April 19, 1988

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

Dear Dr. Miura:

Final Environmental Impact Statement (FEIS)
Wailuna IV - The Lusk Company
Tax Map Key 9-8-2: por. 3

We are notifying you that the Final EIS identified above is acceptable under the procedures established in Chapter 343, HRS, and Title 11, Administrative Rules, Department of Health, Chapter 200, Environmental Impact Statement Rules.

A copy of the Acceptance Report is attached, which identifies several unresolved issues having to do with planning and zoning changes, detailed soils and engineering analysis, construction plans and the availability of sewage facilities, schools, water, etc. The report indicates the approximate timing as to when these issues should be addressed.

If you have any questions, please contact Melvin Murakami of my staff at 527-6020.

Sincerely,

DONALD A. CLEGG
Chief Planning Officer

Attach.

cc: Fred J. Rodriguez, Environmental Communications, Inc.
A. BACKGROUND

The Lusk Company is proposing a 180 unit single-family residential condominium development on approximately 26 acres of State Conservation land situated at the end of Kaahumanu Street in Pearl City. The site is immediately mauka of Increment III of the Lusk Company's Wailuna development. The Lusk Company views the present proposal as Increment IV of their Wailuna development.

The subject site is part of a ridge that is situated at the 600 to 800 foot elevation. It consists of gentle, moderate, and steep slopes. Based on our analysis of the slope map submitted in the EIS, 60% of the site is 20% or less in slope and 40% of the site is more than 20%. 30% of the site exceeds 30% slope.

The Waiau Gulch and Punananani Gulch are situated on the northern and southern sides of the site. There is also an unnamed gulch which is estimated to be about 7 acres in the middle part of the site. These three gulches which were formed by stream flow on the slopes serve as the drainage way for runoff from the subject parcel.

Proposed on-site improvements will include extensive cutting, grading and filling. The applicant intends to grade the high ground and to fill the unnamed gulch. This would moderate existing slopes for housing use. The actual extent of housing uses, however, would be dependant upon changes to the State Land Use classification, Development Plan Land Use Map, Zoning approval, the outcome of detailed soils, engineering and other analysis especially with regard to the on-site gulch area, and adherence to regulatory controls.

There is an existing paved road located along the highest ridge portion on the northern edge of the site. Previous agricultural use consisted of sugar cultivation below the 650-foot elevation. It is estimated that less than 25% of the site was in sugar cultivation.
The soils of the site are as follows:

35% - Manana silty clay loam (MoC) 6 to 12% slopes, moderate and moderately rapid permeability, medium runoff, moderate erosion hazard, moderate shrink-swell potential;

35% - Manana silty clay loam (MoD2) 12 to 25% slopes, moderately rapid permeability, rapid runoff, severe erosion hazard, moderate shrink-swell potential;

30% - Helemano silty clay (HLMG) 30 to 90% slopes, moderately rapid permeability, medium to rapid runoff, severe to very severe erosion hazard, moderate shrink-swell potential.

The proposed project is expected to be completed in one continuous phase by 1993. The total cost of the proposed project is approximately $27,000,000 (1987 dollars).

B. PROCEDURE

1. An EIS Preparation Notice (EISPN) was published in the "Office of Environmental Quality Control (OEQC) Bulletin" of November 8, 1987, under the Register of Chapter 343, HRS Documents. This bulletin was distributed to Federal, State, and City and County agencies, as well as interested community groups. Simultaneously, the applicant requested comments on the proposal directly from forty-three (43) Federal, State, City and County, and private agencies.

2. The deadline for comments from consulted parties and requests to be a consulted party was set for December 8, 1987. Twenty-three (23) parties made replies to the EISPN. The applicant made responses to all substantive comments, and included these in the Final EIS.

3. On January 20, 1988 the applicant submitted the Draft EIS to the OEQC and the DGP pursuant to the requirements of Chapter 343, HRS.


5. Twenty-seven (27) parties commented on the Draft EIS. The applicant's responses are included in the Final EIS.

6. The Final EIS was submitted to the DGP on March 21, 1988 and published in the March 23, 1988 "OEQC Bulletin."
In conclusion, DGP finds that the applicant has complied with the EIS procedures in accordance with Chapter 200 of Title 11, Sub-Chapter 7, Section 11-200-20, 21, and 22 of the EIS Rules.

C. **EIS CONTENT**

The Final EIS consists of a single volume, containing the EIS, the comments, and nine appendixes. The latter include: (1) "Biological Study - Char and Associates;" (2) Archaeological Study - Bishop Museum;" (3) "Traffic Study - Parsons Brinckerhoff Quade & Douglas, Inc.;" (4) "Air Quality Study - Barry D. Root;" (5) "Noise Study - Y. Ebisu & Associates;" (6) "Social Impact - Environment Capital Managers, Inc.;" (7) "Stormwater Drainage - Gordon L. Dugan;" (8) "Soil Report - Harding Lawson Associates;" and (9) a topographic survey by Community Planning, Inc.

The Final EIS for the Wailuna IV 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 reasonably adequate responses to comments, although there are considerable unresolved issues (see below).

E. **UNRESOLVED ISSUES**

1. Government policies with respect to urban usage of the site have yet to be established. The proposal requires changes in the State Land Use District Boundary from Conservation to Urban and requires a change to the City's Development Plan Land Use Map for the Primary Urban Center.

2. The water master plan, sewage master plan, grading and construction plans have yet to be completed. These should be submitted prior to construction activities, or sooner. The United States Department of Agriculture Soil Conservation Service recommends that an erosion plan be developed in a timely manner for gulch areas.

   a. The Board of Water Supply indicates that "Water has not been committed to this project. The availability of water will be determined when the building permit applications are submitted for our review and approval."
b. The Department of Public Works indicates that "The Honouliuli WWTP will have to be expanded before the development is allowed to connect. Completion date for the expanded capacity at the Honouliuli Plant is in the early 1990's."

3. The design capacity of storm drains in the project area is not included in the EIS. The applicant indicates that ". . . the actual runoff quantities are at this time still undetermined since the "ditch/culvert hydraulics" have not been finalized."

The need for storm water retention is unresolved. The Department of Public Works recommends ". . . the retention of stormwater so that, after development of the site, the quantity and rate of runoff leaving the site will be minimized." The applicant indicates, however, in his response to a similar concern expressed by the State Department of Business and Economic Development that "There will be no ponds or retention basins built for the proposed project."

4. The preliminary layout of proposed residential units is still unresolved since all data from soil and engineering design for site improvements are still being developed. "At this stage of review, the consultants are not final in their determination of site improvements needed for residential unit placement on the land."

5. The recreational needs of the project have yet to be determined and should be resolved prior to rezoning. The applicant ensures that Park dedication requirements will be met.

6. The issue of public school availability for the development is unsettled and should be resolved prior to rezoning. The State Department of Education indicated that it ". . . cannot assure the availability of classroom spaces at the elementary and high school. Legislative appropriation on a timely basis may be required to accommodate the growth."

7. The Hawaiian Electric Company has indicated that, "the subject development crosses or is in close proximity to existing HECO 138KV transmission lines." The specific actions to be taken by the applicant in regard to the lines have not been determined to date. This should also be resolved prior to final design of proposed on-site improvements.
8. Final determination by governmental agencies of number and kinds of affordable housing units to be provided for the project is still unclear at this time. This matter should be clarified by unilateral agreement or contract zoning at the time of rezoning.

F. DETERMINATION

Based upon our analysis, the Department of General Planning has determined that the Final EIS is acceptable under the procedures established in Chapter 343, HRS, subject however to resolution the issues highlighted in the previous Section E "Unresolved Issues."

[Signature]

DONALD A. CLEGG
Chief Planning Officer
Final Environmental Impact Statement

Wailuna IV
Waiau, Ewa District, Oahu, Hawaii

The Lusk Company
March 1988
Prepared by Environmental Communications, Inc.
FINAL ENVIRONMENTAL IMPACT STATEMENT

WAILUNA IV

Waiau, Ewa District, Oahu, Hawaii

March 1988

Prepared for
The Lusk Company

by

Environmental Communications, Inc.

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

MAR 18 1988
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. SUMMARY</td>
<td>I-1</td>
</tr>
<tr>
<td>II. PURPOSE</td>
<td>II-1</td>
</tr>
<tr>
<td>III. PROJECT DESCRIPTION AND STATEMENT OF OBJECTIVE</td>
<td>III-1</td>
</tr>
<tr>
<td>A. Location of the Proposed Project</td>
<td>III-1</td>
</tr>
<tr>
<td>B. Project Description</td>
<td>III-1</td>
</tr>
<tr>
<td>C. Statement of Objectives</td>
<td>III-1</td>
</tr>
<tr>
<td>D. Project Phasing and Cost</td>
<td>III-4</td>
</tr>
<tr>
<td>IV. ALTERNATIVES CONSIDERED</td>
<td>IV-1</td>
</tr>
<tr>
<td>1. Proposed Use</td>
<td>IV-1</td>
</tr>
<tr>
<td>2. Alternative Residential Uses</td>
<td>IV-1</td>
</tr>
<tr>
<td>3. No Action</td>
<td>IV-1</td>
</tr>
<tr>
<td>V. AFFECTED ENVIRONMENT</td>
<td>V-1</td>
</tr>
<tr>
<td>A. Geographical Characteristics</td>
<td>V-1</td>
</tr>
<tr>
<td>1. Topography</td>
<td>V-1</td>
</tr>
<tr>
<td>2. Soils</td>
<td>V-1</td>
</tr>
<tr>
<td>B. Hydrological Characteristics</td>
<td>V-2</td>
</tr>
<tr>
<td>1. Surface Water</td>
<td>V-2</td>
</tr>
<tr>
<td>2. Drainage</td>
<td>V-3</td>
</tr>
<tr>
<td>3. Flood Insurance Study Designation</td>
<td>V-3</td>
</tr>
<tr>
<td>4. Wetlands Protection</td>
<td>V-3</td>
</tr>
<tr>
<td>5. Coastal Zone Management</td>
<td>V-3</td>
</tr>
<tr>
<td>C. Biological Characteristics</td>
<td>V-4</td>
</tr>
<tr>
<td>1. Flora</td>
<td>V-4</td>
</tr>
<tr>
<td>2. Fauna</td>
<td>V-5</td>
</tr>
<tr>
<td>D. Historic and Archaeological Characteristics</td>
<td>V-6</td>
</tr>
<tr>
<td>1. Historical Setting</td>
<td>V-6</td>
</tr>
<tr>
<td>2. Previous Archaeological Work</td>
<td>V-6</td>
</tr>
<tr>
<td>3. Survey Results</td>
<td>V-6</td>
</tr>
<tr>
<td>E. Existing Roadways and Traffic</td>
<td>V-7</td>
</tr>
<tr>
<td>1. Roadway System</td>
<td>V-8</td>
</tr>
<tr>
<td>2. Existing Traffic Conditions</td>
<td>V-9</td>
</tr>
<tr>
<td>F. Ambient Air Quality</td>
<td>V-10</td>
</tr>
<tr>
<td>G. Ambient Traffic Noise</td>
<td>V-12</td>
</tr>
<tr>
<td>H. Existing Infrastructure and Utilities</td>
<td>V-12</td>
</tr>
<tr>
<td>1. Water Supply</td>
<td>V-12</td>
</tr>
<tr>
<td>2. Existing Sanitary Sewage Disposal</td>
<td>V-13</td>
</tr>
<tr>
<td>I. Existing Public Facilities and Services</td>
<td>V-13</td>
</tr>
<tr>
<td>1. Police Service</td>
<td>V-13</td>
</tr>
<tr>
<td>2. Fire Protection</td>
<td>V-13</td>
</tr>
<tr>
<td>3. Public Educational Facilities</td>
<td>V-14</td>
</tr>
<tr>
<td>4. Recreational Facilities</td>
<td>V-14</td>
</tr>
</tbody>
</table>
Table of Contents (Continued)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>VI. RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS</td>
<td></td>
</tr>
<tr>
<td>A. Federal</td>
<td></td>
</tr>
<tr>
<td>B. State</td>
<td></td>
</tr>
<tr>
<td>1. Hawaii State Plan</td>
<td></td>
</tr>
<tr>
<td>Section 226-5 Objectives and Policies for Population</td>
<td>VI-1</td>
</tr>
<tr>
<td>Section 226-6 Objectives and Policies for the Economy in General</td>
<td>VI-2</td>
</tr>
<tr>
<td>Section 226-7 Objectives and Policies for the Economy-Agriculture</td>
<td>VI-2</td>
</tr>
<tr>
<td>Section 226-12 Objectives and Policies for the Physical Environment Scenic, Natural Beauty, and Historic Resources</td>
<td>VI-2</td>
</tr>
<tr>
<td>Section 226-13 Objectives and Policies for the Physical Environment-Land, Air, Water Quality</td>
<td>VI-2</td>
</tr>
<tr>
<td>Section 226-15 Objectives and Policies for Facility Systems-Solid and Liquid Wastes</td>
<td>VI-3</td>
</tr>
<tr>
<td>Section 226-16 Objectives and Policies for Facility Systems-Water</td>
<td>VI-3</td>
</tr>
<tr>
<td>Section 226-17 Objectives and Policies for Facility Systems-Transportation</td>
<td>VI-3</td>
</tr>
<tr>
<td>Section 226-18 Objectives and Policies for Facility Systems-Energy/Telecommunications</td>
<td>VI-4</td>
</tr>
<tr>
<td>Section 226-19 Objectives and Policies for Socio-Cultural Advancement-Housing</td>
<td>VI-4</td>
</tr>
<tr>
<td>Section 226-20 Objectives and Policies for Socio-Cultural Advancement-Health</td>
<td>VI-4</td>
</tr>
<tr>
<td>Section 226-21 Objectives and Policies for Socio-Cultural Advancement-Education</td>
<td>VI-4</td>
</tr>
<tr>
<td>Section 226-23 Objectives and Policies for Socio-Cultural Advancement-Leisure</td>
<td>VI-5</td>
</tr>
<tr>
<td>Section 226-104 Population Growth and Land Resources Priority Guidelines</td>
<td>VI-5</td>
</tr>
<tr>
<td>Section 226-106 Affordable Housing, Priority Guidelines for the Provision of Affordable Housing</td>
<td>VI-5</td>
</tr>
<tr>
<td>2. State Functional Plan</td>
<td>VI-5</td>
</tr>
<tr>
<td>3. State Land Use</td>
<td>VI-6</td>
</tr>
<tr>
<td>4. H.R.S. Chapter 205-A Coastal Zone Management (CZM)</td>
<td>VI-6</td>
</tr>
<tr>
<td>C. City and County</td>
<td></td>
</tr>
<tr>
<td>1. General Plan of the City and County of Honolulu</td>
<td>VI-6</td>
</tr>
<tr>
<td>2. Development Plan</td>
<td>VI-7</td>
</tr>
<tr>
<td>3. City and County Zoning</td>
<td>VI-7</td>
</tr>
</tbody>
</table>
Table of Contents
(Continued)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES</td>
<td></td>
</tr>
<tr>
<td>A. Impact on Geographic Characteristics</td>
<td></td>
</tr>
<tr>
<td>1. Erosion</td>
<td>VII-1</td>
</tr>
<tr>
<td>2. Stability</td>
<td>VII-2</td>
</tr>
<tr>
<td>3. Expansion Potential</td>
<td>VII-2</td>
</tr>
<tr>
<td>B. Impact on Hydrological Characteristics</td>
<td>VII-3</td>
</tr>
<tr>
<td>C. Impact on Flora and Fauna</td>
<td>VII-5</td>
</tr>
<tr>
<td>D. Impact on Historical and Archaeological Characteristics</td>
<td>VII-5</td>
</tr>
<tr>
<td>E. Social and Economic Impacts</td>
<td></td>
</tr>
<tr>
<td>1. Demographic Impact</td>
<td>VII-6</td>
</tr>
<tr>
<td>2. Economic Impact</td>
<td>VII-6</td>
</tr>
<tr>
<td>3. Housing Impact</td>
<td>VII-7</td>
</tr>
<tr>
<td>F. Impact on Traffic Conditions</td>
<td></td>
</tr>
<tr>
<td>1. Project Traffic Impacts</td>
<td>VII-7</td>
</tr>
<tr>
<td>2. Regional Impacts</td>
<td>VII-8</td>
</tr>
<tr>
<td>G. Impact on Air Quality</td>
<td>VII-9</td>
</tr>
<tr>
<td>H. Impact on the Noise Environment</td>
<td>VII-10</td>
</tr>
<tr>
<td>I. Impact on Infrastructure and Utilities</td>
<td></td>
</tr>
<tr>
<td>1. Storm Drainage System</td>
<td>VII-12</td>
</tr>
<tr>
<td>2. Water Supply</td>
<td>VII-13</td>
</tr>
<tr>
<td>3. Sanitary Sewage Disposal</td>
<td>VII-13</td>
</tr>
<tr>
<td>J. Impact on Public Facilities and Services</td>
<td></td>
</tr>
<tr>
<td>1. Police</td>
<td>VII-14</td>
</tr>
<tr>
<td>2. Fire</td>
<td>VII-14</td>
</tr>
<tr>
<td>3. Public Educational Facilities</td>
<td>VII-14</td>
</tr>
<tr>
<td>4. Recreational Facilities</td>
<td>VII-15</td>
</tr>
<tr>
<td>5. Electrical Utilities</td>
<td>VII-15</td>
</tr>
<tr>
<td>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</td>
<td>VIII-1</td>
</tr>
<tr>
<td>IX. ANY PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED</td>
<td>IX-1</td>
</tr>
<tr>
<td>X. SUMMARY OF UNRESOLVED ISSUES</td>
<td>X-1</td>
</tr>
<tr>
<td>XI. LIST OF ORGANIZATIONS AND AGENCIES CONSULTED AND LIST OF EIS PREPARERS</td>
<td>XI-1</td>
</tr>
<tr>
<td>XII. COMMENTS AND RESPONSES</td>
<td>XII-1</td>
</tr>
<tr>
<td>XIII. LIST OF ORGANIZATIONS AND AGENCIES CONSULTED DURING THE DEIS CONSULTATION PERIOD AND LIST OF EIS PREPARERS</td>
<td>XIII-1</td>
</tr>
<tr>
<td>XIV. COMMENTS AND RESPONSES</td>
<td>XIV-1</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Location Map</td>
<td>III-2</td>
</tr>
<tr>
<td>2</td>
<td>Conceptual Project Plan</td>
<td>III-3</td>
</tr>
<tr>
<td>3</td>
<td>Development Plan</td>
<td>VI-8</td>
</tr>
</tbody>
</table>

APPENDICIES

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Biological Study - Char and Associates</td>
</tr>
<tr>
<td>B</td>
<td>Archaeological Study - Bishop Museum</td>
</tr>
<tr>
<td>C</td>
<td>Traffic Study - Parsons Brinckerhoff Quade &amp; Douglas, Inc.</td>
</tr>
<tr>
<td>D</td>
<td>Air Quality Study - Barry D. Root</td>
</tr>
<tr>
<td>E</td>
<td>Noise Study - Y. Ebisu &amp; Associates</td>
</tr>
<tr>
<td>F</td>
<td>Social Impact - Environment Capital Managers, Inc.</td>
</tr>
<tr>
<td>G</td>
<td>Stormwater Drainage - Gordon L. Dugan</td>
</tr>
<tr>
<td>H</td>
<td>Soil Report - Harding Lawson Associates</td>
</tr>
</tbody>
</table>
I. SUMMARY

CHAPTER 343, HRS
FINAL ENVIRONMENTAL IMPACT STATEMENT

Action: Applicant

Applicant: The Lusk Company

Landowner: Kamehameha Schools/Bernice Pauahi Bishop Estate

Project Name: Wailuna IV Development

Project Description: The proposed project represents the fourth increment of the existing Lusk Wailuna Development. The proposed project will include the construction of 180 single-family residential condominium units and all appurtenant infrastructure on approximately 26 acres. The 1,500 square foot units, including garages will be sited on 4,000 square foot minimum condominium lots which are comparable to the Patio Home units developed in Increment III.

Project Location: Mauka of the existing Wailuna Development, off Kaahumanu Street, Ewa, Oahu.

Area: 26 acres

Tax Map Key: 9-8-02: por. 3

Existing Use: The project site consists of fallowed sugar cane lands.

I-1
State Land Use: Conservation

Development Plan
Designation: 
   a. Land Use Map: Preservation
   b. Public Facilities Map: None

Zoning: P-1 Preservation

Accepting Authority: Department of General Planning

Agent: Community Planning, Inc.

Contact Person: Environmental Communications, Inc.
Attention: F. J. Rodriguez
P.O. Box 536
Honolulu, Hawaii 96809
Phone: 521-8391

Summary: The proposed project represents the fourth increment of the existing Lusk Wai'aluwa Development Masterplan. The proposed project will include the construction of 180 single-family residential condominium units and all appurtenant infrastructure on approximately 26 acres.

The 1,500 square foot units, including garages will be sited on 4,000 square foot minimum condominium lots which are comparable to the Patio Home units developed in Increment III. Typical units will consist of 3 bedroom and 2 baths and will be sold at average sales prices of $160,000, 1987 market value.

The site is a relatively flat area on the crest of a ridge on the southern flank of the Koolau

I-2
Mountain Range of Oahu. There are major drainages in deep gulches on either side of the site. Within the site is a small gulch with a drainage area. To the extent possible, this site will be utilized and developed for housing purposes. This will be dependent upon more detailed Soils, Engineering, and other analysis. Slopes range from about 10 percent in the flat areas on the ridge tops to about 50 percent on the sides of the gulches.

There is a paved road along the highest ridge on the northern edge of the site. Previous agricultural use consisted of sugar cultivation on approximately 25% of the site, under the Oahu Sugar Company management. At the present time, grazing rights are leased by the landowner, the Bishop Estate.

The project will affect the air and noise environment as well as increase the demand for traffic, drainage, water and other utilities; however, these changes are typical of developments of this nature.

Long-term impacts, beneficial and adverse, result from the implementation and operation of the proposed project. No geological, soils or climatic impacts are expected to occur as a result of the proposed project. Topographic alterations should be limited to grading and infrastructure requirements. Hydrological impacts should also be limited to increased demand on existing drainage systems and additional offsite surface runoff.
Flora and fauna are not expected to be significantly impacted although some may be displaced during the construction period. Former agricultural use of the site makes the presence of any rare or endangered species of fauna or wildlife unlikely. This former use has also significantly disturbed the topography, therefore, no archaeological features are likely to be found on-site.

No significant environmental impacts are expected to occur as a result of the proposed project. Mitigation measures for any minor impacts will be utilized wherever practicable.
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.

The initial action required for this project involves a Development Plan amendment from Preservation usage to Low Density Apartment designation in keeping with the adjacent urban use of the area. The document will be reviewed by the City and County Department of General Planning.
III. PROJECT DESCRIPTION AND STATEMENT OF OBJECTIVES

A. Location of the Proposed Project

The proposed project will be located mauka of the existing Wailuna Developments. The site which is off Kaahumanu Street in Walau, Ewa District of Oahu is identified as TMK 9-8-02; por. 3 and consists of approximately 26 acres (Figures 1 & 2).

B. Project Description

The proposed project represents the fourth increment of the existing Lusk Wailuna Development Masterplan. The proposed project will include the construction of 180 single-family residential condominium units and all appurtenant infrastructure on approximately 26 acres.

The 1,500 square foot units, including garages, will be sited on 4,000 square foot minimum condominium lots which are comparable to the Patio Home units developed in Increment III. Typical units will consist of 3 bedroom and 2 baths and will be sold at average sale prices of $160,000, 1987 market value.

C. Statement of Objectives

The applicant is seeking to provide more homes for the State's growing population (particularly in the Primary Urban Center) by continuing its development on Bishop Estate land in Walau, off Kaahumanu Street adjoining and mauka of the existing Wailuna communities. The applicant is desirous of satisfying the need to meet the demands for "market housing" in this area, as well as to provide affordable housing in negotiation with the Department of Housing and Community Development.
CONCEPTUAL PROJECT PLAN

FIGURE 2
D. Project Phasing and Cost

The proposed project is expected to be completed in one continuous phase in 1993. The total cost of the proposed project is approximately $27,000,000 (1987 Dollars), all of which will be assumed by the developer. The proposed project will not involve the use of County funds.
IV. ALTERNATIVES CONSIDERED

1. Proposed Use

This alternative would result in implementation of the proposed project and would represent further development of the Walluna Masterplan. This increment is planned to be the final phase of residential development at the Walluna site.

2. Alternative Residential Uses

Alternative residential uses, which would consist of higher density residential uses, have not been seriously considered since such uses would constitute higher intensities and would not be in keeping with the character of the surrounding community or the Walluna Masterplan.

3. 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. Weeds and grasses would cover the vacant portions of the site. However, this use would generally be inconsistent with the surrounding residential developments.

Non-use would render the properties useless to the landowner and the tremendous waste of valuable land adjacent to urbanized areas would not provide any benefit to the surrounding communities or the State at large.

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

A. Geographical Characteristics

1. Topography

The project site is located on gentle to steeply sloped lands. The site which consists of fallowed sugar cane lands, is clear of any abandoned structures or topographic variations. The site is located on a ridge on 600 to 800 foot mean sea level elevations. The Wai'au Gulch and Punanani Gulch are found on the northern and southern sides respectively. There is an unnamed gulch on the proposed development site which is the existing drainage way for runoff leaving the subject parcel. This on-site gulch will be filled in at the time of development and approved drainage improvements will convey runoff to the major gulches on each of the project site.

The site is a relatively flat area on the crest of a ridge on the southern flank of the Koolau Mountain Range of Oahu. There are major drainages in deep gulches on either side of the site. Within the site is a small gulch with a drainage area that roughly coincides with the area to be developed. Slopes range from about 10 percent in the flat areas on the ridge tops to about 50 percent on the sides of the gulches. There is a paved road along the highest ridge on the northern ridge of the site.

2. Soils

The site is covered by various types of vegetation including grasses, bushes, shrubs, and large trees. The rock beneath the site is basaltic lava of the Koolau Volcanic series. The original slopes of the volcano are reflected by the flat parts
of the ridges. The gulches are formed by stream flow on the slopes. The rock has been subjected to weathering and there is a mantle of residual soil at the ground surface underlain by soil that displayed the relict structure of the rock. Soil with the parent rock's structure is known as saprolite. The residual soil observed at the site is about 1/2 to 1 foot thick. The saprolite is probably many hundreds of feet thick and underlain by less-weathered rock.

Samples of the residual soil were collected at the site and Atterberg limits tests performed for classification purposes. According to the Unified Soil Classification System, the soil is a silt (ML) and (MH), similar to soils encountered in the previous Waïuna developments.

According to the Soil Conservation Service, the soils are in the Manana and Helemano Soil Series. These soils are in Soil Erosion Resistance Groups II and I, respectively, which are the least erodible of the four groups. Soils on steep slopes are more erodible because of higher runoff velocity.

The soil survey consultants have indicated that in adjacent areas, the soils and saprolite are stiff to very stiff in their natural condition and have moderate to high shear strength and low to moderate expansion potential. During the reconnaissances, no evidence of slope instability was observed on either natural slopes or cut slopes by the sides of roadways.

B. Hydrological Characteristics

1. Surface Water

There are no perennial streams or surface water features on site, however, intermittent streams can be found in the adjacent Waiau and Punanani Gulches.
Annual rainfall onsite is approximately 50 inches (Giambelluca et al. 1984). An established drainage pattern is on the site and provides drainage from lands mauka of the proposed site.

2. **Drainage**

The proposed project is located slightly over 2 miles in a northerly direction from East Loch, Pearl Harbor. The drainage from the proposed site is a portion of the nearly 90 square mile area that drains into Pearl Harbor; however on a subdrainage basis, 23 acres of the project site drains to Punanani Gulch while the remaining 3 acres drains to Waiau Gulch located on the north and west side of the project. The tributary drainage areas to Punanani Gulch and the Waiau Gulch at the project site are 1300 and 3000 acres, respectively, and both eventually drain to East Loch; Punanani Gulch via Waimalu Stream, and Waiau Gulch by a series of unlined and lined drainageways and channels (Community Planning, Inc. 1987).

3. **Flood Insurance Study Designation**

The project site lies within the National Flood Insurance Program Flood Insurance Rate Map Designation of Zone D, an area in which flood hazards are undetermined.

4. **Wetlands Protection**

The project site is not within a wetland area.

5. **Coastal Zone Management**

The site is not located within a coastal zone Special Management Area.
C. Biological Characteristics

A biological survey for the project was conducted by Char & Associates and is summarized below.

The site has been disturbed for some time, first by sugar cane cultivation, and, later by a macadamia nut orchard and grazing. As a result, the biota on the site is represented largely by introduced or foreign species. No rare, threatened or endangered plants or animals were found on the project site during the course of this survey.

1. Flora

The project site was formerly planted in sugar cane and in areas where the soil horizon is exposed there is a layer stained black with charcoal. Sugar cane cultivation was apparently abandoned many years ago and the site then used for a macadamia nut grove. The grove too has since been abandoned and a weedy scrub association has filled in the matrix between the trees. The western portion of the property, along the Waimalu boundary, is covered by grassland with scattered shrubs and appears to still be used for grazing. The soil is very deep, with few stones, perhaps as a consequence of the sugar cultivation. Along the Diamond Head-makai (southeast) corner of the site, severe soil erosion has exposed perhaps eight to ten feet of the soil column.

While there are three vegetation types on the site, they are not generally distinct, but represent successive stages in plant predominates in the lower portion along the roadside. The forest canopy varies from 25 to more than 40 feet in height, with the understory about one-half as high. The macadamia trees are mature to senescent, many having lost their original trunks and subsequently resprouting from near
the base. Under the macadamia trees, the combination of deep shade and heavy pig disturbance has eliminated almost all ground cover. Where the macadamia trees have died, the understory consists of the same plants that constitute the scrub vegetation. Just north of the powerline which crosses the site, there appears to be an old well and house site. A number of exotic ornamentals persist here, but are not significant constituents of the vegetation.

A comprehensive list of the plant species found during this survey is presented in Appendix A.

2. Fauna

A total of ten avian (bird) species were recorded during the project survey. The birds generally prefer the forest and scrub areas on the project site. The Japanese White-eye was abundant during the early morning hours, foraging among the albizia trees. Later in the day, the two cardinal species and the Red-vented Bulbul became more numerous. Although not observed during this survey, game birds such as francolin and possibly pheasant as well as a number of mallard (or munia) species are expected to visit the grassland area.

Feral pigs appear to frequent the site on a regular basis. Evidence of rooting was observed in the grassland, scrub, and forested areas. Plant species which provide edible fruit (guava, strawberry guava, passion fruit, macadamia nut) appear to be visited regularly as evidenced by well-worn pig trails.

Although the grassland was used for grazing horses, no animals were observed during the survey. Cattle from neighboring parcels may occasionally stray onto the property.
D. Historic and Archaeological Characteristics

An Archaeological Reconnaissance Survey for the project area was conducted by the Bishop Museum and is summarized below and is attached as Appendix B.

1. Historical Setting

In 1899, Honolulu Plantation Company began operation (Best 1973: 313). The property consisted of about 9,000 acres and its upper limits were at the 198 meter (650 feet) contour level (Evening Bulletin, Industrial Edition 1901: 5). From a period of 1906 to 1914, Honolulu Plantation Company harvested an average of about 19,000 tons per year (Directory 1914: 26). Oahu Sugar Company eventually took control in 1947 (Best 1973: 313).

2. Previous Archaeological Work

The literature search produced no previous archaeological work conducted in Walau. The nearest area where previous work took place was in the next ʻahupuaʻa (major land division) to the southeast, Waimalu (pers. comm. Joyce Bath, Hawaii State archaeologist). A rockshelter (State No. 80-09-1169), located on the southern slope of Waimalu gulch at an elevation of 61 meters (200 feet) was excavated by Dr. Everett Frost in 1976. As of yet, there is no written report.

Handy and Handy discuss in general terms the Ewa district, noting the area's agriculture, legends, abundance of productivity in Pearl Harbor, and as an established place of political power (Handy 1972: 469-473).

3. Survey Results

Extensive prior disturbance, mainly bulldozer activity is
indicated. Several bulldozer backdirt mounds, cuts and tracks were observed throughout the project area. Also, the area is conspicuously devoid of rocks. The few that are present are either on the bulldozer mounds, along with modern trash, or exposed through erosion on the slopes of the gully. The secondary growth of lantana and Christmas berry found throughout the project area is another indicator of recent disturbance. Moreover, large macadamia nut trees planted in rows indicate an orchard was present at one time.

One recent feature has been found near a banyan tree (Ficus sp.) about 244 meters northeast of the metal gate and 15 meters southeast of the Kaahumanu Street extension. It appears to be a cement cistern sunken in the ground. It measures 3.5 meters in diameter and the concrete roof extends 30 centimeters above the ground surface. The condition of the feature is fair.

About 18 meters southwest of the cistern, near a small stand of eucalyptus trees, is another feature, a collapsed wooden structure. It measures about 13 x 9 meters, oriented on an east-west axis. Due to deterioration and bulldozer activity, it is difficult to determine its exact dimensions. One-gallon jugs, window glass, pieces of stoneware, bits of concrete, fragments of bottle glass, rubber hoses, and a small metal wash tub are in and around the feature. The condition of this feature is very poor.

The spatial relationship, type, and construction of these features indicate that the two structures were associated and probably share common modern origins.

E. Existing Roadways and Traffic

A Traffic Impact Study prepared by Parsons, Brinkerhoff, Quade & Douglas, Inc. was prepared for the proposed project. The study, attached as Appendix C, is summarized below:
1. **Roadway System**

The project site has no existing public access. In the future, the site would be served by the mauka extension of Kaahumanu Street.

Kaahumanu Street, a collector road, runs between the existing Walluna Development and Blaisdell Park at Kamehameha Highway. For most of its length, the Kaahumanu Street right-of-way is 80 feet, which allows two travel lanes in each direction with a parking lane and sidewalk on each side. This road has three signalized intersections: at Komo Mai Drive, at Moanalua Road, and at Kamehameha Highway; all the signals are demand-actuated. Separate turn lanes at intersections are provided by limiting on-street parking at approaches.

Komo Mai Drive links the Pearl City and Newtown communities. At the Kahumanu Street intersection, mauka bound approach is striped with an optional left turn lane and a separate right turn lane; the makai bound approach has a similar configuration, except that the right turn lane results from the lack of parked vehicles alongside the fire station instead of pavement striping.

Moanalua Road services many residential units and commercial uses along the corridor connecting Pearl City with Aiea town. Within the local communities, Moanalua Road also provides an alternative route to the regional H-1 and Moanalua Freeways and Kamehameha Highway. At Moanalua Road, the Kaahumanu Street mauka bound approach allows separate left and right turn lanes with two through lanes. The makai bound approach designates a single lane for each left, through, and right turn movement. In this area Moanalua Road provides two travel lanes in each direction; separate left turn storage bays are striped at the Kaahumanu Street intersection.
Kamehameha Highway is a primary arterial supplementing the H-1 freeway. East-west commuter flows are highly evident during the AM and PM periods. The neighboring commercial uses along this highway also contribute to the traffic flows, especially to the turning movement volumes at the intersections.

2. **Existing Traffic Conditions**

Manual traffic counts and observations taken during the latter part of October 1987 serve as the basis of this discussion on the existing traffic conditions. The AM and PM peak hour differed with each intersection; the roadways that carry regional traffic tended to have its peak hour at an earlier time than roadways serving mostly local traffic.

The signalized intersections were analyzed by the operational methodology described in the 1985 *Highway Capacity Manual*.

The two-phase traffic signal at the intersection of Komo Mai Drive and Kaahumanu Street is highly responsive to the traffic demand, as indicated by the high Level of Service A during both AM and PM peak hours.

At the Moanalua Road intersection with Kaahumanu Street, the traffic signal provides a protected phase (separate from the opposing through movement) for the left turn movements. The results of the analysis show Level of Service E for left turns from the Kokohead bound, mauka bound and makai bound approaches, indicating that these movements incur long delays. Field observations note that the delays are due to the long signal cycle lengths and that the left turn movements receive adequate green time.

The Level of Service D condition reported for the Moanalua Road intersection (overall) is generally reflective of actual
operating conditions at this intersection; waiting vehicles tended to clear during the next green phase. However, during the AM peak hour, the mauka bound left turn and the makai bound right turn movements were impeded by the queue of vehicles in the Moanalua Road left ewa bound lane desiring to enter the H-1 freeway Kokohead bound on-ramp at Wai'alu Interchange.

At the Kamehameha Highway/Kaahumanu Street intersection, Kamehameha Highway left turns have leading protected phases, while all vehicles from the Kaahumanu Street and Blaisdell Park approaches must execute their movements in the same signal phase. For this intersection, the analysis tends to result in levels of service that were higher than observed for the through traffic on Kamehameha Highway. The traffic signals along Kamehameha Highway are not coordinated, which contributes to the poor progression along this corridor. As a result, many of the platoons from downstream intersections are caught by the red phase at this intersection, while portions of the green phase remain underutilized.

F. Ambient Air Quality

An Air Quality study for the proposed project was conducted by Barry D. Root and is summarized below:

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

Particulate measurements are from Pearl City, about 3 miles southwest of the project site. Sulfur dioxide concentrations were also monitored at the Pearl City location until 1985. Sulfur dioxide data for 1985 and 1986 is from Barbers Point, about 13 miles southwest of Wai'alu.
During 1981 carbon monoxide was measured at Fort DeRussy in Waikiki (about 11 miles southeast of the project), and in 1982 and 1983 carbon monoxide was monitored at Leahi Hospital in Kaimuki, about 13 miles southeast of the project. Carbon monoxide readings from 1984 onward are from the Department of Health building in urban Honolulu, about 10 miles southeast of Wailuna.

Ozone levels were also measured at the Department of Health building until December 1980, when the monitor was relocated to Sand Island (about 8 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 taken at the Department of Health building on South Beretania Street.

From the data presented in the Air Quality study, it appears that State of Hawaii ambient standards for particulates, sulfur dioxide, nitrogen dioxide, and lead are currently being met at nearest monitoring stations to the project site.

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

Concentrations of carbon monoxide are more directly related to vehicular emissions and tend to be highest during periods of rush hour traffic. Carbon monoxide would thus be the pollutant most likely to cause difficulty in meeting allowable Air Quality Standards as a result of new residential development in leeward Oahu.
G. Ambient Traffic Noise

A Traffic Noise study was conducted by Y. Ebisu & Associates and is summarized below:

AM and PM peak hour traffic volumes, speeds, and mix assumptions for the existing period, with computed hourly equivalent noise (Leq) at 50 Ft. distance from the centerlines of the Kaahumanu Street sections which will service project traffic are attached in Appendix E. Calculated Day-Night Average Sound Levels (Ldn) at 50 Ft. distance from the roadway's centerline are also shown. For those homes which benefit from the shielding effects of existing walls along Kaahumanu Street, the existing traffic noise levels at these residences are probably 5 to 10 Ldn units less than those without these buffering features. The existing setback distances of the 60, 65, and 70 Ldn contours from the centerline of the street for various street segments from the project site to Kamehameha Highway are shown in the Appendix for worst case, unobstructed conditions. Existing traffic noise levels are in the FHA/HUD "Acceptable, Moderate Exposure" category at residences fronting Kaahumanu Street and north of Komo Mai Drive. Also in the "Acceptable" category are those residences fronting Kaahumanu Street and south of Komo Mai Drive which are shielded from traffic noise by 6 Ft. high walls. Those residences which are not shielded by walls and which are within the setback distances to the existing 65 Ldn contours are in the FHA/HUD "Normally Unacceptable, Significant Exposure" category.

H. Existing Infrastructure and Utilities

1. Water Supply

The project site, although undeveloped, is traversed by an existing 16-inch water main, from Kaahumanu Street. The water main serves as the transmission pipe for the upper
Board of Water Supply's Waialua "850" Reservoir located on Parcel 32 of TMK: 9-8-02. Water for the reservoir is pumped from a lower municipal storage tank, Waialua "550" Reservoir, whose water, in turn, is pumped from the Waialua "285" Reservoir located on Komo Mai Drive. Within the "285" Reservoir site are located several deepwells which provide the water source for the system.

2. **Existing Sanitary Sewage Disposal**

An existing underground 8-inch sanitary sewer extends to the upper end of Kaahumanu Street at the boundary of the project site. Sewage collected by the pipeline is conveyed by existing municipal sewer mains to the wastewater pump station in lower Pearl City. From there it is pumped to the Ho'ouluwili Wastewater Treatment Plant with the effluent discharged by outfall into the Pacific Ocean.

I. **Existing Public Facilities and Services**

1. **Police Service**

The Honolulu Police Department currently services the area through the Pearl City Station and has indicated that the proposed project will not affect the level of police services for the area.

