

*Draft Environmental Assessment*

# **Alii Drive Improvements Along Oneo Bay, Hualalai Road to Walua Road Kailua-Kona, Hawaii**



Prepared for:  
County of Hawaii  
Department of Public Works

Prepared by:  
Wilson Okamoto Corporation

June 2009

**DRAFT  
ENVIRONMENTAL ASSESSMENT**

**ALII DRIVE IMPROVEMENTS  
ALONG ONEO BAY  
HUALALAI ROAD TO WALUA ROAD**

**Federal Highway Administration (FHWA) Transportation Enhancement Program  
Federal Aid Project No. STP-0186(2)**

Submitted Pursuant to the National Environmental Policy Act, 42 U.S.C. 4332 (2)(c) and  
Hawaii Revised Statutes, Chapter 343

County of Hawaii Department of Public Works,  
State of Hawaii Department of Transportation, and  
U.S. Department of Transportation Federal Highway Administration

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This Draft Environmental Assessment (EA) documents impact of proposed improvements to Alii Drive along Oneo Bay south of Kailua Village. The proposed roadway improvements start at Hualalai Road in the north and ends at Walua Road to the south, a distance of about 2,440 feet. Alii Drive, a County of Hawaii roadway, is a two-lane, two-way road used by motorists to reach retail, commercial, resort, recreational, and residential areas south of Kailua Village. Improvements are needed to enhance driver and pedestrian movements to this area of Kailua-Kona.

The Alii Drive Improvements Along Oneo Bay project would provide pedestrian, landscaping, and scenic view improvements along Alii Drive within the project limits which would include: 1) landscape enhancements to the walkway area fronting Hale Halawai; 2) underground placement of existing overhead utility lines; and 3) construction of a new sea wall and pedestrian walkway. The County intends to fund the improvements using Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Transportation Enhancement (TE) funds. As a result, the improvements need to be among the qualifying activities, as described by SAFETEA-LU.

In May 2009, the State DOT published the most recent Statewide Transportation Improvement Program (STIP), Revision #7 for Fiscal Year 2008 – 2013, which includes the Alii Drive Improvements Along Oneo Bay project. Funds will also be provided by the State of Hawaii and the County of Hawaii.

## TABLE OF CONTENTS

	<u>Page</u>
<b>SUMMARY .....</b>	<b>S-1</b>
<b>PREFACE.....</b>	<b>P-1</b>
<b>1. INTRODUCTION.....</b>	<b>1-1</b>
1.1 Project Background .....	1-1
1.2 Purpose and Need.....	1-1
1.3 Project Location and Conditions .....	1-2
1.3.1 Project Location .....	1-2
1.4 Existing Roadway and Right-of-Way .....	1-2
<b>2. PROJECT DESCRIPTION AND ALTERNATIVES CONSIDERED .....</b>	<b>2-1</b>
2.1 Project Description .....	2-1
2.1.1 Phase 1 - View Plane Enhancements – Undergrounding of Overhead Utilities .....	2-1
2.1.2 Phase 2 - Pedestrian, Bicycle and Landscaping Enhancements Sea Wall Extension – Improving of Alii Drive .....	2-7
2.1.2.1 Pedestrian and Bicycle Enhancements .....	2-7
2.1.2.2 Seawall Extension .....	2-7
2.1.2.2.1 Seawall Layout Plan .....	2-10
2.1.2.3 Landscape Enhancements .....	2-10
2.2 Preliminary Construction Cost Estimate Summary .....	2-16
2.2.1 Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU).....	2-16
2.3 Statewide Transportation Improvement Program .....	2-19
2.4 Project Schedule .....	2-19
2.5 Alternatives to the Proposed Action.....	2-20
2.5.1 No Action Alternative .....	2-20
2.5.2 Alternatives Concepts Considered.....	2-20
2.5.2.1 Seawall Extension .....	2-21

