March 6, 1987

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.
Mr. Fred J. Rodriguez, President
Environmental Communications, Inc.
Page 2
March 6, 1987

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

Sincerely,

[Signature]

DONALD A. CLEGG
Chief Planning Officer

Attach.

cc: OEOC
   Mr. Tosh Hosoda, The Gentry Companies
   Department of Land Utilization
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 followed 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:

<table>
<thead>
<tr>
<th>Category</th>
<th>Acres</th>
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<tbody>
<tr>
<td>Residential</td>
<td>727</td>
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<tr>
<td>Apartment-Low Density</td>
<td>82</td>
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<td>Apartment-Medium Density</td>
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<tr>
<td>Commercial/Industrial</td>
<td>115</td>
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<td>Golf Course/Open Space/ School/Parks</td>
<td>393</td>
</tr>
<tr>
<td>Major Roadways</td>
<td>63</td>
</tr>
</tbody>
</table>

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 Wainona 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 Waialua 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.

[Signature]
DONALD A. CLEGG
Chief Planning Officer
Environmental Impact Statement
Development Plan Amendment
FINAL
ENVIRONMENTAL IMPACT STATEMENT
For the Proposed
WAIAWA DEVELOPMENT
Waiau, 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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J  Traffic Noise Study
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 usage. 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 its 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 farmed 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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<td>Commercial/Industrial</td>
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<td>Golf Courses/Open Space/School/Parks</td>
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<td>30 units/acre</td>
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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.
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<td>Extension Ka Uka Boulevard</td>
<td>30 acres</td>
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<td></td>
<td>200 units single family detached residential</td>
<td>5 acres</td>
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<td></td>
<td>100 units multi-family low density apartments</td>
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<td></td>
<td>Sewer trunk line</td>
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<td></td>
<td>Water system with source storage</td>
<td></td>
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<tr>
<td>2</td>
<td>Championship golf course (private/public)</td>
<td>220 acres</td>
</tr>
<tr>
<td></td>
<td>Retirement Area golf course</td>
<td>133 acres</td>
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<tr>
<td></td>
<td>200 single family (retirement)</td>
<td>25 acres</td>
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<td>200 units single family detached</td>
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<td>100 units multi-family</td>
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<td>Main Loop road extension</td>
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<tr>
<td>3</td>
<td>Commercial/Industrial</td>
<td>15 acres</td>
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<td>200 units single family detached</td>
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<td>200 residential (retirement)</td>
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<td>100 multi-family (retirement)</td>
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<td>4</td>
<td>Commercial/Industrial</td>
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<td>Commercial/Industrial</td>
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<td>100 units multi-family (retirement)</td>
<td>5 acres</td>
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E. Funding

The total construction costs for structures and direct site improvements for the first increment Development Plan Amendment area are estimated 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

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 urbanised 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 Waiau 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 Waiau 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-Kapsa 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 introduced, 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 (Actidothres 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 hawaiensis), 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 preceding 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 Walawa 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 Waiau-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 Millani to the north. Between 1970 and 1980 the Waiau-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 Wahalawa. 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 Waialua 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.

V-9
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
VI

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 Waalawa 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 negligible.

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 Honolulu 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 desirable 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.
Walawa will provide safe and healthy resources as required by all governmental laws and regulations.


The diversity of residential types and costs along with the recreational, business, commercial and employment centers within the Walawa 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.


The Walawa 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 usage 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 occurring 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 golf courses 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, personnel 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 desirable. 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 Waiau development will be consistent 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.
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

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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 Kahului Development Project, Southern Oahu

<table>
<thead>
<tr>
<th>Storm Duration</th>
<th>Recurrence Interval</th>
<th>Quantity (in)</th>
<th>Hydraulic Development</th>
<th>Nitrogen Development</th>
<th>Phosphorus Development</th>
<th>Suspended Solids Development</th>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1.45</td>
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<td>66.5</td>
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<td>125.9</td>
<td>116.2</td>
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<tr>
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<td>10</td>
<td>2.5</td>
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<td>40.9</td>
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<td>193.5</td>
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<td>76.1</td>
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<tr>
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<td>3.3</td>
<td>48.4</td>
<td>219.3</td>
<td>171.1</td>
<td>101.3</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
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<td>66.4</td>
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<td>188.5</td>
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<td>936.2</td>
<td>1810.3</td>
</tr>
</tbody>
</table>

- 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 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 (Waiaua 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 Waiaua Stream at the southern end of the site which transports the collected runoff into the Middle Loch of Pearl Harbor. The development of Waiaua will increase the quantity of surface runoff flowing into Waiaua 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 cane fields. 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 occurring 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 Wahona 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 Walhona 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 Millilani 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.

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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.

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 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.

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 occurring 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

VII-17
<table>
<thead>
<tr>
<th>LOCATION</th>
<th>1985 LDN</th>
<th>-----YEAR 2002 LDN-----</th>
<th>PROJECT W/O PROJECT</th>
<th>PROJECT INCREASE</th>
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<td>(1.3)</td>
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<td>H-2 (Outbound) from South</td>
<td>67.3</td>
<td>70.2</td>
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<tr>
<td>H-2 (Inbound) to South</td>
<td>68.6</td>
<td>70.7</td>
<td>71.6</td>
<td>0.9</td>
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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.

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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 Waiau project area. Therefore, the project proposal is to construct onsite the required water source storage reservoirs, and transmission and distribution 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, Waiau 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 Wahona Street; Kamehameha Highway; and proposed easements to the pump
station. Wastewater is then pumped to the regional plant at Honolulu 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 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.

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.

VIII-1
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.
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 associated 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

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 Acquisition

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.
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XII-1
Organizations and Agencies Consulted (Continued)

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| Community Organizations | | | |
|-------------------------|----------------|------------------|
| Pearl City Neighborhood Board No. 21 | - | - | - |
| Waipahu Neighborhood Board No. 22 | - | - | - |
| Millani 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*
Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:


Thank you for consulting with us on the proposed Master-planned community at Waipahu.

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 permit 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,

[Signature]

FOR MAUI NAPAOHA
Manager and Chief Engineer

June 9, 1986

Mr. Kaku Hayashida
Manager and Chief Engineer
Board of Water Supply
City & County of Honolulu
635 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 Waipahu Ridge development. We respond to the following:

The applicant developer's engineering consultant, Community Planning, Inc., will be developing a Water Master Plan for the entire 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,

[Signature]

F. J. Rodrigues

July 16, 1986
June 23, 1986

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

Dear Mr. Rodríguez:

SUBJECT: EIS PREPARATION NOTICE (EISPW)
WALUA 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, Wai'anae 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 Walua 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 Walua project. The site should be a minimum of 25,000 square feet.

2. The Honolulu Fire Department foresees the need in the Walua 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 Walua area may be a suitable location for a Battalion Headquarters, housing three battalion chiefs, three chiefs' aids and a sedan.

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

Should you have any questions, please contact Battalion Chief Kenneth Ward at 941-3335.

Sincerely,

[Signature]
FRANK E. EDAHOLO, MD
Fire Chief

July 16, 1986

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

Dear Chief Kahoomano:

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

1. The request for a fire station site to be located on the Walua 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 the 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 constraints and appreciate the identification of the fire station personnel required for Walua Ridge.

3. Costs that will accrue to the City as a result of the Walua 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,

[Signature]

FJR/ta

[The text below appears to be a signature or a stamp, but it is not legible.]
Mr. Fred Rodriguez, President
Page 2
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 Waiau 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 should be assessed with input from the State Department of Transportation because of the projected increased levels of service surrounding the proposed Waiau Ridge development.

2. **Sewage Treatment and Disposal**
   - The availability of capacity at Honolulu 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.

4. **Drainage System**
   - The Waiau development will increase the quantity of surface runoff flowing into Waiau 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 Waiau 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 use 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.

JUN 9 1986
Mr. Fred Rodrigues, President  
Page 3  
June 5, 1986

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 A. CLEGGS  
Chief Planning Officer

ENVIRONMENTAL  
COMMUNICATIONS  
INC.  
PRELIM

Mr. Donald A. Clegg  
Chief Planning Officer  
Department of General Planning  
City & County of Honolulu  
555 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 Walua 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 also 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 site and scope. This data will be provided to them in the draft EIS to the extent practicable.

6. Recreational lands within the Walua Ridge master plan will be provided to the Department of Parks & Recreation so that compliance with the Park Dedication Ordinance can be met.
Mr. Donald A. Clegg
July 16, 1986
Page 2

7. Agendas 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 25 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 Waiawa 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. Bishu & 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 Chlno, Inc.

Very truly yours,

[Signature]

P. J. Rodrigues

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

June 9, 1986

Dear Mr. Rodriguez:

Subject: EIS Preparation Notice for the Proposed Waiawa Ridge Project

Waiawa, Oahu

Tax Map Keys: 9-4-06: Portion of 10
9-4-08: Portion of 1

Area: 1,242 Acres

Existing Land Use: Vacant

Development Plan: Agriculture

Zoning Map: AG-1 Restricted Agriculture

State Land Use: Agriculture

Applicant: Bishop Estate

Proposed: Redevelop 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 7,000 single family and apartment units. 8,000 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.
July 14, 1986

Mr. Alan 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 Makaha 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. Rodriguez

FJR:10
June 10, 1986

Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 526
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

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

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

The size of the proposed Kalua 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 at the earliest 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 Yoon of our Advance Planning Section at 577-6315 to discuss the project's recreational needs and park requirements.

Sincerely,

Tom Negota, Director

TOM T. NEGOTA, Director

July 16, 1986

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

Dear Mr. Negota:

We are in receipt of your department's comments dated June 10, 1986 on the proposed Kalua 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 discussion 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 development will lend itself to detailed scheduling with your agency to ensure 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,

Fr J. Rodrigues

FJRo
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 Waiau 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 C. Gibb
Chief of Police

July 16, 1986

Chief Douglas G. Gibb
Honolulu Police Department
City & County of Honolulu
1450 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 Waiau Ridge development. We appreciate your continuing concern and look forward to your comments on the draft EIS.

Very truly yours,

F. J. Rodriguez

JUN 3 1986
June 4, 1986

Mr. Fred Rodriguez
President
Environmental Communications, Inc.
P. O. Box 516
Honolulu, Hawaii 96809

Dear Mr. Rodriguez:

Re: EIS for Waiola Ridge Project, Ewa District
(Tax Map Key: 9-6-51 Par. 10, 9-6-61 Par. 11)

In response to your letter dated May 32, 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 Hoomolulii sewer system or part of the Waihale drainage subdistrict during the construction of the Honolulu WWP and Waihale WWP. 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 serviced.

Very truly yours,

[Signature]

RUSSELL W. SMITH, JR.
Director and Chief Engineer

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 Waiola Ridge development and we respond in the followings:

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 Honolulu Sewage Treatment Plant was not designed and constructed with the Waiola 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 Honolulu for this project.

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

Very truly yours,

[Signature]

F. J. R.

F. J. Rodrigues
Mr. Fred Rodrigues, President
May 30, 1986

Dear Mr. Rodrigues:

Subject: EIS Preparatory Notice for Waiawa Ridge Project

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.

Sincerely,

John E. Hirtens

JUN 3 1986
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 Makaha 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. Rodrigues

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

Dear Mr. Rodrigues:

Subject: Walawa 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 Walawa 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 Takesoto of the Planning Branch at 548-5460.

Very truly yours,

TEUE TUKINGA
State Public Works Engineer

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

JUN 3 1986

WAIAWA DEVELOPMENT PLAN AMENDMENT AREA

NOT TO SCALE

FIGURE 1
July 16, 1986

Mr. 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
Malawa Ridge development and we respond in the following:

The close proximity of the minimum security correctional facility to the
northern boundary of the Malawa 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. Rodrigues

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

Dear Mr. Rodrigues:

Subject: Environmental Impact Statement Preparation Notice (EISPW) for Amendment to the Central Oahu Development Plans Malawa Ridge Project
The Gentry Companies Malawa, Central Oahu

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

According to the EISPW, 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 (ALISI) system. The gulch areas are not classified according to the ALISI system.

The Soil Conservation Service Soil Survey identifies the predominant soil series as (1) Malawa (Web, Web, Web) with 0 to 15 percent slopes which is used for sugarcane and pineapple; (2) Lahaina (Lah, Lah, Lah) with 0 to 15 percent slopes which is used for sugarcane and pineapple; (3) Manoa (Moa, Moa, Moa, Moa) with 3 to 25 percent slopes which is used for sugarcane, pineapple and pasture, and (4) rock land and helemao (XeR and XHR) which are found in the gulled areas on the subject parcel. It appears that the majority of these soil types have crop capability classifications that range from 5 to 6. If rehabilitated (soils with few limitations that restrict their use to soils with severe erosion hazard if cultivated and not protected).

Mr. Fred Rodrigues
June 23, 1986
Page 2

The project sites have Land Evaluation Bureau Overall Productivity Ratings of "A", "B", "C" and "X" (within gulches and streams). By this method of classification, the "A"-, "B"-, "C"- and "X"-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 ensure 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 authorized 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 Lands" (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 project levels of agricultural activities and income, and land 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, 86, 84, 82, 74, 66, 60, 59 and 57. 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 - Hau; 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 ESA 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 ESA 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 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 H. Suna
Chairman, Board of Agriculture

Mr. Fred Rodriguez
June 23, 1986
Page 4
July 16, 1986

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

Dear Mr. Suwa:

We are in receipt of your comments dated June 23, 1986 on the proposed Palama 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 Yukito 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

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

Dear Mr. Rodrigues:

SUBJECT: EIS Preparation Notice for the Proposed Makaha Ridge Project

In response to the subject matter, my staff contacted Mr. Taeyong Kim, EIS Analyst 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

FMR: J1

CC: DFS

W. Araki, Leeward Dist.

JUN 2 1986
3. Noise emanating from the existing Pearl City Industrial Park may seriously affect future residents of the proposed Walawa 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 area for recreation.

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 43, Vehicular Noise Control for Oahu.

Sincerely yours,

[Signature]

les, P. S. Matsumara
Director of Health
Mr. Leslie S. Matsubara, Director
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96804

Dear Mr. Matsubara:

We are in receipt of your department's comments dated June 29, 1986 on the proposed Walawa 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 Nylen, Ph.D. Dugan will also be commenting on the Surface Runoff/Drainage aspects of Walawa Ridge.

2. Noise

Y. Eshu & 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 Walawa Ridge.

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

Very truly yours,

F. J. Rodrigues

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

Dear Mr. Rodriguez:

EIS Preparation Notice
Waiau 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 Waiau 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,

Director of Transportation

July 16, 1986

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

Dear Mr. Yamasaki:

We are in receipt of your department's comments dated June 26, 1986 on the proposed Waiau 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 in 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 Waiau 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
Mr. Fred Rodrigues
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96809

Dear Mr. Rodrigues:

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

We have revised the subject preparation notice and offer the following comments:

1. Considering the traffic concerns produced by current development proposals in Central Oahu and the area, 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 sustainability 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 agricultural uses as well as impacts of irreversible 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 high-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 rainfall 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 Honolulu 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,

[Signature]

cc: Office of Environmental Quality Control

MAY 28 1986
Mr. Kent M. Keith
July 16, 1986

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 Honolulu Treatment Plant has been reviewed and approved during the design stage 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. Rodrigues
FJR:

Mr. Kent M. Keith
July 16, 1986
Page 2

1. Traffic will be fully discussed in the draft EIS and the retained consultant firm of Parsons, Brencherhoff, Osada, and Douglas, Inc. is developing a comprehensive traffic study for the Waiau Ridge project. 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 area 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 economies 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 run-off in a study being developed for the draft EIS. Impacts as well as the study will 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 Waiau 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.
Mr. Fred J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96829

Dear Mr. Rodriguez:

Subject: Waikiki Ridge Project Preparation Notice

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

1. Several large developments are planned for the Waikiki area that will utilize the Honolulu 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 Honolulu 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
Director

June 9, 1986

Ms. Letitia N. Uyehara, Director
Office of Environmental Quality Control
State of Hawaii
445 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 Waikiki Ridge development. We respond in the following:

1. The Honolulu sewage treatment plant which serves users from Waikiki to West Beach and from Mililani to Kaena, has a treatment capacity of 25 million gallons of sewage per day. Current sewage is at 17 MGD. The Waikiki project would add 3.5 million 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 changes, 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/la

July 16, 1986
Mr. Fred Rodrigues, President
Environmental Communications, Inc.
P. O. Box 526
Honolulu, Hawaii 96809

Dear Mr. Rodrigues:

Subject: Environmental Impact Statement Preparation Notice, The
Centry Companies, Waiau, between Waiau Gulch and
Stream, TMK 8-4-06: por 10 and 5-6-04: 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
Waiau 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 basin aquifer.

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

Sincerely,

Edwin T. Murahayashi
EIS Coordinator

ETWJM

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

Dear Mr. Murahayashi:

We are in receipt of your office's comments on the proposed Waiau 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 DLRR or the Board of Water Supply. If the source
is to come from existing water wells, the impacts that could accrue from this
project's development and the close proximity of the U.S. Navy's Waiau water
well will be discussed in the draft EIS. Quality and quantity of recharge is
to be covered by Dr. Gordon L. Dagan who will provide the data for use in
the EIS. Dagan 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. Rodrigues

FJR1m

JUN 17 1986

AN EQUAL OPPORTUNITY EMPLOYER
Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P.O. Box 536
Honolulu, Hawaii 96819

Re: Extension of Environmental Impact Statement Preparation
Notice, Waialua 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,

Ernest Koakako
Project Leader
Office of Environmental Services

CC: NMFS - WPPO

July 16, 1986

Edward D. Goldstein
President
Environmental Communications, Inc.

Mr. Ernest Koakako
Project Leader
Office of Environmental Services
United States Department of the Interior
Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96859

Dear Mr. Koakako:

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

1. Municipal water supply for Waialua 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. Stueh, 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 Waialua 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 habitats 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,

Edward D. Goldstein
President

F. J. Rodriguez

FJRod
Mr. Fred Rodrigues, President
Environmental Communications, Inc.
P.O. Box 123
Honolulu, HI 96809

June 19, 1986

Dear Mr. Rodrigues:

Subject: GIS Preparation Notice for Wainana Ridge Project

Keawakapu, 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. DAPKIS
State Conservationist

NO RESPONSE NEEDED

JUN 20 1986
Mr. Fred Rodriguez, President
Environmental Communications, Inc.
P. O. Box 550
Honolulu, Hawaii 96809
2 JUN 1986

Dear Mr. Rodriguez:

ENVIRONMENTAL IMPACT STATEMENT (EIS)
PREPARATION NOTICE, WAIKA MA RIDGE PROJECT
(CITY OF HONOLULU RECREATIONAL 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 Highway should take into consideration
   the presence of a Navy water shaft under Waialae Ridge.

b. The EIS should address the impact the residential development will have
   on the Navy's primary water source for Pearl Harbor, the Waialae tunnel. The
   agricultural fields above the water tunnel comprise the major recharge area.
   Development (ground roads, homes) will merely 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 contaminants due
      to the application of pesticides and fertilizers by individual residents?

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

Thank you for the opportunity of providing these questions.

Sincerely,

P. O. CONNOR
Governor, U. S. Navy

JUN 24 1986

---

Captain P. O'Connor
Chief of Staff
Department of the Navy
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96845-5020

Dear Captain O'Connor:

We are in receipt of the comments dated June 20, 1986 on the proposed
Waialae 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
   silting and chemical contamination.

2. Contamination of ground water by pesticides and fertilizers used by
   individual homeowners 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 develop-
   ment. Today's grading ordinances prohibit mass acreage from being
   cleared and graded without mitigative sources such as grading and
   swishing 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

JUL 16 1986

---

ENVIROMENTAL
COMMUNICATIONS
INC.
DEPARTMENT OF THE ARMY
HQ DOMINICAN UNITED STATES ARMY SUPPORT COMMAND, HAWAII
HEADQUARTERS HAWAII
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 your assistance 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 (TMDNs 9-4-6-10 and 9-6-4-1).

If you can be of assistance, please contact the Environmental Management Office at 635-0694.

Sincerely,

[Signature]

[Name]
Colonel, Corps of Engineers
Director of Facilities Engineering

MAY 2 2 1986
WAIPAHU 2000 COMMUNITY COUNCIL

June 17, 1986

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

Dear Mr. Rodriguez:

Subject: Comments on Waialua 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 Waialua 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 (March 19th HZC 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 - 300 units
- Waialua Ridge Project - 300 units
- Millilit Town Expansion - 300 units

Also, at its May 19th meeting, the HZC voted 8-0 to recommend denial of a CPD-initiated GP amendment which proposed replacing the existing West Beach-Nahakili Secondary Urban Center in Ewa with a single “Secondary Growth Area” encompassing both Ewa and Central Oahu DP areas. The HZC felt that the amendment lacked adequate supporting study of its impacts on water, agricultural lands and other areas of planning concern.

Simultaneously, the HZC recommended City Council 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 Waialua (R-1) Interchange and Kamehameha Highway within the GP’s Primary Urban Center;

Environmental Communications, Inc.

Page 2.

3. Resolution No. 86-201, as amended, be forwarded to the Department of General Planning for processing and consideration in the 5-year review;
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 1,262 acres of fallow agricultural land at Waialua Ridge, Central Oahu, from Agriculture to various urban DP land classifications in implementation of the first increment of a Waialua 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 2,517-acre Master Plan. The project’s EIS Preparation Notice states that a GP amendment to permit the project’s anticipated population has been requested, implicitly 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, Waipahu would take up most of the 28,000 additional population capacity released to Central Oahu by including Waipahu within the PUC, again, virtually foreclosing the development of other, pending Central Oahu projects without increases to Oahu’s projected year-2005 population.

JUN 23 1986

94-329 Waipahu Depot Rd. # Room No. 205, 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 Honolulu Sewage Treatment Plant; the development of the new Second City; Village Park, Hillani Town, Waikiki; economic revitalization and growth in Waipahu; and, of course, regional traffic flows and transportation systems. If the project hinders or prevents the development of other projects (public and private) which will contribute positively towards Waipahu revitalization, our Community Council will probably not support it. We lack sufficient information at this time to determine whether the project will have such effects.