2. **Fire Protection**

Primary fire protection for the area is provided by engine and ladder companies from the Waialua Fire Station. Additional service is available from the Aiea and Pearl City Fire Stations. The Fire Chief has indicated that existing services can adequately accommodate the proposed project.
3. Public Educational Facilities

Waialualu Elementary, Aiea Intermediate, and Aiea High School currently serve the area. Coordination between the Department of Education and the project developer is expected to produce adequate services and facilities to accommodate the increase in student enrollment.

4. Recreational Facilities

Presently, the previous three Waialualu increments have provided recreational amenities for its residents and it is expected that Waialualu IV will also provide to the recreational facility inventory. The applicant will coordinate with the Department of Parks and Recreation to address Park Dedication requirements.
VI. RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

A. Federal

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

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 Wailuna IV project is consistent with many of the goals and policies of the Hawaii State Plan and has been designed to facilitate its objectives. The project's relationship to these plans are presented below:

Section 226-5 Objectives and Policies for Population

The proposed Wailuna IV project represents a housing increase of approximately 180 new housing units or 450-500 persons. Demographic
Analysis for the project (Appendix F) indicates the increase should not significantly impact the area. The majority of future project residents are expected to come from other parts of the island representing a population shift rather than net increase.

Section 226-6 Objectives and Policies for the Economy in General

Development of the proposed project will directly benefit the economy in construction, real estate opportunities, and tax revenues.

Section 226-7 Objectives and Policies for the Economy-Agriculture

The project site is currently designated for Conservation on the State Land Use Classification Map. The project will not have any agricultural impact.

Section 226-12 Objectives and Policies for the Physical Environment-Scenic, Natural Beauty, and Historic Resources

The project plan will generally follow the natural contours of the site and will be designed to be aesthetically pleasing and compatible with the surrounding area.

Section 226-13 Objectives and Policies for the Physical Environment-Land, Air Water Quality

The project site will be cleared with some grading and site clearing, however, no significant environmental impacts are expected from this action. Air quality will be adverse to some extent to the additional vehicular traffic generated by the project.
Water quality impacts will be minimal due to implementation of an effective potable water and drainage systems.

Section 226-15 Objectives and Policies for Facility Systems—Solid and Liquid Wastes

Wastewater generated by the proposed project will utilize the existing sewerage system which connects to the wastewater pump station in lower Pearl City. Solid waste will be collected by governmental or private refuse collection services.

Section 226-16 Objectives and Policies for Facility Systems—Water

Potable water for the project has been appropriated by the Board of Water Supply. The project, which is expected to have an average daily demand of 90,000 gpd, will be serviced by the existing Waiau Reservoir system.

Section 226-17 Objectives and Policies for Facility Systems—Transportation

The proposed project will add to traffic volumes around the project site, however, the project traffic report has indicated that the demand actuated traffic signals should accommodate the additional project generated traffic. Net impact on the regional system will represent less than a one percent increase.
Section 226-18 Objectives and Policies for Facility Systems—Energy/Telecommunications

Energy and telecommunication facilities necessary for the development will be planned and coordinated with the appropriate agencies and public utilities.

Section 226-19 Objectives and Policies for Socio-Cultural Advancement—Housing

The Walluna IV project will provide a notable number of affordable and market housing units to the Master Planned Walluna community. The developers previous experience in the area and the project integral function in the Masterplan should insure units of high quality and value.

Section 226-20 Objectives and Policies for Socio-Cultural Advancement—Health

Medical and health care facilities are currently available in Pearl City, Aiea, Moanalua and Waipahu with emergency services provided by the Kaiser Moanalua Hospital.

Section 226-21 Objectives and Policies for Socio-Cultural Advancement—Education

Education facilities currently serving the project site are: Waimalu Elementary, Aiea Intermediate, and Aiea High School. Coordination between the applicant and the Department of Education will insure that facilities to accommodate the additional demand will be available.
Section 226-23 Objectives and Policies for Socio-Cultural Advancement-Leisure

Recreational facilities to meet park dedication requirements will be provided by the developer. Coordination between the developer and the Department of Parks and Recreation will insure compliance with this requirement.

Section 226-104 Population Growth and Land Resources Priority Guidelines

The proposed project will result in land use change of conservation land to urban usage. The site was formerly used for sugar cane cultivation; however, the surrounding area has been converted to urban use. The proposed project will be consistent with the present surrounding usages and should not be environmentally critical.

Section 226-106 Affordable Housing, Priority Guidelines for the Provision of Affordable Housing

The proposed project will consist of the development of 180 affordable and market units. Coordination between State and County agencies will be utilized in developing guidelines for establishing specific housing target inventories.

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. The following plans were reviewed to determine their applicability and relationship to the proposed project and are found to be generally compatible without any significant conflicts for: Agriculture, Education, Energy, Health, Historic Preservation, Housing, Recreation, Transportation, and Water Resources.

3. State Land Use

All land in the State of Hawaii have been classified into four classifications by the State Land Use Commission. These classifications are Urban, Rural, Agricultural, and Conservation. The proposed project lies within the Conservation District and will require a land use boundary amendment for Urban use.

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

The project site is subject to provisions of the CZM and is, therefore, subject to H.R.S. Chapter 205-A's objectives and policies. The project site is not designated as a Special Management Area, so no permits will be required pursuant to Chapter 205-A.

C. City and County

1. General Plan of the City and County of Honolulu

The General Plan of the City and County of Honolulu provides a statement of long range social, economic, environmental, and design objectives for the Island of Oahu as well as a statement of policies necessary to meet these objectives. The proposed project is generally in conformance with the Economic Activity,
Population, Natural Environment, Transportation and Utilities, Physical Development and Urban Design, Health and Education, and Culture and Recreation plans and policies, however, the plan for Housing is of particular significance.

Housing Objective A promotes the provision of "decent" housing for all the people of Oahu at prices they can afford. Of this objective, Policies: 1, development of programs and controls which will provide decent homes at the least possible costs; and 3, encourage innovative residential development which will result in lower costs, added convenience and privacy, and the more efficient use of streets and utilities; are premises for the development of the proposed project.

2. Development Plan

The project site is identified on the Primary Urban Center Development Plan Map as Preservation. A Development Plan Land Use Map Amendment for Low Density Apartment is currently being requested from the City and County of Honolulu, Department of General Planning (Figure 3).

3. City and County Zoning

The project parcel is currently zoned P-1 Preservation. A change in the zoning designation for urban use is planned to be obtained from the Department of Land Utilization.
VII. ANTICIPATED IMPACTS AND MITIGATIVE MEASURES

A. Impact on Geographic Characteristics

The upper portion of the site would be cut and graded, and the gulch area will be backfilled to more moderate slopes. Geographic and topographic alterations; cutting, clearing, and grading should be limited to these areas which are established by subsequent engineering, soils, and drainage analysis activities appropriate for residential subdivision purposes. No major impacts are expected from the proposed construction. All earthwork will be conducted using landscaping and other mitigation and good housekeeping measures in conformance with State and City standards. The civil engineering consultant will minimize the anticipated impacts of site stabilization by adhering to the City’s Grading Ordinance and also instructing the general contractor to control the volume of work and extensive grading to periods of time when the weather is conducive to earth moving; i.e. cease work during heavy rains, etc. It is felt that with effective scheduling, the site improvements can be achieved with a minimum of runoff.

Based on the preliminary soil study, it was concluded that the proposed development is feasible from a geotechnical standpoint. The precise developable area would be established and concerns regarding erosion, stability and expansion potential can be mitigated using currently accepted design practices, as discussed below:

1. Erosion

By filling the gulch in the central part of the site and limiting new cut/fill slope inclinations, steep slopes will be eliminated from the site. Site grading will direct surface waters away from slope faces and concentrated flows will be carried in lined drainage channels. These measures will mitigate erosion
concerns. A related concern is that there will be increased runoff below the site; we understand that the runoff can be carried by established drainage systems.

2. **Stability**

By cutting the higher area and filling low areas, overall slope stability will be increased by the planned grading. Keying, benching and subdrainage of sidehill fills are the accepted practices for providing stable fills. Subdrains will also be installed in drainage courses to increase slope stability. Cut and fill slope inclinations will be limited based on the results of future test borings and laboratory testing of soil samples. If cut slopes reveal seepage or other adverse conditions, additional features and sub-surface drains can be installed.

3. **Expansion Potential**

This concern can be mitigated by proper moisture control during grading, and by using less expansive soils in the upper few feet below final grade. If highly expansive areas are encountered at final grade, the upper few feet can be removed and replaced with compacted fill of low expansion potential.

From the point of view of soil properties related to engineering, the proposed site is similar to the adjacent projects at lower elevations on the ridge. Harding Lawson Associates (HLA) has performed similar grading work in the previous phases of Wailuna II and III. To date, these adjacent projects have performed as planned. Recent problems in other areas of Oahu were caused mainly by factors which are not present at Wailuna IV. For example, the recent storm damage in Hawaii Kai was in a valley area subject to large, concentrated runoff flows, while Wailuna IV is located near the top of a ridge.
where watershed area is relatively small. Also, the movements in Manoa occur in weak, saturated "Adobe Clay" soils which are not found at Walluna.

Continuous soil engineering observation during construction is important to mitigate the above concerns and to check for unanticipated conditions. As for the previous Walluna developments, soil engineering services will be provided on a daily basis during construction to observe geotechnical aspects of the work and provide consultation, as necessary.

**B. Impact on Hydrological Characteristics**

Groundwater is not expected to be adversely affected by the proposed project and on-site drainage will be handled by project's infrastructure system. Offsite ecological impacts resulting from alterations on the project site are addressed in the Storm Water Runoff Report attached as Appendix G and summarized below:

The results of the storm water runoff volumes indicated that for the 2-year recurrence interval 1 hour duration storm, the full developed conditions are about a magnitude greater than present (1987) conditions; however, as the storm duration and recurrence interval increases, this difference reduces down to approximately 1.4 times greater for the 100-year, 24-hour storm, which produced the greatest calculated incremental storm runoff volume. At higher rainfall intensities and durations, soil saturation increases, thus more runoff occurs. The increased runoff from the project area will correspondingly result in less groundwater recharge within the site of the project; however, the annual evaporation rate at the project site is greater than the annual median rainfall, thus, groundwater recharge would only be expected during significant storm events. Nevertheless, the total incremental volumes involved from the 26 acre site are relatively small. Consequently the resulting groundwater recharge is essentially negligible.
Constituents transported by storm water runoff are of equal, if not greater, environmental significance than the runoff volumes. The incremental changes per storm event for the present (1987) and full developed project conditions for the various duration and recurrence interval storms indicate that from the least to the greatest amount of rainfall: nitrogen increases for the lower level storms, and then decreases at the higher level storms; phosphorus increases for all storms, but the maximum incremental difference is calculated to be less than 38 lb; while suspended solids increases slightly for the 2- and 10-year recurrence interval 1 hour duration storms and then notably decreases for the remaining 1 and 24-hour storms.

The foregoing hydrologic and water quality aspects were only considered for the present and projected full developed conditions. However, increases in constituent loads could result from construction activities, especially if a significant storm occurs during the interim period between exposed and stabilized soil conditions. Thus, to limit these potential increases it is imperative that strict erosion control measures be adhered to.

Other water quality constituents of general concern include biocides and heavy metals. Typically, the biocides in general use tend to breakdown more readily in comparison to the more long lasting types in past decades. Consequently, except for runoff from agricultural land operations, the types and concentrations are usually considered insignificant. Heavy metals, on the other hand, do apparently increase somewhat as a result of urbanisation; however, a biological study of Pearl Harbor conducted by the U.S. Navy in the early 1970’s concluded that the heavy metal burden in Pearl Harbor was below the level of concern (even though several heavy metal sources that were discharging into Pearl Harbor at that time have since been eliminated), and the major detriment to the marine environment appeared to be silt. As previously noted, the suspended solids load for all, except the lower level 1 hour storm events, are calculated to decrease.
C. Impact on Flora and Fauna

Impact on the biological characteristics of the project site have been discussed in the biological survey conducted for the project (Appendix A) and are summarized below:

Because the site has been disturbed for such a long period of time, it is dominated almost exclusively of introduced or foreign species. No rare, threatened or endangered plant or animal species designated by the federal and/or state governments exist on the site.

The project is not expected to have a significant impact on the fauna of the site as all the species are foreign. Common species such as the Myna and House Sparrow will probably increase in numbers.

While the project will result in loss of vegetation and some faunal habitat, it is expected to have only a minimal impact on the total island populations of the species involved.

D. Impact on Historical and Archaeological Characteristics

The archaeological reconnaissance conducted for the project site (Appendix B) concluded that historic documents researched indicate that the project area was in heavy commercial sugar production. Sugar was cultivated as late as 1947. Sugar cultivation practices like the removal of rocks and the use of Fowler stem plows that cut through the soil to a depth of 91 centimeters (36 inches) accounts for much of the man-made disturbances in the project area (Evening Bulletin, Industrial Edition 1901; 5). More recent disturbances probably occurred with the macadamia nut orchard after commercial sugar production. Since the only features encountered were recent and no other remains of archaeological significance were encountered, no further archaeological work is recommended for the project area.
In the event that any archaeological remains are uncovered during construction, all work will be stopped and the State Historic Preservation Officer will be notified.

E. Social and Economic Impacts

A study of demographic, economic and housing impacts was conducted for the project and is attached as Appendix F. Conclusions of the study are presented below.

1. Demographic Impact

The proposed project will cause the in-migration of approximately 180 new households, or 450-500 persons. Based on the buyer profile of the Wailuna II and Wailuna III projects, the majority of these households will be from other parts of the island. The project will have the effect of raising the overall average family income within the area, while lowering the average household size, but will not be significant due to the proposed 180 units.

Overall, the addition of the proposed 180 new homes and households is not expected to have a significant impact on the area. The increase of the general population level by the additional 450-500 new individuals will not change the character of the neighborhood significantly.

2. Economic Impact

The current trends and projections indicate that the economy of Hawaii and the City and County of Honolulu should fare well in the future. This implies that the employment picture will remain favorable for the existing and projected labor force.
The project will contribute approximately $18 million in private authorizations over a 2-year period. It will also provide short-term employment to approximately 50 persons in the construction service (management, clerical, etc.) fields.

3. Housing Impact

Based on the ability of The Lusk Company Hawaii to develop and previously sell Wailuna I, II, and III, and the foregoing housing impact analysis, there is an adequate potential market for the proposed residential units. These proposed units will alleviate the pent-up demand for housing in the upper moderate income to high income brackets. The "affordable" units that will be built as part of the City's requirements will address some of the housing demand of moderate income families. The effective buying power of this group will be heavily dependent upon the economy's ability to support a higher wage level, while maintaining a moderate growth in the cost of living.

F. Impact on Traffic Conditions

The Traffic Impact study (Appendix C) conducted for the project presented the following summary for project and regional traffic impacts.

1. Project Traffic Impacts

The number of vehicles expected to be generated by the 180 single-family dwelling unit project are based on rates compiled by the Institute of Transportation Engineers. The study assumed the Wailuna IV traffic would have similar travel patterns to the existing development. The existing turning volumes at the intersections were utilized as indicators of direction and distribution of travel; these volumes also take
into account the circuitous and alternative routing to the regional system that exists in this area. Data indicates that with the proposed project, volume-to-capacity ratios would increase. At the intersection of Moanalua Road and Kaahumanu Street, makai bound through and right movements would experience Level of Service E conditions in the AM peak hour.

However, the overall intersection Levels of Service would not change. No mitigation measures would be needed at the three Kaahumanu Street intersections to accommodate project traffic. Improved traffic flow could result from changes in signal operation by timing adjustments and coordination with other traffic signals in the area.

2. Regional Impacts

The proposed project would add traffic to the regional highway system. Comparisons of the project-generated traffic to existing volumes in the area and on the H-1 Freeway were used to indicate the magnitude of this increase.

The total peak hour volume of traffic crossing an imaginary line, or screenline, east of Kaahumanu Street was used for the first comparison. Komo Mai Drive, the H-1 Freeway, Moanalua Road and Kamehameha Highway all cross this screenline. In the AM peak hour, the 1987 eastbound traffic totaled over 13,000 vehicles per hour (vph) across the Kaahumanu-east screenline. Westbound traffic in the AM peak hour was nearly 5,400 vph. The proposed project would add 84 vph eastbound and 22 vph westbound to these volumes, or 0.6% and 0.4%, respectively. In the PM peak hour, 1987 volumes were 12,000 vph westbound and 7,300 vph eastbound. The project traffic volumes of 73 vph westbound and 44 vph eastbound would each be 0.6% of existing volumes.
The traffic increases on the H-1 Freeway from the project is projected to be 36 vph eastbound in the AM peak hour, or 0.4% of the existing traffic on H-1. PM peak hour increase in the westbound direction is projected to be 21 vph, or 0.3% of existing traffic. These increases compare to an average annual increase of traffic on H-1 of 15% (AM eastbound) and 10% (PM westbound) over the last two years. Improved transit service to Leeward and Central Oahu could decrease the rate of growth of traffic volumes in this area.

The State Department of Transportation (SDOT) has plans to add a sixth lane in each direction on H-1 between the Waiau and Halawa Interchanges. The added eastbound lane is expected to improve the merging condition at Waiau Interchange, thereby easing congestion and decreasing delays on the approaches to the on-ramp to Honolulu.

A project to interconnect the traffic signals and to improve traffic flow on Kamehameha Highway has also been proposed by the SDOT. The City and County of Honolulu Department of Public Works is planning to widen a portion of Moanalua Road to relieve congestion near Alea town. These improvements will increase regional capacity to serve the increasing traffic demand; as noted above, less than one percent of the demand would be due to the proposed project.

G. Impact on Air Quality

The Air Quality study conducted for the proposed project is attached as Appendix D and is summarized below.

There will be short-term dust emissions during the construction phase of the development. Adequate control measures such as periodic watering and landscaping exist to limit the scope of this impact, but special care will have to be exerted to insure that

VII-9
nearby residents are not subjected to excessive levels of particulate pollution from construction activities.

Indirect air quality impacts are expected to result from new demands for electrical energy. But this impact is most likely to occur in the vicinity of existing or new power plants such as the Kahe Plant on the Waianae Coast and the H-POWER and other proposed new coal-fired plants in Campbell Industrial Park 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. In the future, new methods of generating electrical power such as wind or ocean thermal energy conversion may eventually also play a mitigative role in this regard.

Traffic generated by Walluna IV will increase emissions of carbon monoxide and nitrogen dioxide in the project area. Detailed carbon monoxide modeling carried out for three critical intersections indicates that State of Hawaii Air Quality Standards could be exceeded near the intersections of Kaahumanu Street with Moanalua Road and Kamehameha Highway under present peak hour traffic conditions and worst case meteorological dispersion conditions. By 1993, the anticipated project completion date, decreased carbon monoxide emissions from newer individual vehicles coupled with a relatively low traffic growth rate in this area will still yield projected worst case levels at these two intersections that are lower than present levels, but still higher than allowable standards, with or without the additional traffic from Walluna IV. The regional scale air pollution impact of Walluna IV traffic is estimated to be minimal.

H. Impact on the Noise Environment

The Traffic Noise study conducted for the proposed project is attached as Appendix E and is summarized below.
Predictions of future traffic noise levels along the Kaahumanu Street sections expected to service the project site were made using the traffic volume projections of Traffic Impact Study. Projected increases in peak hour traffic volumes attributable to the project are small (less than 8 percent) south of Komo Mai Drive and large (greater than 30 percent) north of Komo Mai Drive. Projected increases in traffic noise levels attributable to the project are also small (less than 0.3 Ldn) south of Komo Mai Drive, and moderately significantly (greater than 1.2 Ldn) north of Komo Mai Drive.

South of Komo Mai Drive, where existing traffic noise levels are high, project related traffic is predicted to increase current noise levels by 0.1 to 0.3 Ldn by the Year 1993, and non-project traffic is predicted to increase current noise levels by 0.4 to 0.6 Ldn units. Because computed projected traffic noise increases associated with project traffic are very small, the proposed development is not expected to generate significant traffic noise impacts along the sections of Kaahumanu Street south of Komo Mai Drive.

North of Komo Mai Drive, project related traffic is predicted to increase current noise levels by 1.2 to 58.3 Ldn by the Year 1993, and non-project traffic is predicted to increase current noise levels by 1.7 Ldn. The larger increase of 58.3 Ldn is expected to occur in the now vacant lands adjacent to the project site. The increases in traffic noise levels are predicted to be moderately significant.

However, because of the low volumes of existing traffic to the north of Komo Mai Drive, total traffic noise levels after project completion are not expected to exceed 65 Ldn at 50 Ft. setback distance from the centerlines of the north sections of Kaahumanu Street between Komo Mai Drive and the project entrance. At the project entrance, predicted traffic noise levels at 50 Ft. setback from the centerline of Kaahumanu Street are expected to be 58.3 Ldn, and in the "Acceptable, Moderate Exposure" category. For
these reasons, project related traffic is not expected to generate significant noise impacts along the north section of Kaahumanu Avenue.

Because traffic volume and noise level increases along Kaahumanu Street are predicted to be small or result in total noise levels below FHA/HUD standards, traffic noise mitigation measures are not necessary for mitigating noise impacts which might have resulted from project traffic.

Short term construction noise impacts from construction vehicles and on-site activities may occur with projects of this type. However, State Department of Health permit procedures applicable to construction activities would be applicable to this project, and if followed, should minimize noise impacts resulting from on site construction activities.

I. Impact on Infrastructure and Utilities

1. Storm Drainage System

Urban development of the former agricultural area will increase storm runoff. However, that increase can be considered insignificant since the project's tributary areas of 23 acres and 3 acres are only a relatively small portion of the drainage basins of 1,300 and 3,000 acres. The project's tributary areas represent only about 2.5% and 0.1% of their respective overall drainage areas. Therefore, the storm runoff increase due to urbanization should have an insignificant effect on existing down-stream drainage facilities.

During grading and construction, on-site basins will be used as desilting facilities in the event of storms during that period.

The runoff quantities and ditch/culvert hydraulics will be
prepared and submitted to the appropriate City/State agencies for approval when design of grading and construction plans are undertaken.

2. Water Supply

The existing municipal water system in Waiau is adequate to service the proposed 180-unit project with average daily water demand of 90,000 gpd.

The existing Waiau "850" System originally constructed by the developers of Waiau and Waimalu (Newtown), and presently maintained and operated by BWS, was designed for a total average daily demand of 705,000 gpd. However, both projects, which have already been completed, requires only an average daily demand of 480,000 gpd. Inclusion of the proposed project's 180 units would increase that total to 570,000 gpd. Consequently, the existing system has the capacity to serve the project's water requirements.

Also, the project development is limited to an area below the 750-foot elevation which, therefore, is within the pressure service limit of the Waiau "850" System.

For source allocation, however, the developer proposes to request the water from the Board of Water Supply.

The developer also proposes to pay the applicable facility charge to the Board of Water Supply for service to the project.

3. Sanitary Sewage Disposal

The existing municipal wastewater system is presently adequate to accommodate the conveyance, treatment and disposal of the estimated average daily sewage generated by the proposed project of 72,000 gallons per day.
However, the City's Department of Public Works has indicated that the existing 25 MGD capacity of the Honouliuli Wastewater Treatment Plant has already been committed to present and planned projects. They also note that planning for the plant's expansion is underway with construction to start in 1991.

The developer proposes to pay their proportionate share or assessment as established by the City for the expansion of the Honouliuli Wastewater Treatment Plant.

J. Impact on Public Facilities and Services

1. Police

The Honolulu Police Department has indicated that the proposed project will not affect the level of police services for the area which is served by the Pearl City Station.

2. Fire

The Honolulu Fire Department has indicated that existing fire protection facilities and services are considered adequate. Primary fire protection is provided by engine and ladder companies from the Waialua Fire Station with additional service available from the Aiea and Pearl City Fire Stations.

3. Public Educational Facilities

The project area is currently serviced by Waimalu Elementary, Aiea Intermediate and Aiea High Schools. Enrollment increases expected to result from the project are: 30-60 for grades K-6; 5-15 for grades 7-8; and 15-30 for grades 9-12. The Department of Education has indicated that legislative appropriation on a timely basis may be required to accommodate future growth.
4. Recreational Facilities

The project is subject to provisions of a City and County of Honolulu park dedication requirement. It is the developers intent to fulfill this requirement through recreational facilities similar to those provided in Phase I to III of the existing Wailuna Development in compliance with the City's requirements.

5. Electrical Utilities

The existing Waiau-Koolau-Pukele 138 kv line and the Waiau-Wahiawa and Waiau-Koolau 138 kv lines are all in proximity to or pass over by the proposed development. Discussions with HECO for future services will be coordinated prior to and during project development.
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 management, service 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.

The appearance of the project site will be altered from its present open vacant appearance to that of a completed planned low density 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, the proposed development will result in greater number of vehicles going to and from the project areas, resulting in increased vehicular pollution emissions.

The project development will result in a commitment of land for a long-time period. Once the land use of the property is 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 periods, result in a residential use which will likely benefit the developer, the landowner, private businesses, and most significantly, future residents of the community.
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 the proposed development. Additional impacts associated with increased traffic include those for potential air and noise quality. It should be noted that carbon monoxide levels during peak period traffic conditions have exceeded allowable State of Hawaii Air Quality Standards under unfavorable meteorological dispersion conditions.

(4) The need for utility services will increase.

(5) The need for public services for fire and police protection, 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

At this time, there are no unresolved issues with respect to potential physical impacts. No environmental approvals outside of normal building and construction permits are required for the project. A State Land Use Amendment as well as a City Zoning change, will be filed for at the appropriate stage of the planning process. Alternatives to the proposed action were found to be less desirable than the proposed residential condominium project.
XI. LIST OF ORGANIZATIONS AND AGENCIES CONSULTED
AND LIST OF EIS PREPARERS

<table>
<thead>
<tr>
<th>Agency</th>
<th>City and County</th>
<th>State</th>
<th>State Land Use Commission</th>
<th>Department of Accounting and General Services</th>
<th>Department of Agriculture</th>
<th>Department of Business and Economic Development</th>
<th>Department of Defense</th>
<th>Department of Education</th>
<th>Department of Hawaiian Home Lands</th>
<th>Department of Health</th>
<th>Department of Land and Natural Resources</th>
<th>OEQC</th>
<th>Department of Transportation</th>
<th>University of Hawaii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Department</td>
<td>11/09/87</td>
<td>11/12/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board of Water Supply</td>
<td>11/25/87</td>
<td>11/30/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of General Planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Housing &amp; Community Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Land Utilization</td>
<td>12/03/87</td>
<td>12/07/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Parks &amp; Recreation</td>
<td>12/01/87</td>
<td>12/09/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Public Works</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Transportation Services</td>
<td>11/18/87</td>
<td>11/19/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oahu Metropolitan Planning Organization</td>
<td>11/05/87</td>
<td>11/10/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Department</td>
<td>12/15/87</td>
<td>12/18/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Police Department</td>
<td>11/24/87</td>
<td>11/27/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Land Use Commission</td>
<td>11/12/87</td>
<td>12/09/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Accounting and General Services</td>
<td>11/10/87</td>
<td>11/12/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Agriculture</td>
<td>12/01/87</td>
<td>12/07/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Business and Economic Development</td>
<td>*12/04/87</td>
<td>12/21/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Defense</td>
<td>11/04/87</td>
<td>11/09/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Education</td>
<td>11/18/87</td>
<td>12/03/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Hawaiian Home Lands</td>
<td>11/09/87</td>
<td>11/16/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Health</td>
<td>12/08/87</td>
<td>12/10/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Land and Natural Resources</td>
<td>*12/14/87</td>
<td>12/15/87</td>
<td>NRN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OEQC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Transportation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Hawaii</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.H. Water Resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.H. Environmental Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

XI-1
Organizations and Agencies Consulted (Continued)

<table>
<thead>
<tr>
<th>Organizations/Agencies</th>
<th>Date of Comment</th>
<th>Date Comment Received</th>
<th>Date of Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Army Corps of Engineers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Soil Conservation Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Fish and Wildlife Service</td>
<td>11/24/87</td>
<td>11/30/87</td>
<td>NRN</td>
</tr>
<tr>
<td>Headquarters, U.S. Navy, 14th Naval District</td>
<td>12/04/87</td>
<td>12/07/87</td>
<td>12/28/87</td>
</tr>
<tr>
<td>U.S. Department of Transportation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization and Individuals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Association of Apartment Owners of Wailuna</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Association of Apartment Owners of The Heights at Wailuna</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Momilani Community Association</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newtown Community Association</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearl City Community Association</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wai'alu Community Association</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aiea Neighborhood Board No. 20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waipahu Neighborhood Board No. 22</td>
<td>11/20/87</td>
<td>11/20/87</td>
<td>12/28/87</td>
</tr>
<tr>
<td>Kamehameha Schools/Bernice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pauahi Bishop Estate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ms. Ariana A. Fairbanks, et al.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mr. Rodney K. Biven</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawaiian Electric Company, Inc.</td>
<td>11/03/87</td>
<td>11/20/87</td>
<td>NRN</td>
</tr>
<tr>
<td>Oahu Sugar Company, Ltd.</td>
<td>12/10/87</td>
<td>12/14/87</td>
<td>12/28/87</td>
</tr>
</tbody>
</table>

* Received After Deadline Date
NRN - No Response Needed

LIST OF PREPARERS

Community Planning, Inc. - EIS Coordination
  George K. Houghtaling
  Bernard P. Kea

Environmental Communications, Inc. - Technical Writers
  Fred J. Rodriguez
  Taeyong M. Kim

XI-2
LIST OF PREPARERS (Continued)

Char and Associates - Biological Survey
   Winona P. Char

Bishop Museum - Archaeological Reconnaissance Survey
   Jeff Yamauchi

Parsons Brinckerhoff Quade & Douglas, Inc. - Traffic Impact Study
   Julian Ng

Barry D. Root - Air Quality Study

Y. Ebisu & Associates - Traffic Noise Study
   Yoichi Ebisu

Environment Capital Managers, Inc. -
   Demographic, Economic and Housing Impacts
   Bay K.C. Yee

Gordon L. Dugan, Ph.D. - Environmental Aspects of Storm Water Runoff
XII. COMMENTS AND RESPONSES DURING EIS PREPARATION NOTICE
MEMORANDUM

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

FROM: JOHN P. WHALEN, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE -- WAIIKUNA IV DEVELOPMENT, PEARL CITY, OAHU
TAX MAP KEY 2-H-06: PORTION 3

The Department of Land Utilization (DLU) has reviewed the above-referenced Preparation Notice and offers the following comments:

1. The EIS should address the long-term impact of the proposed project on existing groundwater systems.

2. The EIS should justify the need to take the land from Conservation District Use for the development of the proposed housing project. This discussion should focus on the impacts to the watershed.

We hope these comments will be helpful to you in preparation of the EIS. If you have any questions, please contact Art Chalacomb of our staff at 523-4646.

John P. Whalen
Director of Land Utilization

JFW:sl
14008
cc: F. J. Rodriguez

December 3, 1987

ENVIROMENTAL COMMUNICATIONS INC.

December 28, 1987

Mr. John P. Whalen
Director of Land Utilization
659 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Environmental Impact Statement Preparation Notice
Waikuna IV Development

Thank you for your comments dated December 3, 1987 on the Environmental Preparation Notice (EISPN) for the Waikuna IV project. We have reviewed the comments and respond as follows:

1. There is a study currently being prepared for the DUS on impacts that the surface runoff and drainage will have on the project site and also the adjacent areas. There are also analyses included addressing the groundwater systems.

2. An economic/marketing analysis on housing demand is to be provided in the Draft EIS for your review and comment. The impacts on the watershed located mauka of the proposed project site will also be reviewed.

Thank you for your comments.

Very truly yours,

F. J. Rodrigues

FJR:sl
TO:        DONALD A. CLEGG, CHIEF PLANNING OFFICER  
            DEPARTMENT OF GENERAL PLANNING  
FROM:       HIRAM K. KAMAKA, DIRECTOR  
SUBJECT:    ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE  
            MAILUHA IV DEVELOPMENT - WAIKIKI  
            TAX MAP KEY 9-8-02: POR. 3  

We have reviewed the Environmental Impact Statement Preparation Notice for the  
proposed Mailuha IV Development in Waikiki and make the following comments:  
The notice has not addressed the recreational impact and needs of this large  
condominium project.  
Thank you for the opportunity to review and comment on the EISPN.  

HIRAM K. KAMAKA, Director  

December 1, 1987  

DEPARTMENT OF PARKS AND RECREATION  
CITY AND COUNTY OF HONOLULU  

TO:        HIRAM K. KAMAKA, DIRECTOR  
            DEPARTMENT OF PARKS AND RECREATION  
            655 SOUTH KING STREET  
            HONOLULU, HAWAII 96813  

Dear Mr. Kamaka:  
Subject: Environmental Impact Statement Preparation Notice  
          Mailuha IV Development  

Thank you for your comments dated December 1, 1987 on the Environmental  
Impact Statement Preparation Notice (EISPN) for the Mailuha IV  
development. The applicant/developer and their civil engineering consultants  
will be in contact with your staff to best determine how compliance with the  
Park Dedication Ordinance should be met.  

At the present time, the previous three increments provide recreational  
amenities for the current residents; the planning for Mailuha IV will add to  
these amenities, so that compliance with the City's requirements will be  
observed.  

Finally, the continuing land use policy amendment process remaining  
with the current Development Plan Amendment including Zoning Application,  
and the State Land Use Commission Boundary amendment will take approxi-  
mately 18-24 months of planning and review. We are confident that during  
this period of time, the Park Dedication Ordinance compliance will be met.  

Thank you for your comments and we look forward to working with  
your department and staff on this project.  

Yours very truly,  

F. J. Rodrigues  

FJR/ls
November 25, 1987

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

FROM: KAZU HAYASHIDA
MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE FOR WAIKU MIV DEVELOPMENT, TPL 9-8-02; FOR 2

Thank you for consulting with us on the environmental document for the proposed 180 residential condominium units.

Our existing water system can accommodate the proposed development.

The project is sited in the "no-pass zone" where ground disposal of wastewater is not permitted.

If you have any questions, please contact Laurence Whang at 527-6198.

F. J. Rodrigues

NOV 30 1987

December 28, 1987

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

Dear Mr. Hayashida:

Subject: Environmental Impact Statement Preparation Notice Waikehu IV Development

We have received your comments dated November 25, 1987 on the Environmental Impact Statement Preparation Notice (EISPM) for the proposed Waikehu IV residential development. The comment that the existing water system can accommodate the proposed development have been forwarded to the consultants for future reference.

As the project continues through the remaining land use policy change applications (Land Use Commission Boundary review, zoning, and currently, the Development Plan Amendment), a water master plan will be developed and submitted for your approval.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJH/17
TO: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING
FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT
SUBJECT: WAILUNA IV DEVELOPMENT

We have reviewed the project description and location map for the proposed development. The completed single-family units will not affect the level of police services for the area.

Thank you for the opportunity to comment.

DOUGLAS G. GIBB
Chief of Police

CC: F. J. Rodrigues,

ENVELOPE

DEPARTMENT OF COMMUNICATIONS

Chief Douglas G. Gibb
Honolulu Police Department
1455 South Beretania Street
Honolulu, Hawaii 96814

Dear Chief Gibb,

Subject: Environmental Impact Statement Preparation Notice

Wailuna IV Development

Thank you for your department's comments dated November 24, 1987 on the Environmental Impact Statement Preparation Notice (EISPNH) prepared for the proposed Wailuna IV project. The comments provided advising that the project will not affect the level of police service for the area has been provided to the applicant/developer for their information.

We look forward to your office's review of the draft EIS currently under preparation. Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJR:ln

NOV 27 1987
MEMORANDUM

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

FROM: JOSEPH M. MAGALDI, JR., DEPUTY DIRECTOR
DEPARTMENT OF GENERAL PLANNING

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
WAILUA IV DEVELOPMENT, OAHU, HAWAII
DNL-98-02, FOR: 3

November 18, 1987

This is in response to a letter dated November 2, 1987 from Environmental Communications, Inc. requesting our review of the subject preparation notice.

We have the following comments:

The EIS should address the traffic generated by the proposed project and its effect on the surrounding street system. In particular, the capacity of critical intersections should be analyzed.

If there are any questions, please contact Kenneth Hirata of my staff at local 5031.

cc: Environmental Communications Inc.

December 28, 1987

Mr. John E. Hirzen, Director
Department of Transportation Services
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Hirzen:

Subject: Environmental Impact Statement Preparation Notice
Wailua IV Development

Thank you for your comments dated November 18, 1987 on the Environmental Impact Statement Preparation Notice (EISP) for the proposed Wailua IV development. The comments have been forwarded to the applicant/developer and they will be including a traffic impact analysis to be prepared by Parsons, Brinkerhoff, Quade & Douglas, Inc. in the Draft Environmental Impact Statement (DEIS).

We look forward to your agency's review of these findings and the appropriate comments. Thank you again for your continuing interest.

Very truly yours,

F. J. Rodrigues

 cc: 1146 Fort St. Mall, Suite 200, P O BOX 150 - HONOLULU HAWAII - TELEPHONE 541-4133
MEMO TO: MR. DONALD B. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM: HERBERT K. MURAKA
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: EIS PREPARATION NOTICE FOR
MAILUNA IV DEVELOPMENT
Ewa, Oahu, Hawaii

November 9, 1987

We have reviewed the EIS Preparation Notice for the Mailuna IV Development project and have no comments.

Thank you for the opportunity to review the preparation notice.

HERBERT K. MURAKA
Director and Building Superintendent

To: F. J. Rodrigues
Cc: J. Harada

NO RESPONSE NEEDED

NOV 12 1987
MEMORANDUM

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

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Wailuna IV Development Project, Tax Map Key 9-8-62 Portion 3

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

Noise

1. Activities associated with the construction phase must comply with the provisions of Title 11, Administrative Rules Chapter 63, Community Noise Control for Oahu.
   a. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the rules.
   b. Construction equipment and vehicles requiring an exhaust of gas or air must be equipped with mufflers.
   c. The contractor must comply with the conditional use of the permit as specified in the rules and conditions issued with the permit.

2. Traffic noise from heavy vehicles travelling to and from the construction site must be minimized near existing residential areas, schools, and the hospital, and must comply with the provisions of Title 11, Administrative Rules Chapter 62, Vehicular Noise Control for Oahu.

Drinking Water

The EISPN does not identify the projected source of water for the Wailuna IV Development Project. The environmental impact statement should identify and discuss the potable water system which will supply the 180 condominium units. The Drinking Water Program will comment further when they have more information on this water system.

Wastewater Disposal

The EISPN for the subject project must address the quantity of sewage that will be generated and how the sewage will be treated and disposed.

Vector Control

Activities associated with the clearing of land and construction must comply with the provisions of Title 11, Chapter 26, Vector Control, Section 11-26-35, Rodents and Destruction of Structures and Cleaving of Sites and Vacant Lots.

The applicant should also be aware of potential infestations of moles, rats, mosquitoes, flies, honeybees, wasps and other venemous arthropods after the completion of the project.

cc: F. J. Rodriguez

BRUCE S. ANDERSON, Ph.D.
ENVIROMENTAL
COMMUNICATIONS
INC.

December 28, 1987

Dr. Bruce S. Anderson
Deputy Director
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Anderson:

Subjects Environmental Impact Statement Preparation Notice Walluna IV Development

We have received your department's comments dated December 8, 1987 for the Environmental Impact Statement Preparation Notice (EISPNI) of the Walluna IV project. We respond as follows:

Noise
1. thru c: The contractor responsible for all construction activity will be advised that these requirements for compliance with Community Noise Control for Oahu will rest with his operations at the project site.

2. All traffic heavy vehicles that emanate from the construction site will also require compliance with Vehicular Noise Control for Oahu, and will be the responsibility of the contractor.

Drinking Water

The Board of Water Supply (BWS) has advised the developer that there will be potable water supplied for the Walluna IV project. The draft EIS will discuss this requirement and also provide correspondence from the BWS to that effect.

Wastewater Disposal

Sewage generated from the proposed project and the methods of disposal will be described in the draft EIS and a sewage master plan will be prepared and submitted for review to the City Department of Public Works, Division of Wastewater Management.

Vector Control

The contractor that will be clearing and grubbing the project site is also responsible for obtaining the necessary permits to comply with the Health Department Vector Control requirements.

1446 Fort St. Mail Suite 200 - H8R 260 - HONOLULU, HAWAII - TELEPHONE (808) 537-8881

Yours very truly,

F J. Rodrigues

Dr. Bruce S. Anderson
December 28, 1987
Page 2

Thank you for your comments and we look forward to your review of the Draft EIS.
November 5, 1987

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

Dear Mr. Clegg:

Walluna IV Development - EISIN

We have reviewed the environmental impact statement preparation notice for the Walluna IV Development and have no comments to offer on that document at this time. However, we would like to review the transportation impacts identified in the subsequent EIS documents. The transportation impacts should include, at a minimum, the peak hour volumes and some measure of level of service on Kauhau Street and the nearby major arterials resulting from this development.