**TABLE OF CONTENTS (continued)**

	<b><u>Page</u></b>
<b>3. AFFECTED ENVIRONMENT.....</b>	<b>3-1</b>
3.1 Project Limits and Surrounding Land Uses .....	3-1
3.2 Project Limits Land Ownership .....	3-2
3.3 Climate .....	3-3
3.4 Geology and Topography .....	3-3
3.5 Soils and Agricultural Lands .....	3-8
3.5.1 Soils .....	3-8
3.5.2 Agricultural Lands .....	3-9
3.6 Hazardous Wastes .....	3-9
3.7 Volcanic Hazards.....	3-9
3.8 Coastal Environment .....	3-10
3.8.1 Nearshore Conditions .....	3-10
3.8.2 Tides .....	3-11
3.8.3 Typical Waves .....	3-11
3.8.4 Wave Runup .....	3-12
3.9 Hydrology .....	3-13
3.9.1 Ground Water .....	3-13
3.9.2 Surface Water .....	3-13
3.9.3 Coastal Waters .....	3-14
3.10 Flood Hazard.....	3-14
3.11 Biological Resources .....	3-16
3.11.1 Flora and Fauna .....	3-16
3.12 Marine Resources and Water Quality.....	3-16
3.12.1 Coastal Strand.....	3-17
3.12.2 Marine Resources.....	3-17
3.12.3 Water Quality .....	3-18
3.13 Scenic Characteristics .....	3-19
3.14 Traffic .....	3-19
3.15 Air Quality .....	3-22
3.16 Noise .....	3-23
3.17 Archaeological and Cultural Resources.....	3-23
3.18 Socioeconomic Considerations .....	3-24

**TABLE OF CONTENTS (continued)**

	<u>Page</u>
3.19 Infrastructure .....	3-26
3.19.1 Water .....	3-26
3.19.2 Sewer .....	3-26
3.19.3 Electrical, Telephone and Cable Television Systems .....	3-27
<b>4. ENVIRONMENTAL CONSEQUENCES.....</b>	<b>4-1</b>
4.1 Climate .....	4-1
4.1.1 No Action Alternative .....	4-1
4.1.2 Proposed Action .....	4-1
4.2 Geology and Topography .....	4-1
4.2.1 No Action Alternative .....	4-1
4.2.2 Proposed Action .....	4-1
4.3 Soils and Agricultural Lands .....	4-2
4.3.1 Soils .....	4-2
4.3.1.1 No Action Alternative .....	4-2
4.3.1.2 Proposed Action .....	4-2
4.3.2 Agricultural Lands .....	4-2
4.3.2.1 No Action Alternative .....	4-2
4.3.2.2 Proposed Action .....	4-2
4.4 Hazardous Wastes .....	4-2
4.4.1 No Action Alternative .....	4-2
4.4.2 Proposed Action .....	4-3
4.5 Volcanic Hazards.....	4-3
4.5.1 No Action Alternative .....	4-3
4.5.2 Proposed Action .....	4-3
4.6 Coastal Environment .....	4-3
4.6.1 No Action Alternative .....	4-3
4.6.2 Proposed Action .....	4-3
4.7 Hydrology .....	4-4
4.7.1 Ground Water .....	4-4
4.7.1.1 No Action Alternative .....	4-4
4.7.1.2 Proposed Action .....	4-4

**TABLE OF CONTENTS (continued)**

	<b><u>Page</u></b>
4.7.2 Surface Water.....	4-5
4.7.2.1 No Action Alternative .....	4-5
4.7.2.2 Proposed Action .....	4-5
4.7.3 Coastal Waters .....	4-5
4.7.3.1 No Action Alternative .....	4-5
4.7.3.2 Proposed Action .....	4-5
4.8 Flood Hazard.....	4-6
4.8.1 No Action Alternative .....	4-6
4.8.2 Proposed Action .....	4-6
4.9 Biological Resources.....	4-7
4.9.1 Flora and Fauna .....	4-7
4.9.1.1 No Action Alternative .....	4-7
4.9.1.2 Proposed Action .....	4-7
4.10 Marine Resources and Water Quality.....	4-8
4.10.1 Coastal Strand.....	4-8
4.10.1.1 No Action Alternative .....	4-8
4.10.1.2 Proposed Action .....	4-8
4.10.2 Marine Resources.....	4-9
4.10.2.1 No Action Alternative .....	4-9
4.10.2.2 Proposed Action .....	4-9
4.10.3 Water Quality .....	4-10
4.10.3.1 No Action Alternative .....	4-10
4.10.3.2 Proposed Action .....	4-10
4.11 Scenic Characteristics.....	4-11
4.11.1 No Action Alternative .....	4-11
4.11.2 Proposed Action .....	4-11
4.12 Traffic .....	4-12
4.12.1 No Action Alternative .....	4-12
4.12.2 Proposed Action .....	4-12
4.13 Air Quality.....	4-13
4.13.1 No Action Alternative .....	4-13
4.13.2 Proposed Action .....	4-13