Moreover, in recent months our Community Council has been especially interested in the formulation of a comprehensive CP amendment which prescribes greater growth for Central Oahu, particularly in Waipahu, in a rational, defensive manner. Also, the inclusion of Waipahu within the POC as suggested in House No. 86-201 would greatly help Waipahu attain its goals. If the project hinders or prevents formulation of that Central Oahu CP amendment or, in the alternative, inclusion of Waipahu within the POC, 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 ICP that a comprehensive review of regional growth distribution and direction policies in the CP needs to be done first and used as the basis for evaluating the merits of each major pending development proposal. We also think that it's important to avoid piecemeal reviews at the CP level in favor of a holistic review of regional and islandwide planning needs, conditions, and trends. Such a review would avoid the kind of interproject 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 Waipahu Ridge Project at this time.

Very truly yours,

[Signature]

C.J. ANTHONY ANDERSON
President

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

DATE OF INTRODUCTION: MAY 23, 1986
Honolulu, Hawaii

(CITY/CITY OF HONOLULU)

CITY COUNCIL

A HAWAIIAN RESOLUTION was adopted by the City Council of the City and County of Honolulu on the 23rd day of May, 1986, and by the Mayor on the 23rd day of May, 1986.

(ADJOURNED

Resolution No. 86-201

Mr. G.O. Andy Anderson, President
Walapah 2000 Community Council
94-329 Wahala Depot Road, Room 206
Walapah, Hawaii 96797

July 16, 1986

Mr. H. Anderson:

We are in receipt of your organization's comments dated June 17, 1986 on the proposed Walapah 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, Walapah Ridge could be sold for less than 58% of the average value of all of the year 2000 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 of our project that must be addressed is that as a project the size of Walapah Ridge proceeds through the lengthy land use policy change process, the request for change is for 63 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 marketplace will make the final determination as to whether or not Walapah 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 Walapah Ridge.

We would request that the Walapah 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. Rodrigues

FJR/EES

E. Vea

MAY 23, 1986
Honolulu, Hawaii

(SIGNED DOCUMENT)

(CITY/CITY OF HONOLULU)

CITY COUNCIL

A HAWAIIAN RESOLUTION was adopted by the City Council of the City and County of Honolulu on the 23rd day of May, 1986, and by the Mayor on the 23rd day of May, 1986.
Mr. Fred Rodrigues, President
Environmental Communications, Inc.
P. O. Box 534
Honolulu, Hawaii 96809

Dear Mr. Rodrigues,

Environmental Impact Statement Preparation
Wailua Ridge Project

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

Very truly yours,

[Signature]

Geoff Yim, President
CASTLE & COOKE LAND COMPANY

---

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 Wailua 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,

[Signature]

F. J. Rodrigues
June 2, 1986

Mr. Fred Rodrigues, President
Environmental Communications, Inc.
P.O. Box 534
Honolulu, Hawaii 96809

Dear Mr. Rodrigues:

Environmental Impact Statement Preparation
Mauna Ridge Project

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

Very truly yours,

George Yim, President
CASTLE & COOKE LAND COMPANY

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 Mauna 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. Rodrigues

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

ORGANIZATIONS

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* COMMENT RECEIVED AFTER DEADLINE DATE
NRN: NO RESPONSE NEEDED
MEMORANDUM

To:   Mr. Donald A. Clepp, 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
          Malaekahana Development
          The Gentry Companies
          P.O. Box 21759
          Honolulu, Hawaii 96822-0159

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

Appendices A and B of the DEIS contain the soil
information referred to in our letter of June 23, 1986, to Mr.
Rodrigues concerning the EIS Preparation Notice (EISP).

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

- 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 EIS: Provide greater protection to
agricultural lands in accordance with the Hawaii State
Constitution.

JAN 06 1987
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 major crops 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  
Chairperson, Board of Agriculture

cc: Environmental Communications, Inc.
    UEC
    DPED
    EIZ
    CRQC
Ms. Suzanne 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 Waialua by Century 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 4,500 HCGD 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, covers 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 Waialua Village Park, and Millilani Waiau by the agricultural tenants/landowners.

We cannot dispute the physical proximity of the Waialua Ditch and the theoretical availability of this irrigation water source for agricultural use in the Waialua 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.

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 ensure 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 as that costs for infrastructure in relation to attractive settings for residential developments 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 LSA 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 Century 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. Rodrigues

FJR/IS
Mr. Donald A. Claus, Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Claus:

EIS - Waiawa By-County, Waiawa, Oahu

A review of the above subject EIS forwarded by the Office of Environmental Quality Control letter dated December 5, 1995 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 on the weekends, since the IRR 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 Tomyeni, Facilities Management Officer, at 773-2522.

Yours truly,

[Signature]

Jerry M. Tatsuda
Major, Hawaii Air National Guard
Commander

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

JAN 02 1997
January 21, 1987

Major Jerry M. Matsuda
Department of Defense
Hawaii Air National Guard
Office of the Adjutant General
3849 Diamond Head Road
Honolulu, Hawaii 96814-4495

Dear Major Matsuda:

We are in receipt of your comments dated December 30, 1986 on the proposed Mualalai 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 Mualalai Training Area indicates the types of activities being planned and the applicant has indicated that they will begin monitoring the progress of this application and will coordinate both their project and your future proposed uses with your designated staff advisor, Col. Wayne Tomyas.

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

Very truly yours,

F. J. Rodriguez

F. J. Rodriguez

FJR11a
Dear Mr. Clegg:

Subject: DEIS for the Wai'anae Development, Wai'anae, 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 Wai'anae Master Plan. Fully developed, the Wai'anae 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 sewer, water supply, roads, and infrastructure capacities. Inadequate and inadequate to serve as a generic or programmatic EIS.

The preparer's response to DEIS 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.

The Honorable Donald A. Clegg
Page 2
January 7, 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 archeological areas, should utilize a similar base map to enhance review'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 Wai'anae 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-1 and 4, and Appendix C) are based on a project area of 1,274 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 the use may be very significant. As heavy metals are known to interact and accumulate in biotic systems, the DEIS only states that the long-term effects on the biocoenosis in Wai'anae is unclear what "undefined" impact is expected. Furthermore, there is no discussion on the effects of increased nutrients and phosphorus 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 impermeable surface area. Wai'anae Stream and its borders are within the Flood Insurance Rate Map (FIRM) Zone A and Flood Plain. These within the Flood Insurance Rate Map (FIRM) Zone A and Flood Plain. These increased quantities and flow rates of runoff may contribute adversely to the Wai'anae flood hazard potential by making it more susceptible to flooding. This should be fully discussed in the Final EIS.
TheHonorableDonaldA.Clegg
Page3
January7,1987

Inaddition,SectionVI.BoftheFinalEISshoulddiscussconcerns
pertainingtorunoffandfloodhazardsaspartofanoverallreviewof
the project's relationship to Section 226-11 and 11, HRS, Physical Environment,
Hawaii State Plan.

GroundWaterSupplyandQuality

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
(SDOH) (6/20/86) and the Department of the Navy, Pearl Harbor (6/20/86)
regarding the contamination of the Navy's water source, the Waianae shaft, a
full study of the potential problems 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 SDOH 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 226-15(b)(5), 226-20(a)(2); Priority
Guidelines 226-104(b)(9), 226-104(b)(10); and State Health Functional Plan
objective A.

Waste 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
Hououlli or 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 discussed and disclosed 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 indicated. Capacities should be
based on the total Waianae Development (1,500 acres) 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 (Appendix F) concludes that the construction may proceed
without the necessity for further archaeological research at the four sites
invented. 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 or 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. VII-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 226-125, 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 Waianae Stream. This is significant because the surface water runoff from
the project site will be deposited near the refuge via Waianae Stream. The
impact on the refuge and mitigation measures should be disclosed in the Final
EIS.

According to Appendix E, "Terrestrial Vertebrate Animals of Waianae 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 Puaa." (p. 3) Mr. Berger states that he did not see any Puaa
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 Waianae 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.
The Honorable Donald A. Clegg
Page 5
January 7, 1987

Correctional Facility

There is no discussion regarding the project's close proximity to the minimum security Waimalu 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 Waiulua 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 Waimalu Project" states that "use of private transportation to work is very high within the Waimalu tract with 95.5% of all employees utilizing private vehicles and only 2.94% using public transportation. These figures are noticeably 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 35% shift to car pools and a 10% shift to Express buses 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 225-10, HRS) and the State Transportation Functional Plan objectives A and C.

The Honorable Donald A. Clegg
Page 6
January 7, 1987

Housing Needs

The Final EIS should discuss the differences in their operations between the retirement residences (Arcadia and Paliku Nani) and the Waimalu 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 225-10, 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. Ulveing

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

January 21, 1987

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

Dear Mr. Ulvelling:

We are in receipt of your department's comments dated January 7, 1987 on the
proposed Waiakea 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 GDP instructions, the amendment was limited to the
1935 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 1935 acres
application as mandated by the GDP. We would note at this point that there is
filed and in circulation, an EISPR for a 515 acre parcel that is contiguous to the
1935 acres being reviewed in this DEIS, but this EISPR identifies the EISPR
as a "planning" document to identify the impacts of lands to be developed within
a 10-15-10 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,
progressing 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 downstream 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 levels of concern (even though several heavy metals discharge 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. Conse-
sequently, the suspended solids load to Pearl Harbor from this area should be
notably reduced with the completion of the project.

Site improvements will increase impervious surfaces when compared to prior
agricultural use. 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 Waiakea 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 254-11 and 13, BKIS, Physical Environment, Hawaii
State Plan.

Ground Water Supply and Quality

The Pearl Harbor Ground Water Control Area (PHGCA) has been acknowledged,
for several years, as having its groundwater withdrawal being nearly equal to
its long-term sustainable yields; therefore, groundwater pumping in this area
has to be controlled. Nevertheless, the PHGCA 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 Waiakea 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

Pearl Harbor, Oahu.* No. PUP, TF 599, Naval Undersea Research
and Development Center, San Diego, Calif."
In a recent U.S. Geological Survey study reported by Paul R. Eyre, a Report No. 83-697. However, this study involved the use of chlorine as a tracer. In irrigation water applied in concentrations of the 100's of ppb, a concentration measurement one million times higher than the ppt units used for EDB and DRCP. In addition, chlorine 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 adsorbed to the soil properties; thus, chlorides and volatile organic compounds are not comparable.

The State Health Department's concern over the potential for termiticides 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 a zone 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-volatile and unadsorbed chemical to the aquifer, since its applied to and around buildings. If the application of termiticides 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 16 wells with > 20 ppt of EDB and/or DRCP 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 polities 226-14(b) (3), 226-20(a) (2), Priority Guidelines 226-14(b) (9), 226-19(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 increase in the Pearl City. The major off-site sewer trunk main is not on the revised page 20-29 of the Final EIS.

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


Negotiations as to the fair share pro-rata share would be conducted with the City to assure proper allocation of expansion costs at Honolulu WWTP. The sewage treatment will be discussed in the revised Section VI in relation to the objectives and policies of the Hawaii State Plan -- Facility System (Section 226-19, 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 and 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 Harbor 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 imperious surface area.

Dr. Andrew J. Berger, Ph.D. responds to the comment on the Hawaiian owl or Puu. It is true that my statement on the Puu does not confirm that the owl does not occur on Oahu from frequent to 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, using an owl, I would answer 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 Puu in its range in Hawaii, is found to open grassland (e.g. the grading land along the western part of the Saddle Road on Hawaii), in forested areas, and often is found in lowland (Berger, 1981, Hawaiian Birdlife, page 88). If the Puu 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 Puu 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 DACS that there is a clear understanding of the minimum security Waiau 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 DACS' 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 alleviate 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 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 feeding 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 Waialua and Waiau 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

Housing Needs

The applicant has described the Retirement Village community as Leisure Village community 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 and resources to the community.

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 216-17, HR5), Priority Guidelines - Affordable Housing (Section 224-105, HR5) 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.
Mr. Roger A. Uwelung  
January 21, 1987  
Page 7

throughout the DFED 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. Rodrigues

FJR:Ms
Mr. Donald A. Clegg, Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
850 South King St.  
Honolulu, HI 96813

Dear Mr. Clegg:

SUBJECT: Miala by Gentry - EIS

Our review of the proposed Miala development indicates that it may generate the following additional enrollment:

Students Projected

<table>
<thead>
<tr>
<th>Schools</th>
<th>Grades</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highlands Intermediate</td>
<td>7-8</td>
<td>180-220</td>
</tr>
<tr>
<td>Pearl City High</td>
<td>9-12</td>
<td>330-350</td>
</tr>
</tbody>
</table>

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-8 students. The Department of Education has contacted the developer of this need.

Should there be any questions, please call Mr. Richard Inouye at 733-4243.

Sincerely,

Francis M. Watanaka  
Superintendent

cc Mr. F.J. Rodriguez  
OES

December 16, 1986
January 21, 1987

Mr. Charles Taguchi, Superintendent
Department of Education
P.O. Box 2369
Honolulu, Hawaii 96804

Dear Mr. Taguchi:

We are in receipt of your comments dated December 16, 1986 on the proposed Halsea by Genex 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. Rodrigues

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

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (EIS) for the Proposed Palava 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 house 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,

[Signature]

RUSSELL M. FORKUMO
Executive Director

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

JAN 07 1987
Mr. Russell N. Fukumoto
Executive Director
Hawaii Housing Authority
Department of Social Services and Housing
P.O. Box 17907
Honolulu, Hawaii 96820

January 21, 1987

Mr. Fukumoto:

We are in receipt of your comments dated January 6, 1987 on the proposed Halawa by-Century 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 analyses) prepare a study in December, 1983 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 is 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 price 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
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 Waialua Development, Waialua, 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 Waialua Shells due to the Waialua Ridge Development. The proposed Waialua Ridge Project would be located in the recharge area for the Waialua Shells, 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 irritation recharge of the proposed ridge area by brackish waters. In addition, the source has registered low-level contamination by the chemicals dibromochloropropane (DBCP) and chlorpropane (TCP) which has led to the application for listing on the National Priorities List (NPRC). The Waialua Shells 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, requires that no activity be allowed in the recharge area which may further contaminate the Shells.

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
Dr. John Lewis
January 21, 1987
Page 2

applied. Its frequency of application, the volatile nature of the product, its absorption properties to the soil, and the lack of a large quantity of water to drive the non-volatilized and unadsorbed chemical to the aquifer, since its applied to and around buildings. If the application of termiticides 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 volatilisation and/or adsorption by activated carbon. At present, granular activated carbon treatment is being used or will be used to treat the up to 30 wells with >20 ppm of EDB and/or DECP in Central Oahu to less than the detectable limit.

Noise - Y. Ebliou & Associates
The comments made in the EISP in June, 1984 were reviewed by Mr. Ebliou 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, sitting 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 Waipahu 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: Residents can be designed and built to minimize the containment of noise, and minimize risks of noise impacts at adjoining residences. However, under conditions of natural ventilation with open 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. Rodrigues
Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 337, Hawaii Revised Statutes and Chapter 11-200, Administrative Rules, EIS Rules:

TITLE: Valves by Century

LOCATION: Waianae, 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. Cleas, 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. Rodrigues, 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.

NO RESPONSE NEEDED

DEC 11 1986
Mr. Donald A. Clegg  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
690 South King Street  
Honolulu, Hawaii  

Dear Mr. Clegg:  

Subject: Draft Environmental Impact Statement  
Wailea by Gentry  

We have reviewed the subject EIS and have noted the following:  

1. The 200-bed minimum security Wailea Correctional Facility (WCF) is located on THS 9-6-511 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 Wailea 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  

Mr. Donald A. Clegg  

Page 2

Ltr. No. (F)1007.7

( F ) 1 0 0 7 . 7

Mr. Donald A. Clegg  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
690 South King Street  
Honolulu, Hawaii  

Dear Mr. Clegg:  

Subject: Draft Environmental Impact Statement  
Wailea by Gentry  

We have reviewed the subject EIS and have noted the following:  

1. The 200-bed minimum security Wailea Correctional Facility (WCF) is located on THS 9-6-511 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 Wailea 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  

Mr. Donald A. Clegg  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
690 South King Street  
Honolulu, Hawaii  

Dear Mr. Clegg:  

Subject: Draft Environmental Impact Statement  
Wailea by Gentry  

We have reviewed the subject EIS and have noted the following:  

1. The 200-bed minimum security Wailea Correctional Facility (WCF) is located on THS 9-6-511 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 Wailea 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
Mr. Donald A. Clegy
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegy:

January 7, 1987

RE:0455

Draft Environmental Impact Statement
Waiau by Gentry
Waiau, Oahu

The above cited document addresses the potential environmental impacts related to the proposed development of 1,195 acres of land at Waiau, 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 report was prepared with the assistance of Paul Dean, Cartlidge and Associates; Michael Groves, Anthropology; and Jon Hatanaka, Social Work; Frank Peterson, Geology and Geophysical Sciences. The report also includes the assistance of Wellington 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 the project. Perhaps the most serious of these problems is its lack of discussion of the impacts to water quality and quantity in the region. Other topics of concern include the discussion of archaeological features in this area, the lack of substantive discussion of the social impacts that are likely to occur in the future, 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 data 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 these water restrictions are essential, a thorough discussion of water supply alternatives be included in the Final EIS.

Specific Comments:

Page VII-2, an adverse ecological 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 various contaminants being transported onto the receiving waters, i.e., Waiau Stream and Middle Loch of Pearl Harbor. Concentration estimates are given (albeit with a substantial hedge factor) but nothing is given on downstream water quality effects.

Page VII-7, the same comments 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 these concerns in the Draft EIS is particularly significant.

Archeology

The prehistory of the project site disclosed four archeological 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 archeological value, however, the rationale for this conclusion is not given. Sites may have quite different types of value, such as cultural, interpretive, or research. As previously stated, the statement indicates that, presumably in each category of the sites, are not considered significant. In this context, 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 archeological significance is lacking.

It should be noted that historic sites dating prior to World War II may be of some research interest. There is evidence of agricultural, residential, and manufacturing components of large scale farming activities found during the survey. However, no summary of possible historic sites was provided. Although clearly since 1934 the Oahu Sugar Company has been a major influence in the region.

In order to assess the research potential of the historic sites on Waiau Ridge it would be advantageous to complete some background work on the recent history (post 1874) of Oahu, with emphasis on the development of commercial agriculture.

[Stamp: University of Hawaii at Manoa]

[Stamp: AN EQUAL OPPORTUNITY EMPLOYER]

MR. DONALD A. CLEGY

JAN 08 1987
January 7, 1987

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 artifacts were dated to the present century. At all sites, the manufacturing marks or description of the specific artifacts that permit such dating should be included in the report.

Social Impact Analysis

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 C provides certain pertinent descriptive background information about the Kakaako 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 social changes to the Waikiki 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 through traffic on the existing H-1 traffic or through downtown Honolulu. Since the peak-hour 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 OEC
F. J. Rodrigues
Stephen Liu
Michael Graves
Jon Matsuhisa
Wallington Yee
Mr. Jacqueline B. Miller
January 21, 1987
Page 2

Detriment to marine environment appeared to be slight. As presented in the DEIS, the suspended solids load is estimated to increase for the lower intensity storms (1-hour), and the 3-year interval 24-hour storm, 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 eliminate, the incremental lower level sediment producing storms. Consequently, the suspended solids load to Pearl Harbor from this area should be noticeably 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 Naval Base area by Chiles, Inc., 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 indicates to him that the sites listed in his study were essentially dump sites of Oahu Sugar Co. operations at various locations on Waialua 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 on January 7, 1987 for the Waialua 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 149 (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 clearly has no cultural or religious importance.

Site 149, 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 reflects only to our understanding of human utilization of the area that could not be gained by direct informant interviews.

Mrs. Jacqueline N. Miller
January 21, 1987

Site 1471 (bulldozed former canery 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 lie 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 Walawa 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 Milland Town was first presented to the State Land Use Commission. In the subsequent period, there has developed at Milland Town, a self-contained community, with schools, parks, shopping center, fire, police, and emergency medical services, a golf course, and of course the residential sector. At this time, one can evaluate the impacts and interaction between Milland and Waialae 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 Walawa 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

Mrs. Jacqueline N. Miller
January 21, 1987

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 Waialua and Waialua 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 i.e., 1,000 vehicle trips are expected out of the proposed project in the morning peak hour, compared to 3,000 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 1998.

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. Rodrigues

FJR:is
3. Appendix A, "Impact on Agriculture of the Proposed Malawa Development", p. 15 Forage Crop Production:

"...Both the dairies and the feedlots are located too far from Malawa to make Malawa an optimal location for forage production."

Why Malawa 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 herbicide contamination which had been applied during pineapple operations. Therefore, transportation distance would not of itself remove Malawa from being a viable forage production area as the above quotation implies.

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

Sincerely,

Edwin T. Murchayashi
EIS Coordinator

cc: F.J. Rodrigues

Env. Com., Inc.

JAN 08 1987
Mr. Edwin T. Murabayashi
EIS Coordinator
Water Resources Research Center
University of Hawaii
Honolulu, Hawaii 96822

Dear Mr. Murabayashi:

We are in receipt of your comments dated January 7, 1987 on the proposed Wa'awa'a by ENS project. The comments have been provided to the applicant and the technical consultants and we respond as follows:

1. F. IV-1 para. B This sentence is documented in the agricultural impact section, Appendix A, "Impact on Agriculture of the proposed Wa'awa'a 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 lands: sugar cane production; pineapple production; crops, feed, and horticultural production; and livestock production. Livestock production, grazing, has the lowest returns of all 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 pesticide and fertilizer 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

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 user. 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 Wa'awa'a fields.

Pineapple greencrop was a by-product of pineapple production, thus, for it to be a viable activity, the value to users had only to cover the greencrop harvesting and hauling costs. Forage, on the other hand, would have to be sold at a 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. Rodrigues

FJRo
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 Waiala by Gentry, Waiala, 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 Waiala 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,

[Signature]

Chief, Engineering Division

JAN 07 1987
January 31, 1987

Mr. Kauk Cheung
Chief, Engineering Division
Department of the Army
U.S. Army Engineer District, Honolulu
Building 220
P.O. Box 1170
Honolulu, Hawaii 96850

Dear Mr. Cheung:

We are in receipt of your comments dated December 31, 1986 on the proposed
Waiawa by Century 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
Conservation 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

FJRtd

THE FORT STREET MAIL DEPT PHOENIX, ARIZONA 85034 TEL 602-335-7222 FAX 602-335-7515
DEPARTMENT OF THE NAVY

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

Dear Mr. Cleage:

DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE PROPOSED PACIFIC DEVELOPMENT, WAIKU, OAHU, SOUTH SHORE, HAWAII DECEMBER 1980

The subject draft EIS has been provided by the State of Hawaii Office of Environmental Quality Control. The U.S. Navy is submitting comments primarily on the question of water resources, originally raised in the Navy letter of June 20, 1980 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, 1980.