Thank you for the opportunity to review this project.

Sincerely,

Gordon G.W. Lum
Executive Director

CC: F.J. Rodriguez

December 28, 1987

Mr. Gordon G.W. Lum
Executive Director
Oahu Metropolitan Planning Organization
1194 Bishop Street, Suite 1509
Honolulu, Hawaii 96813

Dear Mr. Lum:

Subject: Environmental Impact Statement Preparation Notice
Walluna IV Development

Thank you for your comments dated November 5, 1987 on the Environmental Impact Statement Preparation Notice (EISPN) for the proposed Walluna IV development. The comments have been forwarded to the applicant/developer and they will be including a traffic impact analysis to be prepared by Parsons, Brinkerhoff, Quade & Douglas, Inc. in the Draft Environmental Impact Statement (DEIS).

We look forward to your agency's review of these findings and the appropriate comments. Thank you again for your continuing interest.

Very truly yours,

F. J. Rodriguez

CC: F.J. Rodriguez

NOV 10 1987
TO: DONALD A. CLEG, CHIEF PLANNING OFFICER  
DEPARTMENT OF GENERAL PLANNING 

FROM: FRANK K. KAHUHANUHAO, FIRE CHIEF 

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN) FOR THE WAILANA IV DEVELOPMENT AT KAIU, OHU 

We have reviewed the material provided for the subject EISPN and have no objections to the proposed project. Existing fire protection facilities and service is considered adequate. Primary fire protection is provided by engine and ladder companies from the Waikiki Fire Station with 11 on-duty personnel. Additional service is available from the Ala and Pearl City Fire Stations. 

Thank you for the extension to complete our review and hope our delay in responding has not caused you difficulty. Should you have any questions, please contact Battalion Chief Kenneth Hur at local 3836. 

FRANK K. KAHUHANUHAO 
Fire Chief 

FJK/RMs/Rhh 
cc: F. J. Rodriguez 

DECEMBER 15, 1987 

ENVIRONMENTAL COMMUNICATIONS INC. 

F. J. RODRIGUEZ 
PREZIDT 

DECEMBER 28, 1987 

Chief Frank K. Kahoonano 
Honolulu Fire Department 
1455 S. Beretania Street, Room 305 
Honolulu, Hawaii 96814 

Dear Chief Kahoonano: 

Subject: Environmental Impact Statement Preparation Notice 
Wailana IV Development 

Thank you for your department's comments dated December 15, 1987 for the proposed Wailana IV Environmental Impact Statement Preparation Notice. Your agency's concerns are duly noted and will be reflected in the Draft Environmental Impact Statement currently under preparation. 

Thank you again for your continuing interest and concern. 

Very truly yours, 

F. J. Rodriguez 

FJR/198
December 4, 1987

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

Dear Mr. Clegg:

Subject: Walluma IV Development, Environmental Impact Statement Preparation Notice (EISP)

We have reviewed the subject EISP and have the following comments to offer with respect to the Hawaii Coastal Zone Management (CZM) Program. The EIS should include a discussion of the relationship of the proposed project to the objectives and policies of the Hawaii CZM Law, Chapter 205A, Hawaii Revised Statutes.

Detailed maps should be included in the EIS that depict the environmental characteristics of the site, as well as the layout and infrastructure of the proposed project. In addition, a copy of the Walluma Master Plan should be included so that the cumulative impact of all phases of construction can be considered.

Finally, the DEIS should discuss the impacts of the proposed project on runoff, siltation, and aquifer percolation. In this regard, special attention should be paid to effects on the Pearl Harbor aquifer and on endangered species in the Pearl Harbor area.

We look forward to reviewing the DEIS for this project.

Sincerely,

Roger A. Ulveling

December 28, 1987

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

Subject: Environmental Impact Statement Preparation Notice

Walluma IV Development

We are in receipt of your department's comments dated December 4, 1987 on the proposed Walluma IV Development Environmental Impact Statement Preparation Notice (EISP). We would advise at this time that the comments were forwarded to us by the City Department of General Planning and received in our office December 28, 1987. No copy was provided to us as requested in the EISP sent to all reviewers. Therefore, please provide us with your comments on the Draft Environmental Impact Statement (DEIS) as well as the City Department of General Planning.

The issues of concern will be addressed in the DEIS currently under preparation. We will discuss the impacts relative to Chapter 205A, Hawaii Revised Statutes for the policies of the Hawaii CZM law.

The DEIS will also include a map of the previous three increments for a comparison of the completed Walluma I, II, III, and the proposed Increment IV.

Finally, the discussions on surface runoff, infiltration and impacts on the basal aquifer will be discussed by Gordon L. Dugan, Ph.D. in the DEIS.

Thank you for your continuing concern and comments.

Very truly yours,

F. J. Rodrigues

FJR12a

1146 Fort St., Suite 200, P.O. Box 2359, Honolulu, Hawaii 96804 - Telephone: (808) 955-6311
MEMORANDUM

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

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Waihuna IV Development  
The Lusk Company  
THK: 9-9-02; por. 3  
Ewa, Oahu  
Access: 26 acres

The Department of Agriculture has reviewed the subject EISPN and offers the following additional soil information.

The project site has Land Study Bureau Overall Productivity Ratings of D74, D75 and E107. By this method of classification, the project site has marginal productivity potential for grazing.

We note that the proposed project is within the State Conservation District and is designated reservation by the City and County.

From the information provided in the EISPN and our own research, we do not foresee adverse impacts on the agricultural resources of the area resulting from the proposed project.

Thank you for the opportunity to comment.

SUSANNE D. PETERSON  
Chairperson, Board of Agriculture

cc: Mr. Fred J. Rodrigues  
OSP  
LDC

1146 Fort St. Halli, Suite 200  
P.O. Box 22159  
Honolulu, Hawaii 96822-0159

December 1, 1987

DECEMBER, 1987

MEMORANDUM

To: Ms. Suzanne D. Peterson, Chairperson  
Department of Agriculture  
P.O. Box 22159  
Honolulu, Hawaii 96822-0159

Subject: Environmental Impact Statement Preparation Notice (EISPN) for Waihuna IV Development

We have received your comments dated December 1, 1987 on the EISPN for the Waihuna IV project. We appreciate your department's comments that the proposed project will not adversely impact the agricultural resources of the area.

We note that the project is within the State Conservation District and is designated reservation by the City and County.

From the information provided in the EISPN and our own research, we do not foresee adverse impacts on the agricultural resources of the area resulting from the proposed project.

Thank you for your comments and continuing concern.

Yours very truly,

F. J. Rodrigues

F. J. Rodrigues
November 12, 1987

Mr. Donald A. Clegg, Planning Director
Department of General Planning
City and County of Honolulu
630 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: EISPM for Wailuna IV Development at Ewa, Oahu, Hawaii

Thank you for the opportunity to comment on the proposed development.

We have no comments to offer except that the proposed project location appears to be designated within the State Land Use Conservation District and will require a Land Use District Boundary Amendment.

Sincerely,

ESTHER UEDA
Executive Officer

December 24, 1987

Ms. Esther Ueda
Executive Officer
Land Use Commission
335 Merchant Street, Room 104
Old Federal Bldg., Honolulu, Hawaii 96813

Dear Ms. Ueda:

Subject: Environmental Impact Statement Preparation Notice
Wailuna IV Development

We have received the comments dated November 12, 1987 which your office provided to the Department of General Planning on the Environmental Impact Statement Preparation Notice (EISPM) for the Wailuna IV project. Please be advised that the applicant/developer is currently preparing a petition to be filed in 1988 to amend the State LUC Boundary District of Conservation to Urban for the proposed project.

This petition will be filed at the appropriate time by the developer and your agency will be afforded the opportunity to review the amendment application at that time. Thank you for your comments.

Yours very truly,

F. J. Rodrigues
Mr. Donald A. Clegg, Planning Director
Department of General Planning
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: Wai'anae IV Development
EIS Preparation Notice

Our review of the proposed 180 single family unit development indicates that it will have the following enrollment impact on our area schools:

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>GRADE</th>
<th>APPROXIMATE ENROLLMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wai'anae Elementary</td>
<td>K-6</td>
<td>30 - 60</td>
</tr>
<tr>
<td>Aiea Intermediate</td>
<td>7-8</td>
<td>5 - 15</td>
</tr>
<tr>
<td>Aiea High</td>
<td>9-12</td>
<td>15 - 30</td>
</tr>
</tbody>
</table>

The DOE cannot assure the availability of classroom space at the elementary and high school. Legislative appropriation on a timely basis may or may not be required to accommodate the growth.

Please keep us informed of any changes to the project plans.

Sincerely,

Charles T. Toguchi
Superintendent

CIT: J (NEI)
J.
cc E. Inai, ORS
G. Nakamoto, Central Dist.

F. J. Rodrigues

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

DECEMBER 18, 1987
Honorable Donald A. Clegg  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: Wallina X Development  
Waialua, Oahu

Thank you for the opportunity to review the EIS preparation notice cited above. We offer the following comments:

Historic Sites Concerns:

As this area has never been archaeologically surveyed, we do not know if significant historic sites are present. However, past agricultural use of the project area has almost certainly destroyed any surface sites which may have been present. In addition, agricultural use also tends to destroy archaeological subsurface deposits. We believe, therefore, that this project will have “no effect” on significant historic sites.

The EIS preparation notice includes the caveat that if historic remains such as artifacts, shell or charcoal deposits, burials, and stone platforms, pavings or walls are found during construction, work will stop until the Historic Sites Section evaluates the situation and makes recommendatons for mitigative action, if needed. Our concerns are therefore addressed.

Recreation Concerns:

The subject proposal must comply with county park dedication and public access ordinances. Access to hiking trails used by the public crosses the subject property.

Very truly yours,

[Signature]

W. P. J. Rodrigues  
Board of Land and Natural Resources

DEC 15 1987
December 28, 1987

Mr. William W. Paty, Chairperson
Department of Land and Natural Resources
P.O. Box 521
Honolulu, Hawaii 96819

Dear Mr. Paty:

Subjects: Environmental Impact Statement Preparation Notice
          Mānana IV Development

We are in receipt of your department's comments dated December 14, 1987 on the Mānana IV Environmental Impact Statement Preparation Notice. The comments were received after the deadline date of December 9, 1987 and will be included in the Draft Environmental Impact Statement (DEIS) currently under preparation. Please be assured that your comments will be addressed with similar concerns expressed by other agencies. We will look forward to a response from your staff during the 45-day review period.

Thank you for our continuing concern.

Very truly yours,

F. J. Rodriguez

FIRela

1146 Fort St. Mall, Suite 200, P.O. Box 226
Honolulu, HI 96813
Telephone (808) 541-5605
Mr. Donald A. Clegg
Planning 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 comment on the Preparation Notice for an Environmental Impact Statement concerning the Waianae IV development on Waianae Ridge.

There are no Hawaiian Home Lands in this area, and the Department of Hawaiian Home Lands finds no basis for comment on this project.

Sincerely,

Ilima A. Plaisant, Chairman
Hawaiian Homes Commission

IAP/CI

CC: F.J. Rodriguez
    P.O. Box 536
    Honolulu, Hawaii 96809

NO RESPONSE NEEDED

NOV 16 1987
Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Clegg,

Subject: Environmental Impact Statement
Preparation Notice for Walluma IV Development

We have reviewed the subject document and have no comments to offer.

Very truly yours,

[Signature]

TEUANE TOMINAGA
State Public Works Engineer

cc: F. J. Rodriguez

NO RESPONSE NECESSARY

NOV 12 1987
November 4, 1987

Engineering Office

Dr. Ronald A. Clegg, Planning Director
Department of General Planning
City & County of Honolulu
600 South King Street
Honolulu, Hawaii 96813

Dear Dr. Clegg:

Hawaii IV Development
Ewa, Oahu, Hawaii

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Yours truly,

[Signature]

Jerry H. Katsuda
Major, Hawaii Air
National Guard
Contr & Engr Officer

cc: F. J. Rodriguez

NO RESPONSE NEEDED

NOV 9 1987
November 24, 1987

Mr. Ronald A. Claggs, Planning Director
Department of General Planning
City and County of Honolulu
615 South King Street
Honolulu, HI 96813

Dear Mr. Claggs:

Subject: Mailuma 4V Development

We have no comments to offer at this time but appreciate the opportunity to review the draft EIS on this project.

Sincerely,

[Signature]

RICHARD N. LAGAN
State Conservationist

CC:
Fr. J. Rodrigue, P.O. Box 536, Honolulu, HI 96809

NO RESPONSE NEEDED

NUV 3 O 1987
Mr. Donald A. Clepp, Planning Director
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clepp:

ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
WALLINA IV DEVELOPMENT

The EIS Preparation Notice for the Wallina IV Development has been reviewed
and we have no comments to offer.

Thank you for the opportunity to review the EIS.

Sincerely,

Copy to:
F. J. Rodriguez
P. O. Box 536
Honolulu, Hawaii 96809

NO RESPONSE NEEDED

NOV 16 1987
Mr. Donald A. Clegg, Planning Director  
Department of General Planning  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Re: Environmental Impact Statement Preparation Notice, Walluma IV Development, Ewa, Oahu, Hawaii

Dear Mr. Clegg:

The referenced notice has stated that the environmental impact statement will address flora and fauna of the areas affected by the proposed housing development; therefore, we have no additional comments to offer at the present time.

We appreciate this opportunity to comment.

Sincerely yours,

Ernest Kosaka  
Field Supervisor  
Office of Environmental Services  
Pacific Islands Office

cc: F. J. Rodrigues  
Environmental Communications, Inc.

December 28, 1987

Mr. Ernest Kosaka, Field Supervisor  
U.S. Department of the Interior  
Fish and Wildlife Service  
P.O. Box 58147  
Honolulu, Hawaii 96850

Dear Mr. Kosaka:

Subject: Environmental Impact Statement Preparation Notice  
Walluma IV Development

Thank you for your comments dated December 4, 1987 on the Environmental Impact Statement Preparation Notice (EISP) for the Walluma IV project. We look forward to your agency's review and comments on the Draft EIS currently under preparation.

Thank you for your initial advice.

Very truly yours,

F. J. Rodrigues

FJR Inc
November 3, 1987

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

Attention: Mr. Helvin Murakami

Gentlemen:

Subject: Wai'anae IV Low Density Apartment Development

This is a follow-up for your comments and recommendations.

We have received correspondence from Community Planning, Inc., acting as agents for The Lask Company; applicants for the subject development.

The subject parcel is presently occupied by our Wai'anae-CEIP 138Kv transmission line and we wish to be kept informed of the progress on this application and of any hearing that may be held.

Sincerely,

William F. Huench
Senior Distribution Engineer
Distribution Engineering Department

//WFTU665w-2

cc: Bernard Kea
Community Planning Inc.

RECEIVED NOV 4 1987

NO RESPONSE Needed

NOV 2O 1987
December 10, 1987

Mr. Donald A. Clegg, Planning Director
December 10, 1987
Page 2

5. The Contractor shall be liable for any damages to HECO's facilities.

6. The Contractor shall report any damages to HECO's facilities to the HECO Trouble Dispatch at phone 548-7981.

7. A minimum of 30'-0" shall be maintained between HECO overhead conductors and the final land grade of the development.

8. Service roads and/or trails leading to and from HECO's facilities shall remain accessible for HECO's use at all times.

Sincerely,

Brennen Mungen

Enclosure

cc: F. J. Rodriguez (w/enclosure)

An HEI Company

DEC 14 1987

Mr. Donald A. Clegg, Planning Director
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Environmental Impact Statement Preparation Notice (EISPIN) for Wailuna IV Development

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

As shown on the attached location map (see Enclosure 1), the subject development crosses or is in close proximity to existing HECO 115kV transmission lines. Since these facilities will remain energized during construction, we recommend that the following HECO notes be included as part of the final construction plans:

1. The Contractor shall exercise extreme caution when the excavation and construction crosses or is in close proximity of the HECO 115kV lines and maintain 12'-0" clearance for his equipment while working close to and/or under the overhead facilities.

2. The Contractor shall comply with the directions of the State of Hawaii Occupational Safety and Health Law (DOSSH).

3. When excavation is adjacent to or under existing structures or facilities, the Contractor shall be responsible for properly sheeting and bracing the excavation and stabilizing the existing ground to render it safe and secure from possible sliding, cave-ins and settlement, and for properly supporting existing structures and facilities with beams, struts or underpinning to fully protect it from damage.

4. Should it become necessary, any work required to relocate HECO facilities shall be done by HECO. The Contractor shall be responsible for all costs and coordination.
December 28, 1977

Dr. Brenner Munger, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 2750
Hilo, Hawaii 96720

Dear Dr. Munger:

Subject: Environmental Impact Statement Preparation Notice
Mauana IV Development

Thank you for your comments dated December 10, 1977 on the current status of the HECO 138-KV lines on the proposed project site at Waiawa, Ewa, Oahu.

Discussions with the applicant on this issue have been initiated. Please be assured that the project's electrical design engineer will be made aware of the existing HECO lines so that design can be completed and approved with HECO's involvement in the review process.

It should be noted that the LUC land use policy change amendment process for the project remaining will require approximately 18-24 months to achieve. During this time, the retained civil engineering firm of Community Planning, Inc. will be supervising the project with the applicant.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJRils
November 20, 1987

Mr. Donald A. Clegg, Chief Planning Officer
DEPARTMENT OF GENERAL PLANNING
City & County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Clegg:

Subject: Environmental Impact Statement Preparation Notice
Waialua IV Development
Waialua, Oahu, Hawaii

Thank you for allowing us to review the subject document.

Although we have concerns regarding traffic impacts, adequacy of infrastructure and public services and facilities, and provisions for affordable housing, the Pearl City Neighborhood Board No. 21 wishes to reserve comments on the project until review of the Draft EIS is made and additional meetings are held with the developer/applicant on this matter.

Very truly yours,

John Gerard, Chairman

cc: F.J. Rodrigues
P.O. Box 556
Honolulu, HI 96809

December 28, 1987

Mr. John Gerard, Chairman
Pearl City Neighborhood Board No. 21
P.O. Box 1928
Pearl City, Hawaii 96782

Dear Mr. Gerard:

Subject: Environmental Impact Statement Preparation Notice
Waialua IV Development

Thank you for your comments dated November 20, 1987 on the Environmental Impact Statement Preparation Notice (EISP) for the proposed Waialua IV residential subdivision. We recognize your request to reserve comment on the project until review of the draft EIS is completed and additional meetings are held with the applicant/developer.

You will be provided with the draft EIS for your review and comment during January, 1988 and we look forward to your comments. Thank you for your continuing interest.

Very truly yours,

F.J. Rodrigues

P.J.R. Inc.
<table>
<thead>
<tr>
<th>Agency</th>
<th>Date of Comment</th>
<th>Date Comment Received</th>
<th>Response to Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dept. of Accounting &amp; General Services</td>
<td>01/25/88</td>
<td>01/27/88</td>
<td>NRN</td>
</tr>
<tr>
<td>Dept. of Agriculture</td>
<td>03/08/88</td>
<td>03/10/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of Defense</td>
<td>02/09/88</td>
<td>02/10/88</td>
<td>NRN</td>
</tr>
<tr>
<td>Dept. of Education</td>
<td>02/02/88</td>
<td>02/08/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of Health</td>
<td>02/09/88</td>
<td>02/18/88</td>
<td>NRN</td>
</tr>
<tr>
<td>Dept. of Land &amp; Natural Resources</td>
<td>02/04/88</td>
<td>02/08/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of Business and Economic Development</td>
<td>02/23/88</td>
<td>03/01/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Housing Finance and Development Corp.</td>
<td>02/09/88</td>
<td>02/12/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of Transportation</td>
<td>01/25/88</td>
<td>01/28/88</td>
<td>NRN</td>
</tr>
<tr>
<td>State Land Use Commission</td>
<td>01/27/88</td>
<td>01/28/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>OEQC</td>
<td>02/09/88</td>
<td>02/11/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>University of Hawaii</td>
<td>03/08/88</td>
<td>03/09/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Environmental Center</td>
<td>03/08/88</td>
<td>03/09/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Water Resources Research Center</td>
<td>03/08/88</td>
<td>03/09/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>City &amp; County</td>
<td>02/22/88</td>
<td>02/25/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Board of Water Supply</td>
<td>01/29/88</td>
<td>02/01/88</td>
<td>NRN</td>
</tr>
<tr>
<td>Building Department</td>
<td>02/05/88</td>
<td>02/10/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of General Planning</td>
<td>03/03/88</td>
<td>03/04/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of Land Utilization</td>
<td>03/03/88</td>
<td>03/04/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of Parks &amp; Recreation</td>
<td>02/09/88</td>
<td>02/11/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of Public Works</td>
<td>03/02/88</td>
<td>03/07/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Dept. of Transportation Services</td>
<td>02/09/88</td>
<td>02/11/88</td>
<td>NRN</td>
</tr>
<tr>
<td>Fire Department</td>
<td>02/09/88</td>
<td>02/11/88</td>
<td>NRN</td>
</tr>
<tr>
<td>Oahu Metropolitan Planning Organisation (OMPO)</td>
<td>03/02/88</td>
<td>03/07/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Police Department</td>
<td>02/08/88</td>
<td>02/08/88</td>
<td>03/18/88</td>
</tr>
</tbody>
</table>
Organizations and Agencies

<table>
<thead>
<tr>
<th>Agency</th>
<th>Date of Comment</th>
<th>Date Comment Received</th>
<th>Response to Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Army-DAFE (Facilities Eng. -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USASCH)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navy</td>
<td>01/25/88</td>
<td>01/27/88</td>
<td>NRN</td>
</tr>
<tr>
<td>Soil Conservation Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Army Corps of Engineers</td>
<td>02/23/88</td>
<td>02/25/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>U.S. Coast Guard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Fish and Wildlife Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Geological Survey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Organizations/Agency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Lung Association</td>
<td>03/08/88</td>
<td>03/10/88</td>
<td>NRN</td>
</tr>
<tr>
<td>Hawaiian Electric Company</td>
<td>02/18/88</td>
<td>02/23/88</td>
<td>03/18/88</td>
</tr>
<tr>
<td>Alea Neighborhood Board No. 20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearl City Neighborhood No. 21</td>
<td>03/07/88</td>
<td>03/08/88</td>
<td>03/18/88</td>
</tr>
</tbody>
</table>

LIST OF PREPARERS

Community Planning, Inc. - EIS Coordination
  George K. Houghtaling
  Bernard P. Kea

Environmental Communications, Inc. - Technical Writers
  Fred J. Rodriguez
  Taeyong M. Kim

Char and Associates - Biological Survey
  Winona P. Char

Bishop Museum - Archaeological Reconnaissance Survey
  Jeff Yamauchi

Parson Brinckerhoff Quade & Douglas, Inc. - Traffic Impact Study
  Julian Ng

Barry D. Root - Air Quality Study

Y. Ebisu & Associates - Traffic Noise Study
  Yolchi Ebisu

Environment Capital Managers, Inc. - Demographic, Economic and Housing Impacts
  Bay K.C. Yee

Gordon L. Dugan, Ph.D. - Environmental Aspects of Storm Water Runoff
XIV. COMMENTS AND RESPONSES DURING THE DEIS CONSULTATION PERIOD
Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Walluna IV
Draft Environmental Impact Statement

We have reviewed the subject document and have no comments to offer.

Very truly yours,

[Signature]

Takanori Tominaga
State Public Works Engineer

cc: Mr. F. J. Rodriguez

NO RESPONSE NEEDED

JAN 27 1988
MEMORANDUM

To: Mr. Donald A. Clepp
Chief Planning Officer
Department of General Planning
City and County of Honolulu

Subject: Draft Environmental Impact Statement (DEIS)
Kalihi Valley Development
The Ikkai Company
Thr: 9-8-91, Pl. 3
Area: 26 acres

The Department of Agriculture has reviewed the subject DEIS
and as previously indicated, we do not foresee adverse impacts
on the agricultural resources of the area resulting from the
proposed project.

Thank you for the opportunity to comment on this document.

Suzanne D. Peterson
Chairperson, Board of Agriculture

CC: Mr. F. J. Rodrigues
OSP (Attn: LUD)

NO RESPONSE NEEDED

MAR 10 1988
Mr. Donald A. Class, Chief Planning Officer
Department of General Planning
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Class:

Kailua IV
Ko'olaupoko District, Oahu

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Sincerely,

Jerry M. Handa
Major, Hawaii Air National Guard
Contr & Eng Officer

Enclosures

cc:
Mr. F. J. Rodrigues

NO RESPONSE NEEDED

FEB 10 688
Mr. Donald A. Clegg, Chief Planning Officer
City and County of Honolulu
Department of General Planning
620 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

SUBJECT: Waikuna IV - Draft EIS

Our review of the Waikuna IV Draft EIS indicates that the number of students projected in our November 18, 1987, memo to you is still valid.

We have no additional comments to add at this time.

Should you require any clarification, please call Mr. Richard Iooss at 733-6743.

Sincerely,

Charles T. Toguchi
Superintendent

CC: JF (RES)

cc: E. Jost, OES
L. Vidua, Central Dist.
P. J. Rodrigues

FEB 8 1988

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER
MEMORANDUM

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

From: Deputy Director for Environmental Health

Subjects: Draft Environmental Impact Statement (DEIS) for Wailuna IV, Waiaku, Ewa District, Oahu, Hawaii

Thank you for allowing us to review and comment on the subject DEIS. We have no comments to make at this time.

[Signature]
BRUCE S. ANDERSON, PH.D.

cc: Mr. F. L. Rodriguez

NO RESPONSE NEEDED

FEB 18 1988
FEB 16 1988

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

Dear Mr. Clegg:

SUBJECT: Wailuna IV, Draft EIS

In response to your request, we have reviewed the document cited above; however, we have no comments to offer.

Thank you for the opportunity to review this project.

Very truly yours,

[Signature]

WILLIAM M. PATTY, Chairperson
Board of Land and Natural Resources

Ann. 21st ODI.

Mr. F. J. Rodriguez

NO RESPONSE NEEDED

FEB 17 1988
MEMORANDUM

TO: Roger C. Evans, OCEA
FROM: Balston H. Nagata, State Parks Administrator
SUBJECT: Comments on Draft EIS -- Walluna IV (68-349)

Malau, Kaaawa District, Oahu

The applicant has completed an archaeological survey, and no significant historic sites were found on the project parcel. The area was once under intensive sugarcane cultivation. Therefore, we believe that there will be "no effect" to significant historic sites.

RECREATION CONCERNS:

There are no state park concerns.

Balston H. Nagata

March 18, 1988

Mr. Balston H. Nagata
Department of Land & Natural Resources -- Division of State Parks
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Nagata:

Subjects: Draft EIS for the Proposed Walluna IV Development

We have received your comments dated February 4, 1988 on the Draft Environmental Impact Statement prepared for the Walluna IV project. Your early determination that there will be "no effect" to significant historic sites is acknowledged. Please be assured that in the event sites are uncovered during the construction phase, we will contact your office.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJR
The Honorable Donald A. Clegg
February 23, 1988

Chief Planning Officer
Department of General Planning
City and County of Honolulu
660 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft Environmental Impact Statement (EIS) for the
Waliuna IV Development, Maili, Oahu, Hawaii

The proposed project represents the fourth increment of the existing
Waliuna Development. It will include the construction of 180 single
family residential condominium units on approximately 34 acres of land
currently within the Conservation District. We have reviewed the subject EIS
and have the following comments:

1. The final EIS should evaluate the cumulative environmental
impacts of the total Waliuna development, including the proposed
action and the existing three phases, as required by the
Environmental Impact Statement Rules found in Chapter 290 of
Title II, Administrative Rules. Section 290-200-1(l) of the EIS
Rules states, "the interrelationships and cumulative
environmental impacts of the proposed action and other related
projects shall be discussed in the draft EIS."

2. The Hawaii Coastal Zone Management (CZM) Law, embodied in
Chapter 224A, Hawaii Revised Statutes, mandates that coastal
ecosystems be protected from disruption and adverse impacts.
The EIS implies that storm water runoff will not have adverse
impacts to coastal receiving waters because the constituent load
for the higher level storms, decreases for nitrogen and suspended
solids, and increases only slightly for runoff volumes and fecal
phosphorus. However, the data presented in the consultant's
report (Appendix C) shows that the greatest constituent loads
occur with the lower intensity storms. This is a significant
factor because the lower intensity storms occur with greater
frequency than the higher intensity storms. Thus, the
cumulative net result may pose significant adverse impacts on
coastal receiving waters. The final EIS should address this
matter.

3. The EIS does not present measures to mitigate the impacts of
storm water runoff from the project site as required by the EIS
rules. Mitigation measures are an essential part of an EIS
document and should be included in the final EIS.

4. The EIS should identify the values and resources of the site
which contributed to its Conservation District designation. In
addition, the need to remove these lands from the Conservation
District have not been addressed. These issues have been raised
in comments on the EIS Preparation Notice, but remain unanswered
in the draft EIS.

5. Other alternatives to the proposed use, which should be
considered, are relocation of the proposed project to another
site, perhaps outside of the Conservation District, and lower
density uses of the site.

6. The "No Action" alternative to the proposed use fails to
recognize the values that Conservation lands provide to
surrounding communities and the State in general. The benefit
and compatibility of vacant Conservation lands, with urban areas
situated in adjacent locations, should be recognized in the
final EIS. The open space values, increased groundwater
recharge, and natural beauty of lands within the Conservation
District are factors that should be considered.

7. The final EIS should address in more detail the impact of the
proposed project on groundwater recharge and on the groundwater
resources of the region. The cumulative, long-term effects of
similar developments at such elevations or higher should also be
addressed.

8. The final EIS should identify the number and kinds of affordable
housing units planned for the project.

Sincerely,

[Signature]

Roger A. Ulveng

cc: Mr. P.J. Rodriguez
Environmental Communications, Inc.
Dr. Morris T. Nihira, DEPQCT
March 18, 1988

Mr. Roger A. Uveling
Director
Department of Business and Economic Development
State of Hawaii
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Uveling:

Subject: DEIS for the Wailua IV Development Project

We have received your department's comments dated February 23, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Wailua IV project. We have reviewed these comments with the applicant, their civil engineer and the technical consultants and respond as follows:

1. Discussions with the Office of Environmental Quality Control (OEQC) staff on the appropriateness of Section 11-150-171 as requested by your staff for evaluation of cumulative environmental impacts of the total Wailua Development, are incorrect. OEQC interpretations of this section indicated the cumulative effect would be applicable if the application was for four increments, instead of only Increment IV. As it is understood, the three prior increments are completed, sold, and occupied; the DEIS analyzed the potential impacts of Increment IV only.

2. The potential impacts of surface drainage runoff affecting coastal ecosystems are acknowledged as described during lower intensity storms. Present practice of discharging drainage runoff into the stream in accordance with City and County drainage standards will be employed consistent with the first three increments of Wailua. The City Drainage standards are designed to achieve rapid de-watering to prevent flooding and other impacts from rains and storm events.

3. Mitigation measures to reduce potential impacts to the coastal ecosystems were considered, but due to terrain features, are not practicable. There will be no ponds or retention basins built for the proposed project.

4. The Wailua Company has planned for four increments in their Wailua project and this foresight is reflected in the design of their infrastructural system. The location of the "existing" water reservoir establishes the upper limits of future expansion at the 750-foot elevation. Increments 1-3 were constructed on scared lands and development of Increment IV requires an amendment to the State Land Use Conservation District designation. We cannot dispute the value of the open space resource that would be afforded to present residents of Wailua as well as the total community at large; however, it is the position of the applicant that Increment IV will provide much needed housing for projected increase in population for this portion of the Primary Urban Center. The ability to meet this demand and alleviate housing deficit, clearly overrides the present use of the Conservation District designation.

5. The applicant indicates that for purposes of completing the Wailua project, there are no other lands adjacent to the existing project site that could meet the feasible requirements of Increment IV. Designing to a lower density would result in higher cost that would be beyond the target market.

6. The applicant does not ignore the obvious open space values and natural beauty of the site; these are in fact, the marketing factors that make Wailua an attractive residential product. The Wailua Company does recognize, however, that in terms of "No Action," the use of the adjacent 26 acres in the upper-urbanized areas, will not significantly impact the ability of the larger remaining portion of Conservation District lands project site, to continue its existing function for ground water recharge, open space, and natural beauty.

7. The ability of the proposed project to provide ground water recharge capability is minimal at best due to the terrain features of the site (10-30 degree slope). In an undeveloped condition, the runoff drainage patterns already established do not permit retention time for ground water recharge of any reasonable quantity.

8. Final determination by governmental agencies of number and kinds of affordable housing units to be provided for the project is still unclear at this time.

The applicant will comply with all reasonable requests for housing units to be developed for affordable market use.

Thank you for your comments and continuing concern.

Yours very truly,

F. J. Rodrigues

1146 Fort St; Mail. Suite 200, S. O. Box 2546, Honolulu, Hawaii 96802, Telephone: 941-1565, 1988
Mr. Donald A. Clagg
February 9, 1988
Page 2

We believe that there is a great need for housing that is affordable to families earning below 140% of median. We therefore believe that, in addition to providing 10% of the units to families earning less than 80% of the median, a portion of the units should also be made available to families with incomes ranging from 80% to 140% of median. This translates to sales prices of approximately $76,000 to $147,000, based upon the assumptions listed above.

Sincerely,

[Signature]

Executive Director

February 9, 1988

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

Dear Mr. Clagg:

Re: Draft Environmental Impact Statement (EIS) for
the Proposed RailLine IV

Thank you for the opportunity to review the subject draft EIS. Our comments are as follows:

The applicant is proposing to develop approximately 180 units at an average sales price of $160,000. Based upon the following assumptions, a family would require an annual income of nearly $51,000 to qualify for financing to purchase the averaged priced homes:

1. An interest rate of 10.00%
2. A down payment of 10% of the sales price, or $16,000.
3. A customer trust fund of $150.00 for real property tax, fire insurance, Jesse rent, maintenance fees, etc.

This required income is approximately 150% of the $14,100 median income for a family of four, as established by the U.S. Department of Housing and Urban Development.
March 18, 1988

Mr. Joseph E. Conant
Executive Director
Housing Finance and Development Corporation - DHED
State of Hawaii
P.O. Box 17907
Honolulu, Hawaii 96817

Dear Mr. Conant:

Subject: Draft Environmental Impact Statement for Wailuna IV

We have received your office’s comments dated February 9, 1988 on the Draft Environmental Impact Statement (DEIS) which were prepared for the Wailuna IV project, and a copy was not directed to us.

The comments have been provided to the applicant/developer for their review and future use in determining how best to satisfy your concerns for project sales to the entire market. As you know, the remaining land use amendment process is still very lengthy and still requires a District Boundary Amendment from the State Land Use Commission, the approval at the City level for the Development Plan Amendment and a Zoning Change Request, as well as the Building Permits. In view of these remaining actions to be completed, the applicant/developer will be working with all public agencies such as yours as well as the City Department of Housing & Community Development to ensure compliance with all affordable housing requirements.

Since most of these policies have been determined, future discussions can be continued on how this concern can best be resolved.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJRila

1146 Fort St. Mall, Suite 200 - P. O. Box 7844 - Honolulu, Hawaii 96814 - Telephone: 531-5700
STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 143, Hawaii Revised Statutes and Chapter 11-200, Administrative Rules, EIS Rules:

TITLE: Manoa IV

LOCATION: Waialu, Puu District, 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. Clepp, Chief Planning Officer
C & C of Honolulu Dept. of General Planning
650 S. King St.
Honolulu, HI 96813

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

Mr. F. J. Rodrigues
Environmental Communications, Inc.
P.O. Box 526
Honolulu, HI 96809

Your comments must be received or postmarked by: March 8, 1988

If you have no further use for this EIS, please return it to the Office of Environmental Quality Control.

Thank you for your participation in the EIS process.

No Response Needed JAN 28 1988

4/25/88

Energy Division
January 27, 1988

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

Dear Mr. Clegg:

Subject: Draft EIS for the Proposed Wailuna IV Project

We have no comments to offer except that on page X-1, the statement that "A State Land Use Amendment is contingent upon the Development Plan Amendment, ... may be misleading. The State Land Use Amendment could be obtained prior to obtaining a Development Plan Amendment."

Thank you for this opportunity to comment.

Sincerely,

ESTHER UEDA
Executive Officer

E:to
cc: Fred Rodriguez

March 18, 1988

Ms. Esther Ueda
Executive Officer
Land Use Commission
335 Merchant Street, Room 104
Old Federal Building
Honolulu, Hawaii 96813

Dear Ms. Ueda:

Subject: Draft EIS for the Proposed Wailuna IV Development

We have received your office's comments of January 27, 1988 on the Draft Environmental Impact Statement (DEIS) for the Wailuna IV Development project. The potential misunderstanding has been corrected on page X-1 to reflect that the State Land Use Amendment can be obtained prior to the Development Plan Amendment.

Thank you for calling this to our attention.

Yours very truly,

F. J. Rodrigues
March 8, 1988

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

Dear Mr. CleGG:

Draft Environmental Impact Statement
Wailuna IV
Waimanalo, Oahu

The above referenced document involves construction of 180 single-family residential units and associated infrastructure on land zoned preservation. The Environmental Center has conducted a review of this document with the assistance of Bartall Davis, Anthropology; Bryce Decker, Geography; Yu-Si Fok, Henry Gee, and Edwin Murabayashi, Urban Resources Research Center; and Jennifer Crusmer Environmental Center.

Description of the design capacity of storm drains in the project area is not included in this Draft EIS. In the absence of this information, adequacy of the storm drainage facilities cannot be addressed.

We find the Draft EIS to have no other significant omissions in the environmental aspects which we have reviewed. We have no further comments to offer at this time.

We thank you for the opportunity to review this Draft EIS.

Yours truly,

John T. Harrison
Environmental Coordinator

cc: OESC
F.J. Rodrigues, Environmental Communications, Inc.
L. Stephen Lau
Bartall Davis
Bryce Decker
Yu-Si Fok
Henry Gee
Edwin Murabayashi
Jennifer Crusmer

March 18, 1988

Mr. John T. Harrison
Environmental Coordinator
Environmental Center
University of Hawaii at Manoa
Crawford 317
2590 Campus Road
Honolulu, Hawaii 96822

Dear Mr. Harrison:

Subjects: DEIS for the Wailuna IV Development Project

We have received the comments dated March 8, 1988 from your group on the Draft Environmental Impact Statement (DEIS) prepared for the Wailuna IV project. The comments have been reviewed by the appropriate City/State agencies and we respond as follows:

As stated in the DEIS (page VII-11) the actual runoff quantities are still undetermined since the "ditch/culvert hydraulics" have not been finalized. The new storm drain system will be designed and runoff quantities submitted to the appropriate City/State agencies for approval when design of grading and construction plans are completed. The proposed drainage systems will be routed to outlet into existing Wailua and Puinani gulches. The increase which are due to urbanisation is expected to have an insignificant effect on existing downstream drainage facilities.

Thank you for your comments and continuing concern.

Very truly yours,

F.J. Rodrigues

FJR:ts

1146 Fort St Mall, Suite 200, P. O. Box 95 - Honolulu, Hawaii 96813 - Telephone (808) 547-7007
February 22, 1988

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

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: LETTER DATED JANUARY 21, 1988 FROM THE STATE OFFICE OF ENVIRONMENTAL QUALITY CONTROL TRANSMITTING THE DRAFT EIS FOR WAILUNA IV, THM: 5-2-02; P.O.R.: 3

We have the following comments on the draft EIS:

1. Our existing Wai'au 850-foot water system is adequate to service the proposed development. The water service limit of the system is the 750-foot elevation.

2. The reference on page V-12 to the Wai'au "250" Reservoir should be corrected to the Wai'au "285" Reservoir.

3. Water has not been committed to this project. The availability of water will be determined when the building permit applications are submitted for our review and approval. If water is made available, the applicant will be required to pay our Water System Facilities Charges for source-transmission and storage.

4. A water master plan for the Wailuna IV development should be submitted for our review and approval.

5. The project is in the "no-pass zone," where ground disposal of wastewaters is not permitted. All wastewater disposal should be handled by the municipal sewer system as indicated in the environmental document. (Note: Comments by DPW was not incorporated in Section XII.)

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

cc: Mr. F. J. Rodriguez

FEB 25 1988

March 18, 1988

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

Dear Mr. Hayashida:

Subjects: DEIS for the Wailuna IV Development Project

We have received your agency's comments dated February 22, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Wailuna IV project. We have forwarded these comments to the applicant and their civil engineering consultant and respond as follows:

1. Service availability from the Wai'au 850-foot water system is acknowledged and we will observe the service limit established at the 750-foot elevation.

2. We will revise the reference to page V-12 to the Wai'au "285" Reservoir to read Wai'au "285" Reservoir.

3. The applicant is aware that there are no water commitments for this project. Availability will be determined upon application for building permit and the applicant is prepared to pay a Water System Facilities Charge, source-transmission and storage.

