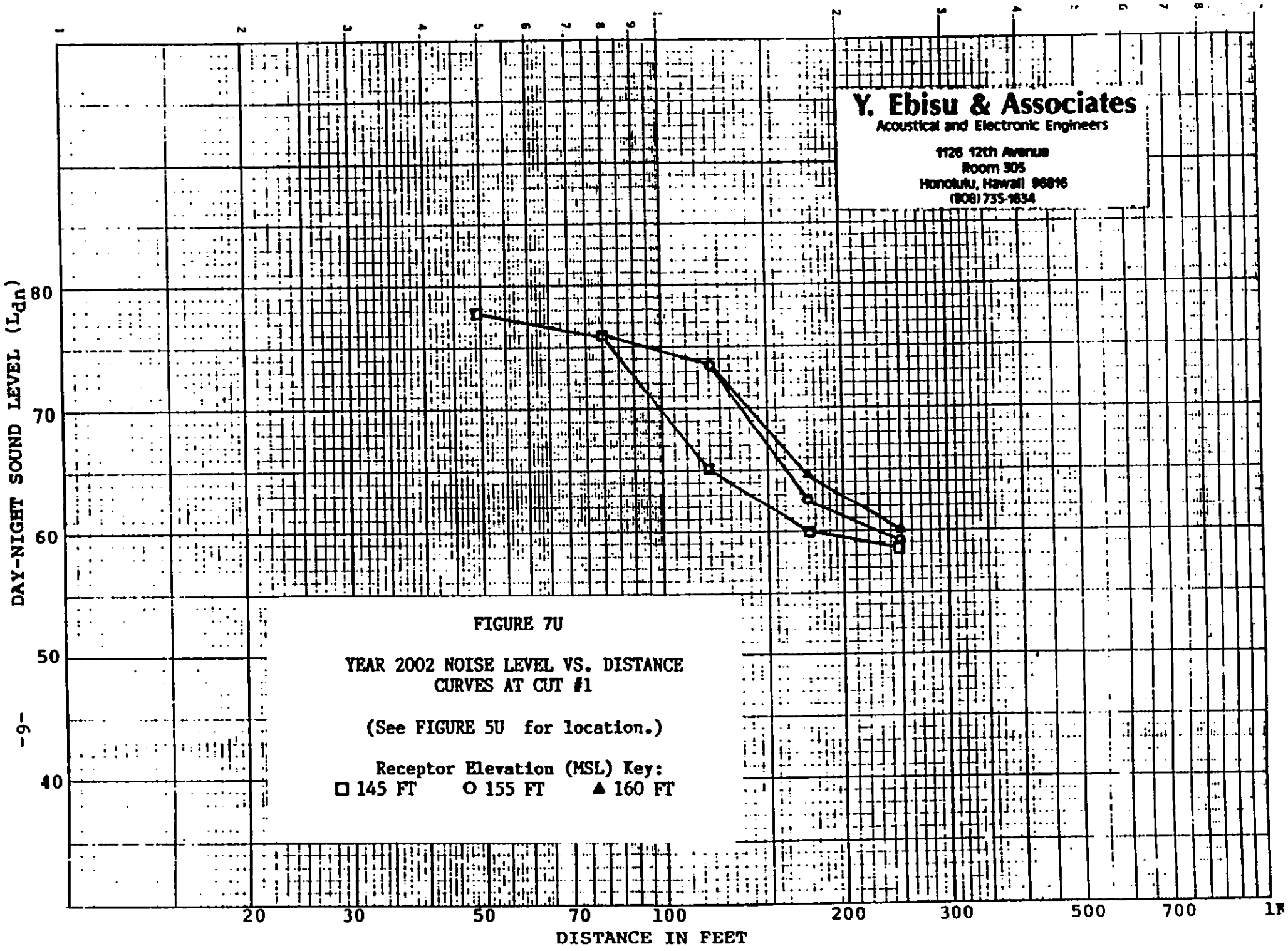