**TABLE OF CONTENTS (continued)**

	<u>Page</u>
4.14	Noise ..... 4-14
4.14.1	No Action Alternative ..... 4-14
4.14.2	Proposed Action ..... 4-14
4.15	Archaeological and Cultural Resources..... 4-15
4.15.1	No Action Alternative ..... 4-15
4.15.2	Proposed Action ..... 4-15
4.16	Socioeconomic Considerations ..... 4-16
4.16.1	No Action Alternative ..... 4-16
4.16.2	Proposed Action ..... 4-16
4.17	Infrastructure ..... 4-17
4.17.1	Water ..... 4-17
4.17.1.1	No Action Alternative ..... 4-17
4.17.1.2	Proposed Action ..... 4-17
4.17.2	Sewer ..... 4-18
4.17.2.1	No Action Alternative ..... 4-18
4.17.2.2	Proposed Action ..... 4-18
4.17.3	Electrical, Telephone and Cable Television Systems ..... 4-18
4.17.3.1	No Action Alternative ..... 4-18
4.17.3.2	Proposed Action ..... 4-18
4.18	Cumulative and Secondary Impacts ..... 4-19
4.18.1	Cumulative Impacts ..... 4-19
4.18.2	Secondary Impacts ..... 4-20
4.19	Compliance With Federal Requirements ..... 4-21
4.19.1	Section 106 Consultation, National Historic Preservation Act ..... 4-21
4.19.1.1	Impacts and Mitigation Measures ..... 4-21
4.19.2	Section 7 Consultation, Endangered Species Act..... 4-22
4.19.2.1	Impacts and Mitigation Measures ..... 4-22
4.19.3	Executive Order 11990 Protection of Wetlands ..... 4-22
4.19.3.1	Impacts and Mitigation Measures ..... 4-22
4.19.4	Executive Order 11988 Floodplain Management..... 4-23
4.19.4.1	Impacts and Mitigation Measures ..... 4-23

**TABLE OF CONTENTS (continued)**

	<b><u>Page</u></b>
4.19.5 Coastal Zone Management Act .....	4-23
4.19.6 Section 4(f) Evaluation of the DOT Act .....	4-24
4.19.6.1 Impacts and Mitigation Measures .....	4-24
<b>5. RELATIONSHIP TO LAND USE, POLICIES AND CONTROLS .....</b>	<b>5-1</b>
5.1 Hawaii State Plan .....	5-1
5.2 State Land Use District.....	5-2
5.3 County of Hawaii .....	5-2
5.3.1 County of Hawaii General Plan.....	5-2
5.3.2 Kona Community Development Plan .....	5-5
5.3.3 County of Hawaii Zoning.....	5-5
5.3.4 Kailua Village Design Plan.....	5-5
5.3.5 County of Hawaii Special Management Area .....	5-8
<b>6. FINDINGS AND ANTICIPATED DETERMINATION.....</b>	<b>6-1</b>
6.1 Preliminary Findings Under State Chapter 343, HRS.....	6-1
6.2 Federal Determination .....	6-5
<b>7. LIST OF REQUIRED PERMIT APPROVALS.....</b>	<b>7-1</b>
<b>8. CONSULTATION.....</b>	<b>8-1</b>
8.1 Public Meeting.....	8-1
8.2 Pre-Assessment Consultation .....	8-1
8.3 Parties Consulted During Draft EA .....	8-2
<b>9. REFERENCES.....</b>	<b>9-1</b>