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 Waiau shaft, the author has failed to do so. For the Navy this is a significant omission. As the Waiau 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, 1980, the agricultural fields above our water tunnel comprise the major recharge area. Development (paved roads, houses) will 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 contaminants due to the application of pesticides and fertilizers by individual residents?

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

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 Hwy Diamond Head traffic lanes already suffer from bottlenecks 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 infrastructure 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, the developer did make brief reference to the capacity of the Honolulu 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.

Sincerely,

T. C. CRANE
Commander, U. S. Navy

Enclosures

Copy to: H. J. Rodriguez, President
Environmental Communications, Inc.
P.O. Box 62
Honolulu, HI 96809

JAN 08 1987
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 eligible 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 agricultural 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 storm. Thus, overall, the sediment load is calculated to decrease significantly when the proposed project is completed. Although, not unusually 1028 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. Dogan)

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 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 2000.

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 Brinkerhoff 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 Honolulu WTP 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. Rodrigues

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

Subject: Draft Environmental Impact Statement for Valley by Centry, dated December 1986

Dear Mr. Clegg:

We have examined the subject Environmental Impact Statement prepared by Environmental Communications, Inc., for the Centry Companies and have the following comments on the Statement.

The Statement should address the possible effects of the project on the salinity and quantities of the ground water in the area. Interest in this element of the environment is shown by two letters enclosed in the Statement that were sent to Environmental Communications, Inc., in response to an RIE 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 quality of water at the Valley 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 Valley 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...
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 19, 1986 on the proposed Waiau Ridge development. The comments were provided to the technical consultant on groundwater runoff and drainage, Gordon L. Douglass, 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 of 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 15 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 cultivation on Oahu was curtailed in 1977. EDB was also used for remote control in pineapple fields (its use was terminated for this practice in 1991), 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 a large aviation fuel spill from the nearby military fuel pipeline. The U.S. Environmental Protection Agency has established limits for drinking water for EDB and DBCP; however, the State Department of Health has set interim limits of 20 ppb for these chemicals, which are essentially at the detectable limit. The lowest in the nation. California for example, set standards of 50 ppb and 1000 ppb, respectively, for EDB and DBCP. The highest average concentrations of EDB and DBCP for the 10 Oahu wells, which had concentrations of >20 ppb and were closed, with one exception (which had an accidental spill of 491 gal. approximately 60 ft from the well head) were generally <100 ppb.

There have been numerous hydrologic studies conducted in Central Oahu in addition to water quality studies and monitoring. The Navy's Waiau shaft, a

Mr. Dan A. Davis
January 21, 1987
Page 2

stable 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. 81-607. However, this study involved using chlorides as a tracer (in irrigation water) applied in concentrations in the 5000 mg/l (ppm), a concentration measurement on several times higher than the ppb units used for EDB and DBCP. In addition, chloride is a "conservative" element, which makes it a long-term acceptable 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 adsorbed to the soil properties; thus, chlorides and volatile organic compounds are not comparable.

The State Health Department's concern over the potential for termiticides 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-volatile and unadsorbed chemical to the aquifer, since its applied to and around buildings. If the application of termiticides 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 volatilisation 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 ppb 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 Inc.
Mr. Ronald 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,

[Signature]

Ernest Kamaka
Project Leader
Office of Environmental Services

cc: Environmental Communications, Inc.

NO RESPONSE NEEDED

DEC 18 1986

Save Energy and You Serve America!
January 6, 1987

Mr. Donald A. Cleps
Chief Planning Officer
Department of General Planning
City and County of Honolulu
440 S. King Street
Honolulu, HI 96813

Dear Mr. Cleps:

Subject: Draft R18 - Waimea Development Plan Amendment (by Gentry)
Waimea, 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,

[Signature]

RICHARD M. DOMINO
State Conservationist

cc: F. J. Rodrigues, President
Environmental Communications, Inc.
P.O. Box 526
Honolulu, HI 96809

NO RESPONSE NEEDED

JAN 06 1987
December 26, 1986

TO: DONALD A. CLIEG, 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
MAIAMA DEVELOPMENT, TDS: 9-4-66; PSR. 10 and
7-4-84; PSR. 1

Thank you for the opportunity to review the Environmental Impact
Statement for the proposed Maiama development. We offer the
following comments:

1. A water master plan should be submitted for our review
and approval.

2. The Maiama 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
327-6130.

KAZU HAYASHIDA

cc: Mr. F.J. Rodrigues,
President

DEC 30 1985
January 21, 1987

Mr. Kean Hayashida
Manager and Chief Engineer
Board of Water Supply
630 South Beretania
Honolulu, Hawaii 96813

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. Rodrigues

FJR:ls

ENVIRONMENTAL COMMUNICATIONS INC.
January 9, 1987

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

Dear Mr. Rodrigues:

This is in response to your request for comments regarding the Waipahu Ridge Draft Environmental Impact Statement (EIS).

In reviewing the Draft EIS for Waipahu 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 Multi-Modal Transportation Plan, and DOT's legislative package should be considered in the Traffic Impact Study to see what effect these proposed improvements would have on the Waipahu Ridge project.

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

Sincerely,

Donald A. Cleary
Chief Planning Officer

JAN 09 1987
Mr. Donald C. Clegg
Chief Planning Officer
Department of General Planning
650 South King Street
Honolulu, Hawaii 96814

January 21, 1987

Dear Mr. Clegg:

We are in receipt of your comments dated January 9, 1987 on the proposed Waiau by City project. The comments have been provided to the applicant and the retained traffic engineering firm, Parsons Beitererhoff 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 transit lines in the project are expected to generate lower peak hour, peak direction traffic demands than a development consisting of all residential units, e.g., 1,600 vehicle trips are expected out of the proposed project to the evening peak hour, compared to 3,000 trips that a similar-sized, residential-only, development could produce.

The regional traffic impact 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 demand 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 Waiau and Waipahu Interchanges.

The SDOT is also proposing to develop a ride-sharing 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 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 Waiau project development could be considered speculative.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

F. J. Rodrigues

Mr. Donald A. Clegg
January 21, 1987
Page 2

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 not 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.
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 to 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 Mililani-Waikele community.

Thank you for the opportunity to provide these comments.

[Handwritten note]

Mr. F. J. Rodriguez
JAN 12 1967
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 Waikiki 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 leasing 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. Rodrigues

FJR inc.
HONOLULU FIRE DEPARTMENT
1455 S. Beretania Street, Room 210
Honolulu, Hawaii 96814
January 14, 1987

TO: DONALD A. BLOGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: FRANK K. KAOHOLUHANOJ, FIRE CHIEF

SUBJECT: EIS - WAIANA BY CENTER

We have reviewed the subject EIS and have no additional comments to those in
Section III of the EIS.
Should you have any questions, please contact Battalion Chief Kenneth Ward at
943-3635.

FRANK K. KAOHOLUHANOJ
Fire Chief

FAX/EMAIL

cc: Fred Rodriguez
Environental Communications, Inc.

NO RESPONSE NEEDED

JAN 14 1987
December 19, 1986

TO:  MR. DONALD A. CLINE, CHIEF PLANNING OFFICER
     DEPARTMENT OF GENERAL PLANNING

FROM:  HERBERT K. MURAKAMI
     DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: DRAFT EIS
         WAIANA DEVELOPMENT
         TRL: 8-4-84:PER. 13 AND 9-4-84:PER. 1

We have reviewed the draft EIS for the Waiana Development
and have no comments.

Thank you for the opportunity to review the draft EIS.

[Signature]
HERBERT K. MURAKAMI
Director and Building Superintendent

[Stamp]
Environmental Commis., Inc.

NO RESPONSE NEEDED

DEC 30 1986
MEMORANDUM

TO: DONALD A. CLAEG, CHIEF PLANNING OFFICER
   DEPARTMENT OF GENERAL PLANNING

FROM: JOHN E. HIRTE, DIRECTOR

SUBJECT: WAIMANALO DEVELOPMENT
   DRAFT ENVIRONMENTAL IMPACT STATEMENT

DATE: 9-4-86; FOR: 10
   9-4-86; PUR: J

This is in response to OHDG'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 10% 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;

Donald A. Cleag, Chief Planning Officer
January 9, 1987
Page 2

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 527-5607.

Received after deadline

[Signature]

Mr. Fred Rodriguez

Jan 16 1987
TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: TOM T. NIKOTA, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS)
WAIKAA DEVELOPMENT
TAX MAP KEY 9-4-06 AND 9-5-04

December 15, 1986

We have reviewed the Environmental Impact Statement for the proposed Waikaa Development and make the following comments and recommendation.

The recreational needs and mitigative proposals for the Waikaa Development have not been adequately addressed in the report. The concerns which we expressed in our review of the project's EIS preparation have not been taken into account. The number, type, size and location of public parks have not been 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 Tum of our Advance Planning Section at 527-6315.

TOM T. NIKOTA, Director

TN:el
Attach.

cc: Mr. F. J. Rodriguez, Environmental Communications, Inc.
The Gentry Companies
January 21, 1987

Mr. Hiram Kanaka, Director
Department of Parks and Recreation
456 South King Street
Honolulu, Hawaii 96813

Dear Mr. Kanaka:

We are in receipt of your comments dated December 15, 1986 on the proposed Waikiki 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 Master 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 Nosoda, Project Manager for Gentry Pacific, Ltd. He can be reached at 671-6481.

Thank you for your comments and continuing interest.

Very truly yours,

F. J. Rodrigues

FJRTA
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 WAIANA BY GENTRY
TRAX MAP KEY: R-4-06, POR. OF 10 AND T-6-01, POR. OF 11

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 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 mdp 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 (mpd) should always be less than the estimated demand for potable water (3.3 mdp, page VH-20).

December 22, 1986

Mr. Donald A. Clegg

December 22, 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 Honolulu sewerage district. Directing wastewater flows to the Waiapu sewer system will jeopardize the ultimate capacity of that system especially since all of Milliken Town-Waipio acres wastewater flows are currently being discharged into Waiapu WWTP. The entire wastewater flows should be directed to Pearl City WWTP 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 Honolulu WWTP was not discussed in the Draft EIS. The daily average wastewater flows in 1986 ranged from 19.56 to 18.67 mdp with an average of 18.30 mdp. Since all of the flows from Milliken-Waipio acres are now treated at the Honolulu WWTP, the daily average flows should be approaching 18 mdp at the present time. If the entire tributary areas of the 25-acres Milliken WWTP were sewerized and connected to the plant, the present average daily flows into the plant would exceed 23 mdp.

Sincerely yours,

RUSSELL L. SMITH, JR.
Director and Chief Engineer

Division of Engineering
Division of Wastewater Management

Environmental Communications, Inc. [Fred Rodriguez]
ENVIRONMENTAL
COMMUNICATIONS
INC.

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 23, 1986 on
the proposed Waikiki by Gentry project. The comments have been provided to
the applicant and the civil engineering consultant, Community Planning, Inc.
and we respond as follows:

3. Existing flooding problems at Waikiki 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 runoffdrainage attributable to the project, and will be designed
   to meet City standards.

4. 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.

5. 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.

6. The discrepancies in Table 1 have been revised to comply with Table 2
   and Figure 2. Thank you for calling this to our attention.

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

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJR/la
Attachment
January 7, 1987

**WATAN DEVELOPMENT**
**SUMMARY**
**WASTEWATER GENERATED**

<table>
<thead>
<tr>
<th>Category</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Residential</td>
<td>3210 homes x 80 gpd x 4 pph = 1,027,200 gpd = 1.027 MGD</td>
</tr>
<tr>
<td>Conventional Apartment</td>
<td>540 units x 80 gpd x 2.8 ppu = 120,960 gpd = 0.121 MGD</td>
</tr>
<tr>
<td>Retirement Residential</td>
<td>2600 homes x 80 gpd x 2.5 pph = 520,000 gpd = 0.520 MGD</td>
</tr>
<tr>
<td>Retirement Apartment</td>
<td>1550 units x 80 gpd x 2 ppu = 248,000 gpd = 0.248 MGD</td>
</tr>
<tr>
<td>Commercial/Industrial</td>
<td>110 Ac. x 10,000 Gad = 1,100,000 gpd = 1.100 MGD</td>
</tr>
<tr>
<td>Neighborhood Business</td>
<td>5 Ac. x 4,000 Gad = 20,000 gpd = 0.020 MGD</td>
</tr>
<tr>
<td>Elementary School</td>
<td>500 students x 25 gpcd = 12,500 gpd = 0.013 MGD = 3.049 MGD</td>
</tr>
</tbody>
</table>

**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)
TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING
FROM: DOUGLAS G. GIBBS, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT
SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE
PROPOSED WAIANA DEVELOPMENT, WAIANA, CENTRAL OAHU,
HAWAII

While a development as large as the proposed Waiana Development Project would result in increased calls for police service, and could 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 reassessment of the project's traffic demands to other access points was evaluated...reassessment indicated that major capacity constraints would occur at other locations."

Donald A. Clegg
December 17, 1986

"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 Waiana development, it would be desirable to have some indication of the downstream impact of the project on our highway system.

cc: Mr. F. J. Rodriguez

Douglas G. Gibbs
Chief of Police

DEC 2 1986
January 21, 1987

Chief Douglas G. Gibb
Police Department
City & County of Honolulu
1905 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 Waipio by Gentry project. The comments have been provided to the applicant and retained traffic planners, 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 are based on historical data or guidelines contained in land use plans. These studies indicate that increases in highway traffic demand 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 Waipio and Waialua Interchange.

Market studies have shown that additional residential units to Central Oahu are needed. Traffic increases can be affected whether or not this specific project is developed. The proposed mixed-use in the project are expected to generate lower peak hour, peak direction traffic demand 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 3,000 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 2003.

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...
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:

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-15 - 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 Mall/Dow project indicated possible violations of both State and Federal carbon monoxide standards. More recently, the PRF Application for the proposed Dole Kipapa Cannery (1984), also indicated possible violations of both federal and state carbon monoxide standards in the vicinity of Ka Uka Boulevard which appears to serve the Maloa 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 B). 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:

1. 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.

2. A superceded mobile emission factor model (MOBILE2) was used instead of the updated MOBILE3 model. This would contribute to low predictions.

Mr. Donald A. Clegg
January 7, 1987

The EPA persistence factor for estimating 8-hour CO levels (6.5) 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 idling vehicles proceeding slowly toward 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

JMM/act
L8702

cc: Mr. F. J. Rodriguez
DCDC
UH-Environmental Center
Mr. James W. Morrow
Environmental Communications Inc.
245 North Kukui Street
Honolulu, Hawaii 96817

January 21, 1987

Dear Mr. Morrow:

We are in receipt of your comments dated January 7, 1987 on the proposed Walsas 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 vehicle has air conditioning or the degree of effectiveness of whatever ventilation 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 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. Rodrigues

Mr. James W. Morrow
January 21, 1987
Page 2
January 6, 1987

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

Re: Proposed "Waiau by Gentry" project at Waiau,
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, "Waiau by Gentry" represents:

1. another unconstitutional assault on O'ahu's prime agricultural lands,
2. another challenge to the integrity of O'ahu'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 Waiau 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 P. Seto
Executive Director

cc: Mr. J. J. Rodriguez, President,
Environmental Communications, Inc.
January 21, 1987

Mrs. Muriel B. Seto
Executive Director
Hawaii's Thousand Friends
441 River Street, Suite 202
Hilo, Hawaii 96720

Dear Mrs. Seto:

We are in receipt of your group's comments dated January 6, 1987 on the proposed Walawa by Century 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 "leasing" on Oahu's prime agricultural lands. The subject lands have been leased by the State since 1963 and the landowner has entered into negotiations with the Gentry Companies to provide a Development Master Plan which can realize the revenue needed to support the Kaneamane Schools.

2. There is no intended damage to the integrity of Oahu's General and Development Plans since 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 by 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 Waiau 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 proportion 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 gains that result from the development of projects like Walawa 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 cannot seek relief or assistance from other sources but must bear the economic burden alone.

Very truly yours,

F. J. Rodrigues

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

January 6, 1987

Dear Mr. Clegg:

Subject: Environmental Impact Statement (EIS) for Waialua Development

We have reviewed the subject document and provide the following comments:

1. Paragraph VII 1.3 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 substations 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 Waialua and Waipio Substations. However, the installation date of the new substation with the first 46/12.47 KV, 12.5 MVA transformer unit will depend upon how quickly the area develops.

2. The above subject may be in close proximity of existing HECO 138 KV 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 17'-6" 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 number 549-7641.
   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 Wagner

Enclosures
cc: Mr. F. J. Rodrigues, President
Environmental Communications, Inc.
January 21, 1987

Dr. Brenner Hunger, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 1990
Hilo, Hawaii 96720

Dear Mr. Hunger:

We are in receipt of your comments dated January 4, 1987 on the proposed Waiawa Substation 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 subcontractor to Community Planning, Inc. At the appropriate time, contact will be made with HEC 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) precludes 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.1.1 as revised.

2. The HECO notes to be included as part of the final construction plans will also be provided to the electrical subcontractor for his reference at the appropriate time.

We have taken the liberty of updating the three maps together to indicate the location of HECI transmission lines on the Waiawa site since this is most germane to the final EIS. The actual maps as we have stated earlier, will be provided to Community Planning, Inc. for their future use.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJR 10
EVALUATION RESEARCH CONSULTANTS

Impact on Agriculture of the Proposed Waiawa Development

August 1, 1986

APPENDIX A
Impact on Agriculture of the Proposed Waianae Development

August 1, 1986

prepared by

Evaluation Research Consultants
626 19th Avenue
Honolulu, Hawaii 96816

for

Environmental Communications, Inc.

Impact on Agriculture of the Proposed Waianae Development

The proposed Waianae development involves two parcels totaling 1,747 acres located on the Leeward side of Oahu roughly between the H2 freeway and Pearl City/Pearl City Palisades. The lands are currently fallow, but previous to 1985, 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 assessing the potential uses of the land. These uses are determined by three sets of factors: (1) the physical, agronomic and environmental characteristics of the lands; (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 Nakayama, "The Agricultural Production Potential of the Lands in the Waianae 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 assessed 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 (between 11 and 20
percent) of the parcel. These lands are well suited for the production of
maize, pineapple, orchards, vegetables, and forex. The crop
capability classifications assigned by the Soil Conservation Service range
between 1 to III if the lands are irrigated. These ratings imply that the
parcels contain 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 94, with
approximately half of the site receiving a LE rating of 80 or higher (letter
from Jack T. Due, Chairman, Board of Agriculture to Fred Rodriguez).

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 Waialua
lands indicates that when irrigated the land has productive potential.
However, the production potential varies widely within the parcel. 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 assessed 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 Waialua are not scarce. Such lands are
found throughout the State. As of 1964, 266,000 acres in Hawaii were used
for crop production (including sugarcane and pineapple). This is 54,600
acres less than were used for crop production in 1964. 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 1968). 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)

<table>
<thead>
<tr>
<th>Year</th>
<th>Super-</th>
<th>Fine-</th>
<th>Other</th>
<th>All</th>
<th>Super-</th>
<th>Fine-</th>
<th>Other</th>
<th>All</th>
</tr>
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<td>Farms</td>
<td>Crops</td>
<td></td>
<td>Crops</td>
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<td>14.9</td>
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<td>14.5</td>
<td>314.8</td>
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<td>19.5</td>
<td>1.9</td>
<td>56.2</td>
</tr>
<tr>
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<td>1.9</td>
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<td>63.0</td>
<td>15.4</td>
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<td>15.0</td>
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<td>19.4</td>
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<td>15.7</td>
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<td>19.5</td>
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<td>1.8</td>
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<td>57.5</td>
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<td>15.5</td>
<td>2.9</td>
<td>51.9</td>
</tr>
<tr>
<td>1975</td>
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<td>26.7</td>
<td>296.1</td>
<td>34.3</td>
<td>15.5</td>
<td>3.2</td>
<td>53.0</td>
</tr>
<tr>
<td>1976</td>
<td>211.6</td>
<td>48.0</td>
<td>26.4</td>
<td>298.0</td>
<td>34.0</td>
<td>15.5</td>
<td>4.8</td>
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<tr>
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<td>25.0</td>
<td>292.3</td>
<td>35.2</td>
<td>15.0</td>
<td>3.5</td>
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<td>27.7</td>
<td>291.4</td>
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<td>15.0</td>
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<td>49.1</td>
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<tr>
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<td>216.8</td>
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<td>35.6</td>
<td>12.0</td>
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<tr>
<td>1980</td>
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<td>43.0</td>
<td>30.7</td>
<td>291.4</td>
<td>33.1</td>
<td>11.3</td>
<td>3.3</td>
<td>47.9</td>
</tr>
<tr>
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<td>41.0</td>
<td>33.2</td>
<td>290.3</td>
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<td>11.0</td>
<td>3.4</td>
<td>47.1</td>
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<tr>
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<td>36.0</td>
<td>30.8</td>
<td>278.8</td>
<td>28.2</td>
<td>11.2</td>
<td>3.6</td>
<td>43.3</td>
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<tr>
<td>1983</td>
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<td>36.0</td>
<td>41.2</td>
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<td>3.6</td>
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<tr>
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<td>26.4</td>
<td>11.8</td>
<td>3.4</td>
<td>41.6</td>
</tr>
</tbody>
</table>


Even after subtracting the past conversions of crop land to urban uses and the projected increases in agricultural land use on Oahu in the year 2015 based on the projections in the LEA conversion report, there are over 12,000 acres of land suitable for crop production not currently in production on Oahu (see Table 2). If more appropriate lands become fallow, this number will increase.

Potential Alternative Agricultural Uses

Based on the physical, economic, 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...
Table 2. Supply and Availability of Crop Lands

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>Oahu</th>
<th>Neighbor Islands</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>6,622</td>
<td>1,200</td>
<td>4,100</td>
</tr>
<tr>
<td>1999</td>
<td>6,622</td>
<td>1,200</td>
<td>4,100</td>
</tr>
<tr>
<td>2000</td>
<td>5,289</td>
<td>543</td>
<td>4,673</td>
</tr>
<tr>
<td>2005</td>
<td>25,796</td>
<td>643</td>
<td>19,531</td>
</tr>
<tr>
<td>2015</td>
<td>13,461</td>
<td>1,219</td>
<td>12,252</td>
</tr>
</tbody>
</table>

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, none of the crops that can be grown in the Waiau area could be grown elsewhere in the State more profitably.