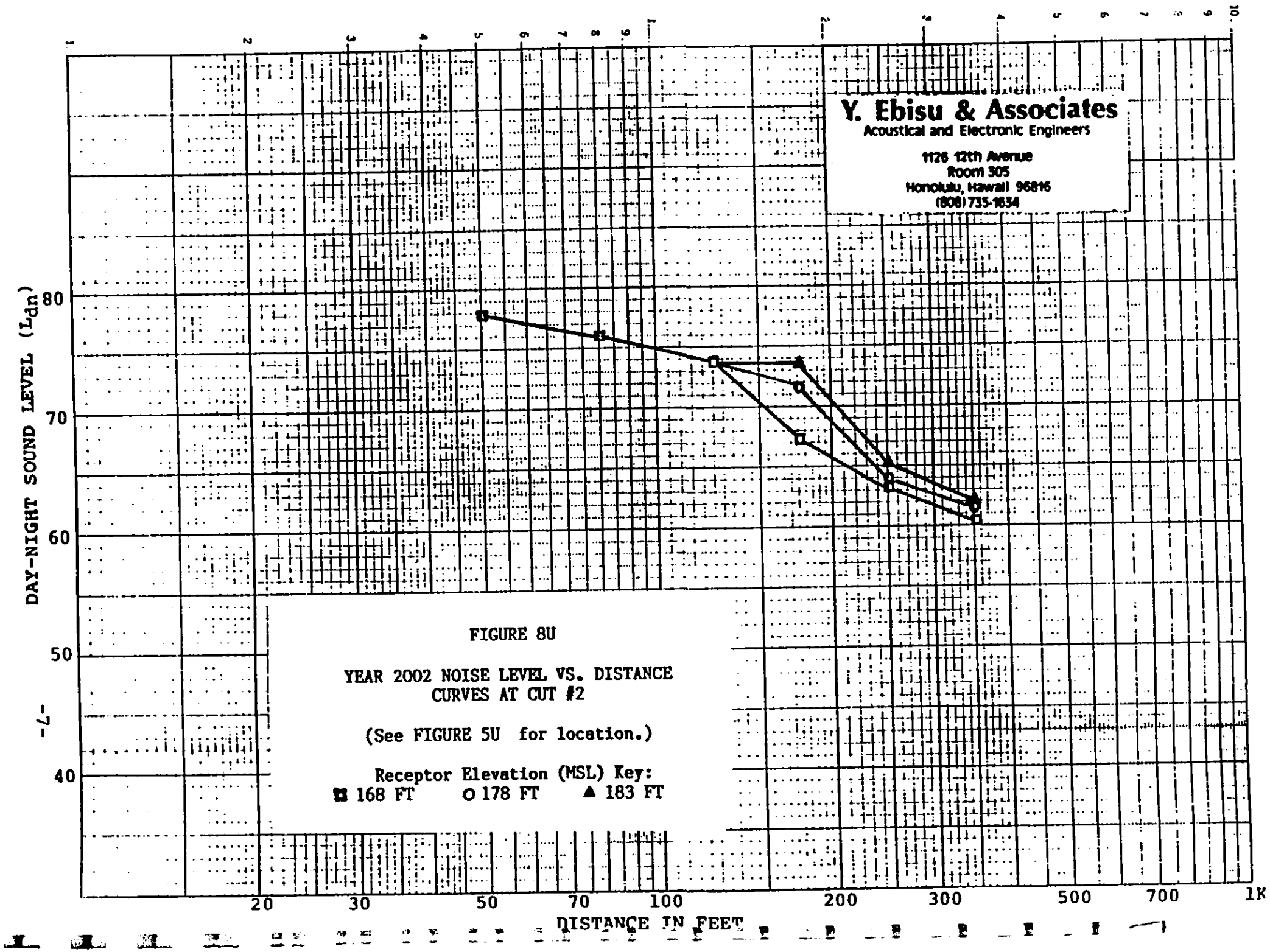