4. A Water Master Plan will be submitted to your office for your review and approval in a timely manner.

5. The applicant acknowledges the "no-pass zone" condition for the project site and will be meeting all codes and standards for the disposal and treatment of wastewater generated by the proposed project.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodriguez

FJ/Rd

1146 Fort St. Hall, Suite 200 • 808-348-3120 • TOLL FREE 800-528-4471 • FAX 808-348-8998
MEMO TO:  MR. DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM:  HERBERT S. MURAKA
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT:  DRAFT HIS FOR WAILUKU IV
WAIAU, WNA DISTRICT, OAHU

We have reviewed the subject draft HIS and have no comments.

Thank you for the opportunity to review the document.

Herbert S. Muraka
Director and Building Superintendent

抄送:  J. Harada
F. J. Rodrigues,
Environmental Communications,
Inc.

No response needed

FEB 1 1988
MEMORANDUM

TO: Donald A. Clegg, Chief Planning Officer
Department of General Planning

FROM: Mike Moon

SUBJECT: Draft Environmental Impact Statement
Wailuna IV
Wainiu, Ewa District, Oahu

February 5, 1988

We appreciate the opportunity to review and comment upon the subject Draft Environmental Impact Statement (DEIS).

The Department's primary concern relates to the provision of housing opportunities for a range of income groups and, in this regard, we note that the DEIS refers to the developer's intent to provide a number of affordable housing units in accordance with the City's requirements. We advised the Department's current policy is to request that at least ten percent of the total number of units developed in the project be set aside for households of low and moderate income, or that the developer contribute in-kind toward the development of such housing. However, this policy is presently under review, and we encourage the developer to maintain contact with the Department so as to keep current with respect to any changes.

Thank you for the opportunity to comment.

Mike Moon
Director

ccc: Mr. F. J. Rodriguez
Environmental Communications, Inc.

FEB 10 1988

March 18, 1988

Mr. Mike Moon, Director
Department of Housing and Community Development
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Moon:

Subject: Draft EIS for the Wailuna IV Development

We have received your department's comments dated February 5, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Wailuna IV project. The applicant/developer has been provided with a copy of your department's comments and is aware of the 10% requirement for affordable housing units. Please be assured that as the project continues through the land use policy review process, there will be continuous communication with your staff to meet this requirement and it will be met.

Thank you for your comments and continuing concern.

Yours very truly,

F. J. Rodriguez

1146 Fort St. Mall, Suite 200

FEB 10 1988

1146 Fort St. Mall, Suite 200
March 3, 1988

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

Dear Mr. Rodriguez:

Mauka IV
Draft Environmental Impact Statement for the Amendment Application from Preservation to Low Density Apartment at Mauka, Wahiawa
Tax Map Key 2-8-01: Pan. of 3, Folder No. 58/PUC-1

We have reviewed the subject document, and offer the following comments:

1. The EIS should indicate that a portion of the site is presently leased for grazing purposes.

2. The project site is described as consisting "... of fallowed sugar cane lands with gentle moderate slopes." This description should be rewritten to inform reviewers of the following:
   a. An extreme slope of 30% or more covers 25% of the site. This is indicated in the storm runoff analysis which you have attached.
   b. The actual extent of fallowed cane lands is approximately 25% of the site consisting of that portion of the site that is situated below the 400-foot contour level and outside of the gulch. This is indicated in the archaeological reconnaissance done by Bishop Estate.

3. The Draft EIS states that no major topographic changes are expected. As a matter of fact, major topographic changes are anticipated. According to information received from the developer, the upper portion of the site would be cut and graded, and the gulch area which exceeds 30% slope will be filled in an attempt to moderate existing topography. Pertinent paragraphs in the report should be rewritten to reflect the proposal.

4. The impact statement proposed Low Density Apartment use and indicates that higher densities would not be in keeping with the character of the surrounding area. It does not, however, discuss Residential uses per se. A direct comparison between Residential uses and the Low Density Apartment should be made.

5. The PECO 138kV transmission line which bisects the site should also be discussed, along with mitigating measures.

6. The surface water contour is misleading and should be rewritten. There is a gulch on site which is the result of decades of water runoff from mauka areas. This gulch is the natural drainage system in the area and is an obvious water feature.

The above corrections should be clearly presented in the body of the report.

Finally, the impact statement should include detailed maps that depict the environmental characteristics of the site, as well as the layout and infrastructure of the proposed project. These should include:

1. A slope analysis of existing conditions in order to determine the extent and location of steeply sloping and moderately sloping lands.

2. A preliminary soils reconnaissance would also be appropriate, given the susceptibility of Mauka soils to sliding if used as a foundation for low buildings or as a foundation for roads and other public facilities.
3. Preliminary layout of proposed residential units and related infrastructure would also be appropriate to establish the impact of development on the natural environment.

These details would allow consideration of the cumulative impact of all phases of development.

Sincerely,

DONALD A. CREGG
Chief Planning Officer

March 18, 1988

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

Dear Mr. Cregg:

Subject: DEIS for the Waikiki IV Development Project

We have received your department's comments dated March 1, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Waikiki IV project. We have reviewed the comments with the applicant and their civil engineering consultant and we respond as follows:

1. The clarification of present land use for grading will be included on page I-2.

2. The more current description of the site conditions as provided by Harding Lawson Associates based on their Preliminary Geotechnical Assessment, will be included on page I-2, and page I-1. The actual acreage of sugar lands previously cultivated on the parcel will be acknowledged and revised accordingly on page I-3.

3. The more current topographical adjustments that will consist of extensive earthwork, grading, and backfilling with less expansive soils will be added as part of the Harding Lawson Associates analysis. Excerpts from their report will be included as additional data on page VIII-1 under Section A, Impact on Geographical Characteristics. Further, the Preliminary Geotechnical Assessment report will be included in the Final Environmental Impact Statement as Appendix B.

4. The project is proposed for a Low Density Apartment amendment on the D.P. Land Use Map in conformity with the zoning designation of the previous phases of the Waikiki development for A-1 Apartment use.

This method for selecting this land use policy option would provide for more flexibility in site design and planning and its earlier approval which would not require more time to obtain additional permits and increase the cost of housing.

The apartment concept has been determined to be incompatible with existing Heights and Crest residential projects at Waikiki. Potential opposition from residents and previously successful marketing of the
Mr. Donald A. Clegg  
March 18, 1968

Page 2

residential units have made the Lusk Company select single-family use as a more feasible and compatible style of living instead of townhouse garden apartment construction to provide homes for the projected population increase in the Primary Urban Center.

5. There are comments provided by the Hawaiian Electric Company and we have responded to the utility via this document. Mitigation as required will be achieved by coordination between the applicant, the civil engineering consultant, the electrical engineering consultant, and HECO's engineering department.

6. There is reference to the Waiawa and Munanu Gulches and the relationship to the various downstream lined and unlined drainage ways on page 14-0172. There is limited or no major sources of surface runoff originating within the project area. The on-site runoff generated will be conveyed to outfall into the two major gulches. The existence of an on-site gulch is noted although it will not be a major factor within the proposed project due to filling of the gulch to provide more developable land area.

Your request for additional data in the impact statement is as follows:

1. A slope map showing various grade categories of the existing conditions will be included in the Final EIS.

2. Based on existing governmental Grading and Erosion Control Standards and recommendations of the soil engineer in their preliminary report, the land will be made more suitable for development by cutting the upper area of the project site and filling the central gulch. This concept has been reviewed and accepted by Department of Public Works (See attachment March 9, 1968 memorandum to DCP from DCP).

3. The preliminary layout of proposed residential units is still unavoidable since all data from soil and engineering design for site improvements are still being developed. At this stage of review, the consultants are not final in their determination of site improvements needed for residential unit placement on the land.

Thank you for your comments and continuing concern.

Very truly yours,

[Signature]

P. J. Rodrigues

FJR'd

Attachment

MARCH 9, 1968

MEMORANDUM

TO:  DR. DONALD A. CLEG, CHIEF PLANNING OFFICE
DEPARTMENT OF GENERAL PLANNING

FROM:  ALFRED J. THIREE, DIRECTOR AND CHIEF ENGINEER

SUBJECT:  PRELIMINARY GEOLOGICAL ASSESSMENT OF SOILS FOR THE
WAILUKU 4th DEVELOPMENT PLAN LAND USE AMENDMENT (88-PUC-11),
WAILUKU, MAUI, HAWAII

We have reviewed the preliminary geological assessment of soils prepared by Harding-Lassen Associates for this proposed project. Our review of the data presented indicates that the proposed filling of the gulch is acceptable. We recommend that the design of the fill incorporate settlement plates to provide reference for monitoring possible stability or settlement problems.

[Signature]

ALFRED J. THIREE

Director and Chief Engineer

cc: Community Planning, Inc.
March 16, 1988

Environmental Communications, Inc.
1148 Fort Street Mall, Suite 200
Honolulu, Hawaii 96813

Attention: Mr. Fred Rodrigues

Gentlemen:

Response to Review Comments
Preliminary Geotechnical Assessment
Vaiana IV, Valiau, Hawaii

We previously performed a preliminary geotechnical assessment of the Vaiana IV site and presented results in a letter report dated February 18, 1988. The report was reviewed and four comments were made. Our responses to the four comments are listed below:

Comment 1. Is our study equivalent to a geologic/soil reconnaissance?
Response: Yes.

Comment 2. If unstable soils are discovered during design or construction, is removal and replacement a possible mitigation measure?
Response: Yes, although unstable soils are not anticipated.

Comment 3. Will drainage be designed to take care of springs, etc., beneath the fills?
Response: Subdrains are required beneath the fills. In addition, if springs or other water sources are encountered, additional drainage will be installed.

March 16, 1988

9560,009.06

Mr. Fred Rodrigues
Environmental Communications, Inc.

Page 2

Comment 4. Settlement plates are recommended to provide reference for monitoring possible stability or settlement problems.

Response: We believe that settlement monitoring is not necessary. However, it would provide additional data and can be installed without such additional effort. Therefore, we have no objection to incorporating settlement plates into the planned fills.

We trust this provides the required information. If there are any questions, please call.

Yours very truly,

Christian P. Moller
Civil Engineer - 5748

CMR/GSM/BE
cc: The Lusk Company/Mr. Brian Yehata
Community Planning, Inc./Mr. Albert Fukushina
MEMORANDUM

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

FROM: JOHN P. WHALEN, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
FOR WALLINA IV, WALLINA, OAHU, OAHU

Thank you for the opportunity to review the DEIS. We have the following comments to offer:

1. Page 1-2 states that the project involves "site clearing and grading, however, no major topographic changes may be expected." At an informational meeting held by the Department of General Planning on February 22, 1988, however, the applicant discussed plans for extensive cutting of slopes and filling of gullies. These plans should be fully disclosed in the EIS.

2. The impact of storm water runoff and siltation (Appendix G) is based on "geographic and topographic alterations ... limited to site clearing and some grading." Storm water runoff and siltation impacts should be reassessed in light of the magnitude of grading and filling proposed. This information should be included in the text of the EIS.

Thank you for the opportunity to comment. If you have any questions, please contact Maureen St. Michel of our staff at 527-3345.

JOHN P. WHALEN
Director of Land Utilization

March 3, 1988

March 18, 1988

Mr. John P. Whalen, Director
Department of Land Utilization
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: DEIS for the Wallina IV Development Project

We have received your department's comments dated March 3, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Wallina IV project.

We have reviewed the comments with the applicant and their civil engineering consultant and we respond as follows:

1. There will be a full discussion in the final Environmental Impact Statement regarding site clearing and grading based on the recently completed soils report submitted by Harding Lawen Associates to the applicant. Based on this analysis, a more accurate depiction of the site conditions can be cited. Further, the mitigative measures required to achieve the improvements onsite will also be provided.

2. The civil engineering consultant will minimize the anticipated impacts of site stabilization by adhering to the City's Grading Ordinance and also instructing the general contractor to control the volume of work and extensive grading to periods of time when the weather is conducive to earth moving. I.e. cease work during dry rains, etc. It is felt that with effective scheduling, the site improvements can be achieved with a minimum of runoff.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJRod

MAR 4 1988
MEMORANDUM

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

FROM: ALFRED J. THIEDE, DIRECTOR AND CHIEF ENGINEER

SUBJECT: WAILuku IV, WAIKIKI DISTRICT, OAHU, HAWAII

WE HAVE REVIEWED THE DRAFT EIS FOR THE SUBJECT PROPOSED DEVELOPMENT AND HAVE THE FOLLOWING COMMENTS:

1. The existing sewers are adequate to serve the proposed development.

2. The Honouliuli WTP will have to be expanded before the development is allowed to connect. Completion date for the expanded capacity at the Honouliuli plant is in the early 1980's.

3. The lower reach of Waiulula Stream is heavily silted, due in part to recent developments in the upper watershed area. Dredging of the stream has been programmed but implementation has been delayed for up to two years because of the difficulty of obtaining a Federal permit.

4. Best management practices should be employed to control erosion and silt loss at the project site during and after construction. We also recommend the retention of stormwater on site, after development of the site, the quantity and rate of runoff leaving the site will be minimized.

ALFRED J. THIEDE
Director and Chief Engineer

CC: Environmental Communications, Inc.

FEB 11 1988

ENVIRONMENTAL
COMMUNICATIONS
INC.

F. J. RODRIGUES
President

March 18, 1988

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

Dear Mr. Thiede:

Subject: Draft EIS for the Proposed Wailuku IV Development

We have received your department's comments dated February 9, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Wailuku IV project. The comments have been provided to the applicant/developer and their civil engineering consultant and we respond as follows:

1. Notification that existing sewers are adequate to serve the development is acknowledged.

2. Expansion at the Honouliuli WTP to meet future demand is understood and the project's civil engineering consultant will maintain contact with your Wastewater Division to ensure compatible scheduling of improvements prior to connection.

3. It is acknowledged that the lower reaches of Waiulula Stream are in need of maintenance dredging, and that the permitting process is a long and arduous one. The applicant/developer is working closely with the civil engineering consultant and the Drainage Division of your department to provide best practicable treatment in solving the problems of erosion and surface runoff. As the project continues through the land use policy review process remaining (State Land Use Commission, Development Plan, and Zoning), the mitigative measures considered best practicable will be discussed and reviewed.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJRs
February 9, 1988

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

FROM:   FRANK K. KAMOKAMANO, FIRE CHIEF

SUBJECT: WAILUKU TV, MA'A'A, ENA DISTRICT, OAHU

Reviewing the materials provided, we foresee no adverse impact on Fire
Department facilities or services.

We have no further comments at this time.

Should you have any questions, please contact Battalion Chief Kenneth Ward at
943-3938.

[Signature]

FRANK K. KAMOKAMANO
Fire Chief

FKK/LDh

cc: Mr. F. J. Rodrigues/
    Environmental Communications, Inc.

NO RESPONSE NEEDED

FEB 11 1988
March 2, 1988

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
650 O. King Street, 8th Floor
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Mailuna IV - Draft EIS

We have reviewed the draft EIS for the Mailuna IV Development and have no substantial comments to offer.

We do wish to have one minor point clarified. On page eight, paragraph one of Appendix C - Traffic Impact Study, it indicated that traffic volumes were increased by six percent to yield future (1993) conditions. Was the six percent based on past trends or reflected agencies/developers projections (e.g., Honolulu's development plan objectives, development commitments for the area, etc.)?

Thank you for allowing us to review the draft EIS.

Sincerely,

Gordon G.W. Lum
Executive Director

抄送: P.J. Rodriguez

March 18, 1988

Mr. Gordon G.W. Lum
Executive Director
Oahu Metropolitan Planning Organization
1364 Bishop Street, Suite 1509
Honolulu, Hawaii 96813

Dear Mr. Lum:

Subjects: DEIS for the Mailuna IV Development Project

We have received your office's comments dated March 2, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Mailuna IV project. The comments have been reviewed by the applicant and the traffic consultant and we respond as follows:

The increased traffic volumes of six percent to yield future (1993) conditions, was determined on the basis of future growth trends projected for the Primary Urban Center (PUC) Development Plan area. It was felt that the projections would thus be consistent with a known or established gauge of growth.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

抄送: F.J. Rodrigues
POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

February 8, 1988

TO: DONALD A. CLEGG, CHIEF PLANNING DIRECTOR
    DEPARTMENT OF GENERAL PLANNING

FROM: DOUGLAS G. GIBB, CHIEF OF POLICE
    HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT: WALLINA IV

We have reviewed the draft environmental impact statement on the
draft environmental impact statement on the
fourth increment of the Lark Wallina Development Master Plan, and
would like to offer the following comments.

In the interest of pedestrian safety and traffic flow, we feel it
advisable that the State Department of Transportation's proposal
to interconnect and coordinate traffic signals on Kamehameha
Highway be implemented.

We would also urge that consideration be given to environmental
security (e.g. deadbolts, window locks, adequate lighting, etc.)
when both the residential units and the public recreational
facility are designed.

Thank you for the opportunity to comment.

[Signature]

DOUGLAS G. GIBB
Chief of Police

CC: Mr. F. J. Rodriguez

March 16, 1988

Gibb Douglas G. Gibb
Honolulu Police Department
City & County of Honolulu
1155 South Beretania Street
Honolulu, Hawaii 96814

Dear Chief Gibb:

Subject: Draft EIS for the Proposed Wallina IV Development

We have received your department's comments dated February 8, 1988 on
the Draft Environmental Impact Statement (DEIS) prepared for the Wallina
IV project. The comments have been reviewed by the applicant and we
respond as follows:

1. The implementation for the proposed coordination and interconnection
   of traffic signals on Kamehameha Highway will be monitored by contact
   with the State DOT.

2. The recommendations on security safeguards have been provided to
   the applicant/developer and they will give this matter the highest
   consideration.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJR/LS

1144 Fort St Mall, Suite 200, Honolulu, Hawaii 96817
Mr. Donald A. Clegg, Planning Director
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
WAILUKA IV, WAIKAU, EWA DISTRICT, OAHU, HAWAII

The Draft EIS for the Wailuka IV has been reviewed and we have no comments
to offer. Since we have no further use for the EIS, it is being returned to
the Office of Environmental Quality Control.

Thank you for the opportunity to review the Draft.

Sincerely,

[Signature]

Copy to:
Mr. F. J. Rodriguez
Environmental Communications, Inc.
P. O. Box 536
Honolulu, Hawaii 96809

Office of Environmental Quality Control

NO RESPONSE NEEDED

JAN 27 1988
DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
Bldg. 4250
Ft. Shafter, Hawai'i 96850

REPLY TO
ATTENTION OF:

February 23, 1988

Planning Branch

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

Dear Mr. Clegg:

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for the Wallluna IV Development. The following comments are offered:

a. Since no work is to be performed in waters of the United States or adjacent wetlands, a Department of the Army permit is not required.

b. The statement in section U.3.3 (page V-2) of the DEIS concerning flood hazards appears to be accurate.

Sincerely,

Kinuk Cheung
Chief, Engineering Division

Copy Furnished:

Mr. P.J. Rodriguez
Environmental Communications
P.O. Box 536
Honolulu, HI 96809

March 18, 1988

Mr. Kinuk Cheung, Chief
Engineering Division
Department of the Army
U. S. Army Engineer District, Honolulu
Building 210
Ft. Shafter, Hawaii 96850-5440

Dear Mr. Cheung:

Subject: DEIS for the Wallluna IV Development Project

We have received your office's comments dated February 23, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Wallluna IV project. The applicant and their civil engineering consultant have been provided copies of your comments and we respond as follows:

1. We acknowledge that a Department of Army permit is not required based on your determination.

2. Our documentation of the flood hazard potential is acknowledged as being acceptable to the Corps of Engineers.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJRals

FEB 25 1988

1146 Fort St Mail, Suite 200, P.O. Box 1234, Honolulu, Hawaii 96813, Telephone (808) 123-4567
Mr. Donald A. Clegg  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
550 South King Street  
Honolulu, Hawaii 96813  

Re: Environmental Impact Statement, Waikima IV, Wai'anae, Ewa  
District, Oahu  

Dear Mr. Clegg:  

We have reviewed the referenced material and find that due to its nature, the proposed project will have no significant deleterious impact on fish and wildlife resources. Please do not hesitate to call on us if we may be of further assistance.  

We appreciate this opportunity to comment.  

Sincerely yours,  

[Signature]  
Ernest Kocaka, Field Supervisor  
Office of Environmental Services  
Pacific Islands Office  

cc: Environmental Communications, Inc.  
DLNR  

NO RESPONSE NEEDED  

FEB 5 1988  

Save Energy and You Serve America!
March 8, 1988

Mr. Donald A. Clegg
Chief Planning Officer
Department of General Planning
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Clegg:

Subject: Draft EIS for Walluma IV

We have reviewed the subject EIS with particular attention to the section addressing air quality impacts and have the following comments to offer.

1. Sections G (Impact on Air Quality), pp. VII-8 to 9, failed to point out that traffic generated by the proposed project will be contributing to greater congestion on the H-1 Freeway, longer commute times, and thus greater exposure of occupants to automotive pollutants. While the contribution of the project itself is relatively small, the public health significance of thousands of vehicle occupants, including many school children, along the H-1 corridor being exposed for longer periods to higher concentrations of carbon monoxide and other pollutants as a result of the cumulative impact of projects such as this certainly deserves mention in the main text of this EIS.

2. Given that the air quality study showed violations of state ambient air quality standards, Section IX, "Any Probable Adverse Environmental Effects Which Cannot Be Avoided," (p. IX-4) of the EIS should have made specific note of this.

3. In the sub-consultant's air quality study (Appendix D, p. 9) the methodology of estimating 8-hour carbon monoxide is discussed. An EPA-recommended "persistence factor" of 0.6 was used to convert 1-hour CO levels to 8-hour levels. That EPA factor is based on field studies in several mainland areas and is

Yours sincerely,

James W. Morrow
Director
Environmental Health

JWRRC
E8010
cc: CSR:

US-Environmental Center
Environmental Communications

NO RESPONSE NEEDED
February 16, 1988

Mr. Donald A. Clegg
Department of General Planning
February 16, 1988
Page 2

5. The Contractor shall be liable for any damages to HECO's facilities.

6. The Contractor shall report any damages to HECO's facilities to the HECO Trouble Dispatch at phone 548-7361.

7. A minimum of 30'-0" shall be maintained between HECO overhead conductors and the final land grade.

8. Service roads and/or trails leading to and from HECO's facilities shall remain accessible for HECO's use at all times.

Sincerely,

[Signature]

Mr. Donald A. Clegg
Department of General Planning

The subject development crosses the existing Waiau-Koolau-Puakea 138kV line and is also in proximity to the existing Waiau-Wahiawa and Waiau-Koolau 138kV lines. These facilities will remain energized during construction. As a result, we recommend that the following HECO notes be included as part of the final construction plans.

1. The Contractor is to exercise extreme caution when the excavation and construction crosses or is in close proximity of our lines and is to maintain 13'-0" clearance for his equipment while working close to and/or under the overhead facilities.

2. The Contractor is to comply with the directions of the State of Hawaii Occupational Safety and Health Law (OSHA).

3. When excavation is adjacent to or under existing structures or facilities, the Contractor is responsible for properly shoring 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.

4. Should it become necessary, any work required to relocate HECO facilities shall be done by HECO. The Contractor shall be responsible for all costs and coordination.
March 18, 1988

Dr. Brenner Hunger, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P.O. Box 2750
Hilo, Hawaii 96725-0001

Dear Dr. Hunger:

Subject: DEIS for the Walluma IV Development Project

We have received your comments dated February 18, 1988 on the Draft Environmental Impact Statement (DEIS) prepared for the Walluma IV project. The comments have been provided to the applicant and their civil engineering consultant who will comply with the request to include the recommended HECO notes as part of the final construction plans.

There will be coordination with the HECO engineering staff by both the civil engineering consultant and their electrical engineer for Walluma IV as the planning continues. There is still a considerable time period remaining before final construction plans are completed, so you may be assured that all concerns will be mitigated.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

F.J.R.

1144 Fort St. Mall. Suite 200 - P.O. Box 35 - Honolulu, Hawaii 96814 - Telephone: 643-1778
March 7, 1988

Mr. Donald Clepp
Chief Fleming Officer
Department of General Planning
City and County of Honolulu
660 S. King Street
Honolulu, Hawaii 96813

SUBJECT: Draft EIS Maunalua IV Development

Dear Mr. Clepp:

Thank you for allowing us to review the subject report.

The Pearl City Neighborhood Board No. 21 submits the following consensus action from eight members for the proposed 100-unit single-family residential condominium project, as there was no quorum at its February 25, 1988 meeting.

1. Eight members are in agreement that all public elementary age students attend Waimanalo Elementary School and that the Waipahu School District be designated as the primary agency to implement programs for all public educational activities of students residing in the Maunalua I, II, III, and IV projects.

2. Five members approve, in concept, the designation of the 26-acre project site for low density apartment use, subject to further review of the infrastructure proposals for water, utilities, water supply and sewer facilities.

3. Three members opposed the project, if affordable housing ($100,000 to $120,000 price range) is included as a requirement for the proposed project.

We would appreciate your consideration of our concerns.

Very truly yours,

Thomas K.Y. Kam
Chairman

MAR 8 1988
March 18, 1988

Mr. Thomas K.Y. Kan, Chair
Pearl City Neighborhood Board No. 21
P.O. Box 1025
Pearl City, Hawaii 96782

Dear Mr. Kan:

Subject: DEIS for the Walluna IV Development Project

We have received the comments dated March 7, 1988 offered by your Board No. 21 on the Draft Environmental Impact Statement (DEIS) prepared for the Walluna IV project.

The Board's support of the project in concept is duly noted and the applicant will continue to work closely with Board No. 21 to assure that Walluna IV is consistent with previous phases at Walluna.

Thank you for your comments and continuing concern.

Very truly yours,

F. J. Rodrigues

FJM/sa

1146 Fort St Mall, Suite 200 • P.O. Box 31081 • Honolulu, Hawaii 96822 • Telephone: (808) 537-4881
APPENDIX A

Biological Study
Walluna IV Project
Waiau, O'ahu

by
Char & Associates

November 1987
TABLE OF CONTENTS

INTRODUCTION ........................................... 1

FLORA SURVEY ........................................... 2
Survey Methods ........................................ 2
Description of the Vegetation ....................... 2

FAUNA SURVEY ........................................... 4
Survey Methods ........................................ 5
Annotated Species List .................................. 5
Avifauna ............................................... 5
Mammals ............................................... 7

DISCUSSION AND RECOMMENDATIONS ................. 8

LITERATURE CITED ...................................... 10

APPENDIX I. LIST OF PLANT SPECIES ................. 11

Prepared for: ENVIRONMENTAL COMMUNICATIONS, INC.
November 1987
BIOLOGICAL SURVEY
WAILUA IV PROJECT
WAIKAI, O'AHU

INTRODUCTION

On November 22, 1967 a biological survey was made of the 276-acre Wailua IV Project site. The site has been disturbed for some time, first by sugar cane cultivation, and later by a macadamia nut orchard and grazing. As a result, the biota on the site is represented largely by introduced or foreign species. No rare, threatened or endangered plants or animals were found on the project site during the course of this survey.

The vegetation on the site consists of a mosaic of plant associations. A bromeliad grassland which grades into a mixed scrub of lantana, Christmas berry, guava, and macadamia nut trees covers most of the project site. A forest of ohia lehua and eucalyptus trees is found along the narrow, paved road which runs the length of the site and services the Board of Water Supply's reservoir located above the project site.

Ten species of birds, all of them foreign, are found on the project site. The most abundant species are the Japanese White-eye and two species of cardinal. Although feral pigs were not encountered during the survey, their occurrence on the site was especially noticeable in the abandoned macadamia nut grove where acat and rooting activity were fairly heavy. In addition, many pig trails criss-cross the project site.

FLORA SURVEY

The project site was formerly planted in sugar cane and in areas where the soil horizon is exposed there is a layer stained black with charcoal. Sugar cane cultivation was apparently abandoned many years ago and the site then used for a macadamia nut grove. The grove too has since been abandoned and a weedy, scrub association has filled in the matrix between the trees. The western portion of the property, along the Waialua boundary, is covered by grassland with scattered shrubs and appears to still be used for grazing. The soil is very deep, with few stones, perhaps as a result of the sugar cultivation. Along the Diamond Head-makai (southeast) corner of the site, severe soil erosion has exposed perhaps eight to ten feet of the soil column.

Survey Methods

A walk-through survey method was employed, with plants identified in the field. Unknown or unrecognized species were collected for later identification by comparison with the literature and herbarium specimens. Fern taxonomy follows Wagner and Wagner (1907), while flowering plant taxonomy follows Wagner, et al., (in prep.). The species recorded are indicative of the season (rainy vs. wet) and environmental conditions under which the survey was conducted. A survey taken at a different time would no doubt yield slight differences in the species list, especially of the weedy, annual species.

Description of the Vegetation

While there are three vegetation types on the site, they are not generally distinct, but represent successive stages in plant
succession on old fields. The first of these is broomedge grassland. Broomedge (Andropogon virgatus) forms a more or less dense cover on the site, varying in height from 3 to almost 6 feet tall. It is particularly well-adapted to periodic burning, and its continued presence on the site may be due to occasional fires. Without these fires, it eventually is invaded by shrubs and trees which shade it out. In fact much of the grassland now has a significant number of shrubs coming in. Locally other grasses supplant broomedge as the dominant and may form small to medium-sized patches. These species include molasses grass (Melinis minutiflora), Natal reed (Panicum repens), Guinea grass (Panicum maximum), and two species of Pennisetum. A few rows of macadamia nut trees (Macadamia integrifolia) are found in the grassland and along the margins of the dense scrub vegetation.

Margins of the grassland are not sharp, but feathered. The number of shrubs increasing until the vegetation is predominately or totally shrub. These are primarily of four species: lantana (Lantana camara), Christmas berry (Schinus terebinthifolius), guava (Psidium guajava), and strawberry guava (Psidium cattleianum). A third species of guava, Psidium littorale, is present on the site in small numbers, and might be confused with the strawberry guava. Christmas berry is present in highest numbers in a shallow gully running lengthwise through the middle of the site. Here it forms an almost pure stand, with a small admixture of Forozan koa (Arecia foroziana) and kolomano (Senecio aurantiacus). On the lower elevation portions of the project site, this gully deepens and eucalyptus predominates just outside the study site.

The forest at the upper end of the site is composed of various species of eucalyptus and albizia (Paraserianthes falcataria), with an understory of macadamia nut trees. Albizia predominates in the lower portion along the roadside. The forest canopy varies from 25 to more than 40 feet in height, with the understory about one-half as high. The macadamia trees are mature to senescent, many having lost their original trunks and subsequently regrowing from near the base. Under the macadamia trees, the combination of deep shade and heavy pig disturbance has eliminated almost all ground cover. Where the macadamia trees have died, the understory consists of the same plants that constitute the scrub vegetation. Just north of the poverline which crosses the site, there appears to be an old well and house site. A number of exotic ornamentals persist here, but are not significant constituents of the vegetation.

A comprehensive list of the plant species found during this survey is presented in Appendix 1.

FAUNA SURVEY

A total of ten avian (bird) species were recorded. The birds generally prefer the forest and scrub areas on the project site. The Japanese White-eye was abundant during the early morning hours, foraging among the albizia trees. Later in the day, the two cardinal species and the Red-vented Bulbul became more numerous. Although not observed during this survey, some birds such as francolin and possibly pheasant as well as a number of manakin (or musia) species are expected to visit the grassland area.

Feral pigs appear to frequent the site on a regular basis. Evidence of rooting was observed in the grassland, scrub, and forested areas. Plant species which provide edible fruit (guava, strawberry guava, passion fruit, macadamia nut) appear to be visited regularly as evidenced by well-worn pig trails.
Although the grassland was used for grazing horses, no animals were observed during the survey. Cattle from neighboring parcels may occasionally stray onto the property.

Survey Methods

The survey was conducted on November 02, 1987 between the hours of 0700 and 1400. Birds were detected both by sight and by their vocalizations. Mammalian presence was determined primarily by observation of tracks and scat (droppings) and by damage to vegetation.

Annotated Species List

The common and scientific names are given for each species. Bird species are in accordance with those listed in Pratt, et al. (1987).

1. Aves

Zebra Dove (Geopelia striata): Foreign
Also known as the Barred Dove, this species occurs in small flocks on the site, preferring open areas with sparse grass cover.

Feral Rock Dove (Columba livia): Foreign
Four wild pigeons were observed flying over the site. The birds probably do not make use of the site for feeding or nesting.

Spotted Dove (Spilopelia chinensis): Foreign
Also known as the Lace-necked Dove, individuals of this species were observed feeding on the ground in the scrub and forested areas.

Northern Cardinal (Cardinalis cardinalis): Foreign
Pairs of birds were observed in scrub and forested areas; common on the site.

Red-crested Cardinal (Paroaria coronata): Foreign
Also known as Brazilian Cardinal. This species was also observed frequently on the site, with the number of birds increasing during the later part of the morning hours.

Common Myna (Acridotheres cristatellus): Foreign
This species is usually associated with residential areas. One pair of birds was observed flying over the site during the later part of the day.

White-rumped Shama (Copsychus malabaricus): Foreign
Also known as Shama Thrush, this species prefers forested areas. A pair of birds was observed in the macadamia trees which form a more or less dense grove under a number of large, old albizia trees along the paved road. The birds probably nest in the area.

Japanese White-eye (Zosterops japonicus): Foreign
Also known locally as Matjita. This species was abundant on the site during the early morning hours, foraging among the albizia trees. Found in lesser numbers in the scrub vegetation.

Red-tailed Bulbul (Pycnonotus jocosus): Foreign
Since its unauthorized cage release in 1965 or sometime earlier, this species has increased and spread rapidly on O‘ahu. This noisy and gregarious species was frequently observed in the scrub and forested areas feeding on fruit.

House Sparrow (Passer domesticus): Foreign
Like the Myna, this species is also associated with humans and is common in urban areas. One bird was observed flying over the site.
2. Mammals

Feral Pig (*Sus scrofa*); Foreign

Scat of wild pigs and evidence of rooting were frequent in areas where the macadamia nut trees were fairly dense. The pigs probably come down from the forested areas above the site to feed on macadamia nuts, earthworms, insects, and guava fruit during the early morning and late afternoon hours as well as night. Hawaiian pigs use well-defined trails within an area of about two to four square miles (Van Riper and Van Riper 1982). Such trails criss-cross the study site and usually pass fruit-bearing trees and vines. Rooting was occasionally observed in grassland areas especially where the bracken fern or kilau was common.

Horse (*Equus caballus*); Foreign

Evidence of browsing and old scat of horses were observed. Horses occasionally use the grassland and scrub areas for grazing but were not seen on the site during the study.

Feral Cat (*Felis catus*); Foreign

Tracks of cat, probably feral, were found in the badly eroded area on the southeast portion of the site.

Mongoose (*Herpestes auropunctatus*); Foreign

Scat and tracks of mongoose were found along the margins of the grassland, especially in the area where an old dirt road runs along the Waimalu boundary of the site.

Rat (*Rattus spp.*); Foreign

Partially gazed fruit of guava and macadamia nut were observed. Two species of rat — Roof Rat (*Rattus rattus*) and Pacific Rat (*Rattus rattus*) — probably occur on the site. In addition, the ubiquitous House Mouse (*Mus musculus*) is expected to occur here, especially in the grassland vegetation.

DISCUSSION AND RECOMMENDATIONS

Because the site has been disturbed for such a long period of time, it is dominated almost exclusively of introduced or foreign species. No rare, threatened or endangered plant or animal species designated by the federal and/or state governments occur on the site.

There is no botanical reason to impose any restrictions or conditions on the development of this site, but some plants on the site do represent potential assets or problems. The following recommendations are offered.

1. Use of native species for landscaping.

Four of the native plants on the site are of some significance and have been used for landscaping by a number of botanical gardens and arboreta as well as a number of individuals. 'Ohi'a lehua (*Metrosideros collina*) was probably a dominant tree here before the site was disturbed by man, and a few trees were found outside the site. Within the project site, a number of more or less even-aged small trees (some up to 8 feet tall) were encountered on the gravelly slope of the shallow central gully, near the powerlines. A single alahio shrub (*Ganithea odorata*) was found in the same gully farther downslope, near the edge of the study site. It was probably also common in the native forest ecosystem. 'Akia (*Viburnum opulus*) is a shrub three to six feet tall with fragrant yellowish-green flowers. It is characteristic of dryish to moist areas and was probably a dominant understory shrub prior to disturbance. It has adapted well to disturbed areas, and, almost qualifies as a major component of the grassland and scrub. Far less common on the site is *A'ula* (*Osteomeles anthyllidifolia*), a prostrate, almost viny, shrub of dry to moist areas.

The plants can be dug out with a sufficient rootball during
the construction phase and retained for use as landscaping material around the common areas.

2. Removal of existing large trees.
A potential asset is the wood from the macadamia trees on the site. Macadamia wood is dense, hard, and the grain is well-figured. It might generate some revenue if sold to local artists who work in woods.

The large albizzia trees on the site are considered weedy by many people, including foresters, and should be removed. It is a rapid-growing tree which soon reaches immense proportions. Unfortunately, the wood is weak and the trees begin to drop large branches, especially during storms and heavy rains. Eucalyptus also tends to drop branches or blow over in high winds, though not to the extent that albizzia does.

The project is not expected to have a significant impact on the fauna of the site as all the species are foreign. Species commensal with man such as the Hynie and House Sparrow will probably increase in numbers.

While the project will result in loss of vegetation and some faunal habitat, it is expected to have only a minimal impact on the total island populations of the species involved.