Waiau 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 Waiau 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 in a few the Oahu Super 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 Waiau ditch passes through the property island of the proposed development. However, the ditch water is currently being used by Oahu Super Company and Castle and Cooke, Inc.

Most crops require about 3 acres feet of water per acre, although some, such as dairies and perennial crops, require more. Based on the estimated costs of delivering water to land 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 in the City and County of Honolulu. If water were purchased from the City and County under current agricultural rates, 3 acres feet would cost $1.125, 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 Hawaii**

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 Kea'au plains near Campbell Industrial Park and on several sugarcane lands in Kailua 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 market. In 1984, over 5 million pounds were produced on 125 acres, of which an estimated 2.5 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 11). 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 Dal Reloc 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 Kauai, 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 cut 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 re assess 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 Waimea 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 Waimea because they require cool temperatures for good quality and profitable yields. The following crops would be unsuitable for that reason: Chinese head cabbage, head broccoli, 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 winter squash and onions except for zucchini and watermelon.
The fruit and vegetable crops which show some potential for commercial production in the Waianae 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 (tyong), green or snap beans, semi-head lettuce, daikon, desksu, ginger root (edible), oriental squash, radishes, bitter melon, and cabbage (hai choy).

### TABLE 3

| Crop                  | Honolulu Direct Demanded (1,000 pounds) | Percent of Max. of Local Production by Local Markets | Number of Months When Local Products Exceed 70% of Market
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Avocado</td>
<td>1,684</td>
<td>97</td>
<td>77</td>
</tr>
<tr>
<td>Bassan Apple</td>
<td>630</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Bluefield</td>
<td>61</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Chinese</td>
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<td>25</td>
<td>63</td>
</tr>
<tr>
<td>Banana, Green</td>
<td>804</td>
<td>86</td>
<td>100</td>
</tr>
<tr>
<td>Bittermelon</td>
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<td>76</td>
<td>100</td>
</tr>
<tr>
<td>Broccoli</td>
<td>6,477</td>
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<td>16</td>
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<tr>
<td>Cabbage, Kai Choy</td>
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<td>100</td>
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<td>15</td>
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<td>13,256</td>
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<td>47</td>
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<td>Watermelons</td>
<td>5,346</td>
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**Crops for Local Markets**

| Crop                  | Honolulu Direct Demanded (1,000 pounds) | Percent of Max. of Local Production by Local Markets | Number of Months When Local Products Exceed 70% of Market
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<td>Ginger Root</td>
<td>1,348</td>
<td>80</td>
<td>100</td>
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<td>Pineapples</td>
<td>36,130</td>
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<td>100</td>
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<td>Papayas</td>
<td>10,579</td>
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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 pumpkins 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 column 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 harvested 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 raised 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 Hawaii 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 six 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

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<tr>
<th>Crop</th>
<th>Number of Acres Required to Meet 100 Percent of Market Demand</th>
<th>Number of Acres Reached Economically Possible</th>
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<tr>
<td>Avocados</td>
<td>116</td>
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<td>Banana, Chinese</td>
<td>242</td>
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<td>Broccoli</td>
<td>185</td>
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<td>Cucumbers</td>
<td>72</td>
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<td>Eggplant, Round</td>
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<tr>
<td>Leeks</td>
<td>48</td>
<td>43</td>
</tr>
<tr>
<td>Onions, Bulb</td>
<td>675</td>
<td>5</td>
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<tr>
<td>Onions, Green</td>
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<td>5</td>
</tr>
<tr>
<td>Pears, Chinese</td>
<td>22</td>
<td>17</td>
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<td>Peppers, Sweet</td>
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<td>8</td>
</tr>
<tr>
<td>Potatoes, Table</td>
<td>1,432</td>
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</tr>
<tr>
<td>Squash, Italian</td>
<td>26</td>
<td>10</td>
</tr>
<tr>
<td>Sweetpotatoes</td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td>Taro</td>
<td>63</td>
<td>10</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>187</td>
<td>20</td>
</tr>
<tr>
<td>Watermelons</td>
<td>106</td>
<td>106</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>766</strong></td>
<td><strong>368</strong></td>
</tr>
</tbody>
</table>

The potential acres for taro was reduced since the apparent market demand is for wetland and dryland types and only the dryland types are feasible on the Waimea lands. Currently, there is little or no potential for expanded avocado production. Supplies on the mainland have increased drastically 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 Waimea. Banana production in areas such as Kauai would require irrigation. Production costs would be substantially less in areas such as Molokai (Kohala) the Puu 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 Waimea is 368 acres.

Lands such as Waimea, 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 acres. 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 Waimea 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 feed. 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 crop 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 Waianae 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 Waianae 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 Waianae to make Waianae an optimal location for forage production.

**Livestock**

The lands in Waianae 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 Waianae 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 Waianae, any likely expansion in the beef industry is most likely to occur on the Island of Oahu.

**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 areas (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.
References


Detailed Land Classification - Island of Oahu, Land Study Bureau, University of Hawaii, January 1963.

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

YUKIO NAKAGAWA REPORT

The Agricultural Production Potential of Lands in the Waialua Revised Development Plan by Gentry, Island of Oahu

July 15, 1986

APPENDIX B
above the pun and moderate below. Runoff is slow and the erosion hazard is slight on the pun unit. The runoff is rapid and erosion hazard is severe on the Waioli unit. Runoff is slow and the erosion hazard is slight on the Mokuleia and Mokulena soils. Runoff is rapid and erosion hazard is severe on the Waioli unit.

Soil of the Helgas series is found on the site in the Puu Pokake gulch and a lower gulch to the northeast as Helmaso silty clay, 20 to 40 percent slope (H1MB). 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 a subangular blocky structure. The soil is neutral in the surface layer and neutral to slightly acid in the subsoil. Permeability is moderate to rapid. Runoff in medium to very rapid and the erosion hazard is severe to very severe.

Soil of the Kanahapui series is also found on the eastern boundary as Kanahapui sandy clay loam, 2 to 6 percent slope (K1MB). The surface layer of this soil is dark-brown clay loam with enough stones to hinder cultivation. The next layer is 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 (SR) 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 soil (F1) is found on the site adjacent to the western side of the gulch. This land type consists mostly of areas filled with basaltic and alluvium from upland areas. A few areas are filled with material from dredging and from soil excavations. Generally, these materials are dumped and spread over margins, low-lying areas along the coastal flat, coral reef, 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 are possible only with the availability of low-cost irrigation water. The selection of the best adapted crop enterprise to fit the climatic and soil conditions, the satisfactory marketability of crops produced and with adequate management skills to successfully operate the enterprise.

Livestock production enterprises except for dairy and beef animal pasture use is not advisable because of the manure odor and nemoral problems which are not compatible with the residential developments in the north and southeast of the site.

Alternate agronomic crop uses on this site are the production of papayas, bananas, guava, orchids and other ornamental plants, flowers and ornamental plants.

The nearly level lands designated prime agricultural lands with slopes of 0 to 10 percent are suitable for the cultivation of selected vegetables, fruits, forage, ornamentals and greenhouse (floral and nursery) crops. The liberal use of fertilizers and other soil amendments and the correct use of pesticides 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
exposure hazard but should be suitable for contour planted perennial
floral and ornamental crops such as Red Ginger, Bird of Paradise, Heliconia,
Flowering and other orchard type crops such as Limes, Macadamia Nuts, Guava,
Banana, Passion Fruit, Mangoes, Litchi and Avocado. With the recent approval
by the Federal government of the use of irradiation to control fruit and
seedborne pests the export potential of Hawaiian grown fruits and some vegetables
may become a reality in the near future.

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| Feb.  | 3.8    | 3.7       | 6.4        | 8.8         | 6.1         | 3.9         | 5.5                  |
| Mar.  | 4.0    | 3.9       | 7.9        | 10.0        | 6.7         | 4.9         | 6.4                  |
| April | 3.7    | 3.8       | 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  | 3.7    | 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. | 3.8    | 2.5       | 6.5        | 8.2         | 5.2         | 2.6         | 4.6                  |
| Oct.  | 2.3    | 2.4       | 4.6        | 7.0         | 3.9         | 3.0         | 3.7                  |

12H-4000A 6h 40Km 12H 12H-40Km 4h-12Km 4h-12Km 24hr 24hr Average

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Cultivation of vegetable crops should be restricted to land of 0 to 10 percent slopes, except for uncertified vise 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 induce 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 statistics yield per acre and farm price figures 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, uncertified culture 8 to 15 percent slopes.)
   - Optimum pH range: 5.5 to 6.8
   - Cultivars: Burgers hybrid, Progress, Sweet Slice and others.
   - Long fruited oriental types not suitable for uncertified culture because of deformed fruit formation.
   - Water requirement: 18 acre inches (406,000 gals.) 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 = $34,044/lb. = $4,642,32

2. **ECOPLANT**
   - Optimum pH range: 5.5 to 6.8
   - Cultivars: Malamalo 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 = $50.14/lb. long types = $10,647.55
   - Estimated gross return/acre/crop = $40.04/lb. round and oblong types = $10,696.00.

3. **GREEN PEPPERS**
   - Optimum pH range: 5.5 to 6.8
   - Cultivars: Keystones 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 crops/acre/year = 2
   - Average yield/acre/crop: 14,500 lbs.
   - Estimated gross return/acre/crop = $23.27/lb. = $327,714.00

4. **TOMATO**
   - Optimum pH range: 5.5 to 6.8
   - Cultivars: Hybrid M-101, M-52 under pruned and staked culture; open pollinated H8218 unpruned and unstaked culture.
   - Water requirement: 30 acre inches (815,000 gals.) per crop.
5. LETTUCE (head types only)

Optimum pH range: 6.0 to 6.8
Cultivars: Romance, Green Renaissance, from October through April
Water requirement: 20 to 40 feet per acre
Average length of crop: 55 to 65 days
Possible number of crops/acre/year: 6 for Romance; 3 for Ainstein
Average yield/acre-crop: 14,700 lbs
Estimated gross return/acre-crop: $33,207.50

6. SWEET POTATOES

Optimum pH range: 5.5 to 6.8
Cultivars: Baby, infant, omaha, centennial
Water requirement: 30 to 40 feet per acre
Average length of crop: 120 days
Possible number of crops/acre/year: 2
Average yield/acre-crop: 11,300 lbs
Estimated gross return/acre-crop: $13,462.20

7. SWEET CORN (green market)

Optimum pH range: 5.5 to 6.8
Cultivars: Hawaiian Superwheat No. 10 hybrid and Pioneerwheat No. 9 hybrid (not adapted to machine harvesting)
Water requirement: 20 to 40 feet per acre
Average length of crop: 60 to 100 days
Possible number of crops/acre/year: 3
Average yield/acre-crop: 1,420 lbs
Estimated gross return/acre-crop: $1,077.20

8. GREEN OR SNAP BEANS

Optimum pH range: 5.5 to 6.8
Cultivars: Pole types: Kansas Wonder or Hawaiian Wonder
Bush types: Green Crop
Water requirement: 20 to 40 feet per acre
Average length of crop: 80 to 120 days for pole types; 75 to 90 days for bush types
Average yield/acre-crop: Pole types: 9,830 lbs; bush types: 7,060 lbs
Estimated gross return/acre-crop: $14,367.30 for Pole types; $9,251.90 for bush types

9. GREEN ONIONS

Optimum pH range: 6.0 to 6.8
Cultivars: Mexican bunching types propagated by seeds
Water requirement: 20 to 40 feet per acre
Average length of crop: 60 to 90 days
Possible number of crops/acre/year: 3
Average yield/acre-crop: 2,600 lbs
Estimated gross return/acre-crop: $42.14/100 lbs

10. DAISY

Optimum pH range: 5.5 to 6.8
Cultivars: Chinese Half-Long and Evergreen hybrid
Water requirement: 20 to 40 feet per acre
Average length of crop: 3 to 4 months
Possible number of crops/acre/year: 10
Average yield/acre-crop: 2,000 lbs
Estimated gross return/acre-crop: $21.27/100 lbs

11. EDIBLE GINGER ROOT

Optimum pH range: 5.5 to 6.8
Cultivars: Chinese ginger
Water requirement: 50 to 60 feet per acre
Average length of crop: 12 to 16 months
Possible number of crops/acre/year: 1
Average yield/acre-crop: 28,140 lbs
Estimated gross return/acre-crop: $69.27/100 lbs

12. BEAN BEANS

Optimum pH range: 5.5 to 6.8
Cultivars: Early Scarlet Globe, Cherry Belle, and others
Water requirement: 12 to 16 feet per acre
Average length of crop: 25 to 30 days
Possible number of crops/acre/year: 12
Average yield/acre-crop: 10,400 lbs
Estimated gross return/acre-crop: $53.44/100 lbs

13. BASKETS
14. TAPI (Upland or non-paddy culture)

Optimum pH range: 5.5 to 6.8  
 Cultivars: Lahua, Piko Kao, Piko Sure, and Piko Ulili.  
 Water requirement: 60 acre inches (480,000 gals.) per crop.  
 Average length of crop = 12 to 14 months.  
 Possible number of crops/acre/year = 1/4 to 1 crop.  
 Average yield/acre/crop = 10,900 lbs.  
 Estimated gross return/acre/crop $22,421/lb. = $2,457.28

15. EDIBLE INDED PEAS (Chinese Peas)  
 Trellises required,

Optimum pH range: 5.0 to 6.8  
 Cultivars: Hana Rangi (broadly mild resistant)  
 Water requirement: 20 acre inches (150,000 gals.) per crop.  
 Average length of crop = 100 to 120 days.  
 Possible number of crops/acre/year = 3 crops.  
 Average yield/acre/crop = 5,020 lbs.  
 Estimated gross return/acre/crop $51.97/lb. = $2,596.20

16. ORIENTAL SQUASH (controlled culture)

Optimum pH range: 5.5 to 6.8  
 Cultivars: White flowered gourd – Yangon (club shaped fruit);  
 Wax gourd (Trygan) – Chinese, Burmese and others.  
 Water requirement: 30 acre inches (225,000 gals.) per crop.  
 Average length of crop = 150 to 180 days.  
 Possible number of crops/acre/year = 2 crops.  
 Average yield/acre/crop = 13,960 lbs.  
 Estimated gross return/acre/crop $90.34/lb. = $1,293.48

17. BITTER MELON (trellised culture)

Optimum pH range: 5.5 to 6.8  
 Cultivars: Medium and long fruited types.  
 Water requirement: 30 acre inches (225,000 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 $62.66/lb. = $8,997.00

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, Telusubito and other Japanese hybrids.

Water requirement: 30 acre inches (225,000 gals.) per crop.  
 Average length of crop = 160 to 180 days.  
 Possible number of crops/acre/year = 2 crops.  
 Average yield/acre/crop = 13,250 lbs.  
 Estimated gross return/acre/crop $22.74/lb. = $3,039.94

19. SQUASH

Optimum pH range: 5.5 to 6.8  
 Cultivars: Black Buri and other zucchini type hybrids.  
 Water requirement: 15 acre inches (112,500 gals.) per crop.  
 Average length of crop = 100 days.  
 Possible number of crops/acre/year = 3 crops.  
 Average yield/acre/crop = 11,500 lbs.  
 Estimated gross return/acre/crop $53.14/lb. = $611.64

20. WATERMELON

Optimum pH range: 5.5 to 6.8  
 Cultivars: Crimson Sweet, Glorious Hybrid and others.  
 Water requirement: 30 acre inches (225,000 gals.) per crop.  
 Average length of crop = 150 days.  
 Possible number of crops/acre/year = 2 crops but market demand and price favors 1 crops/year. Highest prices obtained for fruits harvested in March to April.  
 Average yield/acre/crop = 19,500 lbs.  
 Estimated gross return/acre/crop $90.84/lb. = $1,786.80

21. GOURDS

Optimum pH range: 6.0 to 6.8  
 Cultivars: Yellow Gourds Hybrid, Early Texas Gourds $527, Sweet 906, and Mini Gourd (pungent type).  
 Water requirement: 30 acre inches (225,000 gals.) per crop.  
 Average length of crop = 160 days (need to harvest).  
 Possible number of crops/acre/year = 1 crop from September through February.  
 Average yield/acre/crop = 13,450 lbs.  
 Estimated gross return/acre/crop $51.14/lb. = $684.32

22. POTATOES

Optimum pH range: 5.0 to 6.8  
 Cultivars: Kennebec, Red Pontiac, skin Triumph.  
 Water requirement: 30 acre inches (225,000 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 $89.88/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 strain
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 $31.06/lb. = $3,433.60

24. BROCCOLI
Optimum pH range = 6.0 to 6.8
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 = 10,600 lbs.
Estimated gross return/acre/crop $39.46/lb. = $3,560.37

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.

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 Cabbages, 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.
COMMERCIAL PRODUCTION OF THE FOLLOWING FRUIT CROPS: 1. PAPAYA - 3 years crop cycle (field planting to end of harvest)

- **Optimum pH range**: 5.5 to 6.5
- **Cultivars**: West Indian X 77, Sunrise, and others adapted to the area.
- **Water requirement**: 60 acre inches (1,620,000 gallons) per year for 3 years.
- **Average length of crop**: 3 years.
- **Possible number of crops/acre/year**: 1/3
- **Average crop yield per crop**: 3 years = 45,000 lbs.
- **Estimated gross return/acre/crop**: $84.76/lb. = $17,003.00
- **Estimated gross return/acre/year**: $5,667.67

2. MANGOS

- **Optimum pH range**: 5.0 to 6.5
- **Cultivars**: Williams hybrid, Valley, Taiwan and Brazilian
- **Water requirement**: 60 acre inches/year (1,620,000 gallons)
- **Length of crop**: 10 years.
- **Possible number of crops/acre/year**: 2/10
- **Average yield/acre/crop**: 10 years = 42,660 lbs.
- **Estimated gross return/acre/crop**: 10 years = $14,931.00
- **Estimated gross return/acre/year**: 10 years = $14,931.00

3. GUAVA (For processing)

- **Optimum pH range**: 5.5 to 7.0
- **Cultivars**: B-30 or others with good processing qualities
- **Water requirement**: 60 acre inches/year (1,620,000 gallons) per year.
- **Length of crop**: 25 to 30 years with proper pruning and other cultural practices.
- **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 12 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: $10.00/lb.
- $10.00/lb. * 5,000 lbs. = $50,000.00 first harvest at 3 years.
- $20,000.00 second harvest at 4 years.
- $30,000.00 third harvest after 5 years.
- Yearly return 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 growing vines for good fruit production but the cost of construction of an adequate trellis system is too high for profitable return for this crop. The planting and use of the fast growing Houla is recommended for shortening the growing period. This tree can be treated as a low cost trellis system.

- **Optimum pH range**: 5.5 to 6.5
- **Cultivars**: Yellow Passion Fruit (Passiflora walkeri, cv. Flavicarpa)
- **Water requirement**: 60 acre inches/year (1,620,000 gallons)
- **Length of crop**: 4 to 5 years with proper pruning and other cultural practices.
- **Possible number of crops/acre**: 1 every 5 years.
- **Estimated gross return/acre/year**: $2,924.00 (first year) $2,924.00 (second year)

5. LIMES (Green fleshed varieties only)

- **Optimum pH range**: 5.5 to 6.0
- **Cultivars**: Mexican, Florida Seedless, Hawaiian and others.
- **Water requirement**: 60 acre inches/year (1,620,000 gallons)
- **Possible number of crops/acre**: 1 planting every 15 years.
- **Spacing between trees**: 15 x 15 ft. (15) per acre.
- **Average estimated yield and gross return/acre**: First harvest in third year after field planting of grafted plants 12 to 18 months old.
6. AVOCADO

This crop should be adapted to the soil and climatic condition of this area if grown under irrigation. Cultivars with low and spreading type of growth habit will be easier to harvest. Tick will require more area per tree than reducing the tree population and yield per acre.

Optimum pH range: 5.0 to 7.0

Cultivars: Hass (91-11), Pachy (3-7), Kalamu (11-11),
   Hassul (12-7), Brevil (3-5), Moorish (6-1), Pufete (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
Possble 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. $35/lb. = $36,750/acre.
   Second harvest at 6 years - 50 lbs./tree x 35 trees = 1,750 lbs. $12/lb. = $21,000/acre.
   Third harvest at 7 years - 75 lbs./tree x 35 trees = 2,625 lbs. $25/lb. = $65,625/acre.
   Fourth harvest at 8 years - 150 lbs./tree x 35 trees = 5,250 lbs. $12/lb. = $63,000/acre.
   Fifth harvest at 9 years - 250 lbs./tree x 35 trees = 7,000 lbs. $12/lb. = $84,000/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
in order to obtain average rainfall of 42.0 inches per year in the lower 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 supple-
mental 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 soils 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.
THE CLIMATE, SOIL, AND THE CLOSE LOCATION OF THIS Area TO THE Honolulu market make this area ideal for the production of certain floral and ornamental crops.

1. ANTHURIUMS for cut flowers

Grown under 75% eave 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 (4,620,000 gals.) per acre.
- Developing cost of one acre, 75% shade, eave shade-cloth house:
  - $42,000.00
  - 5 year average yield: 54,316 dozen flowers.
  - Estimated 1st year: $13,000.00
  - Estimated gross return/year: $29,000.00
  - Estimated net return/year: 15,000.00

Estimated net return/acre/year: $4,062.45


In 1984, Oahu produced and marketed 200,000 dozen bunches of cut anthurium flowers valued at $276,000.00 out of a state total of 2,135,000 dozen bunches valued at $7,351,000.00 produced mostly on the Island of Hawaii.

2. DENDROBIUM ORCHID for cut flower production under 30% eave shade-cloth house.

Cultivars: Lutes E:. E. B. L. and Jacqueline Thomas; Unilevel Bliss, Unilevel Supreme, and Unilevel Pearl.
- Water requirement: 60 acre inches/year (1,620,000 gals.) per acre.
- Capital investment for one acre: $127,000.00.
- Yield: 1,000 sq. ft.

Estimated average yield/acre/year: 211,614 floral spikes
122,192.9 dozen.
- Estimated gross return/acre/year: $32,500.00
- Estimated net return/acre/year: $29,500.00

Estimated net return/acre/year: $15,576.40
Estimated net return/acre/year: $15,000.00
- Estimated net return/acre/year: $15,000.00

**NOTE:** Yield and cost figures adapted from "The Economics of Growing Dendrobium on Oahu for Mainland Export," by R.C. Camp, I.I. and P.F. Philipp, Department Paper 37, HES - 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 12,500,000 flowers for lei valued at $314,000.00. The Oahu farms marketed 152,000 dozen sprays valued at $1,000,000.00 and 6,500,000 flower heads valued at $190,000.00.