**TABLE OF CONTENTS (continued)**

**Page**

**LIST OF FIGURES**

Figure 1-1	Project Location Map.....	1-3
Figure 1-2	Aerial Photograph.....	1-4
Figure 1-3	Project Limits Topographic Survey Map.....	1-5
Figure 1-4	Project Limits Topographic Survey Map.....	1-6
Figure 2-1	Preliminary Alignment of Underground System.....	2-3
Figure 2-2	Preliminary Alignment of Underground System.....	2-4
Figure 2-3	Gravity Wall Concept.....	2-9
Figure 2-4	Seawall Layout Plan.....	2-11
Figure 2-5	Pedestrian Enhancement Plan Hale Halawai.....	2-14
Figure 2-6	Character Sketch Enhancement Plan.....	2-15
Figure 2-7	Street Tree Plan.....	2-17
Figure 2-8	Character Sketch Street Tree Plan.....	2-18
Figure 2-9	Precast Box Concept.....	2-23
Figure 3-1	Tax Map Key.....	3-5
Figure 3-3	Flood Hazard.....	3-15
Figure 3-4	Archaeological Site Location Map.....	3-25
Figure 5-1	State Land Use District Map.....	5-3

**LIST OF TABLES**

Table 1-1	Project Limits Right-of-Way (ROW).....	1-7
Table 2-1	Preliminary Construction Cost Estimate.....	2-16
Table 3-1	Land Ownership.....	3-7
Table 3-2	Wave Runup Elevations in Feet Above MSL.....	3-13
Table 3-3	Demographic Characteristics: 2000.....	3-26

## LIST OF APPENDICES

- Appendix A      Requesting Approval for Underground Placement of Utilities, County of Hawaii, April 16, 2001
- Appendix B      Coastal Engineering Analysis for Alii Drive Improvements at Oneo Bay, Kailua-Kona, Hawaii. Sea Engineering, Inc., July 2005.
- Appendix C      Letter from U.S. Fish & Wildlife Service, August 14, 2006
- Appendix D      Letters from NOAA, National Marine Fisheries, September 7, 2006 and October 4, 2006
- Appendix E      Aquatic Resources Survey for the Alii Drive Improvements Project at Oneo Bay, Kailua-Kona, Hawaii. AECOS, Inc., July 2003.
- Appendix F      Archaeological Inventory Survey Alii Drive Improvements Projects, Lands of Hienaloli 1-6, Auhaueae 1-2 and Puaa 1-2, North Kona District, Island of Hawaii, Haun and Associates, July 2005 (revised December 2006).
- Appendix G      Public Meeting Notice and Notes, July 1, 2004.
- Appendix H      Pre-Assessment Consultation Letters

## SUMMARY

<b>Proposing Agency:</b>	County of Hawaii Department of Public Works 101 Pauahi Street, Suite 7 Hilo, Hawaii 96720
<b>Accepting Agency:</b>	County of Hawaii Department of Public Works 101 Pauahi Street, Suite 7 Hilo, Hawaii 96720
<b>EA Preparer:</b>	Wilson Okamoto Corporation 1907 South Beretania Street, Suite 400 Honolulu, Hawaii 96826 Contact: John L. Sakaguchi, AICP, Senior Planner Tel: 808.946.2277; Fax: 808.946.2253
<b>Project Location:</b>	Kailua-Kona, North Kona District, Hawaii
<b>Recorded Fee Owner:</b>	County of Hawaii and Others
<b>Tax Map Key:</b>	County of Hawaii right-of-way, 7-5-009:026 por. and 065 por.
<b>Area:</b>	Underground Electrical Line = 7,320 sq. ft. Seawall = 6,410 sq. ft.
<b>State Land Use Classification:</b>	Urban and Conservation
<b>County Zoning:</b>	Resort/Hotel (V)
<b>Proposed Action:</b>	Improvements to underground utilities to provide pedestrian, landscaping, and scenic view improvements along Alii Drive from Hualalai Road to Walua Road.
<b>Impacts:</b>	No significant impacts are anticipated from construction of seawall and landscape enhancements.