FIGURE 7U

YEAR 2002 NOISE LEVEL VS. DISTANCE CURVES AT CUT #1

(See FIGURE 5U for location.)

Receptor Elevation (MSL) Key:
□ 145 FT O 155 FT ▲ 160 FT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DAY-NIGHT SOUND LEVEL (L_{dn})
80
70
60
50
40
20
30
50
70
100
200
300
500
700
1K
DISTANCE IN FEET
FIGURE 8U
YEAR 2002 NOISE LEVEL VS. DISTANCE
CURVES AT CUT #2
(See FIGURE 5U for location.)
Receptor Elevation (MSL) Key:
168 FT
178 FT
183 FT

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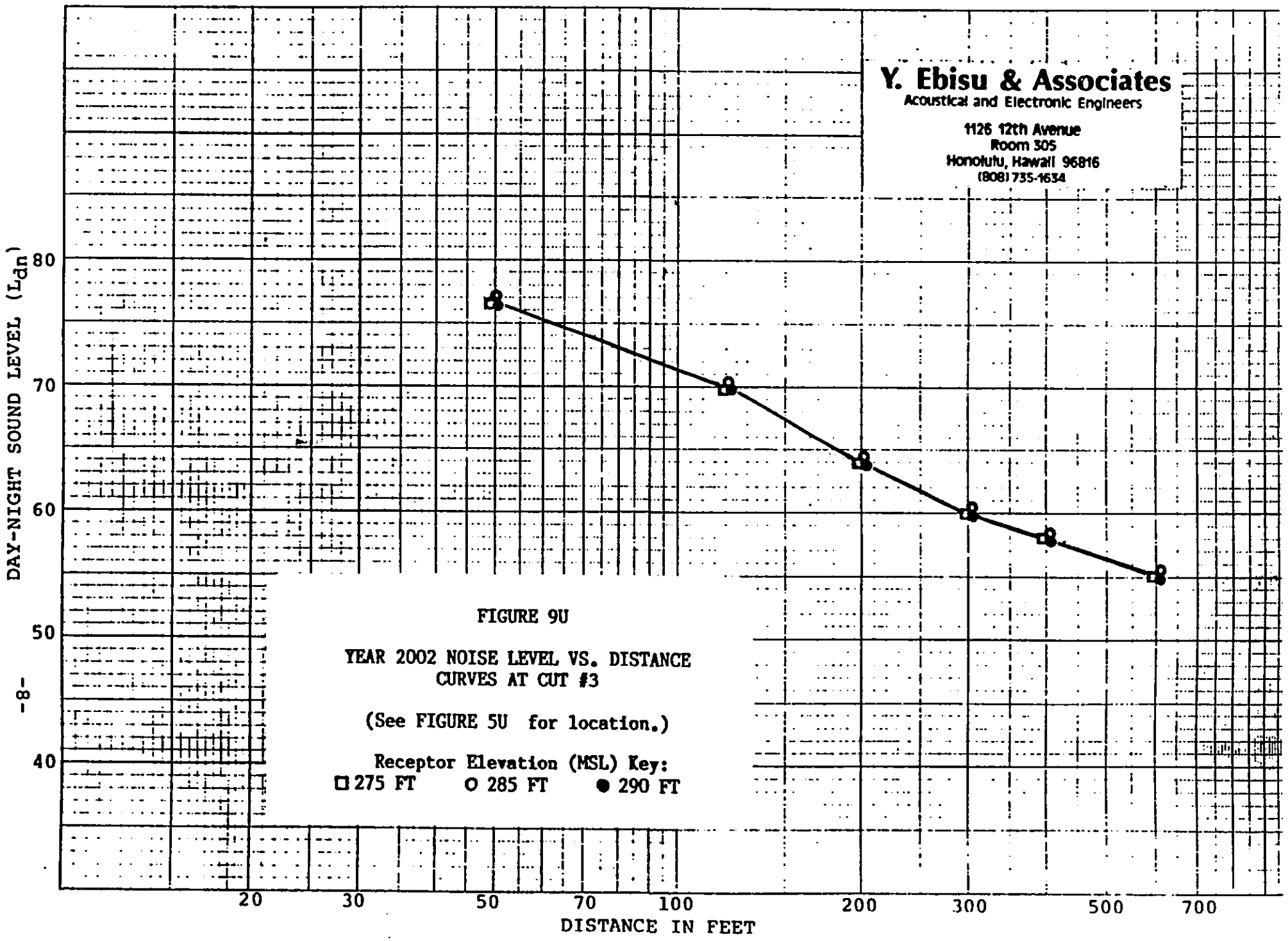

FIGURE 9U

YEAR 2002 NOISE LEVEL VS. DISTANCE CURVES AT CUT #3

(See FIGURE 5U for location.)

Receptor Elevation (MSL) Key:
□ 275 FT O 285 FT ● 290 FT

TABLE 3U

EXISTING AND YEAR 2002 DISTANCES TO 60, 65, AND 70 Ldn CONTOURS

STREET SECTION	60 Ldn SETBACK (FT) EXISTING	60 Ldn SETBACK (FT) FUTURE	65 Ldn SETBACK (FT) EXISTING	65 Ldn SETBACK (FT) FUTURE	70 Ldn SETBACK(FT) EXISTING	70 Ldn SETBACK(FT) FUTURE
H-2 Frwy. (North of Waipio Interchange)	522	532	242	247	113	115
H-2 Frwy. (South of Waipio Interchange)	522	893	242	414	113	193
Ka Uka Boulevard Extension	N/A	143	N/A	66	N/A	31
2,500 VPH Roadway	N/A	130	N/A	60	N/A	28
2,000 VPH Roadway	N/A	112	N/A	52	N/A	24
1,500 VPH Roadway	N/A	92	N/A	43	N/A	20
1,000 VPH Roadway	N/A	70	N/A	33	N/A	15

Notes:

1. Setback distances are to freeway and roadway centerlines.
2. Assumed traffic mix of 96% autos, 2.5% medium trucks, and 1.5% heavy trucks on H-2 Freeway.
3. Assumed traffic mix of 98% autos, 1% medium trucks, and 1% heavy trucks on internal roadways.
4. Ldn assumed to be 1.4 dB greater than two-way, AM Peak Hour Leq.
5. Setback distances are for unobstructed Line-of-Sight conditions.