3. PLUMERIA for lei flowers

The soil and climate in this area are suitable for this purpose. Cultivars which produce blossoms with thick and rigid petals such as the common yellow, gold, and red flowers should be planted on the contour at a spacing of 25 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 the data per tree and per acre are not available. According to the "Statistics of Hawaii Agriculture 1984", there were 17 plumaria farms in the state that produced 25,400,000 flowers valued at $684,000.00. The Oahu production was 9,400,000 flowers valued at $154,000.00.

4. CHRYSANTHEMUM cut flower production of pansy types.

This crop can be 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 325,000 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 growth = 6.5 to 7.0
Cultivars: Common pink, university pink, Senia (red), White Elegance, WGA towel (white with red stripes) and Elegance.

Water requirement = 40 acre-inches/year (1,086,166 gals.)
Average length of crop = 18 months
Possible number of crops/acre/year = 1 crop every 2 years
Average yield/acres/crop = 45,000 plants/acre = 1.054,275 flowers/acre
Estimated gross return/acre/crop $2.58/flower = $117,265.00
Estimated gross return/acre/year $2.58/flower = $117,703.13

In 1984, twenty farms statewide produced and marketed 37,600,000 flowers valued at $1,112,000.00. The island of Maui produced 37,600,000 flowers valued at $1,090,000.00. Hawaii, Kauai and Oahu produced 1,900,000 flowers valued at $47,000.00.

6. Other lei flower production suitable in this area:

a. **PITAKE** - 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 210,000 strands of lei valued at $160,000.00.

b. **TURNEROE** - 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 29,000,000 flowers valued at $770,000.00 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. **KYPA JUQUAQ** - 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 128,750 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 $1.25/flower = $250,000.00.
Estimated cost of planting material $0.75/turf = $196,150 x 0.25 = $24,137.50.
One planting every 5 - 6 years.

In 1984, twenty eight farms produced and marketed 20,000,000 flowers statewide at a wholesale value of $1,095,000.00.

The island of Maui 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 3,000 dozen of flowers at a wholesale value of $186,000.00.

Yield per acre and other production data are not available for this crop.

b. **RED GINGER** as cut flowers were produced on 60 farms statewide with 250,000 dozen of flowers marketed at wholesale value of $237,000.00. The farms on Oahu produced and marketed 50,000 dozen at a value of $176,000.00.

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. Windbreak plantings of suitable trees and shrubs should be planted for protection against strong winds.

Potted plants of the following crops could be raised:

a. **CHRYSANTHEMUM** of the small flowered varieties that respond to light and dwarfing chemicals can be grown. The "Hawaii Statistics"
of Hawaiian Agriculture lists 10 farms statewide produced and marketed 270,000 pots of flowers valued at $957,000.00 wholesale. A few farms on Oahu produced and marketed 81,000 pots of flowers valued at $285,000.00.

Cost of production data are not available for this crop.

b. **Orchids** of the Vanila, 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, eight top dendrobium orchid nurseries statewide produced and marketed 206,000 pots valued at $784,000.00. Seventy one orchid nurseries statewide produced and marketed 375,000 pots of other orchids (excluding dendrobium types) at a wholesale value of $5,838,000.00. The orchid nurseries on Oahu produced and marketed 473,000 pots of orchid of all types valued at $1,638,000.00.

Cost of production data are not available for these crops.

c. **Foliage plants** such as Ficus, dracaenaceae, schefflera, sindrensis, philodendron, monstera, calathea, begonia, maranta, syngonium, colored Ti, dracaena, 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 $4,105,000.00 worth of these potted plants. The Oahu plant nurseries produced and marketed $9,000,000.00 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.

**NOTES:** * 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 landscape 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 controlled plantings to minimize soil erosion problems. Adequate, low cost irrigation water must be available even for this purpose.
Gold tree (Pachypodium densiflorum), Jusmissa (Jusmissa acutifolia) R. and B., Fern tree (Illicium decipiens) Nisop.,
Coconut palm (Cocos nucifera L.), Narthex palm (Physochlaina narthex) (Wendl.) Bateman, Wag new palm (Valetia merillii) (Beech.) H.E. Moore, Royal palm (Roystonia regia) (Linden) Cook.
Areca palm (Chrysalidocarpus lutescens) (Kerri) N. H. M. Bentham, Bottle palm (Mauritia flexuosa) Bailey, Blue fan palm (Licuala homiguella Mart.), Chinese fan palm (Livistownia chinensis) (Jacq.) K. Br., and Bamboo palm (Raphia excelsa) (Thunb.) Henry.

In 1984, forty two plant nurseries statewide produced and marketed $195,000.00 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 $336,600.00 worth of landscaping trees and shrubs.

**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 Oahu, Kauai and Maui.

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 $5,454,76 per acre for the 840 acres used for seed corn operations.

- 30 -
GREEN CROP PRODUCTION

The production of green chop and sorghum under irrigation is possible 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 Wai'anae 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" show that 8,993 acres were used to produce 20,900 tons of pineapple, corn, and sorghum rye. The feed value was valued at $12,000.00.

1. CORN for green chop rye
   Optimum pH range = 6.5 to 8.8
   Cultivars: Any forage type adapted to Hawaiian growing conditions.
   Water requirement: 18 acre-inches (486,000 gallons) per acre.
   Average length of crop: 90 to 120 days.
   Possible number of crops/acre/year: 3
   Estimated yield/acre/crop: 30 tons green chop
   Estimated gross return/acre/crop: $90.00/ton * 30 tons = $2,700.00
   Estimated gross return/acre/year: 3 * $2,700.00 = $8,100.00

2. SORGHUM for green chop rye
   Optimum pH range = 5.5 to 8.8
   Cultivars: Any forage type adapted to Hawaiian growing conditions.
   Water requirement: 18 acre-inches (486,000 gallons) per acre.
   Average length of crop: 90 to 120 days.
   Possible number of crops/acre/year: 3 (plant crop and 2 rations)
   Estimated yield/acre/crop: 25 tons for plant crop and 20 tons for each ration.
   Estimated gross return/acre/year: $30.00/ton and 65 tons = $1,950.00.

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 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 fertilised grass-legume (Sudan and Mocle Roa) 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 Wai'anae could be raised under this system at a monthly per head charge of $12.00 to $24.00.
The following trees and shrubs should be adapted to the area in question for windbreak plantings:

1. DISSERTA IRONWOOD (Pistacia chinensis 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 Waianaelo Agricultural Experimental Farm, University of Hawaii.

2. JAVA PLUM (Eugenia cumini Lax.)
   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 heterophylla (Lam.) R. Br.)
   A relatively fast growing tree with a good regrowth habit. This tree is very resistant to salt spray and adapted to a wide range of soil and climatic conditions from sea level 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 (Casuarina equisetfolia L.)
   A rapid growing tree which can attain heights of 100 ft. in 10 years. This tree grow well in all types of soil and even tolerates brackish and alkali soils. It also tolerates salt spray and is quite 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. SULLY CONE IRONWOOD (Casuarina cunninghamiana L.)
   A fast growing tree reaching 70 to 90 ft. in height and very wind resistant. It is quite similar to the short-leaf ironwood but with shorter and flatter 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. FOR Small (Ficus acuminata (Haw.) de V.)
   A hardy, fast growing, drought tolerant lemuroid 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 X and other species are recommended over the common wild types. Propagation is by scarified seeds. A windbreak planting of for noko can be seen at the Waianae Agricultural Experimental Station.

7. RED HIBISCUS (Hibiscus rosa-sinensis (L.) Hook f. × Hibiscus campbellii Knowles and Weir)
   These Hibiscus are adapted to wide range of soil and climatic conditions, with some species tolerant to high winds at 3,000 ft. elevation. These plants are fast growing, reaching heights of 15 to 20 ft. Propagated by cuttings. Recommended spacing between plants is 3 ft. apart and staggered in double row plantings.

8. PAPER (Phyllopecus quinquefoliata Merr.)
   This is one of the best plants to use as a space saving windbreak hedge. The plant is relatively fast growing and has a wide range of adaptability. The plant can be pruned and trained to any desired height up to 15 ft. The conical stems growing from the original stem cutover form a dense hedge often 10 feet deep and 15 ft. wide. In training the plants to serve as a wind barrier, the long stems are cut at various heights above ground. New stems 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. ESCAPE SAGE (Echinops affinis W.)
   The paper sedge is fast growing and well adapted to a wide range of soil and climatic conditions up to about 1,000 ft. elevation. The plants grow in clumps and attain a height of 8 to 10 ft. This
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<thead>
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<td>Wahiawa silty clay, 3 to 8 percent slopes</td>
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<td>WaC</td>
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plant makes a good outside-row or in-field windbreak planting. Propagation is by cuttings. Spacing recommended is 2 - 3 ft. between plants in a single row.

10. BLUE VITEX (Vitex trifolia L. var. variansata Mold.)

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 Shrub for Windbreaks in Hawaii" by C.T. Stigungs and Wade W. McCall, Cooperative Extension Service Circular 495, College of Tropical Agriculture, University of Hawaii, February 1979.
REFERENCES

YUNIO NAMAGANA

SUMMARY

Education and Degrees:
University of Hawaii, B.S. in Agriculture, 1940
University of Hawaii, M.S. 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 20 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.

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
Portauila, New Hebrides for EWC and South Pacific Commission.

May 1969
Guam, Salina, Tinian, and Rota for the Guam Department of Agriculture and the Trust Territory Department of Agriculture.

January - March 1971
Chiangmai University Multiple cropping project for Food Foundation.

July 1971
Mukah, Sarawak 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

In-State Activities
1955 to 1960

Director of Kauai Agricultural Company, grower and processor of nona, passion fruit, bananas and papayas.
January 1978
Agricultural Potential of Waikane Land, Oahu.

July - August
Instructor in 6 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 Waimea Agri-
cultural Park.

November 1981
The Agricultural Production Potential of Lands in the Enewalii, Kapalii, and Luluku areas of Kaneohe.

July 1982
The Agricultural Production Potential of Lands in the Waiahole area (Marks Estates).

March 1984
The Agricultural Production Potential of the Lands at the Waieahe Project Site, Island of Oahu.

April 1985
The Agricultural Production Potential of Lands in the Kohala Estates Development Phase II Project (Expanded)

Public Service in Agriculture
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
Waiau Development Project
Southern Oahu, Hawaii

Revised February 1986

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ENVIRONMENTAL ASPECTS OF STORM WATER RUNOFF
Waimea Development Project
Southern Oahu, Hawaii

Revised
February 1986

by
GORDON L. DUGAR
Environmental Consultant
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February 1, 1986

MEMORANDUM:

TO:  F. J. Rodrigues, President
     Environmental Communications, Inc.

FROM:  Gordon L. Dugan, M.D.


Enclosed herewith is the report outlining the environmental aspects of storm water runoff for the proposed Waiau 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 Waipahu Development Project, located in southern Oahu, as shown in Figure 1, is situated in the 26.4 sq. mi. Waipahu watershed, which extends from the Middle Loch of Pearl Harbor to the crest of the Ko'olau 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 Waipahu Stream before it flows under Kamehameha Highway and into the Middle Loch of Pearl Harbor.

A USGS stream gaging station (414216000) located on Waipahu Stream near the intersection of Farrington and Kamehameha Highways has been in operation since June 1952. Waipahu 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 approximately 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 Hauula 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: "2000 Plan, Board of Water Supply, City and County of Honolulu, pg 13, 1971"
TABLE 1

Land Use Designation for the Proposed Waiaua
Development Project, Southern Oahu, Hawaii

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Total Area</th>
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<tbody>
<tr>
<td>Residential</td>
<td>782</td>
</tr>
<tr>
<td>Apartments-Low density</td>
<td>75</td>
</tr>
<tr>
<td>Commercial/Industrial</td>
<td>115</td>
</tr>
<tr>
<td>Golf Courses</td>
<td>225</td>
</tr>
<tr>
<td>Major Arterial Roadway</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1167</strong></td>
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</tbody>
</table>

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 area was being cultivated for sugarcane by Aha 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 cultivating (generally too steep) being characterized by ridges and gullies with vegetation consisting primarily of scrub growth and koa hesse. A portion of the gullies 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 facilities; 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 Waiaua watershed are located within the project boundaries, although the lower one, Lualualei-Fill Land-Bea Association, is only included in a small portion of the project. In general, the lower half of the project is characterized by the Nelimana-Waiaua Association while the approximate upper half is known as the Rough Mountains Land-Rapa Association. All three associations are known as being "well-drained" soils (Fonte et al., 1972). The individual soil series within the project and their relationship to stormwater 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 affect on subsequent receiving waters (Waiau 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 Waiau Development Project as it relates to surface water runoff. From and assembled base of 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.

METODOLOGY

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 storms, 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 utilised to determine representative storm water volumes under varying conditions (Lopes, 1974; Lopes and Dogan, 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 (Potts et al., 1975) 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 RESL method utilized information published by Miller and
Vitousek (1973).

Once the increase in surface water runoff volume had been established,
it was necessary to determine the runoff quality for pre- and post-develop-
ment conditions.

The quality parameters for stormwater runoff considered the most repre-
sentative to identify potential changes under different land management
practices (i.e., pre- and post-development conditions) were total nitrogen;
total phosphorus; and suspended solids (sediment).

The U.S. Geological Survey (USGS) in conjunction with its national
stream flow gauging program periodically collects and analyzes samples from
selected streams; Waiau Stream, of which has been included (USGS, 1969-1985).
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 Waiau Watershed, for comparative
purposes, nitrogen and phosphorus values of 5.0 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 concen-
tration values for the Waiau 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 Waiau
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 Waiau 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
Waiau 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,
Fujiiwara (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
sicker situations from the continental U.S.

For the present study, the results of the Honolulu residential area for
<table>
<thead>
<tr>
<th>Table 2: Representative Storm Water Quality Data for Honolulu (Fujisawa, 1973)</th>
</tr>
</thead>
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<tr>
<td><strong>Residential</strong></td>
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<tr>
<td>Total solids</td>
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<td>Suspended Solids</td>
</tr>
<tr>
<td>COD</td>
</tr>
<tr>
<td>BOD</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
</tr>
<tr>
<td>NO&lt;sub&gt;3&lt;/sub&gt;N</td>
</tr>
<tr>
<td>TKN</td>
</tr>
<tr>
<td>Total P</td>
</tr>
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<td>Organic P</td>
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<td>Grease</td>
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<tr>
<td>Total Coliform</td>
</tr>
<tr>
<td>Fecal Coliform</td>
</tr>
<tr>
<td>Fecal Strept</td>
</tr>
</tbody>
</table>

* All units in mg/l except total coliform, fecal coliform and fecal strept which are listed as No./100 ml.
* Stormwater samples collected on Asapu Street near Mahelewi Stream.
* Stormwater samples collected on Bovertown Street between Mahelewi and River 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 0.37, 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 undoubtedly 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, (Fujisawa, 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 storm water 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 basins 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, 1.11, 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 (1983) 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 stormwater runoff and constituent changes due to the proposed Waiau 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 projected project. No attempt was made to compare these changes with contributions from the entire 35,4 sq. mi. Waiau watershed area which would significantly negate 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 "filli" 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 SIZ being Class "B" and

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Area ( acres)</th>
<th>Nitrogen (mg/l)</th>
<th>Phosphorus (mg/l)</th>
<th>Suspended Solids (mg/l)</th>
</tr>
</thead>
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<td><strong>PRE-DEVELOPMENT</strong></td>
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<tr>
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<td>782</td>
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<td>0.57</td>
<td>250</td>
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<tr>
<td>Residential</td>
<td>-75</td>
<td>0.60</td>
<td>0.57</td>
<td>250</td>
</tr>
<tr>
<td>Commercial</td>
<td>115</td>
<td>0.32</td>
<td>0.55</td>
<td>145</td>
</tr>
<tr>
<td>Golf Course</td>
<td>-161</td>
<td>1.2</td>
<td>0.57</td>
<td>250</td>
</tr>
<tr>
<td>&quot;C&quot; Soils</td>
<td>-44</td>
<td>1.2</td>
<td>0.57</td>
<td>250</td>
</tr>
<tr>
<td>Arterial Roadways</td>
<td>-50</td>
<td>1.41</td>
<td>0.11</td>
<td>75</td>
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<tr>
<td><strong>Total Area</strong></td>
<td>1247</td>
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</table>

a) Primarily abandoned sugarcane fields, scrub brush, and koa haua.
b) Based on an average annual flow of 33.3 cfs (24,110 acre-ft/yr) for Waiau Stream —1952 to 1984— (USGS, 1986) of its 34.8 sq. mi. watershed and average nitrogen output of 3.0 lb/acre-yr (Luce, 1972).
c) Based on 10% of the nitrogen value.
d) Based on the reported average suspended sediment output of 27,500 tons/yr (Dept. of Public Works, 1971) from Waiau Watershed, and the average annual flow of Waiau Stream —1952 to 1984— (USGS, 1986) of 33.3 cfs.
e) Constituent values of storm water from Honolulu residential area (Fujisawa, 1973)
f) Constituent values of storm water from Honolulu commercial area (Fujisawa, 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 gutter draining Honolulu residential area (Dept. of Health).
## TABLE 4
Estimated Storm Water Runoff and Constituent Changes due to the Proposed Waiau Development Project, Southern Oahu

<table>
<thead>
<tr>
<th>Duration</th>
<th>Recurrence Interval</th>
<th>Quantity</th>
<th>Storm Water Runoff</th>
<th>Nitrogen</th>
<th>Phosphorus</th>
<th>Suspended Solids</th>
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</thead>
<tbody>
<tr>
<td>hr</td>
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</tbody>
</table>

b) Refer to Table 3.

Revised
January 23, 1986 - 1247 acres
There were no Class A or B soils indicated on the soil maps (Foot 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 48 times greater than pre-developed (1966) conditions; however, as the storm duration 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 poststorm 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 1966 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 decreases 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 in presently undefined.

REFERENCES


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 WAIWA PROJECT, ISLAND OF O'AHU

Winona P. Char & Associates
for
Environmental Communications, Inc.

December 1985

BOTANICAL RECONNAISSANCE OF THE PROPOSED
GENTRY WAIWA PROJECT, ISLAND OF O'AHU

INTRODUCTION
A botanical reconnaissance of the proposed Waiau project was conducted in December 1985. The area proposed for development covers roughly 2405 acres and consists primarily of abandoned sugarcane fields. Three golf courses are planned for the gulleys which run through the cane fields. The deeply dissected lands mauka of the project area and the Waiau 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 cane fields. These former cane lands have more or less gentle slopes. Around the cane fields is a perimeter vegetation composed largely of grass and shrub species. The gulleys which dissect the fields support large blocks of forestry plantings and dense shrubbery growth.

The vegetation types on the study 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 (93%) 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 poso-lote (Emilia sonchifolia), ploches (Plectranthus obtusifolius), 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 treatments, 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 ploches, indigo, butterfly bush ( Buddleia alternifolia ), Java plum ( Syzygium cumini ), abiba ( Albista falcata ), 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 'loha', Metrosideros collina spp. (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 herbicides. The vegetation in these areas are commonly composed of weedy sub-shrubs such as ploches, various species of Scahyosperma, indigo, etc., and taller shrubs such as Christmas berry ( Sclerocarya birrea varia ) and guava. A dense mat of grasses is found between the scattered shrubs. Calytridegrass ( Brachiaria mutica ) and Guinea grass are the most abundant species; occasionally Natal red top ( Hyparrhenia rufa ) or molassesgrass ( Melinis minutiflora ) may be found.

Plantings of introduced trees such as abiba and an assortment of Eucalyptus and Casuarina species are also found in the perimeter vegetation. Young trees of abiba 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 virginicosus 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 'ohia (Metrosideros indica var. americana), yellow wood sorrel (Osalia corniculata), and popolo (Salalum nigrum) are considered weedy. Others like the 'akia (Wrightia sp.) and kila (Psidium cattleianum var. decemcostatum) 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 (Feister and Herbst 1975, U.S. Fish and Wildlife Service 1983) 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 vegetation 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 - Makaha Project, Oahu

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 Lamouroux's unpublished checklist of Hawaiian ferns; taxonomy and nomenclature of the flowering plants (Monocotyledons 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 these 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.
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 etc.

