DEPARTMENT OF COMMUNITY SERVICES
CITY AND COUNTY OF HONOLULU
715 SOUTH KING STREET, SUITE 311 ● HONOLULU, HAWAII 96813 ● AREA CODE 808 ● PHONE: 768-7762 ● FAX: 768-7792

MUFI HANNEMANN
MAYOR

DEBORAH KIM MORIKAWA
DIRECTOR

MARK K. OTO
SENIOR ADVISOR

April 19, 2007

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

Subject: Final Environmental Assessment
Finding of No Significant Impact
Waianae Supportive Housing (Tax Map Key (1) 8-5-28: 44 (por.)
Waianae, Oahu

The Department of Community Services (DCS) has reviewed the comments received during the 30-day public comment period which began on February 23, 2007. DCS has determined that this project will not have significant environmental effects and has issued a Finding of No Significant Impact (FONSI). Please publish the FONSI notice in the next available OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and four copies of the final Environmental Assessment (EA) for your use. Please utilize the same project description used for the draft EA for the FONSI publication. Please call Mr. Keith Ishida at 768-7750 should you have any questions regarding this matter.

Sincerely,

Deborah Kim Morikawa
Director

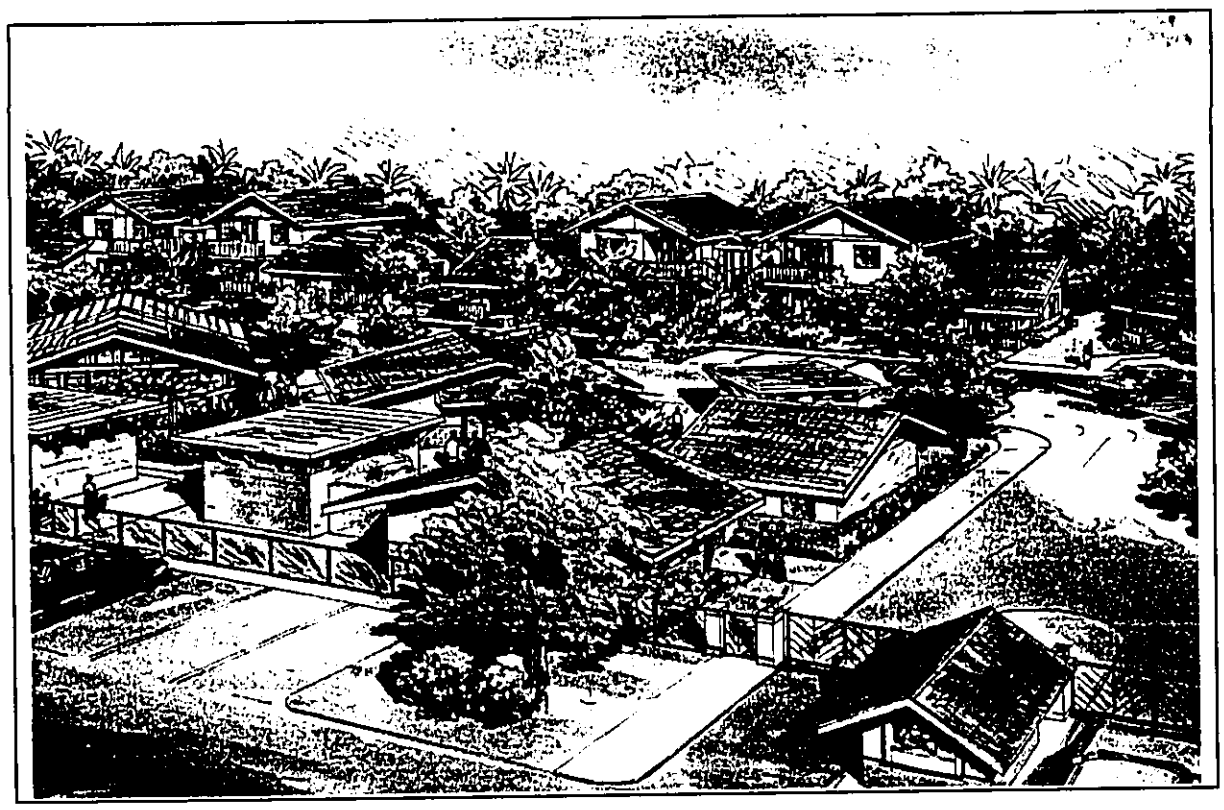
DKM:ki

Enclosures

2007-05-23 - FEA-OA - WAIANAE SUPPORTIVE HOUSING PROJECT

MAY 23 2007

FINAL ENVIRONMENTAL ASSESSMENT
HOUSING SOLUTIONS INC
WAIANAE SUPPORTIVE HOUSING PROJECT
WAIANAE, OAHU, HAWAII



March 2007

Environmental Assessment

for HUD-funded Proposals

Recommended format per 24 CFR 58.36, revised February 2004

[Previously recommended EA formats are obsolete]

Project Identification:	Waianae Supportive Housing Project
Preparer:	Environmental Communications, Inc.
Responsible Entity:	Department of Community Services City and County of Honolulu
Month/Year:	March 2007

Environmental Assessment

Responsible Entity:
Department of Community Services

[24 CFR 58.2(a)(7)]

Certifying Officer:
Deborah Kim Morikawa

[24 CFR 58.2(a)(2)]

Project Name:
Waianae Supportive Housing Project

Project Location:
Tax Map Key 8-5-028: 044 portion

Estimated total project cost:
Approimately$9,000,000

Grant Recipient:
HousingSolutionsInc.

[24 CFR 58.2(a)(5)]

Recipient Address:
2734 South King Street #100

Honolulu, Hawaii 96826

Project Representative:
Mr. Terry Brooks

Telephone Number:
(808) 599-5759

Conditions for Approval: (List all mitigation measures adopted by the responsible entity to eliminate or minimize adverse environmental impacts. These conditions must be included in project contracts and other relevant documents as requirements). [24 CFR 58.40(d), 40 CFR 1505.2(c)]

FINDING: [58.40(g)]

_X_ **Finding of No Significant Impact**
(The project will not result in a significant impact on the quality of the human environment)

___ **Finding of Significant Impact**
(The project may significantly affect the quality of the human environment)

Preparer Signature:

Date: 3/27/07

Name/Title/Agency:

Taeyong Kim / Principal / Environmental Communications, Inc.

RE Approving Official Signature:

Date: _____

Name/Title/ Agency:

Statement of Purpose and Need for the Proposal: [40 CFR 1508.9(b)]

Attached as Section II, C.

Description of the Proposal: Include all contemplated actions that are either geographically or functionally a composite part of the project, regardless of the source of funding. [24 CFR 58.32, 40 CFR 1508.25]

Attached as Section II, D.

Existing Conditions and Trends: Describe the existing conditions of the project area and its surroundings, and trends likely to continue in the absence of the project. [24 CFR 58.40(a)]

Attached as Section III.

Statutory Checklist

[24CFR §58.5]

Record the determinations made regarding each listed statute, executive order or regulation. Provide appropriate source documentation. [Note reviews or consultations completed as well as any applicable permits or approvals obtained or required. Note dates of contact or page references.] Provide compliance or consistency documentation. Attach additional material as appropriate. Note conditions, attenuation or mitigation measures required.

Factors	Determination and Compliance Documentation
Historic Preservation [36 CFR 800]	Section III.D.1 Archaeological survey of the site categorizes the site as Criterion D under National Register guidelines. Criterion D sites are not considered significant.
Floodplain Management [24 CFR 55, Executive Order 11988]	Section III.C.3 Project site is located in FIRM Zone D of FIRM Panel 150001. This is a zone where flood hazards are undetermined.
Wetlands Protection [Executive Order 11990]	Section III.C.3 Project site is not located within nor does it contain any wetlands. Verified by site inspection, observation for delineators, and as supported by site photos.
Coastal Zone Management Act [Sections 307(c), (d)]	Section III.C.3 Project is not located within a Special Management Area as shown in City and County of Honolulu GIS maps.
Sole Source Aquifers [40 CFR 149]	Section III.C.3 Verified by State of Hawaii Department of Health Clean Water Branch website.
Endangered Species Act [50 CFR 402]	Section III.C.2 Verified by letter from Fish and Wildlife Service. Attached as Appendix B.
Wild and Scenic Rivers Act [Sections 7 (b), (c)]	Section III.C.3 Verified by National Parks Service website.
Air Quality [Clean Air Act, Sections 176 (c) and (d), and 40 CFR 6, 51, 93]	Section III.D.5 Verified by data provided by State of Hawaii Department of Health Clean Air Branch website.
Farmland Protection Policy Act [7 CFR 658]	Section III.D.3 Project site is not located within an agricultural zoned area as verified by City and County of Honolulu GIS website.
Environmental Justice [Executive Order 12898]	Section III.D.3 Purpose of project is to provide environmental justice.

HUD Environmental Standards

Factors	Determination and Compliance Documentation
Noise Abatement and Control [24 CFR 51 B]	Section III.D.6 Project will not be affected by major noise sources due to distance as shown in location maps. Project is not expected to be a significant noise source.
Toxic/Hazardous/ Radioactive Materials, Contamination, Chemicals or Gases [24 CFR 58.5(I)(2)]	III.C.1 No known toxic/hazardous/radioactive/contaminated chemicals or gas material were observed on site nor are any other known sources located in the project vicinity. Verified by site inspection. Site has been in vacant but secured use and is in its natural state.
Siting of HUD-Assisted Projects near Hazardous Operations [24 CFR 51 C]	III.C.1 No known hazardous or flammable source material was observed on site nor are any other known sources located in the project vicinity. Verified by site inspection. Site has been in vacant but secured use and is in its natural state.
Airport Clear Zones and Accident Potential Zones [24 CFR 51 D]	III.C.1 Clear zones shown on Honolulu International Airport Clear Zones map.

Environmental Assessment Checklist

[Environmental Review Guide HUD CPD 782, 24 CFR 58.40; Ref. 40 CFR 1508.8 &1508.27]

Evaluate the significance of the effects of the proposal on the character, features and resources of the project area. Enter relevant base data and verifiable source documentation to support the finding. Then enter the appropriate impact code from the following list to make a determination of impact. **Impact Codes:** **(1)** - No impact anticipated; **(2)** - Potentially beneficial; **(3)** - Potentially adverse; **(4)** - Requires mitigation; **(5)** - Requires project modification. Note names, dates of contact, telephone numbers and page references. Attach additional material as appropriate. Note conditions or mitigation measures required.

Land Development	Code	Source or Documentation
Conformance with Comprehensive Plans and Zoning	1	City and County of Honolulu Zoning Map Waianae Sustainable Communities Plan
Compatibility and Urban Impact	1	City and County of Honolulu Zoning Map Waianae Sustainable Communities Plan
Slope	1	Site topographic map and field observation Slope is minimal and suitable for development.
Erosion	2	Site topographic map and field observation Erosion is minimal and project improvements will include site drainage plan.
Soil Suitability	1	Civil engineering plan, USDA Soil Survey Report Coral outcrop lands are suitable for urban development.
Hazards and Nuisances including Site Safety	2	Field observation, tax records Site does not contain any hazards, nuisances or have site safety concerns. Project will eliminate potential of site to be used for hazardous materials disposal.
Energy Consumption	1	Architectural plans. Site is presently vacant. Project will incorporate energy savings measures that will be incorporated in the project specifications.
Noise - Contribution to Community Noise Levels	1	Noise impact is expected to be minimal and typical of residential developments of similar density.
Air Quality Effects of Ambient Air Quality on Project and Contribution to Community Pollution Levels	1	Air pollution attributable to the project will primarily consist of air pollution generated by automobiles added to the site.
Environmental Design Visual Quality - Coherence, Diversity, Compatible Use and Scale	1	Project will be in character with the surrounding uses. Project is considered urban infill. The project will provide some architectural diversity that is not out of character with the surrounding developments.

Socioeconomic	Code	Source or Documentation
Demographic Character Changes	1	Project will increase population in the immediate area however the net regional population is expected to remain unchanged as most residents are expected to come from area beach parks and other nearby housing.
Displacement	1	The project will not result in any displacement as the project site is presently vacant.
Employment and Income Patterns	2	Because transitional housing will be incorporated into the project

		as well as training programs, it is likely that residents of the project may be afforded new opportunities to seek employment and transition into the employed mainstream.

Community Facilities and Services	Code	Source or Documentation
Educational Facilities	1	While the project will bring a new population to the immediate area, school age children living in the area or are homeless living on the beach, all are presently enrolled in local schools. Some minor changes in between elementary schools may occur as a result of the project however it is not expected that these changes cannot be readily met by existing school facilities.
Commercial Facilities	1	Commercial facilities should not be impacted by the proposed project as project residents are expected to already reside in the vicinity.
Health Care	1	Health care services should remain unchanged as no new populations will be introduced into the region.
Social Services	1	Social services should remain unchanged as no new populations will be introduced into the region. The project will include a facility center that may include future social services that may be offered to non-residents.
Solid Waste	1	Demand for solid waste collection in the project area will increase upon development of the project. This increase is expected to offset the decrease in solid waste collection in other areas as the project population is expected to presently reside in nearby areas.
Waste Water	1	Wastewater demand in the project vicinity will increase with development of the proposed project. The current wastewater lines are adequately sized to accommodate the proposed project according to the project civil engineer.
Storm Water	1	Storm water drainage demand in the project vicinity will increase with development of the proposed project. The current storm drain lines are adequately sized to accommodate the proposed project according to the project civil engineer.
Water Supply	1	Potable water demand in the project vicinity will increase with development of the proposed project. The current water lines are adequately sized to accommodate the proposed project according to the project civil engineer.
Public Safety - Police	1	No increase demand for police service is expected as a result of implementation of the proposed project.
- Fire	1	No increase demand for fire protection service is expected as a

		result of implementation of the proposed project
- Emergency Medical	1	No increase demand for emergency medical service is expected as a result of implementation of the proposed project
Open Space and Recreation - Open Space	1	Demand for recreational and open space may increase slightly as a result of the proposed project. Open space is incorporated into the project.
- Recreation	1	Demand for active recreational spaces are readily available in the nearby intermediate school and the numerous parks located along Farrington Highway.
- Cultural Facilities	1	The Waianae Neighborhood Community Center is located adjacent to the project site and is a source of community and cultural affairs along the Waianae Coast.
Transportation	1	Bus service is readily available on Farrington Highway.

Natural Features	Code	Source or Documentation
Water Resources	1	Water resources will not be affected by the proposed project.
Surface Water	1	Presently the site is naturally drained and does not contain any water resources. The proposed project will not affect any natural water features. Surface water runoff will be controlled on-site and directed into the municipal storm water drainage system.
Unique Natural Features and Agricultural Lands	1	The project site does not contain any unique natural features nor does is consist of agricultural lands. This verified by zoning maps and by site observation.
Vegetation and Wildlife	1	According to the Fish and Wildlife service and by field observation, the site does not contain, nor is it a habitat for any threatened or endangered species of flora or fauna.

Other Factors	Code	Source or Documentation
Flood Disaster Protection Act [Flood Insurance] [§58.6(a)]	1	Project site is not located in a flood hazard area as shown in FIRM Panel 150001.
Coastal Barrier Resources Act/ Coastal Barrier Improvement Act [§58.6(c)]	1	Project site is located significantly inland of the shoreline and will not have any impact on coastline areas.
Airport Runway Clear Zone or Clear Zone Disclosure [§58.6(d)]	1	Project site is located approximately 19 miles from the Honolulu International Airport Clear Zones.
Other Factors		

Summary of Findings and Conclusions

ALTERNATIVES TO THE PROPOSED ACTION

Alternatives and Project Modifications Considered [24 CFR 58.40(e), Ref. 40 CFR 1508.9]
(Identify other reasonable courses of action that were considered and not selected such as other sites, design modifications, or other uses of the subject site. Describe the benefits and adverse impacts to the human environment of each alternative and the reasons for rejecting it.)

Section V

Alternatives to the current design were considered but consisted primarily of similar configurations with no substantive variation from the final design. Alternate locations were not considered due to lack of available lands within the project area.

No Action Alternative [24 CFR 58.40(e)]
(Discuss the benefits and adverse impacts to the human environment of not implementing the preferred alternative).

Section V

The no action alternative was considered and rejected since no community benefit would be provided without the project.

Mitigation Measures Recommended [24 CFR 58.40(d), 40 CFR 1508.20]
(Recommend feasible ways in which the proposal or its external factors should be modified in order to minimize adverse environmental impacts and restore or enhance environmental quality.)

Section III.G

Mitigation measures recommended for the project consists primarily of construction period mitigation that can be addressed by Best Management Practices. Traffic improvements consisting of restriping lanes on Farrington Highway are recommended by the traffic consultant.

Additional Studies Performed
(Attach studies or summaries)

Archaeological Survey and Mitigation Plan (Appendix C)
Traffic Impact Analysis Report (Appendix D)

List of Sources, Agencies and Persons Consulted [40 CFR 1508.9(b)]

Section I, Project Summary

FINAL ENVIRONMENTAL ASSESSMENT
HOUSING SOLUTIONS INC
WAIANAE SUPPORTIVE HOUSING PROJECT
WAIANAE, OAHU, HAWAII

Prepared by:

Environmental Communications, Inc.
1188 Bishop Street, Suite 2210
Honolulu, Hawaii 96813

On behalf of:

Housing Solutions Inc.
2734 South King Street #100
Honolulu, Hawaii 96826

Accepted by:

City and County of Honolulu
Department of Community Services
715 South King Street, Suite 311
Honolulu, Hawaii 96813

March 2007

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICIES

I. PROJECT SUMMARY

PROJECT NAME:	Waianae Supportive Housing Project
APPLICANT/LESSEE/ GRANT RECIPIENT:	Housing Solutions Inc.
APPLICANT/LESSEE/ GRANT RECIPIENT ADDRESS:	2734 S. King Street #100 Honolulu, Hawaii 96826
PROJECT REPRSENTATIVE:	Mr. Terry Brooks (808-599-5759)
FEE OWNER:	State of Hawaii
AGENT:	Environmental Communications, Inc. 1188 Bishop Street, Suite 2210 Honolulu, Hawaii 96813
PROJECT LOCATION:	Off Farrington Highway immediately mauka (northeast) of the Waianae Neighborhood Community Center, Waianae District, Oahu, Hawaii
TAX MAP KEY:	8-5-028: 044 por.
PROPERTY OWNERSHIP:	State of Hawaii
LOT AREA:	7.707 acres (335,717 square feet) Approximately 3.662 acres used for project.
EXISTING USE:	The project site consists of vacant lands that are surrounded by residential, school and community uses. The site is presently covered with various weedy species and does not have any built improvements.
PROPOSED USE:	The proposed improvements constitute an in-fill development that will consist of two types of housing: affordable rental and transitional housing. The site will also include parking and a central community center.

STATE LAND USE:	Urban
WAIANAE SUSTAINABLE COMMUNITIES PLAN:	Project site is located in the Waianae Rural Residential area where rural development was supported upon adoption of the Plan in 1997. The Waianae Sustainable Communities Plan is scheduled for an update in 2006 however the proposed project is consistent with all objectives and policies of the current plan and is expected to be consistent with the revised 2006 plan.
COUNTY ZONING:	R-5 Residential
SPECIAL DISTRICT:	None
EA TRIGGER:	Use of State Lands
CERTIFYING OFFICER:	Deborah Kim Morikawa
ACCEPTING AUTHORITY/ RESPONSIBLE ENTITY:	City and County of Honolulu Department of Community Services
ANTICIPATED DETERMINATION:	Finding of No Significant Impact (FONSI)
AGENCIES CONSULTED:	City and County of Honolulu • Department of Community Services • Department of Planning and Permitting • Fire Department • Police Department State of Hawaii • Department of Health, Safe Drinking Water Branch • Department of Health, Air Quality Branch • Department of Land and Natural Resources, Commission on Water Resource Management • Department of Land and Natural Resources, Historic Preservation Division • Office of Hawaiian Affairs

PROJECT COST:	Approximately $9,000,000
PROJECT PHASING:	The project will be completed in one continuous phase.

II. PROPOSED PROJECT AND STATEMENT OF OBJECTIVES

A. Environmental Impact Statement Law and Need for Action

Housing Solutions Inc. has obtained a grant for the use of HOME Investment Partnership Program funds for the proposed action. These funds are provided by the U.S. Department of Housing and Urban Development (HUD) and administered by the City and County of Honolulu (City). Funding administered by the City is subject to the State of Hawaii's Environmental Impact Statement Law, Chapter 343, Hawaii Revised Statutes. This environmental assessment is prepared in conformance with Chapter 343, and is intended to satisfy the requirements of the Code of Federal Regulations (CFR) Title 24, Part 58.

B. Project Location

The project is located within the central portion of Waianae town, Oahu, Hawaii (Figure 1). The site is identified as Tax Map Key: 8-5-028: 044. and does not have a street address (Figure 2). The site is owned by the State of Hawaii.

The project site is located mauka (northeast) of the Waianae Neighborhood Community Center, also known as the Waianae Satellite City Hall, off Farrington Highway. Developed areas surround the project site. Access to the site is available via Kauiokalani Place which serves the adjacent Kauiokalani multi-family complex located directly to the west. The multi-family Waianae Community Development Project borders the project site to the east and north. To the southwest off Kauiokalani Place lies a small vacant parcel reserved for the Waianae Civic Center situated between the Waianae Neighborhood Community Center and the Waianae Intermediate School.

Other landmark uses in the project vicinity include the Waianae District and Regional Park, Waianae Fire Station and Waianae High School, all located makai of Farrington Highway. Pokai Bay is located southeast of the project area.

C. Project Need

Housing Solutions Inc. is a non-profit organization whose mission is to acquire, develop, and operate transitional housing and low income

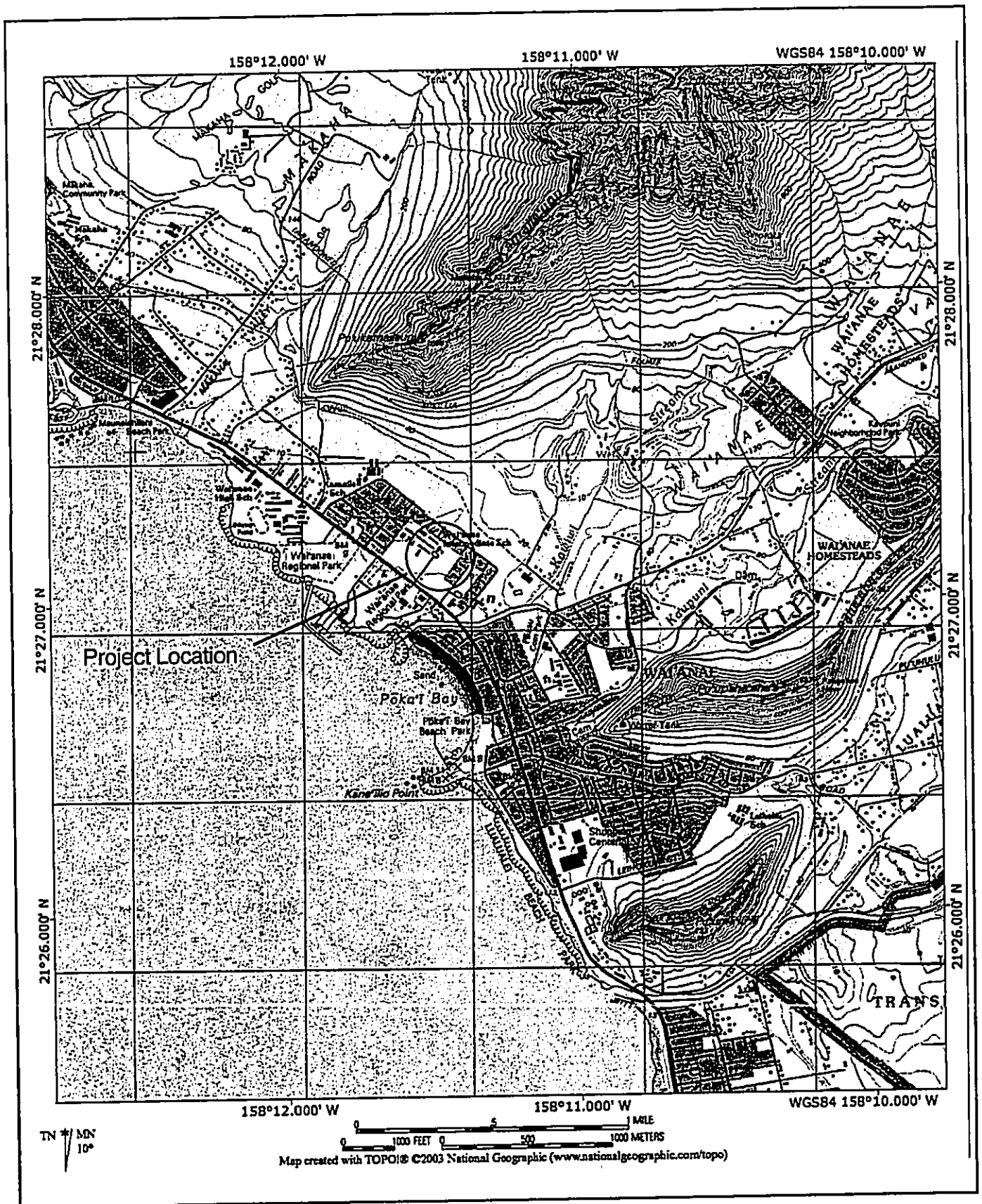


Figure 1: Location Map
Source: U. S. Geological Service

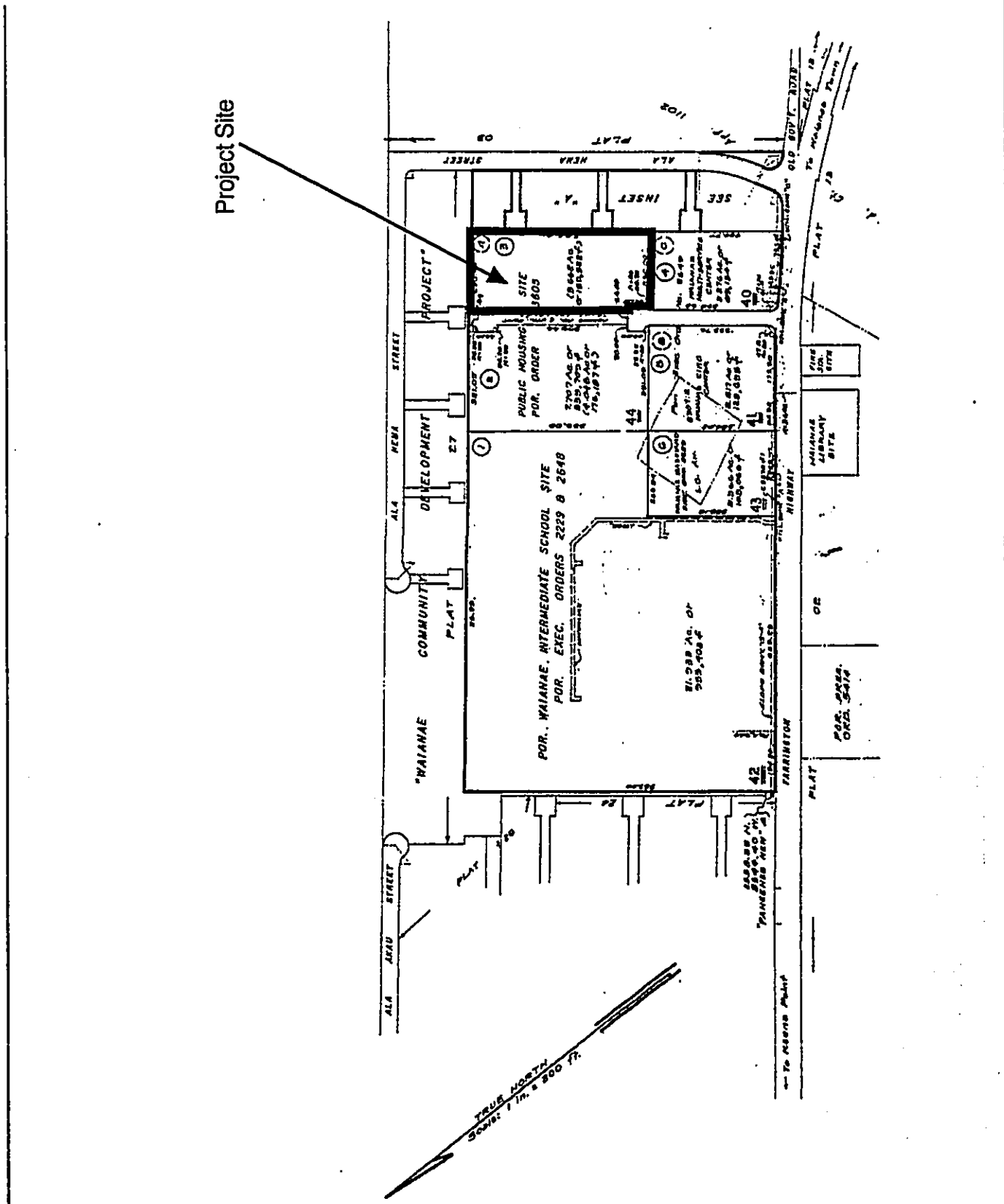


Figure 2: Tax Map
Source: City and County of Honolulu

housing for homeless families and single persons. The organization presently operates several transitional and low-income rental facilities on Oahu. The organization determined that there was significant need for both transitional housing and low income housing in the Leeward Coast. The project site, which is owned by the State of Hawaii, is suitably zoned and represents an infill parcel that had been targeted for residential use. When the site became available for development, Housing Solutions Inc. entered into an agreement with the State of Hawaii to lease the site for the proposed project.

In total, the project will provide 20 studio units, intended to serve as transitional housing, and 30 low-income rental units along with central common facilities and parking. The project has been named Seawinds Apartments.

Final income requirements for rental of the project units have not been finalized at the time of this document however, at a minimum, 80% of the project will be affordable to households earning 60% of the median income adjusted for family size, and 20% of the units will be affordable to households earning 50% of the median income as required by HOME Program rules.

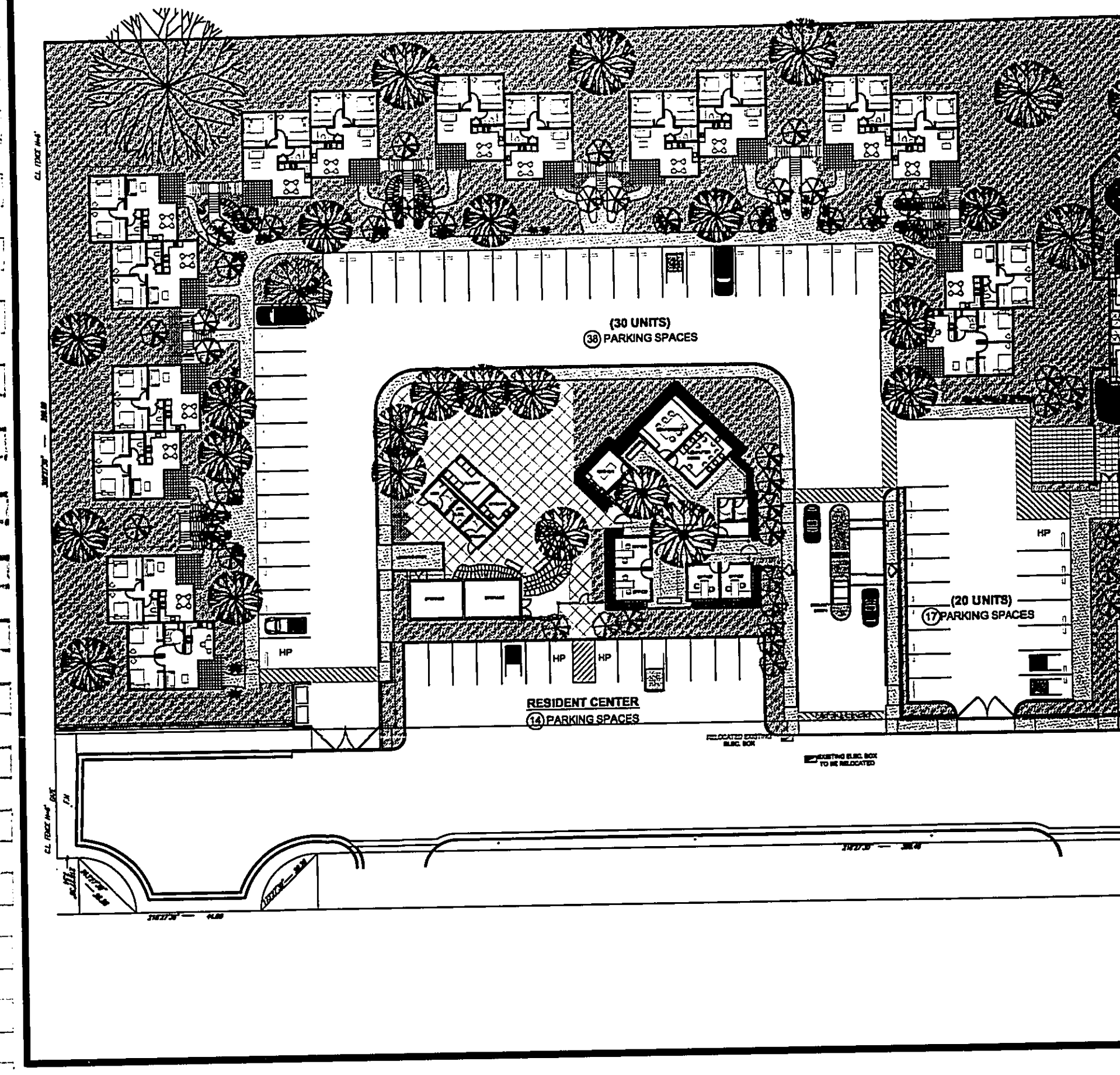
D. Project Description

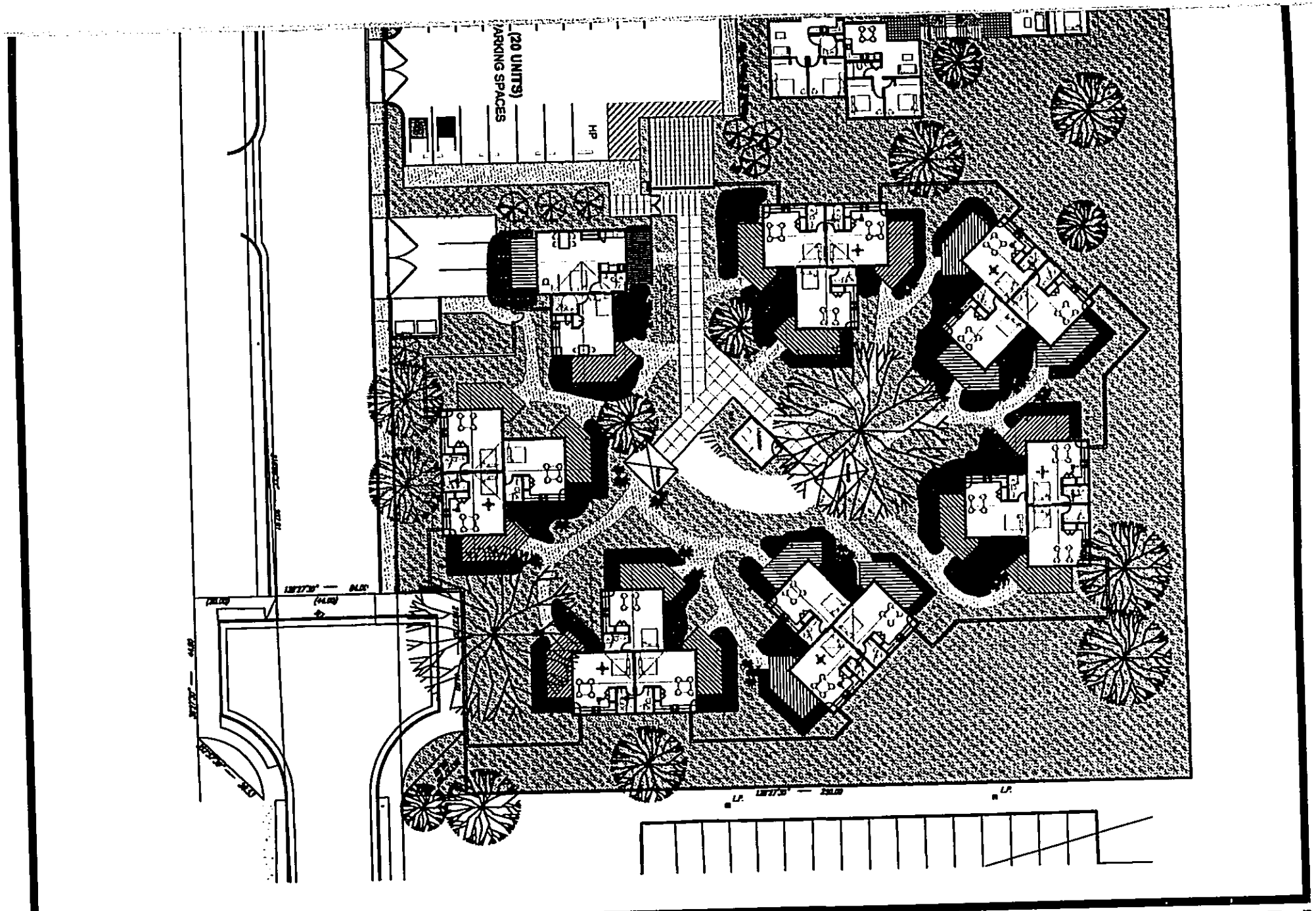
1. Site Plan

The project site plan consists of three distinct components: transitional studio units, affordable rental housing and common facilities (Figure 3). The southern portion of the site holds the studio housing units and a dedicated parking lot. The northern and eastern portions of the site contain the low-income rental units, and the central portion of the site holds the facility center and parking for the rental units and facility center.

Landscaping will be provided throughout the site and will generally consist of grass lawn and shade trees. Open areas will be located along the project perimeter with a large open space located on the southeastern corner.

A single entry and exit point will be located mid-site on Kauiokalani Place where vehicular and pedestrian traffic can be monitored by the central office. Trash storage and collection will be located in two enclosures located off Kauiokalani Place.


(30 UNITS)
(38) PARKING SPACES
HP
HP
HP
RESIDENT CENTER
(14) PARKING SPACES
HP
(20 UNITS)
(17) PARKING SPACES



WAIANAE HOUSING
for
HSI

SITE PLAN
SCALE: 1" = 40'

sheet number

the cjs group
architects llc

The entire perimeter of the site up to the community center parking lot will be secured by fencing. Security for the residents is considered a primary concern therefore all access points into the site are secured. A security booth is located at the site entry to ensure that only residents and guests are allowed into the site. In addition, double gates will restrict vehicular access to prevent tailgating into the complex.

2. Transitional Studio Units

The studio unit component of the project will be located in the southwestern portion of the site immediately north of the Waianae Neighborhood Community Center parking lot (Figure 4). This component has been designed to function as a sub-community within the overall project. Residents of this complex will consist of singles, couples and small families whom have been homeless and require the relearning of life skills and acclimation into a structured living facility before moving into conventional housing.

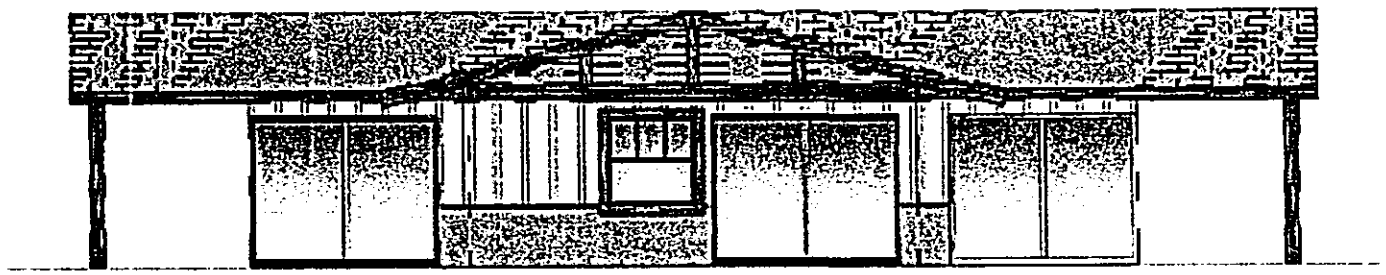
Access into the studio housing complex will be located immediately off the main entry. The complex will consist of 20 studio units that are clustered in groups of three. Each 400 square foot unit will consist of a living/sleeping area, bathroom and kitchen. All units will also feature large lanais and will be configured around a common central space that will promote interaction with neighbors. Low walls will define the studio housing area and will provide a sense of security for the residents.

The central area within the studio housing complex will include a landscaped group meeting area, a dedicated laundry room, and two gazebos that will include cooking area.

A dedicated parking lot for 20 vehicles, including two handicap stalls, serving the studio housing component will be located between the dwelling units and the Community Center. All access into the studio housing area will be through a secured gate that will be monitored by the manager in charge of the complex who will reside in one of the studio units.

3. Rental Units

Thirty two-bedroom/one bath low-income rental units will be located along the northern and eastern sides of the project site (Figure 5). The units are approximately 630 square feet in size and will configured in clusters of four with two units located a ground level and a third and fourth unit located on a second story. A single shared pathway will branch into each cluster to create a strong sense of entry and privacy. Large lanai spaces will be



FRONT ELEVATION
SCALE: 1/8" = 1'-0"

LEFT ELEVATION
SCALE: 1/8" = 1'-0"

Figure 4: Studio Housing Elevation
Source: CJS Group Architects

HSI Waianae Supportive Housing

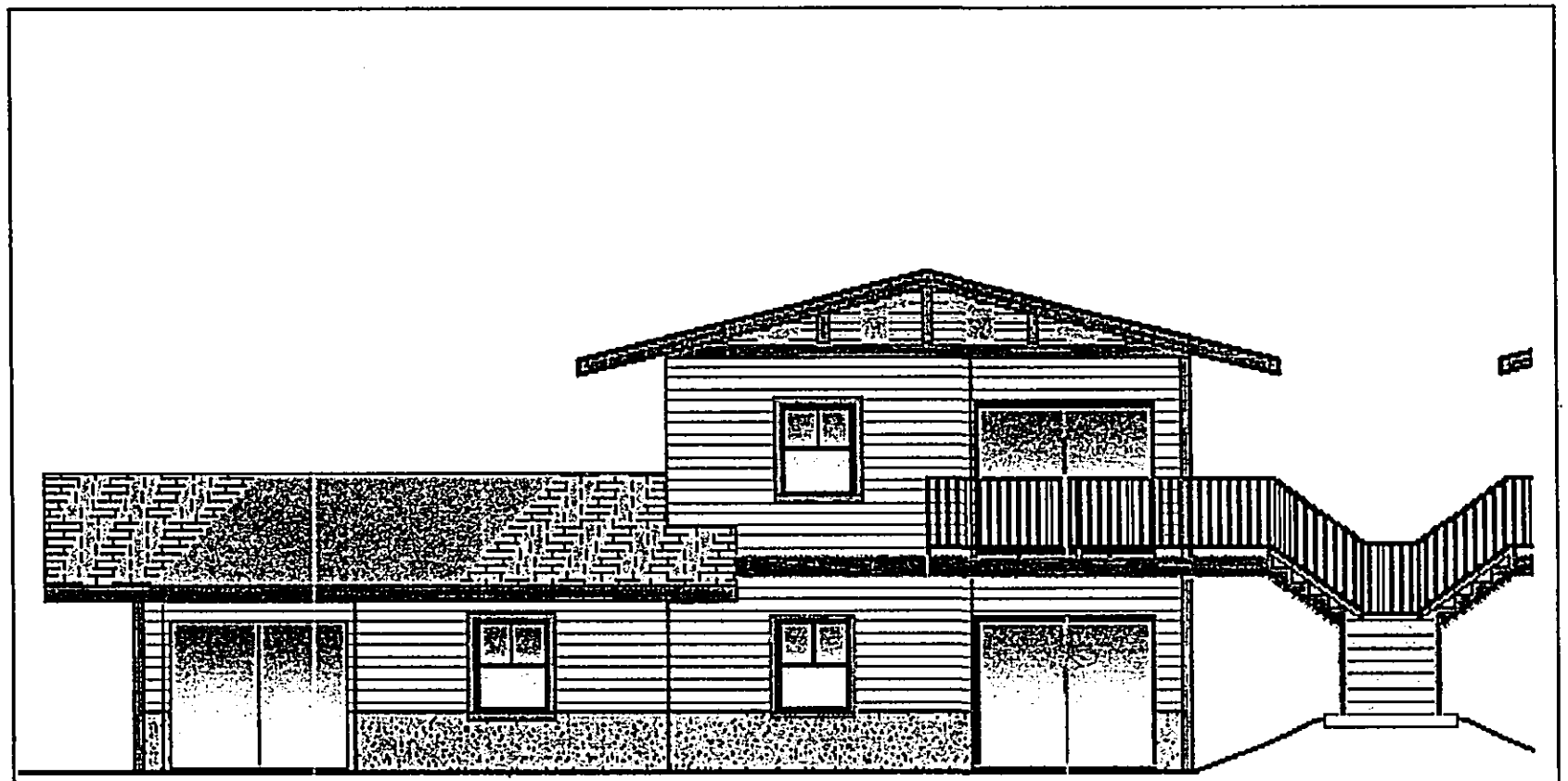


Figure 5: Rental Housing Elevation

Source: CJS Group Architects

HSI Waianae Supportive Housing

March 2007

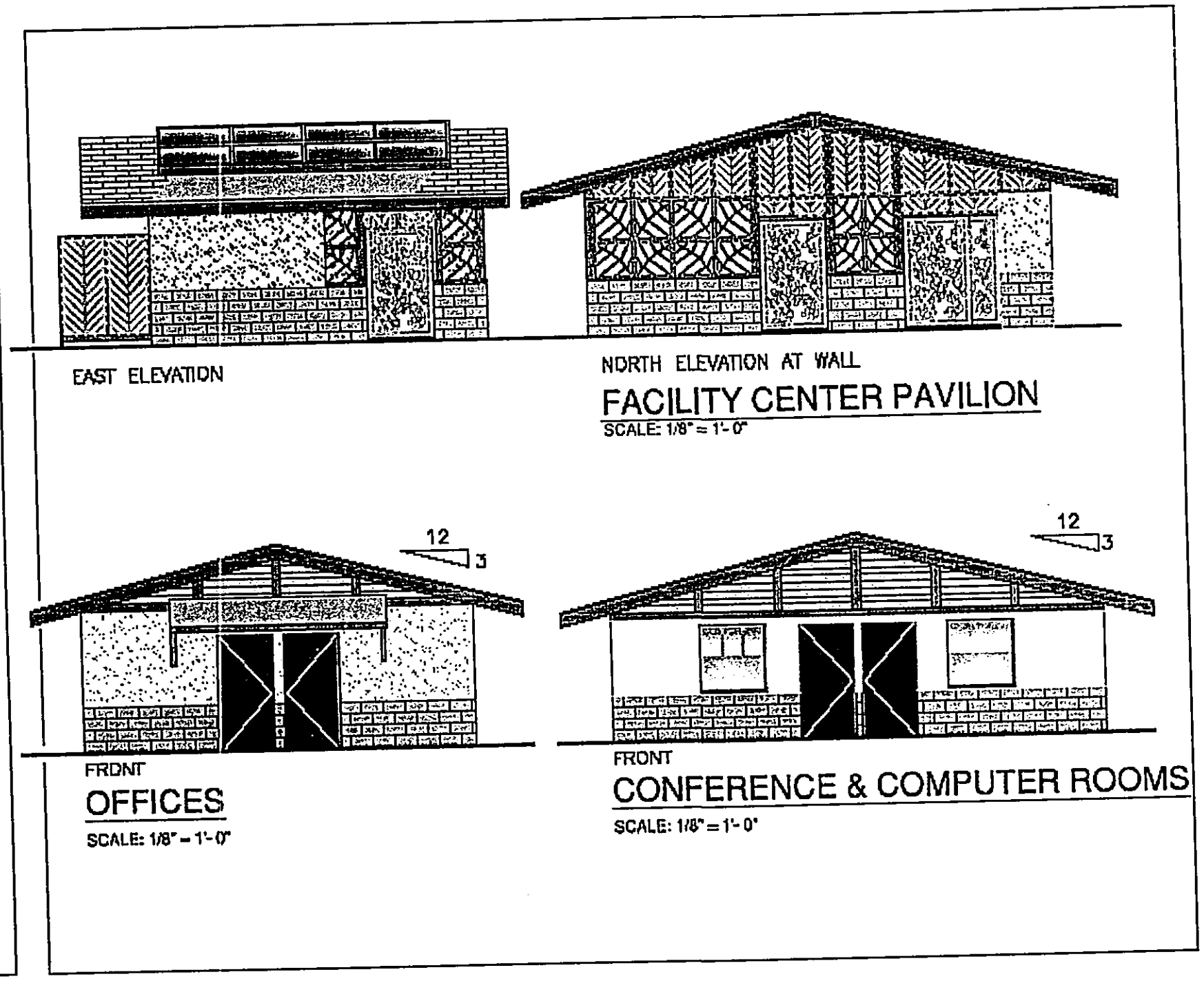


Figure 6: Facility Center Elevation

Source: CJS Group Architects

HSI Waianae Supportive Housing

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March 2007

provided to each unit to promote an indoor/outdoor living. Rents will be affordable to households earning up to 60% of Honolulu's median income.

Forty-five parking stalls, including four handicap stalls will be located throughout the site to provide convenient access to the residents. Generous setbacks and open areas provide for a spacious environment. The Facility Center is easily accessible to all units.

4. Facility Center

The central portion of the site contains the Facility Center. This component is situated to be easily accessible from all residential units. The Center is also located adjacent to the entry/exit point and allows staff to monitor vehicles and pedestrians entering the site.

The Facility Center is designed as a village of buildings that is divided into two major functions: office and education, and community facilities. The office cluster is a secured area that will include four office spaces for the complex management as well as for other programs that may require office space, a conference room, a computer room, a staff kitchen, restrooms and a storage room.

The Facility Center common facilities include a large open space that can be used for group activities, a kitchen, the apartment laundry area, restrooms, janitor's closet, and a storage building. One half of the storage building will be used for maintenance equipment and supplies and the second half will be used for abandoned resident's goods and other storage needs. An outdoor seating area is also provided in this section of the Community Center. A total of six parking spaces including two handicap stalls will be provided immediately west of the Community Center and will be directly accessible and will not require passage through the main security gate.

E. Funding and Schedule

The proposed improvements are anticipated to cost approximately $9,000,000 to construct. The primary funding source for the project is the HOME Investment Partnership Program, and the Federal and State low income housing tax program.

The project is anticipated to commence in fall of 2006 and will be completed in one continuous phase.

F. Necessary Permits And Approvals

Permits and approvals that may be required are listed below:

Permit or Approval	Approving City Agencies
Finding of No Significant Impact	Dept. of Community Services
Sewer Connection Permit	Dept. of Environmental Services
Foundation Permit	Dept. of Planning and Permitting
Building Permit	Dept. of Planning and Permitting
Certificate of Occupancy	Dept. of Planning and Permitting
Grading Permit	Dept. of Planning and Permitting
Grubbing Permit	Dept. of Planning and Permitting
Section 201H	Dept. of Planning and Permitting

G. Chapter 201H, Hawaii Revised Statutes Approvals

The original State Housing site plan project dated April 1992, contained a total combination of 50 one-bedroom two story and two bedroom two story all with tandem parking. The plan as drawn in 1992 (see Appendix 1 – original plan) was granted the exemptions requested however under the approved exemptions, the project would not meet current codes and building standards:

a) Does not meet the current Fire Department code and would not be allowed to be constructed as drawn.
b) Parking layout design does not meet current standards.

With the resulting issues and limitations encumbering the original site plan, the applicant requests for condition of approval, the ability to upgrade and alter the original site plan in order to facilitate and exceed the current required standards (see Appendix 2 – current 2006 site plan) per the proposed project concept documented below.

1. Proposed Project Concept

The 2006 Plan, called Seawinds Apartments, will provide fifty units of housing for low-income individuals and families, including those who were formerly homeless. Twenty units are studio apartments intended for short-term transitional housing, and thirty units are two-bedroom apartments, intended for longer-term housing. Studios are 400 Sq. Ft. in area, built in clusters of three units. Two-bedroom apartments are 660 Sq. Ft. in area, plus covered lanai, with 14 of the 30 units being on the second floor. Each two-bedroom housing cluster consists of 4 units, and has a landscaped

waiting area between each cluster. The two-story complex is 24'-00" in height.

The 20 studio apartments are enclosed in a village-like setting intended to serve singles, couples and small families. These residents will participate in a social services program called "Village of Hope" that will assist them in obtaining long-term housing. Emphasis will be on job referrals and parenting. A separate resident manager will reside in the village to assist and closely monitor residents.

The 30 two-bedroom apartments will also be supported by social services, with emphasis on adult education and career improvement.

The project also features a Facility Center for residents consisting of:

a) Housing administration office
b) Resident support/counseling meeting rooms
c) Educational training classrooms
d) Computer center
e) Open-air resident laundry (with visual access to open play area)
f) Shaded open play area
g) Temporary storage area (for 30-day move-in flexibility)
h) Loading area
i) Trash area
j) Parking per code for guests, handicap and residents

The impact on the existing community should be negligible. The entire Seawinds project is a gated facility with substantial provisions for security. Residents are expected to be those who already utilize existing community services such as public schools and health care.

Appropriate security safeguards have been included to control flow of both pedestrian and vehicle traffic in and out of the complex. This will be implemented via security gates, guard station and intercom call boxes. In addition, a fire truck access gate and lane has been strategically located to meet Fire Department codes and specifications.

The 2006 Plan meets both more stringent building codes and standards than the original plan and provides for significantly improved tenant accessibility.

2. No. of Units/Size

Type of Units	No. of Units	Size (Sq. Ft.)	% Affordable
Studio	20	400	**100%**
2-Bedroom	30	660	**100%**
Total Units	50		

3. Term of Agreement

Period of Affordability will be fifty (50) years per the City and County of Honolulu Sub-Recipient Agreement and the State of Hawaii ground lease

4. Exemptions

Current Exemptions: [Consideration; "Keep Active", "Modify", "Not Required" or "Remove"]

NO.	EXISTING EXEMPTIONS	OBJECTIVES
1.	Exemption from Ordinance No. 83-11, Development Plan Land Use Map, Waianae, to allow Low Density Apartment development in areas designated for Public and Quasi-Public land uses.	**Keep active**
2.	Exemption from Ordinance No. 86-117, Zoning Map Number 15, Lualualei to Makaha, to allow A-1 Apartment Use and the construction of 100 apartment dwellings in an area zoned for R-5 Residential Use.	**Keep active**
3.	Exemption from requirement for Conditional Use Permit, Type 1, for the joint	**Keep active**

	development of two or more adjacent zoning lots pursuant to Section 21-4.40-21 and Table 21-4.1, ROH 1990 (Land Use Ordinance (LUO)).	
4.	Exemption from requirements pursuant to Table 21-5.10-B of the LUO that all structures and parking stalls be set back a minimum of ten feet from the property lines.	**Keep active**
5.	Exemption from off-street parking requirements pursuant to Section 21-3.70-2 of the LUO to allow the construction of 62 parking stalls instead of 100 spaces required for low density apartment use within the Federal Housing Sector of the project.	**Keep active** Current plan meets all off street parking per the current code requirements. Parking criteria: Based on living unit- • under 600 sq.ft. requires 1 stall • between 600 & 800 sq.ft. requires 1.5 stalls • 1 stall for office less than 400sq.ft. 20 Studio @ 400 sq.ft. parking = 20 30 Rental @ 660 sq.ft. parking = 45 Office use less than 400sq.ft = 1 Guest parking = 5 Total Parking = 71 Loading dock = 1
6.	Exemption from provisions for guest parking found on Table 21-3.1(A) of the LUO.	**Not required** as project meets all requirements.

7.	Exemption from requirements for location and improvement of loading spaces pursuant to Section 21-3.70-13 of the LUO to exempt the required loading space from the requirement of being constructed adjacent to the dwelling units.	**Keep active**
8.	Exemption from park dedication requirements (Chapter 22, Article 7, Revised Ordinances of Honolulu 1990 (ROH)), the Rules and Regulations for which require 9,290 square feet to be set aside for parks and playgrounds.	**Keep active**
9.	Exemption from subdivision approval governed by Chapter 22, Article 3, ROH, regarding the rules and regulations for subdivisions and consolidation of lands to secure the required building permits. Application for subsequent subdivision approvals will be submitted for processing once the permits have been secured.	**Keep active**
10.	Exemption from payment of building permit fees required pursuant to Section 18-6.1, ROH.	**Keep active**

11.	Exemption from payment of grading permit fees required pursuant to Section 14-14.4, ROH.	**Keep active**
12.	Basalt gravel anti-termite barriers in lieu of chemical ground treatment if economically feasible – *Resolution CD-1 HCR-262 adopted*	**Remove** as there is has been established through general construction practice not to be economically feasible.
13.	Proposed Land Use Ordinance regarding Ohana dwellings – *Resolution CD-2 and ZCR-499 adopted*	**Remove as it does not apply**

The following listed below are conditions of approval we are submitting for modification:

NO.	CONDITIONS OF APPROVAL	OBJECTIVES Re: Modification
1.	Request to upgrade and alter original plans	The proposed site plan changes are consistent with the current project objectives and will result in an improved residential complex. The proposed changes will result in an efficient, open and friendlier environment.
2.	Request "Facility Center" Parking	The "Facility Center" is for the use of the residents only and is classified as accessory use. Additional guest parking

		has been provided in the event that support teachers and or administrators will visit.
3.	Request for use of Metal Haloid lighting fixtures re: roadway, parking areas and outdoor lighting	Currently a request exists for low pressure sodium lighting fixtures in the complex. Electrical Engineer consultants strongly suggest installing Metal Haloid for better efficiency and security. Low pressure sodium lighting fixtures render very poor color renditions and thus compromise security
4.	Request for modification of original plan request regarding toilets usage	Currently a request exists for use of ultra-low flush toilets and water saving shower heads. This is okay as the current plumbing code now mandates the use of a lower gpm usage
5.	Request for high efficiency gas heaters regarding water heating	Both Mechanical and Electrical Engineers strongly suggest using electrical appliances for safety of avoiding exhaust fumes in each unit, gas water heaters and the need to keep a gas storage tank on premise
6.	Requested in 1992 – Light colored asphaltic tile used for roofing to reduce heat absorption and energy use re: cooling	**Keep active**

III. DESCRIPTION OF ENVIRONMENT, ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Environmental Setting

The project site is located in an urbanized area located in the central portion of Waianae Town, Oahu, Hawaii. The project area is considered rural but due to its proximity to the core services of the town, the immediate area has been heavily urbanized in recent history. The site is designated as "Urban" on the State Land Use Maps and "R-5 Residential" on the County zoning maps.