LITERATURE CITED


### SPECIES LIST

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Biogeographic Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Adiantum</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Asplenium</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Cystopteris</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Polybotryum</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Chamaecyparis</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Commelina</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Cyperus</em></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Dichondra</em></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Legend:**
- **E:** endemic
- **X:** native only to the Hawaiian Islands
- **I:** introduced, native to the Hawaiian Islands before Western contact
- **+:** native to the Hawaiian Islands accidentally or intentionally after Western contact
- **X:** native to the Hawaiian Islands before Western contact; brought to the islands before Western contact
- **V:** variety

**Notes:**
- A very broad sense is used.
- Species not determined.
<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gramineae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Andropogon virginicus L.</td>
<td>broomsedge</td>
<td>X</td>
</tr>
<tr>
<td>Andropogon affine Chase</td>
<td>carpet grass</td>
<td>X</td>
</tr>
<tr>
<td>Chrysopogon aciculatus (Retz.) Trin.</td>
<td>golden beard-grass</td>
<td>X</td>
</tr>
<tr>
<td>Cynodon dactylon (L.) Pers.</td>
<td>Bermude grass</td>
<td>X</td>
</tr>
<tr>
<td>Digitaria sanguinalis (Roentz.) Koeler</td>
<td>crab grass</td>
<td>X</td>
</tr>
<tr>
<td>Digitaria nigra (Presl.) Miq.</td>
<td>crab grass</td>
<td>X</td>
</tr>
<tr>
<td>Digitaria imbricata (L.) Nees ex Elemen</td>
<td>sour grass</td>
<td>X</td>
</tr>
<tr>
<td>Eleusine indica (L.) Gaertn.</td>
<td>goose grass</td>
<td>X</td>
</tr>
<tr>
<td>Hyparrhenia rufa (L.) Stapf in Pfein</td>
<td>thatching grass</td>
<td>X</td>
</tr>
<tr>
<td>Melinis minutiflora Beauv.</td>
<td>nolasses grass</td>
<td>X</td>
</tr>
<tr>
<td>Paniceum maximum Jacq.</td>
<td>Guinea grass</td>
<td>X</td>
</tr>
<tr>
<td>Passerina convolvulus Berg.</td>
<td>tif</td>
<td>P</td>
</tr>
<tr>
<td>Paspalum acrocladum L.</td>
<td>rice grass</td>
<td>X</td>
</tr>
<tr>
<td>Rhynchosporum repens (Willd.) C. E. Hubb.</td>
<td>Natal reedtop</td>
<td>X</td>
</tr>
<tr>
<td>Setaria gracilis Kunth. in Humb. &amp; Bong.</td>
<td>foxtail</td>
<td>X</td>
</tr>
<tr>
<td>Setaria palmerifolia (Koern.) Stapf</td>
<td>palm grass</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liliaceae s.l.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poeae alternata Salis-Drack</td>
<td>bamboo orchid</td>
<td>X</td>
</tr>
<tr>
<td>Cordypine terminalis (L.) Kunth.</td>
<td>Philippine ground orchid</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SCIENTIFIC NAME</th>
<th>COMMON NAME</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DICOTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acanthaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acanthus sinensis (L.) T. Anders.</td>
<td>Chinese violet</td>
<td>X</td>
</tr>
<tr>
<td>Caryota cristata L.</td>
<td>Philippine violet</td>
<td>X</td>
</tr>
<tr>
<td>Anacardiaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schinus terebinthifolius Reddi</td>
<td>Christmas berry</td>
<td>X</td>
</tr>
<tr>
<td>Compositae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acanthoporum australe (Leef.) Kuntze</td>
<td>Paraguay bur</td>
<td>X</td>
</tr>
<tr>
<td>Agrostis gigantea (Regel) King &amp; Robinson</td>
<td>Hamakua pamanani</td>
<td>X</td>
</tr>
<tr>
<td>Agrostis exantae L.</td>
<td>ageratum</td>
<td>X</td>
</tr>
<tr>
<td>Bidens pilosa L.</td>
<td>Spanish needle</td>
<td>X</td>
</tr>
<tr>
<td>Conyza canadensis (L.) Cronq.</td>
<td>horseweed</td>
<td>X</td>
</tr>
<tr>
<td>Emilia cocinea (Sims) B. Don</td>
<td>emilea</td>
<td>X</td>
</tr>
<tr>
<td>Emilia specifolia (L.) DC.</td>
<td>purple emilea</td>
<td>X</td>
</tr>
<tr>
<td>Pluchea indica (L.) Less.</td>
<td>pluchea</td>
<td>X</td>
</tr>
<tr>
<td>Pluchea symbiotica (Mill.) Gillis</td>
<td>pluchea</td>
<td>X</td>
</tr>
<tr>
<td>Vernonia cinerea (L.) Less.</td>
<td>ironweed</td>
<td>X</td>
</tr>
</tbody>
</table>

<p>| Cucurbitaceae  |             |        |
| Horndicia charantia L. | bittermelon | X      |</p>
<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euphorbiaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chamaesyce hirta (L.) Millap.</td>
<td>spurge</td>
<td>X</td>
</tr>
<tr>
<td>Euphorbia lactea Haw.</td>
<td>euphorbia</td>
<td>X</td>
</tr>
<tr>
<td>Phyllanthus deligtus Klein ex Willd.</td>
<td>phyllanthus</td>
<td>X</td>
</tr>
<tr>
<td>Labiatae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyptis pectinata (L.) Poit.</td>
<td>comb hyptis</td>
<td>X</td>
</tr>
<tr>
<td>Leguminosae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acacia confusa Merr.</td>
<td>Formosan baa</td>
<td>X</td>
</tr>
<tr>
<td>Chamaecrista nictitans (L.) Moench.</td>
<td>partridge pea, lau-ki</td>
<td>X</td>
</tr>
<tr>
<td>Desmanthus virgatus (L.) Willd.</td>
<td>viregata peasosa</td>
<td>X</td>
</tr>
<tr>
<td>Desmodium Incanum DC.</td>
<td>beggar's ticks</td>
<td>X</td>
</tr>
<tr>
<td>Desmodium triflorum (L.) DC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigofera suffruticosa Mill.</td>
<td>indigo</td>
<td>X</td>
</tr>
<tr>
<td>Leucaena leucocephala (Lam.) de Wit</td>
<td>baa-baa</td>
<td>X</td>
</tr>
<tr>
<td>Mimosae pubescens</td>
<td>sleepinggrass</td>
<td>X</td>
</tr>
<tr>
<td>Pseudolobus falcataria (L.) Nielsen</td>
<td>abbia</td>
<td>X</td>
</tr>
<tr>
<td>Scienia aurantiaca (N. L. Burm.) Irwin &amp; Barneby</td>
<td>kolomboa</td>
<td>X</td>
</tr>
<tr>
<td>Lythraceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephase carthagenensis (Jacq.) Macbr.</td>
<td>tarweed</td>
<td>X</td>
</tr>
<tr>
<td>Malvaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sida rhombifolia L.</td>
<td>sida</td>
<td>X</td>
</tr>
<tr>
<td>Mestomataceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clidemia hirta (L.) D. Don</td>
<td>Koster's curse</td>
<td>X</td>
</tr>
<tr>
<td>Menispermaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cocculus trilobus (Thunb.) DC.</td>
<td>huehue</td>
<td>X</td>
</tr>
<tr>
<td>Moraceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ficus rubiginosa Desf.</td>
<td>Port Jackson Fig</td>
<td>X</td>
</tr>
<tr>
<td>Myrtaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus delegatia Bt.</td>
<td>Mindanao gum</td>
<td>X</td>
</tr>
<tr>
<td>Eucalyptus paniculata Sm.</td>
<td>gray ironbark</td>
<td>X</td>
</tr>
<tr>
<td>Eucalyptus resinafera Sm.</td>
<td>red mahogany</td>
<td>X</td>
</tr>
<tr>
<td>Eucalyptus robus Sm.</td>
<td>swamp mahogany</td>
<td>X</td>
</tr>
<tr>
<td>Eucalyptus rudis Endl.</td>
<td>flooded gum</td>
<td>X</td>
</tr>
<tr>
<td>Eugenia uniflora</td>
<td>Suriname-cherry</td>
<td>X</td>
</tr>
<tr>
<td>Lepidothys scoparius J. R. &amp; G. Foster</td>
<td>New Zealand tea</td>
<td>X</td>
</tr>
<tr>
<td>Melastoma polybractea Gaud.</td>
<td>'oni's lehua</td>
<td>E</td>
</tr>
<tr>
<td>Pidium castellianum Sabine</td>
<td>strawberry guava</td>
<td>X</td>
</tr>
<tr>
<td>Pidium guajava L.</td>
<td>guava</td>
<td>X</td>
</tr>
<tr>
<td>Pidium littoralis Raddi</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syzygium cumini (L.) Skeels</td>
<td>Java plum</td>
<td>X</td>
</tr>
<tr>
<td>Oenolaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxalis corniculata L.</td>
<td>yellow wood-sorrel</td>
<td>X</td>
</tr>
<tr>
<td>SCIENTIFIC NAME</td>
<td>COMMON NAME</td>
<td>STATUS</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------</td>
<td>--------</td>
</tr>
<tr>
<td>Passifloraceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passiflora adolfsi Sims</td>
<td>liliko'i</td>
<td>x</td>
</tr>
<tr>
<td>Passiflora foetida L.</td>
<td>love-in-a-mist</td>
<td>x</td>
</tr>
<tr>
<td>Passiflora suberosa L.</td>
<td>white passionflower</td>
<td>x</td>
</tr>
<tr>
<td>Passiflora subhirta Ortega</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pittosporaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pittosporum sp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portulacaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portulaca oleracea L.</td>
<td>ornamental purslane</td>
<td>x</td>
</tr>
<tr>
<td>Proteaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sclerola robusta A. Cunn. ex R. Br.</td>
<td>silk-oak</td>
<td>x</td>
</tr>
<tr>
<td>Macadamia intergriffoli Maiden &amp; Betche</td>
<td>macadamia</td>
<td>x</td>
</tr>
<tr>
<td>Rosaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Osteomeles antyllidifolia (Gm.) Lindl.</td>
<td>u'olei</td>
<td>i</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canthium odoratum (G. Forst.) Seen</td>
<td>alahe'e</td>
<td>e</td>
</tr>
<tr>
<td>Pandanus foetida ascendens (Lour.) Merr.</td>
<td>maile pila</td>
<td>x</td>
</tr>
<tr>
<td>Richardia brasiliensis Gomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sterculia assamica Ruiz &amp; Pavon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rutaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citrus sp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staphyleaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melicope americana (L.) var. americana (L.) R. Br. ex Mosara</td>
<td>whala'oe, hi'aloe</td>
<td>i7</td>
</tr>
<tr>
<td>Thymelaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wistaria chinensis (A. Gray) Rock</td>
<td>sia</td>
<td>e</td>
</tr>
<tr>
<td>Umbelliferae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gentella asiatica (L.) Urban</td>
<td>asiatic pennywort</td>
<td>x</td>
</tr>
<tr>
<td>Verbenaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lantana camara L.</td>
<td>lantana</td>
<td>x</td>
</tr>
<tr>
<td>Stachytaerpha dichotoma (Ruiz &amp; Pavon) Vahl</td>
<td>stachytaerpha</td>
<td>x</td>
</tr>
<tr>
<td>Stachytaerpha Jamacensis (L.) Vahl</td>
<td>stachytaerpha</td>
<td>x</td>
</tr>
<tr>
<td>Stachytaerpha urticifolia (Salisb.) Sims</td>
<td>stachytaerpha</td>
<td>x</td>
</tr>
</tbody>
</table>
APPENDIX B

Archaeological Reconnaissance Survey
For The Proposed Wailuna Subdivision
Waiau, Ewa District, O'ahu

by

Bishop Museum

December 1987
INTRODUCTION

Under contract to Environmental Communications Inc., an archaeological reconnaissance survey was performed by the Applied Research Group, Bishop Museum. The project area encompasses approximately twenty-six acres located in Waimalu, Oahu, Hawaii (TMD 9-8-02:por. 3: Fig. 1). Field work was conducted by the author and Carol Kawachi on November 4 and 5, 1987. The cooperation of Ms. Mary Rusch and Ms. Sharon James, of the Lask Company, the land developer, is appreciated. I would like to thank the following for their assistance: Joyce Roth and Agnes Griffin of the Department of Land and Natural Resources, Charles Stone of the State Survey Office, Kapu Smith and Jia Kristin of Bishop Estate.

SCOPE OF WORK

The purpose of a reconnaissance survey is to determine the presence or absence and general nature of archaeological resources within a specified area. Systematic surface survey, limited subsurface testing, and literature search are major tasks undertaken to meet these objectives.

ENVIRONMENTAL SETTING

The project area is located on the lower portion of the ridge that comprises the southern boundary of Waimalu Valley. An erosional gully traverses along the middle of the project area. Elevations range from 162 to 229 meters (530 to 750 feet), and rainfall averages 125 centimeters (49.2 inches) per year, mostly occurring in the winter months (U.S. N.R.R. 1982).

Classified in the low-humus latosol type, the soil of the area is characterized as being deep and well drained with absence of pronounced horizontation of soils and deficient in organic matter (Sahara 1972:2). Most of the sugar cane and pineapple crops grown in Oahu are on this soil type (Ibid.).

Vegetation varies quite dramatically within the project area. A narrow strip of large eucalyptus trees (Eucalyptus sp.) and intermittent patches of
lantana (Lantana camara) parallels the northwest side of the Kahanu Street extension. Ground surface visibility is quite good.

The vegetation on the southeast side of the Kahanu Street extension is denser and more varied. Very dense thickets of lantana, Desmodium sp., and other exotic grasses fringe the street. In the interior is a canopy of Christmas berry (Schinus terebinthifolius), acacia nut (Acacia integrifolia), Java plum (Eugenia cuminata), and guava (Psidium guajava). This large canopy blocks most of the sunlight, keeping the ground surface clear of most other plants. Throughout the interior are persistent patches of very thick lantana that make the area nearly inaccessible and hamper visibility. In other areas ground surface visibility is clear enough to see low-lying archaeological features.

The gully floor is dominated by Christmas berry and common sword fern (Nephrolepis exaltata). The southeast side of the gully rises back again to the ridge where thick waist-high grasses grow (Fig. 2). The gully is 20 to 80 meters from the dirt road that marks the southeast boundary of the project area. There are thick stands of strawberry guava (Psidium cattleianum), lantana, Java plum, Christmas berry, and two small groves of young hog (Amaria hypogaea). In this section, ground surface visibility is poor and low-lying features may have been missed, although that possibility appears remote in view of the lack of archaeological features in surrounding areas.

Just outside the project area, northwest of the reservoir tank, mountain mango (Garcinia menziesii), 'Ulu'ula (Monarda collina), pua'amen (Styphelia taeamum), and kou, the most intact remnants of native flora, are seen on the steep slope.

Three domesticated horses roam the project area and numerous pig trails were seen. Many exotic species of birds occupy the area.

HISTORICAL SETTING

In 1899, Honolulu Plantation Company began operation (Hast 1973: 313). The property consisted of about 9,000 acres and its upper limits were at the 198 meter (650 feet) contour level (Evening Bulletin, Industrial Edition 1901: 3; Fig. 3). From a period of 1906 to 1918, Honolulu Plantation Company...
harvested an average of about 15,000 tons per year (Directory 1914:26). Oahu Sugar Company eventually took control in 1947 (Best 1973:313).

PREVIOUS ARCHAEOLOGICAL WORK

The literature search produced no previous archaeological work conducted in Waimau. The nearest area where previous work took place was in the next valley to the southeast, Waimalu (pers. comm. Joyce Bath, Hawaii State archaeologist). A rockshelter (State No. 80-09-1169), located at an elevation of 61 meters (200 feet) was excavated by Dr. Everett Feist in 1976. As of yet, there is no written report.

Handy and Handy discuss in general terms the area's agriculture, legend, abundance of productivity in Pearl Harbor, and as an established place of political power (Handy 1972:68-73).

SURVEY METHODOLOGY

The project area is bounded by the Kaahumanu Street extension to the northwest, a dirt road to the southeast, a paved road to the northeast, and a metal gate to the southeast (Fig. 4). The Kaahumanu Street extension was used as the base line for the present survey. A total of 33 walk-through transects, placed about 20 meters apart were conducted. The transects were oriented at an angle of 131/314 degrees (magnetic) north, basically perpendicular to the street.

All field and lab notes, drawings, and photographs are on file in the Department of Anthropology, Bishop Museum.

SURVEY RESULTS

Extensive prior disturbance, mainly bulldozer activity is indicated. Several bulldozer backfill mounds, cuts and tracks were observed throughout the project area. Also, the area is conspicuously devoid of rocks. The few
that are present are either on the bulldozer mounds, along with modern trash, or exposed through erosion on the slopes of the gully. The secondary growth of lantana and Christmas berry found throughout the project area is another indicator of recent disturbance. Moreover, large macadamia nut trees planted in rows indicate an orchard was present at one time.

One recent feature has been found near a banyan tree (Ficus sp.) about 204 meters northeast of the metal gate and 15 meters southeast of the Kauheiau Street extension. It appears to be a cement cistern sunk in the ground (Feature A). It measures 3.5 meters in diameter and the concrete roof extends 30 centimeters above the ground surface (Fig. 5). There is a small rectangular hole near the center and the inside depth of the feature is about 3.0 meters. Rusted corrugated iron sheets and various lengths of lumber were found on and around the feature suggesting that there was a structure on top of the cistern. The condition of the feature is fair.

About 15 meters southwest of the cistern, near a small stand of eucalyptus trees, is another feature, a collapsed wooden structure (Feature B). It measures about 13 X 9 meters, oriented on an east-west axis. Due to deterioration and bulldozer activity, it is difficult to determine its exact dimensions. One-gallon jugs, window glass, pieces of stoneware, bits of concrete, fragments of bottle glass, rubber hoses, and a small metal wash tub are in and around the feature. On the southeast side of the collapsed wooden structure, two parallel alignments (3.0 X 0.5 m) of three rectangular boulders each, may have been used as foundations for wooden posts to support a porch. The alignments run in a northeast-southwest axis and the boulders appear to be hewn (Fig. 6). Two shovel pits were dug near the alignments to a depth of about 25 centimeters below ground surface. Only a thin layer of dark red silty-clay matrix, characteristic of the low-lying estuaries was encountered. The condition of this feature is very poor.

The spatial relationship, type, and construction of these features indicate that the two structures were associated and probably share common modern origins (see Appendix A).
DISCUSSION

The historic documents researched indicate that the project area was in heavy commercial sugar production. Sugar was cultivated as late as 1947. Sugar cultivation practices like the removal of rocks and the use of Fowler stone plows that cut through the soil to a depth of 91 centimeters (36 inches) account for much of the man-made disturbances in the project area (Evening Bulletin, Industrial Edition 1901:5). More recent disturbances probably occurred with the acacemia nut orchard after commercial sugar production.

SIGNIFICANCE AND RECOMMENDATIONS

Since the only features encountered were recent and no other remains of archaeological significance were encountered, no further archaeological work is recommended for the project area.
BIBLIOGRAPHY

Anonymous

Bost, Gerald M. and Jesse Gonde

Department of Land and Natural Resources, Division of Water and Land Development

Evening Bulletin

Handy, Craighill E.S. and Elizabeth Green Handy

Neal, Marie C.

Sakura, Tatsuo; Edwin T. Murakayashi, Arthur Y. Ching, Gary D. Dwight, Faith Pujiera, Monica Neal, Lois Hashimoto and Harold Baker
APPENDIX C
Traffic Impact Study
Walluna IV
Waiau, Oahu, Hawaii
by
Parsons Brinckerhoff Quade & Douglas, Inc.
November 1987
TABLE OF CONTENTS

TRAFFIC IMPACT STUDY

WAIHEKA IV
Waiau, Oahu, Hawaii

INTRODUCTION ........................................... 1
EXISTING CONDITIONS .................................. 2
FUTURE CONDITIONS WITHOUT THE PROJECT ............. 8
PROJECT TRAFFIC IMPACTS ............................... 11
REGIONAL IMPACTS ...................................... 16
CONCLUSIONS AND SUMMARY ............................ 17
REFERENCES ............................................ 18
APPENDIX ............................................... 19

LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EXISTING TRAFFIC ANALYSIS ..................... 6</td>
</tr>
<tr>
<td>2</td>
<td>FUTURE CONDITIONS WITHOUT THE PROJECT, ANALYSIS SUMMARY .......... 10</td>
</tr>
<tr>
<td>3</td>
<td>TRIP GENERATION ................................ 11</td>
</tr>
<tr>
<td>4</td>
<td>FUTURE CONDITIONS WITH THE PROJECT, ANALYSIS SUMMARY .......... 15</td>
</tr>
</tbody>
</table>

LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LOCATION MAP ................................... 3</td>
</tr>
<tr>
<td>2</td>
<td>EXISTING TRAFFIC COUNTS ....................... 5</td>
</tr>
<tr>
<td>3</td>
<td>FUTURE TRAFFIC ASSIGNMENT WITHOUT PROJECT ........ 9</td>
</tr>
<tr>
<td>4</td>
<td>PROJECT TRAFFIC ASSIGNMENT .................... 12</td>
</tr>
<tr>
<td>5</td>
<td>FUTURE TRAFFIC ASSIGNMENT WITH PROJECT ........ 14</td>
</tr>
</tbody>
</table>

Prepared for:
THE LISK COMPANY

Prepared by:
PARSONS BEECHERJOFF QUINN & DOUGLAS, INC.

November 1987
INTRODUCTION

The Lush Company proposes to develop Waluna IV for residential use in Waianae, Oahu. Waluna IV would provide 180 single-family dwelling units. The purpose of this study is to identify the expected traffic impact of this proposed project.

The study examined existing traffic conditions at the three signalized Kauhunau Street intersections during the morning (AM) and afternoon (PM) peak hours. Future traffic volumes without and with the proposed project were estimated and traffic conditions were evaluated. The effect of the proposed project's traffic generation on regional traffic volumes was also identified.

EXISTING CONDITIONS

The project site, shown in Figure 1, has no existing public access. In the future, the site will be served by the Hooks extension of Kauhunau Street. The first two increments of the Waluna project, containing 318 apartment units and 127 single-family units, have been completed and are occupied. Currently, the third increment with 170 single-family units is under construction.

Roadway System

Kauhunau Street, a collector road, runs between the existing Waluna development and Blaisdell Park at Kauhunau Highway. For most of its length, the Kauhunau Street right-of-way is 60 feet, which allows two travel lanes in each direction with a parking lane and a sidewalk on each side. This road has three signalized intersections: at Komo Mai Drive, at Hoomalau Road, and at Kauhunau Highway; all the signals are demand-actuated. Separate turn lanes at intersections are provided by limiting on-street parking at approaches.

Komo Mai Drive links the Pearl City and Newtown communities. At this intersection, the Kauhunau Street mainbound approach is striped with an optional left turn lane and a separate right turn lane; the mainbound approach has a similar configuration, except that the right turn lane results from the lack of parked vehicles alongside the fire station instead of pavement striping. The Komo Mai Drive baysidebound approach designates a separate right turn lane, while the westbound approach has a separate left turn lane.

Hoomalau Road services many residential units and commercial uses along the corridor connecting Pearl City with Aiea town. Within the local communities, Hoomalau Road also provides an alternative route to the regional R-1 and Hoomalau Freeway and Kauhunau Highway. At Hoomalau Road, the Kauhunau Street mainbound approach allows separate left and right turn lanes with two through lanes. The mainbound approach designates a single lane for each left, through, and right turn movement. In this area, Hoomalau...
Road provides two travel lanes in each direction; separate left turn storage bays are striped at the Kamehameha Street intersection. During the AM peak period, the left storage lane on Wainamoku Road, at Kamehameha Street, becomes a storage bay for the queue of motorists desiring to turn left to enter the H-1 freeway loop on-ramp, h0k0heh0bd10n, at Wai0 Interchange.

Kamehameha Highway is a primary arterial supplementing the H-1 freeway. Peak-hour commuter flows are highly evident during the AM and PM periods. The neighboring commercial uses along this highway also contribute to the traffic flows, especially to the turning movement volume at the intersections. The north leg of the Kamehameha Highway intersection with Kamehameha Street is the only vehicular access for the Blaisdell Area; the peak access has single approach and departure lanes. The makai leg Kamehameha Street approach designates a separate left turn, a through-left turn option, and a channelized right turn lane. In this vicinity, Kamehameha Highway has three travel lanes in each direction. Double left turn lanes are provided at the h0k0heh0bd10n approach and a single left travel lane has been striped for the eastbound approach. A bus stop exists on the south side of each Kamehameha Highway approach.

Existing Traffic Conditions

Manual traffic counts and observations taken during the latter part of October 1985 serve as the basis of this discussion on the existing traffic conditions. Figure 2 presents the existing traffic volumes from the manual counts. The AM and PM peak hour differs with each intersection; the roadways that carry regional traffic tended to have its peak hour at an earlier time than roadways serving mostly local traffic.

The signalized intersections were analyzed by the operational methodology described in the 1985 Highway Capacity Manual1. The results of the analysis are given in Table 1. Levels of Service are defined in the appendix.

The two-phase traffic signal at the intersection of Wainamoku Drive and Kamehameha Street is highly responsive to the traffic demand, as indicated by the high Level of Service A during both AM and PM peak hours.
At the Moanalua Road intersection with Kahuipau Street, the traffic signal provides a protected phase (separate from the opposing through movement) for the left turn movement. The results of the analysis show Level of Service B for left turns from the kahuaRoadbound, makakau Road and makahau Road approaches, indicating that these movements incur long delays. Field observations note that the delays are due to the long signal cycle lengths and that the left turn movements receive adequate green time, as confirmed by the volume-to-capacity ratios which are less than 1.00.

The Level of Service B condition reported for the Moanalua Road intersection (overall) is generally reflective of actual operating conditions at this intersection; waiting vehicles tended to clear during the near green phases. However, during the AM peak hour, the makakau Roadbound left turn and the makahau Roadbound right turn movements were impeded by the queue of vehicles in the Moanalua Roadbound left turn lane desiring to enter the H-1 freeway kahuaRoadbound on-ramp at Waipahu interchange. The number of vehicles that could enter the left turn lane is constrained by the queue from the on-ramp backs up to the Moanalua Road intersection. The length of the queue affects travel patterns and alternative routes, such as Moanalua Road and Kamehameha Highway, provide some relief. The counts support the observation that Moanalua Road serves local and regional traffic needs as large traffic volumes were nearly equal among the intersection approaches.

At the Kamehameha Highway/Kahuna Road Street intersection, Kamehameha Highway left turns have leading protected phases, while all vehicles from the Kahuna Road and Blaisdell Park approaches must execute their movements in the same signal phase. For this intersection, the analysis tends to result in levels of service that were higher than observed for the through traffic on Kamehameha Highway. The traffic signals along Kamehameha Highway are not coordinated, which contributes to the poor progressions along this corridor. As a result, many of the platoons from downstream intersections are caught by the red phase at this intersection, while portions of the green phase remain underutilized.

Future conditions refer to the year 1993, when Vailima IV is projected to be completed and occupied. Traffic volumes were increased by six percent and the traffic from the Vailima third increment will also include the future traffic assignment is given in Figure 3 and represents future conditions without the project. The results of the analysis are reported in Table 2.

The analysis of future conditions indicates that the service level would drop to Level of Service B for the eastbound approach left turn at the Moanalua Road/Kahuna Road Street intersection in the AM peak hour and for the eastbound through-right turns at Kamehameha Highway/Kahuna Road Street intersection during the PM peak hour. Volume-to-capacity ratios would increase; however, the Levels of Service for the other movements and the overall intersection would remain the same.

The poor levels of service and relatively low volume-to-capacity ratios suggest that signal timing adjustments and coordination of the many traffic signals in the area could decrease delays and improve traffic flow. An evaluation of signal system operation may be necessary to determine which adjustments would result in improved operations.
Table 2
FUTURE CONDITIONS WITHOUT THE PROJECT
ANALYSIS SUMMARY

<table>
<thead>
<tr>
<th></th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>v/c</td>
<td>LOS</td>
</tr>
<tr>
<td></td>
<td>v/c</td>
<td>LOS</td>
</tr>
<tr>
<td>Koko head/Kahaluu Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastbound</td>
<td>0.23 A</td>
<td>0.52 A</td>
</tr>
<tr>
<td>Westbound</td>
<td>0.24 A</td>
<td>0.42 A</td>
</tr>
<tr>
<td>Mainbound</td>
<td>0.22 A</td>
<td>0.39 A</td>
</tr>
<tr>
<td>Makaibound</td>
<td>0.65 B</td>
<td>0.36 A</td>
</tr>
<tr>
<td>Overall Intersection</td>
<td>— A</td>
<td>— A</td>
</tr>
<tr>
<td>Kamehameha Highway/Kahaluu Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>0.49 E</td>
<td>0.42 E</td>
</tr>
<tr>
<td>Through-Right</td>
<td>0.79 D</td>
<td>0.84 D</td>
</tr>
<tr>
<td>Eastbound</td>
<td>0.32 E</td>
<td>0.32 D</td>
</tr>
<tr>
<td>Through-Right</td>
<td>0.62 D</td>
<td>0.87 D</td>
</tr>
<tr>
<td>Left</td>
<td>0.16 D</td>
<td>0.59 D</td>
</tr>
<tr>
<td>Through-Right</td>
<td>0.30 D</td>
<td>0.66 E</td>
</tr>
<tr>
<td>Eastbound</td>
<td>0.77 E</td>
<td>0.76 D</td>
</tr>
<tr>
<td>Through-Right</td>
<td>0.72 D</td>
<td>0.50 D</td>
</tr>
<tr>
<td>Overall Intersection</td>
<td>— D</td>
<td>— D</td>
</tr>
<tr>
<td>Kamehameha Highway/Kahaluu Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>0.20 D</td>
<td>0.14 D</td>
</tr>
<tr>
<td>Through-Right</td>
<td>0.98 C</td>
<td>0.40 A</td>
</tr>
<tr>
<td>Eastbound</td>
<td>0.03 D</td>
<td>0.08 D</td>
</tr>
<tr>
<td>Through-Right</td>
<td>0.35 E</td>
<td>1.12 E</td>
</tr>
<tr>
<td>Eastbound</td>
<td>0.06 C</td>
<td>0.14 C</td>
</tr>
<tr>
<td>Makaibound</td>
<td>0.37 C</td>
<td>0.46 C</td>
</tr>
<tr>
<td>Overall Intersection</td>
<td>— C</td>
<td>— D</td>
</tr>
</tbody>
</table>

Abbreviations:
v/c = volume-to-capacity ratio
LOS = Level of Service

FIGURE 3
FUTURE TRAFFIC ASSIGNMENT
WITHOUT PROJECT

Note: Volumes are rounded to nearest line.
PROJECT TRAFFIC IMPACTS

The number of vehicles expected to be generated by the 100 single-family dwelling unit project are based on rates compiled by the Institute of Transportation Engineers. The trip rates and the project vehicular generation is given in Table 3. The study assumed the Makaha IV traffic would have similar travel patterns to the existing development. The existing auto volumes at the intersections were utilized as indicators of direction and distribution of travel; these volumes also take into account the circuity and alternative routing to the regional system that exists in this area. The project traffic assignment is shown in Figure 4.

Table 3

<table>
<thead>
<tr>
<th>Trip Generation</th>
<th>Rates</th>
<th>Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>10.0</td>
<td>1,000 vpd</td>
</tr>
<tr>
<td>AM Peak Hour</td>
<td>0.21</td>
<td>38 vph</td>
</tr>
<tr>
<td>Enter</td>
<td>0.35</td>
<td>59 vph</td>
</tr>
<tr>
<td>Exit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM Peak Hour</td>
<td>0.43</td>
<td>112 vph</td>
</tr>
<tr>
<td>Enter</td>
<td>0.37</td>
<td>67 vph</td>
</tr>
<tr>
<td>Exit</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations:
- vpd = vehicles per day
- vph = vehicles per hour

Note: Volumes are rounded to nearest five.
Figure 5 provides the future traffic assignment with the project and Table 4 presents the analysis summary. With the proposed project, volume-to-capacity ratios would increase. At the intersection of Moanalua Road and Kamehameha Street, northbound through-right movements would experience Level of Service B conditions in the AM peak hour. However, the overall intersection Levels of Service would not change. No mitigation measures would be needed at the three Kamehameha Street intersections to accommodate project traffic. As noted previously, improved traffic flow could result from changes in signal operation.
### Table 4

<table>
<thead>
<tr>
<th>Future Conditions with the Project Analysis Summary</th>
<th>AM Peak Hour</th>
<th>PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>v/c</td>
<td>LOS</td>
</tr>
<tr>
<td>Koko Head Drive/Kalakaua Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.36</td>
<td>A</td>
</tr>
<tr>
<td>Koko Head-bound</td>
<td>0.38</td>
<td>A</td>
</tr>
<tr>
<td>Koko Head-bound</td>
<td>0.23</td>
<td>A</td>
</tr>
<tr>
<td>Kaahumanu-bound</td>
<td>0.71</td>
<td>B</td>
</tr>
<tr>
<td>Overall Intersection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Honolulu Street/Kalakaua Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.52</td>
<td>E</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.79</td>
<td>D</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.33</td>
<td>E</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.97</td>
<td>E</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Intersection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Kamehameha Highway/Kalakaua Avenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.21</td>
<td>D</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.28</td>
<td>C</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.03</td>
<td>D</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.25</td>
<td>E</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.56</td>
<td>C</td>
</tr>
<tr>
<td>Kahului-bound</td>
<td>0.39</td>
<td>C</td>
</tr>
<tr>
<td>Overall Intersection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

**Regional Impacts**

The proposed project would add traffic to the regional highway system. Comparisons of the project-generated traffic to existing volumes in the area and on the H-1 Freeway were used to indicate the magnitude of this increase.

The total peak hour volume of traffic crossing an imaginary line or intersection, east of Kahaluu Broad Street was used for the first comparison. Koko Head Drive, the H-1 Freeway, and Kamehameha Highway all cross this intersection. In the AM peak hour, the 1987 eastbound traffic totaled 13,000 vehicles per hour (vph) across the Kahaluu/Kalakaua lines. Westbound traffic in the AM peak hour was nearly 5,400 vph. The proposed project would add 54 vph eastbound and 22 vph westbound to these volumes, or 0.6% and 0.4%, respectively. In the PM peak hour, 1987 volumes were 12,000 vph westbound and 7,300 vph eastbound. The project traffic volumes of 79 vph westbound and 44 vph eastbound would each be 0.6% of existing volumes.

The traffic increases on the H-1 Freeway are projected to be 36 vph eastbound in the AM peak hour, or 0.4% of the existing traffic on H-1. PM peak hour increases in the westbound direction are projected to be 21 vph, or 0.3% of existing traffic. These increases compare to an average annual increases of traffic on H-1 of 15% (AM eastbound) and 10% (PM westbound) over the last two years. Improved transit service to Waikiki and Central Oahu could decrease the rate of growth of traffic volumes in this area.

The State Department of Transportation (SDOT) has plans to add a sixth lane in each direction on H-1 between the Waiau and Kalakaua Interchanges. The added eastbound lane is expected to improve the merging condition at Waiau Interchange, thereby easing congestion and decreasing delays on the approaches to the overpass to Honolulu. A project to interconnect the traffic signals and to improve traffic flow on Kamehameha Highway has also been proposed by the SDOT. The City and County of Honolulu Department of Public Works is planning to widen a portion of Mokapu Road to relieve congestion near Ala Moana. These improvements will increase regional capacity to serve the increasing traffic demand; as noted above, less than one percent of the demand would be due to the proposed project.
CONCLUSIONS AND SUMMARY

Traffic on the local roadways and regional highway system would increase with the proposed project, but the project-generated traffic would not have a significant effect on traffic conditions. The demand-actuated traffic signals should be able to adjust the green time for the demand volume at each phase; the local intersections would have sufficient capacity to accommodate the expected increases. Furthermore, while the project would contribute traffic to the regional system, its impact would amount to less than one percent of existing traffic volumes.

REFERENCES


APPENDIX

The 1985 Highway Capacity Manual defines six Levels of Service, labelled A through F, from the best to worst condition. Level of Service for signalized intersections is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. For signalized intersections, the Operational Analysis measures signal operations by two separate indicators, volume-to-capacity (v/c) ratios and Level of Service (LOS). The v/c ratios provide a comparison of the flow rate to its theoretical capacity. Levels of Service are determined by the average length of delay in seconds. These two indicators do not necessarily correlate to each other, however, Levels of Service more strongly correlate to the delays experienced by drivers. Characteristics of each level of service for signalized intersections are described below.

LEVEL OF SERVICE A: This level describes operations with very low delay, i.e., less than 0.5 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

LEVEL OF SERVICE B: This level describes operations with delay in the range of 0.5 to 1.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. Most vehicles stop, but for less than 1.0 seconds, causing higher levels of average delay.

LEVEL OF SERVICE C: This level describes operations with delay in the range of 1.0 to 2.0 seconds per vehicle. These delays may result from lower progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

LEVEL OF SERVICE D: This level describes operations with delay in the range of 2.0 to 4.0 seconds per vehicle. At this level, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LEVEL OF SERVICE E: This level describes operations with delay in the range of 4.0 to 6.0 seconds per vehicle. At this level, most vehicles stop. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.

LEVEL OF SERVICE F: This level describes operations with delay in excess of 6.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over saturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to each delay level.
APPENDIX D

Air Quality Study
For The Proposed Walluna IV Residential Development
Waialu, Oahu, Hawaii

by

Barry D. Root

November 30, 1987
AIR QUALITY STUDY
FOR THE
PROPOSED MAILUNA IV RESIDENTIAL DEVELOPMENT
MAIUA, OAHU, HAWAII

Prepared by
Barry B. Root
Ewa Beach, Hawaii

November 30, 1987

TABLE OF CONTENTS

SECTION
1. SUMMARY
2. PROJECT DESCRIPTION
3. AIR QUALITY STANDARDS
4. PRESENT AIR QUALITY
5. DIRECT AIR QUALITY IMPACT OF PROJECT CONSTRUCTION
6. AIR QUALITY IMPACT OF INCREASED ENERGY UTILIZATION
7. INDIRECT AIR QUALITY IMPACT OF INCREASED TRAFFIC
8. CARBON MONOXIDE DIFFUSION MODELING
9. REGIONAL CONSIDERATIONS
10. MITIGATIVE MEASURES
11. REFERENCES

PAGE
1
1
2
3
4
5
6
7
10
11
12

TABLES
1. SUMMARY OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS
2. SUMMARY OF AIR POLLUTANT MEASUREMENTS AT NEAREST MONITORING STATIONS
3. RESULTS OF PEAK HOUR CARBON MONOXIDE ANALYSIS
4. RESULTS OF EIGHT HOUR CARBON MONOXIDE ANALYSIS

FIGURE
1. LOCATION MAP
SUMMARY

1. The proposed Maalua IV residential development involves site preparation and construction of 180 single-family dwelling units at the end of Kekahamani Street in Mala on Kauai in Hawaii.

2. Present air quality in the project area is estimated to be fair since air monitoring stations have consistently been recording airborne particulate and sulfur dioxide levels that are within allowable State of Hawaii Air Quality Standards; however, emissions from construction activities near major intersections where carbon monoxide levels have exceeded allowable State of Hawaii air quality standards under special meteorological dispersion conditions may be creating "hot spots" in those areas.

3. There will be short-term dust emissions during the construction phase of the development. Adequate control measures such as periodic watering and landscaping exist to limit the scope of this impact, but special care will have to be exercised to ensure that nearby residents 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 or new power plants such as the Kokea Plant on the Molokai coast and the H Power plant at another site in Campbell Industrial Park where increased levels of particulates and sulfur dioxide can be expected. Maximum use of solar energy during construction can at least partially mitigate the magnitude of this impact. In the future, 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. Traffic generated by Maalua IV will increase emissions of carbon monoxide and nitrogen oxides in the project area. Detailed carbon monoxide modeling carried out for three critical intersections indicates that State of Hawaii Air Quality Standards would be exceeded near the intersections of Kekahamani Street with Mala Road and Waimanalo Highway under present peak hour traffic conditions and worst case meteorological dispersion conditions. Over 7,000 anticipated project completion date, decreased carbon monoxide emissions from individual vehicles coupled with a relatively low traffic growth rate in this area will result in projected worst case levels at these two intersections that are lower than present levels, but still higher than allowable standards, with or without the additional traffic from Maalua IV. The regional scale air pollution impact of Maalua IV traffic is estimated to be minimal.

PROJECT DESCRIPTION

The proposed Maalua IV residential development involves site preparation and construction of 180 single-family dwelling units at a site just beyond the end of Kekahamani Street in Maalua, Oahu, as shown in Figure 1. The site is presently undeveloped and access would require construction of an extension to Kekahamani Street. The first two increments of the Maalua project have been completed and are occupied. The third increment is currently under construction. Maalua IV is expected to be completed in 1925.

The purpose of this study is to describe existing ambient air quality in the project area and to estimate the magnitude and potential impact of any proposed project. Mitigative measures and considerations are also discussed as appropriate.
2. AIR QUALITY STANDARDS

State of Hawaii and National Ambient Air Quality Standards (NAAQS) have been established for six classes of pollutants as shown in Table 1. An NAAQS 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 NAAQS have been divided into primary and secondary levels. Primary NAAQS are designed to prevent adverse health impacts while secondary NAAQS 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 NAAQS 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 NAAQS are based on 40 CFR (Code of Federal Regulations) Part 50, while State of Hawaii NAAQS are set in Chapter 11-50, Hawaii Administrative Rules. This chapter was amended in 1986 to make Hawaii NAAQS for particulates and sulfur dioxide essentially the same as 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.

Particulate measurements are from Pearl City, about 2 miles southeast of the project site. Sulfur dioxide concentrations were also monitored at the Pearl City location until 1983. Sulfur dioxide data for 1985 and 1986 is from Barbers Point, about 15 miles southeast of Waipahu.

During 1981 carbon monoxide was measured at Fort DeRussy in Waikiki (about 11 miles southeast of the project), and in 1982 and 1983 carbon monoxide was monitored at Leahi Hospital in Kaimuki, about 13 miles southeast of the project. Carbon monoxide readings from 1985 onward are from the Department of Health building in urban Honolulu, about 10 miles southeast of Waipahu.

Ozone levels were also measured at the Department of Health building until December 1980, when the monitor was relocated to Sand Island (about 8 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 taken at the Department of Health building on South Beretania Street.

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 site.

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

Concentrations of carbon monoxide are more directly related to vehicular emissions and tend to be highest during periods of rush hour traffic. Carbon monoxide would thus be the pollutant most likely to cause difficulty in meeting allowable Air Quality Standards as a result of new residential development in Leeward Oahu.
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 dirt roadways and stockpile 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 and moderate soil and 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 surfaces. This problem can be substantially alleviated by controlling and passing equipment and work areas as early in the development process as possible. Because of the close proximity of existing residences in previous Wailana developments, dust control will have to be an item of special concern. A frequent practice is to establish a regular watering schedule to limit dust emissions and reduce fugitive dust emissions from the construction of Wailana IV to acceptable levels, but if such measures do not prove to be sufficiently effective, erection of temporary dust catching barriers might be necessary.

Heavy construction equipment will also emit some air pollutants in the form of engine exhausts. The largest equipment is usually diesel-powered. Carbon monoxide emissions from large diesel engines are generally about equal to those from a single automobile, but nitrogen oxides 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 nearby streets.

5. AIR QUALITY IMPACT OF INCREASED ENERGY UTILIZATION

Estimating about 1600 square feet average size for the 100 planned residential units yields a total floor space of about 270,000 square feet. Energy consumption rates at the power plant for all-electric single-family dwellings are about 100,000 Btu per square foot, which would create a requirement for over 27 billion Btu of energy per year at the power plant, or about 4,000 barrels of oil if the demand were to be met totally by burning fuel oil.

New energy requirements could be reduced somewhat by the installation of solar water heating for all units at the time of construction, but this particular site is often clouded and windy, thus reducing the potential energy savings that could be gained from solar systems. 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. In fact, an operating wind farm has been developed on the north shore of Oahu.

For the immediate term, however, Hawaiian Electric has decided that purchasing power from new coal-fired plants to be located in Campbell Industrial Park would be the most economical course of action for meeting future energy demands. The new WAIKIKI garbage-to-energy plant is also slated for construction in Campbell Industrial Park.