**Parties Consulted During  
Pre-Assessment:**

Federal Agencies

U.S. Dept of the Army Corps of Engineers  
U.S. Fish and Wildlife Service

State Agencies

Department of Land and Natural Resources,  
Historic Preservation Division  
Department of Land and Natural Resources,  
Land Division  
Department of Land and Natural Resources,  
Commission on Water Resource  
Management  
Department of Health  
Department of Transportation

County Agencies

County of Hawaii Department Environmental  
Management  
County of Hawaii Department of Parks and  
Recreation  
County of Hawaii Planning Department  
County of Hawaii Department of Research and  
Development  
County of Hawaii Police Department  
County of Hawaii Fire Department  
County of Hawaii Department of Water Supply

Others

Hawaii Electric Light Company  
Hawaiian Telcom  
Oceanic Time Warner Cable

## **PREFACE**

Chapter 343, Hawaii Revised Statutes (HRS), as amended, Environmental Impact Statements, requires that a government agency or a private developer proposing to undertake a project consider the potential environmental impacts of the proposed project by preparing an assessment. Use of public funds for a project is among the criteria set forth in Chapter 343, HRS which requires a public agency to prepare an environmental assessment.

The Alii Drive Improvements Along Oneo Bay project will be constructed with funds provided by the U.S. Department of Transportation Federal Highway Administration (FHWA), Hawaii Department of Transportation, and the County of Hawaii Department of Public Works. Use of Federal funds makes projects subject to environmental documentation requirements set forth under the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. Section 4321, and the Council of Environmental Quality Regulations, 40 CFR Parts 1500-1508. In addition, this project involves the use of County funds and lands making it subject to the environmental documentation requirements prescribed under Chapter 343, Environmental Impact Statements, Hawaii Revised Statutes (as amended) and Hawaii Administrative Rules Chapter 200 (Environmental Impact Statement Rules) Title 11, of the State of Hawaii Department of Health as amended (State of Hawaii 1996).

This Draft Environmental Assessment (Draft EA) was prepared in conformance to both State and Federal requirements to address the probable impacts on the surrounding environment resulting from the project.

The FHWA will review comments received on the Draft EA, and then make a determination whether a Finding of No Significant Impact (FONSI) can be issued for this project under NEPA. If issued, a Decision Notice would be prepared and published documenting this determination.

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## **1. INTRODUCTION**

### **1.1 Project Background**

The County of Hawaii, Department of Public Works has the responsibility to maintain and operate the County's roadway system. Alii Drive, a County of Hawaii roadway, is a two-lane, two-way road used by motorists to reach retail, commercial, resort, recreational, and residential areas south of Kailua Village. The portion of Alii Drive from Hualalai Road to Walua Road passes along Oneo Bay and forms the main circulation route along this portion of the coastline in Kailua-Kona. The adjacent sidewalks along Alii Drive are used by pedestrians to reach a number of retail and commercial businesses in this densely developed section of Kailua-Kona.

### **1.2 Purpose and Need**

The project limits along Alii Drive extend from Hualalai Road on the north to Walua Road on the south, a distance of about 2,440 feet, south of Kailua Village. The right-of-way within the project limits varies from 25 feet wide to 88 feet wide. This right-of-way width includes only a short portion which includes raised sidewalks on County-owned land with the remaining portion consisting of painted designated pedestrian walkways at-grade with the travelway used by vehicles. In addition, there are utility poles located within these designated walkways which forces pedestrians to walk around the utility poles.