The project site itself is extensively altered over time. While the site is undeveloped, it was formerly known as a coral flats area which was not suitable for cultivation. Historic uses of the project are included cattle grazing land and military training area. In more recent times, the site has been altered to a degree by infill from adjacent developments but has largely remained unused and has been surrounded by a perimeter fence to prevent undesirable uses from occurring on the property. The site itself is overgrown and is covered with various weedy species of plant material.

Impact and Mitigation

The project will change the existing vacant parcel into a planned, residential complex. In the context of the surrounding uses and the existing land use controls, the site is considered an infill project that is consistent with the surrounding environment. The site is zoned for residential use and consequently would be used for residential development if other projects for the site were considered.

B. Surrounding Uses

Uses adjacent to the project site are very similar in nature. Bordering uses to the north and east include the Waianae Community Development Project which consists of low-density multi-family dwelling units. The southern portion of the project site is bordered by the Waianae Neighborhood Community Center which is often referred to as the Waianae Satellite City Hall. The Kauiokalani rental housing community is located east of the project site. This multi-family complex has a similar rental function and is similar to the rental units proposed by the subject project. An undeveloped parcel lies southeast of the project site. City tax maps indicate that the site is reserved for the Waianae Civic Center.

Further west lies the Waianae Intermediate School. To the south of the project site lie the Waianae District and Regional Parks, Waianae High School, the Waianae Fire Station and the Waianae State Boat Harbor.

Impact and Mitigation

The proposed addition will not alter the surrounding land uses. The site is zoned for residential use and is consistent with the surrounding housing and community uses. The entire complex will be secured to ensure the safety of both residents and abutting uses. No mitigation is required.

C. Physical Environment

1. Geological Characteristics

Topography

The project site is relatively flat with lower lying areas located in the southeastern corner of the site and a depressed area located approximately mid-site. The coralline nature of the site is clearly visible and the site is extensively covered with various weedy and noxious species. Vegetation on site generally consists of weedy finger grass, kiawe trees and koa haole bush. The site is naturally drained and storm water is retained onsite. A chain link fence is located around three sides of the site. The fourth side along the Waianae Neighborhood Community Center is heavily landscaped and does not encourage entry into the project property. The fencing was installed to prevent vandalism and vagrancy on the property.

Impact and Mitigation

The project will require minor surface grading to prepare for the proposed addition. A significant amount of grubbing will also be required to clear the site of the undesirable vegetation. No mitigation other than good housekeeping during the construction period will be required. Best Management Practices will be in place during the grading work in accordance with the Rules Relating to Soil Erosion Standards and Guidelines.

Erosion

The project site is presently in a natural state. Evidence of surcharge exists however the site is stable and does not appear to be affected by erosion. Natural low-lying areas within the center of the site receive

drainage and little or no runoff appears to enter the municipal storm drain system. Upon construction of the site, Best Management Practices will be incorporated to minimize and erosion and drainage impacts. The proposed development will incorporate an on-site drainage system and all non-paved or covered surfaces will be grassed to control any erosion.

Impact and Mitigation

No mitigation measures are required for the unimproved site. During construction, Best Management Practices will be used to control erosion and potential storm drainage. Upon completion of the project, the site will be served by an internal drainage system and erosion control measures, which will primarily consist of grassing, will be utilized on any exposed natural surfaces.

Climate

The geography of the Waianae District is typically warm and dry in climate. Prevailing tradewinds arrive from the northeast. According to the National Weather Service Honolulu Office, over a period of 30 years, normal monthly high temperatures range from 80 degrees in January to a high of 89 degrees in August for an average of 84 degrees. Normal monthly low temperatures range from a low of 65 degrees in February and a high of 74 degrees in August for a monthly average of 70 degrees. Precipitation typically ranges from 0.44 inches in August to a high of 3.8 inches in December.

Impact and Mitigation

The project will not have any impact on the climate.

USDA Soil Survey Report

The project site is located on soils classified as Coral Outcrop (CR) according to Panels 35 and 36 of the *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* by the U.S. Department of Agriculture Soil Conservation Service (Figure 6). This series consists of coral or cemented calcareous sand. Elevations for this material range from sea level to approximately 100 feet. This land type is used for military installations, quarries and urban development.

Impact and Mitigation

No impact on soils is expected. No mitigation is required.

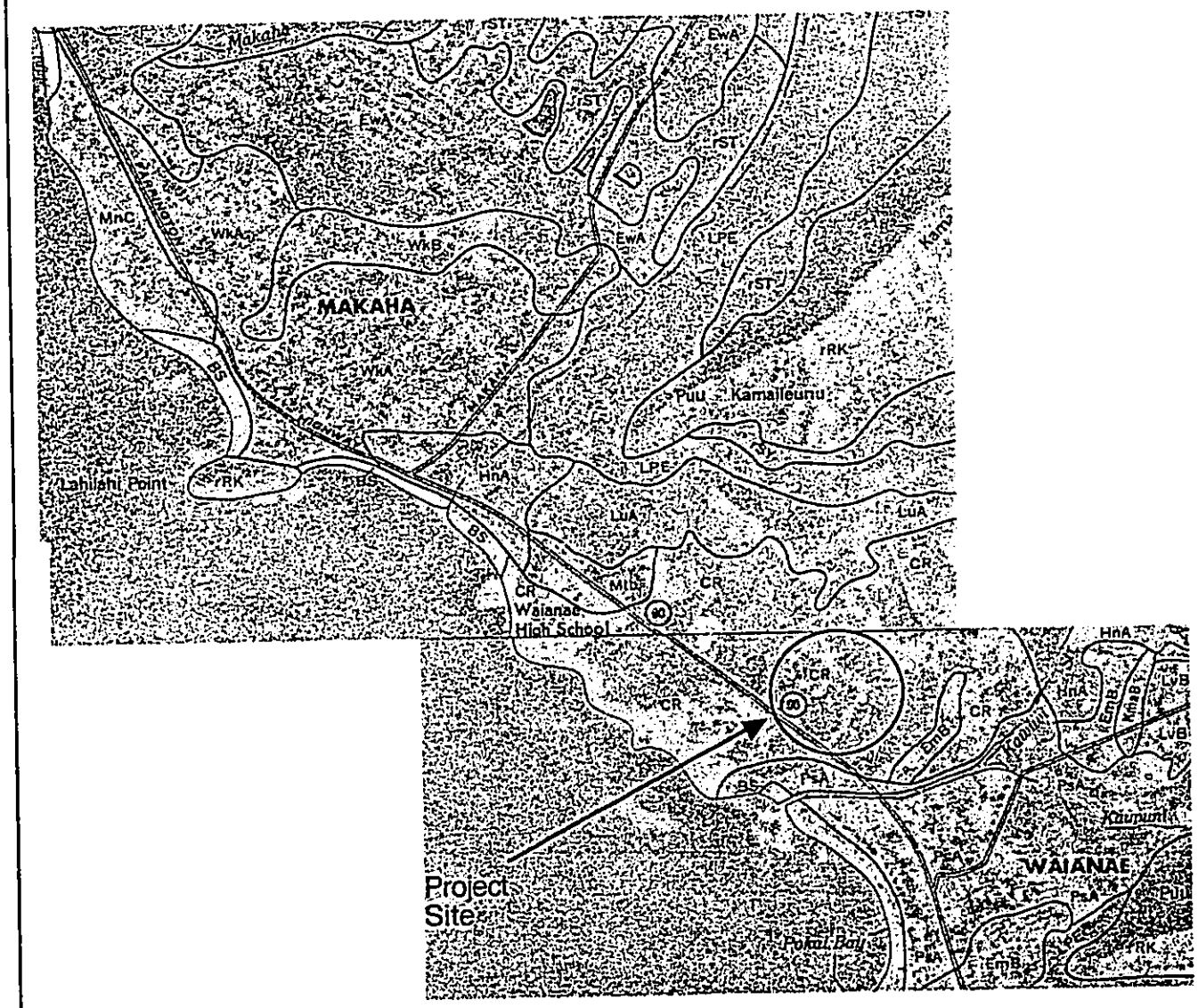


Figure 7: Soils Map
Source: USDA

Land Classification

The *Detailed Land Classification – Island of Oahu* by the University of Hawaii Land Study Bureau identifies the project site as land type U, Urban Land (Figure 7). Typically, urban use is considered for the underlying soil type because urban uses are not hampered by rocky, shallow soils.

Impact and Mitigation

The project site is not considered agricultural land although the site has supported limited grazing before the Waianae Town area was developed. The proposed action is consistent with the current urban and business designations in effect for the site. No farmlands are affected and no mitigation is required.

Ground Contamination

The project site is not located on a recognized dump, landfill, industrial site or other location that may contain hazardous wastes. The site has received fill material from neighboring developments and has collect small amounts of loose trash but no hazardous or toxic materials were observed on-site nor are any historic uses of the site expected to have resulted in toxic ground contamination (24CFR part 58.5(i)(2)). No explosive or flammable operations are known to have occurred on the site nor will these types of operations be allowed on the site (24 CFR 51B).

Impact and Mitigation

The proposed action is not expected to contribute to ground contamination nor is it expected to be affected by existing conditions. No mitigation is necessary.

Hazard Zones

The proposed project is not located near any hazardous or flammable operations. There are no know or planned above ground storage tanks over 100 gallon capacity within a one mile distance as specified by 24 CFR Part 51 Subpart C and is compliant with 24 CFR 58.5(i)(2).

Airport Clear Zones and Accident Potential Zones as specified in 24 CFR 51 D will not have any impact on the proposed project. Runway Clear Zones, which extend 3,000 feet from the ends of the runways at Honolulu International Airport, are located approximately 19 miles from the project site and will not have any impact on the proposed development.

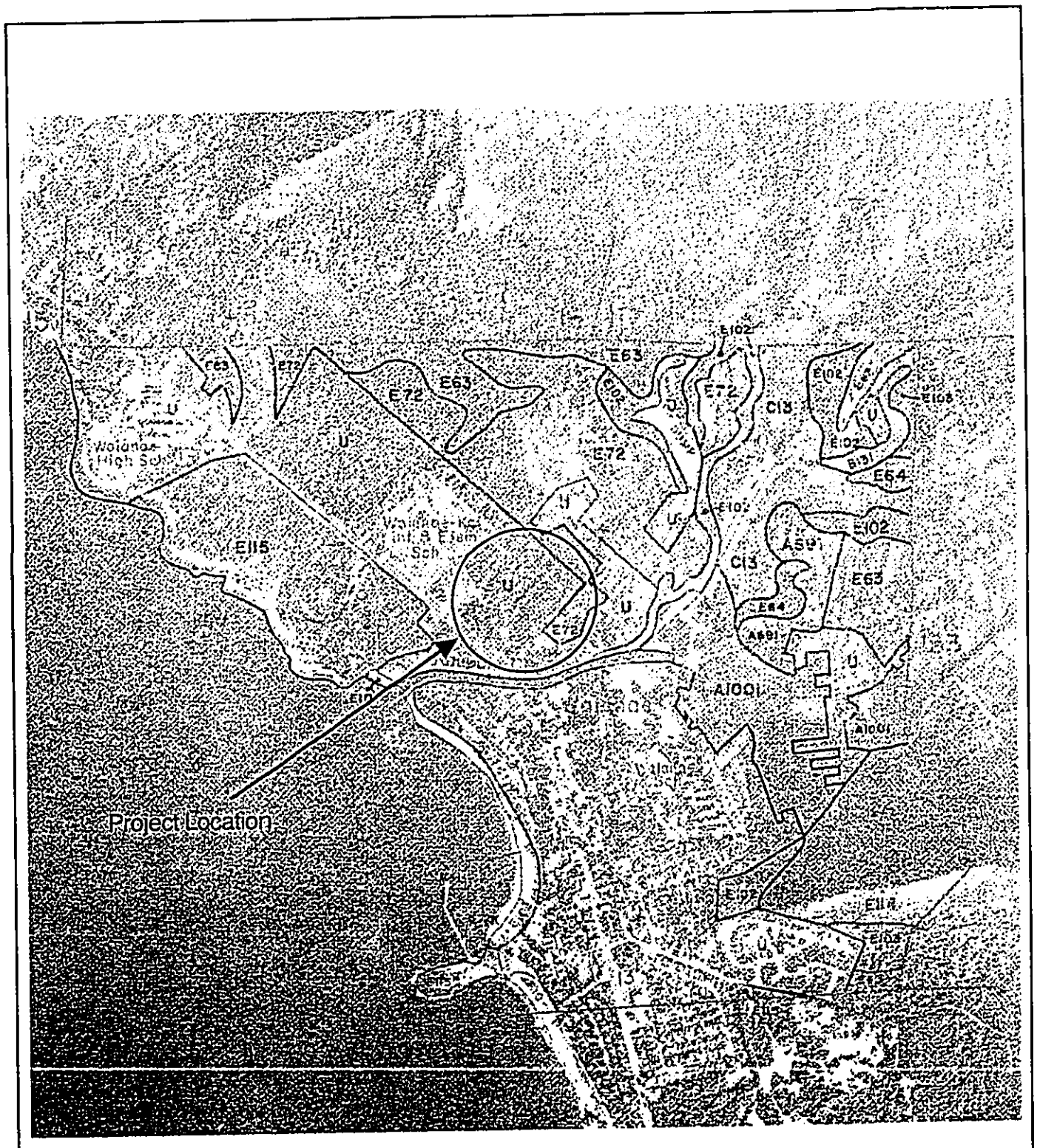


Figure 8: Detailed Land Classification
Source: Land Study Bureau

2. Biological Resources

Flora

The project lot is presently covered with mixed field grasses such as fountain, pili and finger grass, koa haole shrub, and kiawe trees. Other various weedy species were also found on-site and all plant materials are considered common overgrowth indigenous to Hawaii.

Impact and Mitigation

The proposed action will result in the loss of significant amount of wild overgrowth however a significant portion of the site will be replanted with landscaped grass, ornamental shrubs, trees and other plant materials better suited for the proposed use. No mitigation is required however best management practices will be used to ensure that erosion is limited during the construction and that existing soils are kept on-site.

Fauna

The site does not serve as a wildlife habitat although avifauna, feral cats, and rodents may be found on-site. Correspondence with the US Fish and Wildlife Service (FWS) dated June 14, 2006, states that according to their files and data, no federally listed or proposed threatened or endangered species or candidate species, or proposed or designated critical habitat occur on or near the proposed project site (Appendix B). This document addresses 50 CFR 402 regarding the Endangered Species Act.

Impact and Mitigation

The project will not have any impact on rare or endangered fauna and no mitigation is required.

3. Water Resources

Water Sources

The project site is not located adjacent to any wetlands, rivers, streams or other bodies of water. The site is located approximately 700 feet from the Kaupuni Drainage Channel to the south, and approximately 1,500 from the ocean. The site is presently naturally drained on-site and does not run off into the adjacent areas. The project site is not subject to Wetlands Protection Executive Order 11990 as the site is not within or does not contain any wetlands or wetland delineators.

The project is located in the Waianae aquifer according to the Water Resource Commission maps but is not expected to have any impact on the aquifer. The State of Hawaii has two Sole Source Aquifers (SSA) as designated by the Environmental Protection Agency however the project is not located within these SSAs. Therefore, the project is not subject any conditions of 40 CFR 149 regarding sole source aquifers.

The proposed project will require approximately 9000 gallons per day to serve the potable water needs of the residents and the common facilities. This water will be obtained from the Board of Water Supply.

The State of Hawaii does not have any water resources listed in the Wild and Scenic Rivers Act Section 7(b), (c), therefore the project is not constrained by any measures of this Act.

Impact and Mitigation

No adverse impacts on ground water sources are expected. The proposed project is not expected to produce any hazardous runoff that will be disposed of through the municipal drainage and sewer systems.

Hydrologic Hazards and Resources

According to Panel 150001 0185 of *the Federal Emergency Management Agency Flood Insurance Rate Map*, dated September 30, 2004, the project site is located in Zone D, an area in which flood hazards are undetermined. The project is not located in any zone considered ineligible for HUD funding under 24 CFR 55.

Impact and Mitigation

The project site is not known to flood and is generally well drained. No flood heights have been established for the project site however it is assumed that Zone D areas in this highly urbanized environment are not subject to flood hazards. No mitigation is required.

Tsunami Inundation

The *Civil Defense Tsunami Inundation Map* Panel 15, which covers the area from Yokohama Bay to Pokai Bay, indicates that the project site is located in an area vulnerable to tsunami inundation (Oahu Civil Defense Agency, Hawaiian Telcom).

Impact and Mitigation

No mitigation is practicable for this general area consideration. Area residents are advised, in a tsunami event, to evacuate to an emergency shelter. The designated shelters serving the project area are located at Kamaile School and Waianae Elementary School. Both shelters are within walking distance from the project site.

Special Management Area

The project site is not located within the boundaries of the City and County of Honolulu Special Management Area (SMA) Map. The Coastal Zone Management Act, Section 307, states that the respective State shall coordinate coastal management programs. The proposed project is not subject to SMA review therefore is in compliance with Section 307.

Impact and Mitigation

The project site is not within the SMA and no mitigation is required.

D. Human Environment

1. History and Archaeology

Historic Perspective

The project site is located in the ahupuaa of Waianae Kai. According to a report conducted for the project site in 1994 entitled *An Archaeological Inventory Survey and Mitigation Plan of a Seven Acre Parcel (TMK: 8-5-28: por. 42) in Waianae Kai Ahupuaa, Waianae District, Oahu Island*, the project site is located within the small autonomous division of land, or 'ili, of Leohano-iki. The report is included in its entirety as Appendix C.

The project site is located in the southeastern portion of this 'ili and remnants of the 'ili wall remain on the project site (Figure 8). During the period of the Great Mahele, the area was used for pig farming. The report noted that the absence of many kuleana claims in the project vicinity might indicate that the site was used by pre-Contact Hawaiians for permanent or temporary habitation. Other uses occurring in the area include sugar cultivation, cattle grazing and military training.

In June of 1972, the State of Hawaii was granted permission to use the Land Court Award property. The site was condemned for an addition to the Waianae Elementary and Intermediate Schools. The Waianae

Neighborhood Community Center and the surrounding residential developments were subsequently built and the project parcels remains one of the only vacant portions of land remaining in the immediate vicinity.

The report further states that while the project parcel appears to be of little interest historically, the neighborhood to the east, is significant as it contains a heiau and alii residence.

Anecdotal and oral history for the project area is consistent with the historical perspectives detailed in the report. Presently and historically, the site was not used as an agricultural or cultural resource but has been adjacent or ancillary to a number of uses that no longer occur on the property.

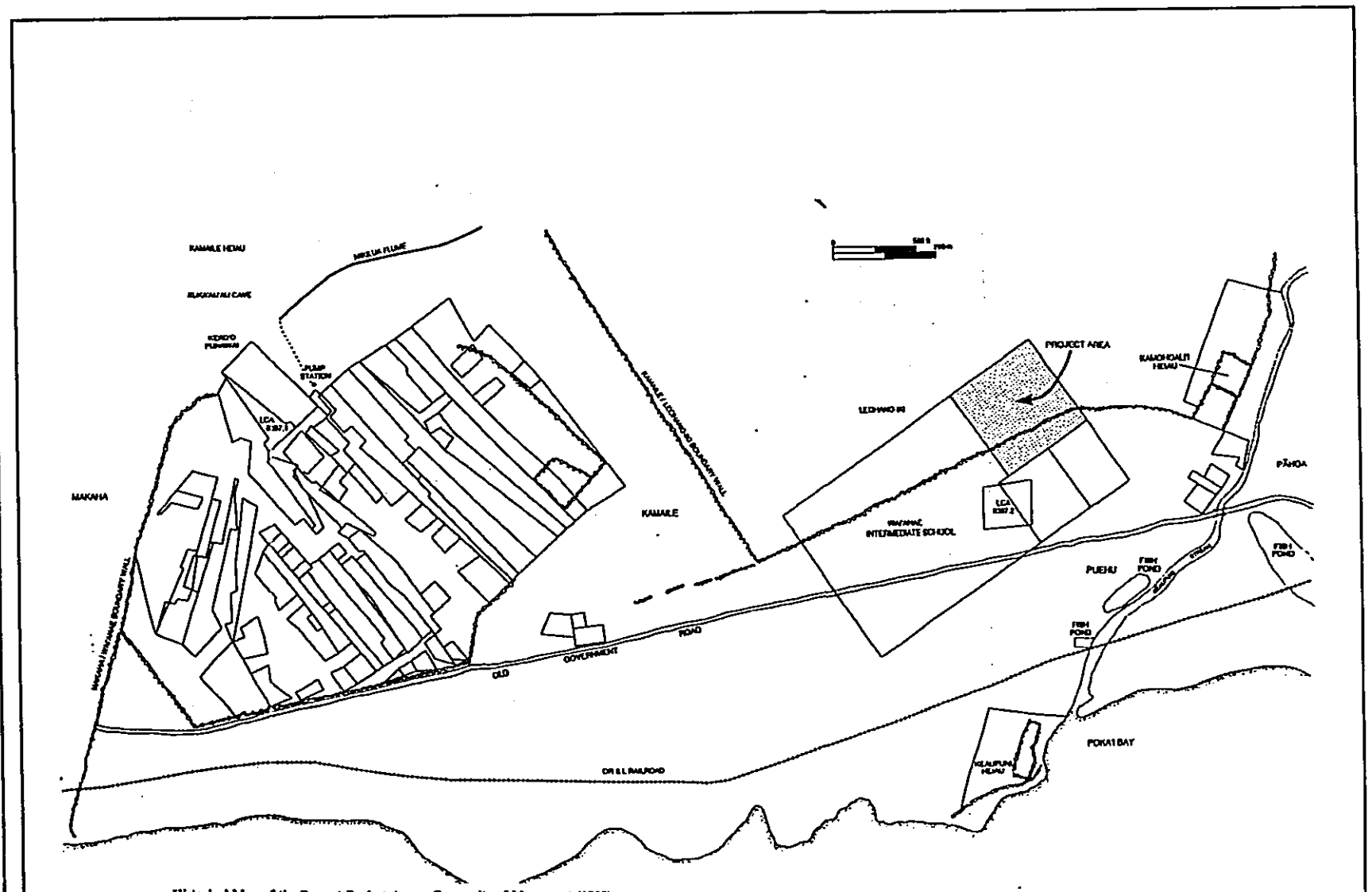
Archaeology

The archaeological inventory survey for the project property identified 24 surface features that were recorded, mapped and described (Figure 9). These features include: a core filled wall, an artifact scatter and trash mound, an L-shaped alignment, a low platform, a terrace, four modified sinkholes, and 14 unmodified sinkholes.

The study concluded that the site documents the existence of at least five distinct land use patterns and chronological periods of occupation, from pre-Contact times to the late twentieth century. The report assesses the site as being significant under National Register Criterion D, indicating that the site *has yielded, or is likely to yield, information pertaining to the prehistory of Hawaii".*

Impact and Mitigation

Approximately one half of the sites identified in the report are located specifically on the current project parcel. The mitigation plan for the project states that since total avoidance of the archaeological features is impractical, and since none of the features are significant enough to actively preserve and interpret, the two options for mitigation are passive preservation, or data recovery. Passive preservation was recommended by the plan. Under this plan, sinkholes would be filled. No surface feature located onsite is considered significant under the National Register Criterion "D". The project is consistent with 36 CFR 800 regarding historic preservation.



Historical Map of the Present Project Area. Composite of Monsarrat (1902) and Jackson (1884) Surveys, with modern TMK parcels (1-8-5-02) and other important improvements superimposed. LCA parcels from the Māhele are shown for Kamaile and the relevant portion of Keobano-Iki. Note overlapping *kuleana* from Monsarrat in Kamaile.

Figure 9: Historical Map

Source: Bishop Museum Anthropology Department

HSI Waianae Supportive Housing

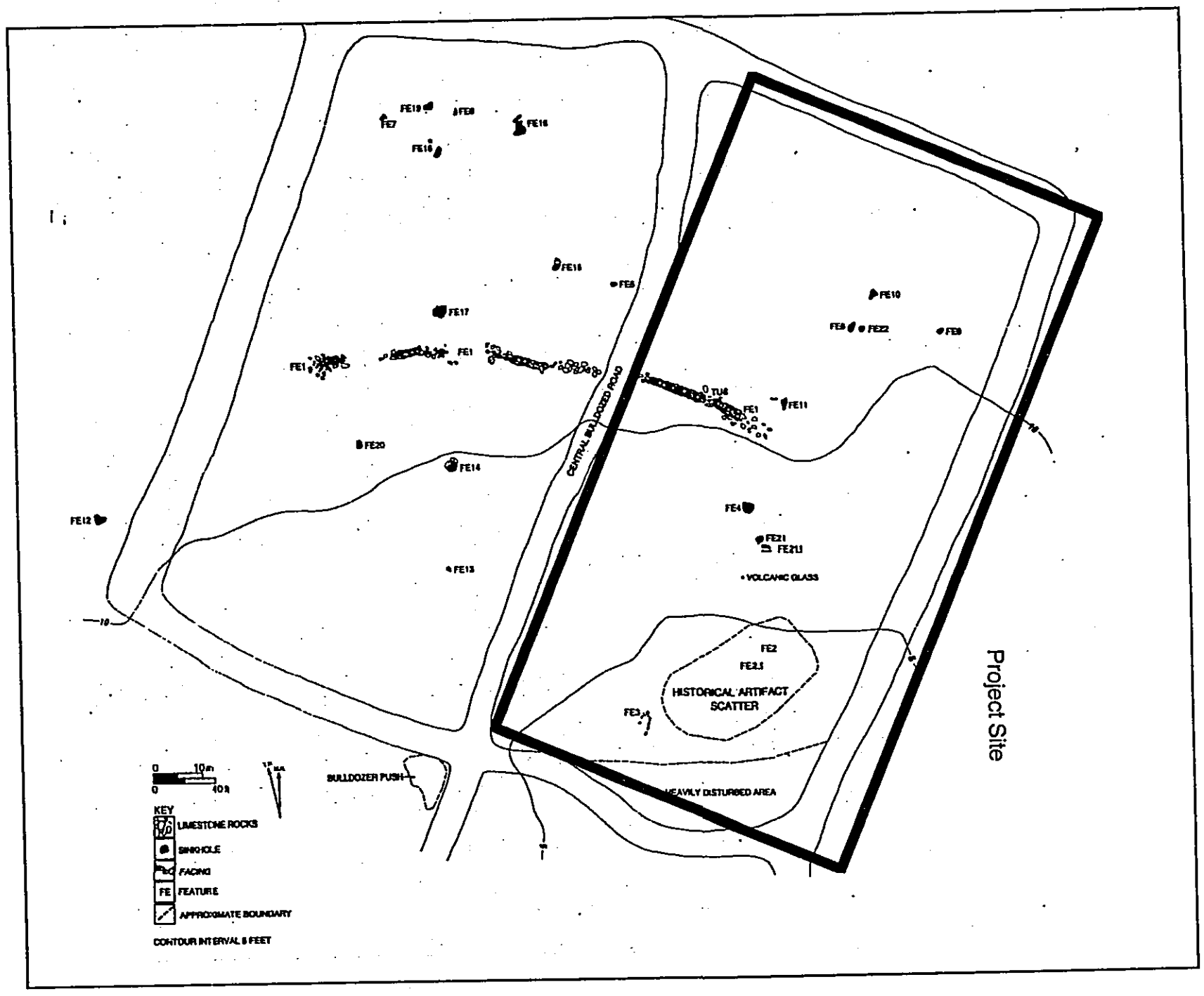


Figure 10: Archaeological Artifacts Map
Source: Bishop Museum Anthropology Department

HSI Walanae Supportive Housing

March 2007

If any archaeological remains are found during site preparation, all work will cease and the State Historic Preservation Office will be notified for further action.

2. Cultural Value

As previously stated, the project parcel is not known to be culturally significant to the Hawaiian population however the site has experienced at least five different land uses. The site itself is not know to be culturally significant however nearby properties located to the east (Kamohoalii Heiau) is historically and culturally significant. Anecdotal reports of the site (G. Kila) made reference to several historic uses and ownership of the area, all of which are consistent with the report provided in Appendix B. It was also mentioned that salt ponds were found in the vicinity and the area was often referred to as the "coral flats". In more recent times, the site was used by the homeless and was often vandalized necessitating the need for a perimeter fence.

Impact and Mitigation

The proposed action is not expected to have any impact on native Hawaiian cultural practices. The area has been unused for any organized activity since the period when it may have been used for military training use. The proposed action is culturally important from a larger social perspective in that it will provide much needed shelter to those in need of low-cost housing and those in need of acclimation to permanent housing. No mitigation for cultural values is required.

3. Socio-Economic Characteristics

The proposed project will contribute significantly to the socio-economic environment within the Leeward Coast community. The project will address two specific needs, homelessness and affordable housing. Homelessness will be addressed by a transitional housing facility that will provide the formerly homeless with the physical shelter and supportive social environment to re-entry the traditional housing model.

To address the unique social considerations of the formerly homeless, the transitional housing component will provide an increased level of security to and program support to educate this population. The complex will be physically separated from the other components of the project and will

feature an exceptional amount of indoor/outdoor living area. Social centers and other support facilities will also be provided to increase resident s level of comfort.

The other component of the project consists of low-cost rental housing. This is a significant need in the area and the proposed project will create a very desirable, secure environment that will meet the needs of this community. In addition to the housing units, a large community center complex will be constructed to house a number of social support/community function needs. Conference rooms, office space for support programs, and a large community kitchen/meeting area will encourage social interaction and group activities.

The project will also provide economic benefits that include the creation of construction employment, the addition of staff and program support positions, the generation of operational income, additional tax revenue, and secondary spending.

The project will not discriminate any resident on the basis of age, race or creed. The project is intended for those whom were formerly homeless or for those who meet income restrictions. The project will be in compliance with HUD Executive Order 12898 regarding Environmental Justice.

The project site is zoned for residential development and is not suitable for agricultural uses. This zoning constraint exempts the project from the Farmland Protection Policy Act, 7 CFR 658.

Impact and Mitigation

The proposed action will generally have positive social and economic impacts. The project is consistent with the plans and policies for directed growth in the Waianae area and is a positive contribution to the ultimate development of the Waianae region.

4. Traffic

The proposed project is located on Kauiokalani Place off Farrington Highway, a major traffic arterial serving the region. Farrington Highway presently provides the only access to the H-1. Traffic generation by the proposed project is not expected to be significant due to the small number of units and the residents to be served.

It should be noted that residents of the project, both in rental and transitional housing components are expected to come from the Leeward coast therefore the project is not expected to increase the area population but will serve an existing population in a new facility.

A traffic study was commissioned by the applicant for the proposed project. This study, entitled *Traffic Impact Analysis Report for the Proposed Waianae Supportive Housing Project*, dated March 2006, is summarized as follows. The study can be found in its entirety as Appendix D.

Existing AM peak hour traffic on Kauiokalani Place operates at level of service (LOS) "F", an unacceptable condition where delays of 50 seconds are more are experienced. During the PM peak hours, the intersection of Kauiokalani Place and Farrington Highway operates at LOS "E", and *undesirable condition* where waits are typically 35 to 50 seconds.

Future traffic conditions without the project for Year 2008 when the proposed project would be completed, will continue to operate at LOS "F" during the AM peak hours and LOS "E" during the PM peak hours.

The proposed project will generate 59 vehicles per hour during the peak AM hours. During the PM peak hours, the project would generate 70 vehicles per hour. Peak hour traffic with the proposed project would result in an AM peak operation at LOS "F" and a PM peak operation of LOS "F". Both peak hour traffic volumes are under 100 vehicles per hour which is the minimum approach volume for a traffic signal.

Impact and Mitigation

The following recommendations are made by the traffic study to mitigate the LOS "F" conditions.

1. Widen/restripe the northwest leg of Farrington Highway to provide a left-turn lane to Kauiokalani Place.

2. Widen/restripe the southeast leg of Farrington Highway at Kauiokalani Place to provide a median shelter lane to facilitate the left-turn movement from Kauiokalani Place.

The proposed left-turn and median shelter lanes on Farrington Highway at Kauiokalani Place can be accommodated within the existing roadway width by eliminating the bicycle lanes on both sides of the highway. The propose improvements are expected to improve Kauiokalnai Place traffic

operations from the existing LOS "F" to LOS "D" and "C", during the AM and PM peak hours of traffic, respectively. Traffic improvements, as recommended, are expected to accommodate the increase in traffic resulting from the development of the proposed project.

5. Air Quality

The project site is located approximately 13 miles from the Department of Health Kapolei air monitoring station located at 95-591 Kalaeloa Boulevard at the entrance to Campbell Industrial Park. This station is located near point source pollution uses that do not have any effect on the project site as prevailing tradewinds carry emissions out to sea, away from the Waianae area. The proposed project will not create any air quality impacts since no pollution sources are proposed with the expansion.

National Ambient Air Quality Standards (NAAQS) applicable to the project vicinity are all well below national standard levels for ozone(03), particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NO_x), and lead (Pb). This information is posted by the State Department of Health and satisfies the requirements of the Clean Air Act, Sections 176 (c) and (d), and 40 CFR 6, 51, 93.

Impact and Mitigation

Air quality may be temporarily affected during the construction period by fugitive dust. This impact is temporary and will occur only during the construction period. Mitigation measures to control dust include frequent watering of exposed soil, dust screening, and general good housekeeping practices. No long-term mitigation is anticipated to be required.

6. Noise Environment

Noise impacts within the project area are consistent and typical of urbanized environments. No significant noise generating uses are located in the project vicinity. Traffic along Farrington Highway is a noise source but is not exceptional and does not affect the project site significantly. Farrington Highway is located approximately 1,000 feet from the project site and is expected to meet 24 CFR Part 51 regarding noise abatement and control as no other significant noise generators are located in the area. The Waianae Intermediate School is located nearby however noise generation from this site is typically limited to lunch and break periods and does not significantly affect day/night noise level averages. Noise

abatement measures are not required for this peak activity periods. The project site is not located in an Air Installation Compatible Use Zone (AICUZ) area and lies beyond FAA noise contours.

Impact and Mitigation

No significant noise impacts are expected on the project site during the long term.

Short-term construction related impacts will occur during the construction period. These impacts are unavoidable and will be subject to prevailing construction noise management regulations. Construction activities may be scheduled to minimize noise impacts on students and adult clients.

Noise levels and impacts on the completed project are expected to be within acceptable levels per 24 CFR Part 51. Project activities shall comply with the Administrative Rules of the Department of Health Chapter 11-46, Community Noise Control.

7. Visual Resources

The proposed action will result in the minor loss of open space that will be replaced by new buildings. The area planned for the new construction is not considered a visual resource and does not offer scenic views. The proposed project may be considered an improvement since it will fill an overgrown, unused but not pristine area. The new structure will be designed to appear visually congruent with the surrounding area. The project will be heavily landscaped and has been designed to eliminate an institutional appearance.

No views of the ocean are available from the project site nor are any views from the ocean affected by the proposed development. Adjacent uses will be minimally affected as most neighboring properties are visually screened by wood or concrete block fencing. Views of the property from and to the Waianae Neighborhood Community Center are presently screened by various trees and landscaping materials.

Impact and Mitigation

The proposed action is not expected to adversely impact the visual resources of the area. The site is not located on or considered part of any significant scenic vista. No mitigation measures are required.

8. Infrastructure and Utilities

The proposed improvements are readily serviced by existing utilities located on Kauiokalani Place.

Water

The project will continue to be serviced by the existing Board of Water Supply system that serves the vicinity. Use of this service will increase with the addition of 50 residential units and common facilities. Water conservation efforts are likely to be implemented by the project applicant upon completion.

Impact and Mitigation

Water demand in the area will increase by approximately 9000 gallons per day. This additional demand is expected to be within the capacity of the existing water system and will not have any significant effect on the local water supply. The sustainable yield of the Waianae aquifer is 3 million gallons per day. No mitigation measures will be required.

Stormwater

The site is presently naturally drained. The proposed project will result in the loss of permeable surface area. Rainwater will be collected by an on-site drainage system and dispersed onsite or directed to the municipal storm drain system. All storm water runoff from the proposed improvements will be reviewed for conformance with City and County of Honolulu regulations.

Impact and Mitigation

The proposed improvements are not expected to have any significant impact on the existing stormwater drainage systems. Stormwater collected onsite will be collected and dispersed on the project parcel or into the municipal system.

Wastewater

The proposed improvements will connect to the existing wastewater sewer system located on Kauiokalani Place. The existing infrastructure has capacity to accommodate the proposed project. It is estimated that the proposed project will require approximately 9000 gallons per day of sewer capacity.

Impact and Mitigation

The proposed improvements are not expected to significantly impact the existing municipal sewer system. No mitigation measures are required.

Solid Waste

It is expected that private refuse collection service will be used to service the project site. The applicant may implement recycling programs.
Impact and Mitigation

The proposed action will result in the generation of additional solid waste. While this is unavoidable, conservation and recycling measures may be considered to minimize the need for landfill or other disposal services.

Telephone and Electrical Services

Telephone and electrical services are available to the site via Kauiokalani Place. Coordination with the local electric and telephone service providers will be expected during the final design and construction phases.

Impact and Mitigation

No impacts or mitigation measures are required.

9. Public Facilities

Fire and Emergency Medical Services

Waianae Fire Station Number 26, located at 85-645 Farrington Highway provides fire protection service to the project area as well as emergency medical service. The station is located within 500 feet of the project site. Response time to the project site is approximately one minute. This facility houses four vehicles: an engine, a tanker, a quint ladder/pumper and an ambulance.

Impact and Mitigation

The project is expected to have minimal impact on fire and emergency medical services. While these services may be used on occasion, this demand is not expected to be significant. Fire protection systems will be

incorporated into the new structures in accordance with required fire regulations.

Police Service

Police service is provided by the Honolulu Police Department (HPD) based out of the Waianae District 8 Substation located at 85-939 Farrington Highway. District 8 encompasses the area between Iroquois Point and Kaena Point. Response time to the site is approximately five minutes.

HPD staff has indicated that the project area is not a notable area for police calls and has not been a source of any problems.

Impact and Mitigation

The project is not expected to increase demand for police services. No mitigation measures are required.

Recreational Facilities

The project site is located within the vicinity of several recreational facilities. The Waianae Elementary School is located within the immediate project vicinity. Located across Farrington Highway are the Waianae District and Regional Parks. Numerous beachfront areas are also available to area residents.

On site, the project will provide ample open areas within the secured complex. The Community Center is expected to be a source of education as well as entertainment. Informal basketball areas may also be available on site.

Impact and Mitigation

No impacts on recreational facilities are anticipated. The project will provide safe play areas within the property.

Schools and Libraries

The Waianae Intermediate School is located within the immediate project vicinity. Elementary Schools serving the area include Kamaile and Waianae Elementary Schools. Waianae High School is located approximately 1/4 of a mile from the project site on makai side of Farrington Highway. The Waianae Public Library is located next to the Waianae High School on 85-625 Farrington Highway.

Impact and Mitigation

Schools may experience some impact from the addition of the rental-housing component of the project where 75 school age children, ranging in age from 6 to 18, are expected to reside. While many of the students may be coming from the general project area, this may still result in an increase at the servicing elementary schools. Concern was expressed by an elementary school principal that the addition of more low-income projects does require additional effort on the part of teachers due to the higher levels of attention that many students of this socio-economic demographic require.

No significant impact on library services is anticipated.

10. Health Care

Waianae Coast Comprehensive Health Center

Waianae Coast Community Health Center (WCCHC) offers family practice treatment as well as a range of other services, including 24-hour emergency care, specialty services (orthopedics, urology, ob-gyn, allergy, etc.), laboratory and radiology services, dental, preventive health, case management, outreach, family planning, a teen clinic, perinatal case management, Native Hawaiian healing (lomilomi, laau lapaau, hooponopono, and laau kahea) and integrated services, homeless outreach, adult day care, transportation, mental health treatment, substance abuse outreach and treatment, health career training, and health professional training.

The main campus of the WCCHC is located approximately 1 mile from the project site. Located within five miles of the project site are also the Harry and Jeanette Weinberg Dental Clinic, the James and Abigail Campbell Clinic, and the WCCHC Substance Abuse Program, all of which are part of the WCCHC.

St. Francis West Hospital

The 24-acre campus features an acute-care medical center, a medical office plaza, a Clinical Service Center, and a 24-bed.

St. Francis Medical Center-West continues to add new clinical services to better serve the community. Its 24-hour Emergency Room is one of the busiest on Oahu, complete with a helipad to facilitate the rapid transport of

patients and Express Care services for treatment of minor medical emergencies. The hospital has brough infusion services to West Oahu as well as magnetic resonance imaging (MRI) and radiation therapy, thus saving residents the inconvenience of traveling to Honolulu for these services.

The Clinical Service Center is home to Clinical Laboratories of Hawaii, Leeward Radiation Oncology and a satellite clinic of the Rehabilitation Hospital of the Pacific. The facility is located approximately 17 miles from the project site.

11. Social Services

The Waianae Coast is served by a large number of social service and outreach programs. Most notable within the project area are the Child and Family Service located at the Waianae Mall, which offers counseling and child abuse support services; PACT Parents and Children Together, which is focused on family reunification; Honolulu Community Action Program, which provides opportunities for the economically disadvantaged, and several Head Start Program locations for pre-schoolers.

The Queen Liliuokulani Children's Center in Nanakuli serves orphaned children. Also located in the vicinity are the Waianae Community Outreach program that serves the Leeward Coast homeless.

12. Commercial Facilities

Farrington Highway, the main coastal arterial, is lined with commercial businesses. The Waianae Mall, the major shopping center along the Waianae Coast, is located within easy walking distance from the project site. In general, daily commercial facilities are easily accessible from the project site.

E. Probable Impact on the Environment

The proposed project does represents a significant change to existing vacant land condition. The specific site environment will change radically from an undeveloped site to a fully developed site. The proposed project will provide highly desired services in transitional housing, low-cost rental housing, and the various training/educational programs that may also be offered within the complex.

While the changes to the physical built environment are considerable, the benefit of the services provided by the facility will be significant and important to the well being of the community. Viewed from this perspective, the benefits of this project outweigh the physical environmental consequences of the development. The built environment should also be considered an improvement over the existing vacant use. Presently, the vacant site is susceptible to vandalism, brush fire and vector impacts.

F. Adverse Impacts Which Cannot be Avoided

Adverse impacts that cannot be avoided are generally related to short-term construction impacts. These impacts can be minimized by sound construction practices, Best Management Practices (BMPs) adherence to applicable construction regulations as prescribed by the Department of Health, and coordination with applicable County agencies. Primary construction related impacts are discussed in greater detail in the Noise Environment and Air Quality sections.

G. Mitigation Measures

Long-term adverse impacts resulting from the proposed improvements are expected to be minimal or non-existent. Long-term traffic, air and noise impacts are not expected to change significantly after improvements are completed. Short-term construction related noise and air quality impact mitigation measures include general good housekeeping practices and scheduled maintenance to avoid a prolonged construction period. The contractor will be directed to use best management practices (BMP) wherever applicable.

H. Irreversible and Irretrievable Commitment of Resources

Implementation of the proposed project will result in the irreversible and irretrievable commitment of resources in the use of non-recyclable energy expenditure and labor. Materials used for new construction may have salvage value; however, it is unlikely that such efforts will be cost-effective. The expenditure of these resources is offset by gains in construction-related wages, increased tax base, secondary and tertiary spending.

IV. RELATIONSHIP TO PLANS, CODES AND ORDINANCES

A. State of Hawaii

Chapter 205, *Hawaii Revised Statutes* establishes the State land use districts that comprise all lands in the State of Hawaii. These districts are "Urban", "Rural", "Agricultural" and "Conservation". The project site is within the Urban boundary on the State Land Use District Boundary Map. The proposed use is consistent with Urban land uses. This designation has been in effect since 1988.

The *Hawaii State Plan* serves as a long-range guide for the development of the State of Hawaii. In general, the project is consistent with the overall principles of the plan but is particularly applicable to the State Housing Functional Plan that sets policies that provide for housing opportunities for all income groups.

B. City and County of Honolulu

The City and County of Honolulu General Plan specifies long-range objectives and policies to guide future growth on the island. The General Plan contains social environmental, economic, and design objectives and associated policies intended to enhance the welfare and prosperity of Oahu residents. The primary element of the Plan that relates to the project is Section IV, Housing. As the project is implemented, it specifically fulfills Objective A, to provide decent housing to all the people of Oahu at prices they can afford. The proposed action is consistent with the various objectives and policies in the General Plan.

The proposed project is located within the area governed by the *Waianae Sustainable Communities Plan* (WSCP). The project site is located in a area designated Rural Residential within the Rural Community Boundary of the Waianae SCP adopted in 2000. The Open Space Map of the same plan indicates that the project vicinity as a "gathering place". The Public Facilities Map of the WSCP also references the Waianae High and Intermediate Schools.

Further review of the WSCP also shows that the project site is not in a view shed, does not affect coastal areas nor is it considered a coastal development. The project is also not considered a mountain or forest area and will not affect any streams. The Cultural Resources Map indicates that the project site is not considered a preservation area. No agricultural uses are proposed for the site nor does the site hold agricultural significance. Lastly, the project can be considered an affordable rental as

promoted by the report but it is not listed as a "Planned Housing Project" as of July 1997. It should be noted the WSCP is scheduled to be revised in 2006.

Under the City and County of Honolulu Land Use Ordinance (LUO), the project site is zoned R-5 Residential.

The project is located outside of the Special Management Area that generally is located near coastal, stream and wetland areas. The project will not require a Special Management Permit.

C. Required Permits and Approvals

Permit or Approval	Approving Agency
City and County of Honolulu	
Finding of No Significant Impact	Dept. of Community Services
Sewer Connection Permit	Dept. of Environmental Services
Foundation Permit	Dept. of Planning and Permitting
Building Permit	Dept. of Planning and Permitting
Certificate of Occupancy	Dept. of Planning and Permitting
Grading Permit	Dept. of Planning and Permitting
Grubbing Permit	Dept. of Planning and Permitting
Site Development Division Master Application for Sewer Connection Section 201H	Dept. of Planning and Permitting

Other	Reviewing Body
Presentation	Waianae Neighborhood Board 24

V. ALTERNATIVES TO THE PROPOSED ACTION

No other use alternatives beyond the non-action alternative were considered for this project. Non-action was considered and rejected since no benefit to the community would be provided and the mission of the applicant would not be furthered.

Within the scope of proposed improvements, alternative design configurations were considered in the design process however none of the alternatives differed significantly from the proposed plan.

Alternative locations were not considered because no other suitable areas are available within the project area. The applicant has determined that the Leeward Coast has significant need for the facilities proposed.

The existing site as open space does not provide any benefit as a recreation area or other community use, nor does the vacant use represent a highest and best use of the project site.

VI. FINDNGS AND REASONS SUPPORTING DETERMINATION OF FINDING OF NO SIGNIFICANT IMPACT

As stated in Section 11-200-12, EIS Rules, Significance Criteria: in determining whether an action may have a significant effort on the environment, every phase of a proposed action shall be considered. The expected consequences of an action, both primary and secondary, and the cumulative as well as the short-term and long-term effects must be assessed in determining if an action shall have significant effect on the environment. Each of the significance criteria is listed below and is followed by the means of compliance or conflict (if extant).

Findings Supporting Determination

- Involves an irrevocable commitment to the loss or destruction of any natural or cultural resource.

The proposed action will occur within a heavily urbanized environment and will not significantly affect natural resources. The site does not serve as a culturally significant gathering place. Archaeological remains were found onsite however an assessment of these remains did not find them to be significant. Passive preservation was recommended for the identified sites and a monitoring plan has been developed for the project.

- Curtails the range of beneficial uses of the environment.

The proposed project is an urban infill project and provides an appropriate use that will benefit the public and will be environmentally consistent with the surrounding urban area. Beneficial uses of the environment will be expanded by the proposed project by providing needed low-income rental and transitional housing services in a convenient urban location.

- Conflicts with the State's long-term goals or guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The proposed action is consistent with the goals and guidelines expressed in Chapter 344, Hawaii Revised Statutes and NEPA. The proposed action is triggered by the use of County funds. The subject Environmental Assessment has been developed in compliance with the Chapter 343.

- Substantially affects the economic or social welfare of the community or state.

The proposed action will make a positive contribution to the welfare and economy of the State and City by providing desirable and needed low cost rental housing and much need transitional housing opportunities to the State of Hawaii. The facility will also contribute positively to the community through the use of goods and services in the area, through construction and operations related employment, and through secondary and tertiary spending and taxes.

- Substantially affects public health.

The proposed improvements will have a positive impact on public health by providing safe and secure housing to the formerly homeless. This will decrease the homeless population and consequently improve the safety and sanitation of the areas formerly occupied by the homeless. No recreational resources will be impacted by the project, nor will the project increase any undesirable environmental impacts.

- Involves substantial or adverse secondary impacts, such as population changes or effects on public facilities.

The proposed action will increase the population within the immediate area and will increase the demand for public facilities by a relatively small amount. These impacts are consistent with uses of this nature and are not considered adverse impacts. The change in demand for public facilities will be readily met by existing infrastructure and services.

- Involves a substantial degradation of environmental quality.

The proposed action will not degrade environmental quality. Impacts associated with the project, such as traffic impact and air and noise quality have been assessed to be minimal.

- Is individually limited but cumulatively has a considerable effect upon the environment or involves a commitment for larger actions.

The proposed action is not a first phase of, or related to, any larger action. The cumulative effect of the project is disclosed in this document and does not involve any planned future actions that will cumulatively impact the environment.

- Substantially affects rare, threatened or endangered species, or their habitats.

The proposed action will not affect any rare, threatened or endangered species of flora or fauna, nor is it known to be near or adjacent to any known wildlife sanctuaries.

- Detrimentally affect air or water quality or ambient noise levels.

The proposed action will not impact air or water quality. Noise may increase slightly from the increased population count in the area but is still expected to remain similar to the existing levels.

Minimal impacts on air quality and noise are anticipated during construction, but will be limited by normal construction practices and Department of Health construction mitigation standards.

- Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach erosion prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The project will not have any impact on an environmentally sensitive area.

- Substantially affects scenic vistas and viewplanes identified in County or State plans or studies.

The proposed action will not affect any scenic vistas or viewplanes. The project is located in an urban environment and is not located within or near any scenic resource.

- Require substantial energy consumption.

The project will increase electrical energy consumption over the existing use. This increase will be consistent with residential use and will be typical of any urban use.

Finding of No Significant Impact

Based on the above stated criteria, the Department of Community Services has determined that the proposed transitional and rental housing project will not have a significant effect on the environment and that a Finding of No Significant Impact (FONSI) is warranted for the project.

CORRECTION

THE PRECEDING DOCUMENTS(S)

HAS BEEN REPHOTOGRAPHED

TO ASSURE LEGIBILITY

SEE FRAME(S)

IMMEDIATELY FOLLOWING

The proposed action will not affect any rare, threatened or endangered species of flora or fauna, nor is it known to be near or adjacent to any known wildlife sanctuaries.

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Finding of No Significant Impact

Based on the above stated criteria, the Department of Community Services has determined that the proposed transitional and rental housing project will not have a significant effect on the environment and that a Finding of No Significant Impact (FONSI) is warranted for the project.

VII. LIST OF AGENCIES, ORGANIZATIONS AND INDIVIDUALS CONSULTED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT PROCESS

	Response
Federal Agencies	
1. U.S. Army Corps of Engineers	
2. U.S. Department of Housing and Urban Development	
3. U.S. Environmental Protection Agency	
4. U.S. Fish and Wildlife Service	
State of Hawaii Agencies	
1. Dept. of Accounting and General Services, Comptroller	2/26/07
2. Dept. of Agriculture	
3. Dept of Business, Economic Development and Tourism, Office of Planning	
4. Dept of Education	3/23/07
5. Dept of Hawaiian Home Lands	
6. Dept of Health, Clean Water Branch	3/9/07
7. Dept of Health, Noise, Radiation and Air Branch	2/12/07
8. Dept of Land and Natural Resources	2/13/07
9. Dept of Land and Natural Resources Historic Preservation Division	
10. Dept. of Transportation	
11. Land Use Commission	
12. Office of Environmental Quality Control	3/7/07
13. Office of Hawaiian Affairs	3/23/07
14. University of Hawaii, Environmental Center	
15. Waianae Public Library	
City and County of Honolulu Agencies	
1. Board of Water Supply	2/27/07
2. Dept of Community Services	
3. Dept of Design and Construction	3/12/07
4. Dept of Facilities Maintenance	
5. Dept of Environmental Services	
6. Dept of Parks and Recreation	2/16/07
7. Dept of Planning and Permitting	3/23/07
8. Dept of Transportation Services	
9. Honolulu Emergency Services Department	

	Response
10. Honolulu Fire Department	2/23/07
11. Honolulu Police Department	2/14/07
12. Municipal Reference Center	

Community Organizations and Private Agencies

1. No. 24 Waianae Coast Neighborhood Board	
2. Hawaiian Electric Company	3/2/07
3. Hawaiian Telcom	

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

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

(P)1036.7

FEB 2 6 2007

Mr. Keith Ishida
Department of Community Services
City and County of Honolulu
715 South King Street, Suite 311
Honolulu, Hawaii 96813

Dear Mr. Ishida:

Subject: Draft Environmental Assessment for the
Waianae Supportive Housing Project

On July 6, 2006, Governor Linda Lingle signed a proclamation declaring a disaster emergency for the homeless individuals and families living on the beaches, in public parks and elsewhere along the Leeward coast. In response to this emergency, the Department of Human Services and the Department of Accounting and General Services constructed the Pai'olu Kaiāulu homeless shelter on what is known as the Waianae Civic Center site (TMK: 8-5-028:041). The facility is scheduled to open in late February 2007 and will have an impact on your Waianae Supportive Housing Project.

We offer the following:

1. Pai'olu Kaiāulu was constructed under the umbrella of the Governor's emergency proclamation, exempting the project from the HRS Chapter 343 environmental review process. A traffic study, which would normally have been required, was not conducted. Accordingly, the impact of Pai'olu Kaiāulu to Kauio'kalani Place and Farrington Highway is undetermined. We do know that the facility will have a maximum of 300 tenants (men, women and children), and a total of 42 parking spaces.

2. The Archeological Inventory Survey in your draft environmental assessment did not include the Figures and it appears that some of the pages are erroneously numbered or missing.

3. A burial was discovered on the northern corner of the Waianae Civic Center site. Although your Archeological Inventory Survey did not find any burials, we recommend caution during earth disturbance activities since your development is in close proximity to our site and there may be a possibility of uncovering more burials.

Thank you for giving us the opportunity to review the draft environmental assessment for the subject project. If you have any questions, please have your staff call Mr. Lance Maja of the Planning Branch at 586-0483.

Sincerely,

ERNEST Y.W. LAU
Public Works Administrator

LM:vca
c: Taeyong Kim, Environmental Communications, Inc.

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Ernest Y.W. Lau, Public Works Administrator
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Lau:

Thank you for your comments of February 26, 2007 regarding the subject project. In response to your comment, we offer the following:

1. We are aware of the Paiolu Kaiaulu project. We support this project and do not see any conflict with the proposed Waianae Supportive Housing project and feel that both projects will serve the community well. A traffic study was conducted for the Waianae Supportive Housing project prior to the Paiolu Kaiaulu initiative however the general recommendations should remain valid.

2. The archaeological inventory survey appendix will be corrected. Figures from the 1994 study were not available however Section III.D.1 does include separate figures provided by the Bishop Museum.

3. We understand the need for caution during and earthwork on the project site. In the event that any significant cultural artifacts or human remains are uncovered, work will cease and the State Historic Preservation Division will be notified.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1111 BISHOP STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4665

LINDA LINGLE
GOVERNOR

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

March 23, 2007

Mr. Keith Ishida
Department of Community Services
City and County of Honolulu
715 South King Street, Suite 311
Honolulu, Hawaii 96813

Dear Mr. Ishida:

Subject: Draft Environmental Assessment for the Seawinds Apartments, Waianae Supportive Housing Project, TMK 8-5-028: por. 44, Waianae (86/SPR-14)

The Department of Education (DOE) has reviewed the Draft Environmental Assessment (DEA) for the Seawinds Apartments.

We agree that the project's 50 units of transitional and affordable apartments will have an impact on the public schools serving the area. If this project needed to have a change in its land use category or zoning, the DOE would ask for a school contribution to offset the impact of the additional students on the area schools. In this case the land is already urban and correctly zoned, so the DOE has no further comment.

We appreciate this opportunity to comment on the DEA. Should you have any questions, please call Heidi Meeker of the Facilities Development Branch at 733-4862.

Very truly yours,

Patricia Hamamoto
Superintendent

PH:jmb

cc: Randolph Moore, Acting Assistant Superintendent, OBS
Duane Kashiwai, Public Works Administrator, FDB
Mamo Carreira, CAS, Campbell/Kapolei/Waianae Complex Areas
✓Taeyong Kim, Environmental Communications, Inc.

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

[illegible] COMMUNICATIONS, INC.

March 27, 2007

Ms. Patricia Hamamoto, Superintendent
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Ms. Hamamoto:

Thank you for your comment of March 23, 2007 regarding the subject project. In response to your comments, we offer the following:

We understand that your department does not have any comments at this time as zoning for the project site is already in place.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

[illegible] BISHOP STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4663

LINDA LINGLE
GOVERNOR OF HAWAII

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

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

In reply, please refer to:
EMD / CWB

03035PKP.07

March 9, 2007

Mr. Keith Ishida
Department of Community Services
City and County of Honolulu
715 South King Street, Suite 311
Honolulu, Hawaii 96813

Dear Mr. Ishida:

Subject: Draft Environmental Assessment
Waianae Supportive Housing Project

The Department of Health (DOH), Clean Water Branch (CWB), has reviewed the limited information contained in the subject document and offers the following comments:

1. The Army Corps of Engineers should be contacted at (808) 438-9258 for this project. Pursuant to Federal Water Pollution Control Act (commonly known as the "Clean Water Act" (CWA) Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40, Code of Federal Regulations (CFR), Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.