The indirect energy-related impact of Wailana IV would thus most likely be an increase in sulfur dioxide and particulates in the vicinity of the Kona Power Plant on the Kona coast and in the vicinity of these new power plants in Campbell Industrial Park.
6. INDIRECT AIR QUALITY IMPACT OF INCREASED TRAFFIC

Once construction is completed, Mailiwa IV will not in itself constitute a major direct source of air pollutants, but by serving as an attraction for increased motor vehicle traffic in the area the project must be considered to be a potentially 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 soot from burning fuel which contains lead as an additive to contribute some lead particles to the atmosphere as well. The major control measure designed to limit lead emissions is a Federal law requiring the use of unleaded fuel in most new automobiles. As older cars are removed from the vehicle fleet, lead emissions should continue to fall. In fact, effective January 1, 1986, the Federal Environmental Protection Agency has revised the allowable lead amount in gasoline to 0.1 gram per gallon. At the beginning of 1985 the standard was 1.1 gram per gallon. The EPA is also advocating a total ban on lead in gasoline to take effect as early as 1989. Existing lead controls seem to have produced desired results in the Honolulu area, however, since reported lead levels at the DOE building were 0.0 micrograms per cubic meter over the last three quarters of 1986.

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

7. CARBON MONOXIDE DIFFUSION MODELING

In order to evaluate the air quality impact of projected increases in traffic associated with Mailiwa IV a detailed carbon monoxide modeling study was carried out. The study was designed to yield carbon monoxide concentration values which could be compared directly to allowable State and National Ambient Air Quality Standards.

Three critical receptor sites near the major intersections along Kaahumanu Street were selected for analysis. The traffic study for the project indicated that these intersections would be likely to have various degrees of increased traffic following Mailiwa IV development. For sites 1 and 2, near the Komo Mai Drive and Maunaloa Road interchanges, peak rush hour traffic occurs in the morning, but for site 3, near the Kamehameha Highway intersection, peak rush hour traffic occurs in the late afternoon.

Modeling was performed for a string of receptor sites located 3 meters from the edge of the roadway in each case and results of highest computed peak hour values are shown in Table 3. Locations of receptor sites are indicated on Figure 1. Of the three sites, only Site 3 represents a location where a person might reasonably be expected to spend an hour in the "ambient air" during peak hour traffic conditions since this site contains outdoor tables for a fast food restaurant.

Computations were made for current peak hour conditions and for 1993 (after project completion). Calculations for 1993 included peak hour traffic volume scenarios with and without Mailiwa IV. Volume projections for 1993 without Mailiwa IV do include projected traffic from the previously approved Mailiwa III increment now under construction. All three intersections currently have demand actuated signal lights.

Using 1986 vehicle registration figures for Oahu, the existing peak hour vehicle mix in the project area is estimated to be 01.6% light duty gasoline-powered vehicles, 4.2% light duty gasoline-powered trucks and vans between 6000 and 8000 pounds, 0.5% heavy duty gasoline-powered vehicles, 0.3% diesel-powered automobiles, 0.1% diesel-powered light duty trucks, 0.3% diesel-powered buses and 0.1% motorcycles. These percentages agree well with traffic counts at the Komo Mai Drive intersection during morning rush hour on Wednesday, October 28, 1987. The same vehicle mix was assumed for 1987 and 1993 emission rate calculations.
Average vehicle speeds were assumed to be 1 mph upstream from red signals and 15 mph downstream from signals or turns. An ambient temperature of 58 degrees F was assumed to simulate a cold winter morning for Site 1 and 2 calculations, while 68 degrees was used for late afternoon peak hour conditions at Site 3.

Vehicle operating characteristics were computed assuming that 20.6 percent of vehicles equipped with catalytic converters and 25.6 percent of vehicles without catalytic converters would be operating in the "cold start" mode and 27.3 percent of all vehicles would be operating in the hot start mode. The EPA computer model EMMAP 2 was run using the above parameters to produce vehicular carbon monoxide emission estimates for each of the years studied. National averages for "air-fueling" rates were assumed.

The EPA computer model EMMAP 2 was used to calculate carbon monoxide concentrations at each of the selected critical receptor sites for each scenario studied. Stability category 6 was used for determining diffusion coefficients for Sites 1 and 2. This stability category represents the most stable (least favorable) atmospheric condition that would be likely to occur in a suburban area such as this during the period within one hour following sunrise. Stability category 4 was used for Site 3 since this is the most stable category that can be used for daytime computations.

To simulate worst case wind conditions a uniform wind speed of one meter per second was assumed with the worst case wind direction determined by the traffic loading at each intersection. For each receptor site concentration values were computed at a height of 1.5 meters in order to estimate levels that would exist within the normal human breathing zone.

Background contributions of carbon monoxide from sources or distant roadways not directly considered in the analysis were assumed to be zero in order to more clearly indicate the impact of project-related traffic. In fact, background levels at these locations could be as high as one milligram per cubic meter in both 1967 and 1972.

Results of the peak hour carbon monoxide study are presented in Table 3. Present peak hour carbon monoxide levels under the worst case assumptions used here are higher than the allowable State of Hawaii one hour 40% at Sites 2 and 3. Estimated peak hour values for 1967 are somewhat lower, but still above the State standard for Sites 2 and 3 even with or without the additional traffic from Kalama IV. For Sites 2 and 3, all scenarios were within acceptable limits whether traffic from the proposed project is included in the computations or not. All of the estimated peak hour worst case carbon monoxide concentrations are well within the national one hour carbon monoxide limit.

Eight hour carbon monoxide levels are estimated by multiplying the peak hour values by a "meteorological persistence factor" of 0.6 which is recommended in EPA modeling guidelines. The assumption of this factor results in lower than peak hour volume over an eight hour period. Multiplying projected peak hour carbon monoxide levels by this factor yields the values that are shown in Table 4 for Site 3. For Sites 1 and 2, the assumption of stability category 6 is not valid for daytime hours, and peak hour values were recomputed for stability category 4 before application of the eight hour persistence factor.

For the 1977 scenario, worst case traffic and meteorological assumptions indicate that the Hawaiian eight hour standard could be exceeded at Sites 2 and 3, particularly at Site 3 as well. If background levels are considered, projected eight hour levels are well within the less stringent national limit at all three locations, but the projected value for the Honolulu Bay intersection is very close to the National Standard.

It is important to note that the worst case conditions analyzed here have a relatively low probability of occurrence. The combination of wind speed and direction used in the computations for Sites 1 and 3 occur annually during the morning rush hour on the order of 6 to 8 days per year. When the wind blows from a northerly direction it usually blows at higher speeds than one meter per second. With wind speeds of two meters per second, for example, computed carbon monoxide concentrations would be half the values shown in Table 2. For Sites 1, the peak hour worst case wind direction and speed combination required to yield highest carbon monoxide concentrations would occur less than once per year. Furthermore, the light wind speeds needed to produce the worst case values shown here would be most likely to occur in conjunction with highly variable wind directions rather than the steady conditions assumed in the calculations.

In computing eight hour carbon monoxide estimates the EPA-suggested factor of 0.6 appears to be reasonable for the case of urban Honolulu in terms of average one and eight hour concentrations. The State Department of Health just recently started to report eight hour concentrations in annual summaries. For the 1967 building, the 1968 average of daily peak hour levels was 2.2 milligrams per cubic meter, while the average daily eight hour value was 1.4, yielding an eight hour factor of 0.63. But the highest reported one hour average was 15.5 milligrams per cubic meter, while the highest eight hour value was only 4.7, yielding a relationship between maximum values of just 0.31. If this factor were to be used to convert one hour worst case estimates into worst case eight hour values, only Site 2 would be higher than the State of Hawaii eight hour AIS.
Aside from the potential indirect air quality impacts along Kamehameha Street studied in detail in the carbon monoxide modeling section, there are potential regional scale impacts to be considered as well. Carbon monoxide computations carried out as part of air quality impact studies for other projects in the leeward Oahu area have indicated potentially high levels of carbon monoxide along the H-1 corridor between Pearl City and Aloha Stadium. Morning peak hour concentrations on the order of the National one hour limit of 10 milligrams per cubic meter have been computed for worst case conditions. Any project in the leeward area which has the potential to increase traffic levels along this corridor can only serve to exacerbate this situation.

Maunakea IV is projected to add about 30 vehicles to this H-1 corridor during the morning rush hour. This represents about 0.4% of the existing traffic on the corridor. In terms of carbon monoxide, the peak hour contribution of Maunakea IV under worst case conditions would be less than 0.2 milligrams per cubic meter. During the last two years, eastbound traffic along this portion of the H-1 freeway has been increasing at an annual rate of 10%, yielding potential annual increments of nearly 6 milligrams per cubic meter to worst case carbon monoxide levels along the corridor. The potential regional air pollution impact of traffic from Maunakea IV thus appears to be relatively small.

9. MITIGATION MEASURES

A. SHORT TERM

As previously indicated the only short term direct adverse air quality impact that the proposed project is likely to create is the emission of fugitive dust during construction. State of Hawaii regulations stipulate the control measures that are to be employed to reduce this type of emissions. Primary control consists of wetting down loose soil areas. An effective watering program can reduce particulate emission to the levels from construction sites by as much as 50%. Other control measures include good housekeeping on the job site and pavement or landscaping of bare soil areas as quickly as possible. In the case of valid complaints from residents of nearby properties regarding fugitive dust, it might be necessary to erect a dust-capturing barrier during the term of project construction.

B. LONG TERM

Once completed, Maunakea IV would be expected to have little direct impact on ambient air quality. Indirect air quality impacts are expected because of the new electrical power requirements of the proposed project. These requirements can be reduced 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 increased by the addition of vehicles traveling to and from Maunakea IV. Project developers have no control over the emission levels of individual vehicles, but the total number of Maunakea-bound vehicles could conceivably be reduced by provision of a park and ride facility or participation in any other regional traffic-limiting strategies developed by governmental traffic planners. The only other logical way to mitigate potential air pollution impacts associated with Maunakea IV would be to reduce the site and scope of the project to produce fewer peak hour vehicle trips.

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 projected in this study could be too optimistic. On the other hand, this analysis did not consider the possibility that technological innovations 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 Maunakea IV it is also noted that tall, dense vegetation can provide some screening of residential areas from larger airborne particulate generated along roadways. It is thus recommended that wherever possible such vegetation cover be included in landscaping plans with plantings occurring as early in the development process as practicable.
REFERENCES


TABLE 1

SUMMARY OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS
(Micrograms per Cubic Meter)

<table>
<thead>
<tr>
<th>POLUTANT</th>
<th>SAMPLING PERIOD</th>
<th>NATIONAL</th>
<th>HAWAII</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Primary</td>
<td>Secondary</td>
</tr>
<tr>
<td>Particulates</td>
<td>Annual Geometric Mean</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Maximum 24-Hour Average</td>
<td>260</td>
<td>150</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>Annual Arithmetic Mean</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Maximum 24-Hour Average</td>
<td>305</td>
<td>365</td>
</tr>
<tr>
<td></td>
<td>Maximum 3-Hour Average</td>
<td>1200</td>
<td>1300</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>Annual Arithmetic Mean</td>
<td>100</td>
<td>70</td>
</tr>
<tr>
<td>Ozone</td>
<td>Maximum 1-Hour Average</td>
<td>240</td>
<td>100</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>Maximum 8-Hour Average</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Maximum 1-Hour Average</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Lead</td>
<td>Calendar Quarter</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

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>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Particulate Matter</strong></td>
<td>50</td>
<td>59</td>
<td>53</td>
<td>55</td>
<td>60</td>
<td>50</td>
<td>47</td>
</tr>
<tr>
<td>No. of Samples</td>
<td>22-93</td>
<td>10-71</td>
<td>19-56</td>
<td>17-57</td>
<td>16-45</td>
<td>16-62</td>
<td>17-65</td>
</tr>
<tr>
<td>Range of Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Value</td>
<td>26</td>
<td>34</td>
<td>31</td>
<td>20</td>
<td>28</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>No. of Times</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>State AGS Exceeded</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Sulfur Dioxide</strong></td>
<td>52</td>
<td>56</td>
<td>42</td>
<td>49</td>
<td>42</td>
<td>50</td>
<td>57</td>
</tr>
<tr>
<td>No. of Samples</td>
<td>5-15</td>
<td>5-15</td>
<td>5-10</td>
<td>5-15</td>
<td>5-15</td>
<td>5-25</td>
<td>5-10</td>
</tr>
<tr>
<td>Range of Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Value</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>No. of Times</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>State AGS Exceeded</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Carbon Monoxide</strong></td>
<td>206</td>
<td>311</td>
<td>173</td>
<td>310</td>
<td>342</td>
<td>218</td>
<td>348</td>
</tr>
<tr>
<td>No. of Samples</td>
<td>1.2-13.8</td>
<td>0-4.6</td>
<td>0-9.9</td>
<td>0-10.9</td>
<td>0-10.4</td>
<td>2-12.5</td>
<td></td>
</tr>
<tr>
<td>Range of Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Value</td>
<td>5.0</td>
<td>1.2</td>
<td>2.3</td>
<td>2.4</td>
<td>1.5</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>No. of Times</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>State AGS Exceeded</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Oxidant (Ozone)</strong></td>
<td>295</td>
<td>314</td>
<td>305</td>
<td>342</td>
<td>206</td>
<td>341</td>
<td>360</td>
</tr>
<tr>
<td>No. of Samples</td>
<td>10-84</td>
<td>10-104</td>
<td>6-151</td>
<td>0-123</td>
<td>0-104</td>
<td>0-128</td>
<td>10-68</td>
</tr>
<tr>
<td>Range of Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Value</td>
<td>48</td>
<td>37</td>
<td>32</td>
<td>48</td>
<td>44</td>
<td>43</td>
<td>39</td>
</tr>
<tr>
<td>No. of Times</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>State AGS Exceeded</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Others:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>49</td>
<td>54</td>
<td>56</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Samples</td>
<td>6-77</td>
<td>0-1.8</td>
<td>0-3</td>
<td>0-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range of Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Value</td>
<td>25</td>
<td>0.3</td>
<td>0.1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Times</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State AGS Exceeded</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Notes:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3

**Results of Peak Hour Carbon Monoxide Analysis**

<table>
<thead>
<tr>
<th>Site Location</th>
<th>High Wind (days)</th>
<th>Year/Scenario</th>
<th>1993</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HIRH Wind</td>
<td>1992</td>
<td>1993</td>
<td>1993</td>
</tr>
<tr>
<td>1 Kanahana St</td>
<td>NW MW</td>
<td>7.7</td>
<td>8.6</td>
<td>7.4</td>
</tr>
<tr>
<td>2 Kanahana St</td>
<td>NE NE</td>
<td>6.6</td>
<td>21.0</td>
<td>17.4</td>
</tr>
<tr>
<td>3 Kanahana St</td>
<td>SE SE</td>
<td>0.7</td>
<td>14.0</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Kanahana St</td>
<td>SE SE</td>
<td>0.7</td>
<td>14.0</td>
<td>11.4</td>
</tr>
</tbody>
</table>

**Notes:**
- See Figure 1 for location of critical receptor sites.
- See text, Section 7, for models and assumptions used for producing these estimates.

**Source:** State of Hawaii Department of Health
### Table 4

**RESULTS OF EIGHT HOUR CARBON MONOXIDE ANALYSIS**

(Milligrams Per Cubic Meter)

<table>
<thead>
<tr>
<th>SITE LOCATION</th>
<th>1997</th>
<th>1999 WITHOUT PROJ</th>
<th>1999 WITH PROJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Kaelehu Street &amp;</td>
<td>4.4</td>
<td>4.0</td>
<td>4.6</td>
</tr>
<tr>
<td>Kamehameha Drive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Kaelehu Street &amp;</td>
<td>10.9</td>
<td>9.0</td>
<td>9.4</td>
</tr>
<tr>
<td>Mauna Loa Road</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Kaelehu Street &amp;</td>
<td>8.4</td>
<td>6.8</td>
<td>7.6</td>
</tr>
<tr>
<td>Kaelemaha Highway</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**STATE OF HAWAII AGG:**

5

**NATIONAL AGG:**

10

**Notes:** See Figure 1 for location of critical receptor sites. See text, Section 7, for models and assumptions used for producing these estimates.

![Figure 1 Location Map](image-url)
APPENDIX E

Traffic Noise Study
For The Proposed Walluna IV Project

by

Y. Ebisu & Associates

November, 1987
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>SECTION TITLE</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LIST OF FIGURES</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>LIST OF TABLES</td>
<td>11</td>
</tr>
<tr>
<td>I.</td>
<td>SUMMARY</td>
<td>1</td>
</tr>
<tr>
<td>II.</td>
<td>PURPOSE</td>
<td>2</td>
</tr>
<tr>
<td>III.</td>
<td>NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY</td>
<td>3</td>
</tr>
<tr>
<td>IV.</td>
<td>GENERAL STUDY METHODOLOGY</td>
<td>6</td>
</tr>
<tr>
<td>V.</td>
<td>EXISTING TRAFFIC NOISE ENVIRONMENT</td>
<td>7</td>
</tr>
<tr>
<td>VI.</td>
<td>PROJECTED TRAFFIC NOISE ENVIRONMENT AND IMPACTS</td>
<td>12</td>
</tr>
<tr>
<td>VII.</td>
<td>RECOMMENDED MITIGATION MEASURES</td>
<td>15</td>
</tr>
<tr>
<td>A.</td>
<td>REFERENCES</td>
<td>16</td>
</tr>
<tr>
<td>B.</td>
<td>EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE</td>
<td>17</td>
</tr>
</tbody>
</table>

---

BY

Y. EBISU & ASSOCIATES

NOVEMBER, 1987
I. SUMMARY

The existing and projected traffic noise levels in the vicinity of the proposed Wailuna IV project at the north end of Kaahumanu Street, Wailau, Oahu were evaluated for their relationship to current FRA/HUD noise standards. Additionally, the traffic noise level increases along the street expected to service the project were calculated. Following completion of the project, increases in traffic noise of 0.1 to 1.2 Ldn units are predicted to occur as a result of project traffic. This level of increase should not generate adverse noise impacts on existing noise sensitive properties which front Kaahumanu Street.

Traffic noise levels in the immediate vicinity of the project entrance are expected to be at a level of 58.3 Ldn units at 50 ft setback distance from the centerline of Kaahumanu Street. Because this level is below current FRA/HUD noise standards special sound attenuation measures will probably not be required for the new units of the Wailuna IV project.
II. PURPOSE

The purposes of this study were to evaluate the future traffic noise impacts which may result from the proposed Wailua IV development at the north end of Kamehameha Street at Wailua, Oahu, and to determine if noise attenuation measures are required to comply with FHWA/USD regulations within the proposed development (Reference 1). Recommendations for the implementation of noise mitigation measures were also to be provided as required.

III. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

The noise descriptor currently used by FHWA/USD to assess environmental noise in general is the Day-Night Average Sound Level (Ldn). This descriptor incorporates a 24-hour average of instantaneous A-weighted sound levels as read on a standard Sound Level Meter. The minimum averaging period for the Ldn descriptor is 24 hours (by definition). Additionally, sound levels which occur during the nighttime hours of 10:00 PM to 7:00 AM are increased by 10 decibels (dB) prior to computing the 24-hour average by the Ldn descriptor. A more complete list of noise descriptors is provided in APPENDIX B to this report.

TABLE 1, derived from Reference 2, presents current federal standards and acceptability criteria for residential land uses exposed to various levels of environmental noise. As a general rule, noise levels of 55 Ldn or less occur in rural areas, or urbanized areas which are shielded from high volume streets. In urbanized areas, Ldn levels generally range from 55 to 65 Ldn, and are usually controlled by motor vehicle traffic noise. Residences which front major roadways are generally exposed to levels of 65 Ldn, and as high as 72 Ldn when the roadway is a high speed freeway. Due to noise shielding effects from intervening structures, residences which are located within interior lots are usually exposed to lower noise levels of 60 Ldn or less.

For the purposes of determining noise acceptability for funding assistance from federal agencies (FHWA/USD and VA), an exterior noise level of 65 Ldn or less is considered acceptable. This standard is applied nationally (see Reference 1), including Hawaii. Because of our open-living conditions, the predominant use of naturally ventilated dwellings, and the relatively low exterior-to-interior sound attenuation afforded by these naturally ventilated structures, an exterior noise level of 65 Ldn does not eliminate all risks of noise impacts. For these reasons, and as recommended in Reference 3, a lower level of 55 Ldn is considered
# TABLE 1

**EXTERIOR NOISE EXPOSURE CLASSIFICATION**

<table>
<thead>
<tr>
<th>Noise Exposure Class</th>
<th>Day-Night Sound Level</th>
<th>Equivalent Sound Level</th>
<th>Federal Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal Exposure</td>
<td>Not Exceeding 55 Ldn</td>
<td>Not Exceeding 55 Leq</td>
<td>Unconditionally Acceptable</td>
</tr>
<tr>
<td>Moderate Exposure</td>
<td>Above 55 Ldn but Not Above 65 Ldn</td>
<td>Above 55 Leq but Not Above 65 Leq</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Significant Exposure</td>
<td>Above 65 Ldn but Not Above 75 Ldn</td>
<td>Above 65 Leq but Not Above 75 Leq</td>
<td>Normally Unacceptable</td>
</tr>
<tr>
<td>Severe Exposure</td>
<td>Above 75 Ldn</td>
<td>Above 75 Leq</td>
<td>Unacceptable</td>
</tr>
</tbody>
</table>

Note: (1) Federal Housing Administration, Department of Defense, and Department of Transportation.

(2) FEMA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 12:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours.

Source: Reference 2.
IV. GENERAL STUDY METHODOLOGY

Traffic noise predictions were performed using the Federal Highway Administration (FHWA) Noise Prediction Model (Reference 4). Existing and projected traffic data at the major intersections of Eshamnanu Street were obtained from the traffic study for the project (Reference 5). For noise modeling purposes, average traffic volumes on the street segments examined were obtained by averaging the traffic volumes at their respective intersection and points.

Existing traffic noise measurements along Eshamnanu Street were made on November 11, 1987 to calibrate the noise prediction model, and to refine predictions of future traffic noise levels. Existing and future traffic noise levels were computed using the AM and PM peak hour traffic volumes contained in Reference 5. Additionally, existing and future setback distances from the centerline of Eshamnanu Street to the 60, 65, and 70 Ldn iso-noise contour lines were also calculated for the worst case condition of unobstructed line of sight to the traffic lanes. The required setback distance to the future 65 Ldn contour line were used to determine the necessity of noise abatement measures for project compliance with FHWA/HUD noise standards.

V. EXISTING TRAFFIC NOISE ENVIRONMENT

TABLE 2 presents the results of the noise measurements at Sites A and B along Eshamnanu Street. FIGURE 1 shows the locations of the 2 measurement sites in relationship to the project site. Agreement between measured and predicted traffic noise levels at Sites A and B were good for a modeled average speed of 35 MPH, and for modeled hard ground conditions between the receptor and the traffic lanes.

TABLE 3 presents the AM and PM peak hour traffic volumes, speeds, and mix assumptions for the existing period, with computed hourly equivalent noise levels (Leq) at 50 FT distance from the centerlines of the Eshamnanu Street sections which will service project traffic. Calculated Ldn at 50 FT distance from the roadway's centerline are also shown in the same table. For those homes which benefit from the shielding effects of existing walls along Eshamnanu Street, the existing traffic noise levels at those residences are probably 5 to 10 Ldn units less than the values shown in TABLE 3. The existing setback distances of the 60, 65, and 70 Ldn contours from the centerline of the street for various street segments from the project site to Eshamnanuwa Highway are shown in TABLE 4 for worst case, unobstructed line of sight conditions. Existing traffic noise levels are in the FHWA/HUD "Acceptable, Moderate Exposure" category at residences fronting Eshamnanu Street and north of Kono Mal Drive. Also in the "Acceptable" category are those residences fronting Eshamnanu Street and south of Kono Mal Drive which are shielded from traffic noise by 6 FT high walls. Those residences which are not shielded by walls and which are within the setback distances to the existing 65 Ldn contours indicated in TABLE 4 are in the FHWA/HUD "Normal Unacceptable, Significant Exposure" category.
TABLE 2

NOVEMBER 11, 1987 TRAFFIC NOISE MEASUREMENTS

<table>
<thead>
<tr>
<th>Location</th>
<th>Time of Day</th>
<th>Ave. Speed</th>
<th>Hourly Traffic Volume</th>
<th>Measured Leq (dB)</th>
<th>Predicted Leq (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE A In parking lot</td>
<td>1500</td>
<td>72</td>
<td>Auto: 224, Med: 0, Truck: 0</td>
<td>58.2</td>
<td>57.4</td>
</tr>
<tr>
<td>next to park near corner</td>
<td>1700</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of Lauahunau Pl. and Khahem St.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SITE B On east sidewalk</td>
<td>1705</td>
<td>10</td>
<td>Auto: 920, Med: 10, Truck: 10</td>
<td>66.1</td>
<td>66.9</td>
</tr>
<tr>
<td>on Khahem St. near Rockantie St. intersection.</td>
<td>1805</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 4

**EXISTING AND FUTURE DISTANCES TO 60, 65, AND 70 Ldn CONTOURS**

<table>
<thead>
<tr>
<th>KAAHUMANU 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>North</td>
<td>74</td>
<td>143</td>
<td>23</td>
</tr>
<tr>
<td>Middle</td>
<td>221</td>
<td>272</td>
<td>70</td>
</tr>
<tr>
<td>South</td>
<td>297</td>
<td>333</td>
<td>94</td>
</tr>
<tr>
<td>At Project</td>
<td>N/A</td>
<td>34</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Notes:**

1. North section of Kaaumanu Street is just north of Kamehameha Hwy.
2. Middle section of Kaaumanu Street is between Kamehameha Hwy and Maunakea Rd.
3. South section of Kaaumanu Street is just south of Maunakea Rd.
4. All setback distances are to the roadway centerline. Setback distances are for unobstructed line-of-sight conditions, under hard ground conditions.
VI. PROJECTED TRAFFIC NOISE ENVIRONMENT AND IMPACTS

Predictions of future traffic noise levels along the Eshumau Street sections expected to service the project site were made (see TABLE 5) using the traffic volume projections of Reference 5. Projected increases in peak hour traffic volumes attributable to the project are small (less than 8 percent) south of Kamo Mai Drive and large (greater than 30 percent) north of Kamo Mai Drive. Projected increases in traffic noise levels attributable to the project are also small (less than 0.3 Ldn) south of Kamo Mai Drive, and moderately significant (greater than 1.2 Ldn) north of Kamo Mai Drive.

South of Kamo Mai Drive, where existing traffic noise levels are high, project related traffic is predicted to increase current noise levels by 0.1 to 0.3 Ldn by the Year 1993, and non-project traffic is predicted to increase current noise levels by 0.4 to 0.6 Ldn units. Because computed traffic noise increases associated with project traffic are very small, the proposed project is not expected to generate significant traffic noise impacts along the sections of Eshumau Street south of Kamo Mai Drive.

North of Kamo Mai Drive, project related traffic is predicted to increase current noise levels by 1.2 to 58.3 Ldn by the Year 1993, and non-project traffic is predicted to increase current noise levels by 1.7 Ldn. The larger increase of 58.3 Ldn is expected to occur in the new vacant lands adjacent to the project site. The increases in traffic noise levels are predicted to be moderately significant. However, because of the low volumes of existing traffic to the north of Kamo Mai Drive, total traffic noise levels after project completion are not expected to exceed 65 Ldn at 50 FT setback distance from the centerlines of the north sections of Eshumau Street between Kamo Mai Drive and the project entrance. At the project entrance, predicted traffic noise levels at 50 FT setback from the centerline of Eshumau Street are expected to be 58.3 Ldn, and in the "Acceptable, Moderate Exposure" category. For these reasons, project related

| TABLE 5 |
| WAILANA IV PROJECT |
| FUTURE (1993) TRAFFIC NOISE LEVELS |

<table>
<thead>
<tr>
<th>STREET SEGMENT</th>
<th>SPEED MPH</th>
<th>VEHICLE MIX (%)</th>
<th>10PM PEAK LDA</th>
<th>10PM PEAK LAC</th>
<th>1PM PEAK LDA</th>
<th>1PM PEAK LAC</th>
<th>LDL(50%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>35</td>
<td>98/2/1</td>
<td>645</td>
<td>63.8</td>
<td>765</td>
<td>64.6</td>
<td>64.6</td>
</tr>
<tr>
<td>Middle</td>
<td>35</td>
<td>98/2/1</td>
<td>1,378</td>
<td>67.1</td>
<td>1,460</td>
<td>67.4</td>
<td>67.4</td>
</tr>
<tr>
<td>South</td>
<td>35</td>
<td>98/2/1</td>
<td>966</td>
<td>65.6</td>
<td>1,784</td>
<td>68.2</td>
<td>68.2</td>
</tr>
<tr>
<td>At Project</td>
<td>35</td>
<td>98/2/1</td>
<td>140</td>
<td>57.2</td>
<td>180</td>
<td>58.3</td>
<td>58.3</td>
</tr>
</tbody>
</table>

Notes:

1. North section of Eshumau Street is just north of Kamo Mai Drive.
2. Middle section of Eshumau Street is between Kamo Mai Drive and Moanalua Road.
3. South section of Eshumau Street is between Moanalua Road and Kaaahamua Highway.
4. Along Eshumau Street, Ldn assumed to be equal to PM Peak Hour Leq(h).
5. Excess ground attenuation coefficient assumed to be zero.
traffic is not expected to generate significant noise impacts along the north section of Keshmann Avenue.

VII. RECOMMENDED NOISE MITIGATION MEASURES

Because traffic volume and noise level increases along Keshmann Street are predicted to be small or result in total noise levels below FHA/HUD standards, traffic noise mitigation measures are not necessary for mitigating noise impacts which might have resulted from project traffic.

Short term construction noise impacts from construction vehicles and on-site activities may occur with projects of this type. However, State Department of Health permit procedures such as those contained in Reference 6 and applicable to construction activities would be applicable to this project, and if followed, should minimize noise impacts resulting from on site construction activities.
A. REFERENCES


(8) "Land Use Ordinance (Ordinance No. 86-07)," Department of Land Utilization, City and County of Honolulu, October 22, 1986.
<table>
<thead>
<tr>
<th>TERM</th>
<th>A-WEIGHTING</th>
<th>ALTERNATIVE(1)</th>
<th>OTHER WEIGHTING</th>
<th>UNWEIGHTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sound Pressure (1) Level</td>
<td>tA</td>
<td>tA</td>
<td>tA</td>
<td>tA</td>
</tr>
<tr>
<td>2. Sound Power Level</td>
<td>tL</td>
<td>tL</td>
<td>tL</td>
<td>tL</td>
</tr>
<tr>
<td>3. Max. Sound Level</td>
<td>tmax</td>
<td>tmax</td>
<td>tmax</td>
<td>tmax</td>
</tr>
<tr>
<td>4. Peak Sound Pressure Level</td>
<td>tPA</td>
<td>tPA</td>
<td>tPA</td>
<td>tPA</td>
</tr>
<tr>
<td>5. Level exceeded x% of the time</td>
<td>Lx</td>
<td>Lx</td>
<td>Lx</td>
<td>Lx</td>
</tr>
<tr>
<td>6. Equivalent Sound Level</td>
<td>tLeq</td>
<td>tLeq</td>
<td>tLeq</td>
<td>tLeq</td>
</tr>
<tr>
<td>7. Equivalent Sound Level Over Time(1)</td>
<td>tLeq(T)</td>
<td>tLeq(T)</td>
<td>tLeq(T)</td>
<td>tLeq(T)</td>
</tr>
<tr>
<td>8. Day Sound Level</td>
<td>tD</td>
<td>tD</td>
<td>tD</td>
<td>tD</td>
</tr>
<tr>
<td>9. Night Sound Level</td>
<td>tN</td>
<td>tN</td>
<td>tN</td>
<td>tN</td>
</tr>
<tr>
<td>10. Day-Night Sound Level</td>
<td>tDN</td>
<td>tDN</td>
<td>tDN</td>
<td>tDN</td>
</tr>
<tr>
<td>11. Yearly Day-Night Sound Level</td>
<td>tDN(y)</td>
<td>tDN(y)</td>
<td>tDN(y)</td>
<td>tDN(y)</td>
</tr>
<tr>
<td>12. Sound Exposure Level</td>
<td>tE</td>
<td>tE</td>
<td>tE</td>
<td>tE</td>
</tr>
<tr>
<td>13. Energy Average value over function(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>set of observations</td>
<td>tE(e)</td>
<td>tE(e)</td>
<td>tE(e)</td>
<td>tE(e)</td>
</tr>
<tr>
<td>14. Level exceeded x% of the total set of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the total set of function(s) domain</td>
<td>tE(x)</td>
<td>tE(x)</td>
<td>tE(x)</td>
<td>tE(x)</td>
</tr>
<tr>
<td>15. Average tE value</td>
<td>tE</td>
<td>tE</td>
<td>tE</td>
<td>tE</td>
</tr>
</tbody>
</table>

(1) "Alternative" symbols may be used to assure clarity or consistency.
(2) Only A-weighting shown. Applies also to C, D, E, C, D, and D weighting.
(3) The term "pressure" is used only for the unweighted level.
(4) If service specified, time is in hours (e.g., the hourly equivalent level is tLeq[1hr]). Time may be specified in non-qualitative terms (e.g., it could be specified as log[120] to mean the washing cycle noise for a washing machine).
APPENDIX F

Wailuna IV
Demographic, Economic and Housing Impacts

by

Environment Capital Managers, Inc.

December 1987
TABLE OF CONTENTS

INTRODUCTION................................................. 1
INTENDED MARKET............................................. 2
DEMOGRAPHIC IMPACTS......................................... 3
   Residential Population................................. 3
   Population Growth...................................... 3
   Resident Population Projections..................... 4
CHARACTER OR CULTURE OF THE NEIGHBORHOOD............. 5
   Age Distribution....................................... 5
   Ethnic Distribution.................................... 6
   Household Size......................................... 7
   Family Income.......................................... 7
   Impact Assessment...................................... 8
ECONOMIC IMPACTS............................................ 9
   Economic Growth........................................ 9
   Overview of the Economy............................... 9
   Hawaii's Economy by Major Sections.................. 9
   Visitor Industry....................................... 9
   Federal Government.................................... 10
   Agriculture............................................ 11
   Construction.......................................... 12
   Forecast.............................................. 13
   Employment............................................. 14
   Government Revenues From the Project................. 15
   Impact Assessment..................................... 17
HOUSING IMPACTS............................................ 18
   Housing Supply and Demand......................... 18
   Housing Supply....................................... 18
   Housing Demand....................................... 19
   The Housing Market.................................... 21
   Affordable Units...................................... 25
   Impact Assessment..................................... 26

PREPARED FOR: Lusk Hawaii
   98-1310 Kamehameha Street
   Pearl City, Hawaii 96782
   December 1987

WAILUA IV
DEMOCRATIC, ECONOMIC
AND HOUSING IMPACTS
MAILUNA IV
Demographic, Economic and Housing Impacts

INTRODUCTION

Lusk Hawaii, developers of Mailuna I, II, III wishes to rezone approximately 26 acres of land from conservation to urban. This area will be used to construct approximately 180 residential units. The objective of this study is to provide an impact analysis for the proposed Mailuna IV Urban Development project, the fourth and final phase, located in Waiau, Ewa, Oahu (TAX 9-8-82; por. 3), with respect to demographic, economic and housing impacts for incorporation into an application for Development Plan Amendment and an Environment Impact Statement of the proposed project.

The proposed development will consist of single-family units. For the purpose of this study, the general market area for the development will include the island of Oahu, which is identical with the Honolulu Standard Metropolitan Statistical Area (SMSA). However, the primary market area will include the specific Honolulu Development Plan Areas:

Primary Market Areas

<table>
<thead>
<tr>
<th>Primary Urban Center (PUC)</th>
<th>Census Tracts 73-82</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewa</td>
<td>Census Tracts 83-96</td>
</tr>
<tr>
<td>Central Oahu</td>
<td>Census Tracts 87-95</td>
</tr>
</tbody>
</table>

The proposed project is contained within Census Tract 78.01 and Census Neighborhood 021.
INTENDED MARKET

For the proposed project, the intended market will include buyers of 160 residential units comprised of largely single-family detached dwelling units. The units, projected for occupancy by 1993, will be of 3 bedroom/2 bath and 4 bedroom/3 bath types.

Based on the type and price range of the housing units proposed by Lask Hawaii, the intended market would be comparable to that of Mailuna II and III, excluding the townhouse buyers. At the current average price of $160,000.00, in 1987 dollars, for the single-family units, the potential buyers would probably be "step-up" buyers with dual wage-earners, small, combined households or the "starterfamily" types, and upgrading from their current residential or apartment units. The heads of household will also tend to be around 35 to 45 years of age.

For the "affordable" housing units proposed to meet the City's minimum affordable housing requirements, the target market would probably be comparable to the Mailuna I and II townhouse buyers. The developer will provide the required number of affordable units in accordance with governmental requirements.
DEMOGRAPHIC IMPACTS

RESIDENTIAL POPULATION

Population Growth

Compared with the State's overall resident population growth between 1920 to 1980, the Ewa Judicial District has outpaced the State by over one-and-one-half percent annually.

Oahu's average annual growth rate was about 3.1 percent over the 1920 to 1980 period. In contrast, the Ewa Judicial District was estimated to yield a 3.9 percent annual growth rate. However, where Oahu's growth rate slowed from a 1920-1930 average of 5.1 percent to 1.9 percent between 1970-1980, the Ewa Judicial District gained momentum, yielding a 3.8 percent growth rate over the 1920-1930 period to a 3.7 percent rate between 1970-1980, peaking to 3.4 percent between the 1950-1970 period. The resident population counts for the Census years 1920-1980 is presented below:

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>Oahu</th>
<th>Ewa District</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920</td>
<td>269,831</td>
<td>137,496</td>
<td>132,335</td>
</tr>
<tr>
<td>1930</td>
<td>366,600</td>
<td>202,887</td>
<td>163,713</td>
</tr>
<tr>
<td>1940</td>
<td>422,770</td>
<td>257,606</td>
<td>165,164</td>
</tr>
<tr>
<td>1950</td>
<td>637,494</td>
<td>535,020</td>
<td>102,474</td>
</tr>
<tr>
<td>1960</td>
<td>631,572</td>
<td>500,400</td>
<td>131,172</td>
</tr>
<tr>
<td>1970</td>
<td>769,913</td>
<td>630,528</td>
<td>139,385</td>
</tr>
<tr>
<td>1980</td>
<td>964,691</td>
<td>762,565</td>
<td>192,126</td>
</tr>
</tbody>
</table>

Within the primary market area, Census Tracts 73-95, the overall growth rates ranged from 4.1 percent to 4.8 percent over the 1950-1980 period. For the Primary Urban Center section of the primary market area, the population growth slowed from a 1950-1960 rate of 5.5 percent to a 2.7 percent growth rate during the 1970-1980 decade. For both Ewa and Central Oahu, the growth paths slowed from a high of 6.3 percent and 6.1 percent, respectively, to a moderate 3.9 percent and 3.5 percent. During the 1970-1980 period, however, the rate picked up to a 4.2 percent and 4.1 percent, respectively. The primary market area's resident population for census years 1950 to 1980 is given below:

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>Oahu</th>
<th>Ewa District</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>28,646</td>
<td>9,758</td>
<td>18,888</td>
</tr>
<tr>
<td>1960</td>
<td>48,974</td>
<td>16,449</td>
<td>32,525</td>
</tr>
<tr>
<td>1970</td>
<td>77,961</td>
<td>24,087</td>
<td>53,874</td>
</tr>
<tr>
<td>1980</td>
<td>95,405</td>
<td>36,255</td>
<td>59,150</td>
</tr>
</tbody>
</table>

Resident Population Projections

Between 1980 to 2005, the State Department of Planning and Economic Development estimated that the City and County of Honolulu's (comprising the Island of Oahu) resident population would grow at an average annual rate of 0.9 percent.

The table below indicates that the Development Plan Area's Primary Urban Center (Census Tracts 5 to 8) is projected to grow at a rate of 0.4 percent per annum--approximately one-half the rate of growth for Oahu's resident population. Ewa, in contrast, is projected to exhibit a phenomenal growth in excess of four times that of Oahu's rate. This is principally due to the planned development of the Second Urban Center.

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>Ewa</th>
<th>Central Oahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>440,201</td>
<td>111,045</td>
<td>329,156</td>
</tr>
<tr>
<td>1990</td>
<td>457,769</td>
<td>114,617</td>
<td>343,152</td>
</tr>
<tr>
<td>1995</td>
<td>467,500</td>
<td>117,640</td>
<td>350,860</td>
</tr>
<tr>
<td>2000</td>
<td>472,952</td>
<td>114,824</td>
<td>358,128</td>
</tr>
<tr>
<td>2005</td>
<td>489,908</td>
<td>119,049</td>
<td>370,859</td>
</tr>
</tbody>
</table>

The three areas will account for over 78 percent of the expected growth on the Island of Oahu to the year 2005, with Central Oahu accounting for over 16 percent, Ewa over 33 percent and the Primary Urban Center 29 percent.