Undergrounding of the utility poles provide enhanced facilities for pedestrians and extension of the seawall would provide enhanced space for pedestrian and bicyclists, which would improve safety for those using the narrow stretch of Alii Drive. The volume of pedestrian traffic is increasing, especially on "boat days" (cruise ships anchor offshore and a shuttle takes passengers to Kailua Pier). When pedestrian traffic is high the presence of utility poles often force pedestrians to walk in the vehicle travel lane. In addition to pedestrian safety, aesthetics is also a concern. The utility poles are obscure and detract from an otherwise beautiful vista. The purpose of the Alii Drive Improvements project is to provide pedestrian, landscaping, and scenic view improvements along Alii Drive from Hualalai Road to Walua Road.

Improvements are needed to enhance driver and pedestrian movements to this area of Kailua-Kona, and to maintain the public health and welfare for the residents of this area of the County.

### **1.3 Project Location and Conditions**

#### **1.3.1 Project Location**

The project limits extend along Alii Drive from Hualalai Road on the north to the intersection of Walua Road on the south, a total length of about 2,440 feet. Alii Drive, Hualalai Road, and Walua Road are County of Hawaii roadways and all have two travel lanes, one lane in each direction. For the most part, the travel lanes along Alii Drive are 11 feet wide. Figure 1-1 shows the project location map. Figure 1-2 shows the project limits aerial photograph. Figures 1-3 and 1-4 show the project limits topographic survey.

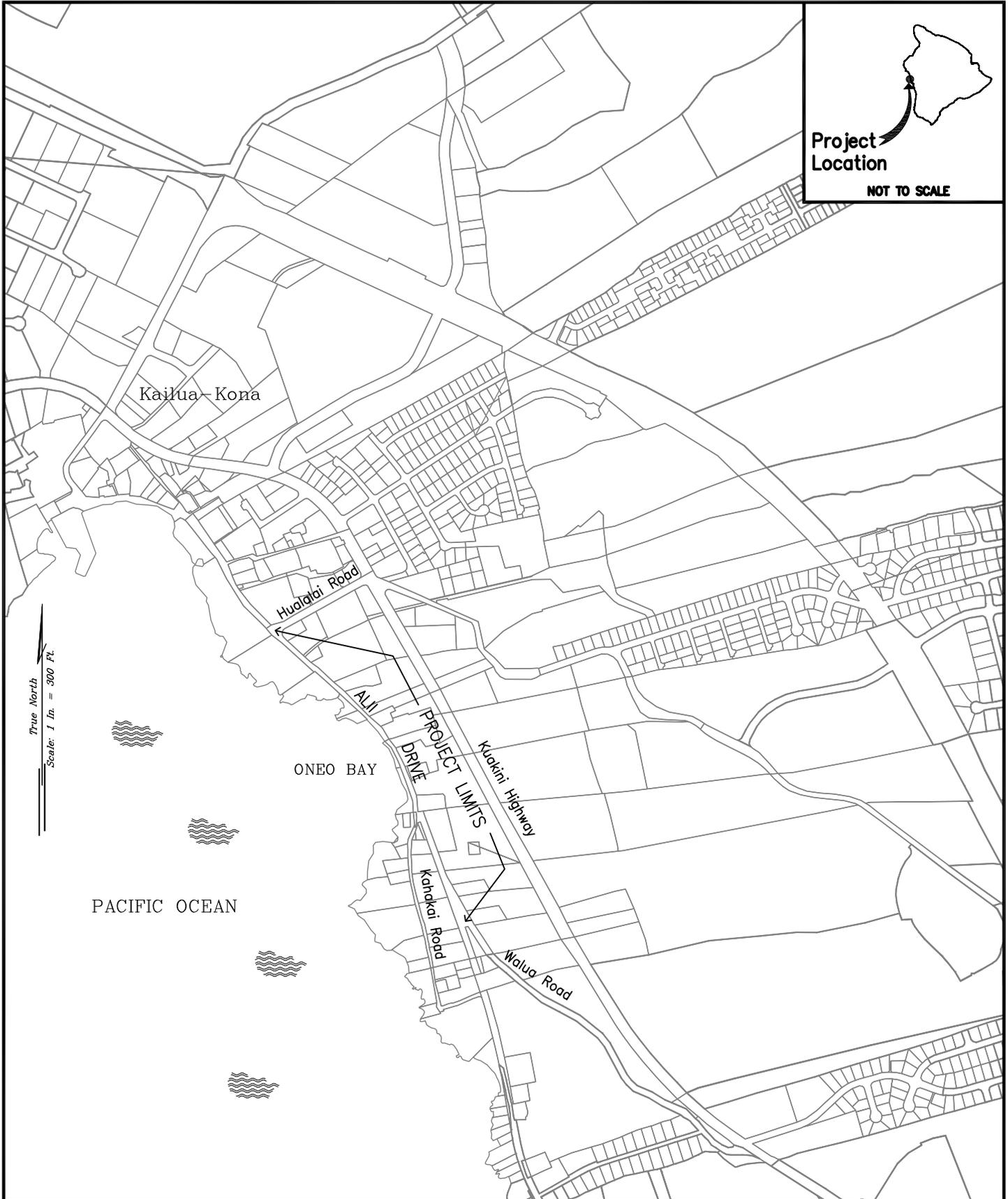
#### **1.4 Existing Roadway and Right-of-Way**