2. In accordance with HAR, Sections 11-55-04 and 11-55-34.05, the Director of Health may require the submittal of an individual permit application or a Notice of Intent (NOI) for general permit coverage authorized under the National Pollutant Discharge Elimination System (NPDES).

   a. An application for an NPDES individual permit is to be submitted at least 180 days before the commencement of the respective activities. The NPDES application forms may also be picked up at our office or downloaded from our website at http://www.hawaii.gov/health/environmental/water/cleanwater/forms/indiv-index.html.

   b. An NOI to be covered by an NPDES general permit is to be submitted at least 30 days before the commencement of the respective activity. A separate NOI is needed for coverage under each NPDES general permit. The NOI forms may be picked up at our office or downloaded from our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html.

      i. Storm water associated with industrial activities, as defined in Title 40, CFR, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi). [HAR, Chapter 11-55, Appendix B]

      ii. Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. An NPDES permit is required before the commencement of the construction activities. [HAR, Chapter 11-55, Appendix C]

      iii. Discharges of treated effluent from leaking underground storage tank remedial activities. [HAR, Chapter 11-55, Appendix D]

      iv. Discharges of once through cooling water less than one (1) million gallons per day. [HAR, Chapter 11-55, Appendix E]

      v. Discharges of hydrotesting water. [HAR, Chapter 11-55, Appendix F]

      vi. Discharges of construction dewatering effluent. [HAR, Chapter 11-55, Appendix G]

      vii. Discharges of treated effluent from petroleum bulk stations and terminals. [HAR, Chapter 11-55, Appendix H]

      viii. Discharges of treated effluent from well drilling activities. [HAR, Chapter 11-55, Appendix I]

      ix. Discharges of treated effluent from recycled water distribution systems. [HAR, Chapter 11-55, Appendix J]

x. Discharges of storm water from a small municipal separate storm sewer system. [HAR, Chapter 11-55, Appendix K]

xi. Discharges of circulation water from decorative ponds or tanks. [HAR, Chapter 11-55, Appendix L]

3. In accordance with HAR, Section 11-55-38, the applicant for an NPDES permit is required to either submit a copy of the new NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the DOH that the project, activity, or site covered by the NOI or application has been or is being reviewed by SHPD. If applicable, please submit a copy of the request for review by SHPD or SHPD's determination letter for the project.

4. Any discharges related to project construction or operation activities, with or without a Section 401 WQC or NPDES permit coverage, shall comply with the applicable State Water Quality Standards as specified in HAR, Chapter 11-54.

The Hawaii Revised Statutes, Subsection 342D-50(a), requires that "[n]o person, including any public body, shall discharge any water pollutants into state waters, or cause or allow any water pollutant to enter state waters except in compliance with this chapter, rules adopted pursuant to this Chapter, or a permit or variance issued by the director."

If you have any questions, please contact the Engineering Section, CWB, at 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

KP:np

c: Mr. Taeyong M. Kim, Environmental Communications, Inc.

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Alec Wong, PE,. Chief
Clean Water Branch
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801-3378

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Wong:

Thank you for your comments of March 9, 2007 regarding the subject project. We have reviewed your comments and thank you for the detailed explanation regarding water quality issues that may affect or be affected by the proposed action. In response to your comments, we offer the following:

1. We will coordinate with the Army Corps of Engineers regarding Section 401 impacts resulting from the project action. Presently, we do not foresee any discharges into the storm drain system which may impact navigable waters.

2. In the event that an individual permit is required for the proposed action, further coordination with your office will commence and an individual permit application will be filed for processing.

3. A General Permit will be required for the project as it is larger than one acre in size. As required by regulations, a copy of the application will be sent to SHPD for review and any determination from SHPD will be forwarded to your office.

4. We understand that any discharges related to project construction or operations shall comply with applicable State Water Quality Standards as specified in HAR, Chapter 11-54.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1188 BISHOP STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4662

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME LEINAALA FUKINO, M.D.
DIRECTOR OF HEALTH

In reply, please refer to:
File: EH/SDWB/AQ

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

February 12, 2007

TO: Mr. Keith Ishida
City and County of Honolulu
Department of Community Services

FROM: Russell S. Takata, Program Manager
Noise, Radiation & Indoor Air Quality Branch

SUBJECT: **Comments to Draft Environmental Assessment for Waianae Supportive Housing Project**

Our comments should be printed as follows:

"Project activities shall comply with the Administrative Rules of the Department of Health:

- Chapter 11-46 Community Noise Control.

Should there be any questions, please contact me at 586-4701.

cc: Taeyong Kim, Environmental Planning Consultant
Environmental Communications, Inc.

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Russell Takata, Program Manager
Noise, Radiation & Indoor Air Quality Branch
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Takata:

Thank you for your comments of February 12, 2007 regarding the subject project. As stated in your comment, the Final EA will be revised to include the statement that the project activities will comply with Chapter 11-46, Community Noise Control.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

[redacted]

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON

ROBERT K. MASUDA
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 13, 2007

Environmental Communications, Inc.
1188 Bishop Street Suite 2210
Honolulu, Hawaii 96813

Attention: Taeyong M. Kim

Gentlemen:

Subject: Waianae Supportive Housing Project, Waianae, Oahu, Tax Map Key: (1) 8-5-28:portion 44

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources has no comment to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Russell Y. Tsuji
Administrator

Cc: Central Files

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Russell Y. Tsuji, Administrator
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Tsuji:

Thank you for your comments of February 13, 2007 regarding the subject project. We understand that your department does not have any comments regarding the proposed project.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1188 BISHOP STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4633

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186
E-mail: oeqc@health.state.hi.us

GENEVIEVE SALMONSON
DIRECTOR

March 7, 2007

Ms. Deborah Kim Morikawa, Director
Department of Community Services
715 S. King Street, Ste. 311
Honolulu, HI 96813

Dear Ms. Morikawa:

Subject: Draft EA for the Waianae Supportive Housing

Thank you for the opportunity to comment on the subject document. OEQC has the following comments.

1. On page 2, please list the HRS 343 EA trigger as use of state lands.
2. Please print the Final EA double-sided.

If you have questions, contact Jeyan Thirugnanam at jeyan.thirugnanam@doh.hawaii.gov.

Sincerely,

Genevieve Salmonson

Genevieve Salmonson
Director

c: Terry Brooks
Taeyong Kim

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawaii 96813

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Ms. Salmonson:

Thank you for your comments of March 7, 2007 regarding the subject project. In response to your comments, we offer the following:

1. Page 2 of the Environmental Assessment has be revised to indicate that the use of State lands is the HRS 343 EA trigger.

2. The Final EA copies will be printed double-sided as requested.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1100 ALAKEA STREET, SUITE 2210 • HONOLULU, HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4662

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD06/2905

March 23, 2007

Taeyong M. Kim
Environmental Communications, Inc.
1188 Bishop Street, Suite 2210
Honolulu, HI 96813

RE: Draft Environmental Assessment for the Proposed Waianae Supportive Housing Project, Waianae, O'ahu, TMK 8-5-28: por. 42.

Dear Taeyong M. Kim,

The Office of Hawaiian Affairs (OHA) is in receipt of your February 14, 2007 submission and offers the following comments:

Our staff has no comment specific to the above-listed proposed project at this time. Thank you for your continued correspondence.

OHA asks that, in accordance with Section 6E-46.6, Hawaii Revised Statutes and Chapter 13-300, Hawaii Administrative Rules, if the project moves forward, and if any significant cultural deposits or human skeletal remains are encountered, work shall stop in the immediate vicinity and the State Historic Preservation Division (SHPD/DLNR) shall be contacted.

Thank you for the opportunity to comment. If you have further questions or concerns, please contact Jesse Yorck, Native Rights Policy Advocate, at (808) 594-0239 or jessey@oha.org.

Aloha,

Clyde W. Nāmu'o
Administrator

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Clyde W. Namuo, Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Namuo:

Thank you for your comments of March 23, 2007 regarding the subject project. In response to your comments, we offer the following:

1. We understand that your department does not have any comments at this time.

2. In the event that any significant cultural deposits or human remains are found during the excavation process, work will stop and the State Historic Preservation Division will be notified.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1188 BISHOP STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4163

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

February 27, 2007

TO: KEITH ISHIDA
DEPARTMENT OF COMMUNITY SERVICES

FROM: KEITH S. SHIDA, PRINCIPAL EXECUTIVE
CUSTOMER CARE DIVISION, BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER DATED FEBRUARY 9, 2007 REGARDING DRAFT ENVIRONMENTAL ASSESSMENT FOR WAIANAE SUPPORTIVE HOUSING PROJECT

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

The existing water system is presently adequate to accommodate the proposed development. However, please be advised that this information is based upon current data and, therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of your building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission and daily storage.

The project is subject to BWS Cross-Connection Control and Backflow Prevention requirements prior to the issuance of the building permit.

The on-site fire protection requirement should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

The construction drawings should be submitted for our review and approval.

If you have any questions, please contact Robert Chun at 748-5440.

cc: Taeyong Kim, Environmental Communications, Inc.

ENVIRONMENTAL COMMUNICATIONS, INC

March 27, 2007

Mr. Keith S. Shida, Principal Executive
Customer Care Division
Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Shida:

Thank you for your comments of February 27, 2007 regarding the subject project. We have reviewed your comments and offer the following:

1. We understand that based on your review of the plans presented to date, the existing water system should adequately serve the proposed project. We also understand that this is based on a preliminary review and ultimately, the availability of water service to the project will be determined when the building permit application is submitted for approval.

2. When water is made available to the project, the developer will be required to pay Water System Facilities Charges as well as provide a compliant BWS Cross-Connection Control and Back Flow Prevention device.

3. Fire protection requirements have been coordinated with the Honolulu Fire Department and will be provided within the project site.

4. We will provide construction drawings to your department for review and approval.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 523-4564 • Fax: (808) 523-4567
Web site: www.honolulu.gov

MUFI HANNEMANN
MAYOR

EUGENE C. LEE, P.E.
DIRECTOR

CRAIG I. NISHIMURA, P.E.
DEPUTY DIRECTOR

March 12, 2007

Mr. Keith Ishida
Department of Community Services
City and County of Honolulu
715 South King Street, Suite 311
Honolulu, Hawaii 96813

Dear Mr. Ishida:

Subject: Draft Environmental Assessment
Waianae Supportive Housing Project

Thank you for giving us the opportunity to comment on the above Draft Environmental Assessment.

The Department of Design and Construction has the following comment:

- The sewer connection application was denied by the Department of Planning and Permitting on March 7, 2006.

Should you have any questions, please contact Jay Hamai of our Wastewater Division, at 768-8750.

Very truly yours,

Eugene C. Lee, P.E.
Director

ECL:lt (195077)

c: Environmental Communications, Inc.
DDC Wastewater Division

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Eugene C. Lee, Director
Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, Hawaii 96813

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Lee:

Thank you for your comments of March 12, 2007 regarding the subject project. In response to your comment, we offer the following:

We understand that the original sewer connection request was rejected by Department of Planning and Permitting on March 7, 2006 due to inadequate capacity at the makai interceptor. Since that time, the project civil engineers have designed a holding tank that will release its contents between 1:00 am and 4:00 am under the advisement of DPP. The tank will have a one and one-half day storage capacity. Plans for this system will be submitted DPP for review as design development of the project proceeds.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1111 BISHOP STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4333

February 16, 2006

TO: DEBORAH MORIKAWA, DIRECTOR
DEPARTMENT OF COMMUNITY SERVICES

ATTENTION: KEITH ISHIDA

FROM: LESTER K. C. CHANG, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
WAIANAE SUPPORTIVE HOUSING PROJECT

Thank you for the opportunity to review and comment on the Draft Environmental Assessment relating to Housing Solutions Inc., Waianae Supportive Housing Project.

The Department of Parks and Recreation has no comment and as the proposed project will not impact any program or facility, you are invited to remove us as a consulted party to the balance of the AES process.

Should you have any questions, please contact Mr. John Reid, Planner, at 692-5454.

LESTER K. C. CHANG
Director

LKCC:mk
(195246)

cc: Mr. Taeyong M. Kim, Environmental Communications, Inc.

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Lester K.C. Chang, Director
Department of Parks and Recreation
Kapolei Hale
1000 Uluohia Street, Suite 309
Honolulu, Hawaii 96707

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Chang:

Thank you for your comments of February 16, 2007 regarding the subject project. We understand that your department does not have any comments as the proposed project will not have any impact on existing programs or facilities.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1110 University Street, Suite 2110, Honolulu, Hawaii 96814 • Tel: 808 528 4661 • Fax: 808 528 4663

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
TELEPHONE: (808) 523-4432 • FAX: (808) 527-6743
DEPT. INTERNET: www.honolulupp.org • INTERNET: www.honolulu.gov

MUFI HANNEMANN
MAYOR

HENRY ENG, FAICP
DIRECTOR

DAVID K. TANOUE
DEPUTY DIRECTOR

2007/ELOG-372(as)

March 23, 2007

MEMORANDUM

TO: DEBORAH MORIKAWA, DIRECTOR
DEPARTMENT OF COMMUNITY SERVICES

ATTENTION: KEITH ISHIDA

FROM: HENRY ENG, FAICP, DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
WAIANAE SUPPORTIVE HOUSING PROJECT
TAX MAP KEY 8-5-28: 44

Thank you for the opportunity to review and comment on the draft environmental assessment (EA) on the above site.

The following are our comments:

Planning Division

1. In Section II.G. 201G, Hawaii Revised Statutes Approvals, the discussion should make clear whether the site received previous exemptions and the circumstances of those approvals. The proposed project is consistent with the long-range vision for the Waianae Sustainable Communities Plan (SCP) area.

2. Section IV.B of the DEA should be revised to include a discussion regarding how the proposed project conforms to the objectives and policies of the General Plan.

   In Section IV.B. Paragraph 1, the Open Space Map schematically indicates the location of Gathering Places but does not pinpoint the Waianae Neighborhood Community Center as one.

3. The Waianae SCP section of the project summary should be revised as follows:

   "The project site is located in an area designated Rural Residential within the Rural Community Boundary of the Waianae SCP adopted in 2000."

4. The site is not located in the Waianae Country Town.

5. The term "201G" should be replaced with "201H." Please add 201H approval to the list of permits needed as shown on Pages 14 and 45.

Site Development Division (Civil Engineering Branch)

1. Page 14 (Necessary Permits and Approvals):

   a) The last item is vague and needs to be clarified. It appears that the applicant meant to say "Site Development Division Master Application Form"; however, it is just that, i.e., a master application form. Which permit(s) and/or approval(s) listed on the form will the project require?

   b) Include Grubbing Permit to the list.

2. Page 38 (Stormwater): Where is the municipal storm drain system located? A drainage report may be required at a later date. Also, the project may need to address storm water quality requirements in accordance with Section II of the "Rules Relating to Storm Drainage Standards."

Site Development Division (Traffic Review Branch)

Kauiokalani Place, which will be providing access to this housing project, is under the ownership of the State Housing Finance Development Corporation or their successor agency. Farrington Highway is under the jurisdiction of the State Department of Transportation (SDOT). The plans for this project, including the traffic impact analysis report (TIAR) should be sent to SDOT for review, since the study identifies major modifications to Farrington Highway, in support of this development. It also appears that the SDOT was not one of the agencies consulted during this review process.

Site Development Division (Subdivision Branch)

The project site was subdivided under Subdivision File No. 1993/SUB-303. It is not clear whether the exemption is still needed from subdivision requirements. The applicant should clarify whether the intention is to further subdivide the site.

Site Development Division (Wastewater Branch)

Our Wastewater Branch has no objections to the proposal. The holding tank system will be utilized to time sewage disposal into the municipal sewer system during low flow periods.

If you have any questions, please contact Adrian Siu-Li of our staff at 527-5072.

HE:nt

cc: Taeyong M. Kim

Doc 525107

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Henry Eng, FAICP, Director
Department of Planning and Permitting
650 South King Street, 7th Floor
Honolulu, Hawaii 96813

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Mr. Eng:

Thank you for your comments of March 23, 2007 regarding the subject project. We have reviewed your comments and offer the following:

Planning Division

1. Previous exemptions under Section 201G were granted for the project in April 1992 as part of an initiative to provide affordable housing. The current list of modifications under Section 201H largely reflect the original requests but are also in compliance with current development requirements. This will be stated in the Final EA. We understand that the project is in compliance with the Waianae Sustainable Communities Plan area.

2. A discussion regarding compliance with the objectives and policies of the General Plan will be included in the FEA. We understand that the Open Space Map does not specifically identify the Waianae Neighborhood Community Center therefore the Final EA will be revised to state that the project area is designated as a "gathering place".

3. The Waianae SCP section of the project summary will be revised as requested.

4. The reference to the Waianae Country Town will be deleted. Thank you for this correction.

5. The term 201G will be replaced by 201H and the 201H approval will be included in the list of permits required.

Site Development Division (Civil Engineering Branch)

1. The item in question will be deleted, as the specific approvals required will be listed in that section. Grubbing Permit will be added to the list of required permits.

2. Storm drains are located on both sides of the project main entrance. We understand that a drainage report may be required at a later date. The project civil engineers will be notified and asked to coordinate this matter with your office.

1100 BISHOP STREET, SUITE 2210, HONOLULU, HAWAII 96813 • TEL 808 521-2521 • FAX 808 521-2522

Site Development Division (Traffic Review Branch)
A copy of the Final Environmental Assessment as well as a copy of the traffic impact analysis report will be sent to the State Department of Transportation for their review and comment.

Site Development Division (Subdivision Branch)

The applicant does not have any intent to conduct any subdivision of the site.

Site Development Division (Wastewater Branch)

We confirm that a holding tank system will be used to time sewage disposal into the municipal sewer system during low flow periods.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

MUFI HANNEMANN
MAYOR

KENNETH G. SILVA
FIRE CHIEF

ALVIN K. TOMITA
DEPUTY FIRE CHIEF

February 23, 2007

TO: DEBBIE KIM MORIKAWA, DIRECTOR
DEPARTMENT OF COMMUNITY SERVICES

ATTN: KEITH ISHIDA, BRANCH CHIEF
COMMUNITY BASED DEVELOPMENT DIVISION

FROM: KENNETH G. SILVA, FIRE CHIEF

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
WAIANAE SUPPORTIVE HOUSING PROJECT
WAIANAE, OAHU, HAWAII
TAX MAP KEY: 8-5-028: 044 PORTION

In response to a letter from Environmental Communications, Inc. dated February 9, 2007, regarding the above-mentioned subject, the Honolulu Fire Department (HFD) reviewed the material provided and has no objections to the proposed project.

However, the HFD requires that the following be complied with:

1. Provide a fire apparatus access road for every facility, building, or portion of a building hereafter constructed or moved into or within the jurisdiction when any portion of the facility or any portion of an exterior wall of the first story of the building is located more than 150 feet (45 720 mm) from fire apparatus access as measured by an approved route around the exterior of the building or facility. (1997 Uniform Fire Code, Section 902.2.1)

2. Provide a water supply, approved by the county, capable of supplying the required fire flow for fire protection to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed or moved into or within the county.

On-site fire hydrants and mains capable of supplying the required fire flow shall be provided when any portion of the facility or building is in excess of 150 feet (45 720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building. (1997 Uniform Fire Code, Section 903.2, as amended.)

3. Submit civil and construction drawings to the HFD for review and approval.

Should you have any questions, please call Battalion Chief Lloyd Rogers of our Fire Prevention Bureau at 723-7151.

Sincerely,

KENNETH G. SILVA
Fire Chief

KGS/SY:bh

cc: Taeyong M. Kim, Environmental Communications, Inc. ✓

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Kenneth G. Silva, Fire Chief
Honolulu Fire Department
636 South Street
Honolulu, Hawaii 96810

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Chief Silva:

Thank you for your comments of February 23, 2007 regarding the subject project. In response to your comment, we offer the following:

1. Fire equipment lanes have been designed into the project. Separate access lanes are provided for both components of the project site as specified in the 1997 Uniform Fire Code.

2. Compliant fire hydrants are provide within the project site near the laundry facility of the studio unit complex, and near the Community Center in rental housing area.

3. Civil engineering and construction drawings will be submitted to HFD for review and approval as requested.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1151 PUNCHBOWL STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4669

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

MUFI HANNEMANN
MAYOR

BOISSE P. CORREA
CHIEF

GLEN R. KAJIYAMA
PAUL D. PUTZULU
DEPUTY CHIEFS

OUR REFERENCE BS-DK

February 14, 2007

TO: DEBBIE KIM MORIKAWA, DIRECTOR
DEPARTMENT OF COMMUNITY SERVICES

ATTENTION: KEITH ISHIDA, PLANNER

FROM: BOISSE P. CORREA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR THE WAIANAE SUPPORTIVE HOUSING PROJECT

This is in response to a letter (dated February 9, 2007) from Environmental Communications, Inc., regarding the subject above.

This project should have no significant impact on the facilities or operations of the Honolulu Police Department.

If there are any questions, please call Major Michael Moses of District 8 at 692-4253 or Mr. Brandon Stone of the Executive Office at 529-3644.

BOISSE P. CORREA
Chief of Police

By
for JOHN P. KERR
Assistant Chief of Police
Support Services Bureau

cc: Mr. Taeyong M. Kim
Environmental Communications, Inc.

Serving and Protecting With Aloha

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Mr. Boisse P. Correa, Chief of Police
Honolulu Police Department
801 South Beretania Street
Honolulu, Hawaii 96813

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Chief Correa:

Thank you for your comments of February 14, 2007 regarding the subject project. We understand that your department does not have any comments as the proposed project will not have any impact on existing operations or facilities.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1188 BISHOP STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4665

Hawaiian Telcom

March 2, 2007

Mr. Taeyong Kim
Environmental Communications, Inc.
1188 Bishop Street, Suite 2210
Honolulu, Hawaii 96813

Dear Mr. Kim:

Subject: Draft Environmental Assessment Waianae Supportive Housing Project

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the Waianae Supportive Housing project.

Hawaiian Telcom, Inc. has underground facilities within the proposed project area. Further review is required by Hawaiian Telcom, Inc. during the design stages of the project to determine if there will be any impact to these facilities.

If you have any questions or require assistance in the future on this project, please call Gary Sumida at 840-1442.

Sincerely,

Jill Z. Lee
Section Manager
Outside Plant Engineering

1177 Bishop Street • Honolulu • HI 96813

ENVIRONMENTAL COMMUNICATIONS, INC.

March 27, 2007

Ms. Jill Z. Lee, Section Manager
Outside Plant Engineering
Hawaiian Telcom
P.O. Box 2200
Honolulu, Hawaii 96841

Subject: Waianae Supportive Housing
Draft Environmental Assessment

Dear Ms. Lee:

Thank you for your comment of March 2, 2007 regarding the subject project. In response to your comment, we offer the following:

We understand that Hawaiian Telcom has underground facilities in the project vicinity. We will coordinate with your office as plans for the project proceed to ensure that there will be no impact on existing facilities.

If you have any questions or comments, please call at 528-4661. We appreciate your participation in the EA review process.

Sincerely,

Taeyong M. Kim, Principal
Environmental Communications, Inc.

1188 BISHOP STREET SUITE 2210 HONOLULU HAWAII 96813 • TEL 808 528 4661 • FAX 808 528 4663

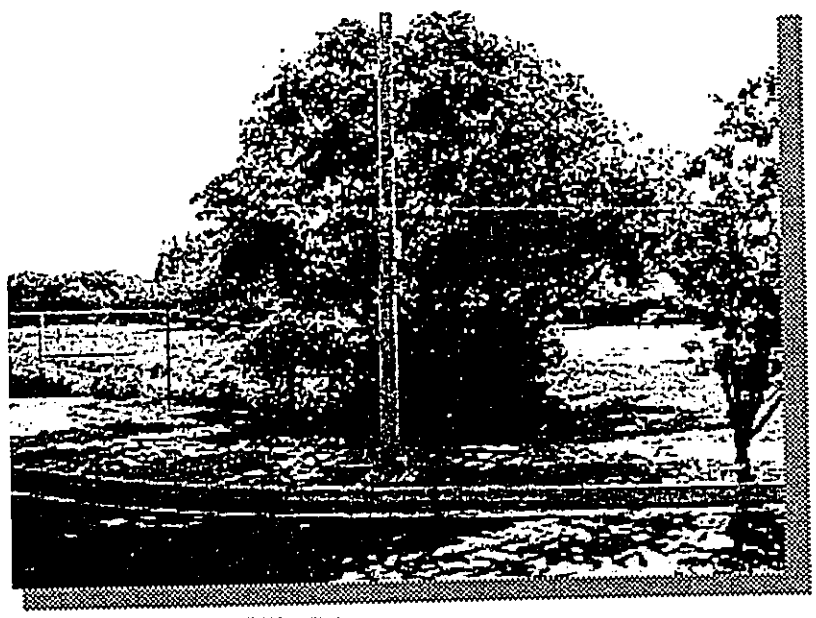
APPENDIX A
SITE PHOTOGRAPHS

View mauka from WMCC parking lot

View of Civic Center Site from WMCC parrking lot

Mauka view of Kauiokalani Place and project site

HSI Waianae Supportive Housing Project



View of boundary between project site and WMCC

Typical lot vegetation

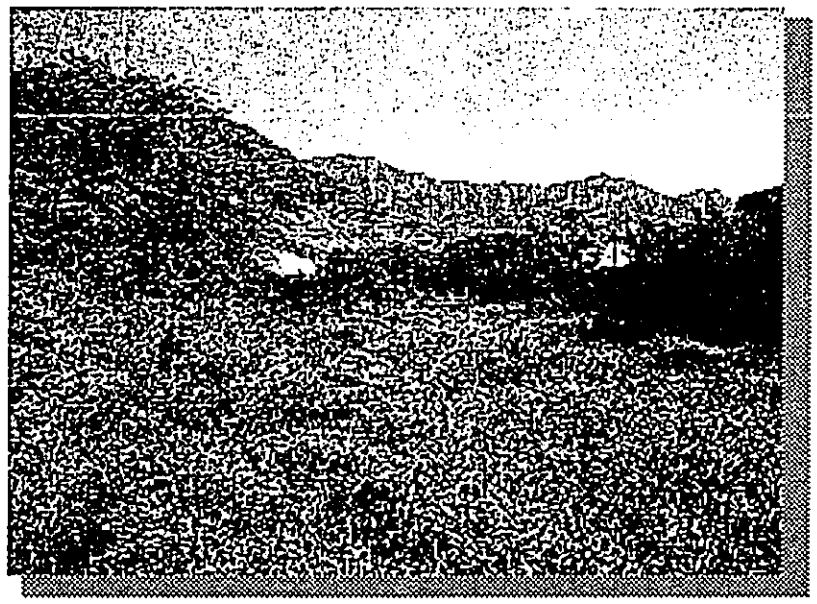
View of mauka boundary

HSI Waianae Supportive Housing Project

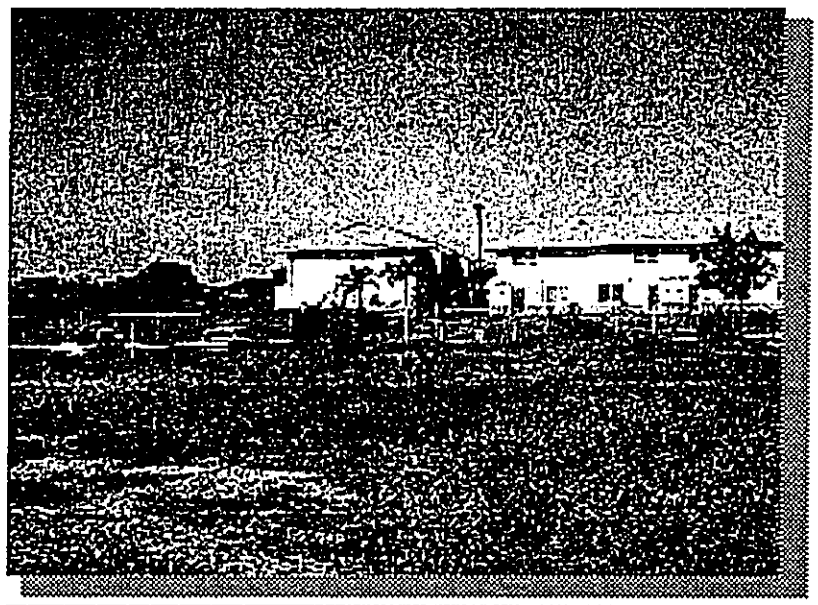
Makai view along Kauiokalani Place

Typical lot vegetation

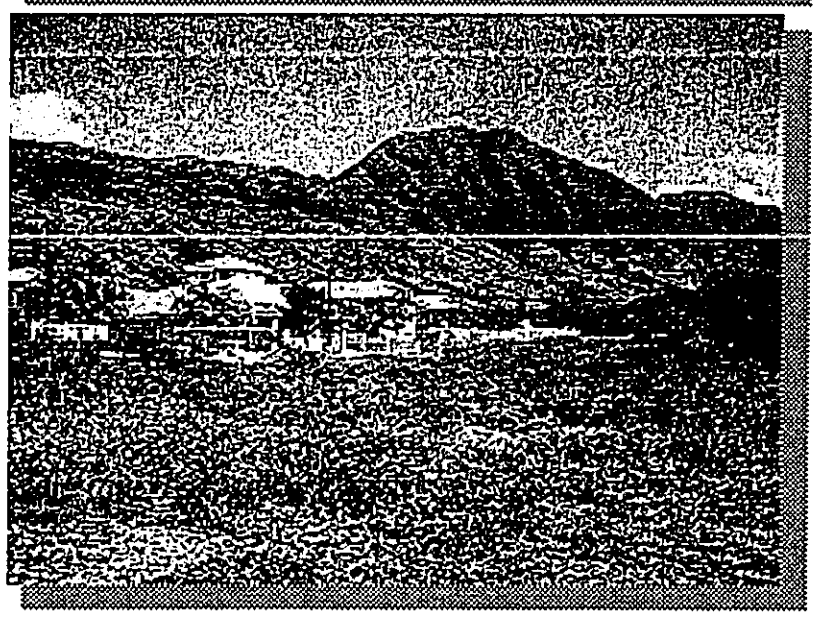
Typical lot vegetation



Mauka view from mid-site



View towards Makaha



Mauka view

HSI Waianae Supportive Housing Project

APPENDIX B
FISH AND WILDLIFE SERVICE LETTER

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawai'i 96850

In Reply Refer To:
1-2-2006-TA-441

JUN 14 2006

Taeyong M. Kim
Principal Planner
Environmental Communications, Inc.
1188 Bishop Street, Suite 2210
Honolulu, Hawai'i 96813

Dear Mr. Kim:

Thank you for your letter dated June 8, 2006, requesting a list of threatened and endangered species that may occur in the vicinity of the proposed urban infill project in Wai'an'ae on the island of O'ahu. We received your letter on June 9, 2006. The proposed urban infill project will occur near Wai'ana'e High School at tax map key 8-5-028-044 and will be funded by Community Development Block Grants administered by the City and County of Honolulu, Department of Community Services.

We reviewed the information you provided and pertinent information in our files, including data compiled by the Hawai'i Biodiversity and Mapping Program. To the best of our knowledge, no federally listed or proposed threatened or endangered species or candidate species, or proposed or designated critical habitat occur on or near the proposed project site.

We appreciate your efforts to conserve endangered species. If you have questions, please contact Assistant Field Supervisor Gina Shultz (phone: 808/792-9400; fax: 808/792-9581).

Sincerely,

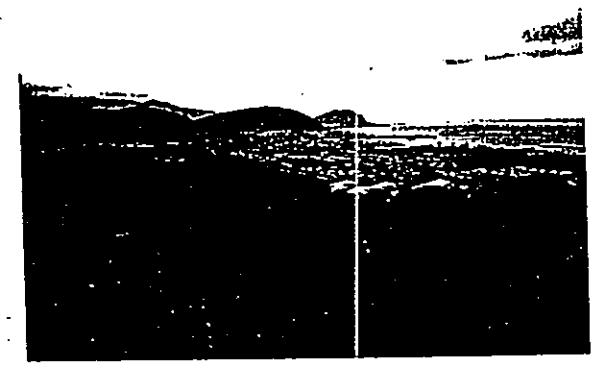
Gina M Shultz

for Patrick Leonard
Field Supervisor

APPENDIX C
ARCHAEOLOGICAL SURVEY AND MITIGATION PLAN

Proj 491

AN ARCHAEOLOGICAL INVENTORY SURVEY AND MITIGATION PLAN OF A SEVEN ACRE PARCEL (TMK: 8-5-28: POR.42) IN WAI'ANAE KAI *AHUPUA'A*, WAI'ANAE DISTRICT, O'AHU ISLAND, HAWAI'I



Prepared for
Franklin Wong and Associates Limited
733 Bishop St.
Suite 1740
Honolulu, HI 96813

Anthropology Department
Bishop Museum
Honolulu, HI 96817

MS #012694
Project #491

AN ARCHAEOLOGICAL INVENTORY SURVEY AND MITIGATION PLAN OF A SEVEN ACRE PARCEL (TMK: 8-5-28: POR. 42) IN WAI'ANAE KAI *AHUPUA'A*, WAI'ANAE DISTRICT, O'AHU ISLAND, HAWAI'I

Prepared by

Krista Flood, B.A.
Paul Christiaan Klieger, Ph.D.
Susan A. Lebo, Ph.D.
Boyd Dixon, Ph.D.
Stephan D. Clark, B.S.
Scot Parry, B.A.

Appendix A: Alan Ziegler, Ph.D.

Prepared for

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January 1994

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Bishop Museum
Honolulu, HI 96817

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ACKNOWLEDGMENTS

We would like to express our gratitude to the many people who contributed to this project and the report. Our thanks and appreciation are extended to Mr. Franklin Wong for his patience and understanding, and cooperation through the duration of this project. Special thanks also go to Mr. Mitsuo Shito, Mr. Ed Morimoto, and Mr. Leonard Paresa Jr., of the State of Hawaii Housing Authority for providing the opportunity to conduct the investigations in Wai'anae.

We would like to express gratitude to Ms. Elaine Jourdane and Dr. Tom Dye of the State Historic Preservation Division (SHPD), Department of Land and Natural Resources (DLNR), for providing excellent advice and feedback during the field inspection of the archaeological inventory survey.

From the Anthropology Department, Bishop Museum, many people contributed their time and effort to complete this report. During the revisions of this report, Steve Clark contributed invaluable guidance and expertise. Boyd Dixon provided invaluable guidance and wrote the Previous Archaeology, Settlement Pattern, Discussion and Conclusion sections of this report. The Bishop Museum field crew, Dino Cleveland and Charlie Ogata worked long, hot hours and put much effort into the field excavations. Paul Klieger and Scot Parry researched and wrote the historical section. Lonnie Somer gave a constructive review of the historical section of the report and commented on osteological materials, and Sara Collins examined the bone materials considered to be human. In the lab, the following personnel worked hard to complete analysis of cultural materials: Angie Steiner-Horton, Jack Morin, Bianca and Don Gaspar, Leonard and Warren Gaspar. Dr. Yosihiko Sinoto provided his expertise concerning the bone fishhook materials.

Nathan Kagihara photographed the artifacts. Susan Lebo analyzed the post-Contact artifacts with deliberation on very short notice. Sean Shiraishi produced the data tables. Brad Evans and Lora Crail made field maps and located features with the theodolite, and also drafted all the figures for this report. Priscilla Billig and Grace Valiente-Sacramento produced the final draft of this report.

Dr. Alan Ziegler analyzed the bone remains collected during survey and excavations and provided insights that come with his experience and expertise in faunal identification and interpretations.

ABSTRACT

This report presents the findings of an archaeological inventory survey of a Wai'anae parcel (TMK: 8-5-28: Por. 42) located in Wai'anae Kai *ahupua'a*, Wai'anae District, O'ahu, conducted by the Anthropology Department, Bishop Museum under contract to Franklin Wong and Associates, Limited. The archaeological features recorded were designated under State Site 50-80-07-2474 (Bishop Museum Site 50-Oa-C3-34).

A total of 24 archaeological features were recorded, mapped, and described. These features included a core-filled wall, an historical artifact scatter, a rubbish mound, an L-shaped, boulder slab alignment, a low platform, a small terrace, four modified sinkholes, 14 unmodified sinkholes.

Eleven test units were excavated in 10 features exposing Hawaiian subsurface features and cultural deposits, as well as possible pre-human extinct bird bone materials. Four sinkholes yielded pre-Contact, indigenous cultural material, in the form of lithics, a bone fishhook fragment, and faunal and floral remains. The excavations also yielded an assortment of historic artifacts, a rubbish dump, and midden deposits dating from the mid-nineteenth to the early twentieth century.

Evidence suggests the site area may have been utilized as a sugar or railroad camp. Small quantities of indigenous artifacts recovered throughout the site area also indicates traditional habitation which appears to directly overlie much of the extinct avifauna. Analysis of the extinct bird bone recovered from the sinkholes suggests pre-human extinction, which may contribute to our understanding of the relationship of human interception and predation to the depletion of the endemic bird population in the Hawaiian Islands.

INTRODUCTION

Under contract to Franklin Wong and Associates, Limited, the Anthropology Department, Bishop Museum, conducted an archaeological inventory survey between 12 and 21 July 1993 on a seven-acre parcel of land. This property (TMK: 8-5-28: por. 42) is scheduled for a low-income housing development on three of the seven acres. These investigations were conducted to satisfy requirements set forth by the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR).

PROJECT AREA DESCRIPTION

The project area is located in the central coastal zone of Wai'anae Valley, on the Leeward coast of O'ahu, north of Pōka'ī Bay, in Wai'anae Kai *ahupua'a* (ancient Hawaiian land division), Wai'anae District, Island of O'ahu (Figures 1 and 2). This property is a roughly rectangular-shaped parcel and is situated approximately 1/3 mile *mauka* (inland) of the shoreline, and less than 1/4 mile from Kaupuni Stream. The area is presently bound on the west by the asphalt parking lot of the Waianae Community Center, on the east by a chain link fence of a housing development, on the south by the unnamed asphalt road, and on the north by housing development and another chain link fence. A series of bulldozed roads is present just inside the periphery of the project area and through the center of the project area (Figure 3).

Environment

The project area rests on karstic topography with moderate to heavy vegetation cover. The topography is similar to Barber's Point, which was described in detail by Allen (in prep.), consisting of exposed karstic flats of coral limestone with sinkholes, depressions, and coral cobbles covering approximately 60% of the ground surface. According to recent survey maps of this parcel, elevation ranges from approximately 3 to 13 feet above mean sea level (amsl) in the project area.

Geology

The project area is situated on the karstic flats of an emerged limestone reef (Stearns and Vaksvik 1935) and is relatively flat with frequent sinkholes, depressions, and coral cobble concentrations. The reef rock at Barber's Point which is much the same as in the Wai'anae project area, is generally described as "limestone" in the literature, but is largely composed of coral reef, rather than sedimentary rock (cf. Prinz et al. 1978:339). The formation is described as reef limestone by Stearns and Vaksvik (1935:169) and Wentworth (1951:43).

Soils

According to Foote et al. (1972:29), the property is classified as a coral rock outcrop of exposed emerged reef. The soil in the project area is classified as Ewa silty clay loam, moderately shallow on 2 - 6 percent slopes. This soil has a profile similar to Ewa silty clay loam on 3 - 6 percent slopes, except that the depth of coral limestone is 20 - 50 inches (ibid. 1972:30, Sheet 36).

Climate

The project area lies in a belt of warm, dry northeasterly trade winds which persist throughout much of the year. Due to the Wai'anae mountain range to the east, the region is also semi-arid (Foote et al. 1972), and rainfall ranges from 3 to 5 inches per annum (Armstrong 1983:62).

Flora

Kiawe (Prosopis pallida) is the dominant vegetation in project area. Other identified plants present in the parcel include *koa haole* (*Leucaena leucocephala*), *noni* (*Morinda citrifolia*), currant tomato (*Lycopersicon pimpinellifolium*), Chinese or Malaysian banyan (*Ficus microcarpa*), ti (*Cordyline terminalis*), octopus tree (*Schefflera actinophylla*), aspera (*Achyranthes aspera*), Prickly pear cactus (*Opuntia megacantha*), sourbrush (*Pluchea carolinensis*), coral berry (*Rivina humilis*), klu (*Acacia farnesiana*), fountain grass

(*Pennisetum setaceum*), *pili* grass (*Heteropogon contortus*), aloe (*Aloe barbadensis*), and finger grass (*Chloris* spp.).

Fauna

Faunal species identified included the small Indian mongoose (*Herpestes auropunctatus*), birds, and unidentified geckos and skinks (Tomich 1986). All of the birds seen were introduced species (Munro 1982), including the red-crested cardinal (*Paroaria culculita*) also known as the Brazilian cardinal, shama thrush *(Copsychus malabaricus*), red vented bulbul (*Pycnonotus cafer*), English (common house) sparrow (*Passer domesticus*).

PREVIOUS ARCHAEOLOGY

Early archaeological research in the *ahupua'a* of Wai'anae focused primarily on known sites of religious significance (Thrum 1907; McAllister 1933), the valley having been the seat of at least eight named *heiau* (temple) and one *pu'uhonua* (place of refuge). Only minimal attention was given to other site types (Sterling and Summers 1978) such as Puehu Fishpond and a few house clusters located further inland. Over the past 25 years, the focus of archaeological work has shifted to that motivated by construction-related development in the valley. Table 1 summarizes previous archaeological work in Wai'anae *ahupua'a*, and Figure 4 shows the location of many of these studies on the U.S.G.S. Wai'anae quadrangle map. This development has consisted of three major activities located in three basic environmental zones: recreation/coastal areas, residential/valley floor, and water management/valley slopes. As these three zones coincide roughly with traditional land use areas, the following discussion will follow a *makai* (seaward) to *mauka* trajectory.

Coast

Native Hawaiian adaptation to the Wai'anae coast has been documented from as early as the A.D. 1200 - 1300s, by radiocarbon dating of domestic refuse (Hammatt et al. 1985) and *imu*, or earth ovens, found under dune sands (Riford 1984). Such an early date for

Table 1
Previous Archaeology of Wai'anae *Ahupua'a*

AUTHOR	TYPE	LOCATION	DATE
Thrum	Reconnaissance	All the valley	1907
McAllister	"	"	1933
Chapman	"	Valley Floor	1967
Sinoto	Survey	"	1975b
Sinoto	Reconnaissance	Coast	1975a
Sterling and Summers	"	All the valley	1978
Hommon	"	Valley Slopes	1978
Sinoto	"	"	1978,1979
Tao	Data Recovery	Coast	1979
Yent & Griffin	Reconnaissance	Valley Slopes	1979
Ahlo	"	"	1980
Bordner/EISC	"	"	1981,1982
Ota	"	"	1981
Rosendahl	Survey	Valley Floor	1981
Chiniago	Reconnaissance	Valley Slopes	1982
Neller	"	"	1982
Riford	Data Recovery	Coast	1984
Hammatt et al.	"	"	1985
"	"	Valley Slopes	1987
Shapiro and Rosendahl	Survey	Valley Floor	1988
SRSC	Reconnaissance	Valley Slopes	1988,1989
Masse	"	Valley Floor	1989
Hammatt et al.	Data Recovery	Coast	1990
Denham et al.	Survey	Coast	1992

residential use of this portion of the O'ahu coast should not be unexpected, as possible freshwater marsh deposits nearby were dated to the second century B.C. (Riford 1984), indicating the area presented a highly productive marine ecotone to early Polynesian settlers (Kirch 1985). Remains of now-extinct aquatic and terrestrial bird species found in limestone sinkholes from the similar karstic geological setting surrounding Barber's Point (Davis in prep; Miller 1993) suggest avian resources may have been more plentiful as well.

In addition to the exploitation of deep-water and littoral resources on the Wai'anae coast, the Puehu Fishpond produced freshwater mullet for which the *ahupua'a* was presumably named (Pukui et al. 1974). While possible pond sediments may have been revealed beneath recent military disturbances (Riford 1984), the full extent of this structure and the dating of its construction have yet to be determined archaeologically (Hammatt et al. 1990; Denham et al. 1992). Remains of the Keaupuni Heiau once located nearby (McAllister 1933), are even more elusive.

Ritual and residential use of Kū'īlioloa Heiau and the surrounding vicinity on Kāne'ilio Point is also indicated by archaeological research (Tao 1979). Dating of this occupation to at least the sixteenth century A.D. based upon analysis of volcanic glass hydration rinds may be technologically questionable, but this general time period for use of the *heiau* falls well within the range of possibility. The sands surrounding Pōka'ī Bay were also used throughout pre-Contact and proto-historic times as Native Hawaiian burial grounds, the remains of numerous individuals being exposed during construction of military recreational facilities (Riford 1984; Hammatt et al. 1985).

Limestone sinks and possible late pre-Contact to early historic period architectural remains have also been noted on the surface of the raised reef just *mauka* of the coastline (Sinoto 1975a), immediately across Farrington Highway from the present project area. Various shaped enclosures and a roughly paved platform suggested temporary habitation of this area for fishing or perhaps animal husbandry. The remains of a railroad berm also was noted, although the rails and ties were not present.

Valley Floor

A great deal of evidence for occupation of the valley floor has been destroyed during post-Contact period sugar cane production, ranching, and more recent residential growth of the community of Wai'anae, judging from the remains recovered during the past 25 years. According to early explorers' accounts (Vancouver 1801), the village of Wai'anae was located behind the sand dunes and Puehu Fishpond at the mouth of Kaupuni Stream, presumably out of range of the south swells during the Kona season. Some of the domestic refuse previously noted under these dunes (Riford 1984; Hammatt et al. 1985, 1990) is most likely the residue from this occupation. Individuals found buried in the same locale may well have been residents of the village, too. Several *heiau* including Kalamaluna, Kāne, Kahoali'i, Malaihakoa, and Kikahi were remembered as being located behind the village (McAllister 1933), but were not recognizable by the early twentieth century.

Surface survey and excavations in the Hawaiian Homestead residential development of Waianae Kai (Rosendahl and Rosendahl 1973; Rosendahl and Shapiro 1988) revealed evidence of pre-Contact habitation in close proximity to post-Contact period agricultural remains. These stone clearing piles, dams, ditches, and terrace walls were most likely the result of the modification of natural slopes and drainages for sugar cane production. Radiocarbon dating of gley-like clay deposits from possible taro cultivation, however, spanned a period from approximately A.D. 1170 to 1510, indicating that agricultural production along the north side of the valley may have begun at least as early as coastal adaptations, if not earlier.

Archaeological reconnaissance along the south side of the valley revealed considerably fewer remains (Rosendahl 1981; Masse 1989), being restricted to terrace walls, an associated stone paving, and a partially walled enclosure along the banks of Kaupuni Stream. These features were interpreted as being the result of early historic period agricultural activities in the area, in the absence of any subsurface excavations. The location of a possible *heiau* was field checked in this vicinity (Sinoto 1975b), but the walled enclosure in question was determined through limited testing to be a pre-Contact habitation structure. The surface remains from a probable *poi* pounder manufacturing workshop were also reported

downstream (Chapman 1967), but the future of the 24 pounders and the site itself was questionable at that time.

Valley Slopes

The upper slopes surrounding the north end of the Wai'anae Valley were noted historically for their agricultural productivity (Handy 1940; Handy and Handy 1972), and in particular, taro cultivation. This was made possible by the abundance of natural springs to the 1,500 fasl elevation, which feed the Kawiwi and Kaupuni Streams. Archaeological research in this vicinity during the past 25 years has been motivated primarily by the tapping of these aquifers for increased modern water consumption on the leeward coast.

In the *makai* end of the valley, one such area was located immediately downslope from Kamaile Heiau at the end of Kamaile'unu Ridge (Hommon 1978). Here, lush vegetation still surrounds the remains of post- and perhaps pre-Contact period retaining walls, ditches, and terracing which have been badly damaged by modern disturbances (P. Klieger and S. Clark, personal communication 1993). At the same approximate elevation (200 fasl) farther *mauka*, a small complex of terraces and stone clearing mounds was found associated with two U-shaped habitation structures (Ahlo 1980; Hammatt et al. 1987). Radiocarbon dating of charcoal from a firehearth within one of these structures yielded a date which indicates a proto-historic occupation of this area. Farther upslope (Yent and Griffin 1979), two stone walls and a small complex of platforms and retaining walls were noted on the surface, but no chronological or functional information was collected.

At the *mauka* end of the valley around the headwaters of the Kānewai Stream, numerous abandoned *lo'i*, or taro terraces (Neller 1982), and possible *kuleana* (traditional Hawaiian property boundary) or ranching period stone walls (Ota 1981) were noted to the 1,600 fasl elevation. Around the headwaters of the Hiu and Kūmaipō Streams to the west, more terraces, long walls, stone lined *'auwai* (irrigation ditches), and habitation debris were noted on the surface (Sinoto 1978, 1979; Bordner 1981; Environment Impact Study Corporation [EISC] 1982; Chiniago 1982). One site in particular, number 2951 (Social Research Systems Co-op [SRSC] 1988), consisted of a complex of agricultural modifications

and substantial walled enclosures which were interpreted as a possible residential area associated with the Pu'u Kawiwi *pu'uhonua* on the ridgetop above. Additional remains downslope (SRSC 1989) may also be part of the "house sites" recorded earlier in the century (McAllister 1933), in the vicinity of Punanaula Heiau.

Settlement Pattern Synthesis

A synthesis of previous archaeological research in the *ahupua'a* of Wai'anae reveals a Native Hawaiian settlement pattern which was perhaps most similar to that recorded in the Mākaha Valley located immediately north (Green 1980), but with a few important differences. Coastal settlement appears to have begun around A.D. 1100 in both areas, although the earliest dated sites in Mākaha come from temporary shelters associated with extensive dryland agriculture (Kirch 1985:118), not coastal dunes. Equally early dates in Wai'anae were also obtained from possible taro *lo'i* on the valley floor, perhaps indicating a level of socio-political organization not associated with cultural developments in Mākaha until several centuries later.

Inland portions of both valleys were then put under increasing agricultural production by the fifteenth to sixteenth centuries A.D., during which time many of the stream heads were tapped for *'auwai* feeding a complex system of downstream modifications and constructions. Radiocarbon dating of upland sites in Wai'anae suggests that this trend continued into the early post-Contact period, as well. Evidence of the dryland cultivation of sweet potato is present in Wai'anae, but does not appear to have been as extensive in scale as in Mākaha Valley, although post-Contact period sugar cane production has undoubtedly destroyed much of the prime planting areas.

The construction of the *lono* class Kāne'ākī Heiau in Mākaha (Ladd 1973), which was later modified into a *heiau luakini* by A.D. 1650, suggests the growing influence of neighboring *ali'i* (chiefs) within the larger O'ahu island polity in the late pre-Contact period. If such an hypothesis is correct, then the presence of at least two *heiau* located on the coast, six on the valley floor, and two in the surrounding hillsides of the Wai'anae Valley would seem to indicate an even higher order of prominence in the hierarchy of Native Hawaiian

chieftainship. The contemporaneity of these religious structures can be debated, however, as chronological and functional data are sadly lacking.

While access to fresh water and arable land appears to be the dominant factor dictating early pre-Contact settlement in the Wai'anae Valley, intra- and interisland conflict may well be one key for understanding later settlement pattern shifts, even into the early Contact period. Struggles between O'ahu warriors and Maui chief Kahekili apparently ended at the Kawiwi *pu'uhonua* in 1785 (Sterling and Summers 1978:76), although this place of refuge could have existed for some time before. After Kamehameha I's invasion of O'ahu in 1795, two *heiau* on the Wai'anae coast were rededicated to Kū during his aborted attempt to invade Kaua'i in 1796 (Kamakau 1992). As many warriors and their families were driven from their lands on the windward and more populated side of O'ahu at this time, the development of upper valley *lo'i* systems and associated habitations in Wai'anae may well have been a response to increased local populations and tribute demands by conquering *ali'i*.

HISTORICAL BACKGROUND

The district of Wai'anae and its *ahupua'a* of Wai'anae Kai on O'ahu have a long and distinctive history. Like other large areas of formerly intensive Native Hawaiian settlement, the lands of Wai'anae Kai are rich in legends that tie gods and goddesses with the land. The titan Māui and his mother Hina the moon goddess, Lono's pig emanation of Kamapua'a, the *'aumakua* (ancestral spirits) Kamohoali'i and Pūhāwai, figure prominently in the place names of Wai'anae Valley (see Beckwith 1970; Sterling and Summers 1978).

By most historical accounts[1], Wai'anae was a land of stubborn orthodoxy. Many aspects of traditional Hawaiian culture continued in Wai'anae long after Western contact catalyzed a chain of events that led to the discarding of native religion, the end to subsistence economy, and a discontinuation of rule by indigenous *ali'i*. Wai'anae, in fact, held on to many aspects of Native Hawaiian culture until at least the mid-nineteenth century.

[1]As applied here, "history" refers to both written and oral records of important people and events.

This report focuses on the oral and documented history of Wai'anae, especially as they relate to important events, people, settlement patterns, and general cultural trends which have affected the present site area.

The Chiefly Lineages

The original district (*kalana*) of Wai'anae was unusual in that it not only possessed several typical mountain-to-coast *ahupua'a* divisions on the leeward side of the Wai'anae range, but also controlled a long strip of up-country land along the saddle between the Wai'anae and the Ko'olau mountains (Wai'anae Uka). Here in central, upland O'ahu, the divine seat of the Nanaulu chiefs was located. To be born at the sacred rocks at Kūkaniloko in Wai'anae Uka signified legitimacy, and membership in the special mythical race of *ali'i* known as the Lō. It seems logical that Wai'anae possessed Kūkaniloko, for its chiefs of the Kumuhonua line that controlled Wai'anae for centuries were senior to all other Nanaulu descendants.

Keaunui, son of Mawcke, was remembered as controlling 'Ewa and its district dependencies of Wai'anae and Waialua (Fornander 1969 II:48). Keaunui's reign occurred near the end of the migratory period in Hawaiian history, around the thirteenth or fourteenth century A.D. (Cordy 1981:204). This is perhaps the first reference, anchored in chronology, to an actual chief of Wai'anae. Kumuhonua succeeded his uncle Keaunui in the 'Ewa polity, and may have also been paramount of O'ahu. The O'ahu political system was developing into a four-echelon society (Cordy 1981:204), with the ranks of paramount, district, and *ahupua'a* chiefs over the commoners (*maka'āinana*). This base of power in ancient O'ahu remained in central-western O'ahu for centuries.

The chief of the polity of the west O'ahu districts of 'Ewa, Wai'anae, and Waialua, representing the senior line of the divine Nanaulu lineage, was probably the most prestigious of all Hawaiian Island lineages. The Kumuhonua line[2] continued dominating the west-central O'ahu polity, if not the entire island, until around the mid-fifteenth century. At this

[2]Also known as the Lakona lineage (Fornander 1969 II:88).

time, the stingy paramount Haka of 'Ewa was killed and the Moikeha line of Nanaulu chiefs was substituted, represented by the *ali'i nui* Ma'ilikūkahi (Fornander 1969 II:88).

Ma'ilikūkahi is credited with making roundtrips to Kahiki (Tahiti), the foreign land beyond the horizon which was believed to be full of wonders and innovations. Ma'ilikūkahi established his residence at Waikīkī in the Kona district (Fornander 1969 II:89), which became a popular seat of the O'ahu *mō'ī* until the end of the monarchy.

Ma'ilikūkahi became the prototypical sacred king of the ancient Nanaulu lineage, providing O'ahu the dreams of peace and fecundity on the path of the god Lono in opposition to bloodthirsty invader chiefs and their cult of human sacrifice inspired by warrior god Kū (Kirch and Sahlins 1992:22; Kamakau 1992:56). During the wars for interisland unification, Kū logically become the dominant state deity. The Ma'ilikūkahi legend of a sacred king who did not practice human sacrifice was especially remembered as a golden age by more contemporary Oahuans who have more recently experienced two centuries of foreign rule (invasion by Maui, Hawai'i Island kings, American missionaries, and U.S. annexation--see Kirch and Sahlins 1992).

Ma'ilikūkahi, in contrast to the predatory attribute of the future invaders of the eighteenth and nineteenth centuries, admonished his chiefs to be generous to the people and not to exploit them.[3] "The chiefs kept to themselves" in the uplands of Kūkaniloko (Kamakau in Kirch and Sahlins 1992:26), and the kinship relationship between the *ali'i nui* and *maka'āinana* had not yet been broken (Klieger 1993a).

Ma'ilikūkahi is credited with ordering O'ahu into the districts and *ahupua'a* which are roughly equivalent to present land divisions (Kamakau 1991:54-55), with an important exception: after the Māhele of 1848, Wai'anae Uka was given to Waialua district. In 1913, it was separated from Waialua and combined with Wahiawa *ahupua'a* to form the seventh O'ahu district (Wahiawa--see Sterling and Summers 1978). The *mō'ī* Ma'ilikūkahi's six districts were ruled by *ali'i nui 'ai moku* (island-eating great chiefs). Lesser chiefs would

[3]Several centuries later, having finished his conquest of the island group, Kamehameha I of Hawai'i would be seen to emulate Ma'ilikūkahi. Much of this ideology is readily evident in Kamakau (1992) and other indigenous historians of the nineteenth century.

hold *ahupua'a*, *kaukau ali'i* were given smaller autonomous parcels (*'ili kūpono*), warriors ruled smaller divisions of land under an *ahupua'a* chief (*'ili 'āina*), and *maka'āinana* would hold a few taro patches under all these chiefs (Kamakau 1991:55). This general pattern remained in effect until the Great Māhele of 1848, but the great *ali'i* became more and more distant from the *maka'āinana*, eventually forming an endogamous ruling class (Klieger 1993a). The separation was made clear with the evolution of an elaborate *kapu* system.