1 = Abandoned Canefields
2 = Perimeter Vegetation
3 = Gulch Vegetation

LITERATURE CITED


<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>STATUS</th>
<th>VEGETATION TYPES</th>
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<td>-</td>
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<tr>
<td>Christella parasitica (L.) Lev.</td>
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<td>-</td>
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<td><strong>MONOCOTYLEDONS</strong></td>
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<td>broomedge</td>
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<td>Bambusa sp.</td>
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<td>Brachiaria subquadripa (Trin.) Hitch.</td>
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<td>Chloris inflata Link</td>
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<td>Chloris virginata Sw.</td>
<td>feather fingergrass</td>
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<td>-</td>
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<tr>
<td>Cynodon dactylon (L.) Pers.</td>
<td>Burma grass, manienie</td>
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<tr>
<td>Digitaria fuscens (Presl) Henr.</td>
<td>creeping kukaipua'a</td>
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<tr>
<td>Digitaria horizontalis Willd.</td>
<td></td>
<td>X</td>
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<td>Digitaria timorensis (Kunth) Balansa</td>
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<tr>
<td>Digitaria violascens Link</td>
<td>kukaipua'a-uka</td>
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<tr>
<td>Eleusine indica (L.) Gaertn.</td>
<td>wiregrass, manienie-ali'i</td>
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<td>COMMON NAME</td>
<td>STATUS</td>
<td>VEGETATION TYPES</td>
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<td>Malinis minutiflora Beauv.</td>
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<td>Opismenus hirtellus (L.) Beauv.</td>
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<tr>
<td>Panicum maximum Jacq.</td>
<td>Guinea grass</td>
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<td>+    +    +</td>
</tr>
<tr>
<td>Paspalum conjugatum Berg.</td>
<td>Hilo grass, mau'u Hilo</td>
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<td>+    +    +</td>
</tr>
<tr>
<td>Paspalum dilatatum Poir.</td>
<td>Dallis grass</td>
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<td>Paspalum filifolium HBK.</td>
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<td>-    +    -</td>
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<td>Paspalum orbiculare Forst. f.</td>
<td>ricegrass, mau'u laiki</td>
<td>X</td>
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<td>Paspalum urvillei Steud.</td>
<td>Vasseygrass</td>
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<td>Pennisetum sp.</td>
<td>feathergrass</td>
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<td>Rhynechelytrum repens (Willd.) C. E. Hubb.</td>
<td>Natal redtop</td>
<td>X</td>
<td>+    +    +</td>
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<tr>
<td>Saccharum officinarum L.</td>
<td>sugar cane, ko</td>
<td>P/X</td>
<td>+    -    -</td>
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<tr>
<td>Setaria glauca (L.) Beauv.</td>
<td>yellow foxtail</td>
<td>X</td>
<td>+    +    +</td>
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<tr>
<td>Sorghum halepense (L.) Pers.</td>
<td>Johnsongrass</td>
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<td>+    -    -</td>
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<tr>
<td>Sporobolus africanus (Poir.) Robyns &amp; Tournay</td>
<td>African dropseed</td>
<td>X</td>
<td>+    -    -</td>
</tr>
<tr>
<td>Trinachne insularis (L.) Nees</td>
<td>sour grass</td>
<td>X</td>
<td>+    -    -</td>
</tr>
</tbody>
</table>

**LILIACEAE**

| Cordyline terminalis (L.) Kunth                      | ti, ki                       | P      | -    -    +    |
| Sansevieria trifasciata Prain                        | bowstring hemp               | X      | -    -    +    |

**ORCHIDACEAE**

| Spathoglottis plicata Bl.                            |                             | X      | -    -    +    |

**PALMAE**

<p>| Cocos nucifera L.                                    | coconut, niu                 | P      | -    -    +    |</p>
<table>
<thead>
<tr>
<th>VEGETATION TYPES</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tr>
<td>SCIENTIFIC NAME</td>
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</tbody>
</table>

| ANACANTHACEAE    |   |   |   |
| Asystasia gongotilla (L.) F. Anders. |   |   |   |
| Asystasia nyassa |   |   |   |
| Asystasia violeata |   |   |   |
| Asystasia angustifolia |   |   |   |

| AMARANTHACEAE    |   |   |   |
| Amaranthus spinosus L. |   |   |   |
| Amaranthus wrightii |   |   |   |
| Amaranthus cruentus |   |   |   |
| Amaranthus hybridus |   |   |   |

| AMARANTHACEAE    |   |   |   |
| Amaranthus spinosus L. |   |   |   |
| Amaranthus wrightii |   |   |   |
| Amaranthus cruentus |   |   |   |
| Amaranthus hybridus |   |   |   |

| BASSIAACEAE      |   |   |   |
| Bassia scoparia |   |   |   |
| Bassia discolor |   |   |   |
| Bassia quadrangularis |   |   |   |

| BIGNONIACEAE      |   |   |   |
| Spilostylis pinnata |   |   |   |
| Spilostylis mollis |   |   |   |
| Spilostylis oreophila |   |   |   |

| CASUARIACEAE      |   |   |   |
| Casuarina stricta |   |   |   |
| Casuarina torulosa |   |   |   |
| Casuarina equisetifolia |   |   |   |

| CASUARIACEAE      |   |   |   |
| Casuarina stricta |   |   |   |
| Casuarina torulosa |   |   |   |
| Casuarina equisetifolia |   |   |   |

Legend:
- X: Present
- +: Absent

Notes:
- 'Nyassa' violet
- 'Nyassa' spiny amaranth, pokasi-kokusi
- 'Nyassa' mango, mankoo
- 'Nyassa' Christmas berry, wiltiska
- 'Nyassa' Maile vine, 'uula-hupe
- 'Nyassa' African tulip tree
- 'Nyassa' common ironwood, longleaf ironwood
- 'Nyassa' Casuarina spp.
<table>
<thead>
<tr>
<th>COMMON NAME</th>
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<tr>
<td>Ageratum conyzoides L.</td>
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<td>Bidens pilosa var. pilosa</td>
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<tr>
<td>Chrysanthemum cancellatum (L.)</td>
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<tr>
<td>Erigeron bonariensis L.</td>
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<tr>
<td>Eupatorium riparium Regel</td>
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<tr>
<td>Pluchea indica (L.) Less.</td>
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<tr>
<td>Sphaeralcea californica (L.)</td>
<td>+</td>
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<tr>
<td>Verronia cinerea (L.) Less.</td>
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<tr>
<td>Ipomoea triloba L.</td>
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<tr>
<td>Mirrema tuberosa (L.)</td>
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<tr>
<td>Lepidium sp.</td>
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<td>Scientific Name</td>
<td>Common Name</td>
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<tr>
<td><strong>CUCURBITACEAE</strong></td>
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<tr>
<td>Homordica charantia L.</td>
<td>balsam apple, bitter gourd</td>
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<tr>
<td><strong>EUPHORBIACEAE</strong></td>
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<tr>
<td>Euphorbia geniculata Ortega</td>
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<td>Euphorbia glomerifera (Mills.) L. C. Wheeler</td>
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<td>Euphorbia heterophylla var. cyathophora (Murr.) Griseb.</td>
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<td>Ricinus communis L.</td>
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<td>Persea americana Mill.</td>
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<td><strong>LEGUMINOSAE</strong></td>
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<td>Albizia falcata (L.) Fosb.</td>
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<td>Cassia floribunda Cav.</td>
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<td>Cassia lechenaultiana DC.</td>
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<td>Cassia occidentalis L.</td>
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<td>Crotalaria pallida Ait.</td>
<td>mucronate rattlespod</td>
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<td>Desmanthus virgatus (L.) Willd.</td>
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<tr>
<td>Desmodium canum (Gmel.) Schinz. &amp; Thell.</td>
<td>Spanish clover, ka'imi</td>
</tr>
<tr>
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<td>Common Name</td>
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<td>Desmodium triflorum (L.) DC.</td>
<td>three-flowered beggarweed</td>
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<td>Indigofera suffruticosa Mill.</td>
<td>indigo, 'iniko</td>
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<td>Leucaena leucocephala (Lam.) de Wit</td>
<td>koa-haole, ekoa</td>
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<td>Medicago polymorpha L.</td>
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<td>Mimosa pudica var. unijuga (Duchass. &amp; Walp.) Griseb.</td>
<td>sensitive plant, puhilahila</td>
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<td>Phaseolus lathyroides L.</td>
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<tr>
<td>Phaseolus limensis Macf. (cultivar)</td>
<td>spotted lima bean</td>
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<td>Pithecellobium dulce (Roxb.) Benth.</td>
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<td><strong>buddleja asiatica Lour.</strong></td>
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<td><strong>Lythraceae</strong></td>
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<td>Cuphea carthaginesis (Jacq.)</td>
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<td>Sida rhombifolia L.</td>
<td>prickly sida</td>
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<td>Sida spinosa L.</td>
<td>clidemia, Koster's curse</td>
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<tr>
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<td>common name</td>
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<td>Ficus rubiginosa Desf.</td>
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<td>Eucalyptus citriodora Hook.</td>
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<td>Eucalyptus robusta Sm.</td>
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<td>Eucalyptus spp.</td>
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<td>Psidium cattleianum Sabine</td>
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<td>Psidium guajava L.</td>
<td>yellow guava, guava</td>
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<td>Syzygium cumini (L.) Skeels</td>
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<td><em>NYCTAGINACEAE</em></td>
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<td>Oxalis martiana Zucc.</td>
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<td><em>PASSIFLORACEAE</em></td>
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<td>Passiflora laurifolia L.</td>
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<td>COMMON NAME</td>
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<td>------------------------------</td>
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<td>PIPERACÉES</td>
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<td>Peperomia leptostachya H. &amp; A.</td>
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<td>Portulaca oleracea L.</td>
<td>common purslane, pigweed, '1hi</td>
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<td>PROTEACÉAE</td>
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<td>Crevilleana robusta A. Gunn.</td>
<td>silkoak, 'oka-kalika</td>
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<td>Macadamia ternifolia var. integrifolia</td>
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<td></td>
<td>(Maiden &amp; Betche) Maiden &amp; Betche</td>
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<td>Solanum sodomum L.</td>
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<td>Waltheria indica var. americana (L.) R. Br. ex Hosaka</td>
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<td>UMBELLIFERAE</td>
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<td>Apium tenufolium (Moench) Thell. ex Hegi</td>
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<td>Asiatic pennywort, pohekula</td>
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<tr>
<td>Daucus pusillus Michx.</td>
<td>wild carrot</td>
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<td>Lantana camara L.</td>
<td>lantana, lakana</td>
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<td>Stachypheta australis Mold.</td>
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<td>Jamaica vervain, ov1, ol</td>
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<td>Stachypheta urticaefolia (Salisb.) Sims</td>
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<td>Verbena litoralis HBK.</td>
<td>weed verbena, ha'uwai</td>
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</table>
ANDREW J. BERGER

Terrestrial Vertebrate Animals of Waiawa Ridge, Environmental Assessment

November 30, 1986

APPENDIX E
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 Waiana Ridge, Environmental Assessment."

If you have any questions or suggestions, please call me:
262-8325.

Sincerely,

Andrew J. Berger
1203 Kualoa Drive
Railroad HI 96754.

DEC 2 1985

November 30, 1985

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 1,200 acres within this property, approximately 1,250 acres, formerly in cane, has topography with grades less than a ten percent." The former 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 tree.

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. Some 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 (Bumraker and Breeze, 1967).

II. Reptiles

1. Blind snake, *Typhlops browningi*

   "This small, secretive snake was apparently introduced from the Philippines in the dirt surrounding plants that were brought in for landscaping the campus of the Kamehameha Boys School in Honolulu. It was first found there in January 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 are 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.

1. **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 *'Alaka'i ('Anas clypeata*), Hawaiian coot or *'Alae Ke'oke'o* (*Fulica americana ala*), and the Hawaiian stil or *A'o* (*Himantopus exilipes laudens*). 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 area of the project site: the Hawaiian owl or Pueo (*Asio flammeus sandvicensis*). 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' occurrence in this area.
I. Indigenous Birds

These are species that occur naturally in Hawaii but whose total range 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 nycticorax), 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 lower in residential areas, golf courses, weedy pastures, open areas in the mountains, and mudflats along the coast. 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 following species occur on and adjacent to the Kaimana land.

1. Order Gruiformes

   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"
         (Breeue, 1959). A number of cattle egrets were released on Oahu
         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 1963 by personnel of the State Division of Forestry and
         Wildlife. I saw a half dozen egrets in flight over the fallen
         cane fields.

   II. Order Galliformes

      B. Family Phasianidae, pheasants, quail, and partridges

      2. Ring-necked Pheasant, Phasianus colchicus

         According to Cook (1933), this Asian pheasant probably was
         introduced to the islands in 1865 "probably by Dr. Hildebrandt.
         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, 1967). It is now not a very
         successful species on Oahu. Hunters killed 255 birds during the
         1960-1961 hunting season, but only one bird was reported during
         the 1953-1954 season (Salt, 1954). I heard one bird call from
         the power line area near the fence for the Kaimana Correctional
         Facility.

   III. Order Columbiformes

      C. Family Columbidae, pigeons and doves

      3. Spotted or Lace-necked dove, Streptopelia e. 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 (Cousin, 1933). It is
now common to abundant on all of the main islands in the chain,
and is classified 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 Schwarts (1949), for example,
found densities as great as 200 birds per square mile in dry areas
on Molokai. The diet was found to consist of 77 percent weed
seeds and about 25 percent fruits; animal matter was "almost
negligible." Tapeworm parasitism, however, was heavy, thus
indicating that the small amount of animal matter eaten by the
doves is important in contracting the worm parasites. The
spotted dove is common in residential and open areas throughout
the Unawa 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 Schwarts (1949)
reported densities as great as 400 to 600 birds per square mile
on Oahu (e.g., Elabor's Point to Makaha) less than 25 years after
the birds had been released on the island. The diet consists of
about 97 percent weed seeds and other plant material; the 3 percent
animal matter includes several species of beetles, grasshoppers,
and wireworm larvae. This small dove also is considered to be a
gamebird in Hawaii. It is very common in all parts of the
Unawa area.

IV. Order Cuciformes

D. Family Tytonidae, Barn Owls.

5. Barn Owl, Tyto alba pallidulus

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 (1960) reported
that Barn Owls had killed more than 100 seabirds and their chicks
on Kauai and Kilauea Island. 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 Unawa Correctional Facility told me
that he had seen "whistling" owls perched on the fence at dusk.
These light-breasted birds certainly were Barn Owls.

E. 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. Reeshow
(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 the island. 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 Naipol Peninsula and two others near Waikiki during 1976 (Keelcake, 59-9); 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.

7. Family Timaliidae, babblers and laughing-thrushes

7. Malolius Laughing-thrush, Gomphus malolius

This bird is a member of the babbler family even though it has long been called the Chinese thrush or Hua-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" (Cas, 1915). Birds later were imported and released on the other islands. These are shy birds that have a loud, clear song, so that they are often heard rather than seen. This laughing-thrush was generally distributed in the heavily vegetated gulches of the area.

8. Family Pycnonotidae, Bulbuls

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.

9. Family Turdidae, Thrushes and Bluebirds

Shama, Cossypha malabarica

Shama is the Indian name for this thrush, which is native to India, Nepal, Burma, Malaysia, and throughout Indo-China. The Hui Han imported Shamas in 1940 and released them in Waimanu Valley "and at some homes in the 2600 block on Makiki Heights road" (Harpham, 1953). 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.

10. Family Sylvidae, Old-world Warblers

Japanese Bush Warbler, Seto spheca 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 Han and by private individuals" (Cas, 1935). The Japanese name is Ugoku. 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.

11. Family Zosteropidae, White-eyes and Silver-eye

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 (Cowan, 1935). Later importations were made by the Iwi Kanu. The Japanese name is Mejino, and Mejiro clubs held singing competitions with these birds. The white-eye has been remarkably successful in Hawaii, it is the most abundant songbird in the Hawaiian Islands. It occurs from sea level to 10,000 feet elevation on Oahu, and it occupies near-desert areas (e.g., Keawaula) and those with an annual rainfall of more than 500 inches.

This species is an abundant species throughout the Kalaheo 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. It is reported to be abundant in Honolulu by 1879, it is now extremely common throughout the Territory (Cowan, 1935). 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 Kalaheo region.

L. Family Ploceidae, Weaverbirds and their Allies

13. Spotted Myna or Ricebird, *Leucopsar moluccus*

This myna 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. Cowan 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 myna 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.


This race of the Black-headed Myna is native to northeastern India, Burma, and northwestern Vietnam. 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 Mynah, Black-headed Mynah, Black-headed Myna, and Black-headed Mynah. Birds apparently were first imported as cage birds from Asia between 1936 and 1941. The species was first reported breeding in the wild by Edwards (1960), who observed ten adults and 15 juvenile birds near West Loch, Pearl Harbor, on April 26, 1969. Ord (1969) reported that the species was abundant "in open grassy areas around Middlet and West Lochs of Pearl Harbor." I observed flocks of this myna 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). Coum (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 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. "I 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 1976.

(kilcup, 35:65). "At least 6 birds" were seen in this area on October 29, 1978 (kilcup, 38:106). By 1979 this grassquit had spread to the Kipapa trail (Gemeinmann, 1981). Although I did not happen to see this species, it undoubtedly occurs in the region of the project site.

17. Red-crested Cardinal, Pyrrhura 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 (Coum, 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 1920 and 1933 (Coum, 1933). It now is common in residential and rural areas but is uncommon in the fallow cane fields.

19. House Finch, Cerculocephalus neglectus frontalis

The House Finch was introduced to Hawaii from California "prior to 1870, probably from San Francisco" (Coum, 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 "Papaya bird"), 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 Agriculture, Environment, and Recreation said that "birds and insects" caused a 20 to 30 percent loss in the sorghum fields at Lihue on Kauai last year. . . . seed-eating birds at Kohala ate 50 tons of sorghum grain in a 20-acre experimental field that was supposed to produce 60 tons" (Hawaiian Advertiser, March 24, 1972, p. B-2). House Finches were singing throughout the project area.

Mammals

1. Endemic Mammals

The only endemic land mammals 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 (Toch, 1969; Kramer, 1971; Tom Bruggencate, 1983). I know of no evidence that there is a resident population on the island of Oahu.

2. 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 aliens 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 pearsonii), as well as the feral cat (Felis rufus) and feral dog (Canis lupus familiaris). Because all of these mammals are serious pests, I did not set traps to sample the nocturnal rodents. It is reasonable to assume that all of these rodents occur in the project area (Toch, 1969; Kramer, 1971).

The feral pig (Sus scrofa) inhabits the valley and gulch floors in the general Naalehu 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 sand-gaped
(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 "nicebirds and nice Finches caused a 30 to 50 percent loss in the sorghum fields at Kilauea on Kauai last year. . . . seed-eating birds at Kahala 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 (Lacturus cinereus amoritus), a subspecies of the North American hoary bat. The Hawaiian bat is found primarily on the islands of Kauai and Hawaii (Touich, 1969; Kramer, 1971; Ton 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 so 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 traps in order to sample the nocturnal rodents. It is reasonable to assume that all of these rodents occur in the project area (Touich, 1969; Kramer, 1971).

The feral pig (Sus scrofa) inhabits the valley and upland fences in the general Naiau 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 Funa

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 valley 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
Hawaiian introduced birds.

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 Hula 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 Cynodon dactylon. The Red-vented Bulbul and the Japanese White-eye cause considerable damage to ornamental flowers and to fruit crops. The Myna has been reported to kill birds on Kauai (Lyd 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, development, 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.

Literature Cited
Hunsaker, Don T., and P. Breese. 1967. Herpetofauna of the


APPENDIX F
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.

![Location of Project Area](image)

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 meanders through the site, generally on a north-south axis, and divides the plateaus into several smaller areas. These gulches provide a natural drainage system through the site and transport storm water runoff from the Ko'olaupoko Mountains to the Middle Level of Pearl Harbor. Two major soil associations are found within the project area: the Luahielaelae and the Lianilua-sugar 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 higher areas. The elevation ranges between 150 to 855 feet above sea level. Winds are predominantly from the northeast, and the median annual temperature is 82°F. Vegetation on the site consists primarily of scrub growth and low brush. Approximately 1,000 acres of the site were previously cultivated for sugarcane by Ohu Sugar Company. However, the lands are now fallow since active cultivation ceased after the last harvest in 1903."

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
III. PREVIOUS RESEARCH

Published information on the area is scarce. McAllister (1925:105) mentions only one site in the vicinity, and that was in Waiau Gulch immediately outside the project area on the southeast:

"Site 121. Puuiki belaua, at the juncture of Manana and Waiau gulches.

"The heimu 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 ceremony the people are said to have been at the foot of the knoll and surrounding the heimu. There are no remains."

Handy (1940:811) refers briefly to taro cultivation in Manana gulch:

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

A reconnaissance survey of the entire project area was conducted by the author in February, 1966. Exposures of partially-buried terrace retaining walls were found in the bottoms of three of the gulches, and a large ahupua'a 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 stone bedrock alignments at the bottom of a gulch at the north end of the survey area (Figures 12 and 131). One of the alignments
Figure 13. Site 1469, looking Northwest

Figure 14. Trench at Site 1469, looking East

SITE 1470

This is a historic dump on the slopes of a gully 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 sugar company near 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 pans, and wooden lumber. 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
GFS/C/GI MAIWA PROJECT
MAIWA, CITY & COUNTY OF HONOLULU, HAWAII
THE GFS/C/GI COMPANIES

August, 1986

Prepared for
Environmental Communications, Inc.
by
Tried Evaluations
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<td>Recreation Facilities</td>
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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 predication 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 83-4, 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 were 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 83-4, 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 well as 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 Valley Center subdivision and Industrial park, will consist of 1242 acres utilized as follows:

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Acres</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Residential</td>
<td>727</td>
<td>5816</td>
</tr>
<tr>
<td>Low Density Apartment</td>
<td>82</td>
<td>1640</td>
</tr>
<tr>
<td>Medium Density Apartment</td>
<td>15</td>
<td>450</td>
</tr>
<tr>
<td>Commercial</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Commercial/Industrial</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Golf Course</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1242</td>
<td>7,960</td>
</tr>
</tbody>
</table>

Only 1242 acres of the project’s 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 7,960 residential units of mixed densities; commercial and industrial areas; two golf courses and appurtenant infrastructure. It should be noted that of the total housing units, 4,150 will be developed as a leisure village/retirement community.

<table>
<thead>
<tr>
<th>Retirement Community</th>
<th>Conventional Housing</th>
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<tbody>
<tr>
<td>Low Density Apartment</td>
<td>Low Density Apartment</td>
</tr>
<tr>
<td>450</td>
<td>1,100</td>
</tr>
<tr>
<td>Residential</td>
<td>Residential</td>
</tr>
<tr>
<td>2,640</td>
<td>3,196</td>
</tr>
<tr>
<td>6,150</td>
<td>3,756</td>
</tr>
</tbody>
</table>
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. WAIANA REGIONAL PROFILE: Socio-Economic Characteristics

A. Demographics: 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 Waiana 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 Waihana 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 Waiana site, 89.03, also includes the Waipio Valley, Hanauma Bay, and Waipio Gentry developments. A small portion of Waihana town and the area around Lick Creek Community College are also included in the tract figures but are also considered a portion of the Waihana CDP.

For comparative purposes in this report, tracts 89.02, 80.09, 80.06 and 80.05 will be considered as surrounding community areas. These areas contain in part or entirety, Millili and Waipio, Manana, Pearl City and Pacific Palisades, respectively.