An alternative 5-year forecast based on data provided through CACI, Fairfax, VA, of the three areas indicates that the Ewa Development Plan Area will exhibit the largest growth through 1992, both in absolute population and households. The alternative 5-year forecasts are provided below:

<table>
<thead>
<tr>
<th>Year</th>
<th>State</th>
<th>Ewa</th>
<th>Central Oahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>440,201</td>
<td>111,045</td>
<td>329,156</td>
</tr>
<tr>
<td>1990</td>
<td>457,769</td>
<td>114,617</td>
<td>343,152</td>
</tr>
<tr>
<td>1995</td>
<td>467,500</td>
<td>117,640</td>
<td>350,860</td>
</tr>
<tr>
<td>2000</td>
<td>472,952</td>
<td>114,824</td>
<td>358,128</td>
</tr>
<tr>
<td>2005</td>
<td>489,908</td>
<td>119,049</td>
<td>370,859</td>
</tr>
</tbody>
</table>
Resident Population Projections

<table>
<thead>
<tr>
<th>DP Area</th>
<th>1987</th>
<th>1992</th>
<th>Annual Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Census Tracts 73-82</td>
<td>52,700</td>
<td>92,900</td>
<td>1.74%</td>
</tr>
<tr>
<td>Ewa</td>
<td>41,900</td>
<td>45,500</td>
<td>1.74%</td>
</tr>
<tr>
<td>Central Oahu</td>
<td>112,800</td>
<td>119,800</td>
<td>1.24%</td>
</tr>
<tr>
<td>Oahu</td>
<td>829,500</td>
<td>865,100</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

In a similar manner, household growth within these areas is provided:

Household Projections

<table>
<thead>
<tr>
<th>DP Area</th>
<th>1987</th>
<th>1992</th>
<th>Annual Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Census Tracts 73-82</td>
<td>25,800</td>
<td>27,600</td>
<td>1.4%</td>
</tr>
<tr>
<td>Ewa</td>
<td>20,600</td>
<td>21,100</td>
<td>1.4%</td>
</tr>
<tr>
<td>Central Oahu</td>
<td>29,000</td>
<td>31,900</td>
<td>1.4%</td>
</tr>
<tr>
<td>Oahu</td>
<td>254,000</td>
<td>266,900</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Character of Culture of the Neighborhood

Age Distribution

Based on the 1980 Census, the population age mix of the neighborhood in which the project is located was generally younger than the general population of Oahu. The 1980 age distribution is provided below:

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Neighborhood 021</th>
<th>Oahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 5</td>
<td>8,744</td>
<td>7,894</td>
</tr>
<tr>
<td>5 - 19</td>
<td>29,266</td>
<td>24,266</td>
</tr>
<tr>
<td>20 - 29</td>
<td>16,180</td>
<td>21,680</td>
</tr>
<tr>
<td>30 - 39</td>
<td>40,300</td>
<td>35,180</td>
</tr>
<tr>
<td>40 - 49</td>
<td>4,530</td>
<td>8,440</td>
</tr>
<tr>
<td>50 and over</td>
<td>1,110</td>
<td>2,550</td>
</tr>
</tbody>
</table>

The median age of persons residing in the neighborhood was 27.6 years, as compared to 28.1 years for Honolulu County.

For the various Development Plan Areas, the age distribution forecasts by CNAI, Fairfax, VA. are as follows:

Age of Population Forecast

<table>
<thead>
<tr>
<th>Age</th>
<th>Census Tract 73 - 82</th>
<th>Ewa</th>
<th>Central Oahu</th>
<th>Oahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4</td>
<td>7,5%</td>
<td>7.0%</td>
<td>10.0%</td>
<td>7.8%</td>
</tr>
<tr>
<td>5 - 14</td>
<td>10.7</td>
<td>10.4</td>
<td>10.7</td>
<td>10.1</td>
</tr>
<tr>
<td>15 - 24</td>
<td>9.8</td>
<td>9.3</td>
<td>9.4</td>
<td>9.6</td>
</tr>
<tr>
<td>25 - 34</td>
<td>9.3</td>
<td>8.6</td>
<td>9.4</td>
<td>9.7</td>
</tr>
<tr>
<td>35 - 44</td>
<td>8.8</td>
<td>8.6</td>
<td>9.6</td>
<td>9.7</td>
</tr>
<tr>
<td>45 - 54</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
<td>5.9</td>
</tr>
<tr>
<td>55 - 64</td>
<td>4.9</td>
<td>5.1</td>
<td>5.4</td>
<td>5.6</td>
</tr>
<tr>
<td>65+</td>
<td>4.8</td>
<td>5.0</td>
<td>5.4</td>
<td>5.7</td>
</tr>
</tbody>
</table>

The median age of persons residing in the neighborhood was 30.0 years, as compared to 31.2 years for Honolulu County.

Character of Culture of the Neighborhood

Ethnic Distribution

The ethnic composition of the neighborhood was dominated by the "Asian and Pacific Islander" group, based on the 1980 Census. The 1980 distribution is summarized below:

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Neighborhood 021</th>
<th>Oahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>28.4%</td>
<td>37.1%</td>
</tr>
<tr>
<td>Black</td>
<td>2.8%</td>
<td>2.3%</td>
</tr>
<tr>
<td>American Indian</td>
<td>0.3%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Eskimo and Aleut</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Asian and Pacific Islander</td>
<td>67.6%</td>
<td>59.8%</td>
</tr>
<tr>
<td>Other</td>
<td>2.3%</td>
<td>4.8%</td>
</tr>
</tbody>
</table>

The "Caucasian" or "white" ethnic group was the next dominant group. In comparison with Oahu, the ethnic group dominance was smaller, but not magnified of the two major groups was much closer on the Oahu-wide basis.
Household Size

Census Tract 78.01 containing the subject property had an average household size of 3.51 persons. Neighborhood 021 had an average of 3.62 persons per household according to the 1980 Census. By comparison, the 1980 Oahu average was 3.15 persons per household. The overall distribution of persons per household is detailed below:

<table>
<thead>
<tr>
<th>Distribution of Household Size</th>
<th>Neighborhood 021</th>
<th>Oahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 person</td>
<td>4.99%</td>
<td>17.70%</td>
</tr>
<tr>
<td>2 person</td>
<td>17.23</td>
<td>26.30</td>
</tr>
<tr>
<td>3 person</td>
<td>21.74</td>
<td>18.87</td>
</tr>
<tr>
<td>4 person</td>
<td>28.27</td>
<td>17.94</td>
</tr>
<tr>
<td>5 person</td>
<td>16.14</td>
<td>9.87</td>
</tr>
<tr>
<td>6 or more persons</td>
<td>11.63</td>
<td>9.87</td>
</tr>
</tbody>
</table>

The significantly lower percentage of single person households can be attributed to the nature of the housing units within the area.

The average household size is expected to decline by as much as 0.2 percent per annum over the 1987 to 1992 period according to the CACI data. The Census Tracts 73 - 82 have an estimated average household size of 3.49 persons in 1987, declining to 3.46 persons by 1992. Oahu is not expected to noticeably change from its current 1987 estimated 3.86 persons per household. Central Oahu will decline to 3.53 persons per household in 1992, from 3.55 persons in 1987. The Oahu average will shift from a 3.11 persons per household in 1987, to a somewhat similar 3.10 household size in 1992.

Family Income

In 1979, more than two-thirds of the families living within the Census Neighborhood 021, had incomes between $20,000 and $49,999. In comparison, less than 20 percent of the Oahu's families had incomes within that range. The general distribution is provided below:

<table>
<thead>
<tr>
<th>Family Income</th>
<th>Neighborhood 021</th>
<th>Oahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $20,000</td>
<td>24.10%</td>
<td>47.30%</td>
</tr>
<tr>
<td>$20,000 - $49,999</td>
<td>48.83</td>
<td>48.83</td>
</tr>
<tr>
<td>$50,000 or more</td>
<td>8.51</td>
<td>9.87</td>
</tr>
</tbody>
</table>

Due to the housing types and prices within that area, one would expect that the middle income families would be attracted to this area.

The forecast of median family incomes by CACI of Fairfax, VA. for the various Development Plan Areas included in the primary market area indicates a real growth of 1.6 to 1.9 percent per annum between 1987 and 1992 with a Oahu-wide average of 1.8 percent per annum. The Census Tract 73 - 82 are estimated to gain an average of $3,700 per family between 1987 and 1992, to yield an annual family income in 1992 of $43,600 in constant 1987 dollars. Oahu is expected to gain an average of $3,400 per family for an annual median family income of $32,200 in 1992. Overall, Oahu's family income is predicted to increase their real incomes an average of $3,200 to a 1992 annual average family income of $38,100.

Impact Assessment

The proposed project will cause the in-migration of approximately 180 new households, or 450-500 persons. Based on the buyer profile of the Wailuku II and Wailuku III projects, the majority of these households will be from other parts of the island. The project will have the effect of raising the overall average family income within the area, while lowering the average household size, but will not be significant due to the proposed 180 units.

Overall, the addition of the proposed 180 new houses and households is not expected to have a significant impact on the area. The general population levels already expected in the area will not be impacted by the additional 450-500 new individuals, nor will be character of the neighborhood will change significantly.
ECONOMIC IMPACTS

Economic Growth

Overview of the Economy

Federal expenditures have dominated Hawaii's economy since Statehood in 1959. However, in 1974, tourism overtook Federal spending to become Hawaii's and Oahu's leading industry. Historically, Federal spending has been a stabilizing factor and tourism providing the economy with real growth in output, employment and income.

Sugar and pineapple still continue to be a dominant force in the agricultural products export industry. However, eroding market shares in the international markets are taking its toll on these two agricultural product groups. The combined effects of sugar and pineapple's diminishing roles in the economy and the somewhat volatile nature of the tourism industry have given greater impetus for State and local policymakers to diversify the economy much more than it has in the past. As such, diversified agriculture and manufacturing have been gaining ground in relative importance. Other ventures such as the film industry, high technology, and aquaculture may play a much larger role in sustaining and enhancing the area's real growth prospects.

In 1985, Hawaii's total personal income rose to $14.6 billion over 1984's figure of $13.7 billion, for a 6.4 percent increase. In comparison, the Consumer Price Index showed a 2.4 percent increase over this same period, indicating a real gain in personal income of about 4 percent.

In 1987, the U.S. economy showed a relatively strong second quarter growth of 2.5 percent. Hawaii's economy is expected to have a moderate growth, but not at the 1986 pace. Based on current economic trends, Hawaii's job market is expected to expand at an annual rate of 3 percent.

Hawaii's Economy by Major Sectors

Visitor Industry. For the first half of 1987, the Hawaii Visitors Bureau (HVB) estimated that 4,212,000 visitors arrived in Hawaii, representing a 1.7 percent increase over the same period in 1986. Of these visitors, over 72 percent consisted of westbound passengers. However, this total represented a 1.1 percent decline over the 1986 westbound traffic. The strength of the visitor industry came from the eastbound traffic, which increased by over 14 percent. The general visitor arrival trend is depicted below:

Visitor Arrivals to Hawaii

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Arrivals</th>
<th>Westbound</th>
<th>Eastbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>3,934,504</td>
<td>3,046,137</td>
<td>888,377</td>
</tr>
<tr>
<td>1981</td>
<td>3,934,623</td>
<td>3,074,791</td>
<td>859,832</td>
</tr>
<tr>
<td>1982</td>
<td>4,242,925</td>
<td>3,279,523</td>
<td>964,400</td>
</tr>
<tr>
<td>1983</td>
<td>4,367,880</td>
<td>3,395,840</td>
<td>972,040</td>
</tr>
<tr>
<td>1984</td>
<td>4,655,580</td>
<td>3,721,380</td>
<td>1,134,200</td>
</tr>
<tr>
<td>1985</td>
<td>4,884,110</td>
<td>4,256,230</td>
<td>1,135,500</td>
</tr>
<tr>
<td>1986</td>
<td>5,606,980</td>
<td>4,256,390</td>
<td>1,350,590</td>
</tr>
<tr>
<td>1987q1</td>
<td>4,212,000</td>
<td>3,036,950</td>
<td>1,036,700</td>
</tr>
</tbody>
</table>

One reason for the increased eastbound demand can be attributed to the favorable exchange rates being exploited by eastbound travellers, particularly the Japanese. The rise in the value of the Japanese yen against the U.S. dollar, effectively lowered the cost of travel services for the Japanese visitors to Hawaii.

On the other hand, for the Westbound visitors, the rising cost of air travel, primarily due to increases in the cost of fuel, hotel room rates and cost of other services, significantly raised the cost of travel services in general.

Since travel to Hawaii is largely a discretionary purchase for both Westbound and Eastbound travelers, the continued strength of the tourist market will be based on the strength of the households' discretionary income. For Westbound travelers, the gain in real disposable-discretionary incomes will largely dictate future travel plans to Hawaii. For Eastbound travelers, a combination of real disposable-discretionary incomes gains, as well as favorable exchange rates will dominate the travel decision.

Federal Government. Federal expenditures in Hawaii have been a major force in providing a stable economic base, with the military playing a significant role. According to the Bank of Hawaii, the total Federal expenditures grew at a average annual rate of 3.6 percent, between 1980 and 1986. Over this same period, defense

-9-
expenditures grew at an average annual rate of 5.4 percent and non-defense spending grew at 0.5 percent per annum. The annual expenditures from 1960 to 1986 are shown below:

<table>
<thead>
<tr>
<th>Federal Expenditures (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>1960</td>
</tr>
<tr>
<td>1961</td>
</tr>
<tr>
<td>1962</td>
</tr>
<tr>
<td>1963</td>
</tr>
<tr>
<td>1964</td>
</tr>
<tr>
<td>1965</td>
</tr>
<tr>
<td>1966(est)</td>
</tr>
</tbody>
</table>

Although the absolute expenditures are relatively constant over the 1980 to 1986 period, the contribution of those dollars to the overall State’s Gross Product has steadily declined since 1980, as shown below:

<table>
<thead>
<tr>
<th>Federal Expenditures vs. Gross State Product (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>1980</td>
</tr>
<tr>
<td>1981</td>
</tr>
<tr>
<td>1982</td>
</tr>
<tr>
<td>1983</td>
</tr>
<tr>
<td>1984</td>
</tr>
<tr>
<td>1985</td>
</tr>
<tr>
<td>1986</td>
</tr>
</tbody>
</table>

Agriculture. Annual Sugar and pineapple production, which was once second only to Federal expenditures, has been steadily declining over the last decade. According to bank of Hawaii data, since 1980, sugar production declined from 1.1 million tons to 1.0 million tons, with employment dropping from 3,817 to 1,771. The pineapple industry had a similar profile, with reduction in tonnage from 559,000 in 1980, to 441,000 in 1985. Due to lower labor costs outside the U.S., both sugar and pineapple are turning to increasing mechanization by modernization of these industries, in an attempt to remain competitive in the world markets through increases in productivity and lower costs. However, the likelihood of sugar and/or pineapple to regain its dominance is poor.

In an effort to promote the continued existence of the agriculture industry in Hawaii, the diversified agriculture sector has gained impetus, although small in absolute value. Bank of Hawaii data indicates that of the various components of the diversified agriculture sector, the floriculture industry, comprising cut flowers, foliage and other nursery products, generated only 3 percent of the 1985 sales, amounting to $44.2 million. Livestock products contributed about 30 percent to the total value of diversified agriculture’s cash receipts in 1985.

A summary of agriculture’s contribution to the State’s Gross Product is presented below:

<table>
<thead>
<tr>
<th>Revenue from Agriculture (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>1980</td>
</tr>
<tr>
<td>1981</td>
</tr>
<tr>
<td>1982</td>
</tr>
<tr>
<td>1983</td>
</tr>
<tr>
<td>1984</td>
</tr>
<tr>
<td>1985</td>
</tr>
<tr>
<td>1986</td>
</tr>
</tbody>
</table>

Construction. Construction in Hawaii by the Bank of Hawaii shows that total construction in Hawaii rose by about 26 percent in 1986, as measured by taxable completions. The strength of the construction industry seems to be gaining more momentum. From 1983, there have been a steady growth in authorizations (building permits issued) for both the State and Oahu, as shown in below:

<table>
<thead>
<tr>
<th>Construction on Oahu and Statewide (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>1980</td>
</tr>
<tr>
<td>1981</td>
</tr>
<tr>
<td>1982</td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>Oahu</td>
</tr>
<tr>
<td>State</td>
</tr>
</tbody>
</table>
Although government authorizations seemed to provide a major stimulus to the industry since 1985, private authorizations have been growing at a much slower rate since 1985. 

For the period between 1986 to 1990, the State Department of Planning and Economic Development estimates that construction will remain strong, with over $3.1 billion in major construction activity within Oahu. A summary of major construction activity in terms of project costs is given below:

<table>
<thead>
<tr>
<th>Period</th>
<th>Total Oahu (in millions)</th>
<th>Total State (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987-1990</td>
<td>1,181,200.8</td>
<td>5,442,816.0</td>
</tr>
<tr>
<td>1991-1995</td>
<td>1,061,670.0</td>
<td>1,875,460.0</td>
</tr>
<tr>
<td>1996-2000</td>
<td>579,600.0</td>
<td>916,100.0</td>
</tr>
<tr>
<td>2001-2005+</td>
<td>340,300.0</td>
<td>340,300.0</td>
</tr>
</tbody>
</table>

As other new construction projects enter into its planning stages, the strength of the industry should continue to fade during 1991. However, actual outcomes will be dictated by the stability of both the national and local economies.

The State DPED Series H-F projections estimates that in 1995, personal income will be $8.9 billion. In 1990, personal income will increase to $10.1 billion. Over this same period, per capita personal income is estimated at $10,917 and $11,761, respectively.

Historically, the civilian employment on Oahu has increased, but at a decreasing rate since 1980. Between 1975 and 1980, employment increased by 10 percent. Between 1980 and 1985, employment increased by only 5.3 percent per year. Currently, job growth on Oahu has slowed to about 3 percent per year. The employment trend since 1980 is given below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Oahu</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>322,500</td>
<td>418,000</td>
</tr>
<tr>
<td>1991</td>
<td>328,500</td>
<td>427,000</td>
</tr>
<tr>
<td>1992</td>
<td>328,600</td>
<td>430,000</td>
</tr>
<tr>
<td>1993</td>
<td>336,550</td>
<td>442,000</td>
</tr>
<tr>
<td>1994</td>
<td>338,650</td>
<td>445,000</td>
</tr>
<tr>
<td>1995</td>
<td>343,300</td>
<td>454,000</td>
</tr>
<tr>
<td>1996</td>
<td>351,400</td>
<td>467,000</td>
</tr>
</tbody>
</table>

Oahu's principal employer is the services industry which provided 92,150 jobs in 1986, followed by the retail and wholesale trade sector which provided 91,750 jobs. In particular, the retail trade, along with the services sector, has benefited enormously from the economic growth which Oahu has had over the past two years.

The public sector, which includes Federal, State and local governments, provided an annual average of 79,200 jobs on Oahu in 1986, of which the State provided over 49 percent. The local government, over the period 1980 to 1986, had a relatively stable job count, averaging about 9,500 jobs per year.

A profile of the major employing sectors on Oahu between 1980 and 1986 as provided by the State Dept. of Labor and Industrial Relations is summarized below:

-13-

-14-
Employment By Sector on Oahu

<table>
<thead>
<tr>
<th>Year</th>
<th>Services</th>
<th>Trade</th>
<th>Government</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>79,350</td>
<td>87,600</td>
<td>75,550</td>
<td>80,600</td>
</tr>
<tr>
<td>1981</td>
<td>81,450</td>
<td>87,300</td>
<td>75,400</td>
<td>80,150</td>
</tr>
<tr>
<td>1982</td>
<td>80,200</td>
<td>86,050</td>
<td>76,350</td>
<td>83,500</td>
</tr>
<tr>
<td>1983</td>
<td>82,250</td>
<td>86,300</td>
<td>77,450</td>
<td>84,100</td>
</tr>
<tr>
<td>1984</td>
<td>84,550</td>
<td>89,600</td>
<td>77,000</td>
<td>82,450</td>
</tr>
<tr>
<td>1985</td>
<td>87,300</td>
<td>91,900</td>
<td>79,000</td>
<td>84,100</td>
</tr>
<tr>
<td>1986</td>
<td>92,350</td>
<td>91,750</td>
<td>79,200</td>
<td>87,350</td>
</tr>
</tbody>
</table>

In 1987, preliminary estimates by the Hawaii Department of Planning and Economic Development, Research and Economic Analysis Division, indicated that there were 356,400 jobs on Oahu. The State's Series H-3 projections for the City and County of Honolulu, indicates that by the year 2005, there will be a total of approximately 486,400 civilian jobs on Oahu. Of these total jobs, the above major employing sectors are projected to provide the following number of jobs:

Employment By Sector on Oahu

<table>
<thead>
<tr>
<th>Year</th>
<th>Services</th>
<th>Trade</th>
<th>Government</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>91,200</td>
<td>102,350</td>
<td>82,100</td>
<td>96,600</td>
</tr>
<tr>
<td>1995</td>
<td>97,900</td>
<td>110,000</td>
<td>85,000</td>
<td>101,500</td>
</tr>
<tr>
<td>2000</td>
<td>102,800</td>
<td>115,500</td>
<td>87,800</td>
<td>105,100</td>
</tr>
<tr>
<td>2005</td>
<td>105,500</td>
<td>119,700</td>
<td>96,600</td>
<td>107,100</td>
</tr>
</tbody>
</table>

The unemployment rate is expected to average about 5.5 percent per annum to the year 2005 period. Currently, Oahu's unemployment rate stands at 4.3 percent, down from the same period last year of 5.1 percent.

Government Revenues from the Project

Typically, State and local governments can expect to gain financially from a new residential development. For the State, general excise tax revenues from construction and from home sales would provide substantial short-term revenue. Income tax revenues generated due to construction activities and construction workers' salaries are additional revenue sources.

For the City and County of Honolulu, the primary source of revenue would be in the form of additional or increased property taxes, due to the increased values to the property upon reclassification, rezoning, and construction. This would be a long-term source of additional revenue.

Based on various assumptions made regarding the proposed project, the approximate government revenue effects of the development can be made. The assumptions are:

1. The effective average sales revenues generated by the proposed project will be $300,000 per unit, in 1987 dollars.
2. Construction and infrastructure costs for the development will average about $100,000 per unit.
3. Direct labor costs would be about one-third of sales revenues.
4. The average absorption rate for residential sales will be 80 units per year.

Using these assumptions, a magnitude-of-order estimate of the total revenues that could potentially accrue to the state and local governments were calculated and summarized below:

**General Excise Taxes**

<table>
<thead>
<tr>
<th>Description</th>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>$0.72 million</td>
</tr>
<tr>
<td>Residential Sales</td>
<td>0.12 million</td>
</tr>
<tr>
<td>Personal Consumption</td>
<td>0.22 million</td>
</tr>
</tbody>
</table>

**Income Taxes**

<table>
<thead>
<tr>
<th>Description</th>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate</td>
<td>0.06 million</td>
</tr>
<tr>
<td>Construction</td>
<td>0.18 million</td>
</tr>
<tr>
<td>Personal</td>
<td>0.46 million</td>
</tr>
</tbody>
</table>

In total, it is estimated that during the construction period, approximately $2.0 million in additional short-term revenues would accrue to the State of Hawaii and the City and County of Honolulu, that could be attributed to the development of the proposed residential project. Over the longer-term period, real property tax revenues will
contribute approximately $190,000 per year in constant dollars.

**Impact Assessment**

The current trends and projections indicate that the economy of Hawaii and the City and County of Honolulu should fare well in the future. This implies that the employment picture will remain favorable for the existing and projected labor force.

The project will contribute approximately $18 million in private authorizations over a 2-year period. It will also provide short-term employment to approximately 50 persons in the construction services (management, clerical, etc.) fields.

**HOUSING IMPACTS**

**Housing Supply**

Construction activity over the past 3-5 years should provide a continued supply of new residential units, especially the larger, 2-bedroom and over units. However, the total supply will be constrained by existing public policies and regulations, and the conditions of the financial marketplace. In particular, the City and County of Honolulu's General Plan and Development Plan will have a significant impact on the limits to growth of residential units.

Despite mortgage rate improvements during the previous year, the Bank of Hawaii's Construction in Hawaii 1982, reported that authorizations of new single-family units decreased by approximately 12.5 percent between 1985 and 1986. In contrast, authorizations of new multi-family units increased by about 14.2 percent over this same period. Residential authorizations in 1986, in both single and multi-family units totalled 4,212. This represented a 0.1 percent decrease over the 1985 period. From 1980 to 1986, authorizations of new single-family units dipped during the 1981-1982 recession period. However, new multi-family units' authorizations have been relatively constant, as presented below:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>1,650</td>
<td>3,411</td>
<td>377,065</td>
<td>226,954</td>
</tr>
<tr>
<td>1981</td>
<td>1,915</td>
<td>3,521</td>
<td>355,330</td>
<td>175,341</td>
</tr>
<tr>
<td>1982</td>
<td>801</td>
<td>2,585</td>
<td>53,209</td>
<td>116,923</td>
</tr>
<tr>
<td>1983</td>
<td>1,562</td>
<td>1,280</td>
<td>107,494</td>
<td>65,462</td>
</tr>
<tr>
<td>1984</td>
<td>2,199</td>
<td>1,054</td>
<td>154,437</td>
<td>41,556</td>
</tr>
<tr>
<td>1985</td>
<td>2,313</td>
<td>1,965</td>
<td>156,783</td>
<td>89,318</td>
</tr>
<tr>
<td>1986</td>
<td>2,074</td>
<td>2,188</td>
<td>182,450</td>
<td>105,460</td>
</tr>
</tbody>
</table>

Construction trends indicate that on the average, smaller size units are being built. In 1980, the average single-family house was 1,294 square feet. In 1986, this average fell to 1,194 square feet. For multi-family units,
the average unit size was 1,190 square feet in 1980. In 1986, the average size fell by 33 square feet to 856 square feet.

The average price of the single-family units increased from $123,673 in 1980, to $156,618 in 1986. The average price for the multi-family units increased from $93,228 in 1980, to $108,456 in 1986. In 1982, the average multi-family dwelling unit peaked at $114,468. These trends can be clearly seen below:

Average Size and Price of Units

<table>
<thead>
<tr>
<th>Year</th>
<th>Single-Family</th>
<th>Multi-Family</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>House Price</td>
<td>Living Area</td>
</tr>
<tr>
<td></td>
<td>(sq. ft.)</td>
<td>(sq. ft.)</td>
</tr>
<tr>
<td>1980</td>
<td>1,291</td>
<td>1,190</td>
</tr>
<tr>
<td>1981</td>
<td>1,303</td>
<td>1,252</td>
</tr>
<tr>
<td>1982</td>
<td>1,340</td>
<td>1,319</td>
</tr>
<tr>
<td>1983</td>
<td>1,377</td>
<td>1,379</td>
</tr>
<tr>
<td>1984</td>
<td>1,412</td>
<td>1,447</td>
</tr>
<tr>
<td>1985</td>
<td>1,457</td>
<td>1,518</td>
</tr>
<tr>
<td>1986</td>
<td>1,505</td>
<td>1,545</td>
</tr>
</tbody>
</table>

Average single-family housing prices rose at an average annual rate of 2.5 percent. Multi-family unit prices increased at an average annual rate of 2.5 percent.

The annual Oahu housing survey conducted by the Federal Home Loan Bank of Seattle and the U.S. Postal Service yielded an overall vacancy rate of 1.3 percent for 1986. For March 1983, this survey revealed an identical rate of 1.3 percent for Oahu.

Housing Demand

One of the primary components of housing demand is the household formation rate and household size. A comparison of the 1970 and 1980 Census data on household formation rates with the 1980 Census indicates that single-member households, although at a much higher rate, still steadily increased. Yet, over this ten-year period, grew at an average annual rate of 3.7 percent. In contrast, multiple-member households grew at an average annual rate of 3.4 percent.

This faster rate of increase in single-family households, plus the later age of marriage and the aging of our population are reflected in the decrease in persons per household. In 1970, the average number of persons per household was 3.57. In 1980, the average decreased to 3.14 persons per household. In 1982, HPD estimated that statewide, the average persons per household was 3.13 persons.

If the current trend toward declining household size continues through the next decade, then the demand for housing will largely consist of smaller units. In addition, outpace the total household income, the smaller housing will favor moderate- to high-rise residential developments.

In 1970, 45 percent of all occupied housing units were owner-occupied. This proportion increased in 1980 to 49.9 percent. Owner-occupied housing units grew at an average annual rate of 4.5 percent annually, while renter-occupied units grew at a more modest rate of 2.5 percent.

With the favorable interest rates of the previous year and the continuation into the first half of 1987, the level of mortgage activity increased significantly. However, this has slowed as interest rates have increased.

Within the immediate area of the proposed project, described as Census Tract 78.01, through data from CACI, Fairfax, VA., two major market segments comprising the "Upper-middle income, high value Suburbs, mostly professional group and the "Young, mobile households in multi-unit housing".

Within the "Upper-Middle Income, High Value Suburbs, Mostly Professional" segment, two sub-segments can be identified in this area. The first contain "primarily young and middle-aged families with pre-teen and teenage children". Their annual household incomes exceed $35,000 with significant numbers of households with incomes greater than $50,000. The housing in this area is relatively new and included in this first sub-segment.

The second sub-segment consists of middle-aged households with young children. Their household incomes are
slightly less than the first sub-segment, with their incomes concentrated in the $25,000 to $50,000 range. Again, the home values are high and of recent vintage. Approximately 42 percent of the households in this census tract fall in this category.

Comprising over 41 percent of Census tract 78.01, the "Young, Mobile Households in Multi-Unit Housing" segment contains the extremes of young households and older households, with few middle aged persons and children. Their annual incomes tend to exceed $50,000. The adults in the area tend to be well educated, primarily in the professional and managerial occupations.

The Housing Market

The following listing by the Bank of Hawaii's Construction in Hawaii of existing inventory residential developments from 1982 to 1986, indicates a variety of factors are interacting with the supply and demand conditions within the primary market area:

<table>
<thead>
<tr>
<th>Single Family Residential Developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>House Area</td>
</tr>
<tr>
<td>Project/Developer</td>
</tr>
<tr>
<td>Falahna Heights II</td>
</tr>
<tr>
<td>Finance Realty Co.</td>
</tr>
<tr>
<td>Units Sold</td>
</tr>
<tr>
<td>Price Range</td>
</tr>
<tr>
<td>1,350</td>
</tr>
<tr>
<td>20 (1982)</td>
</tr>
<tr>
<td>6 (1984)</td>
</tr>
<tr>
<td>4 (1985)</td>
</tr>
<tr>
<td>9 (1986)</td>
</tr>
<tr>
<td>Falahna Heights III</td>
</tr>
<tr>
<td>Finance Realty Co.</td>
</tr>
<tr>
<td>1,350</td>
</tr>
<tr>
<td>15 (1985)</td>
</tr>
<tr>
<td>22 (1986)</td>
</tr>
<tr>
<td>Village Park</td>
</tr>
<tr>
<td>Waitec Development</td>
</tr>
<tr>
<td>1,000</td>
</tr>
<tr>
<td>150 (1982)</td>
</tr>
<tr>
<td>149 (1984)</td>
</tr>
<tr>
<td>1,200</td>
</tr>
<tr>
<td>5,300 (1986)</td>
</tr>
<tr>
<td>Pahoa in Waipio</td>
</tr>
<tr>
<td>Gentry-Waipio</td>
</tr>
<tr>
<td>1,280</td>
</tr>
</tbody>
</table>

| Millani Town                          |
| Millani Town                          |
| 925-1,300'                            | 203 (1982) |
| 915-1,415'                            | 234 (1983) |
| 1,300                                 | 315 (1984) |
| 1,200                                 | 474 (1985) |
| 1,000                                 | 520 (1986) |
| 97,200-178,200                        |
| 104,200-191,800                       |
| 113,745-198,900                       |
| 113,745-198,900                       |
| 118,700-198,000                       |

| Royal Summit                          |
| Royal Summit                          |
| 1,700                                 | 115 (1982) |
| 54 (1983)                             | 158,500-300,000 |
| 1,500                                 | 46 (1984) |
| (lots)                                | 150 (1985) |
| 97,500-100,700                        |

| Ahikoe                                |
| Ahikoe                                |
| 1,000                                 | 16 (1983) |
| 20 (1985)                             | 123,000-135,639 |
| 8 (1986)                              | 127,500-138,000 |

| Kula, Nohea & Kaulana                |
| Kula, Nohea & Kaulana                |
| 1,220                                 | 280 (1983) |
| 115,000-160,000                      |

| Nohea                                 |
| Nohea                                 |
| 1,200                                 | 154 (1984) |
| 112,000-160,000                      |

| Kaulana                               |
| Kaulana                               |
| 1,200                                 | 224 (1984) |
| 117,000-162,000                      |

| Luana                                 |
| Luana                                 |
| 1,200                                 | 53 (1984) |
| 117,000-162,000                      |

| Kekuani                                |
| Kekuani                                |
| 1,205                                 | 42 (1984) |
| 140,000-180,000                      |

| Heights at Waikuna                    |
| Heights at Waikuna                    |
| 31 (1985)                             | 149,000-199,000 |

| Colony Ridge                          |
| Colony Ridge                          |
| 1,080                                 | 56 (1986) |
| 152,000-207,000                      |

| Ho-o Kumu                             |
| Ho-o Kumu                             |
| 1,594                                 | 52 (1986) |
| 140,000-166,055                      |

| Palisades Venture                     |
| Palisades Venture                     |
| 1,100                                 | 12 (1986) |
| 127,800-130,000                      |

| Nahalaoke                             |
| Nahalaoke                             |
| 1,596                                 | 29 (1986) |
| 235,000-315,000                      |
### Multi-Family Residential Developments

<table>
<thead>
<tr>
<th>Project/Developer</th>
<th>Living Area (sq.ft.)</th>
<th>Units Sold</th>
<th>Price Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuola (Wai`oli)</td>
<td>750</td>
<td>50 (1982)</td>
<td>79,000- n.a.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 (1984)</td>
<td>81,000- 88,000</td>
</tr>
<tr>
<td>Kuola, Ihoana &amp; Hikino</td>
<td>600</td>
<td>200 (1983)</td>
<td>45,000- 83,000</td>
</tr>
<tr>
<td>Gentry-Wai`oli</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wailua</td>
<td>1,391</td>
<td>48 (1982)</td>
<td>110,000-147,000</td>
</tr>
<tr>
<td>John D. Lusk &amp; Son</td>
<td>1,400</td>
<td>24 (1983)</td>
<td>130,000-159,000</td>
</tr>
<tr>
<td></td>
<td>1,375</td>
<td>36 (1983)</td>
<td>132,000-165,000</td>
</tr>
<tr>
<td>College Gardens</td>
<td>840</td>
<td>105 (1982)</td>
<td>78,000- 92,150</td>
</tr>
<tr>
<td>Leer Siegler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palehua Villas</td>
<td>800</td>
<td>22 (1984)</td>
<td>78,700-104,200</td>
</tr>
<tr>
<td>Finance Realty</td>
<td></td>
<td>15 (1985)</td>
<td>78,700-105,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 (1986)</td>
<td>78,700-110,600</td>
</tr>
<tr>
<td>Palehua Mene`e</td>
<td>1,142</td>
<td>9 (1984)</td>
<td>99,400-124,000</td>
</tr>
<tr>
<td>Finance Realty</td>
<td></td>
<td>6 (1985)</td>
<td>75,500-124,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>36 (1986)</td>
<td>75,700-124,000</td>
</tr>
<tr>
<td>Palehua View Estates</td>
<td>1,257</td>
<td>1 (1984)</td>
<td>125,000</td>
</tr>
<tr>
<td>Finance Realty</td>
<td></td>
<td>1 (1985)</td>
<td>117,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 (1986)</td>
<td>117,600</td>
</tr>
<tr>
<td>Ihoana (Wai`oli)</td>
<td>500</td>
<td>132 (1984)</td>
<td>50,000- 69,000</td>
</tr>
<tr>
<td>Gentry-Wai`oli</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hikino &amp; Pulua</td>
<td>n.a.</td>
<td>124 (1984)</td>
<td>50,000- 88,000</td>
</tr>
<tr>
<td>Gentry-Wai`oli</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alii Plantation</td>
<td>900</td>
<td>185 (1984)</td>
<td>89,000-102,900</td>
</tr>
<tr>
<td>Leer Siegler</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millani Terrace Apartments</td>
<td>537</td>
<td>60 (1984)</td>
<td>55,000- 68,400</td>
</tr>
<tr>
<td>Millani Town</td>
<td></td>
<td>723 (1985)</td>
<td>55,000- 68,400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>133 (1986)</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

### Housing Demand and Supply Projections (in Thousands of Units)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oahu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td>271.4</td>
<td>292.1</td>
<td>309.9</td>
<td>324.9</td>
<td>338.8</td>
</tr>
<tr>
<td>Supply</td>
<td>264.3</td>
<td>272.5</td>
<td>281.6</td>
<td>289.1</td>
<td>292.4</td>
</tr>
<tr>
<td>Net Deficit</td>
<td>7.1</td>
<td>19.6</td>
<td>28.3</td>
<td>35.8</td>
<td>46.4</td>
</tr>
<tr>
<td>Primary Urban Center</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td>162.1</td>
<td>172.7</td>
<td>178.1</td>
<td>181.4</td>
<td>185.1</td>
</tr>
<tr>
<td>Supply</td>
<td>159.7</td>
<td>164.4</td>
<td>168.3</td>
<td>171.4</td>
<td>172.4</td>
</tr>
<tr>
<td>Net Deficit</td>
<td>2.4</td>
<td>3.3</td>
<td>4.0</td>
<td>5.0</td>
<td>8.7</td>
</tr>
<tr>
<td>Ewa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td>9.6</td>
<td>13.8</td>
<td>21.3</td>
<td>25.3</td>
<td>30.9</td>
</tr>
<tr>
<td>Supply</td>
<td>9.2</td>
<td>11.9</td>
<td>16.9</td>
<td>20.9</td>
<td>22.9</td>
</tr>
<tr>
<td>Net Deficit</td>
<td>0.4</td>
<td>1.9</td>
<td>4.4</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>Central Oahu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td>31.0</td>
<td>33.6</td>
<td>35.4</td>
<td>38.5</td>
<td>40.5</td>
</tr>
<tr>
<td>Supply</td>
<td>29.7</td>
<td>29.7</td>
<td>29.8</td>
<td>29.9</td>
<td>29.9</td>
</tr>
<tr>
<td>Net Deficit</td>
<td>1.3</td>
<td>3.9</td>
<td>5.6</td>
<td>8.6</td>
<td>10.6</td>
</tr>
</tbody>
</table>
Primary Market Area

<table>
<thead>
<tr>
<th>Demand</th>
<th>40.6</th>
<th>47.4</th>
<th>56.7</th>
<th>63.8</th>
<th>71.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>38.9</td>
<td>41.6</td>
<td>46.7</td>
<td>50.7</td>
<td>52.8</td>
</tr>
<tr>
<td>Net Deficit</td>
<td>1.7</td>
<td>5.8</td>
<td>10.0</td>
<td>13.1</td>
<td>18.6</td>
</tr>
</tbody>
</table>

The general conclusion to be drawn is that additional housing within the primary market area is needed. The market should absorb the additional housing units proposed by the developer.

Affordable Units

On the demand side, the single-digit interest rates in 1985 provided the means for a greater number of families to purchase their homes or to "step-up" to a larger home. However, the "affordability gap" continued to be a major obstacle for many households. It is this group that have income too high to qualify for public assistance and too low to purchase outright at market rates.

The principal reason is the ever-growing divergence between average mortgage payments, driven by housing costs and interest rates, and average family incomes. From 1980, average prices of residential units increased between 2.5 to 2.9 percent per year. Assuming this rate of increase continues and that Oahu's median family incomes will rise by 1 to 2 percent per year, the "affordability gap" will continue to widen.

However, examination of projected household income growth distribution reveals that possibly a greater number of households may realize higher real incomes within "affordable" ranges. This idea can be illustrated by the projected growth from CACI of Fairbanks, VA, of household incomes between 1987 and 1992, as shown below:

Growth Rates of Household Incomes, 1987-1992

<table>
<thead>
<tr>
<th>Income Range</th>
<th>FHIC</th>
<th>Oahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10,000 - $14,999</td>
<td>1.3%</td>
<td>1.7%</td>
</tr>
<tr>
<td>$15,000 - $24,999</td>
<td>1.7%</td>
<td>2.5%</td>
</tr>
<tr>
<td>$25,000 - $34,999</td>
<td>1.1%</td>
<td>0.9%</td>
</tr>
<tr>
<td>$35,000 - $49,999</td>
<td>0.3%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Median Income: $18,000

As seen, the $50,000+ households indicate significant advances keeping pace with rising housing prices.