The four generations of descent from Ma'ilikūkahi seem to have been a time of peace and prosperity in a unified O'ahu. It was shattered after the death of Ma'ilikūkahi's great great granddaughter Kalaimanuia, the sovereign queen of O'ahu who chose to rule from Kalauao in 'Ewa[4] (Klieger 1993a). On Kalaimanuia's deathbed she made a *kauoha* (oral will), giving her eldest son Kū-a-Manuia the titular dignity of the O'ahu kingdom, and Kona and Ko'olau Poko districts as personal lands. Another of Kalaimanuia's sons, Ka'ihikapu-a-Manuia, was placed in charge of Kalaimanuia's gods, Kūkalani and Kūho'one'enu'u (Kamakau 1991:60). Ka'ihikapu-a-Manuia was also given the lands of Kalauao, 'Aiea, Hālawa, and Moanalua to manage under the *mō'ī*. Another son, Hao, was given the rest of 'Ewa and Wai'anae (Kamakau 1991:60). Kalaimanuia's sister, Kekela, became chiefess of Waialua and Ko'olauloa.

The quartering of O'ahu land occurred in the early seventeenth century, following Cordy's chronology (1981:205). As divided, these parcels were larger than the traditional districts (*kalana*) established by Ma'ilikūkahi, perhaps reflecting either an elaboration of the chiefly hierarchy or a fission of a unified O'ahu polity into four smaller units.

The placement of close kin of the paramount chief over districts or the smaller *ahupua'a* which might have otherwise been ruled by hereditary chiefs closely aligned with the *maka'āinana* of the regions, seems to demarcate the beginnings of a state-level political system (Hommon 1976).

Ka'ihikapu-a-Manuia overthrew the misrule of his older brother, Kū-a-Manuia, who had been exploiting the people as paramount O'ahu chief. Ka'ihikapu-a-Manuia

[4] near the site of the present Pearl Ridge Shopping Center.

accomplished this with the help of brother Hao of Wai'anae and 'Ewa, who had more resources in land and men (Klieger 1993a).

While Ka'ihikapu-a-Manuia became *mō'ī* (Fornander 1969:270-271; Kamakau 1964:62), he became uneasy with the opulence of Hao's court at Waikele in 'Ewa, and perceived it as threat to his own rule. As in the past, the 'Ewa/Wai'anae polity again had begun to demonstrate its independence in the political economy. On the advice of his *kahuna*, Ka'ihikapu-a-Manuia devised a sort of Trojan shark, which was filled with his warriors and presented as a gift to Hao at Waikele. Hao was killed at his Hapupu Heiau at Waikele (Thrum in Sterling and Summers 1978:25)--his son Nāpūlānahu-mahiki-a-Hao fled to safety in his domain of Wai'anae, and then seceded from Ka'ihikapu's kingdom. This event occurred c. A.D. 1578 to 1618 (Cordy 1981:206). Wai'anae began to develop a reputation as a refuge for renegade O'ahu chiefs.

Nāpūlānahu-mahiki-a-Hao married his aunt Kekela who ruled Waialua and Ko'olauloa. By this union they controlled northern and western O'ahu. The island had been split into two polities (Fornander 1969 II:272; Kamakau 1991:67). Cordy suggests that this 'Ewa-Wai'anae society fell to three sociopolitical levels, as Nāpūlānahu and Kekela had been only district chiefs (Cordy 1981:206-207).

Ka'ihikapu-a-Manuia's son Kakuhihewa eventually rectified the island division by marrying the daughter and heir of Nāpūlānahu-mahiki-a-Hao and Kekela, Kaea-a-Kalona (Fornander 1969 II:273). According to legends recorded by Kamakau and Fornander, Kakuhihewa's reign was an idyll of peace and prosperity, following the Ma'ilikūkahi prototype.

Kakuhihewa was succeeded by his son Kāne:kapu-a-Kakuihewa by Kaea-a-Kalona, and three other sons (Fornander 1969 II:275) were most likely given *moku 'āina*[5] quarters in the manner of Kalaimanuia's will of the early seventeenth century. Kaihikapu-a-Kakuhihewa was probably chief of the 'Ewa/Wai'anae *moku*. Kealohi-a-pe'ekoa of the Kaua'i royal line

[5]*Kalana* is an indigenous O'ahu term for *'okana* or "district" known elsewhere in Hawai'i. *Moku 'āina* usually refers to a larger division of an entire island. The quarterings of O'ahu will be referred to as *moku 'aina*.

obtained either the Wai'anae *kalana* or *ahupua'a*, and thus became connected with the 'Ewa *ali'i nui 'ai moku* under O'ahu *mō'ī* Kānekapu-a-Kakuihewa (Fornander 1969 II:293).

A few years later, 'Ewa and Wai'anae aided Kawelo-a-Maihunali'i, a cousin of Kealohi-a-Pe'ekoa, in a civil war on Kaua'i. The war was fought against Kawelo-'Aikanaka, twin brother of Kealohi-a-Pe'ekoa. Kawelo-a-Maihunali'i had married into the Kalona lineage of 'Ewa-Wai'anae (Fornander 1969 II:276, 295). His claim to Kaua'i was initially thwarted. He received refuge on lands near Kolekole Pass under Kaihikapu-a-Kakuhihewa (or his heirs), a position which he used to eventually overthrow his rival on Kaua'i. He became *mō'ī* of that island.

In legend, Kawelo-a-Maihunali'i was most likely the chief Kawelo, whose god forbade him initially to go to war on Kaua'i. Kawelo had made sacrifices at Kāne Heiau in Kamaile, according to some legends (McAllister in Sterling and Summers 1978:72), which is very close to the project area to the northwest. The *heiau* was perhaps built by Kawelo for the gods Kāne-i-ka-pua-lena and Kalanihehu (Beckwith 1970:407).

Frustrated in his wish for war by his god, Kewelo broke his *akua ki'i* (god image) upon the rocks near the mouth of Keaupuni Stream (a.k.a. Kaupuni) directly *makai* of the present project area, and west of the *'ili* of Pāhoa. This place was called Puehu (dispersion) in memory of the event (Sterling and Summers 1978:70). The *loko wai*[6] fishpond of Puehu or adjacent *loko pu'uone*[7] of Pāhoa are probably the ponds from which Wai'anae received its name (mullet water).

Pāhoa appears to have received its name from a legend of Kamapua'a, the trickster pig-god. Kamapua'a was fond of raiding the Wai'anae people's *lo'i* for taro corms. He was caught and tethered to the rock Pāhoa to await his roasting at the *imu* at Pu'u Kahea. The god then sent a myriad of manifestations marching across the plains. The spirits then proceeded to devour the men (Sterling and Summers 1978:72; cf. Pukui et al. 1974:174).

[6]a fresh water fishpond usually excavated out from a stream near its mouth.

[7]a sand-banked fishpond usually formed on the other side of a beach sand berm. An important example is Mokuhinia, the royal fishpond in Lahaina, Maui (see Klieger 1993b).

The legends of Kawelo are numerous and variant (see Beckwith 1970:405-414). One thread that emerges is the intercourse at this time between the kingdom of Kaua'i and the district of Wai'anae on O'ahu. Notably absent in most of the myths are reference between the other O'ahu districts and Kaua'i. Wai'anae may have been the traditional port for Kaua'i-O'ahu interaction. In the early years of the seventeenth century (Cordy 1981:205), the severe *kapu moe*, the law of prostrating before a chief, was introduced from Kaua'i to O'ahu. Its infraction landed the transgressor in the *imu* to be roasted (Beckwith 1970:411).

Most likely Wai'anae was again heading for autonomy, for Kānekapu-a-Kakuhihewa's son Kaho'owahaokalani (mid-seventeenth century--Cordy 1981:205) apparently had to reunite O'ahu yet again (Hommon 1976:327).

By the late seventeenth century, the pattern of O'ahu *ali'i 'ai moku* becoming autonomous was now repeating in ever-quickening cycles of fission, fusion, and fission. It was a notable phenomenon on all major Hawaiian islands during the late-expansion period (or proto-historic--Kirch 1985), and was most likely characteristic of the rise of competitive petty states. Wai'anae, it seems, had the resources and political structure to have operated as a petty state in direct competition with the Kona-Ko'olau Poko stronghold.

At this time, the Wai'anae *kalana* was making the transition from the last vestiges of the true Polynesian chiefdom, where common folk and chiefs were still bound by common genealogy and rules of redistribution within the political unit (see Hommon 1976; Kirch 1985) to the first level of state organization. Whether part of the kingdom of O'ahu or independent, Wai'anae was still ruled by a Nanaulu *ali'i nui*, a *kama'āina* chief from Kūkaniloko on its ancestral domains--but the *ali'i* had formed an endogamous class apart from the commoners, and were maintaining the distance by increasingly severe *kapu*.

At this time, Wai'anae still controlled not only the entire southwestern coast of O'ahu and its important fisheries, but had access to the inland resources of central O'ahu through its lands in Wai'anae Uka. Furthermore, it commanded the strategic pass of Kolekole in the Wai'anae Mountains.

The right to rule O'ahu as paramount was changing at this time from one based in senior Kūkaneloko legitimacy to one based on collateral usurpation through the force of arms. As Hommon states,

> By 1600, the cleavage between commoners and chiefs had advanced to such an extent that the control exercised by the chiefs was no longer based on kinship, but rather on the demonstration of the monopoly of power. (1976:231)

The 'Ewa, Wai'anae and Waialua chiefs in the late expansion period on O'ahu had become very independent again by the time of Kūali'i, great grandson of Kānekapu-a-Kakuhihewa (c. early eighteenth century), when the titular O'ahu *mō'ī* was considered nothing more than the *kalana* chief of Ko'olau Poko by the other district chiefs. This slight motivated Kūali'i to exert much effort at retaining his supremacy as *mō'ī* of O'ahu.

According to Beckwith, O'ahu was divided into four quarters, in a manner similar to Kaihikapu-a-Manuia's *māhele*. Each *moku 'āina* was a "Lono" realm with *ali'i nui* named Lono.[8] Wai'anae-'Ewa was the domain of Chief Lono-kukaelekoa (Beckwith 1970:395). The Beckwith collection of legends seems to reflect the sentiment that autonomous Lono petty state chiefs were ruling their lands on the Lono path of cultivation and fecundity. This was in contrast to the covetous desires and violent means of a warrior chief named Kū (Kūali'i). 'Ewa, Wai'anae, and Waialua districts were apparently especially difficult for Kūali'i to subdue (Fornander 1969 II:280-281). At the battle of Kalena in the uplands of Wai'anae Uka, Kūali'i was victorious. But 'Ewa and Wai'anae districts continued to revolt. Kūali'i returned from an expedition to Hawai'i to win a large battle at Wai'anae, where "the waters of Kalapo were dammed and a large number of dead bodies were strewn below Eleu." (Fornander in Sterling and Summers 1978:61)

Through Kūali'i's war, the island-wide polity was eventually reestablished. Most likely the lands held by the rebellious *ali'i 'āi moku* chiefs were redistributed to Kuali'i's favorites. Although the specific genealogical connections apparently have been lost, it seems

[8]Fornander disputes this tradition, 1969 II:280

that the Kaua'i/O'ahu sociopolitical bonds, as had been evident in the Wai'anae district in previous generations, were especially active during Kūali'i's time. The O'ahu *mō'ī*, through inheritance and marriage, first obtained the Kona district of Kaua'i, then its titular dignity of king (Fornander 1969 II:295). Kūali'i's son Peleioholani became viceroy of at least the Kona district (Lihue) of that island for the O'ahu king. During the reign of Peleioholani as *mō'ī* of O'ahu and Kaua'i, the island of Moloka'i came under his domain, having previously roasted several of its chiefs (Kamakau 1992:232).

With the death of Peleioholani in 1770, the islands of O'ahu and Kaua'i formed separate kingdoms under a son and daughter of Peleioholani. Kumahana ruled O'ahu for three years until he was deposed by the *ali'i nui*. The chiefs selected Kahahana, son of Elani, of the great Lakona dynasty of 'Ewa, who carried on the Nanaulu legacy. Most likely Wai'anae was still closely aligned to 'Ewa.

Kahahana was raised in *hānai* on Maui, and had blood connections to that royal family through his mother (Kamakau 1992:128). The king was known to have restored many *heiau* on O'ahu, including Kamohoali'i[9] in Wai'anae (Kamakau 1992:134). This was an inland temple, located about 200 m east of the present project area near Pu'ukāhea. The *heiau*, also known as Haua (Sterling and Summers 1978:71) was believed to have been Kahahana's residence and the site of pig-god Kamapua'a's near-roasting. It was probably here too that Kahahana ordered the death of Kahulupue, son of the *kahuna nui*, Ka'opulupulu. The *kahuna nui* had prophesied if Kahahana continued to take such a murderous path, he would be killed and his kingdom would vanish. While being pursued by Kahahana, Kahulupue dove into the sea at Nene'a Beach in Poka'i Bay, committing suicide. Ka'opulupulu was subsequently killed by Kahahana at Pu'uloa. Having killed the priest and his son, the vision of the *kahuna* was further realized.

Invasions from the East

In 1783, O'ahu was invaded by King Kahekili of Maui, Kahahana's *hānai* father, who sensed that the chaos on O'ahu would be fortuitous for his campaign. He proceeded to

[9]probably named for Pele's shark brother (Beckwith 1970:129).

conquer the island and kill its native *mō'ī*. The native O'ahu chiefs, including Elani, gathered at Waipi'o in 'Ewa to plot a rebellion against the Maui invaders headquartered in Ko'olau Poko (Kamakau 1992:138). The O'ahu chiefs managed to kill chief Hu'eu of Maui at Waialua. Outraged, and remembering the past cruelty of the O'ahu chiefs, Kahekili summarily destroyed nearly the entire heritage of the Nanaulu chiefs of O'ahu antiquity. The Maui chief Kalaikoa, living in Moanalua, constructed a house enclosure with the bones of the O'ahu chiefs (Kamakau 1992:138).

One O'ahu chief, Pupuka, survived and rallied the surviving forces gathered at the refuge of Kawiwi, along the Kamaile ridge dividing Mākaha and Wai'anae. Kawiwi was the mythical setting for a story of an ancient woman who was fed by birds. A trail led from the fortress of Kawiwi to Kamaile (McAllister in Sterling and Summers 1978:75). Many of Pupuka's men died of starvation there or were flung over the cliffs (Kamakau 1992:140). The few chiefs and chiefesses who survived the genocide fled to Kaua'i. No doubt Maui chiefs then replaced indigenous lords in the lands of Wai'anae.

The conquering Maui king Kahekili died in 1794. Almost immediately, his son Kalanikūpule, and brother Ka'eo, fought for control of O'ahu. Kalanikūpule had controlled Maui, Moloka'i, O'ahu and Lāna'i, while Ka'eo ruled Kaua'i. Kalanikūpule was assisted by the Maui chiefs of Waialua and Wai'anae (Kamakau 1992:168). At the battle of Kūki'iahu at Kalauao in 'Ewa, uncle Ka'eo, his wives and chiefs, were killed by Kalanikūpule. (With the death of Ka'eo, his surviving son Kaumuali'i became the last king of Kaua'i). Kalanikūpule then turned his thoughts toward conquest of Hawai'i, with fatal results.

Kamehameha the Great of Hawai'i, of course, proceeded to snatch Maui, then turned his energies on O'ahu. In 1795, Kalanikūpule lost the Battle of Nu'uanu. The islands were now unified under Kamehameha, save Kaua'i. Kalanikūpule's Maui-O'ahu chiefs were dispossessed, but some reputedly settled in isolated Wai'anae. In order to help maintain O'ahu traditions, a group of indigenous astrologers (*kilokilo hoku*) apparently founded a school at Poka'i Bay (Mouritz in Sterling and Summers 1978:68).

According to Kamakau (1992:173), Kamehameha sacrificed to Kū at Ha'ena Heiau in 'Ewa, then sailed with his war fleet to Wai'anae, stopping there before proceeding on to invade Kaua'i. According to Thrum (in Sterling and Summers 1978:71), a *heiau* for Kū

named Ha'ena was consecrated by Kamehameha at Wai'anae. Kamehameha's fleet was turned back by storms as they attempted to invade Kaua'i. McGrath et al. (1973:14) suggest that Kamehameha had angered the local gods. Kamehameha was never able to invade Kaua'i, leaving King Kaumuali'i to peacefully surrender his sovereignty in 1810. The existence of such an anecdote may reflect the close association of Kaua'i with Wai'anae in the then-recent past. Or as Kirch and Sahlins (1992:25) suggest, it may characterize the sentiments of indigenous O'ahuans, who, in the face of the invaders from the East, looked back with blind fondness to the rule of their own paramounts.

Following the traditions of a conquering king, Kamehameha divided O'ahu among his lesser chiefs, including two Caucasians, Young and Davis (Klieger 1993a). He was advised not to place any important chief in power, lest they challenge his rule while he was away (Kamakau 1992:173). When Kamehameha returned to O'ahu in 1804, he brought his *ali'i nui* who would stay and rule Wai'anae and other regions after his death. These included wife Ka'ahumanu and her brother Kahekili Ke'eaumoku, and collaterals Kalanimōkū and his brother Boki (Figure 5). Boki was made governor (*kia 'āina*) of O'ahu in 1816, and with it the control of many lands (Kame'eleihiwa 1992).

It is not certain which chief initially received the guardianship of Wai'anae from Kamehameha. To add to the confusion, many documents of the early to mid-nineteenth century do not differentiate between the district of Wai'anae and the *ahupua'a* of Wai'anae Kai. What is clear is that most of the district was considered personal land of the king. The lands of Wai'anae, unlike many other properties on O'ahu, were not established as hereditary estates for Kamehameha's Kona uncles and their descendants. It is evident, however, that in the 1820s, most of Wai'anae district was firmly in the hands of Governor Boki.

The period of the 1810s to the 1820s was a time of extreme exploitation of the Wai'anae *maka'āinana* for the exclusive benefit of Boki's sandalwood harvest. Being Crown property, no doubt the proceeds of the Wai'anae sandalwood sale were for the benefit of Boki's ward, young King Kauikeaouli Kamehameha III, with the chief retaining a healthy

commission. Boki placed several *konohiki* in immediate charge of Wai'anae district, including Kanepaiki in Mākaha, and Ka'apuiki and Au'a in Wai'anae Kai. Boki himself maintained a residence at Poka'i Bay by 1826 (McGrath et al. 1973:22).

Boki was a traditionalist, opposed to the ruling clique of Ka'ahumanu and the power of the new religion introduced by American missionaries. Wai'anae, with its natural isolation from the political center of O'ahu, and with broad and substantial subsistence and cash-crop resources, became an island of nonconformity in the path of the radical changes sweeping the kingdom.[10] This, combined with Wai'anae's traditional tendency toward independence, provided an atmosphere where Boki and his anti-Christian followers could thrive.

In 1826, Ka'ahumanu's Christian *kahuna nui*, Hiram Bingham, paid a missionary call at Wai'anae and stayed with the *konohiki* Ka'apuiki. Bingham noted, with some horror, that the people of Wai'anae had not converted to Christianity and were still respecting the old gods, including Kamapua'a (McGrath et al. 1973:22).

To help spread the new religion of the *haole* god, Ka'ahumanu had established four mission schools in Wai'anae that appeared to be initially popular, as noted by Chamberlain in 1826. Two years later, however, the attendance had dropped to almost nothing. Chamberlain blamed the head teacher, Ka'apuiki (Kirch and Sahlins 1992:92). It was a common practice to fill the position of educational supervisor with the main landlord. Ka'ahumanu immediately blamed Boki and his dissolute influence. Boki was probably far more interested in harvesting sandalwood than extolling his chiefs to promote the new learning. Fond of luxurious western consumer products as a novel means of maintaining traditional *ali'i* prestige (see Sahlins 1981), Boki was heavily indebted to Caucasian merchants. Sandalwood was a quick cash commodity, but it could not sustain Boki's voracious consumption. While Ka'ahumanu, representing the government, assumed the debts of other *ali'i nui*, she slighted Boki and his wife Liliha (Kamakau 1992:284). In desperation,

[10]In future years, King Kauikeaouli Kamehameha III established a private residence at Moku'ula in Lahaina that was similarly off-limits to the Ka'ahumanu clique (see Klieger 1993b).

Boki sailed away to the New Hebrides (Vanuatu), where he had received reports of abundant sandalwood. He was never to return--Lono had made his exit to Kahiki.

The governorship of O'ahu and the district of Wai'anae were left in his wife Liliha's hands. She was no friend of Ka'ahumanu or her ruling missionary clique. Liliha, following Boki, was still guardian of the young king. Together with Chief Abner Pākī, who was given the *ahupua'a* of Mākaha, Ka'apuiki and 'Au'a of Wai'anae Kai, and several foreign traders, attempted a *coup d'etat* against Ka'ahumanu in 1830. They amassed their forces at Boki's old residence in Wai'anae, now under the control of Ka'apuiki. But 'Ulumaheihei Hoapili, governor of Maui and father of Liliha, talked his daughter out of staging the "Pahikaua War." The imperious Queen Regent acted immediately: Ka'ahumanu deposed Liliha as governor of O'ahu and chiefess of Wai'anae, and Ka'ahumanu's brother Kuakini was installed in her place. Liliha's lands were taken away, too. The King had been taken from her previously when Ka'ahumanu found Liliha drunk at 'Ewa (Kamakau 1992:298).

The death of Ka'ahumanu on 5 June 1832, must have been a festive day in Wai'anae. Kauikeaouli Kamehameha III had taken charge, appointing his *aikane*[11] Kaomi joint-ruler, and had planned to appoint Liliha as *kuhina nui* and governor. Pākī was also to be a governor. When faced with the combined displeasure of the powerful Christian *ali'i* followers of Ka'ahumanu, including her niece Kīna'u, the king backed down. Governor Hoapili went to Wai'anae and destroyed his daughter's still (Kamakau 1992:340).

The cycles of rebellion which had characterized Wai'anae politics for nearly two hundred years were finally rooted out during the rule of *kuhina nui* Kīna'u and her husband Kekūanaō'a, the new governor of O'ahu and commander of the fort at Honolulu. It may have been too late for Wai'anae--the population was collapsing. The combined forces of foreign epidemics (e.g. smallpox in 1853), nearly continual warfare or insurrection, and the lure of the market economy of Honolulu, resulted in an estimated six-to eight-fold decrease in population from the time of Western contact in 1778 to 1853. By the time of the Great Māhele in 1848, Wai'anae was a mere shadow of its former self.

[11]male intimate--a traditional prerogative of the *ali'i nui*.

The Great Māhele of 1848

The voluminous body of documents produced by the great division of Hawaiian land under Kamehameha III in 1848 provides a detailed snapshot of sociopolitical relationships of the early nineteenth century. Despite the inroads of Western innovation, much of traditional Hawaiian land tenure, reflecting the ancient relationship between commoner and chief, was still intact at the moment of the Māhele. Following the freehold award of lands in the Māhele, Hawaiian culture changed as never before. A detailed analysis of these materials for Wai'anae provide information specifically relating to the present project area.

In December 1847, just prior to the Māhele division of all the lands in the kingdom, several *ali'i nui* were called to testify on the nature of land reserved by their ancestor, the conqueror Kamehameha I, to be his private holdings. Among many great tracts of land from Hawai'i to Kaua'i, the *ahupua'a* of Wai'anae Kai, in fact the entire *kalana* of Wai'anae, was reserved by the founding king. On O'ahu, other royal lands listed included Waikīkī, Kāne'ohe, Kailua, Waimānalo, He'eia, and most of Honolulu. These were acknowledged by Kekau'onohi, Joshua Ka'eo, Abner Pākī, Iona Pi'ikoi, John Papa 'Ī'ī, and other chiefs who had intimate knowledge of the state of affairs of the court of Kamehameha I (State Archives of Hawaii [AH] 1847). From this list, the initial *māhele* was made by Kauikeaouli Kamehameha III, separating his lands and awarding others to the chiefs. Subsequently, the government, the military, and eventually the commoners received lands.

While the old Regent Ka'ahumanu received many lands at the passing of her husband, a complete list has never been found (Kame'eleihiwa 1992). According to 'Ī'ī, however, all the large *'ili kūpono* went to Ka'ahumanu. These were smaller divisions of *ahupua'a* that were held in fief directly to the *mō'ī* rather than to the chief of the *ahupua'a*.[12] The *'ili* of Pāhoa, at the mouth of Keaupuni Stream near the present project area, seems to have been one of the *'ili kūpono* of Ka'ahumanu.

During the Māhele, Victoria Kamāmalu was awarded Pāhoa (Land Commission Award [LCA] 7713). She had received most of her lands from her mother, Kīna'u, who was

[12] Large divisions under the *ahupua'a* chief were known as *'ili 'āina*, although the distinctions were breaking down by the time of the Māhele.

the heiress of Ka'ahumanu in *'āina* and in political office as *kuhina nui*. Kame'eleihiwa (1992:124) notes that Governor Kekū'anaō'a, *kahu* (guardian) and father of Victoria Kamāmalu, had claimed the entire *ahupua'a* or *kalana* of Wai'anae. He had often claimed large parcels of land for his daughter, claiming inheritance from Ka'ahumanu through Kīna'u. There is no record in the *Indices* that he commuted this land for consideration elsewhere. It is possible that this broad Wai'anae claim was based on Ka'ahumanu's seizure of Liliha's lands after this widow of Boki was deposed. Whatever the backroom political maneuvers, it is clear that the traditionalist King Kauikeaouli ultimately triumphed in Wai'anae over Ka'ahumanu *mā*. Wai'anae *kalana* remained Crown Land, save Mākaha *ahupua'a* which remained in the possession of another member of the anti-Ka'ahumanu king's party, Abner Pākī.

The present project area is within the *'ili* of Leohano-iki, "the Voice of Majesty (the smaller)" (Figure 6). During the time of the Great Māhele of 1848, there was at least one house site on the property. Land Commission Award 8307 describes the claim of Kukanono for lands at the *'ili* of Leohano-iki and Kamaile to be granted to his grandchild Waine'e. *Apana* 1 in Kamaile consisted of a one-acre *mo'o 'āina*[11] named "Holau 2." The taro patches, named "Kapaele" and a house site named "Luluou" were found in the *lo'i* fields of Kamaile, directly under the cave of Kūka'au'au and below Kamaile *heiau po'okanaka* (Native Testimony [NT] 9:403). Just beneath Kūka'au'au was the spring (*puna wai*) of Keko'o, which was the major fresh water source in this arid area (James 1991:86). The existence of the spring in an area of great aridity helps explain the establishment of the ancient Hawaiian village and *lo'i* system of Kamaile. Kukanono also described a fishpond "for Liliha" on the south of his Kamaile *mo'o 'āina* (Native Register [NR] 5:528).

The second *apana* of Kukanono and Waine'e was a 1.6-acre house site in nearby Leohano-iki *'ili*. The eastern portion of this land is part of the present project area. Kukanono's *pāhale* in Leohano-iki was described in the Native Register as being bounded to the north by the government pig enclosure "made by Kulepe," on the south and west by the

[11]a section of land smaller than an *'ili*.

government roads, and to the east by the house site of Kawelo (NR 5:527). Kawelo's house site would seem to have been in the present project area.

Kawelo's house site, however, was not awarded during Māhele proceedings, nor does it appear that any land was given to a Kawelo in Wai'anae. As house site claims were usually awarded to applicants during the Māhele, Kukanono's description may in fact refer to the ruins of the residence of Chief Kawelo-a-Maihunali'i, the renowned king of Kaua'i who reputedly built Kāne Heiau in Kamaile to the west of the project area. Furthermore, the land of Puehu, where Kawelo broke his *akua ki'i*, is adjacent to Kukanono's lot to the east.

Kukanono registered his claim on 11 February 1848, and died shortly after. His grandchild Waine'e provided the necessary testimony with witnesses to the claim in court on 26 February 1850, to the effect that this land was given to Kukanono by Kalama at the time of Kamehameha I (NT 9:405). This Kalama could have been an ancestor of S. P. Kalama, the Land Commission secretary, who was probably an intermediate *konohiki* in Wai'anae at the time of the Māhele. He seems to have managed the lands of Kamaile in pre-Māhele times (*Indices* 1929). The *Indices* show that a Kamaka'i and Kalama (or Kamalama) received the bulk of the *'ili* of Kamaile, with 19.00 and 10.20 acres, respectively. Waine'e also received 0.86 acres of land in Kamaile from a certain Kaili (*Indices* 1927).

Kulepe, the government pig *luna*, received a total of 4.77 acres in Leohano-iki during the Māhele (*Indices* 1929), in three *apana*. Despite its name, Leohano-iki was a large *'ili* that followed the north shore of Keaupuni Stream from the coast to about two kilometers upstream. Grants were given in several *apana* to individuals across the *'ili* of Kamaile, Leohano-iki, and the Pohako'i divisions, often for the benefit of others. Waine'e, for example was given land in Kamaile and Leohano-iki. This may indicate that tightly connected extended family (*'ohana*) units existed in this region.

To the east of Leohano-iki lay Leohano-nui, also called "Ana." A long wall which apparently divided the two *'ili* was paralleled by the government road which led into the valley. Keohano-nui ended at Keaupuni Stream. In the Native Testimony, Kahaleauka claimed that his *lo'i* and *kula* lands in Leohano-nui were bordered on the *makai* side by still-

extant Malaeha'akoa Heiau. This is the *heiau* that McAllister described nearly one hundred years later as:

> Malaihakoa Heiau [sic]...only a corner of the foundation remains, protruding into a cane field, but the site is known by the natives. The portion remaining has a base of large rocks, with apparently smaller rocks used for paving. It is known on the plantation as a Hawaiian graveyard, and Hawaiian workers will not touch it. It has been in the present condition for more than 30 years. (McAllister in Sterling and Summers 1978:72)

The *'ili kāpono* of Pāhoa existed on the other side of Keaupuni Stream. Long associated with *ali'i*, Pāhoa was awarded to Victoria Kamāmalu, heiress to both the positions of *kuhina nui* and the throne from the time of the death of her brother, Alexander Liholiho Kamehameha IV, in 1863 to her own in 1866. Pāhoa *'ili* existed in segments (*lele*), which included beach land and its *pu'uone*[14] fishpond, as well as irrigated *lo'i* and *kula* land.

The fishpond of Pāhoa was on the east side of the mouth of Keaupuni Stream (see Figure 1). On the west were two, smaller freshwater ponds, still present on Jackson's 1884 map of Wai'anae. The larger of the two *loko wai* is most likely the site of Puehu, where Kewelo broke his *akua ki'i*. It may also be the pond called "Pūhā" by Pukui et al. (1974:220) that was home to the lizard (*mo'o*) goddess Pūhāwai. Guardian lizards were denizens of freshwater ponds (Klieger 1993b). The *loko wai* was just *mauka* of Keaupuni Heiau, which in later times became the house site of rancher J. M. Dowsett and the Dowsett Hotel (McAllister in Sterling and Summers 1978:70).

The tripartite division of an *'ili* such as Pāhoa into *lele*, was common in Hawai'i (Klieger 1993a). A chief who controlled an *'ili* of this sort would be able to exploit three environmental regimens—coastal fisheries, irrigated fields, and often some upland pasturage or forest areas. In this sense, they functioned as micro-*ahupua'a*--islands of relative autonomy and self-sufficiency within larger productive/political units. Post-Kamehameha

[14]a "sand hill" fishpond. These ponds often formed behind beach sand berms near the mouths of streams, and were modified by human design for the purposes of aquaculture.

Wai'anae is interesting in that while the king directly controlled the *ahupua'a* as private land, the *kuhina nui* controlled the prime *'ili kū* of Pāhoa.

In contrast, the *'ili* of Kamaile, located on the opposite side of the project area, appears only to have been a contiguous land division of *lo'i* and tiny fishponds. Its political importance as a village and area of great taro productivity was no doubt due to the presence of freshwater springs on the flanks of Kamaile'unu Ridge. In an 1873 document on the ancient divisions of O'ahu, Kamaile is listed as an *ahupua'a* Wai'anae *kalana*, of equal standing as Nānākuli, Wai'anae, Mākaha, Kea'au, 'Ohikilolo, Makua, and Keawa'ula (Kuhano in Kame'eleihiwa 1992:330). During the Māhele, however, Kamaile was treated as an *'ili* of Wai'anae Kai. Kamaile was casually surveyed for the present report by Klieger.

The springs flow out of the lava rocks immediately behind the *lo'i mo'o'āina* in Kamaile, which at the time of the Māhele, were long strips of land separated by walls and subdivided into individual taro patches. Water would flood the top patch and move in succession to the lower ones. Often in the middle of the *mo'o'āina*, a field (*kō'ele*) would be cultivated for the consumption of the local *ali'i*.

Just above Kamaile Springs is Kūka'au'au cave, probably an old lava tube. The cave is about 7 m wide at the entrance and 3 m high, and extends about 10 m. The floor is covered with a silty soil blackened with charcoal. There is still a great deal of evidence of probable Native Hawaiian occupation in the cave, including plentiful shellfish midden, bird and mammal bones, basalt flakes, and other artificial materials on the surface.

Downslope of the cave are long, parallel walls with some compartmentalization. As noted by Hommon:

> *Maka'i* [sic] of the pumping station are a series of retaining walls, some of which are directly associated with an old ditch or flume (not the upper flume [sic] shown in Stell's map). Some of these walls might be pre-contact, since they are of old style, but high grass prevented detailed investigation. Portions of these walls were evidently destroyed by the pumping station construction. (1978:1)

These may be the remains of *mo'o'āina* boundaries in Kamaile. In the region below the springs, several basalt boulder rectangular alignments were found which may have been house sites. These features were apparently also observed by Hommon in 1978. From Kukanono's testimony, his *mo'o 'āina* was directly beneath Kuka'au'au cave.

To the north was "the house of Mahi" described in Kukanono's Māhele claim. In examining the Monsarrat map of the 1870s, it is entirely possible that Mahi's house site is one of the rectangles noted in the pedestrian survey, and that the long walls extending downward from Kuka'au'au cave are the remains of Kukanono's *Apana* 1 or those of an adjacent neighbor. Kamaile was described in 1865:

> I stopped at Kamaile, a fertile, well-watered little land, between Waianae and Makaha. The people here appeared thriving and well to do. The taro lands were well cultivated. There were a number of fish ponds, and I noticed a considerable quantity of land under cotton culture. (*Hawaiian Gazette 1865*)

While the fishponds are gone, Klieger found wild cotton (*Gossypium sp.*) growing at Kamaile. Not surprisingly for an area still watered by springs, the land appeared as a verdant island with numerous very large, seemingly ancient monkey pod (*Samanea saman* [Jacq.] Merr.) and mango (*Mangifera indica*) trees, surrounded by drier areas of *kiawe*.

Monsarrat's map clearly shows a wall extending from a large enclosure along Keaupuni Stream, across the present site area to Kamaile. This is most likely the wall of the *mauka* government pig enclosure described by Kukanono in 1848. Parts of this limestone slab wall were still extant in 1993. Following the Monsarrat map, the wall continued to a point just east of Kamaile, where it intersected a north-south wall extending from Kamaile ridge. This is mostly likely the *'ili* boundary between Kamaile and Leohono-iki. Kamaile was eventually enclosed by a wall of similar type (Figure 7).

The absence of further *kuleana* claims in the immediate vicinity of the present project area is consistent with its karstic geology. Lacking well-developed soils, the present project area was most likely utilized by pre-Contact Hawaiians for permanent to temporary

habitation, being roughly convenient to the irrigated fields of Kamaile on the west and the fields watered directly by Keaupuni Stream on the east. The area is also protected from storm surges frequently experienced along the coastline. (In 1993, the Wai'anae coast was severely impacted by the storm surge and winds of hurricane Iniki).

In examining Māhele documents for the Kamaile/Leohano-iki neighborhood, it is interesting to note that Boki and Liliha's *konohiki*, Ka'apuiki, was apparently not removed from power in Wai'anae Kai following the Pahikaua War of 1830. The testimony of Kahaleula for LCA 3087B in Leohano-nui noted that he had obtained "his land from Ka'apuiki during Kekauluohi's time" (*kuhina nui* from 1839 to 1845). In fact, the witness for Kahaleula's claim of 1849 was none other than the tenacious Wai'anae *konohiki* Ka'apuiki himself! (NT 9:403).

During the Māhele, old Ka'apuiki was awarded the large house site enclosure located about 200 m east of the project area. Not only may this be "Kawelo's house site" mentioned by Kukanono, but it is among the most important sites along the Wai'anae coast. Examining the Monsarrat Survey map of 1878 (1902), the Jackson Survey map of 1884, Thrum and McAllister's descriptions, and other documents, it is evident that this is the site of Kamohoali'i Heiau and King Kahahana's residence. It also could have been Boki's house, especially if Ka'ahumanu controlled Pahoa across the stream. The sacred site and *ali'i* residence were destroyed by plantation manager Richardson in the 1880s and the property used for his own house (McGrath et al. 1973).

The livestock wall that passes through the present property site once extended to the east to form the *makai* wall of the chiefly enclosure.

Post-Māhele History of Wai'anae Kai

In May 1853, the residents of Wai'anae experienced a major smallpox epidemic. The disease was not completely eradicated until January 1854. A missionary census taken in 1835 recorded 1,654 residents along the coast of Wai'anae. By 1855, a tax collector recorded only 62 taxpayers, adult males, living in Wai'anae Kai. This may roughly represent a population of 250 individuals in Wai'anae Valley in 1855. By 1870, the

population of the whole Wai'anae coast was only 500. Due in part to the large decrease in population, much of the land ended up being owned by just a few landowners (McGrath et al. 1973:28, 29). It also signalled the end to most subsistence agriculture in the coastal region.

Sugar

Hermann A. Widemann became one of those few men to control Wai'anae land when on 11 September 1879 (U.S. Army Corps of Engineers, Vol. III), he leased 827.35 acres in Waianae Kai from the Crown for 25 years (State of Hawaii, Bureau of Conveyances Liber 69). This is the land surrounding LCA 8307.2 and the project area.

Widemann was a German immigrant who became active in Hawaiian politics (Figure 8). He was Justice of the Supreme Court (*Pacific Commercial Advertiser* 1873), President of the Board of Health, a member of the Board of Education (Privy Council 12:39), Minister of Interior (Widemann 1874), and Minister of Finance (Krauss 1957:235). He was appointed to the Privy Council (Privy Council 12:37) and became a commissioner to aid the development of the resources of the Kingdom (Widemann 1876 14:27). He held several office while living on Kaua'i. Besides his political adventures, Widemann ran a dairy and a sugar plantation on Kaua'i until the 1860's when he sold out and moved to O'ahu (*The Independent* 9/9/1896:2).

On 9 July 1878, while Widemann was preparing to purchase the land for his Wai'anae sugar plantation, most of the local farmers had little hope for his success. But Widemann and his plantation had a few advantages. He had strong financial backing by Hackfield & Co. (later known as American Factors--Amfac) and a reputable sugar planter, George N. Wilcox of Kaua'i (McGrath et al. 1973:37). Widemann had become acquainted with Wilcox when the latter had purchased his failing sugar plantation, Grove Farm, on Kaua'i. Wilcox then turned the plantation into a profitable enterprise.

Widemann explained why he wanted to try sugar farming again:

> To be perfectly honest I'm sorry now that I let Grove Farm go, I have been interested for some time in a new plantation with excellent prospects at Waianae on Oahu. (ibid.)

Wilcox agreed to help by borrowing $40,000.00 from Hackfield & Co. at 6% interest and then loaning it to Widemann at 8% interest (Krauss 1957:187, 190). Widemann also had to his benefit the favor of the Hawaiian Crown. It was his influence with the King David Kalākaua that helped him obtain a lease on Wai'anae Crown Lands (McGrath et al. 1973:37).

Widemann hired about 20 Native Hawaiians, 15 Caucasian technicians, and 60 Chinese laborers. He then built 24 new houses in Wai'anae Valley to house them. He obtained the water rights to Kamaile, an action deeply resented by Native Hawaiians. His plantation manager was Julius Lyman Richardson, who was remembered as being a harsh but efficient man. A plantation camp was built at Kamaile on the site of the old Native Hawaiian village.

Richardson was especially distasteful to the Hawaiians after he dismantled Haua Heiau, using the stones to build a wall around his house located on the former sacred site (McGrath et al. 1973:38). Jackson's Survey map of 1884 notes Richardson's house on the site of the old *konohiki* Ka'apuiki's residence. This also was the locale of Kamohoali'i Heiau, scene of Kamapua'a's hijinks and O'ahu King Kahahana's residence. In a sense, the big boss was the new Boki. Richardson's choice of the traditional chiefs' house site could not have slipped his attention.

As early as 1878, the workmen began clearing and plowing fields and digging irrigation ditches. After the first planting of sugar cane, the laborers were used to prepare a site for the new mill. A water reservoir and 1 km of wooden pipe were constructed to help bring water to the mill site. The mill machinery was manufactured in Glasgow, Scotland, and was transported by boat to the Wai'anae shore (*Hawaiian Gazette* 1880:3).

The next challenge for the plantation employees was to get the machinery from the boat to the mill site (c. 1 km southeast of the present project area). A tram track was constructed by driving piles into the coral and then the large parts were moved to the mill by small tram cars. The mill was then constructed along with a smokestack that stood about 30 m above the plantation. The *Hawaiian Gazette* stated, "Great credit is due to Messrs. Widemann and Richardson for their energy in accomplishing so much in so short a time" (1880:3).

The next challenge was to provide a railroad for hauling harvested cane to the mill and workers back and forth to work. The laborers kept busy laying over 10 km of track while they waited for the locomotive to be shipped. Since it was manufactured by Fowler Co. in Leeds, England, the next step was to transport it from the large transport ship to land. Its size made it impossible to load onto a whaleboat. The workmen dismantled the locomotive and brought it to the plantation in pieces. Once on dry land they were able to re-assemble the engine. The only problem was that the locomotive did not fit the narrow-gauge track so they had to take it apart once again, machine it down, and put it back together for the last time (McGrath et al. 1973:41).

Probably the greatest challenge for Waianae Co. was locating more water. Wai'anae streams did not have enough water to accommodate all the new sugar fields popping up. The answer to this problem was drilling, a new process designed to tap artesian water. The process was discovered in nearby 'Ewa in 1879. Widemann took the opportunity to make use of this new discovery. He contracted the three McCandless brothers, pioneers in this field, to drill 33 wells into his property at a cost of $50,000.00 to $75,000.00. They could only charge him full price if they found water and half price if they found nothing (Pratt 1939:275). The resulting volume of water was insufficient, forcing the company to augment with whatever surface water they could find.

By 1884, the population of Wai'anae had not only increased but it was now known as the second largest town on O'ahu. There were several stores, churches, schools, and a clubhouse. Mail service started up the following year. Waianae Co. had 475 acres of sugar cane growing, 1,200 tons of sugar produced in the mill, 15 km of railroad track laid, and 175 men employed by 1884. Coffee was even planted for a short time in the uplands of Wai'anae Valley (McGrath 1973:42).

Ten years later, Waianae Co. had an additional 125 acres of cane growing, 1,300 more tons of sugar produced, an additional 5 km of track laid, and double the number of men employed as there was in 1884. In addition, another shop and a saloon opened at about this time near the present Wai'anae Library and present project area. The 1890 census recorded 903 residents in the district (McGrath et al. 1973:42, 46, 48).

The biggest event of that decade occurred on 4 July 1895 when the 'Ewa mill railroad tracks were connected with Waianae Co.'s tracks. More people passed through Wai'anae that first week than in the whole previous year (McGrath et al. 1973:61). Wai'anae was obviously growing, so much so that an additional store and a hotel quickly sprang up. The Dowsett Hotel on Keaupuni Point was located near the modern Wai'anae Public Library, just south of the present site area. By 1896 the population of Wai'anae coast had reached 1,281. In 1898, railroad tracks were extended around the other side connecting Wai'anae with Waialua. In 1899 the tracks continued to Kahuku (McGrath et al. 1973:62, 72). This was entrepreneur Dillingham's Oahu Railway and Land Company (O. R. & L.).

Cattle

During the 1880s the Dowsett family controlled a large estate in the Hawaiian Islands. One of their land holdings included 17,200 acres in the Wai'anae Valley that they had leased from the Crown for cattle grazing (McGrath et al. 1973:32). This parcel of land (Grant 5009) was located directly northeast of LCA 8307.2 (Territory of Hawaii [TH] Survey Map, Land Court 1935).

The founder of the estate was James Isaac Dowsett. He was the son of the well-known British Navy Captain Samuel J. Dowsett who had come to the islands in 1828. James, who was born in Honolulu on 15 December 1829, was the first non-missionary Anglo-Saxon born in the islands (Day 1984:37).

During his lifetime Dowsett owned and operated a whaling fleet, a fleet of schooners for interisland trading, a dairy, a lumber business, a salt works, and an Aberdeen Angus cattle ranch (*Honolulu Advertiser* 5/12/1930 ed. pg.). He also grew sugar and *'awa* (Widemann 1891 [52]:145). He became a nobleman during the reign of King Kalākaua (*Honolulu Advertiser* 5/12/1930 ed.pg.).

James I. Dowsett's nephew, John M. Dowsett, became quite a businessman/politician in his own right. He was born in Honolulu on 24 October 1862. John Dowsett married Wilhelmine (Minna) Widemann, daughter of Hermann A. Widemann, owner of Waianae Co., on 30 April 1888. In 1897, John Dowsett became Honolulu agent for Waianae Co. Over the next few years he held such positions as an officer in the Inter-island Steam

Navigation Co., a member of the Board of Agriculture and Forestry, a member of the Board of Prison Inspectors, a legislator, and a senator by 1905. He became vice-president and largest shareholder of Waianae Co. (Nellist 1925).

The Dowsetts were not as popular as Widemann, but they knew how to make money and the plantation thrived. In 1895 John Dowsett was credited with directing a reforestation project of the upper Wai'anae Valley. The purpose of the project was to recreate the watershed. Heavy sandalwood and other forestry clearing had probably eliminated much of the forest by the mid-nineteenth century (Klieger 1993a). Dowsett was probably concerned with stabilizing the soil and raising the water table for plantation use. Laborers fenced off the lower portions of the mountains to keep the cattle out so the trees they planted and other foliage could grow. They also dug a large system of ditches in order to catch water runoff from the Wai'anae Mountains (*Honolulu Advertiser* 12/6/1931:10). This was another example of the use of the freshet system in O'ahu (Klieger 1993a).

Dowsett continued his innovations: In 1897, a hydroelectric plant was placed about 0.7 km southeast of Mount Kōlealiʻiliʻi and about 5 km northeast of the project area. A 12-inch pipe about 2 km long carried 2.2 million gallons of water from the ditches down to the plant, creating 440 horsepower. This was enough power to produce 300 kilowatts of electricity. The electricity was used to drive all the water pumps at the wells, except for the three Diesel stations and the mill generators during the off-season. With the aid of a four-inch pipe connected to the hydroelectric plant, fresh water was also pumped into the laborers' camp. The water that remained traveled through an open ditch to the lower fields in Wai'anae. Some of that water was also used to take out a little of the salty taste from the brackish "Makaha" (Kamaile) artesian water used on the Mikilua canefields (*Honolulu Advertiser* 12/6/1931:10).

Dowsett constructed the Kamaile-Mikilua galvanized iron flume and tunnel system that extended about 8 km from Kamaile Springs to the canefields in southern Mikilua. This flume also branched out in and around the area covering in length a total of about 16 km (*Honolulu Advertiser* 12/6/1931:10).

On 4 September 1906 J. M. Dowsett, as Vice-president and Secretary of Waianae Co., took over H. A. Widemann's lease of 827.35 acres in Wai'anae Kai (State of Hawaii,

Bureau of Conveyances Liber 69). On 31 December of the same year J. M. Dowsett purchased this land in a land grant at public auction for $69,700.00. Included in this tract was a large section (153 acres) labeled as a reserve that surrounded LCA 8307.2 and the present project area (Grant 5009).

In 1900, the U.S. Congress passed the Organic Act which among other matters confirmed the cession of Hawaiian "public lands"[13] to the United States and provided specific laws to take care of those lands. In 1910, an amendment to the Organic Act directed the Territorial Government to release land for homestead use. For a piece of land to be set aside for homesteading, 25 or more qualified people had to apply for the land (MacKenzie 1991:15, 17). Following the establishment of this amendment, homestead land was allotted in Wai'anae Pāhoa (1912) and in Lualualei (1913) (TH Survey Map 1938).

Military

By 1909, the use of irrigation had begun changing the appearance of the countryside. In areas where grasslands were predominant, *kiawe* and other shrubbery began to flourish (Hammatt 1985:30). In 1910, the population of the Wai'anae Coast had risen to 1,846 with 750 individuals employed at Waianae Co. A majority of these workers were Japanese, Chinese, Portuguese, and Native Hawaiian. In 1914, Wai'anae finally built a four-room school and within four years possessed a new courthouse (McGrath et al. 1973:77-78). On 2 July 1918, the U.S. Army established a reserve in Wai'anae Kai by Presidential Executive Order 2900. Along with the reserve they also took over the majority of Pōka'ī Bay for an amphibious training camp. The bivouac was called Waianae-kai Military Reservation (U.S. Army Corps of Engineers n.d. III). At the time the land was taken, Governor McCarthy expressed his belief that all of the land had been held by the Territory. There were 131 acres taken from Wai'anae plantation that he said he thought must have been wasteland not used for plantation purposes (*Honolulu Advertiser* 7/16/1918:1).

In 1929, the U.S. government condemned over 4,000 acres in Lualualei to be used as a Naval Ammunition Depot. The ammunition stored there was used on the ships at Pearl

[13]formerly Crown Lands

Harbor Naval Base (McGrath et al. 1973:113). A few years later the U.S. Navy claimed a total of 8,000 acres for their depot and built a communications station there (Allen 1950:226). On 31 July 1930, Presidential Executive Order 5414 was issued. The purpose of this directive was to increase the level of military activity along the Waianae-Kai Reservation.

In 1931, J. M. Dowsett died and his family sold the plantation to the financing company, American Factors. Amfac hired Robert Fricke to take over as plantation manager. He was well known for his attempts at conserving water. Fricke increased the number of reservoirs at the plantation and had them lined with concrete to prevent seepage (*Honolulu Advertiser* 12/6/1931:1). In fact, he was so fanatical in saving water that he would spy on the plantation workers to insure they saved water (McGrath et al. 1973:119).

Throughout the Great Depression Wai'anae continued to grow. In 1935, the first bus service to and from Honolulu was established. During that year a new theater and a new road that wound through Kolekole Pass were also constructed (McGrath et al. 1973:132). By 1940 there were 2,948 permanent residents compared with just under 2,000 for the last two decades (Schmitt 1977:13-14).

During World War II the Wai'anae coast closely resembled the coast of Normandy during the D-day assault. Barbed wire was strung across the beaches, numerous tanks sat in formation on the roads, and amphibious landing craft were anchored off the coast of Pōka'I Bay. The Waianae Co. mill smokestack was even covered in camouflage (McGrath et al. 1973:137-38). There were eight army divisions totaling 201,000 men trained at Waianae-Kai military reservation. This base was the largest of several amphibious training centers. Troops at Wai'anae traveled up the coast to Mākua where they carried out mock assaults upon replicas of the Japanese beach defenses at Tarawa (Allen 1950:226). During their amphibious training, the soldiers "practiced going down landing nets with full pack and weapons, wrestling their equipment through surf, and digging in when they hit the beach" (Allen 1950:190).

Though Wai'anae was indeed prepared for attack, no real enemy action occurred there. However, during training a stray artillery shell hit a mango tree and depth charges wiped out large schools of *akule* fish. Many of the residents noted "that more damage was

inflicted on the Waianae coast by our own troops than by the enemy" (McGrath et al. 1973:135).

During the war years Waianae Sugar Co. suffered tremendously. With the draft and the high paying military positions, there were few people to work the fields (McGrath et al. 1973:136). By 1944, the plantation had announced a record loss of $123,918.00, losses blamed on a lack of rainfall since 1941. This drought stunted the cane on the remaining fields and depleted the sugar yield from 8,000 tons in 1933 to 3,000 in 1945. On 22 May of the same year the decision was made by the employees of the plantation to join the International Longshoremen's and Warehousemen's Union. This meant an increase of salary and benefits for the workers. Unfortunately, it was money that the plantation did not have (McGrath et al. 1973:140). In addition, the demand for sugar fell following the end of World War II since there was no longer any need to supply a large military operation overseas--Honolulu Plantation Co. of 'Ewa also liquidated at this time (Klieger 1993a).

In September 1946, Dillingham terminated service on the O.R.& L.--the railroad that had always hauled Waianae Co.'s cane. Dillingham commented on the situation:

> With the tonnage back to prewar volume and wages now double pre-war rates, and demands upon us for still further wage increases, the future holds no promise of sufficient increase in tonnage or rates to permit us operating other than at a tremendous loss. The shippers are just not in a position to meet what would be necessary in increased rates. (*Honolulu Advertiser* 9/21/1946:4)

On 17 October 1946, at a meeting of the stockholders of Amfac, a liquidation order was issued for Waianae Sugar Co. (*Honolulu Advertiser* 10/18/1946:1). Within days of the stockholders meeting, an enterprising Chinese-American investor, Chin Ho, was seriously looking into purchasing the Wai'anae property. With a loan from Bishop Bank President George Waterhouse and some sound advice from consulting engineer H. A. R. Austin, Chin Ho purchased the property. He purchased more than 9,000 acres for $1,250,000.00--the largest land purchase ever made by an Asian-American in Hawai'i. He gave the company 18 months to harvest the existing crop and six more months after that for the nearly 180 resident

employees to relocate. He even offered to buy the 1,000 head of pure-bred cattle owned by the company if they could not sell them (*Honolulu Advertiser* 4/20/1972:A21).

Ho's idea for the land was to divide it and create a community by marketing the land as house lots. The new corporation was known as the Waianae Development Co., Ltd. (*Honolulu Advertiser* 10/23/1946:1). They advertised beach front property for $2,500.00 with 10% down. Lots in Mākaha Valley were going for between $2,000.00 and $2,700.00 with $50.00 down (McGrath et al. 1973:148, 152). By 1950 Chin Ho was getting a return on his investment (*Honolulu Star-Bulletin* 12/4/1950:8).

According to the census records, the population has continued to increase ever since. In 1950 the population was 7,024; in 1960 there were 16,452 individuals in Wai'anae Kai; in 1970 there were 24,077; in 1980 there were 31,487; and in 1990 there were 37,411 people residing in Wai'anae (Schmitt 1977:14; Hammatt 1985:33; Department of Business, Economic Development and Tourism [DBEDT] 1993).

On 18 March 1959, the United States government provided that any federal agency controlling land would be brought before the President to determine if any particular land was still needed. On 11 April 1964, the United States government ruled that the land labeled as Parcel 1 in the Waianae-Kai Military Reservation would be given back to the State of Hawaii. However, the 1.56-acre lot covered under Land Commission Award 8307.2 was not part of the land given to the State because it was still under private ownership (State of Hawaii, Bureau of Conveyances Liber 4738). It was not until 22 June 1972, by final order of condemnation that the State of Hawaii was allowed to use the LCA property. The property was condemned for an addition to the Waianae Elementary and Intermediate Schools. The Waianae Civic Center was also built on the southeast and southwest corners of this land (State of Hawaii, Bureau of Conveyances Liber 8443). Between these two areas of modern development lies the present project area.

While the present site appears to be of little interest historically, its immediate neighborhood to the east should warrant particular concern and protection, being the site of an important *heiau* and *ali'i* residence. The Kamaile area to the west presently exhibits a high degree of Native Hawaiian architectural preservation, an example of a successful and

productive village in an otherwise arid environment. Special attention to these historic resources are warranted.

SCOPE OF ARCHAEOLOGICAL INVESTIGATIONS

The field and archival research tasks performed during these investigations are outlined in the State Historic Preservation Division's (SHPD) draft guidelines and regulations for archaeological inventory surveys and include:

1. Oral history and historical documents research for the property.
2. Review and synthesis of previous archaeological work for the entire *ahupua'a*.
3. Detailed plan mapping of all cultural features on the property.
4. Test excavations to determine the nature and extent of subsurface cultural remains and to assist in evaluating the significance of the site under criteria specified in federal and state regulations.
5. Profile recording of test pits, field analysis of soils, and recovery of relevant samples and artifacts.
6. Archaeological laboratory analysis of samples and artifacts as needed.
7. Inventory survey report write-up.
8. Revision by SHPD, editing, and final report production.

Research Questions

The archaeological inventory survey of the project area in Wai'anae was designed to achieve a better understanding of the impact of human settlement and land use on the landscape through time, from the initial phase of Polynesian settlement of Hawai'i to the modern era. Individual test unit location was therefore determined by the necessity of sampling the full range of possible culturally modified features located during surface survey. Information concerning the probable function and chronological history of these features was required to evaluate their potential eligibility under National Register criteria outlined in the following section on Significance.

More general issues addressed during excavation and analysis were derived, in part, from prior knowledge of the archaeological and paleoenvironmental history of similar karst

environments (with sinkholes) on Leeward O'ahu (Barber's Point and West Beach in 'Ewa). Specific questions, therefore, focused on the presence or absence of comparative data from which to interpret regional patterns while analyzing the content and context of individual features to ascertain the role of Site 50-80-07-2474 in local cultural processes. A summary of these questions is presented below.

1. Was the Native Hawaiian use of these natural sinkhole features consistent with their utilization in other leeward areas of O'ahu, or were there obvious regional variations?

2. Does the use of the project area in late pre-Contact and early historic periods appear to be as "marginal" as it is perceived today, or was the area once the focus of more intense activity?

3. Is the range of pre-Hawaiian avifauna in the project area similar to that of Barber's Point, or was Wai'anae more peripheral to their native habitat?

4. Does it appear that Wai'anae was a nesting area for these extinct species, or are the remains the result of introduction by raptorial species of indigenous birdlife?

5. Does evidence in Wai'anae exist for implicating human predation or habitat destruction as a factor in this avifaunal extinction, or does early Polynesian settlement occur after their disappearance?

6. Have more recent sugar cane production and military exercises in the project area adversely impacted the cultural resources, or do they remain virtually undisturbed today?

METHODS AND PROCEDURES

The following section presents relevant methods and procedures employed during the survey, excavation, and analysis of the archaeological remains recorded and recovered within the project area.

FIELD METHODS

Surface Survey

An intensive archaeological inventory survey of surface structural remains within the seven acre project area was conducted with a three-person crew. The entire property was surveyed in order to determine the most appropriate location for a three acre development. The purpose of the survey was to locate surface structures, midden, and artifacts prior to designing a testing strategy.

Each crew member was spaced approximately 10 m apart and followed a compass bearing of 31° to the northeast property boundary and followed the back azimuth on the return sweep. As surface remains were located, they were flagged, cleared, and given sequential feature numbers. The features were then located on a project area map using a laser theodolite "Total Station." All features were photographed in black and white and color slide film and were recorded on standard Bishop Museum forms.