Population:

Population statistics from the Department of Planning and Economic Development for 1984 list Waiana (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 occurring outside of the Waihana CDP, namely Waipio Gentry. This increase is fairly consistent with the population changes occurring between 1970 and 1980 for the suburban communities in the immediate area.
### Table I
Population Growth Within CT 89.03 (Ma'ili)

<table>
<thead>
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<th></th>
<th>Walapa GDP</th>
<th>Remainder in Honolulu County</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>2,744</td>
<td>1,623</td>
<td>2,367</td>
</tr>
<tr>
<td>1980</td>
<td>2,282</td>
<td>4,104</td>
<td>6,556   (+177.23)</td>
</tr>
<tr>
<td>1984</td>
<td>-</td>
<td>-</td>
<td>12,787   (+94.76)</td>
</tr>
</tbody>
</table>

* Sources: DPED
1970 Census of Housing: Block Statistics

These changes are significantly larger than those occurring 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 Ma'ili

<table>
<thead>
<tr>
<th></th>
<th>Honolulu County</th>
<th>Ma'ili (CT 89.03)</th>
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</thead>
<tbody>
<tr>
<td>1970</td>
<td>610,528</td>
<td>2,169</td>
</tr>
<tr>
<td>1980</td>
<td>762,566 (+20.9%)</td>
<td>6,546 (+177.23)</td>
</tr>
<tr>
<td>1983</td>
<td>805,900 (+5.6%)</td>
<td>12,783 (+94.76)</td>
</tr>
</tbody>
</table>

* Source: The State of Hawaii Data Book 1985

High growth is not limited to areas within the immediate Ma'ili vicinity. Neighboring areas outside of the Ma'ili 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

<table>
<thead>
<tr>
<th></th>
<th>Hanana</th>
<th>Pearl City</th>
<th>Pacific Palisades</th>
<th>Millilani</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>2,811</td>
<td>7,846</td>
<td>6,349</td>
<td>4,420</td>
</tr>
<tr>
<td>1980</td>
<td>3,377 (+20.1%)</td>
<td>7,465 (+5.1%)</td>
<td>5,706 (+55.3%)</td>
<td>25,874 (+655.1%)</td>
</tr>
<tr>
<td>1984</td>
<td>6,823 (+102%)</td>
<td>7,483 (+0.2%)</td>
<td>5,745 (+0.6%)</td>
<td>30,940 (+99.7%)</td>
</tr>
</tbody>
</table>

* 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 Millilani 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 6,546, Ma'ili had 1,426 households, with an average 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 Ma'ili households can also be separated into sub-categorias part of the Walapa GDP and those in the northern Honolulu County areas.
### Table IV

<table>
<thead>
<tr>
<th>Honolulu County</th>
<th>Waialua (CT total)</th>
<th>Waialua (Waipahu CDP)</th>
<th>Waialua (Remainder of Honolulu County)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>762,565</td>
<td>6,566</td>
<td>4,184</td>
</tr>
<tr>
<td>Number of Households</td>
<td>210,214</td>
<td>1,626</td>
<td>485</td>
</tr>
<tr>
<td>Mean per Households</td>
<td>3.3</td>
<td>4.0</td>
<td>5.2</td>
</tr>
</tbody>
</table>

#### Projected Population Increases:

1980 census data indicates Waialua 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 Waialua Development will actually contain.

The Waialua Ridge Plan, will consist of 7,569 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 Waialua 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

<table>
<thead>
<tr>
<th>Retirement Community</th>
<th>Conventional Housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Density Apartment</td>
<td>Conventional Housing</td>
</tr>
<tr>
<td>1,100 @ 1.6 = 1,760</td>
<td>540 @ 3.0 = 1,620</td>
</tr>
<tr>
<td>Medium Density Apartment</td>
<td>Residential 3,216 @ 1.3 = 10,641</td>
</tr>
<tr>
<td>450 @ 1.6 = 720</td>
<td>12,253</td>
</tr>
<tr>
<td>Residential @ 1.6 = 4,150</td>
<td>6,640</td>
</tr>
<tr>
<td>Total = 18,873</td>
<td></td>
</tr>
</tbody>
</table>

#### Age:

The Waialua community is primarily composed of detached dwelling units consisting of nuclear or extended families. The age breakdown within the area indicates that the highest percentage of adults fall within the 25 to 64 year age categories. Although the overall distribution is similar to Honolulu County, the Waialua area does express slightly higher numbers of school age children and teens. A decrease in ages 95 and over is also indicated.

*See page 154.
Table VI
Age Groups (1980)

<table>
<thead>
<tr>
<th>Honolulu County</th>
<th>Walawa (89.0%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 5</td>
<td>60,154(7.9%)</td>
</tr>
<tr>
<td>5-9</td>
<td>56,721(7.4%)</td>
</tr>
<tr>
<td>10-14</td>
<td>58,528(7.7%)</td>
</tr>
<tr>
<td>15-19</td>
<td>69,716(9.1%)</td>
</tr>
<tr>
<td>20-24</td>
<td>89,371(11.7%)</td>
</tr>
<tr>
<td>25-34</td>
<td>143,456(18.6%)</td>
</tr>
<tr>
<td>35-44</td>
<td>89,330(11.7%)</td>
</tr>
<tr>
<td>45-64</td>
<td>74,752(9.5%)</td>
</tr>
<tr>
<td>65-74</td>
<td>65,097(8.4%)</td>
</tr>
<tr>
<td>75+</td>
<td>35,932(4.7%)</td>
</tr>
<tr>
<td></td>
<td>19,436(2.5%)</td>
</tr>
</tbody>
</table>

Table VII
Place of Birth

<table>
<thead>
<tr>
<th>Honolulu County</th>
<th>Walawa CT</th>
<th>Malawa (Walapah CDP)</th>
<th>Malawa (Remainder of Honolulu County)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
<td>420,120(55%)</td>
<td>4,108(61%)</td>
<td>1,204(52.8%)</td>
</tr>
<tr>
<td>Mainland</td>
<td>229,234(30%)</td>
<td>958(14.5%)</td>
<td>145(6.8%)</td>
</tr>
<tr>
<td>Foreign</td>
<td>113,211(14.8%)</td>
<td>1,615(24.5%)</td>
<td>980(41.7%)</td>
</tr>
</tbody>
</table>

Years of School Completed:

Malawa 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 Malawa.

Table VIII
Education

<table>
<thead>
<tr>
<th>Honolulu County</th>
<th>Malawa (CT total)</th>
<th>Malawa (Walpaah CDP)</th>
<th>Malawa (Remainder of Honolulu County)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Highschool Graduates</td>
<td>75.6</td>
<td>76.3</td>
<td>62.0</td>
</tr>
<tr>
<td>College 1-3 Years</td>
<td>78,386(18.8%)</td>
<td>686(23.4%)</td>
<td>304(23.8%)</td>
</tr>
<tr>
<td>College 4 or More Years</td>
<td>93,201(21.7%)</td>
<td>728(19.7%)</td>
<td>171(13.4%)</td>
</tr>
</tbody>
</table>

Walawa exhibits significant differences in its residents' places of birth compared to Honolulu County distributions. As a whole, the Malawa 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 Malawa where foreign born outnumber mainlanders by a ratio of 1.7 to 1.

Further breakdowns of the tract into Walapah CDP and Remainder of Honolulu County sub-tracts indicate clear differences in internal composition. The Walapah CDP contains a high percentage of foreign born (41.2%) with relatively few mainlanders (6%) which reflects the high percentage of Filipinos residing in Walapah. 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.
Labor Force

The Malawa population, compared to Honolulu County, has a large percentage of employable age persons. Labor force figures for the whole Malawa 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).

Malawa'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>
<thead>
<tr>
<th></th>
<th>Honolulu County</th>
<th>Waialua (CT total)</th>
<th>Waialua (Waipahu CDP)</th>
<th>Waialua (Remainder of Honolulu County)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons 16 Years &amp; Older</td>
<td>574,903</td>
<td>4,603</td>
<td>1,692</td>
<td>2,911</td>
</tr>
<tr>
<td>Total Labor Force</td>
<td>397,889 (69.2%)</td>
<td>3,488 (75.8%)</td>
<td>1,190 (70.3%)</td>
<td>2,298 (78.9%)</td>
</tr>
<tr>
<td>Civilian Labor Force</td>
<td>339,863</td>
<td>3,264</td>
<td>1,132</td>
<td>2,132</td>
</tr>
<tr>
<td>Employed</td>
<td>324,113 (95.4%)</td>
<td>3,099 (94.9%)</td>
<td>1,037 (91.6%)</td>
<td>2,062 (96.7%)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>15,750 (4.6%)</td>
<td>165 (5%)</td>
<td>95 (8.4%)</td>
<td>70 (3.3%)</td>
</tr>
</tbody>
</table>
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 1971:

Waiawa exhibits overall higher-than-average affluence with substantially higher median and mean incomes over County wide figures. The majority of households (46.4%) 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 15.9% earning under $20,000 in comparison to Honolulu County's 47.7%. Households with incomes over $55,000 are also notably higher in the Waiawa area. Income distribution within the split Waiawa tracts is homogeneous.

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 numbers per household (CPR 5.2, Remainder 3.6), corresponding economic adjustments are expected in actual disposable income (Table X).

<table>
<thead>
<tr>
<th>Table X: Occupation and Selected Industries</th>
<th>Honolulu County</th>
<th>Waiawa (CPI total)</th>
<th>Waiawa (Waiawa GDP)</th>
<th>Waiawa (Remainder of Honolulu County)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed -16 Years &amp; Older</td>
<td>324,115</td>
<td>3,099</td>
<td>1,037</td>
<td>2,062</td>
</tr>
<tr>
<td>Managerial, Administrative Specialty</td>
<td>79,934(16.4%)</td>
<td>1,216(16.7%)</td>
<td>256(10.8%)</td>
<td>968(19.4%)</td>
</tr>
<tr>
<td>Technical, Sales Administrative Support</td>
<td>109,521(22.4%)</td>
<td>2,038(28.5%)</td>
<td>662(27.4%)</td>
<td>1,382(28.5%)</td>
</tr>
<tr>
<td>Service Occupations</td>
<td>56,939(11.7%)</td>
<td>1,149(15.9%)</td>
<td>386(16.8%)</td>
<td>754(19.1%)</td>
</tr>
<tr>
<td>Farming, Forestry, Fishing</td>
<td>5,838(1.2%)</td>
<td>170(2.8%)</td>
<td>110(5.5%)</td>
<td>64(1.3%)</td>
</tr>
<tr>
<td>Precision, Production, Repair</td>
<td>36,546(7.5%)</td>
<td>406(6.7%)</td>
<td>181(7.6%)</td>
<td>305(6.2%)</td>
</tr>
<tr>
<td>Operators, Fabricators, Laborers</td>
<td>35,335(7.2%)</td>
<td>798(11.3%)</td>
<td>392(16.4%)</td>
<td>466(8.4%)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>24,982(5.1%)</td>
<td>267(3.7%)</td>
<td>120(5.4%)</td>
<td>147(3.5%)</td>
</tr>
<tr>
<td>Wholesale &amp; Retail Trade</td>
<td>79,644(16.4%)</td>
<td>767(10.8%)</td>
<td>264(11.1%)</td>
<td>603(10.4%)</td>
</tr>
<tr>
<td>Professional &amp; Related Occup.</td>
<td>59,927(12.3%)</td>
<td>485(6.8%)</td>
<td>107(4.6%)</td>
<td>378(7.3%)</td>
</tr>
<tr>
<td>Private Wage &amp; Salary Workers</td>
<td>231,719(46.4%)</td>
<td>2,141(67.3%)</td>
<td>76(75.2%)</td>
<td>1,555(63.4%)</td>
</tr>
<tr>
<td>Government Workers</td>
<td>79,056(22.3%)</td>
<td>857(26.9%)</td>
<td>248(23.6%)</td>
<td>617(28.9%)</td>
</tr>
<tr>
<td>Local Government Workers</td>
<td>10,583(3.2%)</td>
<td>90(2.8%)</td>
<td>80(3.8%)</td>
<td>82(3.8%)</td>
</tr>
<tr>
<td>Self-employed Workers</td>
<td>16,312(4.5%)</td>
<td>94(3%)</td>
<td>11(1.1%)</td>
<td>83(3.9%)</td>
</tr>
</tbody>
</table>
### Table XI
**Income in 1979**

<table>
<thead>
<tr>
<th>Household Type</th>
<th>Honolulu County</th>
<th>Waipahu (CT total)</th>
<th>Waipahu (Waipahu GDP)</th>
<th>Waipahu (Remainder of Honolulu County)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>230,931</td>
<td>1,641</td>
<td>463</td>
<td>1,188</td>
</tr>
<tr>
<td>Less than $10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>48,655(20.9%)</td>
<td>104(6.3%)</td>
<td>62(13.4%)</td>
<td>42(3.9%)</td>
</tr>
<tr>
<td>$10,000-$19,999</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>68,151(29.5%)</td>
<td>152(9.3%)</td>
<td>36(7.8%)</td>
<td>116(9.8%)</td>
</tr>
<tr>
<td>$20,000-$29,999</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>68,499(29.7%)</td>
<td>77(4.6%)</td>
<td>185(40.8%)</td>
<td>587(49.4%)</td>
</tr>
<tr>
<td>$30,000-$49,999</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33,441(14.5%)</td>
<td>419(25.4%)</td>
<td>120(25.9%)</td>
<td>299(25.2%)</td>
</tr>
<tr>
<td>$50,000 and More</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19,794(8.6%)</td>
<td>204(12.4%)</td>
<td>60(13%)</td>
<td>144(12.1%)</td>
</tr>
<tr>
<td>Median Income</td>
<td>$275,877</td>
<td>$31,651</td>
<td>$29,139</td>
<td>$31,495</td>
</tr>
<tr>
<td>Mean Income</td>
<td>$25,180</td>
<td>$32,266</td>
<td>$32,319</td>
<td>$33,635</td>
</tr>
</tbody>
</table>

### Table XII
**Home Ownership and Rental Units**

<table>
<thead>
<tr>
<th>Honolulu County</th>
<th>Waipahu (CT total)</th>
<th>Waipahu (Waipahu GDP)</th>
<th>Waipahu (Remainder of Honolulu County)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner-Occupied</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>115,290</td>
<td>1,392</td>
<td>370</td>
</tr>
<tr>
<td>Median Income</td>
<td>$35,248</td>
<td>$32,386</td>
<td>$32,282</td>
</tr>
<tr>
<td>Mean Income</td>
<td>$33,693</td>
<td>$34,820</td>
<td>$34,379</td>
</tr>
<tr>
<td>Renter-Occupied</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households</td>
<td>115,641</td>
<td>259</td>
<td>93</td>
</tr>
<tr>
<td>Median Income</td>
<td>$33,912</td>
<td>$22,932</td>
<td>$20,093</td>
</tr>
<tr>
<td>Mean Income</td>
<td>$16,693</td>
<td>$24,910</td>
<td>$24,125</td>
</tr>
</tbody>
</table>

---

### Housing

In 1980, 1,704 housing units were listed for the Waipahu tract. Since 1980, the area has undergone extensive growth primarily due to development of the Waipahu Gentry subdivision. The 1,500 unit development, which is near completion, is the prime factor responsible for population increases between 1980 and 1984 (Table I). Waipahu Gentry, which is comprised of light industrial, commercial, and mixed residential units, is similar to the proposed Waipahu development in character, however, the Waipahu development will also include a golf course and luxury homes as well as retirement/lessee village homes.

Home ownership within Waipahu is very high with only 15.7% of 1980's households renting. Compared to Honolulu County's 49.9% home ownership figure, Waipahu's 84.3% appears exceptionally high. It should be noted, however, that Waipahu is comprised primarily of detached single family units with rental apartment units being almost non-existent.

If a current unit count of approximately 1,200 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 Waialua tract with 91.4% of all employees utilizing private vehicles and only 2.9% using public transportation. These figures are noticeably higher than Honolulu County figures of 74.4% 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

<table>
<thead>
<tr>
<th></th>
<th>Honolulu County (CTT total)</th>
<th>Waialua (Waialua CDP)</th>
<th>(Waialua Reminder)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Vehicle</td>
<td>282,479 (76.6%)</td>
<td>3,017 (91.5%)</td>
<td>974 (91.4%)</td>
</tr>
<tr>
<td>Public Transportation</td>
<td>17,042 (103)</td>
<td>95 (2.9%)</td>
<td>51 (4.8%)</td>
</tr>
<tr>
<td>Other*</td>
<td>43,622 (11.8%)</td>
<td>77 (2.4%)</td>
<td>41 (3.8%)</td>
</tr>
<tr>
<td>Work at Home</td>
<td>6,380 (1.8%)</td>
<td>37 (1.1%)</td>
<td></td>
</tr>
</tbody>
</table>
| Mean travel time to work, minutes | 22.6                      | 27.3                  | 26.8              | 27.6

* Includes bicycles, walk to work

Schools:

The Waialua area is currently serviced by three public schools for grade K through 12. These schools are: Kamehameha Elementary for grades K thru 6; Highlands Intermediate for grades 7 thru 9; and Pearl City High School for grade 10 thru 12. Waialua 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 1981-1993" 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 once future enrollment gains are expected with the number of new developments occurring within district.

Table XIV
Waialua Area School Projections

<table>
<thead>
<tr>
<th></th>
<th>(Actual)</th>
<th>(Projected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamehameha Elementary</td>
<td>505</td>
<td>624</td>
</tr>
<tr>
<td>Highlands Intermediate</td>
<td>476</td>
<td>441</td>
</tr>
<tr>
<td>Pearl City High School</td>
<td>2437</td>
<td>2473</td>
</tr>
</tbody>
</table>

These projections do not account for the proposed Waialua development but do consider those projects under construction or within final planning stages. These projections also indicate that enrollment for current and recognized
future residents can be accommodated within existing facilities due to the significant decline experienced over the past decade.

Table XV
Public and Private School Enrollment

<table>
<thead>
<tr>
<th>Grades</th>
<th>Honolulu County (CT total)</th>
<th>Waikane (Maui County)</th>
<th>Waikane (Revised Honolulu County)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grades</td>
<td>103,958(56.55) 1,236(63.1%)</td>
<td>464(61.3%)</td>
<td>722(63.4%)</td>
</tr>
<tr>
<td>K-8</td>
<td>Public</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td>103,958(56.55) 1,236(63.1%)</td>
<td>464(61.3%)</td>
<td>722(63.4%)</td>
</tr>
<tr>
<td>Grades</td>
<td>19,481(10.42) 191(9.82)</td>
<td>531(7.28)</td>
<td>138(11.7%)</td>
</tr>
<tr>
<td>Grades</td>
<td>9-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td>51,521(28.0%) 508(25%)</td>
<td>200(28.2%)</td>
<td>300(24.7%)</td>
</tr>
<tr>
<td>Grades</td>
<td>4-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td>9,105(5.1%) 19(1%)</td>
<td>12(1.6%)</td>
<td>7(0.6%)</td>
</tr>
</tbody>
</table>

Table XIV figures indicate that Waikane's student population is similar to Honolulu County's public and private school mix for grades K thru 8. Waikane'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 allows for a 1% rise in the general price level, as indicated by the consumer price index during 1984, for a real GDP of 6.5% following a 3.2% rise in 1981. This indicates that 1984 marked the local economy's second year of recovery from the 1980-1982 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 job outlook increased 1.4% (4,250 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 was occurred in the 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. Job outlook for non-agricultural, self-employed family workers and domestic workers as a group also declined by 319 jobs to a total of 28,750 in 1984. After accounting for all sectoral gains and losses, the total statewide job outlook showed a net increase of 1.2% percent or 5,450 jobs during 1984 compared to 8,100 in 1981. The number of persons employed in the state increased by 4,300 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 totaling 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 drugstore and a variety of retail, food, and service stores. The primary target market would be the Waiau population. The secondary market would include Waipahu Center and with access by freeway or bus. The tertiary market would be Waipahu Center and not 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 R. S. Rozek, Jr., John Zapotocky and Daniel McFadden, indicates:

"The need for office space in the Waiau, Pearl City, Wahiawa 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., shortcomings, 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 Waialua 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 Waialua 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 1,450 jobs.
The project's market analysis and economic impact analysis consultants have projected the creation of 1,415 jobs from the development of the project. This total which is similar to the previous projection is detailed below:

<table>
<thead>
<tr>
<th>Use</th>
<th>Area</th>
<th>Employment Ratio</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shopping Centers</td>
<td>225,000 a.f.</td>
<td>1/120 a.f.</td>
<td>859</td>
</tr>
<tr>
<td>Food Service</td>
<td>225,000 a.f.</td>
<td>1/240 a.f.</td>
<td>938</td>
</tr>
<tr>
<td>Retail</td>
<td>70 ac</td>
<td>20/acre</td>
<td>1,400</td>
</tr>
<tr>
<td>Light Industrial</td>
<td>total</td>
<td></td>
<td>66</td>
</tr>
<tr>
<td>Golf Courses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>7,909 units</td>
<td>1/750 units</td>
<td>158</td>
</tr>
</tbody>
</table>

Source: John Zapotocky and Decision Analysts Hawaii, Inc.

This is not intended to suggest that all of these jobs will be held by Waialua 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 desirable employment sources which should be compatible with the Waialua 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 diversified 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 (Million)

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.

Makaha Beach Resort

The Makaha 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.

Kuliouou

The Kuliouou 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 Koolau area, 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 place 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 B 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 440 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.

<table>
<thead>
<tr>
<th>Category</th>
<th>Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannery</td>
<td>1,050</td>
</tr>
<tr>
<td>Ill Tech</td>
<td>7,000</td>
</tr>
<tr>
<td>Maille Office Park</td>
<td>1,500</td>
</tr>
<tr>
<td>Millard Regional Shopping Center</td>
<td>1,000</td>
</tr>
<tr>
<td>West Beach</td>
<td>6,000</td>
</tr>
<tr>
<td>Construction</td>
<td>500</td>
</tr>
<tr>
<td>Harbor</td>
<td>1,600</td>
</tr>
<tr>
<td>Koolina</td>
<td>5,000</td>
</tr>
<tr>
<td>Miscellaneous Jobs</td>
<td>4,300</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30,550</strong></td>
</tr>
</tbody>
</table>

Sources: 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 measurable 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 Wailea 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 in 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 Wailea project will be its 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, 400 medium density apartments, and 1,000 single family residential units, would serve retirees interested in both a leisurely and active lifestyle with well-contained activities as golfing, tennis, swimming, exercise rooms, library, game rooms, and other meeting facilities. The residents will be 55 years of age or older, all owner occupants. Design features include security, landscape aesthetics 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 Pohal Nani, were interviewed by Economics Research Associates for the study Development Potential for the Waialua 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 a congregate living environment; 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.

Pohal Nani

Pohal Nani Good Samaritan Kauihale is one of two retirement centers on Oahu operated by the Good Samaritan Society. Located in Kaneohe on the windward coast of Oahu, Pohal Nani includes a 14-story main building housing 174 apartments, administrative, dining and recreational facilities.

Pohal 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 Pohal 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 Kahamao Convalescent Hospital on the grounds for intermediate care and skilled nursing.