When considering the availability of rental housing as a viable substitute for owner-occupied housing, the availability of the rental housing stock is decreasing. The conversion of rental units to condominiums during the late 1970s and early 1980s, combined with the increasing disinterest towards the private construction of rental units, have created a shortage of rental housing. This has increased the upward pressures on rental prices and increased the marginal disincentive for rental, in favor of owner-occupied units. This has increased the latent demand for owner-occupied housing.

From the supply side, the decreasing rate of growth of the housing stock on Oahu will contribute to the rising housing prices, as buyers "bid up" the existing inventory of available homes. Therefore, increasing the supply of all housing types will be critical in maintaining an inventory of affordable housing.

Thus, affordable housing will probably be possible only through multi-family residential developments. This is principally due to the restrictive nature of urban land availability.

Impact Assessment

Based on the ability of each of the four developed and sold Malana I, II, and III, and the foregoing housing impact analysis, there is an adequate potential market for the proposed residential units. These proposed units will alleviate the pent-up demand for housing in the upper moderate-income to high-income brackets. The "affordable" units that will be built as part of the City's requirements will address some of the housing demand of moderate-income families. The effective buying power of this group will be heavily dependent upon the economy's ability to support a higher real wage level, while maintaining a moderate growth in the cost of living.
REFERENCES


## DEMOGRAPHIC FORECAST REPORTS

### 1980 Census, 1987 Update and 1992 Forecasts

#### Census Tract 73-02
- Ewa
- Central Oahu
- Oahu

### APPENDIX A

#### COUNTRY, FAIRFAX, VA, PACIFIC ECONOMIC SYSTEMS CONSULTANTS, AND ENVIRONMENT CAPITAL MANAGERS.
### Table: Household Income

<table>
<thead>
<tr>
<th>Year</th>
<th>1980</th>
<th>1987</th>
<th>1992</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOUSEHOLD INCOME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$0—9999</td>
<td>1873</td>
<td>19.5</td>
<td>637</td>
<td>8.1</td>
</tr>
<tr>
<td>$10,000—14,999</td>
<td>1412</td>
<td>15.5</td>
<td>1114</td>
<td>10.5</td>
</tr>
<tr>
<td>$15,000—24,999</td>
<td>661</td>
<td>23.5</td>
<td>2273</td>
<td>21.4</td>
</tr>
<tr>
<td>$25,000—49,999</td>
<td>1473</td>
<td>21.3</td>
<td>2634</td>
<td>23.7</td>
</tr>
<tr>
<td>$50,000—74,999</td>
<td>854</td>
<td>9.3</td>
<td>2489</td>
<td>23.4</td>
</tr>
<tr>
<td>$75,000—99,999</td>
<td>76</td>
<td>9.1</td>
<td>1167</td>
<td>11.2</td>
</tr>
<tr>
<td>100,000—19,999</td>
<td>7</td>
<td>6.1</td>
<td>198</td>
<td>13.6</td>
</tr>
</tbody>
</table>

### Table: Age Distribution

<table>
<thead>
<tr>
<th>Age</th>
<th>1980</th>
<th>Update</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>3926</td>
<td>10.8</td>
<td>4264</td>
</tr>
<tr>
<td>5-11</td>
<td>5459</td>
<td>15.1</td>
<td>5712</td>
</tr>
<tr>
<td>12-16</td>
<td>3745</td>
<td>10.3</td>
<td>4098</td>
</tr>
<tr>
<td>17-25</td>
<td>5817</td>
<td>10.5</td>
<td>5911</td>
</tr>
<tr>
<td>26-34</td>
<td>9790</td>
<td>16.9</td>
<td>10091</td>
</tr>
<tr>
<td>35-44</td>
<td>7948</td>
<td>22.1</td>
<td>10499</td>
</tr>
<tr>
<td>45-54</td>
<td>7635</td>
<td>7.3</td>
<td>3620</td>
</tr>
<tr>
<td>55-64</td>
<td>1580</td>
<td>4.4</td>
<td>2040</td>
</tr>
<tr>
<td>65+</td>
<td>1104</td>
<td>3.0</td>
<td>1618</td>
</tr>
</tbody>
</table>

### Table: Race Distribution

<table>
<thead>
<tr>
<th>Race</th>
<th>1980</th>
<th>Update</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>15210</td>
<td>42.0</td>
<td>16800</td>
</tr>
<tr>
<td>Black</td>
<td>752</td>
<td>2.5</td>
<td>907</td>
</tr>
<tr>
<td>Other</td>
<td>20271</td>
<td>55.5</td>
<td>24194</td>
</tr>
</tbody>
</table>

### Table: Central Data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CENSUS</td>
<td>Update</td>
<td>Forecast</td>
<td>Change</td>
<td>Growth</td>
</tr>
<tr>
<td>Population</td>
<td>16093</td>
<td>11270</td>
<td>11937</td>
<td>7019</td>
</tr>
<tr>
<td>Households</td>
<td>36142</td>
<td>29780</td>
<td>31947</td>
<td>2163</td>
</tr>
<tr>
<td>Families</td>
<td>23986</td>
<td>22694</td>
<td>27111</td>
<td>1718</td>
</tr>
<tr>
<td>Avg. HN Size</td>
<td>3.58</td>
<td>3.55</td>
<td>3.53</td>
<td>0.02</td>
</tr>
<tr>
<td>Avg. Fam Size</td>
<td>3.87</td>
<td>3.80</td>
<td>3.77</td>
<td>0.03</td>
</tr>
</tbody>
</table>

### Table: Total Income (Millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>1980</th>
<th>1987</th>
<th>1992</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Capita Inc</td>
<td>5908</td>
<td>9261</td>
<td>9943</td>
<td>261</td>
</tr>
<tr>
<td>Avg Fam Inc</td>
<td>23766</td>
<td>25062</td>
<td>28361</td>
<td>3311</td>
</tr>
<tr>
<td>Median Fam Inc</td>
<td>12147</td>
<td>14642</td>
<td>24584</td>
<td>7776</td>
</tr>
<tr>
<td>Avg HN Inc</td>
<td>10409</td>
<td>14643</td>
<td>24584</td>
<td>7776</td>
</tr>
<tr>
<td>Median HN Inc</td>
<td>12147</td>
<td>14642</td>
<td>24584</td>
<td>7776</td>
</tr>
</tbody>
</table>
### Age Distribution

<table>
<thead>
<tr>
<th>Age Range</th>
<th>White Males</th>
<th>Black Males</th>
<th>Other Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>14377</td>
<td>6.3</td>
<td>41187</td>
</tr>
<tr>
<td>25-34</td>
<td>5163</td>
<td>2.2</td>
<td>21543</td>
</tr>
</tbody>
</table>

#### Income Distribution

<table>
<thead>
<tr>
<th>Income Level</th>
<th>White Males</th>
<th>Black Males</th>
<th>Other Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>$50000-74999</td>
<td>60154</td>
<td>7.9</td>
<td>62773</td>
</tr>
<tr>
<td>$75000-99999</td>
<td>79949</td>
<td>10.5</td>
<td>84262</td>
</tr>
<tr>
<td>$100000-124999</td>
<td>61194</td>
<td>8.0</td>
<td>57472</td>
</tr>
<tr>
<td>$125000-149999</td>
<td>31602</td>
<td>10.7</td>
<td>72906</td>
</tr>
<tr>
<td>$150000-174999</td>
<td>113615</td>
<td>16.7</td>
<td>117339</td>
</tr>
<tr>
<td>$175000-199999</td>
<td>156822</td>
<td>20.6</td>
<td>204125</td>
</tr>
<tr>
<td>$200000-224999</td>
<td>74575</td>
<td>9.8</td>
<td>70552</td>
</tr>
<tr>
<td>$225000-249999</td>
<td>64916</td>
<td>8.5</td>
<td>71556</td>
</tr>
<tr>
<td>$250000-274999</td>
<td>55268</td>
<td>7.3</td>
<td>74274</td>
</tr>
</tbody>
</table>

#### Average Age

- White Males: 31.7
- Black Males: 33.0
- Other Males: 34.9

#### Median Age

- White Males: 28.1
- Black Males: 31.2
- Other Males: 32.9

---

**Important Notes:**

1. Household income includes the income of families and unrelated individuals. Household income is the total available income for the area.

---

**Source:** CACI, Fairfax, VA.
<table>
<thead>
<tr>
<th>ACORN</th>
<th>ACORN TYPE DESCRIPTION</th>
<th>1997 %</th>
<th>HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1</td>
<td>ESTABLISHED SUBURBS</td>
<td>0.0</td>
<td>1242</td>
</tr>
<tr>
<td>A 2</td>
<td>NEWER SUBURBS</td>
<td>0.0</td>
<td>2550</td>
</tr>
<tr>
<td>A 5</td>
<td>OLDER FAMILIES, HIGHER DENSITY</td>
<td>0.0</td>
<td>7404</td>
</tr>
<tr>
<td>A 6</td>
<td>OLDER FAMILIES, VERY HIGH INCOME</td>
<td>0.0</td>
<td>17744.6</td>
</tr>
<tr>
<td>B 5</td>
<td>YOUNG FAMILIES, HIGH MOBILITY</td>
<td>0.0</td>
<td>15765</td>
</tr>
<tr>
<td>B 7</td>
<td>FAMILIES WITH OLDER CHILDREN</td>
<td>0.0</td>
<td>1688</td>
</tr>
<tr>
<td>E 9</td>
<td>HIGH INCOME, BLUE COLLAR</td>
<td>0.0</td>
<td>2550</td>
</tr>
<tr>
<td>C 10</td>
<td>YOUNG ADULTS, HIGH/MID INCOME</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>C 11</td>
<td>COLLEGE UNDERGRADUATES</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>D 14</td>
<td>MIDDLE INCOME, BLUE COLLAR</td>
<td>0.0</td>
<td>2550</td>
</tr>
<tr>
<td>D 15</td>
<td>MIDDLE-LOW INCOME, BLUE COLLAR</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>E 16</td>
<td>YOUNG HISPANICS, SOUTHWESTERN</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>E 17</td>
<td>OLDER POPULATION, ETHNIC MIX</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>E 18</td>
<td>POOR FAMILIES, VERY OLD HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>E 19</td>
<td>GROWING METRO, MIDDLE INCOME</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>F 20</td>
<td>LOW-MID INCOME, LOW VALUE HOUSE//apt</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>F 21</td>
<td>OLDER POPULATION, OLD RENTAL HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>G 21</td>
<td>MIDDLE INCOME, MIDDLE VALUE HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>H 24</td>
<td>YOUNG FAMILIES</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>H 25</td>
<td>YOUNG MOBILE FAMILIES</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>H 26</td>
<td>FARMS &amp; OLDER HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>H 27</td>
<td>SEASONAL HOUSING/AIR FAM.</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>J 28</td>
<td>SEASONAL HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>K 37</td>
<td>HIGH INCOME, HIGH MOBILITY</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>K 38</td>
<td>POOR FAMILIES, HIGH MOBILITY</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>L 40</td>
<td>HIGH INCOME, MIDDLE VALUE HOUSE//apt</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>L 41</td>
<td>MIDDLE INCOME, LOW VALUE HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>L 42</td>
<td>LOW INCOME, MIDDLE VALUE HOUSE/apt</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>N 43</td>
<td>MILITARY AREAS</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>M 44</td>
<td>INSTITUTIONS</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACORN</th>
<th>ACORN TYPE DESCRIPTION</th>
<th>1997 %</th>
<th>HOUSEHOLDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 3</td>
<td>OLDER FAMILIES, HIGHER DENSITY</td>
<td>1.5</td>
<td>3899.0</td>
</tr>
<tr>
<td>A 5</td>
<td>OLDER FAMILIES, VERY HIGH INCOME</td>
<td>6.8</td>
<td>17744.6</td>
</tr>
<tr>
<td>B 5</td>
<td>YOUNG FAMILIES, HIGH MOBILITY</td>
<td>5.2</td>
<td>15462.5</td>
</tr>
<tr>
<td>B 7</td>
<td>FAMILIES WITH OLDER CHILDREN</td>
<td>3.7</td>
<td>15462.5</td>
</tr>
<tr>
<td>E 6</td>
<td>MIDDLE INCOME, BLUE COLLAR</td>
<td>2.5</td>
<td>15462.5</td>
</tr>
<tr>
<td>C 9</td>
<td>UPPER-MID INCOME, HIGH VALUE COND.</td>
<td>2.5</td>
<td>15462.5</td>
</tr>
<tr>
<td>C 10</td>
<td>YOUNG ADULTS, MID/LOW/MID INCOME</td>
<td>1.5</td>
<td>3899.0</td>
</tr>
<tr>
<td>C 11</td>
<td>COLLEGE UNDERGRADUATES</td>
<td>0.2</td>
<td>592.0</td>
</tr>
<tr>
<td>C 12</td>
<td>COLLEGE STUDENTS</td>
<td>0.7</td>
<td>1783.0</td>
</tr>
<tr>
<td>B 13</td>
<td>MIDDLE INCOME</td>
<td>13.2</td>
<td>15462.5</td>
</tr>
<tr>
<td>B 14</td>
<td>OLDER, MIDDLE INCOME</td>
<td>0.9</td>
<td>2550.0</td>
</tr>
<tr>
<td>E 15</td>
<td>LOWER-MIDDLE INCOME, BLUE COLLAR</td>
<td>6.2</td>
<td>20831.0</td>
</tr>
<tr>
<td>E 16</td>
<td>YOUNG HISPANICS, SOUTHWESTERN</td>
<td>0.0</td>
<td>592.0</td>
</tr>
<tr>
<td>E 17</td>
<td>OLDER POPULATION, ETHNIC MIX</td>
<td>3.1</td>
<td>592.0</td>
</tr>
<tr>
<td>E 19</td>
<td>GROWING METRO, MIDDLE INCOME</td>
<td>0.0</td>
<td>2550.0</td>
</tr>
<tr>
<td>F 20</td>
<td>LOW-MID INCOME, LOW VALUE HOUSE//apt</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>F 21</td>
<td>OLDER POPULATION, OLD RENTAL HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>F 22</td>
<td>MIDDLE INCOME, MIDDLE VALUE HOUSE/ apt</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>G 22</td>
<td>MIDDLE INCOME, MIDDLE VALUE HOUSE/ apt</td>
<td>1.2</td>
<td>2550.0</td>
</tr>
<tr>
<td>G 24</td>
<td>YOUNG FAMILIES</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>H 25</td>
<td>YOUNG MOBILE FAMILIES</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>H 26</td>
<td>FARMS &amp; OLDER HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>H 27</td>
<td>SEASONAL HOUSING/AIR FAM.</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>H 28</td>
<td>RURAL INDUSTRIAL</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>I 29</td>
<td>OLDER FAMS &amp; RETIREES, HIGH MOBILITY</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>I 30</td>
<td>OLDER HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>I 31</td>
<td>SMALL TOWNS</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>I 32</td>
<td>EASTERN EUROPEANS, SOUTHERN U.S.</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>J 34</td>
<td>LOW VALUE VERY OLD HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>J 35</td>
<td>MOBILE HOME AREAS</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>K 37</td>
<td>HIGH INCOME, HIGH MOBILITY</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>K 38</td>
<td>POOR FAMILIES, HIGH MOBILITY</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>L 40</td>
<td>HIGH INCOME, MIDDLE VALUE HOUSE/ apt</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>L 41</td>
<td>MIDDLE INCOME, LOW VALUE HOUSING</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>L 42</td>
<td>LOW INCOME, MIDDLE VALUE HOUSE/ apt</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>N 43</td>
<td>MILITARY AREAS</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
<tr>
<td>M 44</td>
<td>INSTITUTIONS</td>
<td>0.0</td>
<td>1783.0</td>
</tr>
</tbody>
</table>
### 1980 Census Statistical Summary of Selected Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Census Tract 78.01</th>
<th>Census Neighborhood 021</th>
<th>City</th>
<th>State of Hawaii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident Population</td>
<td>122,813</td>
<td>42,577</td>
<td>762,565</td>
<td>954,691</td>
</tr>
<tr>
<td>Number of Households</td>
<td>3,527</td>
<td>11,140</td>
<td>236,214</td>
<td>294,052</td>
</tr>
<tr>
<td>Average Number of Persons Per Household</td>
<td>3.15</td>
<td>3.76</td>
<td>3.15</td>
<td>3.15</td>
</tr>
<tr>
<td>Median Age (years)</td>
<td>28.0</td>
<td>27.6</td>
<td>28.0</td>
<td>28.3</td>
</tr>
<tr>
<td>Percent Foreign Born</td>
<td>11.8</td>
<td>12.2</td>
<td>14.0</td>
<td>14.2</td>
</tr>
<tr>
<td>Persons 25 and Over; Percent High School Graduate</td>
<td>89.0</td>
<td>81.5</td>
<td>75.0</td>
<td>75.0</td>
</tr>
<tr>
<td>Civilian Labor Force: Percent Unemployed</td>
<td>2.6</td>
<td>4.1</td>
<td>4.6</td>
<td>4.7</td>
</tr>
<tr>
<td>Median Family Income (1979 dollars)</td>
<td>31,326</td>
<td>30,031</td>
<td>23,056</td>
<td>22,751</td>
</tr>
<tr>
<td>Total Housing Units</td>
<td>3,625</td>
<td>11,168</td>
<td>252,078</td>
<td>274,725</td>
</tr>
<tr>
<td>Total Housing Units: Percent in 1-Unit Structures</td>
<td>72.7</td>
<td>80.2</td>
<td>47.1</td>
<td>51.7</td>
</tr>
<tr>
<td>Total Housing Units: Percent Vacant or Transient</td>
<td>2.6</td>
<td>2.0</td>
<td>8.2</td>
<td>11.4</td>
</tr>
<tr>
<td>Occupied Units: Percent Owner-Occupied</td>
<td>88.6</td>
<td>76.4</td>
<td>47.9</td>
<td>51.7</td>
</tr>
<tr>
<td>Renter Occupied: Percent 1.01 or More Persons Per Room</td>
<td>11.5</td>
<td>13.5</td>
<td>15.5</td>
<td>15.5</td>
</tr>
</tbody>
</table>

APPENDIX G

Environmental Aspects of Storm Water Runoff
Walluna IV Development

by

Gordon L. Dugan, Ph.D.
Environmental Consultant
TABLE OF CONTENTS

Page

LIST OF FIGURES .................................................. 111
LIST OF TABLES ...................................................... 114
INTRODUCTION ....................................................... 1
PURPOSE AND SCOPE ............................................... 4
METHODOLOGY ....................................................... 5
SURFACE WATER RUNOFF ALTERATIONS ............................. 9
Quantity ............................................................ 9
Quality ........................................................... 11
SUMMARY AND CONCLUSIONS .................................... 14
REFERENCES ......................................................... 17

ENVIRONMENTAL ASPECTS OF STORM WATER RUNOFF

WAILEA IV DEVELOPMENT,
SOUTHERN MAUI, HAWAII

December, 1987

by
Gordon L. Dugas, Ph.D.,
Environmental Consultant
LIST OF FIGURES

Figure No.  
1. Hydrologic and Geologic Characteristics of Oahu .......... 2

LIST OF TABLES

Table No.  
1. Representative Storm Water Quality Data for Honolulu ... 6  
2. Estimated Storm Water Runoff and Constituent Changes due to the Proposed Wailana IV Development, Southern Oahu, Hawaii .................................................. 10

INTRODUCTION

The proposed 26 acre, 180 unit Wailana IV Project, a high end extension along Kahuakino Street of the present Wailana Development, is located slightly over 2 miles in a northerly direction from East Loch, Pearl Harbor, as indicated in Figure 1. The drainage from the proposed site is a portion of the nearly 90 sq mi area that drains into Pearl Harbor; however, on a subdrainage basis 23 acres of the project site drains to Puanani Gulch while the remaining 3 acres drains to an unnamed gulch located on the east (west) side of the project. The tributary drainage areas to Puanani Gulch and the unnamed ditch at the project site are 1300 and 3000 acres, respectively, and both eventually drain to East Loch; Puanani Gulch via Waimalu Stream, and the unnamed ditch by a series of unlined and lined natural and engineered conveyance channels (Community Planning, Inc. 1987).

The proposed project site is situated within a former sugarcane field, where sugarcane cultivation has been curtailed for nearly a decade, consequently the vegetation of the area is best described as consisting of grass (including wild sugarcane) and brush coverage, interspersed by trees. The elevation of the project site ranges from nearly 500 ft to approximately 750 ft. The median annual rainfall for the site is about 50 in. (Glaubelica et al. 1984). Two soil series are located within the project site; Manana and Holomana, with Manana, the more well-drained of the two, covering approximately three-quarters of the site. The relationship of these soil series to storm water runoff will be discussed in a later section of the report.
Associated with development projects such as proposed reclamation projects, alterations in surface runoff resulting from modifying existing ground conditions, interests in land development projects, and generally a result of concerns over land use, public safety, and environmental issues. The first factor requires the identification of changes in peak discharge rates, the magnitude of which are necessary for designing adequate drainage structures to prevent flooding. The second factor requires identification of changes in total runoff volume, as well as sediment, nutrients, and other constituents loads, and affects the increased runoff volume and sediment and nutrients loads, and the probable effect on subsequent receiving waters (East Loch of Pearl Harbor). A third factor is the effect of the natural resources serving as the investigation area, the effect of the natural resources serving as the investigation area, and the probable effect on subsequent receiving waters (East Loch of Pearl Harbor).
PURPOSE AND SCOPE

The purpose of this study is to evaluate the environmental impact of the proposed 26 acre Valuna IV Development as it relates to surface water runoff. From an assemblage of baseline hydrologic and water quality data, an estimate of the existing and projected volume and quality characteristics of surface water runoff will be made, along with an assessment of the environmental impact resulting from this runoff, in the form of written comments.

METHODOLOGY

The methodology used in this study consisted of assembling, analyzing, and interpreting existing data from federal, state, and county agencies, as well as from on-site surveys of field conditions.

Inasmuch as the scope of work consisted of estimating the alterations in volume and quality of surface water runoff resulting from the proposed project, it was necessary to identify those factors that affect runoff generation and runoff quality for both pre- and post-development conditions.

Methods currently available to estimate the surface water runoff volume from a specific storm event requires the determination of reasonable rainfall-runoff coefficients for varying magnitude and duration 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, methods developed by the Hawaii Environmental Simulation Laboratory (HESL) of the University of Hawaii, (Lopes, 1984; Lopes and Dugan, 1979) and the U.S. Soil Conservation Service (SCS)(1988), were utilized to determine representative storm water volumes under varying conditions.

The HESL method is based on the use of soil maps (Foote et al. 1973) and the incorporation of curve numbers from the U.S. SCS which were 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. The two soil series for the project, Mānana and Holomana, are respectively classified as "A" and "C". The USDA method also included data derived from Hawaii and the rainfall-frequency for given recurrence and duration storms (Giamella et al. 1964). The rainfall recurrence interval storms chosen for evaluation purposes were 2, 10, 50, and 100 yr with 1 and 24 hr durations.

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

The quality parameters of stormwater runoff considered the most representative to identify potential changes under different land management practices (i.e. pre- and post-development conditions) are: total nitrogen; total phosphorus; and suspended solids (sediment). Unfortunately, there is no water quality data from the streams, principally intermittent, that are by or near the project site from representative drainage areas.

To circumvent the problem of determining representative nitrogen and phosphorus values in surface runoff, for comparative purposes, nitrogen and phosphorus values of 3.0 and 0.3 lb/acre-yr, respectively, were selected to represent pre-project (1987) development conditions. These values were derived from a compilation of data relating to nutrient outputs from rural and agricultural lands throughout the nation that were reported by Loehr (1972). To convert the output loads to concentration values the nitrogen and phosphorus values of 3.0 and 0.3 lb/acre-yr, respectively, were divided by the median annual rainfall of 50 in. and a rainfall-runoff coefficient of 0.30 to result in concentration values of 0.88 and 0.09 mg/L, respectively, for pre-project development conditions. Suspended solid concentration values typically range from 1000 to 1500 mg/L or higher, but for conservative purposes a pre-project development value of 1000 mg/L was selected.

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, Fujihara (1973) reported urban water quality data collected from storm drains in different land use drainage areas of Honolulu (residential, commercial and industrial), as shown in Table 2. These values compare favorably with similar situations from the continental U.S.

For the present study, the quality results of the storm waters from the Honolulu residential area of Table 2 for nitrogen, phosphorus, and suspended solids of 0.60, 0.57, and 250 mg/L, respectively, were used for the proposed project's full development conditions. Attention is likewise drawn to the heavy metal content of residential storm water runoff.

The aforementioned stormwater runoff constituent concentrations for nitrogen, phosphorus, and suspended solids for pre-development (1987) can then be applied to the post-development runoff volumes to determine the projected sediment and nutrient loads from the project site.
Table 1

Representative Storm Water Quality Data for Honolulu *(Fujivara, 1973)*

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>Commercial</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Solids</td>
<td>511</td>
<td>278</td>
<td>266</td>
</tr>
<tr>
<td>Suspended Solids</td>
<td>252</td>
<td>162</td>
<td>12</td>
</tr>
<tr>
<td>COD</td>
<td>142</td>
<td>309</td>
<td>40</td>
</tr>
<tr>
<td>BOD</td>
<td>10</td>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>7.1</td>
<td>5.7</td>
<td>6.7</td>
</tr>
<tr>
<td>DOy-N</td>
<td>0.391</td>
<td>0.156</td>
<td>1.1</td>
</tr>
<tr>
<td>TKN</td>
<td>0.381</td>
<td>0.372</td>
<td>2.70</td>
</tr>
<tr>
<td>Total P</td>
<td>0.53</td>
<td>0.53</td>
<td>2.17</td>
</tr>
<tr>
<td>Ortho P</td>
<td>0.27</td>
<td>0.19</td>
<td>1.27</td>
</tr>
<tr>
<td>Grease</td>
<td>2.6</td>
<td>19.8</td>
<td>2.2</td>
</tr>
<tr>
<td>Lead</td>
<td>0.407</td>
<td>0.987</td>
<td>1.657</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.013</td>
<td>0.011</td>
<td>0.013</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.312</td>
<td>0.788</td>
<td>0.729</td>
</tr>
<tr>
<td>Copper</td>
<td>0.036</td>
<td>0.036</td>
<td>0.021</td>
</tr>
<tr>
<td>Iron</td>
<td>0.277</td>
<td>0.295</td>
<td>0.049</td>
</tr>
<tr>
<td>Total Coliform</td>
<td>83.500</td>
<td>21.500</td>
<td>11.500</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>1.355</td>
<td>463</td>
<td>589</td>
</tr>
<tr>
<td>Fecal Strep</td>
<td>6,355</td>
<td>7,900</td>
<td>7,350</td>
</tr>
</tbody>
</table>

*All units in mg/l except total coliform, fecal coliform, and fecal strep which are listed as No./100 ml

*Storm water samples collected on Lunalilo Street near Kokohele Stream

*Storm water samples collected at Kokohele Stream between Bannanan

*Storm water samples collected near Nevis and Pacific Streets

---

**Surface Water Runoff Alterations**

**Quantity**

The estimated storm water runoff and constituent changes due to the proposed 26 acre Waikiki IV Development Project are shown in Table 2. The values presented 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. No attempt was made to compare these changes with contributions from its surrounding, or parent watershed areas, which would significantly negate apparent changes caused by the land use change within the project site.

As can be readily observed in Table 2, the storm water runoff volume for the Waikiki IV Development Project for the 2 yr, 1 hr duration storm for post (full) development conditions is about a magnitude greater than pre-developed (1973) conditions; however, as the storm duration and recurrence interval increases, this difference reduces down to approximately 1.4 times greater for the 100 yr, 24-hr storm. At higher rainfall intensities and durations, soil saturation increases, thus more runoff occurs.

As would be generally anticipated, the greatest calculated incremental storm runoff volume resulted from the 100-yr storm with a 24-hr duration. The increased runoff from the project area will correspondingly result in less groundwater recharge within the site of the project; however, the annual evaporation rate at the project site is greater than the annual median rainfall, thus, groundwater recharge would only be expected during significant storm events. Nevertheless the total incremental volumes involved from the 26 acre site are relatively small (Table 2), consequently the resulting groundwater recharge is essentially negligible. These runoff
### Table 2

Estimated Storm Water Runoff and Constituent Changes due to the Proposed Wailea IV Development, Southern Kaahumanu

<table>
<thead>
<tr>
<th>Storm INTENSITY</th>
<th>Quantity Development</th>
<th>Hydraulic Development</th>
<th>Nitrogen Development</th>
<th>Phosphorus Development</th>
<th>Suspended Solids Development</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1987 Full</td>
<td></td>
<td>1987 Full</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>event</td>
<td></td>
<td>event</td>
<td></td>
</tr>
<tr>
<td>hr yr</td>
<td>in.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>14</td>
<td>2</td>
<td>0.1</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>20</td>
<td>10</td>
<td>1</td>
<td>0.1</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>0.1</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) From "Rainfall Frequency for Oahu" (Glennon, et al. 1984).
b) Based on a nitrogen value of 0.08 mg/L for undeveloped (1987) conditions and 0.60 mg/L for full development.
c) Based on a phosphorus value of 0.09 mg/L for undeveloped (1987) conditions and 0.57 mg/L for full development.
d) Based on a suspended solids value of 1000 mg/L for undeveloped (1987) conditions and 250 mg/L for full development.
for all storms, but the maximum incremental difference is calculated to be less than 38 lb; while suspended solids increases slightly for the lower level 1 hr duration storms and then notably decreases for the remaining higher level and duration storms.

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 could result from construction activities, especially if a significant storm occurs during the interim period between earth moving operations or exposed soil conditions and soil stabilization completion. The impact of construction activities can be minimized by adhering to strict erosion control measures, as outlined in the City and County of Honolulu (1988) ordinance relating to grading, grubbing, and stockpiling.

Other water quality constituents of general concern include biocides and heavy metals. Typically, the biocides in general use tend to breakdown 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.

Heavy metals, on the other hand, do apparently increase somewhat as a result of urbanization. The possible long-term effect, if any, that the apparent slightly increased heavy metals have upon the biological life of the receiving waters (East Loch of Pearl Harbor) at the concentrations and especially at the very low loading rates expected is not presently well defined. However, a biological study of Pearl Harbor, conducted by the U.S. Navy in the early 1970's concluded that the heavy metal burden in Pearl Harbor was below the level of concern (even though that several heavy metal sources that were discharging into Pearl Harbor at that time have since been eliminated) and that the major detriment to marine environment appeared to be silt (Evans et al., 1972). As previously noted in Table 2, the suspended solids load for all, except the lower level 1 hr storm events, are calculated to decrease.
SUMMARY AND CONCLUSIONS

The proposed 26 acre, 180 unit Wallina IV Project, a maka extension of the present Wallina Development, is located slightly over 2 miles in a northerly direction from East Loch, Pearl Harbor, Southern Oahu. The proposed project site, situated within a former sugarcane field that has been fallow for over a decade, is presently covered with grass (including wild sugarcane) and brush, with an interspersion of trees. The elevation of the site ranges from nearly 550 ft to approximately 750 ft, while the median annual rainfall is about 50 in.

The purpose of this study is to evaluate the environmental impact of the proposed 26 acre project as it relates to surface water runoff. To this end the study identified changes in total runoff volumes, as well as sediment, nutrient, and other constituent loads, and what these potential changes are expected to have on the ecosystem of the natural resource serving as the "sink." The study does not directly relate itself to peak discharge rates resulting from storms, which are required for designing adequate drainage structures to prevent flooding and other excess storm water runoff related aspects. The storm water runoff from the project site, which includes a 1200 acre and 3000 acre tributary drainage area, eventually flows into East Loch of Pearl Harbor.

The methodology utilized in the evaluation of the environmental impact of storm water runoff from the project site consisted of the incorporation of methods developed by the Hawaii Environmental Simulation Laboratory of the University of Hawaii and the U.S. Soil Conservation Service soil maps, a rainfall frequency atlas, and derived storm water-quality constituent values. The rainfall recurrence interval storms chosen for evaluation purposes were 2, 10, 50, and 100 yr, with 1 and 24 hr durations. No attempt was made to compare the calculated changes with contributions from its surrounding or parent watershed areas, which would significantly negate apparent changes caused by the land use change within the project site.

The results of the storm water runoff volumes indicated that for the 2 yr recurrence interval 1 hr duration storm the full developed conditions are about a magnitude greater than present (1987) conditions; however, as the storm duration and recurrence interval increases, this difference reduces down to approximately 1.4 times greater for the 100 yr, 24 hr storm, which produced the greatest calculated incremental storm runoff volume. At higher rainfall intensities and durations, soil saturation increases, thus more runoff occurs. The increased runoff from the project area will correspondingly result in less groundwater recharge within the site of the project; however, the annual evaporation rate at the project site is greater than the annual median rainfall, thus, groundwater recharge would only be expected during significant storm events. Nevertheless, the total incremental volumes involved from the 26 acre site are relatively small (Table 3), as expected, consequently the resulting groundwater recharge is essentially negligible.

Besides the changes in volume of storm water runoff, the quality of the various constituents being transported is of equal, if not more important. The incremental changes per storm event for the present (1987) and full developed project conditions for the various duration and recurrence interval storms indicate that from the least to the greatest amount of rainfall; nitrogen increases for the lower level storms, and then
decreases at the higher level storms; phosphorus increases for all storms, but the maximum incremental difference is calculated to be less than 38 lb; while suspended solids increases slightly for the 2 and 10 yr recurrence interval 1 hr duration storms and then notably decreases for the remaining 1 and 24 hr storms.

The foregoing hydrologic and water quality aspects were only considered for the present and projected full developed conditions. However, increases in constituent loads could result from construction activities, especially if a significant storm occurs during the interim period between exposed and stabilized soil conditions. Thus, to limit these potential increases it is imperative that strict erosion control measures be adhered to.

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 in past decades. Consequently, except for runoff from agricultural land operations the types and concentrations are usually considered insignificant. Heavy metals, on the other hand, do appear to increase somewhat as a result of urbanization; however, a biological study of Pearl Harbor conducted by the U.S. Navy in the early 1970's concluded that the heavy metal burden in Pearl Harbor was below the level of concern (even though that several heavy metal sources that were discharging into Pearl Harbor at that time have since been eliminated), and the major detriment to the marine environment appeared to be silt. As previously noted, the suspended solids load for all, except the lower level 1 hr storm events, are calculated to decrease.

REFERENCES


APPENDIX H

Preliminary Geotechnical Assessment
Walluna IV

by

Harding Lawson Associates
Engineers and Geoscientists
February 19, 1988
09560, 009.06

Lusk Hawaii Builders
98-1510 Kaahumanu Street
Pearl City, Hawaii  96782

Attention: Mr. Brian Yahata

Gentlemen:

Preliminary Geotechnical Assessment
Wailuna IV
Waiau, Hawaii

INTRODUCTION

This letter presents the results of our preliminary geotechnical assessment of the site for a residential development, Wailuna IV. The site is located on a ridge above previously-constructed residential projects by the same developer. Conceptual designs include extensive grading for roadways and building pads. The major grading work will involve cutting higher areas and filling a 50-foot-deep gulch that crosses the center of the site.

The purpose of our assessment was to identify geotechnical engineering concerns that could limit development or should be addressed during design. The scope of our services included reviewing conceptual development plans prepared by the Project Civil Engineer and performing a geologic reconnaissance of the site. Our geologist visited the site on February 4, 1988.

SITE AND SOIL CONDITIONS

The site is a relatively flat area on the crest of a ridge on the southern flank of the Koolau Mountain Range of Oahu. There are major drainages in deep gulches on either side of the site. Within the site is a small gulch with a drainage area that roughly coincides with the area to be developed. Slopes range from about 10 percent in the flat areas on the ridge tops to about 50 percent on the sides of the gulches.
February 19, 1988  
09560,009.06  
Mr. Brian Yahata  
Lusk Hawaii Builders  
Page 2

There is a paved road along the highest ridge on the northern edge of the site.

The site is covered by various types of vegetation including grasses, bushes, shrubs, and large trees. The rock beneath the site is basaltic lava of the Koolau Volcanic series. The original slopes of the volcano are reflected by the flat parts of the ridges. The gulches were formed by stream flow on the slopes. The rock has been subjected to weathering and there is a mantle of residual soil at the ground surface underlain by soil that displayed the relict structure of the rock. Soil with the parent rock's structure is known as saprolite. The residual soil observed at the site is about 1/2 to 1 foot thick. The saprolite is probably many hundreds of feet thick and underlain by less weathered rock.

We collected samples of the residual soil at the site and performed Atterberg limits tests for classification purposes. According to the Unified Soil Classification System, the soil is a silt (ML) and (MH), similar to soils encountered in the previous developments. The test results are shown on Plate 1.

According to the Soil Conservation Service,* the soils are in the Manana and Helemano Soil Series. These soils are in Soil Erosion Resistance Groups II and I,** respectively, which are the least erodible of the four groups. Soils on steep slopes are more erodible because of higher runoff velocity.

From our experience in adjacent areas, the soils and saprolite are stiff to very stiff in their natural condition and have moderate to high shear strength and low to moderate expansion potential. During our reconnaissance, no evidence

---


of slope instability was observed on either natural slopes or cut slopes by the sides of roadways.

DISCUSSION AND CONCLUSIONS

Based on our preliminary study, we conclude that the proposed development is feasible from a geotechnical standpoint. Concerns regarding erosion, stability and expansion potential can be mitigated using currently accepted design practices, as discussed below:

Erosion

By filling the gulch in the central part of the site and limiting new cut/fill slope inclinations, steep slopes will be eliminated from the site. Site grading will direct surface waters away from slope faces and concentrated flows will be carried in lined drainage channels. These measures will mitigate erosion concerns. A related concern is that there will be increased runoff below the site; we understand that the runoff can be carried by established drainage systems.

Stability

By cutting the higher area and filling low areas, overall slope stability will be increased by the planned grading. Keying, benching and subdrainage of sidehill fills are the accepted practices for providing stable fills. Subdrains will also be installed in drainage courses to increase slope stability. Cut and fill slope inclinations will be limited based on the results of future test borings and laboratory testing of soil samples. If cut slopes reveal seepage or other adverse conditions, additional drains or other features can be installed.

Expansion Potential

This concern can be mitigated by proper moisture control during grading, and by using less expansive soils in the upper few feet below final grade. If highly expansive areas are encountered at final grade, the upper few feet can be removed and replaced with compacted fill of low expansion potential.
February 19, 1988
09560, 009.06
Mr. Brian Yahata
Lusk Hawaii Builders
Page 4

From the point of view of soil properties related to engineering, the proposed site is similar to the adjacent projects at lower elevations on the ridge. Harding Lawson Associates (HLA) has performed similar grading work in the previous phases of Wailuna II and III. To date, these adjacent projects have performed as planned. Recent problems in other areas of Oahu were caused mainly by factors which are not present at Wailuna IV. For example, the recent storm damage in Hawaii Kai was in a valley area subject to large, concentrated runoff flows, while Wailuna IV is located near the top of a ridge where the watershed area is relatively small. Also, the movements in Manoa occur in weak, saturated "Adobe Clay" soils which are not found at Wailuna.

Continuous soil engineering observation during construction is important to mitigate the above concerns and to check for unanticipated conditions. As for the previous Wailuna developments, we will provide soil engineering services on a daily basis during construction to observe geotechnical aspects of the work and provide consultation, as necessary.

If you have questions or comments regarding our assessment, we will be pleased to discuss them.

Sincerely,

[Signature]

George S. Ho
Civil Engineer

RLS/GTSH/CPM/all: ASSESSMENT
This work was done by me
Date: 1/1/88
Attachment: Plate 1

cc: Community Planning, Inc./Mr. Bernard Kea
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Source</th>
<th>Classification</th>
<th>Natural M.C. (%)</th>
<th>Liquid Limit (%)</th>
<th>Plasticity Index (%)</th>
<th>% Passing #200 Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>☀</td>
<td>1</td>
<td>RED BROWN SILT (MH)</td>
<td>28.8</td>
<td>85</td>
<td>27</td>
<td>-</td>
</tr>
<tr>
<td>▲</td>
<td>2</td>
<td>BROWN SILT (ML-OL)</td>
<td>33.8</td>
<td>49</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>◆</td>
<td>3</td>
<td>DARK BROWN SILT (MH-OH)</td>
<td>27.5</td>
<td>59</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>☐</td>
<td>4</td>
<td>RED BROWN SILT (MH-OH)</td>
<td>31.3</td>
<td>59</td>
<td>21</td>
<td>-</td>
</tr>
</tbody>
</table>

Reference: ASTM D 423, 424