Test Excavations

Eleven controlled test units were excavated using trowels, whisk brooms, and brushes using standard archaeological recording methods. Plan views were drawn at the surface of each layer and at the base of excavation for each test unit. The matrix was excavated by stratigraphic layers and arbitrary 5 or 10 cm levels. The soil was screened using 1/8-and 1/4-inch nested screens to determine if subsurface cultural deposits were present. Much of the 1/8-inch material from sinkhole features was sorted in the laboratory.

Surface collections of artifacts and midden were made as each feature selected for excavation was cleared and prepared for excavation. Artifacts were assigned temporary field numbers and locations were triangulated when found *in situ*. Black and white photographs

were taken at the surface and at the base of excavation for all test units. A representative profile was drawn and photographed for all test units.

Soils were described in the field. Stratigraphic layer descriptions are based on field tests of color (Munsell 1975), texture, soil structure, consistence (dry, moist, and wet), root abundance, estimated percentage of rock inclusions, thickness range of layer, cultural content, and boundary topography. Soil color was tested during moist and dry conditions. The layer descriptions follow the format used by the U.S. Department of Agriculture's Soil Survey Manual (1951).

LABORATORY PROCEDURES

Marine faunal remains were identified using Bishop Museum reference collections and Kay (1979) to aid in processing. Bone materials recovered from excavations were identified by Dr. Alan Ziegler, and weighed in the laboratory. Collected charcoal samples were dried and weighed.

Artifacts recovered from the Wai'anae project area were analyzed and cataloged in Bishop Museum's Archaeology Laboratory. Each artifact was measured, drawn, and assigned a unique catalog number incorporating the Bishop Museum site designation for the artifact. For example, artifact number 50-Oa-C3-34-1 is the first artifact cataloged for Site 50-Oa-C3-34.

Most glass and ceramic items were washed, and metal items were brushed. Corroded metals were additionally cleaned in an ultrasonic cleaner, to enable dating of diagnostic characteristics such as nail type. Following assignment of artifact numbers and completion of artifact cards, sorted materials were entered into a database inventory. Post-Contact artifacts were analyzed to determine manufacturing chronology and dates, geographic source and function. Artifacts of pre-Contact manufacture were analyzed to determine type and function. All artifacts were placed in acid-free containers for curation and storage.

All field notes, photographs, maps, records, and drawings are filed under project 502, and are stored in the Anthropology Department Documents Room at Bishop Museum. Black-and-white photographs are cataloged under roll numbers Oa(a)-942 through 945, and 947.

RESULTS

This section presents the results of the archaeological inventory survey and presents feature descriptions, results of test excavations, stratigraphic layer descriptions, and analysis of artifacts and midden materials. An interpretive discussion of individual test excavations follows excavation results for each test unit. The features found during the surface survey were designated under State Site 50-80-07-2474[16] and under Bishop Museum Site 50-Oa-C3-34[17].

SURFACE SURVEY

A total of 24 surface features were recorded, mapped, and described for Site 50-80-07-2474 during the surface survey. Figure 9 provides the location of these features on a map of the project area. Feature types found included a core-filled wall (Feature 1), an artifact scatter and trash mound (Features 2 and 2.1, respectively), an L-shaped alignment (Feature 3), a low platform (Feature 11), a terrace (Feature 21.1), four modified sinkholes (Feature 14, 17, 20, and 21), and 14 unmodified sinkholes (Features 4 through 10, 12, 13, 15, 16, 18, 19, and 22).

Table 2 summarizes the surface features of Site 50-80-07-2474, and includes information pertaining to formal feature type, feature size, and whether the feature was tested during the inventory survey. Preliminary functional interpretations are also provided in Table 2 where possible.

During the survey, it was noted that several articulated skeletons of small and large mammals were found on the surface of the project area. Observed were complete skeletons

[16] Under the Hawaii State numbering system, "50" is the State of Hawaii, "80" is the Island of O'ahu, "07" is the U.S.G.S. Waianae quadrangle map, and 2474 is the individual site number.

[17] Under the Bishop Museum site numbering system, "50" is the State of Hawaii, "Oa" is the Island of O'ahu, "C3" is the Waianae District *ahupua'a* of Wai'anae and Wai'anae Kai, and "34" is the individual site number.

Table 2
Summary of Archaeological Surface Features from Site 50-80-07-2474 (50-Oa-C3-34)

Fe. No.	Feature Type	Size l by w (meters)	Tested	Preliminary Interpretation	Comments
1	Wall	95.0 by 1.3	Yes	Boundary marker/cattle barrier	Core-filled; dates from early to mid-nineteenth century
2	Artifact Scatter	37.0 by 26.0	No	Dump	Contains historical and modern rubbish
2.1	Trash mound	2.0 by 1.5	Yes	Dump	Contains mid-nineteenth to early twentieth century rubbish
3	L-shaped alignment	3.30 by 1.0	Yes	Foundation for habitation structure	Contains traditional Hawaiian and post-Contact artifacts
4	Sinkhole	1.80 by 1.60	Yes	Temporary habitation/midden sinkhole	Contains traditional Hawaiian cultural materials and extinct avifaunal remains
5	Sinkhole	0.57 by 0.45	No	Undetermined	Roughly oval-shaped
6	Sinkhole	1.40 by 0.90	No	Undetermined	Two *ti* plants growing in the sink
7	Sinkhole	1.52 by 1.35	No	Undetermined	Roughly bell-shaped sink
8	Sinkhole	2.05 by 1.50	Yes	Agricultural	Contains traditional Hawaiian cultural materials
9	Sinkhole	0.75 by 0.61	No	Undetermined	Recent rubbish in sink
10	Sinkhole	1.85 by 1.32	Yes	Undetermined	Bowl-shaped interior
11	Low Platform	2.20 by 1.30	Yes	Surface Marker for pet burial	Dog skeleton in canvas tarp found
12	Sinkhole	2.05 by 1.13	No	Undetermined	1940s beer bottle cache found in sinkhole
13	Sinkhole	1.40 by 1.25	No	Undetermined	Roughly circular sinkhole
14	Modified Sinkhole	2.25 by 1.53	Yes	Habitation/Work area	Contains traditional Hawaiian cultural materials and extinct avifauna
15	Sinkhole	1.95 by 1.55	No	Undetermined	Roughly circular sinkhole with modern rubbish
16	Sinkhole	1.55 by 1.10	No	Undetermined	Contains U.S. military artifacts
17	Modified Sinkhole	1.40 by 0.90	Yes	Habitation/midden sinkhole	Contains traditional Hawaiian cultural materials and extinct avifauna
18	Sinkhole	1.80 by 0.72	No	Undetermined	Modern rubbish in sinkhole
19	Sinkhole	1.80 by 1.30	No	Undetermined	Irregular-shaped sinkhole
20	Modified sinkhole	1.58 by 1.30	No	Undetermined	Low wall of limestone slabs on east side

Table 2 (cont'd.)

Fe. No.	Feature Type	Size l by w (meters)	Tested	Preliminary Interpretation	Comments
21	Modified sinkhole	3.00 by 2.05	No	Undetermined	*Gallus gallus* remains and basalt manuport on surface
21.1	Terrace	1.75 by 1.30	Yes	Undetermined	Surface pebble pavement on north end
22	Sinkhole	1.36 by 1.00	No	Undetermined	Irregular-shaped sinkhole

of a dog (*Canis familiaris*) in the Feature 2 area, and a cat (*Felis catus*) near Feature 8. Scattered remains of cattle (*Bos* spp.) were found adjacent to the core-filled wall (Feature 1), and in several of the sinkholes too small to record as cultural features. Chicken (*Gallus gallus*) bone was also found on the surface of two sinkholes (Features 8, 21).

It was obvious that the project area has been used in the recent past as a dumping ground as numerous piles of recent rubbish were present on the surface and in sinkholes that were near the housing subdivisions. The recent rubbish was recorded in field notes, but none was collected. Other rubbish was obviously related to military activities, based on the presence of ammunition boxes, ammunition cartridges, and what appeared to be k ration cans. Some of the modifications to the sinkholes may be related to military activities in this area.

Surface artifacts dating to the post-Contact Period (post-A.D. 1778) were quite numerous and mostly concentrated in the southeast quadrant of the project area, in the vicinity of Feature 2. Artifacts collected from the surface and in excavations are discussed in the section titled "Artifacts."

The ground visibility was generally good, except in areas where grasses and fallen *kiawe* trees covered the ground. Roads were made by bulldozers throughout the property, creating piles of debris and destroying portions of Feature 1 (wall), the remnants of which are piled along the central bulldozed road. In spite of the relatively poor ground visibility in areas of surface debris, it is probable that all surface cultural features in the project area were found.

Feature Descriptions

Feature 1

Feature 1 is a core-filled, free-standing wall that extends roughly east-west in the central portion of the project area (see Figure 9). The wall measured approximately 95.00 m long and ranged from 1.00 to 1.50 m in width, with an average width of 1.30 m. The wall is curvilinear and has several significantly large (5.0 to 7.0 m) breaks, including a break that

was formed by the central bulldozed road in the project area. Other breaks in the wall appear to be a result of bulldozing, or reuse of the wall rocks (robbing rocks).

The exterior of the wall is constructed of limestone slabs and boulders, set upright or on edge, that range from 0.50 to 0.90 m in diameter (Figure 10). The interior of the wall is filled with angular to subangular, limestone cobbles, and pebbles. The top of intact portions of the wall is roughly level (Figure 11).

Skeletal remains of cattle (*Bos* sp.) were found adjacent to the wall.

Feature 2

Feature 2 is situated in the southeast quadrant of the project area (see Figure 9), and consists of a moderate to dense historical ("historical" refers to those remains more than 50 years old) artifact and rubbish scatter. The primary concentration of historical artifacts covers an area approximately 37.00 (east-west) by 26.00 m (north-south) in size (Figure 12). Beyond this concentration, the density of historical artifacts is greatly reduced. Several historical artifacts were found beyond the primary artifact concentration, particularly in the areas of Features 4, 8, and 10. The ground surface in the Feature 2 artifact concentration is about 80% visible, having relatively little grass cover compared with the surrounding area.

The artifacts in the scatter consist of bottles and bottle fragments, Japanese, Chinese, American, and European ceramics, tin cans, unidentified metal, large metal buckets, a galvanized steel pot, and enamelware. Modern trash is moderately to densely scattered in this area and may be attributed to public dumping.

Within the boundary of Feature 2 are smaller areas of refuse dumping and collapsed temporary architecture. Present are a collapsed plywood structure with a wooden window frame and mattress, another modern trash concentration including a metal chair, wire mesh, carpet, glass, plastic, vinyl, and other debris. A small, centrally located trash mound was designated as Feature 2.1.

In the northwest section of the feature the skeleton of a dog was collected 1.0 m southeast of a small circular depression. The cranium of the dog was collected approximately 4.0 m southwest of the post-cranium skeletal remains. The depression is

shallow and circular, measuring 1.0 by 1.0 m and about 20 cm deep, and was not given a feature designation.

On the periphery of the artifact scatter, at the northwest corner, is an L-shaped alignment of limestone boulders and slabs (Feature 3) that may be associated with one of the subsurface components of Feature 2.

Feature 2.1

This is a small rubbish mound located within the central portion of Feature 2 (see Figure 12). The mound measures 2.0 by 1.50 m in size and about 0.25 m in height and consists of dark brown silt loam mixed with historical artifacts, including modern glass fragments, bottles, ceramic fragments, and metal items.

Feature 3

This feature is located in the southeast quadrant of the project area (see Figure 9) and just outside the southwest periphery of Feature 2 (historical artifact scatter). Feature 3 is an L-shaped alignment of limestone boulder slabs and cobbles. It measures 3.30 (north-south) by 1.0 m (east-west) and 0.15 m high (Figure 13). The alignment is comprised of five limestone boulder slabs that are deeply embedded in the soil. One large surface cobble situated west of the alignment is probably not associated with this structure. The area west of the north-south alignment is considered the "interior" of the feature and the area just east of the north-south alignment is considered the "exterior" of the feature. A recent coffee mug handle was near the structure on the surface.

Feature 4

This feature is a small-to moderately-sized, unmodified, roughly bell-shaped sinkhole situated in the central east portion of the project area (see Figure 9). It measures 1.80 by 1.60 m in size (Figure 14). The interior sink surface is 0.68 m below the sinkhole rim. A large amount of *kiawe* debris, *koa haole* seeds, land snail shells, seeds, and grasses littered the surface. Chicken bone and pig bone were collected from the surface. A Chinese banyan

tree is growing just outside the sink on the south side. A whole enamelware pot was collected near the sinkhole.

Feature 5

Feature 5 is a small, unmodified, roughly oval-shaped sinkhole located approximately 5.0 m west of the central bulldozed road in the central north portion of the project area (see Figure 9). The dimensions of this sinkhole are 0.57 by 0.45 m. The interior sink surface is 1.45 m below the sinkhole rim.

Feature 6

Feature 6 is a small, unmodified sinkhole located in the northwest quadrant of the project area (see Figure 9). It is roughly oblong-shaped and measures 1.40 by 0.90 m. The interior sink surface is 1.40 m below the sinkhole rim. Two ti plants are growing in the sink and a Chinese banyan tree is growing just outside of the sinkhole with the roots extending into the sinkhole. Modern trash, including bottles, paper rubbish, and what appeared to be a decomposing railroad tie, littered the sinkhole's surface.

Feature 7

Feature 7 is a small, unmodified, roughly bell-shaped sinkhole located in the northwest quadrant of the project area (see Figure 9). It measures 1.35 by 1.52 m with the interior sink surface situated 1.85 m below the sinkhole rim. A large, dead *kiawe* tree trunk, apparently cut with a hand saw, is present in the sinkhole.

Feature 8

Feature 8 is an unmodified, roughly oval-shaped sinkhole located in the northeast quadrant of the project area on the east side of the central bulldozed road (see Figure 9). It measures 2.05 by 1.50 m (Figure 15). The interior sink surface is 0.30 m below the sinkhole rim. *Gallus gallus* (chicken) bone remains were present on the surface. An articulated cat (*Felis catus*) skeleton was found on the surface about 5.0 m west of Feature 8.

Feature 9

Feature 9 is a small, unmodified, roughly circular sinkhole located in the northeast quadrant of the project area (see Figure 9). It measures 0.75 by 0.61 m with the interior sink surface situated 0.65 m below the sinkhole rim. The sink's surface was littered with modern debris, including an aerosol can, bottles, and a piece of carpet. A *koa haole* tree is growing from the west end of the sinkhole.

Feature 10

Feature 10 is a small, roughly oval-shaped, unmodified sinkhole situated in the northeast quadrant of the project area on the east side of the central bulldozed road (see Figure 9). This sinkhole has relatively smooth bowl-shaped sides and measures 1.85 by 1.32 m (Figure 16). The interior sink surface is 0.40 m below the sinkhole rim. *Kiawe* and *koa haole* debris littered the sink's surface.

Feature 11

Feature 11 is a low platform situated in the northeast quadrant of the project area (see Figure 9). The platform is oblong-shaped and measures 2.20 by 1.30 m and ranges from 0.20 to 0.25 m in height (Figure 17). This low platform is crudely constructed and consists of a defined edge (face) of large, angular to subangular limestone cobbles. The platform's surface is roughly level and consists of angular to subangular, limestone cobbles and pebbles. A piece of branch coral was present on the north end of the platform.

Feature 12

Feature 12 is a moderate to large, unmodified, irregular-shaped sinkhole located in the southwest quadrant of the project area on the west side of the western-most bulldozed road (see Figure 9). It measures 2.05 by 1.13 m, with the interior sink surface situated 1.10 m below the sinkhole rim. Two *koa haole* trees are growing in the sinkhole; one at the southeast end and one at the northwest end. A cache (numbering approximately 12) of beer bottles with stippling (post-1940) was neatly stacked under the overhang of the sinkhole at the south end.

Feature 13

Feature 13 is a small, roughly circular, unmodified sinkhole located in the southwest quadrant of the project area west of the central bulldozed road (see Figure 9). It measures 1.40 by 1.25 m with the interior sink surface situated 0.50 m below the sinkhole rim. A Chinese banyan tree is growing from the north end of this sinkhole.

Feature 14

Feature 14 is a moderately large, semi-oblong, modified sinkhole situated in the southwest quadrant of the project area (see Figure 9). Four limestone boulders appear to have been purposefully placed on the north and west sides of this sinkhole (Figure 18). The feature measures 2.25 by 1.53 m with the interior sink surface situated 0.58 m below the sinkhole rim.

Feature 15

Feature 15 is an unmodified sinkhole located in the northwest quadrant of the project area, west of the central bulldozed road (see Figure 9). It is roughly oval-shaped and measures 1.95 by 1.55 m with the interior sink surface situated 1.36 m below the sinkhole rim. A limestone boulder slab is situated in the central portion of the sinkhole, dividing it in half. The slab is large enough (1.95 by 0.30 m) to be considered natural roof fall. A metal can and a golf ball were present on the surface of the sink.

Feature 16

Feature 16 is a roughly oblong-shaped sinkhole situated near the northern boundary of the project area on the west side of the central bulldozed road (see Figure 9). This sinkhole measures 1.55 by 1.10 m, with the interior sink surface situated 0.65 m below the sinkhole rim. A small (inaccessible), adjoining sinkhole is present on the northeast side. Mammal bone (probably *Bos* spp.), tin cans, artillery shell containers, and organic debris (*kiawe* and *koa haole* trees) littered the surface.

Feature 17

Feature 17 is a relatively large, roughly rectangular, modified sinkhole, located in the northwest quadrant of the project area, west of the central bulldozed road (see Figure 9). It measures 1.40 by 0.90 m with the interior sink surface situated 1.85 m below the sinkhole rim (Figure 19). Two large limestone boulders inside the sinkhole at the north end were apparently placed to facilitate access to the sinkhole. The sink's surface was littered with *kiawe* and *koa haole* tree debris. Surface artifacts consist of a large quantity of rusted tin can fragments, an ammunition box, glass bottles, beer cans, and a bandage tape roll. A piece of braided 3/4-inch steel cable with "eyes" on both ends was also present in the sinkhole, buried under surface boulders.

Feature 18

Feature 18 is an oblong-shaped, unmodified sinkhole located in the northwest quadrant of the project area on the west side of the central bulldozed road (see Figure 9). It measures 1.80 by 0.72 m with the interior sink surface situated 1.40 m below the sinkhole rim. Limestone boulders, tin cans, and bottles are present on the surface. A Chinese banyan tree is growing in the north end of the sinkhole.

Feature 19

Feature 19 is an irregular-shaped, unmodified sinkhole located in the northwest quadrant of the project area (see Figure 9). It measures 1.80 by 1.30 m with the interior sink surface situated 1.30 m below the sinkhole rim. Three boulders are present in the south end of the sinkhole but their placement does not indicate human modification.

Feature 20

Feature 20 is a roughly oval-shaped, modified sinkhole located in the southwest quadrant of the project area, on the west side of the central bulldozed road (see Figure 9). It measures 1.58 by 1.36 m with the interior sink surface situated 0.73 m below the sinkhole rim. Along the exterior eastern side of the sinkhole, two to three courses of loosely stacked,

angular limestone slabs form a low wall. Approximately eight tin cans, and modern bottles (no deposit, no return), and an Olympia beer can were found on the sink's surface. Three small *koa haole* trees are growing in the sink.

Feature 21

Feature 21 is a modified sinkhole located in the southeast quadrant of the project area, east of the central bulldozed road (see Figure 9). The modification is a small terrace, designated as Feature 21.1 (see below), situated on the east side of the sinkhole. The sinkhole measures 3.0 by 2.05 m with the interior sink surface situated from 0.10 to 0.25 m below the sinkhole rim (Figures 20 and 21). Bone remains of chicken (*Gallus gallus*), and a basalt manuport were present on the surface of the sinkhole. Approximately five meters southeast of this sinkhole, a volcanic glass flake was collected from the surface. Smaller sinkholes are present to the north and west.

Feature 21.1

This feature is a small, rectangular-shaped terrace located at the east edge of Feature 21 (see Figures 20 and 21). The terrace measures 1.75 by 1.30 m and ranges from 0.15 to 0.25 m in height. The east, west, and south sides are defined by medium to large, subangular limestone cobbles; the north side is defined by a pebble surface on exposed limestone bedrock. The terrace exhibits two surface pavings. On the north end, a leveled area of approximately 0.90 by 0.80 m in size is paved with angular limestone pebbles and is about 5 - 10 cm higher than the rest of the terrace. South of the pebble-paved area, the terrace surface slopes to the south and consists of small, angular limestone cobbles and pebbles.

Feature 22

Feature 22 is a small, irregular-shaped, unmodified sinkhole located in the northeast quadrant of the project area, on the east side of the central bulldozed road (see Figure 9). A *kiawe* tree is growing in the sink's east end. This feature measures 1.36 by 1.00 m with the interior sink surface situated 0.26 m below the sinkhole rim.

EXCAVATION RESULTS

The following features were selected for test excavations: Feature 1 (historic wall), Feature 2 (historic artifact and rubbish scatter), Feature 3 (L-shaped alignment), Feature 4 (sinkhole), Feature 8 (sinkhole), Feature 10 (sinkhole), Feature 11 (low platform), Feature 14 (modified sinkhole), Feature 17 (modified sinkhole), and Feature 21.1 (terrace). The sinkholes selected for excavation were purposefully chosen, based on shape and size, in order to sample morphological variation in the features. Also, an equal number of sinkholes was selected from both sides of the central bulldozed road in order to determine if one side of the bulldozed road was more feasible for development.

Surface collections of artifacts and midden were made as each feature selected for excavation was cleared, cleaned, and prepared for excavation.

Samples of all stratigraphic layers were tested for the presence of carbonates in the soils/sediments with a solution of dilute hydrochloric acid (HCl). Except for Layer I samples, all soil samples were strongly to violently effervescent, indicating a substantial quantity of carbonates in the soils.

Feature 1

Excavation Procedures

A single 1.00 by 0.50 m test unit (TU8) was excavated through Feature 1 at one of the breaks in the wall near the east end (see Figures 9 and 11). The purpose of this unit was to examine the wall's architecture and to correlate the wall's foundation with the underlying stratigraphy.

Excavation Results

The foundation of this core-filled wall (Feature 1) was resting in the lower portions of Layer I. Historical artifacts were recovered in this layer. Very sparse marine shell was recovered in Layer II under the wall.

Figures 22 and 23 illustrate the cross section of the wall and the three stratigraphic layers underlying wall construction. Excavation of the wall revealed that large boulder slabs were used for exterior faces and two large foundation boulders were imbedded in Layer I deposits in the central portions of the wall. The wall fill consisted of angular and subangular, limestone cobbles and pebbles. Debris from *kiawe* and *koa haole* trees, as well as deposits of dark brown (10YR 3/3, moist), fine silt were present among the rocks of the fill. These deposits continued under the base of the wall and were designated as Layer I. Layer I sediments under the wall consisted of very dark brown (10YR 2/2, moist) silt loam with a high organic content. Layer I ranged from 3.0 to 8.0 cm thick and contained approximately 10%, by volume, angular limestone cobbles and pebbles. The upper 1.0 to 2.0 cm of Layer I consist of the existing organic, or O horizon (leaf and twig litter), and a very organic loamy silt that is slightly darker than the lower portions of Layer I. The silt loam matrix was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II and has an abrupt, smooth boundary.

Layer I was found directly underlying two of the wall's large central boulders, uncovered by the excavation. It was also found directly underlying the base of the boulders that form the exterior faces of the wall (see Figure 22).

Artifacts recovered from upper portions of this layer include recent emerald green, bottle glass fragments and one .22-caliber bullet. A spent, lead pellet gun bullet, believed to be associated with Layer I, was recovered from a clean-up of TU8 after excavation was completed. No faunal remains were recovered from this layer.

Layer II was a dark brown to grayish brown (10YR 5/2.5, moist) pebbly, gravelly, silt containing 30 - 40%, by volume, angular limestone gravel and pebble. Layer II ranged from 2.0 to 8.0 cm thick and was loose, slightly sticky, and slightly plastic. Layer II was found directly overlying Layer III with an abrupt to clear, smooth boundary. Layer II also directly overlies limestone bedrock in the northern portions of TU8. Very sparse marine shell (*pipipi*, *Nerita picea*) was recovered from Layer II deposits underneath the wall.

Layer III was a light yellowish brown (10YR 6/4, moist), sandy, gravelly, cobbly, silt and ranged from 2.0 to 10.0 cm thick. It contained, by volume, 50% angular limestone

gravel, pebbles, and cobbles. The cobbles are flattened, suggesting limestone bedrock deterioration. The silt matrix was loose, slightly sticky, and nonplastic, and was present only in the southern two-thirds of TU8. Layer III was noncultural and was found directly overlying limestone bedrock.

Discussion

The emerald green bottle glass fragments from upper portions of Layer I within Feature 1 are likely from a twentieth-century soda bottle (see section titled "Historic Artifacts"). It is possible that these glass fragments, as well as the .22-caliber bullet, filtered down through the loose rocks at the break in this portion of the wall.

The fact that the wall's foundation boulders rest in the lower portions of Layer I indicates that the wall construction occurred fairly recently, and that it is probably not a pre-Contact feature.

Feature 2.1

Excavation Procedures

A 1.00 by 0.50 m test unit (TU9) was excavated into the north side of this small trash mound (see Figure 12). This feature was tested to determine the depth and the content of the mound, to examine the underlying stratigraphy, and to determine the relationship between the mound and the surface artifact scatter. Prior to excavation, diagnostic artifacts and midden remains were collected from the mound's surface and from the adjacent areas.

The upper 33 cm of the mound was excavated in 5-cm levels to provide a tighter control of the depositional patterns of artifacts and midden remains. The feature was then bisected (in TU9) to quickly examine stratigraphy in the lower portions of the mound.

Excavation Results

Surface historical artifacts recovered from the surface of Feature 2.1 include ceramics, bottle glass shreds, household metal, and unidentified metal fragments. These are discussed in the section titled "Historical Artifacts." Historical artifacts were found in Layer

I overlying the mound, within the lenses (Lens A, B, and C) that comprise the mound, and within Layer II underlying the mound.

Three stratigraphic layers were revealed in TU9, as well as three discontinuous sediment deposits, designated as Lens A, B, and C (Figure 24). Layer I was a very dark brown to very dark grayish brown (10YR 3/2.5, moist) silt loam with a high organic content. These silt loam deposits ranged from 2.0 to 9.0 cm thick, contained less than 5%, by volume, angular limestone pebbles, and were loose, nonsticky, and nonplastic. Layer I was found directly overlying Lens A with an abrupt, smooth boundary that sloped down to the north.

Faunal remains recovered in Layer I include marine shell, crab claws, and bone remains of mammal (pig tooth), fish (unidentified bone) and bird (chicken). A small amount of wood charcoal was also recovered. Artifacts recovered include ceramics (porcelain and stoneware), bottle glass sherds in various colors, lamp glass sherds, window glass sherds, wire nails (whole and fragments), numerous (1500+) tin can fragments, iron fragments, crown bottle caps, and a bone button fragment.

Lens A is a very dark brown (10YR 2/2, moist) fine, silt loam with a high humic content. This lens ranged from 3.0 to 7.0 cm thick and was loose, slightly sticky, and plastic. It contains less than 1%, by volume, angular limestone pebbles. Lens A was found directly overlying Lens B and Lens C with an abrupt, smooth boundary. Lens A extended outside of TU9 in all directions.

Faunal remains recovered in Lens A were restricted to marine shell and crab claws. A sparse quantity of wood charcoal was also recovered. Artifacts recovered included ceramics (earthenwares, porcelain, and stoneware), bottle glass sherds of various colors, lampglass sherds, cut and wire nails, cut bone, tin can fragments, iron and lead fragments, and a fragment of rubber.

Lens B was a discontinuous deposit of very dark gray (10YR 3/1, moist) fine, silt. This lens was intermittently present, ranged from 2.0 to 3.0 cm thick, and was loose, slightly sticky, and slightly plastic. Lens B was found directly overlying Lens C with an abrupt, smooth boundary.

Faunal remains recovered in Lens B were restricted to marine shell. A sparse quantity of charcoal was also recovered. Artifacts recovered in Lens B included ceramics (earthenwares and porcelain), bottle glass sherds of various colors, lamp glass sherds, window glass sherds, cut and wire nails, a carved and drilled bone die, a brass safety pin fragment, limestone marbles (whole and fragment), a plated copper thimble, porcelain and shell buttons, tin can fragments, iron fragments, and a bottle cap liner.

Lens C was a very dark grayish brown (10YR 3/2, moist) silt loam with light brownish gray (10YR 6/2, moist) mottles. The light grayish brown mottles appeared to be directly related to root activity. This lens ranged from 4.0 to 6.0 cm thick and had a very compact surface, more than the surfaces of Layer I, Lens A, and Lens B. It contained less than 5%, by volume, subangular to angular limestone pebbles. The silt loam matrix of this lens had a slightly greasy texture, and was friable, slightly sticky, and slightly plastic. Lens C was found directly overlying Layer II and had an abrupt, smooth boundary.

Faunal remains recovered from Lens C included sparse marine shell, crab claws, bone remains of fish (unidentified bone) and mammals (medium and large mammal), as well as sparse, unidentified egg shell. Artifacts recovered included ceramics (earthenwares, porcelain, and stoneware), bottle glass sherds of various colors, lampglass sherds, window glass sherds, wire nails, bone button fragments, a brass shoe boot eyelet, porcelain and shell button fragments, a shell ornament, tin can fragments, and an iron fragment.

Layer II is a yellowish brown (10YR 5/4, moist) pebbly, silty clay loam with common, medium mottles of light brownish gray (10YR 6/2, moist) to grayish brown (10YR 5/2, moist). It ranged from 23.0 to 24.0 cm thick, and contained 20%, by volume, subangular to angular limestone pebbles. The silty clay loam matrix was friable, slightly sticky, and slightly plastic. Layer II was found directly overlying Layer III and had a clear to diffuse, smooth lower boundary.

Faunal materials recovered from Layer II was restricted to crab claws. Artifacts recovered from this layer include bottle glass sherds of various colors, wire nails, and a slateboard fragment.

Layer III was a light brown (7YR 6/3, moist) to pink (7YR 6/3, moist) pebbly, sandy silt with a minimum thickness of 10.0 cm. This deposit was quite moist during excavation,

and contained approximately 35%, by volume, decomposing, subangular limestone pebbles. The matrix was loose, nonsticky, and nonplastic. The lower boundary is undetermined.

Faunal remains recovered from this layer were restricted to crab claws. No artifacts were recovered.

Discussion

Based on the presence of microstratigraphy (Lenses A through C), in Feature 2.1, and on the presence of historical artifacts within this mound, it appears that this feature was used for refuse disposal over a period of time. Analysis of historical artifacts from the mound places this time period between the mid-nineteenth to the early twentieth century.

The presence of historical artifacts in Layer II deposits underlying the mound suggests that activities associated with the deposition of these artifacts pre-date the mound's formation. Although a distinct buried surface was not observed within Layer II, extensive mottling in this layer may have masked a buried surface.

The light brown (7YR 6/3, moist) to pink (7YR 6/3, moist) color and pebbly, sandy silt texture of the Layer III matrix, as well as the presence of deteriorating limestone pebbles in the matrix, suggest that Layer III is an *in-situ* C-horizon soil formed through chemical and physical weathering of the limestone bedrock in this area.

Feature 3

Excavation Procedures

The purpose of testing this L-shaped alignment was to correlate the soil stratigraphy between the interior and the exterior of the feature, to determine the relationship between the boulder slabs in the alignment and the underlying stratigraphy, to determine the presence/absence of cultural materials, and to determine feature age and function.

A single 1.00 by 0.50 m test unit (TU2) was placed over the alignment to sample both interior and exterior portions of the feature (see Figure 13). The interior of the structure was excavated and screened separately from the exterior to compare results.

Excavation Results

Layers I and II in the interior of Feature 3 yielded both traditional Hawaiian and historical artifacts. One basalt flake was recovered from Layer III. Two subsurface, possible pavements (Features 3.1 and 3.2) were also identified. TU2 revealed three distinct stratigraphic layers. The stratigraphic sequences recorded in the interior and exterior of this feature exhibit minor variations and are presented separately.

. *Interior Stratigraphy of Feature 3* -- The west half of TU2 was excavated in what was believed to be the interior of Feature 3. Figures 25 and 26 illustrate stratigraphic profiles of the feature's interior. Here, Layer I was a very dark brown (10YR 2/2, moist) silt loam with a high organic content, mixed with a litter of *kiawe* debris and grasses. The upper 2.0 to 3.0 cm of this layer was very loose and dry and could be swept away with a whisk broom. The remainder of Layer I was more compact and was slightly moist. It contained approximately 10 - 15%, by volume, angular limestone pebbles. Layer I ranged from 5.0 to 12.0 cm thick and was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II in the feature's interior with a clear, wavy boundary.

Faunal remains recovered in Layer I included marine shell and unidentified bird bone. Artifacts recovered in this layer included a volcanic glass flake, a volcanic glass core, bottle glass sherds, and a tin can fragment.

Layer II was a pale brown (10YR 7/3, moist) sandy, gravelly, cobbly silt with approximately 30%, by volume subangular to angular limestone gravel and cobbles. Layer II ranged from 10.0 to 24.0 cm thick, and had common, medium, very dark brown (10YR 2/2, moist) mottles. The silt matrix was friable, slightly sticky, and slightly plastic. Layer II was found directly overlying Layer III and had a clear, wavy boundary.

Faunal remains recovered from Layer II in the Feature 3 interior were marine shell, crab claws, and bone remains of mammals (pig, medium mammal) and fish (unidentified bone). Sparse charcoal was also recovered. Artifacts recovered included an edge-altered basalt flake, a limestone flake, bottle glass sherds, a wire nail, tin can fragments, and a .22-caliber bullet.

Approximately 15 cm below the Layer II surface, a possible limestone and basalt cobble paving, was found and designated Feature 3.1. Figures 25 and 26 illustrate this possible pavement in profile, and Figure 27 shows the pavement in a photograph during excavations. The surface of the pavement was uneven. Layer II was found directly overlying and underlying the pavement cobbles.

Layer III was a very pale brown (10YR 7/4, moist) cobbly, pebbly silt with approximately 50%, by volume, deteriorating subangular limestone pebbles and cobbles. The silt matrix is fine, loose, nonsticky, and nonplastic. The maximum thickness and lower boundary of this layer were undetermined.

Faunal remains recovered from Layer III in the interior of Feature 3 was restricted to sparse sea urchin remains. Sparse charcoal was also recovered. A single basalt flake was the only artifact found in the sample of Layer III.

Exterior Stratigraphy of Feature 3 -- In the southern half of TU2, excavated just outside of Feature 3, a similar stratigraphic sequence was observed. Figures 26 and 28 illustrate this sequence. Layer I was a very dark brown (10YR 2/2, moist) silt loam with a high organic content, mixed with *kiawe* twig and leaf debris and grasses. It contained less than 10%, by volume, angular limestone pebbles and cobbles. The silt loam matrix ranged from 6.0 to 10.0 cm and was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II and had a clear, wavy boundary.

Faunal remains recovered from Layer I just outside Feature 3 was restricted to marine shell. No artifacts were found.

Another possible paving, designated as Feature 3.2, was found approximately 10.0 cm below the Layer I surface. This possible paving was not as extensive as the interior paving (Feature 3.1) and consisted of basalt and limestone cobbles (see Figure 27). While the interior paving was found directly overlying and underlying Layer II, the exterior paving (Feature 3.2) was found directly overlying and underlying Layer I. Layer I deposits under the Feature 3.2 paving were, however, less than 2.0 cm thick.

Layer II was a pale brown (10YR 7/3, moist) sandy, pebbly, cobbly, silt with approximately 20%, by volume, angular limestone cobbles and pebbles. It ranged from 14.0 to 18.0 cm in thickness and contained common, medium very dark brown (10YR 2/2, moist) mottles. The sandy silt matrix was friable, slightly sticky, and slightly plastic. Layer II was found directly overlying Layer III and had a clear to diffuse, wavy boundary. No faunal remains or artifacts were recovered from the sample of this layer outside Feature 3.

Layer III is a very pale brown (10YR 7/4, moist) pebbly, gravelly silt with approximately 50%, by volume, deteriorating limestone pebbles and cobbles. The fine, silt matrix was loose, nonsticky, and nonplastic. The maximum thickness and boundary topography of Layer III was undetermined. No faunal remains or artifacts were recovered in the sample of this layer.

Discussion

The presence of traditional artifact forms (edge-altered basalt flake, basalt and limestone flakes, and volcanic glass flake and core) in stratigraphic layers of Feature 3 suggest that it was occupied during a time period when traditional Hawaiian stone tool manufacture and use were still prevalent. This time period could represent either the late pre-Contact era (late 1700s) or early post-Contact era (early 1800s). The presence of historical artifacts (bottle glass sherds, a wire nail, and tin can fragments) further implies that this feature was also used during the post-Contact period. Analysis of historical artifacts from this feature suggest mid- to late nineteenth century.

The interpretation of the concentration of basalt and limestone cobbles as pavements (Features 3.1 and 3.2) is considered preliminary because of the small size of the excavated sample. However, presence of two possible pavements (interior and exterior) suggests that this L-shaped alignment may represent a structural foundation for a house or other habitation feature. If these cobble concentrations are indeed pavements, their presence could reflect a permanent habitation, instead of a short term, temporary habitation structure. Further excavations are recommended to confirm this hypothesis.

Feature 4

Excavation Procedures

This sinkhole feature was tested to determine the presence/absence of cultural and paleontological materials. To achieve this, a single test unit (TU1), 0.50 by 0.50 m in size, was excavated adjacent to the wall of the sinkhole (see Figure 14).

Excavation Results

Traditional Hawaiian cultural materials, as well as paleontological materials (avifauna) were identified in Layers II and IIa. The Feature 4 surface was littered with land snail shells, and debris from nearby *koa haole*, *kiawe*, and Chinese banyan trees. Bone remains of pig and chicken were collected from the surface. Excavations in Feature 4 revealed a four layer stratigraphic sequence (Figure 29).

Layer I was a very dark brown (10YR 2/2 moist) silt loam with less than 10%, by volume, angular limestone gravel, pebbles, and cobbles. The silt loam matrix ranged from 7.0 to 21.0 cm thick and was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II deposits with an abrupt, smooth boundary. No faunal remains or artifacts were recovered from this layer.

Layer II was a dark grayish brown to grayish brown (10YR 4.5/2, moist) cobbly, pebbly, silt loam with approximately 25%, by volume, angular limestone cobbles and pebbles. The silt loam matrix ranged from 14.0 to 27.0 cm and was loose, nonsticky, and nonplastic. Large roots from both a *koa haole* and a banyan tree were present in this layer. Layer II was found directly overlying Layer IIa with a clear to diffuse boundary that sloped down significantly to the west.

Faunal remains from Layer I included marine shell, sea urchin, bone remains of mammals (both Polynesian and introduced rats, small mammal), fish (shark or ray, unidentified fish bone), and bird (medium Procellariids, Passeriforms, unidentified bird bone, and egg shell fragments). Also recovered from Layer II was bone remains from a goose (*Branta* sp.), either the historically known Hawaiian goose (*Branta sandvicensis*) or one of the prehistorically extinct, apparently semiflightless (or possibly flightless) geese. Sparse charcoal was also recovered. No artifacts were found in this layer.

Layer IIa is a light brownish gray (10YR 6/2, moist) pebbly, cobbly silt loam with approximately 20%, by volume, angular limestone pebbles and cobbles. The silt loam matrix is loose, nonsticky, and nonplastic. A yellowish brown (10YR 5/4, moist) mottle, resembling Layer III, was found at the base of this layer. Layer IIa was found directly overlying Layer III with an abrupt, wavy boundary. Layer IIa was found directly overlying limestone bedrock as well.

Faunal remains recovered from Layer IIa included marine shell, sea urchin, crab claws, bone remains of unidentified fish, birds, and small and medium mammals. Unidentified egg shells were also recovered. Identified mammal species include both Polynesian (*Rattus exulans*) and introduced rats, and the extinct hoary bat (*Lasiurus cinereus*). Identified fish remains included shark or ray, surgeon fish (Acanthuridae), tunas/mackerels (Scombridae), and triggerfish (Balistidae).

Birds identified from the bone materials from Layer IIa included the Hawaiian petrel (*Pterodroma phaeopygia*), prehistorically extinct on O'ahu but still extant on other Hawaiian islands; the O'ahu lowland *Moa-nalo* (*Thambetochen xanion*), a prehistorically extinct, large, obviously flightless, goose-like member of the Anatidae family; the lesser O'ahu rail (*Porzana ziegleri*), a prehistorically extinct flightless rail; as well as Passeriforms and small and medium Procellariids. The small Procellariid remains represent either a prehistorically extinct species or an extant one that was never historically recorded as occurring on O'ahu.

Layer III was a brown to very dark brown (10YR 4/3, moist) pebbly, cobbly silt with approximately 15% angular to subangular deteriorating limestone pebbles and cobbles. The silt matrix ranged from 1.0 to 10.0 cm thick and was loose, nonsticky, and nonplastic. Layer III was found directly overlying limestone bedrock and was noncultural.

Discussion

The presence of wood charcoal, and traditional Hawaiian midden remains (marine shell, sea urchin, and perhaps some of the fish bone) in Layers II and IIa suggests that Hawaiians utilized this sinkhole, possibly for refuse disposal. The sloping, lower boundary

of Layer II could indicate that the Layer II deposits were raked out of the center, towards the sides of the Feature 4 sinkhole.

There are two possible explanations for the presence of extinct avifauna remains in Layers II and IIa. One explanation is that these birds were victims of predation by Hawaiian, and the deposition of the bone remains reflect midden refuse.

A second explanation is that the avifaunal remains were naturally deposited prior to human occupation. After use of the sinkhole by Hawaiians, these avifauna remains were disturbed (moved from their original depositional context) and mixed with deposits formed by cultural activities. Until further work is conducted in this sinkhole, the second explanation is preferred.

Feature 8

Excavation Procedures

This sinkhole was tested to determine the presence/absence of cultural and paleontological materials. To achieve this, a single test unit (TU4), 0.50 by 0.50 m in size, was excavated underneath a small overhang against the northwest wall of the sinkhole (see Figure 15).

Excavation Results

Sparse chicken bone (*Gallus gallus*) was collected from the surface of TU4, and *kiawe* and *koa haole* debris littered the sink's surface. Excavations in Feature 8 revealed traditional Hawaiian cultural materials in Layers I and II and sparse wood charcoal in Layer III.

Figure 30 illustrates the profile of TU4 where four stratigraphic layers were identified. Layer I was a very dark brown (10YR 2/2, moist) silt loam with a high organic content, and approximately 10%, by volume, subangular to angular limestone cobbles and pebbles. The silt loam matrix ranged from 3.0 to 5.0 cm in thickness and was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II and had an abrupt, smooth boundary.

Faunal remains recovered from Layer I were restricted to marine shell fragments. Sparse wood charcoal was also recovered. A single basalt flake is the only artifact recovered from this layer.

Layer II was a dark grayish brown (10YR 4/2, moist) pebbly, gravelly silt loam with approximately 15 - 20%, by volume, subangular limestone pebbles and gravel, and less than 10% limestone cobbles. The silt loam matrix ranged from 5.0 to 13.0 cm thick and was friable, slightly sticky, and slightly plastic. Layer II was found directly overlying Layer III and had an abrupt, smooth boundary.

Faunal remains recovered from Layer II included sparse marine shell, sea urchin, and bone remains of mammals (medium mammal) and birds (chicken, medium Procellariids). Sparse wood charcoal was also recovered. No artifacts were found.

Layer III was a grayish brown to brown (10YR 5/2.5, moist) very cobbly, pebbly, silt loam with approximately 60 - 80%, by volume, angular limestone pebbles and cobbles. The silt loam matrix ranged from 23.0 to 33.0 cm thick, and was loose, nonsticky, and nonplastic. Layer III was found directly overlying Layer IV and limestone bedrock, and had a clear, smooth boundary. Cultural materials recovered from this layer were restricted to sparse wood charcoal.

Layer IV was yellowish brown (10YR 5/4, moist) silt with approximately 10%, by volume, limestone pebbles and cobbles. The silt matrix ranged from 4.0 to 5.0 cm thick and was loose, nonsticky, and nonplastic. Layer IV was found directly overlying limestone bedrock and was noncultural. No faunal remains were recovered.

Discussion

The presence wood charcoal and traditional Hawaiian midden materials, including marine shell, sea urchin, and bird bone remains in Layers I and II suggest that Feature 8 was used by Hawaiians. A subtle, but possibly significant observation was the low cobble content in Layer II in Feature 8, compared to the Feature 4 sinkhole. One explanation for the low cobble content being considered is that Hawaiians removed the larger cobbles in this layer to facilitate use of the sinkhole for planting purposes. This hypothesis is examined further in the section titled "Discussion," presented at the end of the report.

Feature 10

Excavation Procedures

This feature was tested to determine the presence/absence of cultural and paleontological materials. To achieve this, a 0.50 by 0.50 m test unit (TU3) was excavated adjacent to the northeast wall of the sinkhole (see Figure 16).

Excavation Results

A single historical artifact was recovered from Layer I, and sparse marine shell was recovered from Layer II. Figure 31 illustrates the profile of TU3 in Feature 10 where two stratigraphic layers were identified.

Layer I was a very dark brown (10YR 2/2, moist) silt loam with a high organic content. It contained less than 5%, by volume subangular to angular limestone cobbles and pebbles. The silt loam matrix ranged from 5.0 to 12.0 cm thick and was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II and had a clear, wavy boundary. Cultural materials recovered from Layer I included one clear glass fragment. Layer II was a grayish brown to brown (10YR 5/2.5, moist) gravelly, silt loam. It contained about 25%, by volume, limestone gravel and sand. This silt loam matrix ranged from 10.0 to 11.0 cm thick, and was loose, nonsticky, and nonplastic. Layer II was found directly overlying limestone bedrock. Faunal remains recovered from this layer included 0.7 g of marine shell (*Drupa ricina*).

Discussion

The presence of a nondiagnostic, clear glass fragment in Layer I of Feature 10 could indicate that this sinkhole was utilized during the historic era. It is also possible that this glass sherd is from a bottle broken near the sink.

The color and texture of Layer II suggest that this deposit is an *in-situ* C-horizon soil. It is possible, therefore, that the sparse marine shell remains in Layer II were a naturally occurring component of the parent material of this soil.

Feature 11

Excavation Procedures

Because of the size, shape, and form of Feature 11, it was tested to determine the presence of a human burial. To achieve this, a 1.00 by 0.50 m test unit (TU5) was excavated into the northern two-thirds of this low platform. TU5 incorporated the location of the single piece of branch coral on the surface of the feature (see Figure 17). The feature had a substantial amount of grass cover and *kiawe* and *koa haole* tree debris that was cleared to expose the feature.

Excavation Results

The surface cobbles were removed within TU5 and a thin (1.0 to 2.0 cm) deposit of very dark brown (10YR 2/2, moist) silt loam with a high organic content was revealed. These deposits were swept away with a whisk broom. Directly underlying the silt loam deposits was a relatively unweathered, green canvas tarp. When the exposed edge of the tarp was pulled back carefully, a dog cranium was revealed. It was observed that the surface branch coral roughly marked the position of the cranium. The post-cranial skeleton was present but was not disturbed or examined. This grave was extremely shallow, possibly due to the shallow soil depth in this area. After recording and mapping a portion of the burial, TU5 was backfilled and the platform was restored to its original state. No profile was drawn.

Discussion

This shallow dog burial is probably a recent (within the last 5 to 10 years) pet burial, based on the relatively good condition of the canvas tarp.

Feature 14

Excavation Procedures

The presence of the boulder modifications to this sinkhole prompted testing of Feature 14. This modified sinkhole was tested to determine the presence/absence of cultural and paleontological materials. To achieve this, two 0.50 by 0.50 m test units were excavated in

this feature (see Figure 18). TU6 was excavated under an overhang in the southwest corner of the feature. After this excavation was completed, it was realized that insufficient stratigraphic information was recovered. TU7 was therefore excavated adjacent to the northeast wall of the sinkhole.

Excavation Results

Test Unit 6

This test unit revealed two stratigraphic layers (Figure 32), both containing traditional Hawaiian faunal materials. Layer I was a very dark brown (10YR 2/2, moist) cobbly, pebbly silt loam with approximately 50%, by volume, angular limestone cobbles and pebbles. The silt loam matrix was 5.0 cm thick and was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II and had a clear, wavy boundary.

Faunal materials recovered in Layer I included sparse sea urchin remains and amphibian (gecko) bone remains. Sparse wood charcoal was also collected. No artifacts were found.

Layer II was a very dark grayish brown (10YR 3/2, moist) cobbly, pebbly silt with approximately 60%, by volume, angular limestone pebbles and cobbles. The silt matrix ranged from 15.0 to 20.0 cm thick, and was loose, nonsticky, and nonplastic. Layer II was found directly overlying what was believed to be large limestone boulders. These boulders caused excavations to cease in this unit.

Faunal materials recovered from this layer included sea urchin remains, crab claws, bone remains of mammals (Polynesian rat, mouse), and unidentified fish and bird bone. Very sparse wood charcoal was also recovered.

Test Unit 7

The surface of TU7 was scattered with very sparse marine shell, sea urchin fragments, and unidentified seeds. Probable human bone fragments were recovered from Layer II, but no evidence of human burial activities was found. Excavation of this test unit revealed three stratigraphic layers (Figure 33) containing traditional Hawaiian faunal remains.

Layer I was a very dark brown to black (10YR 2/1.5, moist) silt loam with approximately 10%, by volume, limestone cobbles and pebbles. The silt loam matrix ranged from 5.0 to 7.0 cm thick and was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II and had a clear, smooth boundary.

Faunal materials recovered from Layer I included sea urchin remains, bone remains of mammals (Polynesian and introduced rats, small mammal), amphibians (gecko), birds (spotted dove, [*Streptopelia chinensis*]), and fish (unidentified fish bone).

Layer II is a dark brown (10YR 4/2, moist) cobbly, pebbly silt with approximately 50%, by volume, angular limestone cobbles and pebbles. The silt matrix ranged from 25.0 to 34.0 cm thick and was loose, nonsticky, and nonplastic. Layer II was found directly overlying Layer III and had a clear, wavy boundary.

Faunal materials recovered from the lower portions of this layer included marine shell, sea urchin remains, crab claws, and bone remains of mammals (Polynesian rat, mouse, medium mammal), birds (Hawaiian petrel [*Pterodroma phaeopygia*], small and medium Procellariids), and fish. Fish bone remains include eight identified families including Belonids (needlefish), Holocentrids (squirrelfish), Carangids (jacks), Mullids (goatfish), Cirrhitids (hawkfish), Labrids (wrasses), Acanthurids (surgeonfish), Balistids (triggerfish), and Monocanthids (filefish).

Artifact materials recovered from Layer II included a bone (probably human) octopus lure point fragment and six long bone fragments (probably human) that are believed to represent raw material for fishhook manufacture.

Layer III was a very dark grayish brown (10YR 3/2, moist) cobbly, pebbly silt with approximately 15%, by volume, angular limestone cobbles and pebbles. The silt matrix ranged from 5.0 to 10.0 cm thick and was loose, nonsticky, and nonplastic. Layer III was found directly overlying limestone bedrock.

Faunal materials recovered in this layer include marine shell, sea urchin remains, crab claws, and bone remains of amphibians (gecko), and unidentified bird, fish, and small mammal bone. Sparse wood charcoal was also recovered.

Discussion

The presence of traditional Hawaiian faunal materials in Layers I through III, and the octopus lure point fragment in Layer II, indicate that Feature 14 was utilized by Hawaiians. Since no historic materials were present, it is suggested that the cultural materials from this site date to sometime during the pre-Contact period (pre-A.D. 1778). Like Feature 4 sinkhole, the presence of extinct avifauna associated with the cultural materials in Feature 14 appears more likely to be the result of prehuman deposition of the avifauna remains and mixing of these materials through later cultural activities that occurred within the sinkhole.

The presence of the octopus lure point fragment, and the probable human bone raw material for additional hook manufacture suggests that Hawaiians here were engaged in the manufacture of bone tools.

Feature 17

Excavation Procedures

This feature was tested to determine the presence/absence of cultural and paleontological materials. To achieve this, a single 0.50 by 0.50 m test unit (TU10) was excavated on the south side of this modified sinkhole (see Figure 19).

Excavation Results

A surface collection from Feature 17 during excavations recovered fragments of bottle glass, tin cans, and iron, as well as a metal ammunition box, and a metal bandage tape roll. The metal items are probably associated with World War II U.S. military activities (see section titled Historical Artifacts).

Excavation of TU10 revealed three stratigraphic layers and a pit feature (Figure 34). two of which contained historical artifacts (Layers I and II), as well as traditional Hawaiian cultural materials. An excavated feature, apparently a pit (Feature 17.1) was found in association with Layer II.

Layer I is a black (10YR 2/1, moist) cobbly, pebbly silt loam with a high organic content. It contains approximately 30%, by volume, angular to subangular limestone cobbles

and pebbles. The silt loam matrix ranged from 4.0 to 6.0 cm thick, and was loose, nonsticky, and nonplastic. Layer I was found directly overlying Layer II and had a clear, smooth boundary.

Faunal materials recovered from Layer I include sea urchin remains, crab claws, bone remains of mammals (mouse, unidentified small mammal), reptiles (toad, *Bufo marinus*), amphibians (gecko), fish (Carangids, Labrids, Balistids, and Monocanthids), and birds (unidentified medium and large bird). A sparse quantity of egg shell was recovered as well. Floral remains recovered include wood charcoal and unidentified seeds.

Artifacts recovered from Layer I include fragments of tin can and iron, horseshoe nail fragments, a rubber fragment, pieces of one or more 78-rpm phonographic records, and a rubber toy goat.

Layer II was a dark brown (10YR 3/3, moist) cobbly, pebbly, silty clay loam with approximately 15 to 20%, by volume angular and subangular limestone cobbles and pebbles. The silty clay loam matrix ranged from 18.0 to 23.0 cm thick, and was friable, slightly sticky, and slightly plastic. Layer II directly overlies Feature 17.1, a possible pit feature, and Layer III and had a clear, smooth boundary.

Faunal materials recovered from Layer II include marine shell, crab claws, sea urchin remains, and bone remains of mammals (Polynesian rat and introduced rats, mouse, dog, pig, small and medium mammal), reptiles (gecko), fish (Carangids, Labrids, Balistids, Monocanthids, unidentified fish bone), and birds (medium Procellariids, a possibly extinct crow [*Corvus* spp.], Passeriforms, unidentified small and medium bird). Floral remains include sparse wood charcoal. Artifacts found in this layer include a wire nail and tin can fragments.

Feature 17.1 is a pit feature that was previously excavated through underlying Layer III deposits (see Figure 27). The excavated portion of this pit recorded in TU10 measured 30 cm in diameter and 40 cm maximum depth. The pit was filled with sediments similar to Layer II in color and textures. The pit fill, however, was slightly grayer in color and was loosely compacted. The lower boundary of the pit is clear to diffuse, creating an pitfill/Layer III interface approximately 10 cm thick.

Faunal materials recovered in pit fill of Feature 17.1 include sparse marine shell, sea urchin remains, crab claws, bone remains of mammals (Polynesian and Norway rats, dog, small and medium mammal), reptiles (gecko), fish (Labrids, Balistids, Monocanthids, unidentified fish bone), and birds (Hawaiian petrel, medium Procellariids, common moorhen [*Gallinula chlorupus*], medium and large bird). Sparse wood charcoal was also recovered. One artifact, a limestone flake, was recovered from the pit fill.

Layer III is a light brownish gray to pale brown (10YR 6/2.5, moist) sandy silt with approximately 5%, by volume, subangular to angular, limestone cobbles and pebbles. The maximum thickness observed for Layer III, based on the presence of the pit (Feature 17.1), is 50 cm, although only a small amount of Layer III was excavated from the base and outside the pit in TU10. The sandy silt matrix was friable, slightly sticky, and nonplastic. The lower boundary of Layer III was undetermined.

Faunal remains recovered from Layer III include crab claws, bone remains of mammal (Polynesian rat and small mammal), fish (unidentified fish bone), and birds (Hawaiian petrel, medium Procellariids, lesser O'ahu rail [Porzana ziegleri], Rallid or Fulica, crow [Corvus spp.], the historically extinct *kioea* (Chaetoptila), Passeriform, small and medium bird). Sparse wood charcoal and unidentified seeds were also recovered. No artifacts were found in this layer.

Discussion

The presence of the ammunition box, tin cans and many of the other metal artifacts indicate that this sinkhole was used by the U.S. military during the World War II era. The presence of historical artifacts of a similar type in Layer II suggests that this layer may be associated with the 1940s time period. If this is true, it is possible that the pit feature, Feature 17.1, may have been excavated during this period, perhaps as a privy. However, no historical artifacts were recovered from the Feature 17.1 pit fill. The only artifact found in the pit was a limestone flake, which is a traditional Hawaiian artifact. Thus, the age and function of the Feature 17.1 pit remains in question.

The presence of traditional Hawaiian faunal remains (marine shell, sea urchin, dog and pig bone), and the limestone flake from Feature 17.1, suggests that Hawaiians utilized

this sinkhole, possibly for temporary habitation purposes, during the pre-Contact period. The presence of avifaunal remains in Layer III, several of which represent extinct species, probably represents prehuman deposition. Their presence in the pit fill of Feature 17.1 is probably the result of mixed Layer III and Layer II deposits within the pit.

Feature 21.1

Excavation Procedures

This feature was tested to determine the presence/absence of cultural materials in order to assess feature age and function, and to examine the feature's architecture. To achieve this, a 1.00 by 0.50 m test unit (TU11) was excavated into the south side of the terrace (see Figure 20).

Excavation Results

Excavation of this terrace revealed the architectural components of the terrace, as well as one underlying stratigraphic layer (Figure 35) containing sparse faunal remains.

TU11 revealed that the limestone pebble paving on the north side of the terrace is only a surface component. The remaining terrace surface and underlying limestone fill consists of angular to subangular limestone gravel, pebbles and small cobbles, many of which appeared crushed. The rock fill was mixed with windblown, organic materials (*kiawe* and *koa haole* tree debris) and loose, very dark brown (10YR 2/2, moist) sandy silt. This fill ranged from 10.0 to 12.0 cm thick and was found directly overlying Layer I deposits.