The ERA development report indicated that the Waialua Leisure Village would provide for a currently unfulfilled market. It was suggested that the demand for these type of accommodations 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 accommodations 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 1,216 residential units and 546 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 semi-detached homes, patio homes, townhouses, duplexes, garden-type apartment units.

The Central and Kwa 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 desirable area.

This recent activity may be related to the focus on Central Oahu and Kwa 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/demand" 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 users. 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 accommodate 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 Waiawa 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 Waialua plan provides a site for an elementary school space should it be required. The school site would be developed when the Waialua 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 Waiehu development and Village Park. As the Waialua project is developed, it is anticipated that the existing outside facilities will be able to absorb Waialua'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 accommodate the increase in middle and upper school levels resulting from the Waialua community.

Recreation Facilities

Waialua 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 use while a multi-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, Waialua'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 Waialua 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 Waialua. 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 Waialua project is developed. It is estimated that when fully developed, Waialua 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 population), 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 Waiehu development. The Honolulu Fire Chief's office has indicated that a station should be planned on-site of the Waialua 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 ongoing 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 Walawa site is located on the Walawa plain of Central Oahu. Walawa 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 350 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 followed by Oahu Sugar. Portions of the site are used for minor cattle grazing while the remainder lies medieval. 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 Walawa site is relatively flat and open. Views from the site are excellent overlooking the southern coast of Oahu. The site while formerly in agricultural use, seems ideally suited for an authentically pleasing residential development.

The site is physically separated from the eastern developments of Pearl City, Manana, and Pacific Palisades by the Walawa Stream and Gulch. The western developments of Seaview, Creastview, and Kauloa Gentry are also physically separated from Walawa by the H-2 Freeway and Panahana Gulch.

The alterations occurring from agricultural use to urban use will be extensive and largely permanent, however these changes are not necessarily negative.
Views of the Walawa site are limited because of it's physical separation on the east and west. The view planes of Walawa along the II-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 Walawa Gulch serves as a buffer between eastern developments and the Walawa plain. Hauka views from the II-1 Freeway and Harvard-Oahu will not be significantly altered since the Walawa site is located on an elevated plateau.

No scenic views should be significantly impacted from development of the Walawa 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

Walawa presents many interesting facets in its composition and characteristics. Taken as a whole, the Walawa 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, Walawa 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 Hawaiian born and a sizable 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. Similarly and statistically speaking, Walawa is a very stable young middle-class community with an ethnic diversity.

As stated earlier, however, closer observation of the Walawa area reveals three clearly identifiable separate subcommunities. Statistically, Walawa is divided into two sub areas as defined by the Bureau of the Census. A portion of Walawa falls into a census designated place, namely Walabu Town, while the remainder (primarily Fairview 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 Waipahu tract consists of a population that is largely foreign born. As a former plantation town, the Waipahu CDP has served as a center of ethnic Filipinos. This social gravity may account for the strong ethnic ties within the area. Extended households which are cultural practices common to the Filipino community probably account for the significantly large household sizes (5.2 versus 3.1 for Honolulu County) recorded for the sub-area. The Waipahu area comprised of Koolau View and Sea View, on the other hand, is predominantly local born with a smaller average household size of 3.5. 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 Waipahu community has undergone significant change in recent years however, these changes lack statistical data since most occurred after the 1980 census. The 9% population growth since 1980 is largely the result of the development of Waipahu Gentry. The Waipahu Gentry project, which consists of residential and 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 Anahula Paliku, Wai'oulu and Oceanic Millilani Town expansion projects. These self-servicing developments are planned as comprehensive, cohesive communities rather than residential only subdivisions. Waipahu 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 Waipahu community expansion. The portion of Waipahu town located within the Waipahu tract was developed earliest from the other Waipahu 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. Sea View and Crestview, which were developed in the 1960's, represent another trend in development; the subdivision. Such residential subdivisions of tract home were common place during the rapid expansion period of the construction boom and growth era. Gentry Waipahu 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 accommodations.

This concept of internal self-sufficiency establishes a sense of community easier than residential subdivisions that must integrate with larger urban areas.

The nature and degree of social changes in a community are dependent 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 Sea View and Crestview developments and Gentry Waipahu. Prior to the development of Gentry Waipahu, Sea View and Crestview depended upon commercial, recreational and education facilities outside of the immediate area but with the development of Gentry Waipahu, 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 Waipahu 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 Gentry Waipahu development almost doubled the population in the area yet was afforded a smooth transition into the existing community.
The Proposed Developments:

The proposed Gentry Waipio project will also significantly add to the population of the Waipio area. With a projected figure of approximately 18,875 new residents, Gentry Waipio 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 supposive rather than adverse and development of the comprehensive Waipio 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 Waipio 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 presents itself as dynamic and growing. The Waipio, and Central Oahu areas are already targeted for extensive comprehensive community growth by developers as well as private developers. With this in mind, it is apparent that the Waipio Development can be a key to the urban build up of central Oahu.

A particularly significant feature of the proposed development is its 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. Waipio'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 Waipio Development and adjacent communities.

No visiter population changes are expected from the Waipio 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 immigrants.

Community Integration:

With the development of the proposed Waipio projects changes will occur on the existing community. However, these changes should not be unexpected since changes of a similar nature have already occurred 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, golf courses, additional commercial and industrial areas, and the retirement village.

Social impacts occurring 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 Waipaku CDP portion of Waipalua 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 separate from the large Pearl City and Waipalua communities.

The high rate of home ownership indicates that existing residents have made financial and emotional commitments and are strongly motivated to maintain their established quality of life. 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 Malawa Development appears to be socially beneficial to both the existing Malawa community and the Central Oahu area in general. By providing a diverse and exemplary model of a comprehensive community, the Malawa 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 Malawa Development could be holistically viewed as being greater than the sum of its parts.
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<tr>
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<td>19</td>
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</table>
MAIWA DEVELOPMENT
TRAFFIC IMPACT ASSESSMENT

INTRODUCTION

A development plan has been proposed by The Gentry Companies for approximately 2500 acres on Maiala 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 Waialua. Table 1 summarizes 1985 machine counts taken by the State Highways Division. Analysis using Highway Capacity Manual 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 Waialua 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.
### Table 1
EXISTING TRAFFIC

<table>
<thead>
<tr>
<th></th>
<th>Southbound</th>
<th>Northbound</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K-2 Freeway at Kipapa Bridge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-Hour (Weekday, May 1985)</td>
<td>25064</td>
<td>23780</td>
</tr>
<tr>
<td>AM Peak Hour (5:45 - 6:45 a.m.)</td>
<td>2816</td>
<td>1232</td>
</tr>
<tr>
<td>PM Peak Hour (4:30 - 5:30 p.m.)</td>
<td>1710</td>
<td>2509</td>
</tr>
<tr>
<td><strong>Kamehameha Highway at Kipapa Stream</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-Hour (Weekday, May 1985)</td>
<td>9503</td>
<td>9987</td>
</tr>
<tr>
<td>AM Peak Hour (7:00 - 9:00 a.m.)</td>
<td>951</td>
<td>389</td>
</tr>
<tr>
<td>PM Peak Hour (4:30 - 5:30 p.m.)</td>
<td>595</td>
<td>967</td>
</tr>
<tr>
<td><strong>Kamehameha Highway at Waipahu Street (approach volumes)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24-Hour (Weekday, April 1984)</td>
<td>35099</td>
<td>20180</td>
</tr>
<tr>
<td>AM Peak Hour (7:30 - 8:30 a.m.)</td>
<td>1711</td>
<td>869</td>
</tr>
<tr>
<td>PM Peak Hour (4:30 - 5:30 p.m.)</td>
<td>737</td>
<td>2339</td>
</tr>
</tbody>
</table>

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

Māhōna Street is the major collector road serving the Pearl City Industrial Park. Māhōna 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 Māhōna Street. However, west of Māhōna 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 Waialua Ridge site provide a baseline to compare traffic conditions and to identify impacts. The State Highways Division's peak hour traffic projections4 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 Kamehameha Highway.
- Separate approach lanes on Waipahu Street (eastbound) at Kamehameha 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.

-6-

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  

<table>
<thead>
<tr>
<th>Land Use (Parameter)</th>
<th>Daily (vpd)</th>
<th>PM Peak Hour (vph)</th>
<th>PM Peak Hour (vph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Enter &amp; Exit</td>
<td>Enter</td>
<td>Exit</td>
</tr>
<tr>
<td>Residential (dwelling unit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Family</td>
<td>10.0</td>
<td>0.21</td>
<td>0.55</td>
</tr>
<tr>
<td>LowDensity Apartment</td>
<td>6.1</td>
<td>0.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Leisure Village - net traffic (dwelling unit)</td>
<td>3.3</td>
<td>0.05</td>
<td>0.72</td>
</tr>
<tr>
<td>Commercial/Industrial (acre)*</td>
<td>367.8</td>
<td>10.7</td>
<td>5.2</td>
</tr>
<tr>
<td>Golf Course (per acre)</td>
<td>6.9</td>
<td>0.22</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Notes:  
vpd = vehicles per day  
vph = vehicles per hour  
* Weighted average of light industrial, industrial park, warehousing, general office building, and retail.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Total Trip Ends</th>
<th>Net Trip Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily (vph)</td>
<td>AM Peak Hour (vph)</td>
</tr>
<tr>
<td></td>
<td>Enter &amp; Exit</td>
<td>Enter</td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3216 Single Family Units</td>
<td>32,160</td>
<td>675</td>
</tr>
<tr>
<td>540 Apartments</td>
<td>3,290</td>
<td>54</td>
</tr>
<tr>
<td>Leisure Village</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4150 Units)</td>
<td>13,700</td>
<td>208</td>
</tr>
<tr>
<td>Commercial/Industrial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(110 acres)</td>
<td>40,460</td>
<td>1,177</td>
</tr>
<tr>
<td>Golf Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(210 acres)</td>
<td>1,450</td>
<td>46</td>
</tr>
<tr>
<td>TOTAL</td>
<td>91,060</td>
<td>2,160</td>
</tr>
</tbody>
</table>

Notes

vd = 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 Wai'alu-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 Wai'anae 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 and location (Figure 3).

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Honolulu</th>
<th>Pearl City</th>
<th>Central Oahu</th>
<th>Waipahu - Ewa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>0.04</td>
<td>0.02</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td>Population</td>
<td>0.69</td>
<td>0.06</td>
<td>0.11</td>
<td>0.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Traffic Distribution Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak Hour</td>
</tr>
<tr>
<td>Enter</td>
</tr>
<tr>
<td>Exit</td>
</tr>
<tr>
<td>PM Peak Hour</td>
</tr>
<tr>
<td>Enter</td>
</tr>
<tr>
<td>Exit</td>
</tr>
</tbody>
</table>
The proposed project will access the highway system at three locations: the Waipio Interchange, Kamehameha Highway at Waipahu Street, and Waianae Street.

The proposed Waiau project is expected to affect traffic conditions in the region by redistributing travel demands. The State's traffic assignment, which assumed no development at Waiau, was based on a rate of development in the area north and west of the Waiau Interchange consistent with population projections. The State's traffic assignment was therefore adjusted to reflect the inclusion of development at Waiau 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 Waiau Interchange) and for H-2 (north of Waipio Interchange) by interpolating the State Highways Division's estimates for traffic in 1998 and 2000 without the Waiau development. With the Waiau traffic demand on H-2, these volumes were adjusted so that the total traffic demand into the Waiau Interchange would remain constant in year 2002 with or without the Waiau 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 Waialua 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. Future with-project traffic assignments at these locations are shown in Figures 4 and 5.

Only minor impacts are expected at the Wainana Street connection because of the low traffic volumes in the area.

---

FIGURE 4

TRAFFIC ASSIGNMENT (WAIPIO INTERCHANGE) WITH PROJECT — YEAR 2002
Waipio Interchange

A diamond interchange will not have sufficient capacity to serve the Waialua 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 Waialua project; however, the capacity of the two-lane ramp would be exceeded with the first 2-1/2 years of development at Waialua.

A double-lane loop ramp serving Waialua 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 Waialua 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 Paikikaali 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 1990. At full development, AM Peak Hour traffic demand from the Waialua 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 10% of the Waialua 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 Waialua Development will increase turn volumes at two locations along Kamehameha Highway, at Ka Uka Boulevard and at Waipio Street. At both locations, near-capacity conditions are expected with or without the Waialua traffic during future peak hours.

The analysis of future conditions without the Waialua project assumed only minor 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 Waialua 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

<table>
<thead>
<tr>
<th></th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Southbound</td>
<td>Northbound</td>
</tr>
<tr>
<td></td>
<td>L.S. V/C</td>
<td>L.S. V/C</td>
</tr>
<tr>
<td>Existing (1985)</td>
<td>B 0.48</td>
<td>B 0.21</td>
</tr>
<tr>
<td>Future (2002)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without Waiaawa Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North of Waipio I.C.</td>
<td>C 0.59</td>
<td>B 0.28</td>
</tr>
<tr>
<td>South of Waipio I.C.</td>
<td>D 0.77</td>
<td>B 0.41</td>
</tr>
<tr>
<td>With Waiaawa Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North of Waipio I.C.</td>
<td>B 0.44</td>
<td>B 0.21</td>
</tr>
<tr>
<td>South of Waipio I.C.</td>
<td>E 0.95</td>
<td>B 0.47</td>
</tr>
<tr>
<td>Table 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAMP LEVELS OF SERVICE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Welpto Interchange</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(Year 2002 - No Mitigation)</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Without Mitigation</strong></td>
<td>SS</td>
<td>NB</td>
</tr>
<tr>
<td>Single-lane Ramps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North (SB-off, NB-on)</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>South (SB-on, NB-off)</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>Double-lane Ramps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North (SB-off, NB-on)</td>
<td>D</td>
<td>B</td>
</tr>
<tr>
<td>South (SB-on, NB-off)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>With Mitigation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-lane Ramps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North (SB-off, NB-on)</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>South (SB-on, NB-off)</td>
<td>F</td>
<td>D</td>
</tr>
<tr>
<td>Double-lane Ramps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South (SB-on, NB-off)</td>
<td>F</td>
<td>C</td>
</tr>
<tr>
<td>With Loop Ramp (SB, on)</td>
<td>F*</td>
<td>--</td>
</tr>
<tr>
<td>Loop Ramp (WB-to-SB)</td>
<td>D</td>
<td>--</td>
</tr>
</tbody>
</table>

**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 Kaneohe 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>
<thead>
<tr>
<th></th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Project (Year 2002)</td>
<td>1380</td>
<td>1365</td>
</tr>
<tr>
<td>Waipahu Street</td>
<td>1344</td>
<td>1229</td>
</tr>
<tr>
<td>With Project (Year 2002)</td>
<td>1350</td>
<td>1365</td>
</tr>
<tr>
<td>Ka Uka Boulevard</td>
<td>1367</td>
<td>1242</td>
</tr>
<tr>
<td>Waipahu Street</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Critical Movement Analysis Planning Application (Levels of Service are not assigned):

<table>
<thead>
<tr>
<th>Sum of Critical Movements</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1,200</td>
<td>Under Capacity</td>
</tr>
<tr>
<td>1,200 to 1,400</td>
<td>Near Capacity</td>
</tr>
<tr>
<td>1,400+</td>
<td>Over Capacity</td>
</tr>
</tbody>
</table>
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 Waialua Interchange.

An additional interchange with N-3 or new ramps into Waialua 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 B shows a program which could reduce the traffic generated by the Waialua Development to a level which can be served by the proposed improvements.

| Table B | TRAFFIC DEMAND REDUCTION PROGRAM
<table>
<thead>
<tr>
<th>Location</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Volume (vehicles/hour)</td>
<td>2002</td>
<td>2024</td>
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<td>C) Shift to Express bus</td>
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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 Ko'olau 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 Wai'anae 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 Wai'anae-Waipahu (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.


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
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 queuing 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 queuing. 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 possibly 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.

Highways

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
Waiaua Development, Oahu Hawaii

Revised December 22, 1986

APPENDIX I
AIR QUALITY ASSESSMENT
FOR THE
PROPOSED WAIWA DEVELOPMENT
OAHU, HAWAII

Prepared by
Barry D. Root
Kaneohe, Hawaii

Revised
December 22, 1986
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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 Waiwa 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 Waiamoa 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 Waiwa 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 Waiwa 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 2600 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 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 Wailea. 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 Wailea either.

Finally, natural air pollutant producers which could affect air quality in the Wailea 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 Wai'anae 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, 1968, the Federal Environmental Protection Agency has revised the allowable lead amount in gasoline to 0.1 gram per gallon. At the beginning of 1968 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 Waia Development assume that the Waipio Interchange will have a full diamond configuration, while computations for the scenario with Waia 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. Waia 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 Waia Development contributions by assuming that all Waia Development 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 operating in the hot start mode. The EPA computer model MOBILE2 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 1.8 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 0.8 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 winds 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 mornings 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 Kaneohe Highway and along the H-1 corridor between Waipahu and Hālawa Interchanges indicates that State of Hawai‘i Hawai‘i 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 Waipahu Development it is also noted 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 occurring as early in the development process as practicable.
REFERENCES


<table>
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<th>SAMPLING PERIOD</th>
<th>AMBIENT AIR QUALITY STANDARDS</th>
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<tr>
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<td>40</td>
<td></td>
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<td>Calendar Quarter</td>
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<td>1.5</td>
<td></td>
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Notes: 1. Carbon monoxide standards are in milligrams per cubic meter.
### TABLE 2

**SUMMARY OF AIR POLLUTANT MEASUREMENTS AT NEAREST MONITORING STATIONS**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<td>173</td>
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<td>1.2-13.8</td>
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<td>0-8.6</td>
<td>.6-10.9</td>
<td>0-10.4</td>
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<td>5.1</td>
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<td>52</td>
<td>58</td>
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<tr>
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<td>No. of Times</td>
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<td></td>
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**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)**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>1996</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Waiawa Development</td>
<td>1.8</td>
<td>5.8</td>
</tr>
<tr>
<td>With Waiawa Development</td>
<td>7.2</td>
<td></td>
</tr>
</tbody>
</table>

**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 AQ Standards:**  
STATE AQS: 10  
NATIONAL AQ Standards: 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)

<table>
<thead>
<tr>
<th>SITE 1 (H-2 Freeway at proposed Waipio Interchange)</th>
<th>YEAR</th>
<th>1986</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Waiawa Development</td>
<td>1.1</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>With Waiawa Development</td>
<td>4.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SITE 2 (Intersection of Waipahu Street and Kamehameha Highway)</th>
<th>Without Waiawa Development</th>
<th>9.2</th>
<th>5.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>With Waiawa Development</td>
<td>7.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SITE 3 (H-1 Freeway between Waiawa and Halawa Interchanges)</th>
<th>Without Waiawa Development</th>
<th>15.8</th>
<th>8.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>With Waiawa Development</td>
<td>10.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

STATE OF HAWAII AQ5: 5
NATIONAL AQ5: 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.
Y. EBISU & ASSOCIATES

Updated Traffic Noise Study for the Proposed
Waiawa Development Plan (Year 2002)

July 1986

APPENDIX J
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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 Waiau 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 Ewaheheo Highway and H-2 Freeway were calculated for the Year 2002 planning period. Increases in traffic noise ranging from 0 to 3.2 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 Waiau residents can be minimized by the use of buffer zones of adequate depth on the Waiau side of H-2 Freeway, and along the internal roadways of the development. In order to not preclude federal (FHWA/FRA) assistance on the project, it is suggested that minimal 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 Ewaheheo 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 Waipio 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 Eneo-Nea 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 Ene-Nea Highway at the proposed connection will be less than 10% of the total non-project traffic. Traffic noise level increases along Eneo-Nea Highway 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 units), 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 3U. 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 3U. 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 netback distances to the 60, 65, and 70 Ldn traffic noise contours under worst case sound propagation conditions (300 degree field-of-view to the freeway lanes) as a result of project and non-project traffic on H-2 Freeway Year 2002. Increases in the netback 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. Al-
though the distances to the 60 Ldn contour appear to be very large
under the worst case propagation conditions, the presence of in-
tervening natural or man-made noise barriers between the receptor
and roadway is more probable at the larger netback distances, and
actual distances to the 60 Ldn contour are significantly shorter.
This shielding effect is evident in the proposed Waipio Develop-
ment area (see FIGURE SB). 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 SB.

TABLE 49 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 I-2 Freeway north and south of
the proposed Waipio Interchange. Traffic noise levels represent
project plus non-project Ldn at the 2002 planning year. An in-
dicated in TABLE 49, 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 inter-
change, non-project traffic are predicted to cause significant in-
creases 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

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

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 Enn Yks 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 in 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 Kaneohe Bay Highway and attributable to the proposed Waipahu Development are predicted to be less than 0.5 Ldn (or 48), and will be difficult to measure. The proposed Waipahu Development is not anticipated to generate adverse traffic noise impacts along Kaneohe Bay Highway in the Year 2002 planning period.

Because traffic noise along H-2 Freeway to the north of the proposed Waipahu 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 Waipahu Interchange and the existing Waipahu 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 0.6 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 Waipahu Development side of the H-2 Freeway, possible noise impacts may occur at the low and medium density apartment complexes at the northwest end of the development (see FIGURE 38). The extent of the noise impacts will depend upon the setback distances and building elevations planned within these proposed housing areas (see FIGURES 76, 86, and 98). 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 Waipahu 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 Waipahu 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')

- 5 -
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 58, 70, 80, and 90, and TABLE 30; construction of sound attenuation berms or walls where adequate setbacks cannot be achieved; incorporating sound attenuating window design features in upper-story houses 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 in 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


### TABLE 3U

EXISTING AND YEAR 2002 DISTANCES TO 60, 65, AND 70 Ldn CONTOURS

<table>
<thead>
<tr>
<th>STREET SECTION</th>
<th>60 Ldn SETBACK (FT)</th>
<th>65 Ldn SETBACK (FT)</th>
<th>70 Ldn SETBACK (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EXISTING</td>
<td>FUTURE</td>
<td>EXISTING</td>
</tr>
<tr>
<td>H-2 Frwy. (North of Waipio Interchange)</td>
<td>522</td>
<td>532</td>
<td>242</td>
</tr>
<tr>
<td>H-2 Frwy. (South of Waipio Interchange)</td>
<td>522</td>
<td>893</td>
<td>242</td>
</tr>
<tr>
<td>Ka Uka Boulevard Extension</td>
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<td>2,500 VPH Roadway</td>
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<td>130</td>
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<tr>
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<td>70</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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.