Underlying the terrace rock, Layer I consisted of very dark brown (10YR 2/2, moist) gravelly, silt loam with approximately 15 to 20%, by volume, angular and subangular limestone gravel. The silt loam matrix ranged from 2.0 to 14.0 cm thick, and was friable, slightly sticky, and nonplastic. Layer I was found directly overlying and underlying Lens A, and directly overlying limestone bedrock.

Faunal materials recovered in lower portions of Layer I, under Lens A and outside the terrace, include very sparse marine shell and sea urchin remains. No cultural materials were found in Layer I underlying or within the rocky fill of the terrace.

The edge of a lighter deposit, designated Lens A, was found in the southeast corner of TU11. This deposit was a brown (10YR 4/3, moist) sandy, gravelly silt with approximately 15 to 20%, by volume, limestone gravel. This silt matrix was about 5 cm thick and was loose, nonsticky, and nonplastic. No cultural materials were found in Lens A.

Discussion

The presence of sparse traditional Hawaiian faunal remains (marine shell and sea urchin) in the lower portions of Layer I, outside of the terrace area, indicates that Hawaiians were utilizing this area, but does not necessarily prove that Hawaiians constructed Feature 21.1. The absence of historical artifacts in, or underlying, the terrace could indicate that the terrace is not a post-Contact structure.

ARTIFACTS

A total of 3,702 portable artifacts were recovered from surface collections and test excavations in features of Site 50-80-07-2474. Of the total, 10 (0.3%) are traditional, or indigenous artifact forms and the remainder, 3,692 (99.7%), are historical artifacts dating to the post-Contact period. The traditional artifact forms include artifacts fashioned from basalt, volcanic glass, limestone, and bone. Historical artifacts include items manufactured from ceramics, glass, metal, bone, limestone, rubber, shell, and slate.

The distribution of traditional Hawaiian artifacts in Feature 3 is summarized in Table 3. Table 4 summarizes the traditional artifacts found in sinkhole features (Features 8, 14, and 17). Table 5 summarizes historical artifacts found in sinkhole and nonsinkhole features throughout the site. Traditional artifacts are presented below by raw material categories.

Traditional Hawaiian Artifacts

Of the 10 traditional artifacts recovered, eight are lithic items and two are bone. Lithic artifact recovered are primarily debitage flakes. Crabtree (1972:58) defines debitage as residual lithic material resulting from tool manufacture. The study of debitage flakes is useful to determine tool manufacturing techniques and for demonstrating technological traits.

Table 3
Summary of Indigenous Artifacts for Feature 3 at Site 50-80-07-2474

Feature:	Feature 3 (Interior)			Total Artifacts
Test Unit:	Test Unit 2			
Layer/Level:	I/1	II/1	III/2	
VOLCANIC GLASS				
Flake	1			1
Core	1			1
TOTAL VOLCANIC GLASS	2	0	0	2
BASALT				
Edge-Altered Flake		1		1
Flake			1	1
TOTAL BASALT	0	1	1	2
LIMESTONE				
Flake		1		1
TOTAL LIMESTONE	0	1	0	1
TOTAL ARTIFACTS	2	2	1	5

Table 4
Summary of Indigenous Artifacts for Features 8, 14, 17 Sinkholes and Surface Collection at Site 50-80-07-2474

Feature:	near 4	8	14	17.1	
Test Unit:	---	Test Unit 4	Test Unit 7	Test Unit 10	Total Artifacts
Layer/ Level:	surface	I/1	II/2	Pit Fill	
BASALT					
Flake		1			1
TOTAL BASALT	0	1	0	0	1
LIMESTONE					
Flake				1	1
TOTAL LIMESTONE	0	0	0	1	1
BONE					
Octopus Lure point fragment			1		1
Cut Bone			1		1
TOTAL BONE	0	0	2	0	2
VOLCANIC GLASS					
Flake	1				1
TOTAL VOLCANIC GLASS	1	0	0	0	1
TOTAL ARTIFACTS	1	1	2	1	5

Table 5
Distribution of Historic Artifacts at Site 50-80-07-2474

Feature:	1		2	2.1								3		Near 4	17			
Test Unit:	8			9								2 (Interior)			10			
Layer/Level:	I	I-III	surface	surface	I/1	Lens A	Lenses A/B	Lens C	II/1	II/2	II/3	I/1	II/2	surface	surface	I/1	II/2	TOTALS
CERAMIC VESSELS, Sherds																		
Earthenware				11		6	1	8										26
Porcelain				9	21	6	12	4										52
Stoneware				1	1	1		2										5
BOTTLE GLASS, Whole																		
Clear															1			1
Selinium															1			1
BOTTLE GLASS, Sherds																		
Amber/brown			2	1	11	5	2	8	4			2	1					36
Aqua			24	2	19	1	25	30				1	1					103
Citron							1											1
Clear			2		2	6	15	3		1	1							30
Cobalt Blue				1														1
Green, Emerald	11				1													12
Green, Pale			1		1	2		3										7
Manganese			9		22	28	1	4	3									67
Olive			1		4	1	14	8	3									31
TABLEGLASS, Sherds																		
Manganese				2														2
LAMPGLASS, sherds																		
Clear					5		7	4										16
Frosted						1												1
Manganese					1	6												7
ARCHITECHTURAL ITEMS																		
Window Glass, Sherds					9		7	4										20
Cut Nails, Whole/frags						2	2											4

Table 5 (cont'd.)

Feature:	1		2	2.1								3		Near 4	17			TOTALS
Test Unit:	8			9								2 (Interior)			10			
Layer/Level:	I	I-III	surface	surface	I/1	Lens A	Lenses A/B	Lens C	II/1	II/2	II/3	I/1	II/2	surface	surface	I/1	II/2	
Wire Nails, Whole/frags					38	36	2	13	3				1				1	94
Unid. Nails, frags					5													5
PERSONAL ITEMS																		
Bone Buttons, frag					1			1										2
Bone Die, whole							1											1
Brass Safety Pin, frag							1											1
Brass Shoe Boot Eyelet, whole								1										1
Limestone Marble(?), whole							1											1
Limestone Marble(?), frag							1											1
Phonographic Record, frags																35		35
Plated Copper Thimble, whole							1											1
Porcelain Buttons, whole							1											1
Porcelain Buttons, frag								1										1
Rubber toy, whole (goat)																1		1
Shell Buttons, whole							3											3
Shell Buttons, frags								1										1
Shell Ornament, whole								1										1
Slateboard, frag									1									1
MANUFACTURED ITEMS																		
Cut Bone						2												2
HOUSEHOLD METAL																		
Enamelware Pot, whole														1				1
TIN CAN																		
Tin Cans, whole															9			9
Tin Cans, frags					5	17	407	374					10		32	670		1515
Tin Cans, (poss), frags					1500							1					2	1503
Tin Jar Lid, whole															1			1

Table 5 (cont'd.)

Feature:	1		2	2.1								3		Near 4	17			TOTALS
Test Unit:	8			9								2 (Interior)			10			
Layer/Level:	I	I-III	surface	surface	I/1	Lens A	Lenses A/B	Lens C	II/1	II/2	II/3	I/1	II/2	surface	surface	I/1	II/2	
UNIDENTIFIED METAL																		
Iron, frags				13	9	29	6	1							1	8		67
Lead, frag						1												1
FARM/RANCH-RELATED ITEMS																		
Horseshoe Nails, frags																9		9
AMMUNITION/FIREARMS																		
.22 cal. Bullet	1	1											1					3
Ammo Box															1			1
MISC. OTHER																		
Bandage Tape Roll															1			1
Bottle Cap Liner							1											1
Crown Bottle Caps					2													2
Rubber, frags						1										1		2
TOTAL HISTORIC ARTIFACTS.	12	1	39	40	1657	151	512	471	14	1	1	4	14	1	47	724	3	3692

Debitage flakes usually represent the various stages of progress of the raw material from the original form to the finished tool (ibid.).

Volcanic Glass

A total of three volcanic glass artifacts was collected from the surface and in excavations (see Tables 3 and 4). Volcanic glass artifacts include two debitage flakes and one core. The glass is very dark and opaque.

Volcanic glass flakes were tools probably used in food preparation, for cutting and scraping plants, or for delicate woodworking tasks (Kirch 1985). The volcanic glass flake in the traditional Hawaiian tool kit may have been analogous to the present day "pocket knife" (Barrera and Kirch 1973:185-186). The volcanic glass debitage flakes recovered were small (less than 1.5 cm in length and width) and each had a ventral surface and complete proximal (striking platform) and distal (termination) ends. Neither of the flakes appeared to be retouched or edge-altered.

One flake was a surface find about five meters south of Feature 21, a sinkhole. The other volcanic glass flake was recovered from Layer I in the interior of Feature 3 (L-shaped alignment).

Volcanic glass cores are modified nodules usually having at least one flake scar. The core found in Feature 3, Layer I, measured 1.1 by 1.0 cm and had eight (and possibly nine) flake scars. This indicates that the core was frequently used, probably to produce volcanic glass flakes.

Basalt

A total of three basalt artifacts were recovered from test excavations. Of these, two are debitage flakes and one is an edge-altered flake. The raw material from these artifacts ranges from a medium-grained, slightly porous, gray basalt with mineral inclusions to a fine-grained, dark gray, slightly porous basalt.

The debitage flake recovered from Layer I in sinkhole Feature 8 measures 3.5 by 5.1 cm. The other flake was recovered from TU2, Layer III/2 in Feature 3 (L-shaped alignment), and measures 1.2 by 1.4 cm.

The edge-altered flake found in TU2, Layer II/1 is a debitage flake with three edges showing macroscopic scarring. This flake tool is roughly triangular in shape and measures 4.1 by 3.7 cm. It is probable that this tool was used in food preparation, for scraping plants or butchering meat.

Limestone

Two of the lithic artifacts are debitage flakes probably produced from local limestone deposits. Both flakes are relatively small with lengths and widths measuring under 1.5 cm. One flake was found in Feature 3 (L-shaped alignment), TU2, Layer II/1, while the other was recovered from Feature 17.1 pit fill.

Bone

Two bone artifacts were recovered from sinkhole Feature 14, including a piece of cut bone and a fragment of an octopus lure point (Dr. Yoshi Sinoto, personal communication). The octopus lure point fragment (Figure 36) was recovered from Layer II/2 and is one of five components to the cowrie octopus lure which include a wooden stem, a stone sinker, a cowrie shell, a hook, and a hackle (or tail) for ti leaves (Buck 1987).

This artifact measures 4.0 by 1.4 cm and was probably manufactured from human bone, based on the presence of other probable human long bone fragments found in the same provenience in Feature 14 (Layer II/2).

Octopus fishing was apparently an aristocratic sport in which the cowrie lure was commonly used when the squids came in close to shore (Buck 1957:359).

Historical Artifacts

The historic artifacts recovered from the test excavations at State Site 50-80-07-2474 (50-Oa-C3-34) date from the late nineteenth century to the early twentieth century. Historical artifact distribution is summarized in Table 5. The primarily domestic artifacts include materials manufactured in the mainland U.S., Europe (primarily Britain), and Asia. These artifacts occur predominately in Feature 2 and 2.1 (Table 5). In contrast, Feature 17

contains more recent twentieth-century trash, such as possible k ration cans, an ammunition box, and metal buckets, which may not have been associated with domestic occupation of this area.

Possible locally-produced materials from the site include several bone and shell buttons. These buttons are similar in appearance to buttons recovered from other domestic nineteenth-century contexts in Hawai'i and the U.S. mainland.

Other items were produced in Europe or on the U.S. mainland which were intended for Hawaiian markets, such as Hawaiian soda bottles. These bottles where imported for filling by local bottling companies.

Among the ceramics, a single hand painted refined earthenware sherd was found, commonly referred to locally as "Lokelani." This pattern was produced in Staffordshire, England (Mission Houses Museum, n.d.), and was widely imported for the American market. It was shipped to the eastern U.S., transported overland to San Francisco, and then to Honolulu merchant houses (Mission Houses Museum, n.d.). Lokelani sherds are not infrequently recovered from late-nineteenth-century contexts in O'ahu.

Glass medicinal, extract and beverage bottles, and beverage and food tin cans in the historic assemblage most likely were produced by companies located on the U.S. mainland. Few, however, have identifiable makers' marks or labels. No clearly European or Asian bottles or tin cans were identified from this site. All of the identifiable Asian materials at this site are porcelain food-related storage and eating vessels.

Mixed assemblages of American (both items made in Hawai'i and items made on the U.S. mainland), European, and Asian materials occur in Feature 2, while no Asian material occurs in any of the other features. In Feature 2, Test Unit 9, a mixed assemblage of European and Asian artifacts was recovered from the surface in Layer I and in Lens A, B, and C.

The historic materials from this site are discussed below by major functional categories, including ceramic vessels, bottle and tableware vessels, lamp glass, architectural items, personal items, worked bone, tin cans, household metal, firearms and ammunition, and miscellaneous items. These categories are designed to provide a summary of the range of materials associated with particular types of activities at Site 50-80-07-2474.

Ceramic Vessels

Ceramic vessels are most commonly classified into three major ware classes: earthenwares which are further subdivided into semi-coarse, coarse, and refined earthenwares (e.g., whitewares and ironstones); stonewares; and porcelains (Majewski and O'Brien 1987). The ceramic vessel assemblage includes refined earthenware and porcelain tablewares and utilitarian stoneware food containers. The refined earthenwares are European, most likely British, in origin. None have makers' marks, however, and only the Lokelani sherd can be identified as British in manufacture. The stonewares are Chinese, including soy jars and/or vegetable pot sherds, while the porcelains are European and Asian. No semi-coarse earthenwares, such as yellowware vessels or coarse earthenwares such as buff-paste flower pots and majolica vessels, were found at Site 50-80-07-22474.

The major references used for identifying and dating the American/European ceramics include Cheek et al. (1983), Garland (n.d.), Godden (1964), Leidemann (1988), Lofstrom (1976), Lofstrom et al. (1982), Majewski and O'Brien (1987), Miller (1980), and Mission Houses Museum (n.d.). For analysis of the Asian ceramics, the following references were used: Costello and Maniery (1988), Olsen (1978), Quellmalz (1972, 1976), Sando and Felton (n.d.), Willits and Lim (1981), Stenger (n.d.), and Ward, Abbink, and Stein (1977). Figures 37 and 37 illustrate examples of Asian and Euroamerican ceramics from Site 50-80-07-2474.

Refined Earthenwares

A total of 26 European or possibly European/American refined earthenware vessel sherds were found in Feature 2.1, TU9. None occur in any of the other features of the site, including Feature 17, a sinkhole where twentieth-century trash occurs.

With the exception of a single Lokelani type refined earthenware sherd from Feature 2.1, TU9, Layer I, Level 1, all of the earthenwares are plain. This possible Lokelani sherd has a white paste and a white to light-bluish tinted exterior (see Figure 38f). It is a rim sherd to a small to medium bowl with underglazed handpainted decoration on both the interior and exterior surfaces. On the interior, a single red band or line appears along the rim, while the exterior has a similar red band on the rim with a floral motif on the bowl

body. Only the green leaves and stems are visible. This pattern was made in England, and possibly elsewhere, during the late nineteenth century and twentieth century (Mission Houses Museum, n.d.).

The plain refined earthenwares include sherds from at least six small to medium bowls, one large bowl, two cups, one large plate, and three saucers. One of the cups had a handle, now gone. These earthenwares include both white whitewares and bluish-tinted whitewares, both types being common during the second-half of the nineteenth century, with white whitewares still being produced today. These refined earthenwares exhibit cracking in the glaze crazing and have relatively porous non-vitrified paste.

Stonewares

Stonewares were found only in Feature 2.1, TU9 (see Table 5). Of these sherds, four are from Chinese brown-glazed vessels (Olsen 1978; Quellmalz 1976) and one is a possible alkaline-glazed vessel of unknown function and manufacture. Of the brown-glazed sherds, one is a rim sherd from a vegetable pot and three are body sherds from a jar or pot. These brown-glazed vessels were covered with a brown to black glaze on both the interior and exterior with the glazing ending just above the exterior base.

The absence of European or U.S. mainland stonewares is not unexpected as they would have been more expensive to import. Most U.S. mainland stonewares were expensive to ship overland, were produced primarily as storage vessels, and were purchased empty and usually within a 100-mile radius of where they were made (Greer 1981).

Olsen (1978:32) reports that the Chinese brown-glazed foodstuff jars "can be rightly thought of in the same terms as the Mason jar in our Western culture. Both are inexpensively mass-produced to contain certain produce for shipping and storage and yet may be employed for many other purposes after being emptied and cleaned." No Mason or other glass storage jars were identified in the assemblage from Site 50-80-07-2474. Common brown-glazed vessels imported to the U.S. from China in the nineteenth century include soy-sauce jars, foodstuff jars, and wine bottles (Costello and Manlery 1988; Olsen 1978; Quellmalz 1976).

Porcelains

The porcelains (34 sherds) are primarily Asian in manufacture. Only three sherds were identified as possibly European and five were unidentified as to the county of manufacture. Paste, glaze, vessel form, and decorative methods provide important manufacturing data. The Asian porcelains recovered from Site 50-80-07-2474 primarily have a hard white paste, are plain or have blue-on-white decoration. All of the sherds identified as possibly European have a hard white paste, are plain, sometimes thicker, have relief-molded decoration, and vary from the Asian porcelains in vessel form (see Figures 37 and 38).

In cross-mending (i.e., reassembling sherd to the same vessel) sherds based on decoration, vessel form, and diagnostic sherd type (rim, handle, base, etc.), at least 20 different porcelain vessels are represented. Blue-on-white transfer print and hand-painted decorations predominate in both the Japanese and Chinese/Japanese material. Polychrome transfer prints occur less frequently. Among the possible European porcelain sherds, two vessels exhibit relief-molded decoration. The remainder are plain, and include only one rim sherd.

As Olsen (1978:5) reports, common decorated mass-produced export type Chinese porcelain, i.e., porcelain vessels produced for the export market for use in homes and public establishments, has a long and important history in the U.S. Among the common decorated mass-produced export Chinese porcelains found at archaeological sites in Hawai'i and the U.S. mainland are blue-on-white with a smaller number of polychromes.

Rice bowls predominate the Asian porcelain assemblage from Site 50-80-07-2474. Within this assemblage, about 20 different vessels are represented based on decoration. Other vessel forms include medium to large bowls and a possible plate. Without additional research, a number of the porcelain sherds were identified only as Chinese/Japanese, while fewer sherds were identified as Japanese or probably Japanese or Chinese. All of the Japanese and Chinese/Japanese sherds were rice bowls. One larger bowl and the possible plate were identified as probably Chinese in manufacture. Both Japanese and Chinese porcelains occur in Feature 2.1, TU9. Some ceramic patterns occur in several levels, with some evidence of cross-mending across levels.

For example, the Dashed Line underglaze blue-on-white transfer print pattern is found on five sherds from the surface and two sherds in TU9, Lens C. Among these seven sherds, the entire rim to base is represented. The rim has a Three Friends motif on the interior and a Dashed Line motif with flower blossoms on the exterior (see Figure 37b). An identical vessel is described in Costello and Maniery (1988:54; Figure 61) as having been produced during the Meiji Period (c. 1868 to 1912). No other Dashed Line rice bowls occur in the assemblage.

A second Japanese rice bowl was found in TU9, Lens B, with a blue-on-white transfer print decoration on both the interior and exterior surfaces. This vessel is represented by a single rim sherd. The interior decoration is geometric, while the exterior is floral. An underglaze polychrome transfer print occurs on the exterior of a Japanese rice bowl from the surface of Feature 2.1. This vessel is over 80% complete, and is decorated with six, round "dendritic-style" transfers, three of which are blue and three are brown (see Figure 37a). A single, hand-painted blue band occurs at the top of the footring.

Two additional rice bowls represented by large sherds are from Feature 2.1, TU9, Layer I and Lens B, respectively. The first rice bowl (3 sherds) has a blue wash along the interior and exterior rim, a polychrome (blue and brown) underglaze floral transfer print on the exterior (see Figure 37g). This print is represented by three flowers spaced across the central body portion of the bowl. A thin hand-painted blue band occurs at the top of the footring. The second rice bowl is represented by a single body-base sherd and has a blue underglaze transfer print of a small "pagoda-style" garden lantern and ground just above the footring. A thin hand-painted green band occurs at the top of the footring.

Eight additional Japanese rice bowls occur with floral, botanical, or scenic decoration, including a bowl with an underglaze polychrome (blue and green) chrysanthemum transfer print found on the surface of Feature 2.1. This bowl is similar to one described by Costello and Maniery (1988:62; Figure 85). Four sherds from Lens A in TU9 appear to be from the same rice bowl, although they do not all cross-mend. These sherds include two rim and two body fragments decorated with an underglaze blue-on-white scenic transfer print.

The remaining diagnostic Japanese porcelains include one rim sherd with an underglaze blue-on-white bird and geometric/scenic design, and two bowls with polychrome,

brown and blue underglaze floral transfers and double hand-painted blue bands at the top of the footring. These rice bowls are from Feature 2.1, TU9, Layer I and Lens B, respectively.

Three rice bowl sherds identified as Japanese/Chinese have overglaze polychrome decorations. One is a rim sherd.

Two additional diagnostic Asian porcelain vessels occur in the assemblage. The first vessel is represented by two sherds, including a rim-body sherd and a base-body sherd. However, they do not cross-mend. This vessel was identified as possibly Chinese, with a Four Flowers decoration. This decoration is also called Flowers of the Four Seasons and Four Seasons (Costello and Maniery 1988:34). These authors describe this pattern as:

> Overglaze polychrome. Interior: lotus, chrysanthemum, prunus, and tree peony around the edge; a peach in center. Exterior: two red brush strokes opposite each other under rim (probably stylized bats). Red overglaze basemark: characters in square border (unreadable). (Costello and Maniery 1988:34)

The possible Four Flowers vessel from Site 50-80-07-2474 has an overglaze polychrome decalcomania-handpainted floral decoration on the exterior and the bottom of the bowl interior (see Figure 37f). A red overglaze basemark occurs identical to the one described by Costello and Maniery (1988). The glaze is blue-green.

Two Chinese medium to large porcelaneous stoneware bowls occur in the assemblage. The first has a possible Double Happiness pattern (Sando and Felton n.d.:8; Willets and Poh 1981) and is represented by one sherd from Feature 2.1, TU9, Lens B. This body sherd has a grayish-white paste and gray or bluish glaze over a handpainted, scroll- or calligraphy-style cobalt blue decoration (see Figure 38d). The second bowl also has a bluish or green glaze and is decorated with underglaze cobalt blue handpainting on both the interior and exterior. This body-base sherd has a thick stroke floral decoration on the interior and two bands on the exterior, one at the top of the footring.

Bottle Glass Vessels

The majority of the bottle glass made in the U.S. during the nineteenth century are from mold-blown bottles. Almost all mold-blown bottles have seam marks, with a variety of mold types having been used in the U.S. beginning in the early nineteenth century (Munsey 1970:38). Among the mold types used during this period are non-shoulder, dip, pattern, cup bottom, post-bottom plate, and blow-back molds. Accessory molds and tool markings associated with specific mold-blown bottles include turn molds, plate molds, suction machine cutoff scars, and lip finishing marks (Munsey 1970:38-40). Both specific mold types and tool markings provide important technological and dating information. Embossing, makers' marks or trademarks, lip/rim types, and glass colors also provide data on manufacturing sources and dating. All of these attributes are utilized in our efforts to identify the range of bottle types represented in the assemblage from Site 50-80-07-2474 and their relative manufacturing and depositional ages. The major references used in identifying and dating the bottles and bottle glass sherds from Site 50-80-07-2474 include Fike (1987), Munsey (1970), Toulouse (1971), Ward, Abbink, and Stein (1977), and Wilson (1981).

The diagnostic, datable bottle glass sherds from Features 2 and 2.1 are from mold-blown bottles. As such, it is probable that within Feature 2.1, the majority of the small body sherds without datable diagnostic attributes are also from mold-blown bottles. No free-blown bottles or automatic machine-made bottles were found in Features 1, 2, and 3. Further, among the recovered lip/rim sherds from Features 2 and 2.1, almost all lips are either applied with a turn-molded neck (c. 1810-1880) or non-applied with a turn-molded neck (c. 1880-1910). No lip sherds were found in Features 1 and 3. Two diagnostic lip/rim sherds were found in Feature 17, both are from twentieth-century automatic machine-made bottles. Figure 39 illustrates representative, diagnostic bottle glass sherds recovered from Feature 2.1, TU9.

Both pontils and snaps were used to hold the bottles while they were being mold blown. Munsey (1970:47-48) identifies four common types of empontilling bottles during the nineteenth century. These types include the solid iron bar pontil, the blowpipe pontil, the

bare iron pontil, and the use of the snap. No solid iron bar or blowpipe pontils occur on bottles from the assemblage at Site 50-80-07-2474. Bare iron pontils (c. 1845-1860s) and snaps (c. 1850s-1900) were used during the period this site was occupied. A small number of bottles were found at Site 50-80-07-2474 with either a bare iron pontil or a snap base (no lines on the base).

Among the diagnostic base sherds in Feature 2.1 are post-bottom plate molds (c. 1820-1890), pontil marks (or scars), kickups or pushups, and snap-formed (or snap case) bases from the use of a snap tool rather than a pontil (c. 1850-1910). Turn-mold marks from bottles being turned in the mold appear on many bottle sherds in the assemblage. Munsey (1970:40) reports that turn-mold marks are associated mostly with the manufacture of wine bottles during the 1880 to 1910 period. Additional diagnostic attributes on base sherds include embossed makers' marks or trademarks. No diagnostic base sherds were found in Features 1, 3, and 17.

On many mold-blown bottles, the lip was attached after the bottle was removed from the mold. Identification of lip type in addition to how the lip was applied, turned, and/or finished provides information about bottle types or functions (e.g., soda, medicinal) and dating. Within the assemblage from Site 50-80-07-2474, beer, brandy, blob, continuous thread, crown, double bead, and patent lip/rim types occur (see Wilson 1981:111).

Six diagnostic lip/rim bottle glass sherds occur in Feature 2.1. Of these, soda, medicinal, and beer bottles are represented, along with a small jar of unknown function. A blob-top soda bottle lip/rim to neck sherd (see Figure 39b) was found on the surface of Feature 2.1 (c. 1870s-1880s). The mold seams are still visible on the shoulders of this bottle. A cobalt blue medicinal or culinary bottle represented by part of the body, the shoulders, neck, and lip/rim was also found on the surface (see Figure 39a). This bottle has a smoothly applied lip/rim and a non-turn-molded neck (c. 1870-1913). The seams are still visible on the neck, shoulders, and body. The lip/rim is a small, slightly tapered collar with flared bead. A second medicinal bottle was found in Lens B (TU9) of Feature 2.1. This clear bottle is represented by three sherds, including about one-half of the lip/rim. The lip/rim is prescription in shape and has been smoothly applied (ca. 1880-1910). Three beer bottle lip/rim sherds were found, including an aqua beer bottle (c. 1880-1910) with a non-

applied brandy-type finish (short collar with bead) from Feature 2.1, Lens B; the neck is missing. A second beer bottle lip/rim was found on the surface of Feature 2.1 (see Figure 39c). This aqua lip/rim to neck sherd has a non-applied crown finish and turn-molded neck (c. 1880-1910). The third beer bottle is represented by 14 sherds, including a lip/neck to shoulder fragment and part of the base. The lip/rim is non-applied turn molded (c. 1880-1910), however, the seams are still visible on the neck. The base is a post-bottom mold embossed as indicated by a portion of a single letter or number.

Eight diagnostic base sherds were found in Feature 2.1, including one medicinal, one snuff, and five alcohol, probably beer and wine bottles. The medicinal bottle is a Blake-Shaped (Fike 1987; Wilson 1981) light or pale green mold-blown, snap-held bottle (c. 1850s-1910). The base has an oblong recessed plate with largely undecipherable embossed lettering and numbering (see Figure 39d). The brown snuff bottle base was recovered from Feature 2.1, Lens A. It is a semi-rounded fragment (c. 1880 to present) like the bottle shown in Munsey (1971:80). The alcohol bottle bases include one clear, one light green, one red-amber, and two olive green bottles. The clear mold-blown base sherd is very small and is embossed G CO. The light green bottle base is from the surface of Feature 2.1 and is mold blown, with no visible evidence of seams. The center of the kickup or pushup plate is embossed B S L 6. An olive green wine bottle base from the surface of Feature 2.1 is embossed A. MONTEIRO C. PORTUGAL. It is mold blown with a low kickup or pushup. A neck to base olive green wine bottle was recovered from Feature 2.1, Lens A in TU9. It has a low kickup or pushup and the seams on the body, shoulder, and neck have been removed by turn molding (c. 1880-1910). No embossing occurs on the base. The red-amber wine bottle (?) base has a kickup or pushup, no mold seams, and evidence of turn molding (c. 1880-1910). A manganese-decolorized (c. 1880-1920) alcohol bottle represented by one base and one body sherd was found on the surface of Feature 2. This mold-blown bottle was not turned in a mold, the seams are still visible on the body.

Two whole bottles with continuous thread lip/rims were found in Feature 17. These are the only diagnostic bottle sherds from this feature. Both bottles are clear and machine made. Both bottles are hygiene, toiletry-related. The larger of the two is embossed on one side LUCKY TIGER FOR SCALP AND HAIR and LUCKY TIGER MFG. CO. KANSAS

CITY, MO. on the reverse. The base is also embossed, reading N (within a square) and 4. This mark belongs to the Obear-Nestor Co., and dates from 1915 to the present (Toulouse 1971). A large Owen's ring from an Owens automatic blowing machine is visible on the base (c. 1910-present). Several LUCKY TIGER trademarks are listed in Fike (1987:68), but none are identical to the label on the bottle from Feature 17. The other whole bottle from this feature has an Owen's ring on the base (c. 1910-present) and is embossed on the base S (in a circle) PAT. 114363. This has been identified as Swindell Bros., which Toulouse (1971:542) identifies as having been located in Baltimore, Maryland, and, with this mark dating c. 1920 to 1959. The remaining bottle glass sherds are body fragments and, with few exceptions, do not exhibit evidence of embossing. Body sherds account for about 93% of the bottle glass assemblage. Of these sherds, aqua, manganese decolorized, amber/brown, clear, and olive green are the most common, respectively (see Table 5). Within all color categories alcohol-spirits related sherds predominate, particularly beer. No fruit jar or other large-mouth bottles were identified. A small number of medicinal-extract related bottles were indicated based on body shape and diameter. The emerald-green sherds from Layer I underlying the core-filled wall (Feature 1) are from a twentieth-century soda bottle, possibly "Seven-Up."

Tableglass Vessels

The tableglass assemblage includes only two tumblers found on the surface of Feature 2.1. Both tumblers are manganese decolorized (c. 1880-1920), of which one is faceted (12-sided) and the other is decorated (see Figure 39e).

Lamp Glass

A total of 24 glass sherds were identified as possible lamp globe fragments from Feature 2.1, TU9 (see Table 5). Of these, 16 are clear, one is frosted, and seven are manganese decolorized. Only one sherd is a ground rim (most probably representing wear), the remainder are body sherds. All of the sherds were thin and are from kerosene-type lamps.

Architectural Items

Architectural items from the site include window glass fragments and nails almost entirely from Feature 2.1, TU9 (see Table 5). The nails include both machine cut (c. 1840-1890) and wire nails (c. 1890-present), of which wire (or common) nails predominate. Few of the nails are whole, and all are badly deteriorated. A number of the nails could not be identified and are listed in Table 5 as unidentified nail fragments.

Personal Items

An assortment of nineteenth-century personal items were found in Feature 2.1. Thirty five twentieth-century phonographic-record fragments and a small rubber goat toy were recovered from Feature 17. These record fragments are from a 78-rpm record (c. 1905-1950). The soft blue rubber goat was made in a mold (c. 1890-1950).

In Feature 2.1, clothing-related personal items predominate. These items include buttons, a brass safety pin, and a brass-plated shoe/boot eyelet (see Table 5). Other personal items from this feature are toys, including two limestone marbles (one complete and one fragment), a copper-plated sewing thimble, a slateboard writing fragment, a bone die (i.e., playing or gambling die), and a shell ornament.

Several of the buttons are bone or shell and may have been locally made. Among these are two bone button fragments (see Table 5) and three mother-of-pearl four-hole buttons (one is in two pieces). All of these buttons are shirt/dress buttons. One complete two-hole China button and one broken four-hole China button were found in Feature 2.1 (see Table 5). Both are shirt/dress buttons (see Figure 38).

The limestone marbles (one complete) were probably made in Germany. Randall (1971:102), citing Baumann (1970), reports that no calcareous stone marbles were produced in the U.S.; Germany's production of such marbles peaked around 1740 and again after the mid-nineteenth century when exports, including to the U.S., rose appreciably. These calcareous marbles were primarily marble or limestone with diameters ranging from 1.0 cm to 3.2 cm.

The two marbles from Site 50-80-07-2474 fall within this range and fizzed when tested with HCl acid, indicating a calcareous composition. The whole marble is 1.5 cm in diameter, while the broken marble measures approximately 1.3 cm in diameter.

The sewing thimble and safety pin are commercial and, without further research, their source of manufacture is unknown. The bone die, however, is probably local in manufacture. The bone was blackened before it was worked, the edges are faceted, and all of the faces have been polished (Figure 40). The holes on each face are drilled. The hole for the number "one" is oversized, while the same hole size is used for numbers "two" through "six" on the other die faces.

The shell ornament (Figure 41), made from a *Conus* spp. shell, is also homemade and has a single hole drilled through the center.

Worked Bone

Two pieces of worked bone were found in Feature 2.1 (see Table 5). One is from a medium to large mammal, while the other is from a small mammal. Both show evidence of cut marks and shaping.

Household Metal

A single household metal container was found on the surface near Feature 4 (see Table 5). This container is a small tin-enameled pot, largely complete; the handle is missing.

Tin Cans

Although both whole tin cans and tin can fragments were recovered from Feature 17, only tin can fragments were found in Feature 2.1 in TU9, and a single, possible can fragment was found in Feature 3 at Site 50-80-07-2474 (see Table 5). The tin cans in Feature 17 are much more recent that the cans found in Feature 2.1. Tin cans from Feature 17 probably date to the mid-twentieth century, while cans from Feature 2.1 were deposited in the late nineteenth century. The whole tin cans from Feature 17 are predominately food and

beverage containers probably associated with military activities. The tin cans in Feature 2.1 were too badly deteriorated to determine their original contents.

Among the whole tin cans from the surface of Feature 17 is a possible Spam-type food can with key-style opener (c. 1935-1975) and 13 food/beverage cans with vertical seams (c. 1935-196), including six cans ranging from 2 1/2 to 3 1/2 inches in diameter and from 3 1/2 to 5 inches tall, three possible k rations cans measuring 3 inches in diameter and 1 1/4 inches tall, and two one-gallon food cans. At least seven of the food/beverage cans were opened with a knife or blade, one with a rotary can opener, and the others were opened with a key or are unidentified. Two of the cans had foil liners. Also found on the surface were 25 tin can fragments and a pry-off type metal lid (c. 1929-1960).

Unidentifiable Metal

This category includes largely flat iron fragments and an unidentified "lead blob" fragment from Feature 2.1, and several strapping fragments with holes from Feature 17 (see Table 5). The lead "blob" may be a smashed .22-caliber bullet or lead that was being curated for reuse.

Firearms and Ammunition

A military metal ammunition box was found on the surface in Feature 17, TU10 (see Table 5); the bottom is mostly gone but the top and key remain. This box is painted "Army Green" with yellow lettering, which reads:
DO NOT USE AS FOOD CONTAINER 340 CARTRIDGES CAL. 30 BLANK M 1909 LINKED LOT LC L 12127.

Ammunition found at Site 50-80-07-2474 includes a spent .22-caliber lead bullet and a lead spent pellet gun bullet from Feature 1, TU8. A third spent bullet from a .22-caliber gun was found in Feature 3 (see Table 5). No other ammunition was found at the site.

Miscellaneous Other Items

This category includes a metal bandage roll holder, now in two pieces; unidentifiable rubber fragments, a bottle cap fragment, and a bottle cap liner fragment (see Table 5).

Historical Artifact Summary

The historic artifacts recovered from Features 2 and 2.1 at Site 50-80-07-2474 date from the late nineteenth century to the early twentieth century (c. 1880-1910 period). No twentieth-century bottle glass or ceramic vessels were found. Among the architectural items, both machine-cut and wire nails occurred. Predominately twentieth-century artifacts were found in Features 1 and 17. In Feature 1, this material appears to be from a single emerald green soda bottle. In contrast, Feature 17 contains military-related deposition of bottles and metal. This material includes primarily beverage bottles from liquor and beer, and food cans, including possible k ration cans. An official military ammunition box was also found in this feature.

Features 2 and 2.1 contains a wide assortment of domestic-related items containing American, European, and Asian remains. The ceramics are primarily Asian, Chinese and Japanese, with a smaller amount of European tablewares. The Asian ceramics are predominately rice bowls, with several brown-glazed food jars also found. The bottle glass in Features 2 and 2.1 appears to be American, with one alcoholic bottle from Portugal. No Asian bottles were recovered from this feature or elsewhere at the site. The tin cans are too badly deteriorated to determine their function, but no evidence was found for cans being imported from outside the U.S.

Possible locally-produced materials from the site include several bone and shell buttons. In addition, several pieces of cut/worked bone and shell were also found in Feature 2.1. Among these was a *Conus* spp. shell which had been drilled and made into an ornament.

The artifactual data from Site 50-80-07-2474 indicate a mixed assemblage of American (both Hawaiian and U.S. mainland), European, and Asian materials in Features 2 and 2.1, with only American material in Features 1, 3, and 17. Items recovered from Features 2 and 2.1 appear to have been deposited in association with Asian immigrants in Wai'anae working either in the sugar industry or possibly with the railroad, while Feature 17 is associated with twentieth-century U.S. military activities. The artifact assemblages from Features 1 and 3 are too small to make statistically valid interpretations.

Table 6
Analysis of Faunal/Floral Remains of Site 50-80-07-2474

Feature:	1	2.1							3					21.1	TOTALS
Test Unit:	TU8	TU9							TU2 (Interior)				(Exterior)	TU11	
Layer/Level:	II	surface	I/1	Lens A	Lenses A/B	Lens C	II/3	III/1	I/1	II/1	II/2	III/1	I/1	I/1	
	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
FAUNA: MOLLUSCA															
Gastropoda															
Cellana spp.					<0.1										<0.1
Nerita picea	0.8		0.4			0.1			0.4						1.7
Nerita polita				0.5											0.5
Cypraea caputserpentis				0.2	1.5									0.8	2.5
Cypraea Spp.									0.2				0.8		1.0
Cymatium Spp.													6.0		6.0
Drupa Spp.									0.2						0.2
Euplica Varians			1.0												1.0
Conus Spp.											0.2				0.2
Turbo Spp.				0.2						1.1					1.3
TOTAL Gastropoda	0.8	0.0	1.4	0.9	1.5	0.1	0.0	0.0	0.8	1.1	0.2	0.0	6.8	0.8	13.8
Bivalvia															
Brachidontes Spp.										0.3	0.5				0.8
Tellina Palatum									4.6				0.4		5.0
Tellina Spp.				0.3											0.3
Pinctada Spp.									0.5	0.3					0.8
Ctena Bella					<0.1										<0.1
Lioconcha Heiroglyphica			0.3												0.3

MIDDEN

Sparse quantities of midden materials (nonartifactual cultural debris) were collected from test excavations at Site 50-80-07-2474. General categories of faunal remains include marine mollusks (gastropods and bivalves), Echinoderms (sea urchin), Arthropods (crustaceans), mammals, fish, birds, reptiles, and amphibians. Floral remains are represented by wood charcoal and seeds.

The results of midden analyses for Features 1, 2.1, 3, and 21 are presented in Table 6 and results of midden analyses for sinkhole Features 4, 8, 14, and 17 are presented in Table 7. The weight values in Tables 6 and 7 reflect totals from both 1/4 and 1/8-inch mesh screens. Weights (in grams) are provided in the midden tables by stratigraphic layers (I-III) and arbitrary 10 cm levels (1, 2). Under the Feature 2.1 heading in Table 6, Lenses A, B, and C reflect 5 cm levels. Further notes and observations of the bone materials are provided in Appendix A.

Faunal Remains

Mammals

Nonhuman mammal bone materials identified at Site 50-80-07-2474 include Polynesian and Norway rats (*Rattus exulans and R. norvegicus*), domestic mouse (*Mus musculus*), domestic dog (*Canis familiaris*), pig (*Sus scrofa*), and an extinct Hoary bat (*Lasiurus cinereus*). Sparse probable human (*Homo sapiens*) bone materials were also recovered.

Bone remains of the Polynesian rat was restricted to sinkholes (Features 4, 14, and 17) and, except for Layer I in Feature 14, TU7, these remains were found in deeper stratigraphic layers (II and III). Remains of the Norway rat were only found in Feature 4 sinkhole (Layer II).

Pig and dog remains were quite sparse and were found in surface proveniences (Feature 4), historical contexts (Lenses A/B in Feature 2.1 and Layer II in Feature 3), and in one of the sinkholes (Feature 17, Layer II/1 and Feature 17.1 pit fill). Dog and pig bone is a common pre-Contact component in Hawaiian archaeological sites.

Table 6 (cont'd.)

Feature:	1	2.1							3					21.1	TOTALS
Test Unit:	TU8	TU9							TU2 (Interior)				(Exterior)	TU11	
Layer/Level:	II	surface	I/1	Lens A	Lenses A/B	Lens C	II/3	III/1	I/1	II/1	II/2	III/1	I/1	I/1	
	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
TOTAL Bivalvia	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	5.1	0.6	0.5	0.0	0.4	0.0	7.2
TOTAL MOLLUSCA	0.0	0.0	1.7	1.2	1.5	0.1	0.0	0.0	5.9	1.7	0.7	0.0	7.2	0.8	21.0
ECHINODERMATA															
Podofora atrata															
Tests - unid.												0.5			0.5
Spines - unid.														0.2	0.2
TOTAL ECHINODERMATA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.2	0.7
ARTHROPODA															
Decopoda - (crab claws)		0.8	0.1	0.3		0.3	2.0	1.0		0.3					4.8
TOTAL ARTHROPODA	0.0	0.8	0.1	0.3	0.0	0.3	2.0	1.0	0.0	0.3	0.0	0.0	0.0	0.0	4.8
VERTEBRATE FAUNA															
MAMMALIA															
Sus scrofa										5.6					5.6
Sus - tooth					0.8										0.8
unid. - bone-med						0.7				1.1					1.8
unid. - bone-lge						2.0									2.0
TOTAL MAMMALIA	0.0	0.0	0.0	0.0	0.8	2.7	0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0	10.2

Table 6 (cont'd.)

Feature:	1	2.1							3					21.1	TOTALS
Test Unit:	TU8	TU9							TU2 (Interior)				(Exterior)	TU11	
Layer/Level:	II	surface	I/1	Lens A	Lenses A/B	Lens C	II/3	III/1	I/1	II/1	II/2	III/1	I/1	I/1	
	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
PISCES															
unid. - bone			3.0		0.8	0.4				1.1					5.3
unid - scales			0.6												0.6
TOTAL PISCES	0.0	0.0	3.6	0.0	0.8	0.4	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	5.9
AVES															
Gallus gallus			0.6												0.6
unid. bone - med			1.0						0.2						1.2
unid. egg shell						0.4									0.4
TOTAL AVES	0.0	0.0	1.6	0.0	0.0	0.4	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	2.2
TOTAL VERTEBRATE FAUNA	0.0	0.0	5.2	0.0	1.6	3.5	0.0	0.0	0.2	0.0	7.8	0.0	0.0	0.0	18.3
FLORA															
Charcoal, unid. spp.			11.9	7.0	7.7					0.8		0.4			27.8
TOTAL FLORA	0.0	0.0	11.9	7.0	7.7	0.0	0.0	0.0	0.0	0.8	0.0	0.4	0.0	0.0	27.8

Table 7
Analysis of Faunal Materials from Sinkhole Features of Site 50-80-07-2474

Feature:	4					8		14					17					17.1	TOTALS
Test Unit:	TU1					TU4		TU6		TU7			TU10					Fill	
Layer/Level:	surface	II/1	II/2	IIa/1	IIa/2	I	II/1	I/1	II/1	I	II/2	III/1	I	II/1	II/2	III/1	III/2		
	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
FAUNA: MOLLUSCA																			
GASTROPODA																			
Cellana sandwicensis					1.0														1.0
Nerita picea				0.5														0.7	1.2
Strombidae spp.												0.1			0.6				0.7
Cypraea caputserpentis														0.2	18.4				18.6
Cypraea mauritiana				1.0	0.8														1.8
Cypraea spp.						0.8													0.8
Drupa Spp.											<0.1								<0.1
Morula granulata														1.1					1.1
Anachis miser											<0.1			<0.1	0.1				0.1
Euplica Varians												1.5							1.5
Conus spp.		7.1		1.4										0.2					8.7
Trochus Spp.														0.3					0.3
Turbo Spp.					0.2														0.2
Gastropoda - unidentified											0.6	0.1							0.7
Operculum - Unidentified											<0.1			1.8					1.8
TOTAL GASTROPODA	0.0	7.1	0.0	2.9	2.0	0.8	0.0	0.0	0.0	0.0	0.6	1.7	0.0	3.6	19.1	0.0	0.0	0.7	38.5

Table 7 (cont'd.)

Feature:	4					8		14					17					17.1	TOTALS
Test Unit:	TU1					TU4		TU6		TU7			TU10					Fill	
Layer/Level:	surface	II/1	II/2	IIa/1	IIa/2	I	II/1	I/1	II/1	I	II/2	III/1	I	II/1	II/2	III/1	III/2		
	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
BIVALVIA																			
Brachidontes Crebristratus												<0.1							<0.1
Brachidontes Spp.				0.2	0.1						0.1			0.1				0.1	0.6
Tellina Palatum		4.7																	4.7
Tellina Spp.						0.4	0.8				0.6			0.3					2.1
Pinctada Spp.														0.1					0.1
Ctena Bella												<0.1							<0.1
Lioconcha Heiroglyphica														0.1					0.1
TOTAL BIVALVIA	0.0	4.7	0.0	0.2	0.1	0.4	0.8	0.0	0.0	0.0	0.7	0.0	0.0	0.6	0.0	0.0	0.0	0.1	7.6
ECHINODERMATA																			
Echinothrix diadema					0.2								0.2	0.3					0.7
Echinometra mathaei			0.1	0.2	1.1										<0.1				1.4
Echinometra oblonga										<0.1	0.1								0.1
Podofora atrata																			
"Beak" parts - unid.		0.1		0.3	0.6					<0.1	0.6			0.2					1.8
Tests - unid.		0.4		1.9	7.2		0.5	0.1	0.1	0.2	1.3	1.1	0.1	0.4				0.1	13.4
Spines - unid.		0.5	0.8	0.5	1.1				0.2	0.3	0.9	0.6			0.1				5.0
TOTAL ECHINODERMATA	0.0	1.0	0.9	3.1	10.2	0.0	0.5	0.1	0.3	0.5	2.9	1.7	0.3	0.9	0.1	0.0	0.0	0.1	22.6
ARTHOPODA																			
Decopoda - (crab claws)					0.6				1.1		0.3	7.9	0.4	1.8	1.2	1.9	1.7	2.0	18.9
TOTAL ARTHOPODA	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	1.1	0.0	0.3	7.9	0.4	1.8	1.2	1.9	1.7	2.0	18.9
TOTAL MARINE SHELL	0.0	12.8	0.9	6.0	12.8	1.2	1.3	0.2	2.8	1.3	7.7	17.4	1.2	3.0	1.3	1.9	1.7	2.9	76.4

Table 7 (cont'd.)

Feature:	4					8		14					17					17.1	TOTALS
Test Unit:	TU1					TU4		TU6		TU7			TU10					Fill	
Layer/Level:	surface	II/1	II/2	IIa/1	IIa/2	I	II/1	I/1	II/1	I	II/2	III/1	I	II/1	II/2	III/1	III/2		
	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
VERTEBRATE FAUNA																			
MAMMALIA																			3.3
Lasiurus cinereus					3.3						29.5								29.5
Homo sapiens																			
Rattus exulans		1.1	0.5	0.5	0.5				0.3	0.7	1.2	0.9		0.7	0.7	0.1	<0.1	1.0	8.2
Rattus norvegicus			0.2																0.2
Rattus spp.				0.1											<0.1			0.3	0.4
Mus musculus					<0.1				0.2	0.6	0.1	<0.1	<0.1	<0.1					0.9
Canis familiaris														0.3				1.3	1.6
Sus scrofa	9.5													0.2					9.7
unid. - bone-small		0.6			0.5					<0.1		3.0	<0.1	0.2	0.5		<0.1	1.2	6.0
unid. - bone-med					0.2		0.2				1.6			1.1	0.3	0.3		0.6	4.3
TOTAL MAMMALIA	9.5	1.7	0.7	0.6	4.5	0.0	0.2	0.0	0.5	1.3	32.4	3.9	0.0	2.5	1.5	0.4	0.0	4.4	64.1
AMPHIBIA													0.3						0.3
Bufo marinus																			
TOTAL AMPHIBIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.3
REPTILIA																			0.5
Gekkonidae								<0.1		0.4		<0.1	0.1	<0.1	<0.1				
TOTAL REPTILIA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	<0.1	0.1	<0.1	<0.1	0.0	0.0	0.0	0.5
PISCES																			1.3
Shark or ray		1.1			0.2														
Belonid											0.4							·	0.4

Table 7 (cont'd.)

Feature:	4					8		14					17					17.1	TOTALS
Test Unit:	TU1					TU4		TU6		TU7			TU10					Fill	
Layer/Level:	surface	II/1	II/2	IIa/1	IIa/2	I	II/1	I/1	II/1	I	II/2	III/1	I	II/1	II/2	III/1	III/2		
	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
Holocentrid											0.5								0.5
Carangid											4.7			0.3					5.0
Mullid											0.4								0.4
Cirrhitid											0.3								0.3
Labridae Spp.											0.4			<0.1				<0.1	0.4
Scarus Spp.				0.4															0.4
Acanthurid					<0.1						0.7								0.7
Scombrid					0.1														0.1
Ballistid					0.2						0.5			1.1	<0.1			<0.1	1.8
Monacanthid											0.3			0.1	<0.1			<0.1	0.4
unid. - bone		0.3		0.8	0.8				0.6	5.9	14.4	15.1	0.3	3.2	1.6	0.1	0.7	2.2	46.0
unid. - otolith												<0.1							<0.1
TOTAL PISCES	0.0	1.4	0.0	1.2	1.3	0.0	0.0	0.0	0.6	5.9	22.6	15.1	0.3	4.7	1.6	0.1	0.7	2.2	57.7
AVES																			
Pterodroma phaeopygia					0.1						0.4					0.3	0.7	0.4	1.9
Procellarild - small				0.3							0.2								0.5
Procellarild - med			0.7	0.8			0.9				0.9		2.5	1.1	0.2	2.2	0.7	5.5	15.5
Branta sp.			0.9																0.9
Thambetochen xanion				1.1															1.1
Gallus gallus	21.9					5.3	5.3							1.6					34.1
Porzana ziegleri				0.3													<0.1		0.3
Gallinula chlorupus																		0.2	0.2
Rallid or *Fulica*																0.2			0.2

Table 7 (cont'd.)

Feature:	4								8				14								17								17.1	TOTALS
Test Unit:	TU1								TU4				TU7								TU10								Fill	
Layer/Level:	surface		III/1		III/2		IIa/1		I		III/1		I		II/2		III/1		I		II/1		II/2		III/1		III/2			
	g	%	g	%	g	%	g	%	g	%	g	%	g	%	g	%	g	%	g	%	g	%	g	%	g	%	g	%	g	%
Streptopelia chinensis																														<0.1
Corvus sp.																														2.0
Chaetopila sp.																														0.2
Passeriform			0.3								0.2												0.2							1.0
unidentified bone - small																					0.1	0.1	0.1	0.1	0.4	0.4	0.1	0.1		1.2
unidentified bone - med			1.4	0.3	1.7																1.5	1.5	1.5	1.5	0.3	0.3	1.9	1.9	0.4	11.3
unidentified bone- large				1.0	0.4																1.3								0.3	3.2
unidentified egg shell			0.3		0.2																1.2	0.1								1.8
TOTAL AVES		21.9	2.0	2.9	4.6	2.1	5.3	6.2		0.0	0.4	0.4		7.7	7.7	57.0	19.9	5.8	11.8	4.6	4.6	2.5	3.6	3.7	4.1	4.4	8.1	14.7	76.4	198.6
TOTAL VERTEBRATE FAUNA		31.4	5.1	3.6	6.4	7.9	5.3	6.4		<0.1	1.5	7.7		7.7	7.7	57.0	19.9	5.8	11.8	4.6	4.6	5.6	4.1	4.4	4.1	1.7	3.4	0.3	0.3	30.6
FLORA																														
Asyntaxia gengetica		3.4	0.4											2.0	1.0															6.3
Seeds - unid.			<0.1							0.2	<0.1					7.2	2.9	0.2	0.2			0.7	1.5	3.4	0.3					17.5
Charcoal, unid. spp.		3.5	0.4	0.0	0.0	0.0	0.2	1.1		<0.1	0.4	5.4		2.0	1.0	7.6	3.1	0.2	0.2	0.1	0.1	0.7	1.7	3.4	0.3					30.6
TOTAL FLORA		3.5	0.4	0.0	0.0	0.0	0.2	1.1		<0.1	0.4	5.4		2.0	1.0	7.6	3.1	0.2	0.2	0.1	0.1	0.7	1.7	3.4	0.3					30.6

The remains of the extinct hoary bat, recovered in Feature 4 (Layer IIa, TU1) is probably the result of prehuman deposition (see Appendix A).

Pisces

Fish remains recovered include spines, scales, vertebrae, mandibular fragments (dental jaws), and cranial fragments. Eleven families of fish have been identified in the fish bone materials. These include Belonidae (needlefish), Holocentridae (squirrelfish), Carangidae (jacks), Mullidae (goatfish), Cirrhitidae (hawkfishes), Labridae (wrasses), Scaridae (parrotfish), Acanthuridae (surgeonfish), Balistidae (triggerfish), Scombridae (tunas and mackerels), and Monocanthidae (filefish). The family of sharks and rays was also represented.

Of these families, nine are represented in Feature 14, TU7, Layer II/2, a culturally modified sinkhole containing extinct bird remains. In addition, four families are represented in Feature 17, another culturally modified sinkhole containing extinct bird remains, and five are represented in Feature 4, an unmodified sinkhole. Unidentified fish bone is represented in sinkhole features as well as Features 2.1 and 3 (see Tables 6 and 7), which contain historical artifacts. Fish remains are further discussed in Appendix A.

Aves

A majority of the bird bone remains (avifauna) were recovered from sinkhole features, with only sparse avifaunal remains recovered from other feature types (see Tables 6 and 7). Chicken, or red junglefowl (*Gallus gallus*), remains appeared in Layer I deposits in both Feature 2.1 (trash mound) and in the interior of Feature 3 (L-shaped alignment). Chicken bone was also observed on the surface of several of the sinkholes (Features 4, 8, and 21) and in sinkhole deposits (Features 8 and 17). The presence of *Gallinula chloropus*, the common moorhen, in the pit fill of Feature 17.1 may reflect either pre-Contact or historical deposition.

Extinct Avifauna -- Not all the bird bone remains reflect cultural deposition. According to Ziegler (see Appendix A, this report), prehistorically extinct bird forms include a true goose (*Branta* sp.) and a goose-like *moa-nalo* of the family Anatidae (*Thambetochen xanion*), a small flightless rail (*Porzana ziegleri*), a large crow (*Corvus* sp.), and the medium-sized passeriform,(cf. *Chaetoptila* sp.). In addition, Ziegler points out that the Hawaiian petrel (*Pterodroma phaeopygia*) is prehistorically extinct on O'ahu but still present on some of the other Hawaiian Islands, while the "Small Procellariids" in Table 7 represent either a prehistorically extinct species or an extant one that was never historically recorded as occurring on O'ahu. The presence of eggshells in association with these remains in the sinkholes suggests that these birds were probably nesting in this area.

Three sinkholes (Features 4, 14, and 17) contained extinct avifauna remains. In Feature 4, extinct avifaunal remains recovered from Layer II deposits include the true goose (*Branta* sp.). In Layer IIa, extinct avifaunal remains include the Hawaiian Petrel (*Pterodroma phaeopygia*), the lesser O'ahu rail (*Porzana ziegleri*), the O'ahu lowland *moa-nalo* (*Thambetochen xanion*), and small Procellariids. Sparse wood charcoal and faunal remains (marine shell, sea urchin remains, and bone remains of fish) believed to be associated with Hawaiian use of the sinkhole are also present in Layers II and IIa in Feature 4.

In Feature 14, the bone remains of the Hawaiian petrel and small Procellariids represent the extinct avifauna from Layer II/2 in TU7. Faunal materials (marine shell, sea urchin, and bone remains of mammals and fish) and bone artifacts (cut bone, octopus lure point fragment) were also recovered in Layer II/2.

In Feature 17, extinct avifauna found in Layer II deposits was restricted to crow (*Corvus* sp.). In Feature 17.1 pit fill, extinct avifauna includes the Hawaiian petrel and crow. In Layer III, a prehuman deposit, extinct avifauna is represented by the Hawaiian Petrel, crow, and the Passeriform *kioea* (cf. *Chaetoptila* sp.). Traditional Hawaiian cultural materials and historical items were recovered from Layer II and Feature 17.1 in this sinkhole.

The presence of these extinct avifauna in stratigraphic layers bearing traditional Hawaiian cultural materials is likely due to stratigraphic mixing of prehuman deposits in the sinkholes with these cultural bearing layers. Bird bone remains are further discussed in Appendix A.

Reptiles

Reptilian bone remains recovered from features at Site 50-80-07-2474 have been identified to the family Gekkonidae. It is probable that most of the material represents the Polynesian-introduced (?) family of geckos. These remains were found only in sinkhole features (see Table 7).

Amphibians

Amphibian bone remains recovered from Site 50-80-07-2474 include sparse remains of *Bufo marinus*, the giant neotropical toad, introduced to Hawai'i in 1932 (see Appendix A). Toad remains were found only in Layer I of Feature 17 (see Table 7).

Arthropods

The crustacean remains recovered are restricted to crab claws and very sparse exoskeleton remains. These have been identified tentatively as land crab and *may* be *Geograpsus crinipes*, based on preliminary identification of these remains at Barber's Point (see Appendix A). These crustacean remains were found in most features of the site (see Tables 6 and 7).

Marine Shell

In the Hawaiian food economy, there was a great dependence upon marine resources, including marine and fresh/brackish water mollusks to supplement *poi*, the starchy mainstay of the Hawaiian diet (Titcomb 1979). It is somewhat surprising, therefore, that mollusks, including both gastropods (univalves) and bivalves are sparsely present (see Tables 6 and 7). Nine families (including 11 genera) of gastropods and six families of bivalves (including five genera) have been identified in the marine shell remains. The gastropod families (and

genera) include Conidae (*Conus*), Neritidae (*Nerita*), Cypraeidae (*Cypraea*), Cymatiidae (*Cymatium*), Thaididae (*Drupa* and *Morula*), Strombidae (*Strombus*), Trochidae (*Trochus*), Turbinidae (*Turbo*), and Columbellidae (*Anachis* and *Euplica*). The bivalve families include Veneridae (*Lioconcha*), Patellidae (*Cellana*), Tellinidae (*Tellina*), Pteriidae (*Pinctada*), Mytilidae (*Brachidontes*), and Lucinidae (*Ctena*).

Marine shell remains were recovered on the surface or in stratigraphic layers of most features (see Tables 6 and 7). Of the mollusks recovered, *Cypraea* remains appear to slightly dominate (by weight) the marine shell materials. The numerous Hawaiian names for the known varieties of cowries, as well as a general term for the cowrie group (*leho*), indicates the importance of cowries in the Hawaiian economy as food, ornaments, tools, and octopus lures (Titcomb 1979:340). Cowrie shells were recovered in historical features (Feature 2.1, trash dump, Feature 3, L-shaped alignment), unmodified sinkholes (Features 4 and 8), and modified sinkholes (Feature 17). Feature 21.1, a rock terrace, also contained very sparse cowrie remains. The absence of cowrie shell in the excavated sample of Feature 14, where a octopus lure point was found, is notable.

Floral Remains

Wood charcoal and unidentified seeds comprise the floral materials (see Tables 6 and 7). Sparse quantities of unidentified seeds were recovered from Features 4, 14 and 17. A seed from the introduced Chinese violet (*Asystasia gangetica*) was recovered in one of the sinkholes-- Feature 14, TU6, Layer II.

Wood charcoal occurred in sparse quantities in Features 4, 8, and 14, while slightly larger quantities were recovered in Feature 17. Sufficient charcoal for radiocarbon-age determinations was not recovered from any provenience.

Summary of Faunal Remains

The presence of a variety of marine mollusks shells, sea urchin remains, and a variety of small and medium to large fish bone recovered from Features 4, 8, 14, and 17 suggest

that various marine environmental zones (shoreline, littoral, and sublittoral zones) were utilized for sources of food for the occupants of this site.

The presence of sparse dog and pig bone probably reflects traditional Hawaiian faunal refuse in Feature 17 sinkhole. In the historical features (Features 2, 2.1, and 3) the presence of pig remains suggests that traditional Hawaiian subsistence practices continued in Wai'anae well into the post-Contact period.

DISCUSSION

State Site 50-80-07-2474 appears to have been somewhat peripheral to the impact of many of the broader historical events previously outlined in the report, from the archaeological perspective. This was probably due to the relatively impermeable limestone reef deposits which precluded any profitable use of the area except for the hardiest attempts at dryland agriculture, specifically that which focused on some of the small sinkholes. Nevertheless, five basic land use patterns were observed at this site and will be described below in rough chronological order of their initial appearance: refuse disposal, agriculture, ranching, habitation, and military.

REFUSE DISPOSAL

The earliest use of sinkholes for refuse disposal *may have* begun with the deposition of remains of extinct avifauna found in these features, if they were deposited by pioneering Polynesian immigrants to the Hawaiian Archipelago circa A.D. 400 (Kirch 1985:69). However, no evidence of butchering or cooking was observed upon analysis of these remains, which appear to have accumulated in the sinkholes as a result of natural processes. More likely, limited use began with the first documented settlements around Pōka'ī Bay in the twelfth century, and gradually increased through the early historic period as populations grew throughout the *ahupua'a*. Such utilization was encountered in the Barber's Point area on O'ahu (Davis, in prep.), although the habitation areas associated with these dumps do not appear to have been as substantial as those along Kaupuni Stream near State Site 50-80-07-2474.

While the distinction between this category of sinkhole and agricultural features described below is based primarily on subsurface evidence, the artifactual content of both these feature types can often be very similar. A description of the refuse disposal type is therefore presented in this section to illustrate the morphological attributes (or lack of them) that "Midden Sinkholes" shared with "Inferred Garden Features" in the following section. These definitions are quoted verbatim from a Barber's Point report in preparation by Bishop Museum, as this information is not yet available in print.

MIDDEN SINKHOLE

> This natural feature of the landscape does not show any evidence of structural modification; nor does it show any evidence that it was actually occupied. It does contain shell and bone midden, however, and often other cultural debris. Most of these features are too small for even temporary habitation, and were believed to be primarily refuse dumps. (Davis, in prep.:35)

In viewing the usage of these features across the site from this perspective, it becomes apparent that the majority of excavated sinks (Features 4, 10, 14, 17) fall into the Midden Sinkhole category, while only Feature 8 appears likely to have been used as a Garden Feature (see below). This should hardly be surprising given the close proximity of substantial habitation areas along Kaupuni Gulch. The range of midden debris and artifactual materials from these sinks also represents a cross-section of other kinds of activities presumably occurring at permanent coastal settlements through time. Features 4, 14, and 17 all portray these activities as detected through the recovery of limestone flakes (lithic tool maintenance and/or production), carbonized wood (food preparation), and a variety of marine shell, sea urchin and bone remains (food consumption).

Evidence from Feature 14 also suggests religious behavior in the form of a (probable) human long bone fragment which was apparently part of a finished lure point. The associated bone material found within the same stratigraphic provenience as the lure point fragment, also suggests it is probably made from human skeletal material. The making of

fishhooks from human bone was practiced by Native Hawaiians to humiliate certain enemies defeated in war, robbing them of their *mana* (spiritual power) present in their *'iwi* (bones).

> "Hooks of human bones were made from bones of the *'olohe*, 'hairless men,' not the bones of all men." (Kamakau 1976:77)

Archaeological remains from this behavior are most prevalent during the late prehistoric period (Kirch 1985:204), coinciding with the time in which Wai'anae was the scene of armed conflict between O'ahu inhabitants and invaders from Maui and Hawai'i Islands. Certainly, it is not beyond the realm of possibility, that the fragment of human long bone found in Feature 14 belonged to one such off-island warrior, his treatment after death serving to avenge local losses during battle.

More recent refuse has accumulated in the sinks and on the surface of Site 50-80-07-2474 as the result of U.S. military exercises during WW II, the construction of housing developments and Wai'anae Intermediate School nearby, and subsequent transitory use of the project area by local inhabitants. This category includes the presence of modern beer bottles, a Christmas tree stand, children's toys, a bicycle, and the burial of a large dog in Feature 11, revealed in TU5.

AGRICULTURE

The setting of the project area relative to more productive flood plain soils less than 100 meters to the east must have made the site only minimally attractive for pre-Contact period planting under normal climatic conditions. Sinkholes which were probably utilized for cultivation in Wai'anae appear to fit only one basic functional category previously identified in the Barber's Point area of O'ahu (Davis, in prep.), the "Inferred Garden Feature" described below.

INFERRED GARDEN FEATURE

> This...feature class has little or no obvious surface evidence of cultural modification, but in the past could have offered suitable conditions for plant cultivation...[T]his category is represented

> by pockets of humic clay-silt sediment ...found in 'moderately deep' sinkholes...[E]vidence includes the relatively deeper (by soil probe) sediments within the pockets; [and] a conspicuous absence of loose surface rock... (Davis, in prep.:36)

The absence of more substantial modification of these limestone sinkholes probably reflected the marginal status of the project area, as did the relative paucity of garden features in general. Only the small low terrace (Feature 21.1) near sink Feature 21 and surrounding "rake outs" of surface stones may have been associated with this usage, similar enigmatic features having been observed in the Barber's Point area (Earl Neller, personal communication 1993).

As can readily be seen from a comparison of this pattern of sinkhole utilization to the midden sinks above, both produced no evidence of surface modifications. Since artifactual content alone cannot be used as an indicator of function (see below), the factor which must be used to discriminate between these two types of sinkholes is the make-up of the soil matrix in which the midden is found. A relatively homogeneous rock-free stratum with some terrigenous soil development would be consistent with agricultural usage. The presence of midden debris in cross-bedded strata comprised primarily of eroding limestone, on the other hand, would more likely have resulted from periodic dumping activities associated with nearby habitation.

Soils encountered in Layer II of the Feature 8 sinkhole, appear most characteristic of those assumed to be conducive to cultivation, although the clay content found at Barber's Point soils was absent in Wai'anae. In particular, the relatively rock-free nature of the stratum and the inclusion of midden debris, primarily marine shell and carbon flecking, suggest that mulching of the soil with redeposited refuse prior to planting may have been undertaken periodically. Such practices were also standard on the leeward side of Hawai'i Island (Handy and Handy 1978:129) and midden-filled planting circles were observed at the site of Kaunolū, on the island of Lāna'i (Dixon et al. 1992:103).

Crops which might be expected to have been cultivated within the sinkholes were probably not those more easily produced in nearby flood plain/wetland settings: perhaps sweet potatoes or various herbs and spices. That adequate subsurface water supplies were

available beneath these sinks in pre-Contact times is attested to, however, by the present-day occurrence of ti plants, *kiawe*, and banyan trees in the project area. The limited scale of production made possible through cultivation of sinkholes also suggests these crops were most likely grown for *maka'āinana* household consumption and did not play a major part in surplus cultivation for *ali'i* tribute, unlike the nearby taro *lo'i*.

RANCHING

The ranching period of land use within the *ahupua'a* did not begin until the late-1800s, well after initial Euro-American settlement on the island. While the impermeable limestone reef deposits may have discouraged agricultural pursuits in the project area, the lush grass cover which blanketed the coastal plain of Wai'anae (at least during the winter months) encouraged the introduction of cattle. Grazing herds were apparently a major source of frustration to the early Native Hawaiian farmer on O'ahu (Kirch and Sahlins 1992), however, as many a *lo'i*, sweet potato patch, or household garden was damaged by foraging cows. In order to combat this problem in the Kamaile area, a network of stone walls was constructed which restricted access of the cattle to coastal habitation and residential areas (see Historic Background section).

At State Site 50-80-07-2474, one such wall was located oriented approximately east-west midway through the property, roughly parallel to the historic coast road and later railway bed. Feature 1 was composed strictly of locally available limestone and was probably built by Native Hawaiian masons, judging from the "core-filled" traditional construction manner. That the wall functioned properly is attested to by the bones of several cows scattered across the property, many found on the *makai* side of the feature. The partially preserved state of Feature 1 within the project area today indicates the wall also served as a source of building material after the abandonment of the ranching enterprise.

HABITATION

Perhaps even before cattle ranching began in the *ahupua'a* of Wai'anae, Site 50-80-07-2474 may have been the locus of Native Hawaiian habitation during the early historic

period. A small structure of perishable materials was apparently erected over the Feature 3 foundation wall and cobble paving found in the southeast corner of the project area, the only portion of the site which contains any depth of soil today and presumably could have supported a garden and shade or fruit trees prior to the arrival of *kiawe*. Small fragments of metal and bottle glass encountered in Layer I of TU2 indicate a post-Contact period habitation date to the structure. Flakes of volcanic glass also found in Layer I and the presence of traditional midden debris (marine shells and *kukui* nut fragments) in Layer II suggest the inhabitants were indigenous to Hawai'i. Unfortunately, no quantity of carbonized wood sufficient to submit for radiocarbon dating was recovered during excavation.

After the construction of the Feature 1 cattle wall in the late 1880s, Site 50-80-07-2472 became the locus of more temporary habitation as sugar cane production began to dominate the well-watered Kaupuni Stream flood plain and surrounding valley floor to the east. While structural evidence from this occupation is absent, the remains of a small garbage dump (Feature 2.1) within a larger surface scatter of historic debris (Feature 2) indicate a relatively intensive occupation for a short period of time. Analysis of the artifacts excavated from TU9, found the materials to be primarily glass beverage and ceramic rice containers dating to the end of the nineteenth century. This date, plus several abandoned five-gallon metal buckets found across the surface of Feature 2 indicates the inhabitants were probably involved in sugar plantation work or railroad construction, several camps having been noted on early twentieth century maps of the area. The limited range of functional types of glass bottles (mostly beer and liquor), the single dice for gambling, the presence of only single specimens and not entire sets of ceramic vessels, and the relatively few personal effects suggest the occupants were not nuclear families, but mostly single males-- probably recent immigrants from Asia or the Philippines.

The site, again, became the locus of temporary habitation in the past 20 years or less, probably an encampment for a "homeless" family. A rudimentary shelter constructed of scrap wood, screening, and even carpet was found to contain used furniture, Styrofoam coolers, and cooking utensils. Domestic debris surrounding this shelter did contain a wide variety of functions such as baby bottle nipples, suggesting habitation by an entire family group. A Hawaiian driver's license for a Samoan woman, found in this surface debris on the

edge of Feature 2, may even denote the ethnic identity of the inhabitants, or perhaps victims of less law abiding occupants at the site.

MILITARY

U.S. military exercises on the coast of Wai'anae were also one of the most recent activities contributing to refuse accumulation in the sinkholes of State Site 50-80-07-2474. World War II amphibious landing practice and the accompanying soldiers left behind vast quantities of military debris (shell casings, food containers, etc.) and beer bottles which are still well preserved in the arid environment. It is possible that destruction of the Feature 1 historic cattle wall was hastened during this period, when construction materials were needed for military base housing and facilities on Pōka'ī Bay. Several sinkholes may also have been intentionally filled with stones during prolonged training exercises, to provide suitable "foxholes" for simulated combat.

CONCLUSIONS

The archaeological inventory survey of State Site 50-89-07-2474 in Wai'anae *ahupua'a* has provided valuable evidence for documenting human adaptation to a karstic environment on a portion of the leeward coast of O'ahu which has not received much attention to date. Such "marginal" areas in Hawai'i have customarily been assigned the importance attributed to them today, that of a wasteland of little value to anyone. While the project area appears to have been somewhat peripheral to broad historical events through time, the preservation of this evidence is much more intact than in areas which have undergone centuries of modification.

SIGNIFICANCE

Archaeological remains recorded at State Site 50-80-07-2474 have documented the existence of at least five distinct land use patterns and chronological periods of occupation at the site, from pre-Contact times to the late twentieth century. In assessing the significance of these cultural remains according to National Register Criteria for Evaluating Historic

Properties (U.S. Department of the Interior [USDI] 1982), it appears that Site 2474 is significant under National Register Criterion D, indicating that this site "has yielded, or [is] likely to yield, information pertaining to the prehistory or history of Hawai'i." (State Historic Preservation Division [SHPD] 1991)

MITIGATION PLAN

Based on the location of archaeological features of Site 2474 with respect to the proposed housing development plan, it appears that the development will have an adverse effect on 12 of the 24 features of this site. These features, including Features 1, 5, 6, 7, and 13 through 20, are situated in the immediate impact zone of the housing development (Figure 42).

Of the remaining features (Features 2, 2.1, 3, 4, 8, 9, 10, 11, 12, 21, 21.1, and 22), all but one (Feature 12) are located outside of the immediate development impact zone to the south. Feature 12 is located outside the proposed development to the northwest. The proposed housing development will likely have an indirect impact on the features outside of the immediate impact zone, primarily due to the probable increase in visitation to and accessibility of these remaining features.

Since total avoidance of the features located in the proposed housing development seems impractical, and since none of the features are significant enough to actively preserve and interpret (active preservation), there are really only two viable options that exist for the mitigation of adverse effects of the proposed housing development upon the cultural and paleontological features of Site 2474: passive preservation and data recovery. Of these options, passive preservation, which involves preserving a feature "as is", seems to be the most practical and economical mitigation effort for most of the features. Passive preservation, for the purpose of conservation of archaeological resources in the project area, involves the concept of an archaeological "data bank" where theoretically future archaeological data recovery methods will be greatly improved and more efficient.

Figure 42. Archaeological Feature Locations of Site 50-80-07-2474 with Respect to Proposed Housing Development Plan.

See fold-out map.

PRESERVATION PLAN

Table 8 summarizes the preservation strategy of the 24 archaeological features of Site 2474. It provides the designation, type, and location with respect to the proposed housing development plan of the features. The column labelled "Status" at the far right of Table 8 indicates the most viable preservation strategy for each feature. In this column, the "No Longer Significant" entry means that this feature is no longer considered significant under National Register Criterion "D", and indicates that it is not likely that further excavations will yield new information pertaining to feature age and function. Surface features tested during the inventory survey, and considered "no longer significant", include the core-filled wall (Feature 1), the historical artifact scatter (Feature 2), the trash mound (Feature 2.1), the dog burial (Feature 11), and the small terrace (Feature 21.1) adjacent to the Feature 21 modified sinkhole.

Modified and Unmodified Sinkholes

Sinkholes, both modified and unmodified, are the dominant feature type within the project area (see Figure 42). A source of cultural materials and features, as well paleontological remains (extinct bird and mammal bones), *all* recorded sinkholes (Features 4 through 10, and 12 through 22) are still considered to be significant under National Register Criterion "D", and are recommended for passive preservation (see Table 8). In order to conserve the information and materials within these features, it is recommended that all the recorded sinkholes be filled-in with either sand or a clay-based fill material prior to construction of the housing development.

Procedures for Sinkhole Preservation

The following procedures are recommended for sinkhole features prior to construction.

1. Final photographic documentation of each sinkhole. This would entail relatively close-up black-and-white, and color, photographs of the interior sink surface from at least two angles, and of any surface modifications (e.g. low walls or piles of limestone slabs) surrounding the sinkholes.

Table 8
Mitigation Plan for Features at Site 50-80-07-2474

Feature Number	Feature Type	Feature Location	Status
1	Wall	Both inside and outside development impact zone	No Longer Significant
2	Historic artifact scatter	South (outside) of development impact zone	No Longer Significant
2.1	Trash mound	South (outside) of development impact zone	No Longer Significant
3	L-Shaped alignment	South (outside) of development impact zone	Passive Preservation
4	Sinkhole	South (outside) of development impact zone	Passive Preservation
5	Sinkhole	In grass area at edge of proposed road on south side	Passive Preservation
6	Sinkhole	In parking lot area between BLDGs 7/8 and 12	Passive Preservation
7	Sinkhole	In grass area at south side of BLDG 10	Passive Preservation
8	Sinkhole	South (outside) of development impact zone	Passive Preservation
9	Sinkhole	South (outside) of development impact zone	Passive Preservation
10	Sinkhole	South (outside) of development impact zone	Passive Preservation
11	Platform (dog burial)	South (outside) of development impact zone	No Longer Significant
12	Sinkhole	North (outside) of development impact zone	Passive Preservation
13	Sinkhole	In grass area on northeast side of BLDG 1	Passive Preservation
14	Modified Sinkhole	In parking lot area north of BLDG 1	Passive Preservation

Table 8 (cont'd.)

Feature Number	Feature Type	Feature Location	Status
15	Sinkhole	In area of BLDG 7	Passive Preservation
16	Modified Sinkhole	In parking lot area between BLDGs 7/8 and 12	Passive Preservation
17	Modified Sinkhole	In grass area between BLDGs 6 and 8	Passive Preservation
18	Sinkhole	In area between BLDG 8 and parking lot on mauka side	Passive Preservation
19	Sinkhole	In parking lot area between BLDGs 7/8 and 12	Passive Preservation
20	Modified Sinkhole	In parking lot area between BLDGs 5 and 6 (near mailboxes)	Passive Preservation
21	Modified Sinkhole	South (outside) of development impact zone	Passive Preservation
21.1	Terrace	South (outside) of development impact zone	No Longer Significant
22	Sinkhole	South (outside) of development impact zone	Passive Preservation

2. Final photographic documentation of surface artifacts in the sinkholes. This would entail black-and-white photographs of any surface artifacts that were not collected or photographed during the inventory survey.

3. Application of double-thick (2.0 to 4.0 mil) black plastic sheets directly onto the sinkhole surface. This should prevent chemical and other forms of contamination, as well as preserve and mark the original interior sinkhole surface.

4. Careful filling in of sinkholes with sand (preferable some sort of non-coralline sand) or a clay-based fill material. Some compacting will be necessary.

Surface Features

The only surface feature that is still considered significant under National Register Criterion "D" is Feature 3, the L-shaped alignment. This possible house foundation is situated outside the immediate impact zone of the housing development to the south (see Figure 42). While construction activities should not affect the surface remains of this feature, it is possible that it will be impacted as a result of increased use of the area by new and old residents. It is therefore recommended that this feature be covered with double-thick (2.0 to 4.0 mil) plastic sheets, followed by 2.0 to 3.0 feet of fill material to conserve this archaeological resource.

Because the soils in the project area are relatively thin, it is not anticipated that subsurface features, such as human burials, will be discovered inadvertently during construction excavations. However, the State Historic Preservation Division, Department of Land and Natural Resources should be notified immediately if such a discovery is made during construction.

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APPENDIX A

Comments on the Analysis of Faunal Remains

By Dr. Alan Ziegler, Ph.D.

Summary of Features

Feature 2

This seems to represent, primarily, the post-Contact Period because of the historical artifact material. Even the bird (including chicken) and mammal material could possibly all be post-Contact. "Sea Turtle" seems lacking in this and all other features.

Feature 4

In contrast to Feature 2, this one at least has the look of a pre-Contact site. I received no historic artifactual material and, except for a single bone of historically introduced House Mouse (possibly intrusive, judging from its relatively fresh-looking condition), all of the bone material could be from pre-Contact species. The fish include a "Scombrid", which must have been taken offshore, and perhaps the "Shark or Ray" was also.

The single bone of hoary Bat is of interest, and I wonder if you might care to offer it (with data, especially any date you might have for its stratigraphic position) to Carla Kishinami of the Zoology Department there. Because there is a second, extinct and undescribed, species of bat now known from the islands, I hope the Bishop Museum will care to save all bat remains found in archaeological and paleontological contexts for the use of current and future researchers.

Feature 14

Although historically introduced species of both a dove and at least two rodents are present, the remaining material could possibly all be prehistoric. (I suspect the small lizards, small birds, and rodents may be prey remains of an avian and/or mammalian predator.) There is a wide variety of common inshore fish present, but these are certainly not "choice"

individuals in terms of size. Most of these are exceptionally small (i.e., 5-15 or so cm in length) and must have been taken by hand-netting, trapping, and/or poisoning rather than by hooking, spearing, or surround-netting.

Feature 17

Taken as a whole, this feature seems to represent a quite extended period: from Historic back into, likely, prehuman times. A fragment of ferrous metal is present; the fish are much like those of Feature 14; the birds include at least three species prehistorically extinct on O'ahu; and historically introduced rodents are present. Again, I think most of the small lizard, small bird, and rodent bones are probably prey remains of avian and/or mammalian predators--possibly different species using the site as a roost or den at more than one period in the site's chronology.

There is very little faunal material indicating that the Wai'anae area sampled is primarily a post-Contact site: only a metal-sawed bone fragment of a large mammal, a *Rattus* bone or two that might be of a historically introduced species, and a partial cat skeleton from the surface. I had mentioned that the chicken represented is a large form, but this is not an indication of pre- versus post-Contact times because both large- and small-bodied birds seem to have been present here during both periods.

Everything else identified could conceivably be entirely pre-Contact and/or early post-Contact, including two traditionally worked fragments of mammal bone, one of these possibly human. The excavation unit with the worked possible human bone also held a half-dozen or so broken limb-bone fragments that I referred to "*Homo sapiens*"; if correctly referred, and assuming that no other human material was held out of the bags I received, I would think these fragments represent raw material originally intended for making traditional artifacts rather than the remains of either a primary or secondary burial.

Whatever the time period of the fairly obvious human occupation here, the midden of some areas seems to have been laid down on top of a prehistorically extinct bird deposit. Two specific localities very obviously showing the presence of several species of prehistorically extinct birds are FEATURE 4 TU1 Sink 4 and Feature 17 of TU10. The

variety and general appearance/condition of these bird bones seems fairly typical of prehistoric deposits in coralline reef sinkholes elsewhere in this part of Leeward O'ahu.

As you will see, the prehistorically extinct bird forms are a true goose and a goose-like moa-nalo of the family Anatidae, a small flightless rail, a large crow, and the medium-sized passeriform "cf. *Chaetoptila* sp.". In addition, "*Pterodroma phaeopygia*" is prehistorically extinct on O'ahu but extant on some other islands, while the "Small Procellariid" represents either a prehistorically extinct species or an extant one that was never historically recorded as occurring on O'ahu.

I see no certain indication (e.g., burning, butchering marks, etc.) that the prehistorically extinct birds represented by bones here were eaten by humans. I did notice, however, that several of these bones are stained dark brown, presumably meaning that they had at one time been in water or saturated ground for probably a minimum of several dozen years. These stained bones may well also be partially premineralized from this same period of immersion but I have no method of scientifically checking this--my very subjective opinion derives from what seems to be a somewhat porcelain-like texture of the stained bones. Some other bones of these extinct species did not show the staining, though, so it is possible there was some stratigraphic mixing of the various layers containing these bones by later human occupants.

In regard to what vertebrates the people here were eating, I would say the diet probably included a fair variety of types. The fish are of a limited number of inshore reef families (with the possible exception of the fairly large "Shark or Ray") but the individuals (other than the two or three "Monacanthid" individuals--see information in the Faunal Category List) seem possibly relatively choice in terms of both family and medium-to- large body size; in other words, the fish eaten here do not represent the greater variety of families and wider range of body sizes that would be expected if the total catches from, for example, surround-net hauls were brought to the site and eaten. No sea turtle remains seem present.

Among birds, chicken was eaten primarily but there may possibly also have been a moorhen ("*Gallinula chloropus*") and a "Medium Procellariid" individual or two consumed (--at least one medium-sized member of the family, "*Puffinus pacificus*", was fairly abundant on or around O'ahu in early historic times, as it still is today). An occasional dog may have

been eaten, as well as a possibly slightly greater number of pigs, although the remains of neither are exceptionally numerous among the material. I assume the rats were not human food items, although they could possibly be raptorial bird prey-remains, as might also be the one or two "Small Passeriform" birds.

I noted a bit of "Crustacean" exoskeleton among the material. If there is any significant amount of such material, you may have the presence of possible extinct(?) land crab material. This putative land crab is small but seems to have very broad chelae compared to those of the normal shore crabs. This may be *Geograpsus crinipes*.

CATEGORIES USED FOR BISHOP MUSEUM FAUNAL IDENTIFICATIONS

Alan C. Ziegler
Revised 20 August 1993

MISCELLANEOUS

Artifact.....anyhistorically manufactured item as well as any geological, vegetal, osteological, or other material obviously or possibly intentionally "worked", including bones showing apparent butchering marks.

NON-VERTEBRATE

Basalt.....allnon-disintegrated volcanically derived material, including pumice, and volcanic glass fragments not included under "Artifact".

Charcoal

Vegetable.....alluncharred or otherwise unmodified vegetal material.

Coral Reef Rubble.....includingfragments of mollusk, echinoderm, etc., that seem obviously to have weathered out of the reef or to be quite beachworn, and thus probably not human food midden.

Echinoderm.....usually,exoskeleton remains of sea urchin, quite possibly being human food midden.

Mollusk.....non-fossilmaterial of marine, freshwater, and/or terrestrial forms that seems to have entered the deposit in a relatively fresh condition, most of the non-terrestrial material probably being human food midden.

Crustacean.....usually,exoskeleton remains of crab or lobster, with an occasional barnacle plate, much--but not all--probably being human food midden.

Invertebrate.....remainsof invertebrate groups either not more specifically identifiable, or other than those listed above; for example, bryozoan exoskeletons, calcareous polychaete worm tubes, etc.

VERTEBRATE

CLASS CHONDRICHTHYES (Sharks and Rays)
AND/OR OSTEICHTHYES (Bony Fishes)
[Arrangement and nomenclature follow Gosline, W.A., and V.E. Brock, 1960 (reprinted 1965), *Handbook of Hawaiian Fishes*, University of Hawaii Press, Honolulu.]

Shark.....notidentified to any lower taxonomic level; in Hawai'i there are 9 families comprising about 22 species.

Ray.....notidentified to any lower taxonomic level; in Hawai'i there are 3 families comprising about 5 species.

Belonid.....member(s)of the family Belonidae (Needlefishes), of which there are 3 species in Hawai'i; usually found somewhat offshore near the ocean surface, and reaching 100 cm in length.

Holocentrid.....member(s)of the family Holocentridae (Squirrelfishes), of which there are about 15 species in Hawai'i; many of them found in deeper reef areas, with most of them fairly small and only 1 or 2 approaching 45 cm in length.

Priacanthid.....member(s)of the family Priacanthidae ('Aweoweos or Bigeyes), of which 4 species are usually encountered in Hawai'i; either near-shore or deeper-water forms, with maximum lengths of about 35 cm.

Carangid.....member(s)of the family Carangidae (Jacks), of which there are over 20 species in Hawai'i; most of them deeper-water and fairly large forms; the species *Caranx ignobilis* (Ulua--or Papio for the smaller young) sometimes ranging in close to shore, and reaching 100 cm or more in length.

Mullid.....member(s)of the family Mullidae (Goatfishes), of which there are 10 species in Hawai'i; many of them living on the reef or frequently visiting it, usually about 20-25 cm long but a few reaching 40-60 cm.

Cirrhitid.....member(s)of the family Cirrhitidae (Hawkfishes), of which there are 5 or 6 species in Hawai'i; all inshore forms, only 1 of which reaches as much as 30 cm in length.

Pomacentrid.....member(s)of the family Pomacentridae (Damselfishes), of which there are about 14 species in Hawai'i, all except 2 characteristic of inshore waters (most in abundance), and reaching maximum lengths of near 25 cm.

Labrid.....member(s)of the family Labridae (Wrasses), which is the largest family of fishes in Hawai'i with over 40 species; predominately inshore forms, most of them fairly small but with a few larger forms reaching about 50 cm in length.

Scarid.....member(s)of the family Scaridae (Parrotfishes), of which the genera *Calotomus* (2? species) and *Scarus* (4-5 species) are essentially the only 2 expected to occur in Hawai'i; both being typically inshore groups, and including 1 or 2 species that may reach 70 cm in length.

Acanthurid.....member(s)of the family Acanthuridae (Surgeonfishes), of which there are over 20 species in Hawai'i; most of them inshore forms, with the genus *Naso* (Unicornfish or [mostly] Kala) comprising the 5 generally largest of these, reaching 40 to 75 cm in length.

Scombrid.....member(s)of the family Scombridae (Tunas and Mackerels), of which there are perhaps a dozen species in Hawaiian waters; almost all open-ocean (pelagic) forms, many reaching a m or more in length.

Balistid.....member(s)of the family Balistidae (Triggerfishes), of which there are about 10 species in Hawai'i; mostly inshore forms, with the largest reaching about 35 cm in length.

Monacanthid.....member(s)of the family Monacanthidae (Filefishes), of which the small *Pervagor spilosoma* (Fantail Filefish), reaching only about 15 cm in length and sometimes washing up on beaches dead in great numbers, is by far the most abundant of the 8 species to be expected in near-shore Hawaiian waters; the genus *Alutera* contains the largest species, reaching about 60 cm in length.

Diodontid.....member(s)of the family Diodontidae (Spiny Puffers), of which 2 species of the genus *Diodon*, ranging from 35 to 70 cm in maximum length, are by far the most abundant in Hawaiian inshore waters, the single remaining species reported for Hawai'i (genus *Chilomycterus*, 50 cm in length) apparently being quite rare here; all of these species are suspected of possessing an intrinsic poison although the flesh is apparently sometimes eaten without ill effects.

Fish.....materialof indeterminate class and family.

CLASS AMPHIBIA

Order Anura
Family Bufonidae: (True Toads)

Bufo marinus (Giant Neotropical Toad).....introduced to the Hawaiian Islands in 1932.

CLASS REPTILIA

Order Squamata
Family Indeterminate

Small Lizard.....lizard(s)with a head-and-body length of less than about 10 or 15 cm; usually not identified to any lower taxonomic level although, in Hawai'i, most or all of the material probably represents the Polynesian-introduced(?) families Gekkonidae (geckos) and/or Scincidae (skinks) rather than any of the smaller members of historically introduced families.

CLASS AVES

[Arrangement and nomenclature of historically known forms--unless modified by the various Olson and James' references listed below--follow Pratt, H.D., P.L. Bruner, and D.G. Berrett, 1987, *The Birds of Hawaii and the Tropical Pacific*, Princeton University Press, Princeton, New Jersey; while information on prehistorically extinct forms is drawn from Olson, S.L., and H.F. James, 1982, Prodromus of the fossil avifauna of the Hawaiian Islands, *Smithsonian Contributions to Zoology*, No. 365; Olson, S.L., and H.F. James, 1991, Descriptions of thirty-two new species of birds from the Hawaiian Islands: Part I. Non-passeriformes, *Ornithological Monographs* No. 45; and James, H.F., and S.L. Olson, 1991, Part II. Passeriformes, *ibid.* No. 46.]

Order Procellariiformes
Family Procellariidae: (Shearwaters, Petrels, and Fulmars)

Puffinus sp. (Shearwater).....(see "Small Procellariid" and "Medium Procellariid" categories below for the various species of this genus most likely represented.)

Pterodroma phaeopygia (Hawaiian Petrel)

Small Procellariid.....smaller member(s) of the family Procellariidae, in the general size range of *Puffinus nativitatis* (Christmas Shearwater), *Bulweria bulwerii* (Bulwer's Petrel), *Pterodroma hypoleuca* (Bonin Petrel), as well as, apparently, *Puffinus lherminieri* (Audubon's Shearwater) and the possibly undescribed "*Pterodroma* sp.", both noted as previously being found on Moloka'i and/or O'ahu by Olson and James 1982:32-33.

Medium Procellariid.....medium-sized member(s) of the family Procellariidae, in the general size range of *Puffinus pacificus* (Wedge-tailed Shearwater), *Puffinus newelli* (Newell's Shearwater), and *Pterodroma phaeopygia* (Hawaiian Petrel).

Family Hydrobatidae (Family Oceanitidae of Olson and James 1982:33): (Storm-Petrels)

Oceanodroma castro (Band-rumped Storm-Petrel)....material of a very small member of this family, presumably this species although I have not been able to obtain comparative skeletal material of it either locally or from the Smithsonian Institution, although I have satisfactory material of the larger *Oceanodroma tristrami* (Tristram's Storm-Petrel).

Order Anseriformes
Family Anatidae: (Swans, Geese, and Ducks)

Branta sp. (Goose).....presumably, either the historically known *Branta sandvicensis* (Hawaiian Goose) or one of the prehistorically extinct, apparently semiflightless--or possibly even flightless--medium-sized forms morphologically similar to, but evidently specifically distinct from, *Branta sandvicensis*; (see Olson and James 1991:42-47).

Thambetochen xanion (O'ahu Lowland Moa-nalo).....prehistorically extinct, large, obviously flightless, goose-like member of the family Anatidae (see Olson and James 1991:28-37.)

Small Anatid.....duck(s)in the size range of *Anas wyvilliana* (Hawaiian Duck), *Anas laysanensis* (Laysan Duck), and some migrant or accidental continental teal; smaller than most other migrant ducks that often reach the Hawaiian Islands, which are often in the general "medium" size range of continental *Anas platyrhynchos* (Mallard).

Medium Anatid.....(including the former category "Small-to-Medium Anatid"); member(s) of the family Anatidae in the general size range of smaller geese and larger ducks, such as *Branta sandvicensis* (Hawaiian Goose) and continental races of *Anas platyrhynchos* (Mallard).

Order Falconiformes
Family Accipitridae: (Eagles and Hawks)

Circus dossenus (Wood Harrier).....(formerly the category "Small Accipitrid"); prehistorically extinct, bird-catching hawk, known only from O'ahu and Moloka'i (see Olson and James 1991:64-67).

Order Galliformes
Family Phasianidae: (Turkeys, Peafowl, Guineafowl, Chickens, Pheasants, Quail, etc.)

Gallus gallus (Red Junglefowl).....(in almost all cases, fragmentary material representing pre-Contact Polynesian junglefowl would not be distinguishable from that of historically introduced chicken breeds of this same species. Also, I am not sure that most such material of other phasianids such as various species of larger pheasants [*Phasianus*, *Lophura*, etc.], as well as guineafowl [*Numida*],--all historically introduced--could usually be distinguished.)

Large Galliform.....member(s) of an indeterminate family (--although, in Hawai'i, most likely all historically introduced members of the family Phasianidae--) in the general size range of *Pavo cristatus* (Common Peafowl; introduced to the Hawaiian Islands in 1860) and *Meleagris gallopavo* (Wild [and Domestic] Turkey; introduced in 1788).

Order Gruiformes
Family Rallidae: (Rails, Moorhens or Gallinules, Coots, etc.)

Porzana ziegleri (Lesser O'ahu Rail).....(formerly the category "Small Oahu Rail"); the smaller of 2 prehistorically extinct flightless rails known from O'ahu (see Olson and James 1991:51-53, 59-60).

Porzana sp. (Hawaiian Flightless Rail).....(formerly the category "Small Flightless Rallid"); sparrow- to plover-sized flightless member(s) of the family Rallidae; (see Olson and James 1991:49-62 for the various species potentially represented on the different Hawaiian Islands).

Gallinula chloropus (Common Moorhen)

Fulica cf. *alai* (Hawaiian Coot).....osteologically possibly indistinguishable from *Fulica americana* (American Coot), a rare visitant to the Hawaiian Islands; (as in the case of the preceding category, certain bones of this species could also potentially have been assigned to the "Medium Rallid" category [which see, below]).

Medium Rallid.....member(s) of the family Rallidae in the general size range of *Gallinula chloropus* (Common Moorhen) and *Fulica* cf. *alai* (Hawaiian Coot); most of the material probably consists of certain bones of 1 or both of these 2 species that I cannot satisfactorily distinguish, especially in the case of fragmentary material.

Order Charadriiformes
Family Charadriidae: (Plovers and Dotterels)

Pluvialis dominica (Lesser Golden-Plover).....this relatively common migratory species is most abundant--and thus most readily available for capture--in the Hawaiian Islands from August through April, although a few individuals may occasionally be found here all year.

Family Scolopacidae: (Curlews, Turnstones, Tattlers, Sandpipers, etc.)

Numenius tahitiensis (Bristle-thighed Curlew)

Order Columbiformes
Family Columbidae: (Pigeons and Doves)

Streptopelia chinensis (Spotted Dove).....introduced to the Hawaiian Islands sometime in the 1800's. (There are no native Hawaiian columbiforms, and of the 20 or so species of the order [all family Columbidae except for 1 sandgrouse of the family Pteroclidae] historically introduced to the State only 4 managed to establish widespread, long-surviving, populations: *Columba livia* [Rock Dove or "Domestic

Pigeon"], *Streptopelia chinensis* [Spotted Dove], *Geopelia striata* [Zebra Dove], and *Zenaidura macroura* [Mourning Dove--apparently only in the Pu'uwa'awa'a area in the North Kona District of Hawai'i Island]. Thus, I presume most or all bones of columbids found will represent only these 4 forms although in a few cases osteologically similar species--introduced but now extirpated--could conceivably be represented.)

Order Strigiformes
Family Strigidae: (Typical Owls)

Grallistrix orion (O'ahu Stilt-Owl).....(formerly the category "Long-legged Oahu Owl"); prehistorically extinct, diurnal, bird-catching member of the family; (see Olson and James 1991:74-76).

Medium Strigid.....comprises owl material that does not appear to be the sole Hawaiian representative of the family Tytonidae *Tyto alba* (Common Barn-Owl, introduced to the Hawaiian Islands in 1958), but very likely represents either or both the native *Asio flammeus* (Short-eared Owl) and the prehistorically extinct owl genus *Grallistrix* (Stilt-Owls) of Olson and James 1991:67-81 (both family Strigidae), many of whose bones I cannot yet satisfactorily distinguish, especially when fragmentary.

Order Passeriformes
Family Corvidae: (Ravens, Crows, Magpies, and Jays)

Corvus sp. (Crow).....member(s) of the genus in the general size range of continental *Corvus corax* (Common Raven) and thus larger than the extant *Corvus hawaiiensis* (Hawaiian Crow); on O'ahu presumably either or both the prehistorically extinct Hawaiian *Corvus impluviatus* and *C. viriosus* of James and Olson 1991:11-22 could be included.

Family Meliphagidae: (Honeyeaters)

Chaetoptila sp. (Kioea).....(historically extinct on Hawai'i Island, and known only fossil elsewhere in the State; see "Medium Passeriform" category below and also Olson and James 1982:39 as well as James and Olson 1991:80.)

Family Indeterminate

Small Passeriform.....member(s) of 1 or more families of this order ("Perching Birds" or "Songbirds"), up to the general size of cardinals or smaller thrushes; most of the extinct and extant endemic Hawaiian passeriform species--as well as a number of the historically introduced ones--would be of this size.

Medium Passeriform.....member(s) of this order in the general size range of myna and robin to larger jays; among endemic Hawaiian passeriform species, apparently only the extinct *Chaetoptila* sp. (family Meliphagidae) and, possibly, a very few of the larger prehistorically extinct species of Hawaiian Honeycreepers and Finches (subfamily Drepanidinae of the family Fringillidae; see James and Olson 1991)--as well as a few of the historically introduced species of various families--would be of this size.

Order and Family Indeterminate

Medium Raptorial Bird.....member(s) of either the order Falconiformes (eagles, hawks, falcons, etc.) or Strigiformes (Barn- and Typical owls), in the general size range of *Circus dossenus* (Wood Harrier), *Buteo solitarius* (Hawaiian Hawk), *Tyto alba* (Common Barn-Owl), *Asio flammeus* (Short-eared Owl), and the prehistorically extinct owls of the genus *Grallistrix* (Stilt-Owls) of Olson and James 1991:67-81.

Small Bird.....member(s) of indeterminate order and family up through the general size of storm-petrel, quail, plover, sparrow, myna, and thrush; probably a large amount of the material represents passeriforms but smaller native or historically introduced species of 3 or 4 other orders could well be included, also.

Medium Bird.....member(s) of indeterminate order and family in the general size range of shearwater and petrel, tropicbird, night-heron, duck, hawk, junglefowl (=chicken), moorhen and coot, curlew, gull, owl, crow, and so on; in Hawai'i, probably no passeriforms other than Hawaiian species of the genus *Corvus* would be included, but a number of native or historically introduced species of up to a half-dozen other orders could potentially be.

Large Bird.....member(s) of indeterminate order and family in the general size range of albatross, booby, frigatebird, goose, eagle, turkey, raven, and so on; in Hawai'i, a number of native or historically introduced species of up to a half-dozen orders could potentially be included.

CLASS MAMMALIA

[Insofar as possible, arrangement and nomenclature follow Tomich, P.Q., 1986, *Mammals in Hawai'i, Second Edition*, Bishop Museum Press, Honolulu; except that the more generally accepted name *Mus musculus* is used here instead of *Mus domesticus*.]

Order Chiroptera
Family Vespertilionidae: (Common Bats)

Lasiurus cinereus (Hoary Bat)

Order Primata
Family Hominidae: (Humans)

Homo sapiens (Modern Human)

Order Rodentia
Family Muridae: (Old World Rats and Mice)

Rattus exulans (Polynesian Rat).....comprises all material of this Polynesian-introduced species that, because of its relatively small size, could be distinguished with some degree of certainty from corresponding material of the 2 larger *Rattus* species (see following category) historically introduced to the Hawaiian Islands.

Rattus norvegicus and/or *R. rattus* (Norway and/or Roof Rat)...comprises all material that, because of its relatively large size, could be distinguished with some degree of certainty from that of the smaller *Rattus exulans*; although, except for essentially intact crania, I doubt that isolated skeletal elements of these 2 larger, post-Contact, species can safely be distinguished from each other.

Rattus sp. .....comprises material presumably all representing this genus but that could not be assigned to any particular 1 of the 3 *Rattus* species named in the just-preceding 2 categories, usually because of either its fragmentary nature or its relative immaturity.

Mus musculus (House Mouse).....introduced to the Hawaiian Islands sometime after 1778.

Order Carnivora
Family Canidae: (Wolves, Dogs, Foxes, etc.)

Canis familiaris (Domestic Dog).....(I doubt that it is possible to distinguish remains of pre-Contact Polynesian dogs from morphologically similar forms of historically introduced ones, although individuals of very large or otherwise osteologically distinct introduced modern breeds of this same species might be successfully identified as such.)

Family Felidae: (Lions, Tigers, Cats, etc.)

Felis catus (House Cat).....introduced to the Hawaiian Islands sometime after 1778.

Order Artiodactyla
Family Suidae: (Pigs, Babirusa, Wart Hogs, etc.)

Sus scrofa (Pig).....(justas in the case of the Domestic Dog, I doubt that it is possible to distinguish remains of pre-Contact Polynesian pigs from morphologically similar breeds of historically introduced ones, although individuals of extremely large or otherwise osteologically distinct introduced modern breeds of this same species might be successfully identified as such.)

Family Bovidae: (Cattle, Buffalo, Goats, Sheep, etc.)

Bos taurus (Domestic Cattle).....member(s) of the family Bovidae in the cattle size range; although I have referred all such material to this species (introduced to the Hawaiian Islands in 1793), in reality, other such large bovids as *Bubalus bubalis* (Water Buffalo; introduced about 1881?) and *Bison* (North American Bison; introduced in 1968) could not be distinguished from it on the basis of most fragmentary material.

Capra hircus/Ovis sp. (Domestic Goat/Sheep).....comprises fragmentary material from 1 or more smaller historically introduced members of, presumably, the family Bovidae, with the osteologically very similar *Capra hircus* (Domestic Goat; introduced to the Hawaiian Islands in 1778) and *Ovis aries* (Domestic Sheep; introduced in 1791) being the species most likely represented, although *Ovis musimon* (Mouflon; introduced in 1954) is an additional possibility on some Hawaiian Islands. (Except for portions of the cranium, I doubt that isolated, often fragmentary, bone material of these 2 genera

can safely be distinguished, considering both their general skeletal similarity and the osteological variation occasioned by possible interbreeding with and among the different breeds of domestic stock.)

Family Indeterminate

Medium Artiodactyl.....member(s) of indeterminate family, other than Suidae (=pig); although on most isolated Pacific islands the possibilities (all historically introduced) are probably limited to Cervidae (various deer) and smaller Bovidae (*Capra hircus* [Domestic Goat] and *Ovis aries* [Domestic Sheep]); however, in Hawai'i, *Antilocapra americana* (Pronghorn) of the family Antilocapridae, as well as the bovid *Ovis musimon* (Mouflon)--introduced here in 1959 and 1954, respectively--must additionally be considered.

Large Artiodactyl.....member(s) of indeterminate family, although on most Pacific islands the possibilities (all historically introduced) are probably limited to larger Bovidae in the cattle size range (see "*Bos taurus*", above); however, in Hawai'i, such relatively recently imported animals as Giraffidae (various giraffes) must additionally be considered.

Order and Family Indeterminate

Small Mammal.....member(s) of indeterminate order and family up through the general size of *Rattus* sp. and mongoose; in Hawai'i, Polynesian- or historically introduced species of at least 3 orders could potentially be included.

Small-to-Medium Mammal.....member(s) of indeterminate order and family in the general size range of wallaby, rabbit, dog, and cat; in Hawai'i, Polynesian- or historically introduced species of at least 3 orders could potentially be included.

Medium Mammal.....member(s) of indeterminate order and family in the general size range of man, porpoise, seal, pig, deer, and goat/sheep; in Hawai'i, native or introduced species of at least 4 orders could potentially be included.

Large Mammal.....member(s) of indeterminate order and family in the size range of medium and large whales, horse, mule, donkey, and cattle; native or historically introduced species of up to 4 orders could potentially be included.

CLASS INDETERMINATE

Order and Family Indeterminate

Small Vertebrate.....comprises highly fragmented bone material representing member(s) of indeterminate class, order, and family, but with an estimated head-and-body length less than about 0.3 m.

Medium Vertebrate.....comprises highly fragmented bone material representing member(s) of indeterminate class, order, and family but with an estimated head-and-body length of from about 0.3 m to, roughly, 2.0 m.

Large Vertebrate.....comprises highly fragmented bone material representing member(s) of indeterminate class, order, and family, but with an estimated head-and-body length of more than about 2.0 m.

APPENDIX D
TRAFFIC STUDY

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

WAIANAE SUPPORTIVE HOUSING PROJECT

WAIANAE, HAWAII

TAX MAP KEY: 8-5-028: PORTION OF 44

PREPARED FOR

HOMELESS SOLUTIONS, INC.

PREPARED BY

THE TRAFFIC MANAGEMENT CONSULTANT

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

WAIANAE SUPPORTIVE HOUSING PROJECT

WAIANAE, HAWAII

TAX MAP KEY: 8-5-028: PORTION OF 44

PREPARED FOR

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MARCH 31, 2006

PREPARED BY

THE TRAFFIC MANAGEMENT CONSULTANT

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FOR THE PROPOSED
WAIANAE SUPPORTIVE HOUSING PROJECT
WAIANAE, HAWAII
TAX MAP KEY: 8-5-028: PORTION OF 44

I. Introduction

A. Project Description

Homeless Solutions, Inc. is proposing to develop 50 dwelling units in Waianae, Hawaii. The project site is located on Kauiokalani Place, mauka of the Waianae Neighborhood Community Center, also known as the Waianae Satellite City Hall. The 7.707-acre project site is identified as Tax Map Key 8-5-028: portion of 44. Figure 1 depicts the vicinity map.

Site access is proposed on a private roadway at the end of Kauiokalani Place. The Waianae Supportive Housing Project will provide 71 parking stalls. The project will be comprised of two residential components and a community center. The project site is depicted on Figure 2.

The transitional housing component of the project will consist of 20 studio units. Residents of the transitional housing complex will consist of families without children or single persons, up to two persons per unit. The low-income housing component will consist of 30 two-bedroom/one bath low-income rental units for families, up to four persons per unit. The community center is designed as a village, totaling about 3,300 square feet of floor area. The community center is intended for use by the residents only. Full build out and occupancy for the proposed project is expected in the latter part of 2007. A planning horizon of the Year 2008 is used for the purpose of this traffic impact analysis, as the first full year of occupancy of the proposed project.

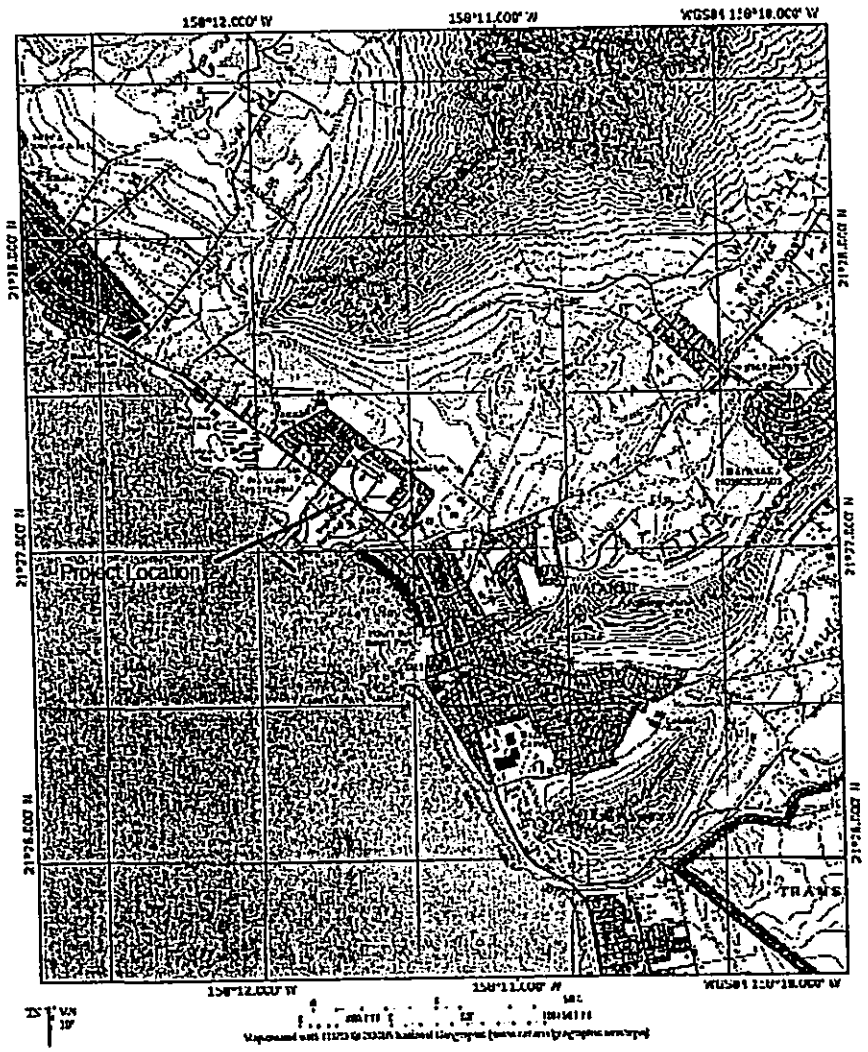


Figure 1. Location and Vicinity Map

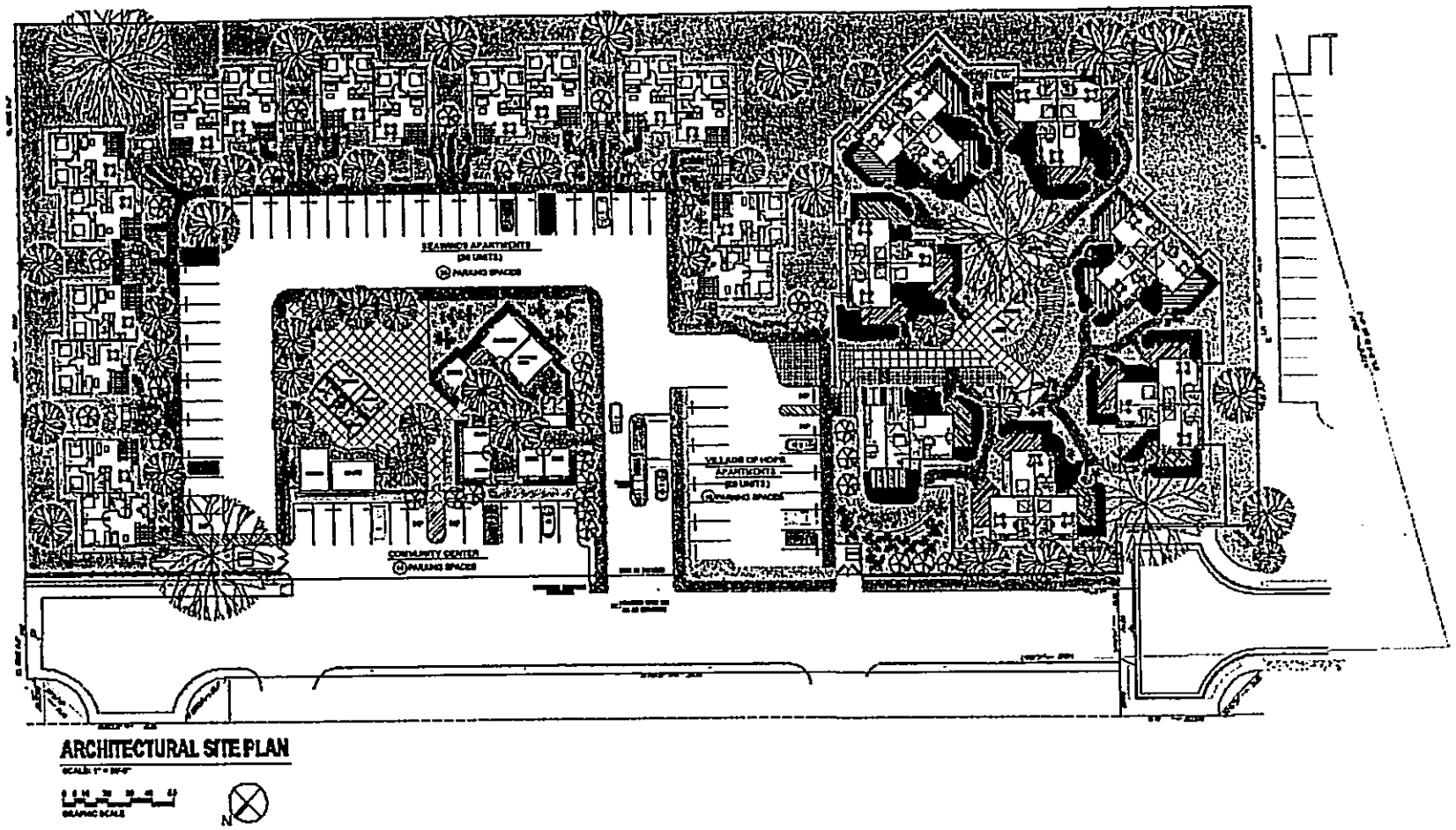


Figure 2. Site Plan

B. Purpose and Scope of the Study

The purpose of this study is to analyze the traffic impacts resulting from the development of the proposed Waianae Supportive Housing Project. This report presents the findings and recommendations of the study. The scope of this study includes:

1. Description of the proposed project.
2. Evaluation of existing roadways and traffic conditions.
3. Development of trip generation characteristics of the proposed project.
4. Analysis of the 2008 traffic conditions without the proposed project.
5. Identification and analysis of traffic impacts resulting from the development of the full build out of the proposed project.
6. Recommendations of improvements, as necessary, that would mitigate the traffic impacts identified in this study.

C. Methodologies

1. Capacity Analysis Methodology

The highway capacity analysis, performed for this study, is based upon procedures presented in the Highway Capacity Manual (HCM), published by the Transportation Research Board, 2000. HCM defines Level of Service (LOS) as "a quality measure describing operational conditions within a traffic stream". Several factors may be included in determining LOS, such as: speed, travel time, freedom to maneuver, traffic interruptions, driver comfort, and convenience. LOS "A", "B", and "C" are considered satisfactory Levels of Service. LOS "D" is generally considered a "desirable minimum" operating level of service. LOS "E" is an undesirable condition, and LOS "F" is an unacceptable condition. Intersection LOS is primarily based upon delay. Worksheets for the capacity analysis, performed throughout this report, are compiled in the Appendix. Table 1 summarizes the LOS criteria.

Table 1. Level of Service Criteria For Unsignalized Intersections (HCM)

LOS	Control Delay (sec/veh)
A	≤ 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

2. Trip Generation Methodology

The trip generation methodology is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in Trip Generation, 7th Edition. The ITE trip rates for an apartment building were developed by correlating the total vehicle trip generation data with various activity/land use characteristics, such as the vehicle trips per hour (vph) per person. The ITE trip rates for a general office building were used to analyze the community center

II. Existing Conditions

A. Roadways

Farrington Highway is a two-way, four-lane, undivided arterial roadway, which provides access to the Waianae coast. In the vicinity of Kauiokalani Place, Farrington Highway is about 54 feet wide, with curbs, gutters, and sidewalks on both sides of the highway. Farrington Highway also contains bicycle lanes on both sides of the highway, which begin about 350 feet southeast of Kauiokalani Place at Ala Hema Street. Farrington Highway is unsignalized at its intersection with Kauiokalani Place.

Kauiokalani Place is a two-way, two-lane cul-de-sac roadway, which provides access to the Waianae Community Center and an existing multi-family complex. Kauiokalani Place is 28 feet wide, with curbs, gutters, and sidewalks on both sides of the street. Kauiokalani Place is stop-controlled at its Tee-intersection with Farrington Highway, opposite a driveway to the City and County of Honolulu Department of Parks and Recreation baseyard.

B. Existing Peak Hour Traffic Volumes and Operating Conditions

1. Field Investigation and Data Collection

Manual traffic count surveys were conducted at the intersection of Farrington Highway and Kauiokalani Place on March 14 and 16, 2006, during the peak periods of traffic – from 6:30 AM to 8:30 AM and from 3:30 PM to 6:00 PM. The peak period traffic data are presented in the Appendix.

2. Existing AM Peak Hour Traffic

The AM peak hour of traffic occurred between 7:15 AM and 8:15 AM. Farrington Highway carried about 2,500 vehicles per hour (vph), total for both directions. Kauiokalani Place carried less than 100 vph, total for both directions, during the existing AM peak hour of traffic. Kauiokalani Place operated at LOS "F", during the existing AM peak hour. The existing AM peak hour traffic on Kauiokalani Place does not meet the minimum threshold approach volume of 100 vph required under "Warrant 3, Peak Hour" of the Manual on Uniform Traffic Control Devices (MUTCD) for the installation of traffic signals.

Makaha-bound traffic was observed to queue back across the Kauiokalani Place intersection from the signalized intersection at Waianae Intermediate School driveway. Figure 3 depicts the existing AM peak hour traffic volumes.

3. Existing PM Peak Hour Traffic

The PM peak hour of traffic generally occurred between 4:00 PM and 5:00 PM. Farrington Highway carried about 1,700 vph, total for both directions. Kauiokalani Place carried less than 50 vph, total for both directions, during the existing PM peak hour of traffic. Kauiokalani Place operated at LOS "E" at Farrington Highway, during the existing PM peak hour. The existing PM peak hour traffic on Kauiokalani Place does not meet the minimum approach volume of 100 vph required under the peak hour traffic signal warrant of the MUTCD. The existing PM peak hour traffic volumes and the results of the capacity analysis also are depicted on Figure 3.

III. Future Traffic Conditions

A. External Traffic

Historical traffic count data, dating back to 1995, were obtained from the State Department of Transportation (DOT) on Farrington Highway at the Mailiilii Stream Bridge. The DOT data indicated little or no growth in 24-hour traffic on Farrington Highway. For the purpose of this traffic impact analysis, a background growth factor of 0.5 percent per year was applied to the existing traffic demands to the Year 2008.

B. Year 2008 Peak Hour Traffic Analysis Without Project

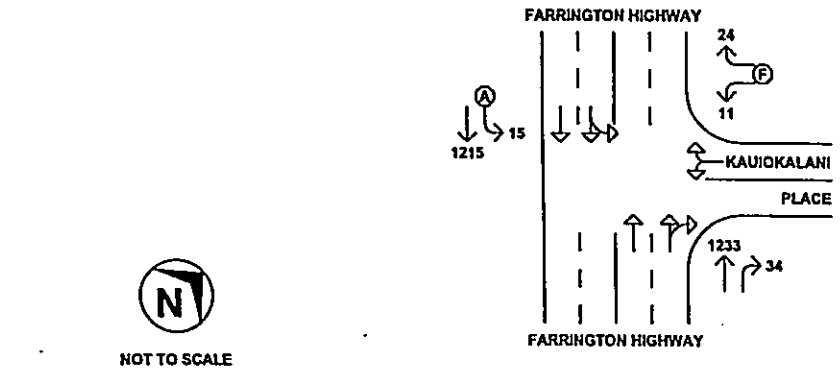
Kauiokalani Place is expected to continue to operate at LOS "F" at Farrington Highway, during the AM peak hour of traffic without the proposed project. During the PM peak hour of traffic without the proposed project, Kauiokalani Place is expected to operate at LOS "E" at Farrington Highway. Figure 4 depicts the AM and PM peak hour traffic without the proposed project.

IV. Traffic Impact Analysis

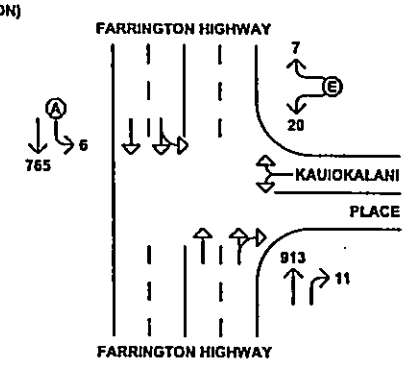
A. Site-Generated Traffic

1. Trip Generation Characteristics

The trip generation characteristics are based upon the expected 160 residents at the proposed project, i.e., 20 studio apartments with two persons per unit, and 30 two-bedroom apartments with four persons per unit. The community center staff also is expected to generate traffic to/from the project site. During the AM peak hour of traffic, the proposed Waianae Supportive Housing Project is expected to generate a total of 59 vph – 16 vph entering the site and 43 vph exiting the site. The proposed project is expected to generate a total of 70 vph – 43 vph entering the site and 27 vph exiting the site, during the PM peak hour of traffic. Table 2 summarizes the trip generation characteristics of the proposed project.



EXISTING AM PEAK HOUR TRAFFIC



EXISTING PM PEAK HOUR TRAFFIC

Figure 3. Existing Peak Hour Traffic

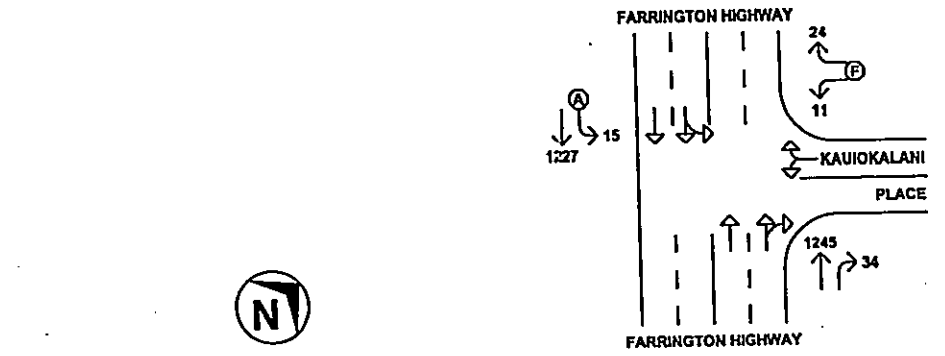


Figure 4. Peak Hour Traffic Without Project

Table 2. Peak Hour Trip Generation Characteristics (vph)						
Land Use (ITE Code)	AM Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
Apartment (220)	11	42	53	42	23	65
Community Center (710)	5	1	6	1	4	5
Totals	16	43	59	43	27	70

2. **Trip Distribution**

The trip distribution is based upon existing traffic patterns. Figure 5 depicts the AM and PM peak hour site-generated traffic assignments for the proposed project.

B. Peak Hour Traffic Impact Analysis With Project

The Kauiokalani Place is expected to operate at LOS "F" at Farrington Highway during both the AM and PM peak hours of traffic with the proposed project. The projected AM and PM peak hour traffic on Kauiokalani Place are not expected to meet the minimum approach volume of 100 vph required under the peak hour traffic signal warrant of the MUTCD. The AM and PM peak hour traffic with the proposed project and the results of the capacity analysis are depicted on Figure 6.

V. Recommendations and Conclusions

A. Recommendations

The following traffic improvements are recommended to mitigate LOS "F" conditions on Kauiokalani Place, during the existing AM peak hour of traffic.

1. Widen/restripe the northwest leg of Farrington Highway to provide a left-turn lane to Kauiokalani Place.
2. Widen/restripe the southeast leg of Farrington Highway at Kauiokalani Place to provide a median shelter lane to facilitate the left-turn movement from Kauiokalani Place.

B. Conclusions

The proposed left-turn and median shelter lanes on Farrington Highway at Kauiokalani Place can be accommodated within the existing roadway width by eliminating the bicycle lanes on both sides of the highway. The proposed improvements are expected to improve Kauiokalani Place traffic operations from the existing LOS "F" to LOS "D" and "C", during the AM and PM peak hours of traffic, respectively. Traffic improvements, recommended herein, are expected to accommodate the increase in traffic resulting from the development of the proposed Waianae Supportive Housing Project.

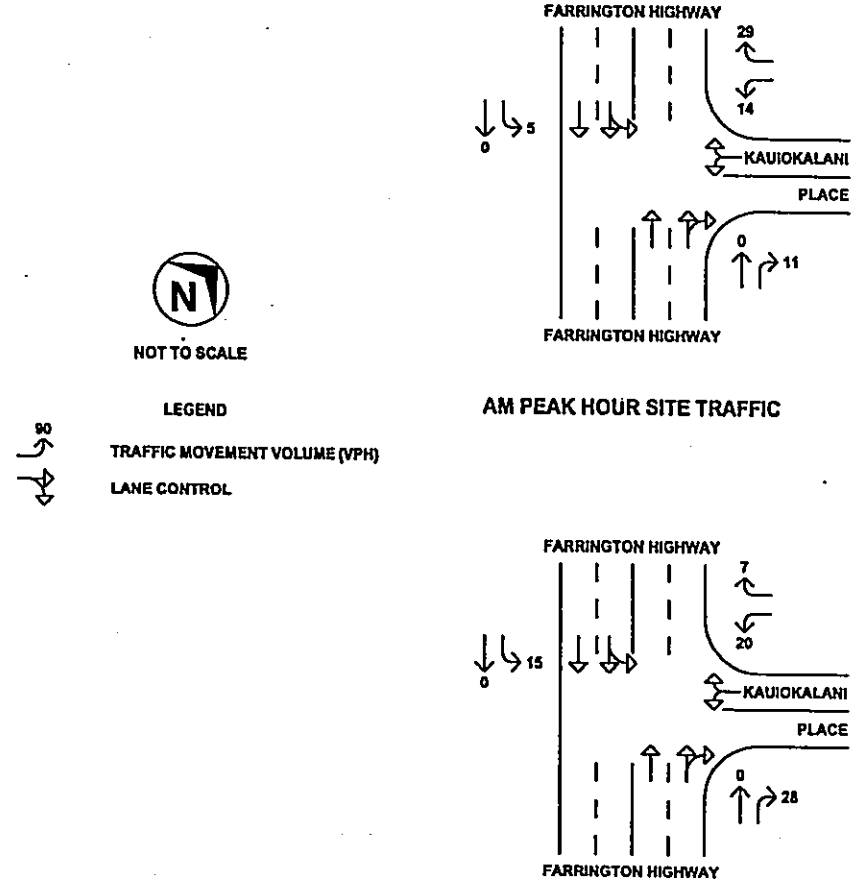


Figure 5. Peak Hour Traffic Assignment

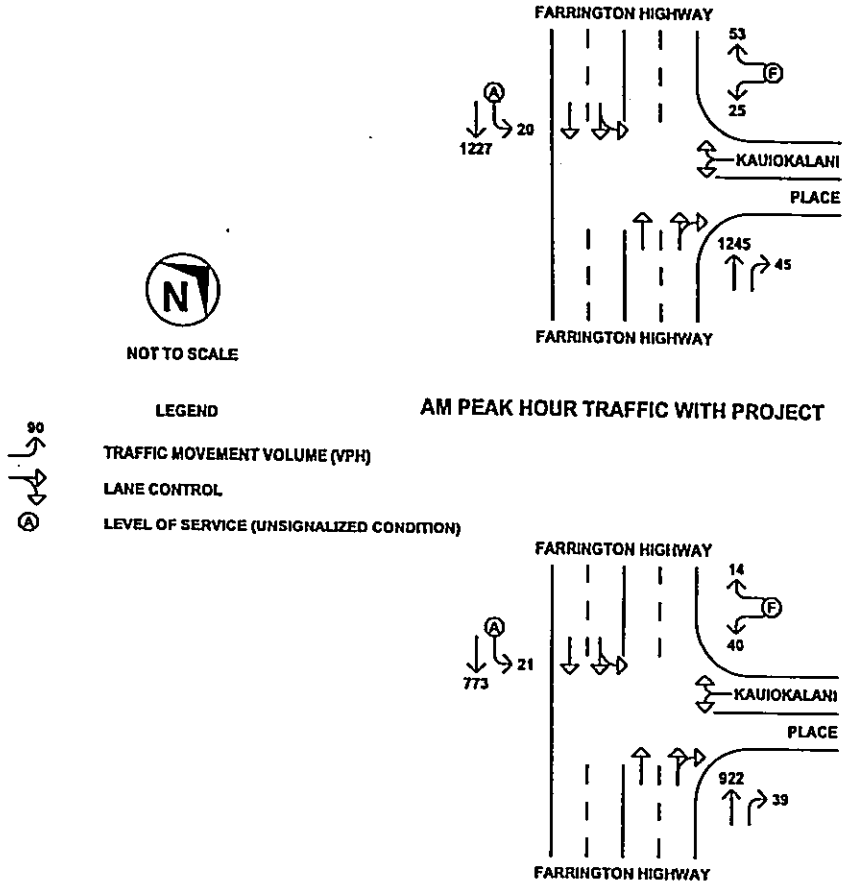


Figure 6. Peak Hour Traffic With Project

TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

WAIANAE SUPPORTIVE HOUSING PROJECT

WAIANAE, HAWAII

TAX MAP KEY: 8-5-028: PORTION OF 44

APPENDIX

TRAFFIC COUNT DATA — **FILE NAME: Farringon Hwy Kaulokalani Pl**

PROJECT: Waianae Supportive Housing Project — PERIOD: AM Peak
LOCATION: Honolulu, Hawaii — NORTH:
E-W STREET Kaulokalani Place — TECHNICIAN: RSO
N-S STREET: Farrington Hwy — DATE: 3/16/06

		Kaulokalani Place						Farrington Hwy							
TIME		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	TOTAL	HRLY
6:30	6:45	2	0	0	0	0	0	2	132	0	2	156	2	296	
6:45	7:00	0	0	1	4	0	2	3	169	2	1	164	0	346	
7:00	7:15	0	0	1	2	0	2	2	195	3	0	225	0	430	
7:15	7:30	0	0	1	6	0	14	0	348	11	5	263	1	649	1721
7:30	7:45	0	0	1	2	0	3	0	370	4	3	354	1	738	2163
7:45	8:00	0	0	1	1	0	3	0	326	9	4	312	0	656	2473
8:00	8:15	0	0	0	2	0	4	0	189	10	3	286	0	494	2537
8:15	8:30	0	0	0	5	0	0	0	138	1	0	183	0	327	2215
AM PEAK HOUR															
7:15	8:15	0	0	3	11	0	24	0	1233	34	15	1215	2	2537	2537
PHF				0.75	1.38		2.00		0.83	2.13	1.25	0.86	0.50		
														0.86	PHF

TRAFFIC COUNT DATA — **FILE NAME: Farringon Hwy Kaulokalani Sec 3**

PROJECT: Waianae Supportive Housing Project — PERIOD: PM Peak
LOCATION: Honolulu, Hawaii — NORTH:
E-W STREET Kaulokalani Place — TECHNICIAN: RSO
N-S STREET Farrington Hwy — DATE: 3/14/06

		Kaulokalani Place						Farrington Hwy							
TIME		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	OTAL	
15:30	15:45	0	0	0	10	0	2	0	219	8	5	271	0	515	
15:45	16:00	0	0	0	6	0	2	0	211	5	2	181	0	407	
16:00	16:15	0	0	0	6	0	1	0	250	3	3	207	0	470	
16:15	16:30	0	0	0	4	0	1	0	213	2	0	201	0	421	1813
16:30	16:45	0	0	0	4	0	3	0	213	2	0	174	0	396	1694
16:45	17:00	0	0	0	6	0	2	0	237	4	3	183	0	435	1722
17:00	17:15	0	0	0	2	0	0	0	226	2	1	186	0	417	1669
17:15	17:30	0	0	0	0	0	0	0	239	1	0	204	0	444	1692
17:30	17:45	0	0	0	5	0	2	0	248	2	1	156	0	414	1710
17:45	18:00	0	0	0	1	0	1	0	238	1	2	150	0	393	1668
PM PEAK HOUR															
16:00	17:00	0	0	0	20	0	7	0	913	11	6	765	0	1722	1813
PHF					0.83		1.75		0.91	0.92	0.50	0.92			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	11	24	1233	34	15	1215
Peak Hour Factor	1.00	1.00	0.83	1.00	1.00	0.86
Hourly flow rate (vph)	11	24	1486	34	15	1413
Pedestrians	10					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2249	770				1530
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2249	770				1530
tC, single (s)	6.8	6.9				4.1
tC, 2 stage (s)						
tF (s)	3.5	3.3				2.2
p0 queue free %	67	93				96
cM capacity (veh/h)	34	341				428

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	35	990	529	486	942
Volume Left	11	0	0	15	0
Volume Right	24	0	34	0	0
cSH	88	1700	1700	428	1700
Volume to Capacity	0.40	0.58	0.31	0.04	0.55
Queue Length 95th (ft)	40	0	0	3	0
Control Delay (s)	70.4	0.0	0.0	1.1	0.0
Lane LOS	F			A	
Approach Delay (s)	70.4	0.0		0.4	
Approach LOS	F				

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	20	7	913	11	6	765
Peak Hour Factor	0.83	1.00	0.91	0.92	0.50	0.92
Hourly flow rate (vph)	24	7	1003	12	12	832
Pedestrians	10					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1459	518				1025
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1459	518				1025
tC, single (s)	6.8	6.9				4.1
tC, 2 stage (s)						
tF (s)	3.5	3.3				2.2
p0 queue free %	79	99				98
cM capacity (veh/h)	117	499				667

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	31	669	346	289	554
Volume Left	24	0	0	12	0
Volume Right	7	0	12	0	0
cSH	141	1700	1700	667	1700
Volume to Capacity	0.22	0.39	0.20	0.02	0.33
Queue Length 95th (ft)	20	0	0	1	0
Control Delay (s)	37.5	0.0	0.0	0.7	0.0
Lane LOS	E			A	
Approach Delay (s)	37.5	0.0		0.2	
Approach LOS	E				

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	11	24	1245	34	15	1227
Peak Hour Factor	1.00	1.00	0.83	1.00	1.00	0.86
Hourly flow rate (vph)	11	24	1500	34	15	1427
Pedestrians	10					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2270	777			1544	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2270	777			1544	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	66	93			96	
cM capacity (veh/h)	33	337			422	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	35	1000	534	491	951
Volume Left	11	0	0	15	0
Volume Right	24	0	34	0	0
cSH	86	1700	1700	422	1700
Volume to Capacity	0.41	0.59	0.31	0.04	0.56
Queue Length 95th (ft)	41	0	0	3	0
Control Delay (s)	73.5	0.0	0.0	1.1	0.0
Lane LOS	F			A	
Approach Delay (s)	73.5	0.0		0.4	
Approach LOS	F				

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	20	7	922	11	6	773
Peak Hour Factor	0.83	1.00	0.91	0.92	0.50	0.92
Hourly flow rate (vph)	24	7	1013	12	12	840
Pedestrians	10					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1473	523			1035	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1473	523			1035	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	99			98	
cM capacity (veh/h)	114	495			662	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	31	675	350	292	560
Volume Left	24	0	0	12	0
Volume Right	7	0	12	0	0
cSH	138	1700	1700	662	1700
Volume to Capacity	0.22	0.40	0.21	0.02	0.33
Queue Length 95th (ft)	20	0	0	1	0
Control Delay (s)	38.4	0.0	0.0	0.7	0.0
Lane LOS	E			A	
Approach Delay (s)	38.4	0.0		0.2	
Approach LOS	E				

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	25	53	1245	45	20	1227
Peak Hour Factor	1.00	1.00	0.83	1.00	1.00	0.86
Hourly flow rate (vph)	25	53	1500	45	20	1427
Pedestrians	10					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2286	782			1555	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2286	782			1555	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	20	84			95	
cM capacity (veh/h)	31	334			418	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	78	1000	545	496	951
Volume Left	25	0	0	20	0
Volume Right	53	0	45	0	0
cSH	82	1700	1700	418	1700
Volume to Capacity	0.95	0.59	0.32	0.05	0.56
Queue Length 95th (ft)	130	0	0	4	0
Control Delay (s)	176.8	0.0	0.0	1.5	0.0
Lane LOS	F			A	
Approach Delay (s)	176.8	0.0		0.5	
Approach LOS	F				

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	40	14	922	39	21	773
Peak Hour Factor	0.83	1.00	0.91	0.92	0.50	0.92
Hourly flow rate (vph)	48	14	1013	42	42	840
Pedestrians	10					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1548	538			1066	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1548	538			1066	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	50	97			93	
cM capacity (veh/h)	97	484			644	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	62	675	380	322	560
Volume Left	48	0	0	42	0
Volume Right	14	0	42	0	0
cSH	118	1700	1700	644	1700
Volume to Capacity	0.53	0.40	0.22	0.07	0.33
Queue Length 95th (ft)	61	0	0	5	0
Control Delay (s)	65.0	0.0	0.0	2.2	0.0
Lane LOS	F			A	
Approach Delay (s)	65.0	0.0		0.8	
Approach LOS	F				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

Waianae Supportive Housing Project
3: Kauiokalani Pl & Farrington Highway

AM Peak Hour With Project - With Improvements
HCM Unsignalized Intersection Capacity Analysis

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	24	53	1245	42	18	1227
Peak Hour Factor	1.00	1.00	0.83	1.00	1.00	0.86
Hourly flow rate (vph)	24	53	1500	42	18	1427
Pedestrians	10					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	4					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2280	781			1552	
vC1, stage 1 conf vol	1531					
vC2, stage 2 conf vol	749					
vCu, unblocked vol	2280	781			1552	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	85	84			96	
cM capacity (veh/h)	162	335			419	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	77	1000	542	18	713	713
Volume Left	24	0	0	18	0	0
Volume Right	53	0	42	0	0	0
cSH	251	1700	1700	419	1700	1700
Volume to Capacity	0.31	0.59	0.32	0.04	0.42	0.42
Queue Length 95th (ft)	31	0	0	3	0	0
Control Delay (s)	25.6	0.0	0.0	14.0	0.0	0.0
Lane LOS	D			B		
Approach Delay (s)	25.6	0.0		0.2		
Approach LOS	D					

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

Waianae Supportive Housing Project
3: Kauiokalani Pl & Farrington Highway

PM Peak Hour With Project - With Improvements
HCM Unsignalized Intersection Capacity Analysis

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	40	14	922	39	21	773
Peak Hour Factor	0.83	1.00	0.91	0.92	0.50	0.92
Hourly flow rate (vph)	48	14	1013	42	42	840
Pedestrians	10					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	4					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1548	538			1066	
vC1, stage 1 conf vol	1044					
vC2, stage 2 conf vol	504					
vCu, unblocked vol	1548	538			1066	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	97			93	
cM capacity (veh/h)	292	484			644	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	62	675	380	42	420	420
Volume Left	48	0	0	42	0	0
Volume Right	14	0	42	0	0	0
cSH	321	1700	1700	644	1700	1700
Volume to Capacity	0.19	0.40	0.22	0.07	0.25	0.25
Queue Length 95th (ft)	18	0	0	5	0	0
Control Delay (s)	18.9	0.0	0.0	11.0	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	18.9	0.0		0.5		
Approach LOS	C					

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX E
NEIGHBORHOOD BOARD MEETING MINUTES

Printable version (copy and paste link into browser):
http://www.honolulu.gov/nco/nb24/06/24_2006_04Min.pdf

WAIANAE COAST NEIGHBORHOOD BOARD

REGULAR MEETING MINUTES
TUESDAY, APRIL 4, 2006
WAIANAE COMMUNITY CENTER

CALL TO ORDER: Chair Cynthia Rezentes called the meeting to order at 7 p.m. with a quorum present.

MEMBER'S PRESENT: Karen Awana, Albert Silva, Josiah Hoohuli, James Kelii, Patty Teruya, Neddie Waiamau-Nunuha, Cynthia Rezentes, Alvin Awo, Jo Jordan, James Manaku, Sr., and Frank Slocum.

MEMBER'S ABSENT: Kaipo Pomaikai, Suzanne Leonida, and Glen Kila

GUESTS: Gary Oliva (HECO), Pat Patterson, Angela Sacrider; SORT: Polly Grace, Jaime Freitas, Charles Freitas, Jeanette Grace, George Grace, Stephanie Joseph, Ronald Joseph, Jr., Ronald Joseph, Sr., Lance Jones, Frank Lopes, Mike Stemmett, Sam McCracken, Laurie Miyagawa, Roy Miyagawa, Scott Chinen, Kalea Makanui, and Evelyn Souza; Randy Obata (Congressman Ed Case's Office staff), Harold Kageura (HECO), Breene Harimoto (BOE), Clarence Batonoban, Lily Cabinatan, Cdr. Mark Sevilla (US Navy), M. Kaahaaina, Mata Tiave, Mjr. Mike Tamashiro (HPD), Lt. Favian Loo (HPD), Dr. Ricardo Custodio (WCCHC), Marianne Glushenko (WCCHC), Holly Cabacungan, Clayton Brown (BWS), John S. Kaopua, Russell Nanoo (Waste Management), Capt. Kenny Kong (HFD), Alice Greenwood, Doug Westbrook, Bob Sullivan (Waianae Rotary), Herb Hew Len, Kehaulani Hew Len, Pat Lee (HHCTCP), Gary Omori (HHCTCP), Lori Watland (Princess Kahanu Estates), Michael Corner, William & Melva Aila, Robert Fisher; WCO: Kaui Kapu , Gary Ayres, Franny Navarro, Philip Placencia, Tulu Toa, Laura Pitolo and Stanlyn Placencia; Kuulei Jolonino, Georgette & Joaquin Silva (Bedminster Oahu LLC), Rachel Apo & Kalani Apo (Bedminster Oahu LLC), Mieko Shintani, Sheyo Shintani, Charles & Emi Harvey, W. Aldeguer, Leandra Wai, Fred Dodge, Tom Caldwell, Jose Dizon (HECO), Kit Glover, Dennis Ryan, Carol Ryan, Jeff Coelho (City and County of Honolulu), Ken Shimizu (Mayor's Representative), John DeSoto, and Kelley Santiago (Neighborhood Commission Office staff).

WELCOME/PULE/PLEDGE OF ALLEGIANCE/HAWAII PONO'I: Chair Rezentes welcomed everyone to the meeting. Kimo Kelii gave the Pule. Slocum led the Pledge of Allegiance followed by Hawaii Pono'i led by Neddie Waiamau-Nunuha.

7:05 p.m. – Teruya arrived. (10 members present)

REPORTS, PART ONE:

Honolulu Fire Department – Capt. Kong reported the following for the month of March 2006: (1) Statistics include 51 fires and 194 emergencies. (2) Fire Safety Tip: Cooking fires are the leading cause of home fires and the second major cause of death among older adults. If you are cooking and must leave the kitchen,

even for only a few minutes, turn off the stove. Keep a fire extinguisher (with a minimum rating of 2A10BC) in or near your kitchen and learn how to use it. Inspect the fire extinguisher regularly to ensure that it has not expired.

7:08 p.m. – Jordan arrived (11 members present)

Emergency Medical Services – A representative was not present.

Honolulu Police Department – Capt. Loo reported the following for the month of March 2006: (1) Statistics include 3 robbery, 28 burglary, 76 theft, 14 auto theft, 35 theft from vehicle, 86 person, 1 ID theft, 96 motor vehicle collision, 2 DUI, 32 criminal property damage and 5 drug cases. Total arrest for the month is 450 (335 adults and 115 juveniles). (2) Crime Tip of the Month: Neighborhood Security Watch: The NSW program is sponsored by the Honolulu Police Department and involves both police and citizen participation. The primary goals of the program are to support communities through neighborhood security watches, reduce crime and increase police and citizen partnerships. NSW programs are an effective way to decrease crime in your neighborhood. NSW program members work directly with beat officers, the district resource officer, and various community members in working

toward building a safer community. To start a NSW program in the Waianae area contact Officer Antone Pacheco at 692-4250.

Questions, comments and answers: (1) Teruya expressed thanks to Major Tamashiro for increased monitoring of Tracks Beach. She also commended HPD for their work on March 12, when several electric poles fell onto the Farrington Hwy, causing a major traffic disaster.

Waianae Community Area of Responsibility – No report.

Weed & Seed – Awana reported that the next meeting would be held on Thursday, April 20 at 7 p.m. at the Waianae Community Center. US Attorney, Ed Kubo is expected to be present to discuss the results of the Waianae Weed & Seed application.

United States Army – Major Hausted reported the following: (1) Various Army officials with meet on Wednesday, April 12 at Schofield to discuss how soldiers can assist area public schools.

Questions, comments and answers: (1) Chair Rezentes briefly reported meeting with Tad Davis, Deputy Assistant Secretary of the Army for Environment on March 17. She explained that a paper analysis of the chemical weapons, offshore dumping will be provided by June and an update will also be included in the May issue of Westside Stories. (2) Referring to a flier distributed by the Army at an earlier date, Alice Greenwood corrected the term "duds" and indicated that there are some "live rounds". (3) When asked for an update about the Makua EIS, Maj. Hausted reported that he had no update.

United States Navy – Cmdr. Sevilla reported normal operations for the month. In response to previous questions regarding the use of facilities at Barbers Pt./Kalaeloa, Cmdr. Sevilla reported that a short-term lease could be provided. He added that if the board so wishes, he can arrange for a briefing of the process to enter into a lease.

Questions, comments and concerns: (1) In response to a question for an update, Cmdr. Sevilla was unable to provide an update on the aircraft carrier in Kalaeloa. He reported that ongoing studies continue.

BOARD BUSINESS:

Approval of Agenda – Teruya moved seconded by Kelii to defer Item 8.3 "Support for Resolution 06-121 Raceway Park Condemnation" until further notice for the City Corporation Counsel.

Discussion followed: (1) Chair Rezentes explained that she received a letter from the Executive Secretary of the Neighborhood Board Office and the Corporation Counsel, just prior to the meeting. Since the City Council deferred the Resolution they stated there is nothing concrete to discuss and requested the matter be

deferred.. She added that the board could be held individually liable for discussing the private issue. (2) Various concerns were raised on behalf of the supporters of the resolution who were present at the meeting.

The motion passed unanimously, 11-0-0.

Teruya moved seconded by Kelii to move Item 8.5 "Waimanalo Gulch Sanitary Landfill Community Benefits Package" under Item 6.1 "Mayor's Representative Report".

Discussion followed: (1) Teruya reported that the City Managing Director, Jeff Coelho had a flight to catch and requested to be placed earlier on the agenda. Jordan expressed opposition, indicating that the move is not fair.

The motion passed, 10-1-0. (Nay: Jordan)

Without objections, the Board unanimously voted to approve the agenda as amended, 11-0-0.

Defer Approval of Regular Meeting Minutes for Tuesday, December 7, 2005 – The Approval of the Regular Meeting Minutes for Tuesday, December 7, 2005 was deferred, as the minutes are incomplete.

Defer Approval of Regular Meeting Minutes for Tuesday, February 7, 2006 – The Approval of the Regular Meeting Minutes for Tuesday, February 7, 2006 was deferred, as the minutes are incomplete.
Defer Approval of Regular Meeting Minutes for Tuesday, March 7, 2006 – The Approval of the Regular Meeting Minutes for Tuesday, March 7, 2006 was deferred, as the Chair was not given enough time to review the draft copy.

Treasurer's Report: Teruya reported the following account balances for the month of March 2006: (1) Operating - $784.30 (2) Publicity - $894.00 (3) Refreshment - $0.00

Committee Reports:

Transportation/OMPO – Awana reported that Project 509, the Lualualei to Kunia Road, replaced Project 357, the second access road in Waianae. She added that Project 509 would be added to the present 2030 Transportation Plan.

Honolulu High Capacity Transit Corridor Project – Gary Omori and Pat Lee were present and distributed informational brochures on the Honolulu High Capacity Transit Corridor Project. They requested placement on a future agenda to allow the project team to explain various transportation alternatives.

Questions, comments and answers: (1) Polly Grace raised concern regarding the cost to ride rail transit. She explained that the cost would play a big role in ridership. (2) Concern was raised about the condemnation of agricultural lots and the possibility of construction debris being placed in the City landfill. (3) Question was raised as to the how many passengers per hour would use the rail. Omori reported the studies are in progress and more definitive answers will be provided at a later time.

Planning & Zoning – No report.

Parks & Recreation/Parks Beautification – Jordan reported the following: (1) Pokai Bay Canoe Halau – Awaiting inspection from Hawaiian Electric Co. (2) Makaha Canoe Halau – Waiting for repair of locks. (3) Kaaupuni Park – Construction to begin within the next two months. (4) A meeting will be held on Thursday, April 14 with State Parks Officials to discuss the closure of Keawaula Beach Park.

Education – Kelii reported the following: (1) 2006 & 2007 Goals and Objectives for the Education Committee include, the "Imua Project", to develop action plans and strategies with assisting the pubic and private schools within the Waianae Coast in passing their Adequate Yearly Progress (AYP) and No Child Left Behind (NCLB) mandates; The Education Forum Project, Prioritize the educational needs, issues and concerns of the residents of the Waianae Coast by organizing and hosting an "Education Forum"; The Master Plan for Education Project", Upon gathering, collecting and aggregating the data from past, current and future

educational programs, organizations, schools and entities, the committee will develop a master plan focused on making education a top priority on the Waianae Coast. (2) Production of the Education Directory is still in progress. (3) The next Education Committee meeting will be held on Thursday, April 6 at 6 p.m. at Leeward Community College in Waianae.

Questions, comments and answers: (1) Kelii will follow-up on which schools along the Coast will offer Summer School Programs this summer.

Housing – Manaku reported that the next committee meeting would be held on Wednesday, April 12 from 6:30 p.m. to 8:30 p.m. at the Waianae District Park.

Announcements:

1. Jordan reported receiving a notice inviting the public to a meeting regarding the impact of tourism. Two meetings will be held. The first on Saturday, April 8 at 10 at the Waianae District Park. The second meeting will be held at Nanakuli High and Intermediate School on Thursday, April 13 from 6:30 p.m. to 8:30 p.m.

2. Silva reported that the Annual Luau would take place on Saturday, May 13 at the Lady of Keeau facilities in Makaha (former First Hawaiian Bank recreation facilities). He added that assistance with preparing for the event is appreciated. Anyone wishing to assist with the event was asked to contact him at 696-6778.
George Grace of Paradise Lua committed to donating port-a-potty's for the event.

3. Awana made the following announcements: (1) Neighborhood Prayer Walk – United in Prayer Nanakuli Transformation is hosting A Neighborhood Prayer Walk on Sunday, April 9 from 3:30 p.m. to 6:30 p.m. at the Nanakuli Protestant Church. For more information, please contact Pastor Farley at 256-3596. (2) Adopt-A-Block – Volunteers will conduct a neighborhood walk on Saturday, April 29 from 8 a.m. to Noon in the Mohihi Street Subdivision on Helelua Street to stencil storm drains, remove litter and distribute litter bags and information on water pollution prevention tips. Volunteers were asked to meet on Helelua Street at 8 a.m. To volunteer call 527-5815 or 692-5208 for more information.

4. Waiamau-Nunuha reported that the Waianae Lions Club is now in Open Season and meets on the 2nd Tuesday of every month.

5. Pat Patterson announced the following: (1) The Hawaii Clean Elections Group of Waianae will meet on Tuesday, April 11 at 6 p.m. at Leeward Community College in Waianae. (2) The Habitat for Humanity will take over 20 family mortgages. To join the family support committee, please call 696-7882. (3) Makua Sunrise – Makua Sunrise, a "all religions" event, will take place on Sunday, April 16 at 6 a.m. at Makua.

6. Chair Rezentes distributed her April Newsletter and mentioned that on March 22, Mr. Larry Wilderman of Sphere dba Pacific Aggregate Inc. announced that he will not continue his pursuit to converting the former Kaiser Quarry into a construction and demolition debris landfill.

Community Concerns:

1. Manaku raised concern of two pipes that were laid between the two Lahilahi roads, causing a very hazardous "hump" in the road.

2. Slocum reported that he requested a listing of parolees in the Waianae area from the Paroling Authority. He has not yet received a response to his request.

3. Awo raised concern of the construction debris and abandoned vehicles left at the dump

located behind Waianae mall.

4. Silva mentioned that the traffic signals along the coastline were synchronized for the afternoon rush-hour traffic, but is not synchronized for morning traffic. He suggested that the lights be synchronized for morning traffic as well.

5. George Grace, Polly Grace, Charles Freitas, Ronald Joseph, Jr. and Evelyn Souza of S.O.R.T (Save Oahu's Race Track), a group that wants to save the existing racetrack at Campbell Industrial Park expressed opposition to a $50 million tax break for the development of a new motor sports facility. The group would like the current track retained for racers to race.

6. Holly Cabacugan raised concern about the digging of a newly paved road at Lualualei Rd. and Leihoku St. She suggested that construction company's work collaboratively to deter re-digging and repaving.

7. John Tabancura mentioned of the parking problem along Lualualei Homestead Rd., near Leihoku School, during school hours. He added that the parking issue jeopardizes the safety of the students, forcing them to walk alongside the roadway.

Kelii moved seconded by Silva to add the Board of Education to the agenda. The motion carried *unanimously, 11-0-0.*

1) **Board of Water Supply** – Chair Rezentes reported that there were no breaks for the month of March. (2) General Water Announcement: When it rains heavily, the pumpage drops because people don't water their lawns, wash their cars, or do other heavy water consumption outdoor activities. As of March 8, 2006 water usage was 127.28 million gallons per day, down from last year's 146.43 million gallons per day. While this can briefly cause water levels to rise, this does not indicate that there is more water in the aquifer, only that BWS are pumping less water from it. Usually, when the rain ends, the aquifer levels will go back to regular levels as pumpage rises to accommodate people resuming the activities they put off while inclement weather was occurring. During heavy rains there is always considerable runoff. Despite the runoff, rainy weather helps maximize the amount of rainfall available for aquifer recharge. Winter and spring rains help to balance out the dry months we experience in the summer. Consumers should continue to be mindful of water use even during periods like these as the effects from them will not be immediately evident.

   Water Conservation Tip: a) The height at which you mow your lawn can have a direct effect on how much and how often you water it. Make sure you know what the correct height is for the type of grass you have on your lawn. b) Leaving grass cuttings on your lawn can help soil retain moisture naturally.

Board of Education – Breene Harimoto highlighted the following: (1) The 2005 BOE Annual Report is available for review. The report was designed and produced by students of Kapolei High School. (2) Board Policy on Substitute Teachers – At its general business meeting on march 16, 2006, the BOE approved Board Policy 1900-10, "Substitute Teachers Policy." The policy recognizes that a well-qualified and stable substitute teacher pool is integral to fulfill classroom instruction needs. It also recognizes that equipping substitute teachers with the appropriate skills and knowledge to perform their duties and responsibilities satisfactorily are essential to classroom instruction and administering to the educational needs of students. (3) Of the 6,500 public school students in Waianae, 72% are economically disadvantaged, 16% is special ed and 6% require a special language classes. (3) At its February 16 meeting, the BOE passed a resolution opposing landfills near schools. (3) The next community meeting will be held on Wednesday, April 5 at Kapolei Middle School from 6:30 p.m. to 8:30 p.m.

Questions, comments and answers: (1) In response to a question raised for an additional Charter School, Harimoto explained that the State is at a maximum for new Charter School, however conversions to a Charter School is allowed. He added that a law is pending to lift the cap of the number of Charter Schools

allowed. (2) Harimoto was unsure if all teachers at Nanakuli High and Intermediate School obtained a Master's degree. (3) Polly Grace raised concerns regarding providing lunches to all public school students and the after school program being offered only to students on free or reduced lunch programs. (4) Ronald Yamagata made mention of a letter that he sent in March of 2004 to the Department of Education with concerns of the drainage canal, egress and traffic signal at Waianae High School. To date, he has not received a response to his letter.

BREAK: By consensus of the board, the meeting continued without a break.

ELECTED OFFICIALS:

Mayor's Representative – Jeff Coelho along with John DeSoto distributed a 4-page packet containing information about the operation guidelines for multi-track benefits program committees, a organizational flow chart of the committees, a description of the Oversight Committee and a nomination form for residents to nominate their candidate to serve on the Oversight Committee.

Coelho explained the following: (1) Purpose of the Guidelines - The purpose of the guidelines are to provide the manner by which to organize the Committees (MTBPC) whose purpose will be to the implementation oversight and benefits the multi track benefit program for Leeward Coast. (2) Nature of the Committees - The committees formed to implement the MTBPC will be interim bodies tasked to perform its duties as proposed. These operational guidelines shall guide in the performance of the teams and their tasks. (3) Organizational Structure – Composition. Each Committee shall be composed of up to nine members including the Mayor's representative. The members shall elect a chairperson, who shall preside at all meetings. (4) CIP Priorities – The investigation envisioned shall solely mean data-gathering and fact-finding activities such as on-site visitations, interviews and similar activities for the sole purpose of determining the facts in order to recommend CIP priorities. Consensus shall be the express consent or approval of or majority of all members from the Committee. (5) Conduct of Meetings – The committees shall hold a regular meeting at least once a month or hold special meetings as often as deemed necessary by its' members. (6) Guidelines on release of information – The Chairperson of each committee shall adopt appropriate guidelines as to which information or documents of the Committee may be released to the public or third parties. (7) Grants mandate of the Community Benefits Committee – The Committee shall be the principal mechanism to monitor the implementation of the grant program and as such shall undertake the following function: Receive grant applications from the community, review and make recommendations to the City Administration. (8) Oversight Committee – The Oversight Committee (OC) will consist of a selected group of volunteer community members who meet periodically to provide feedback to local facility managers. The purpose of the committee is to serve as a liaison between Waste Management (WM) and the community, opening the lines of communication and serving as a vehicle for meaningful dialogue between citizens and landfill management. Nomination forms were provided and are due by Tuesday, April 18. Forms may be submitted to the Mayor's Representative, Ken Shimizu or dropped off to the Managing Director's Office at Honolulu Hale. Nominations will also be accepted by mail, email or by calling 523-4834.

Questions, comments and answers: (1) Manaku questioned how the amount of money to be included in the benefits package. Coelho stated that $2 million would be provided in addition to the $11.9 million already included in the CIP budget. (2) Kelii questioned which communities would partake of the benefits package. Coelho responded by stating that the communities of the Leeward Coast would be involved. Kelii stated that the information provided is too vague and requested that more detailed information be provided. He recommended that the communities involved be listed individually. (3) Jordan mentioned that community members, Ron Schaedel and Mike Freitas have both been before the board questioning the status of the benefits package. She added that both members nominated themselves to serve of the committee and has not received a response. Jordan disagreed with the $2 million allocation and stated that $52 million per year is generated from the landfill. She requested more money provided to the people. (4) Coelho reiterated that they are soliciting nominations for community members to serve on the committee and apologized for the two-week deadline. (5) Question was raised as to the standards of selecting committee members. Coelho reported that the Mayor has assembled a selection committee to interview the nominees. (5) Various comments were made that the selected nominees equally represent the communities involved. (6) Question was raised as to why the committee would consist of only 9 members. John DeSoto explained that the number "9" was selected to keep the committee at a minimum number. However, the community may

request a change in the number of members on the committee. (7) Dennis Ryan expressed interest in serving on the committee. He added that he would like to see funds provided to the community.

Kelii moved seconded by Hoohuli to oppose the proposal in its current form.

Discussion followed: (1) Kelii expressed that the language of the guidelines is too vague. He requested that more detailed information be provided as to the selection process of the committee and assurance that each committee be provided equitable representation. (2) Coelho noted that the process is at a point to move forward. He stated that he couldn't make assurances that the program would be revised differently and such action may even cause a delay. (3) Chair Rezentes recommended that instead of opposition, to include within the guidelines, "equitable representation." (4) Hoohuli suggested that each community be allowed to select their own representative to serve on the committee. (5) Jordan agreed with Kelii and stated that she is insulted by the way the City is handling the project. She referenced a statement made by Coelho earlier in the meeting that the same presentation would be done at the next Makakilo/Kapolei/Honokai Hale Neighborhood Board later in month. She stated that the board does not meet until after the April 18 deadline and requested the deadline be extended.

Jeff Coelho left the meeting.

Kelii called for the question.

The motion failed, 7-2-2. (Aye: Jordan, Manaku, Waiamau-Nunuha, Kelii, Hoohuli, Slocum and Awo; Nay: Teruya and Rezentes; Abstain: Awana and Silva)

Due to time constraints, the remaining elected officials were asked to submit their report to review only.

Councilmember Todd Apo – Written report was submitted.

Office of United States Representative Ed Case – A representative was present.

Governor's Representative – A written report was submitted.

Senator Colleen Hanabusa – A written report was submitted.
Representative Mike Kahikina – A written report was submitted.

Representative Maile Shimabukuro – A written report was submitted.

UNFINISHED BUSINESS:

Slocum left the meeting. (10 members present)

Presentation by Housing Solutions, Inc. regarding planned facility behind the Waianae Neighborhood Community Center – Stanlyn Placencia, Wai'anae Community Outreach was available to provide the board with the planned facility behind the Wai'anae Neighborhood Community Center update.

Recommendation by Housing Committee to support the project by Housing Solutions, Inc. The recommendation was unanimously adopted, 10-0-0.

10 p.m. - The Neighborhood Assistant left the meeting.

Submitted by:

Kelley Santiago
Neighborhood Assistant

Board Secretary Teruya took the remaining minutes.

NEW BUSINESS:

8.1 **HECO Update on Downed Power Poles March 11-13, 2006**
Harold Kageura, HECO Vice President of Energy Delivery, apologized for the March 12 incident and for the hardships and inconvenience that the community experienced. Kageura shared a brief overview of the cause of the incident.

Eyewitnesses described unusual localized high wind conditions, which the National Weather Service described in the media as a possible "wind rotor". It caused a wiliwili tree and two utility poles to fall and the weight of these poles and the cables caused the other 10 poles to break and fall.

HECO's findings are that the first two utility poles fell because of the unusual wind rotor, the significant termite damage in one of the initial poles that fell, and the weight and size of the electric, telephone, cable TV and other cables on the pole. It's likely that the two poles would not have gone down if only one or two of these conditions existed; however, the combination of all three conditions caused the accident. HECO has accelerated inspections of all utility poles along portions of Farrington Highway that are potential traffic bottlenecks. HECO has completed inspections between Kahe Power Plant and Hakimo Road. Inspections between Jade St. and Old Government Rd. are underway.

Since most of the utility poles are jointly-owned or-used by HECO, Hawaiian Telecom, Oceanic, and others like the State, HECO will be discussing with these other users longer term solutions ranging from installing more poles (to handle the weight) to installing steel or concrete poles to undergrounding lines or a combination of these options. Residents can report unusual conditions by calling HECO's trouble line at 548-7961. It residents feel their concerns were not addressed; resident can also call Kageura 543-7570.

Concerns & questions:

It was noted that t due an accident of such magnitude along Farrington Highway, HECO,HPD, CIVIL DEFENSE did extremely well in having a emergency plan together for the community. Although there were some inconveniences for the commuters, HECO and staff worked quickly to re-store power and replace the existing poles that were damaged. The community felt grateful that there were no injuries at this incident.

8.2 **Support Requested for Wai'anae Coast Comprehensive Health Center New Proposed 3 story building –** Dr. Rick Custodio, presented a sketch photo of the expansion proposal for the Wai'anae Coast Comprehensive Health Center. There are 470 employees who care for more than 25,000 patience yearly. They believe in high quality care and would like to provide this in their new facility plans for the Health Center. An update will be provided to the Board.

- proposed services and building
- service in behavior health care
- good service brought to the community of Wai'anae
- adding in a basement in their facility
- height variance of 43 or 44 feet height
- will not be built close to the current building
- construction to be in the middle of summer
- 3 story building with elevators

8.3 **Presentation by Bedminster Oahu LLC for MSW Composing Treatment Facility at the former Kaiser Cement Plant**

Georgette Silva owner of Pine Ridge Farms Inc., and property owner of Bedminster LLC was present to inform the board of proposed Recycle plans at the plant located at 87-1650 Paakea Road, Nanakuli.

A movie slide was shown and explained that a recycle plant was proposed in the area site and how it will benefit the community and the current landfill of disposal of waste. It will dispose of the rubbish waste into compose and be sold to the distributors. It was stated that this proposal will reduce the landfill and nothing was disposed into the ground.

The following concerns were brought to the attention of the landowners at the location Of the Old Kaiser Road, Nanakuli.

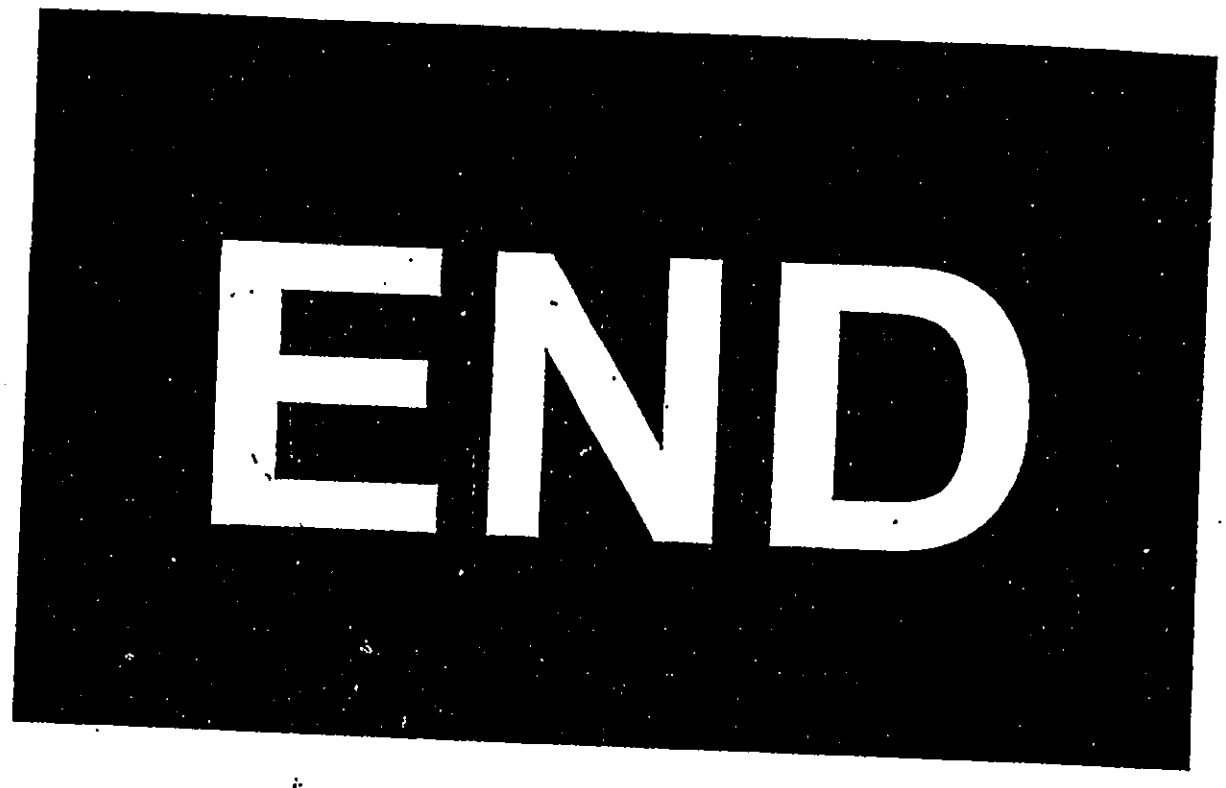
1) traffic concerns through Nanakuli town would increase due to the trucks that will do business at the location;
2) can this facility be placed in the Waimanalo Gulch, instead of the Nanakuli community;
3) currently, the company is taking concrete, rocks and being sold to the contractors
4) Nanakuli looks like a industry site and their proposal is requesting for 7 days of operation at the site; 7am to 4 pm
5) Concerns were noted that this is still a landfill type proposal and the multiple increase of trucks with the PVT trucks already traveling on Lualualei Road;
6) Some community member expressed, as farmers they may support in the recycling program, but, not a landfill;
7) Concerns about odors in the community;
8) What happens when a black out, or a system back up?
9) How much compost are you producing? And how would you sell the compost and not having sit on the facility grounds;
10) The property is zoned industrial and recycling is allowed;
11) There are certain LUO ordinances where a permit is required;
12) There is a bill moving through legislature to condemn the Nanakuli "B" property for affordable housing;
13) Are you from the community?
14) Air quality, fire protection and the equipment's electrical motor's was an issue at the Cobb County, Ga. And a history of serious problems into a well run composting operation;
15) Several community members shared their concerns and objected to a proposal in the community;
16) Why is the hold up at the Paakea Road Emergency Access Road project for the community?

Without further objections, the Board adjourned at 11:30 p.m.

Submitted by:

Patty Kahanamoku
Teruya Secretary/Treasurer

Thursday, April 27, 2006



CERTIFICATION

I HEREBY CERTIFY THAT THE MICROPHOTOGRAPH APPEARING IN THIS REEL OF FILM ARE TRUE COPIES OF THE ORIGINAL DOCUMENTS.

2007
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J. Kaae
SIGNATURE OF OPERATOR

TOP

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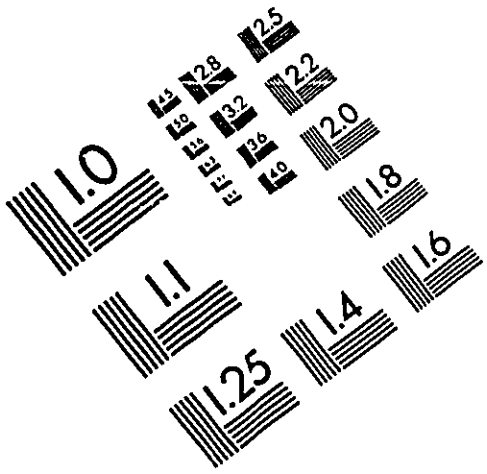

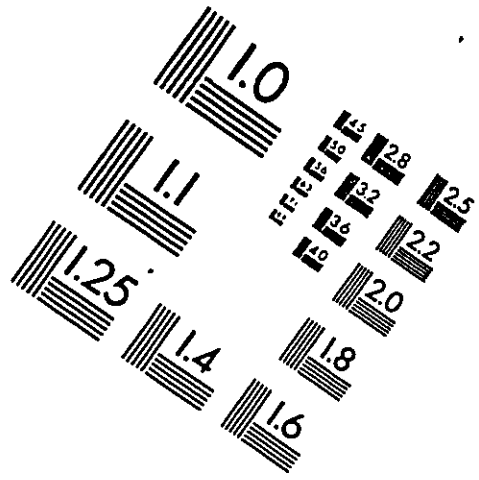

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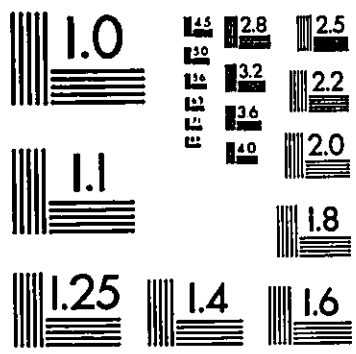

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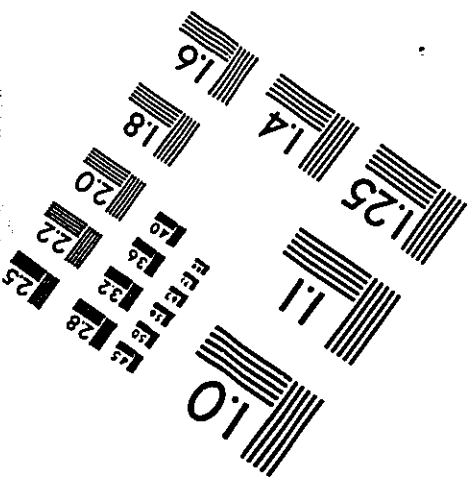

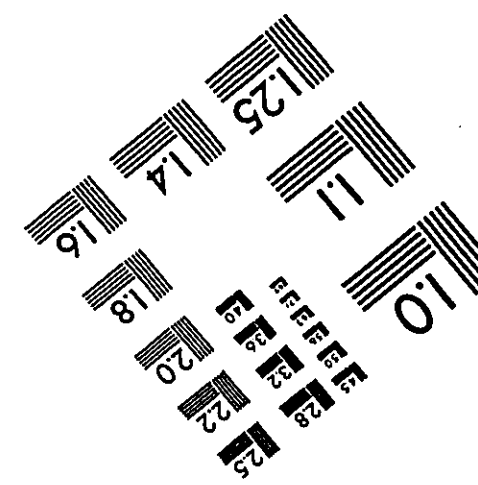

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