Alii Drive between Hualalai Road and Walua Road accommodates two-way traffic for all types of vehicles, including commercial delivery trucks, heavy trucks and large tour buses. The posted speed limit is 15 miles per hour for this section of Alii Drive.

On-street parking along the Alii Drive right-of-way is limited to a short stretch fronting Hale Halawai. A total of 9 parallel parking stalls are available in this section. These parking stalls are not metered.

Raised pedestrian sidewalks are located on the makai side of Alii Drive from Hualalai Road to the southern end of the Restaurant Row complex, for about 600 feet, or approximately 25 percent of the project limits. For the remainder of the makai side of the project limits, the pedestrian walkway is designated with a painted white line adjacent to the travel lanes.

The mauka raised pedestrian sidewalk extends from Alii Sunset Plaza to the area fronting the Coconut Grove complex. The pedestrian walkway on the mauka side is also designated with a painted white line adjacent to the travel lane. The



**ALII DRIVE IMPROVEMENTS ALONG ONEO BAY  
HUALALAI ROAD TO WALUA ROAD**

**PROJECT LOCATION MAP**

**FIGURE  
1-1**

Figure 1-2 Aerial Photograph



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

PROJECT SITE AERIAL

FIGURE 1-2



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUJA ROAD

TOPOGRAPHIC SURVEY – EXISTING CONDITIONS

FIGURE

1-3



ALII DRIVE IMPROVEMENTS ALONG ONO BAY HUALALAI ROAD TO WALUA ROAD

TOPOGRAPHIC SURVEY – EXISTING CONDITIONS

FIGURE

1-4

pedestrian walkway is especially narrow near the Kona Alii residential complex and the parking lot north of the entry road to the Roman Catholic Church parcel.

The makai center section of the project limits includes the shoulder/pedestrian walkway adjacent to the makai travel lane along Oneo Bay. This section of Alii Drive provides drivers and pedestrians clear views of the ocean only obstructed by the utility poles and overhead lines. This section is protected from the sea by a concrete rubble masonry (CRM) seawall which extends about 2 feet above the existing grade of the Alii Drive travel lane and the adjacent shoulder/pedestrian walkway. Both the seaward and mauka faces of the wall are faced with basalt rocks, similar to basalt boulders and cobbles found along the shoreline.

The County-owned right-of-way varies throughout the project limits, from 25 feet wide at its narrowest, the area fronting Kona Alii, to 88 feet at its widest point at the Alii Drive and Walua Road intersection. For most of the project limits, the right-of-way varies from about 30 to 40 feet wide. Table 1-1 shows the project limits right-of-way.

<b>Table 1-1</b>			
<b>Project Limits Right-of-Way (ROW)</b>			
<b>Location</b>	<b>ROW (ft)</b>	<b>Raised Sidewalk</b>	
		<b>Makai</b>	<b>Mauka</b>
Fronting Hale Halawai	41	Yes (1)	No
Fronting Restaurant Row	38	Yes (2)	No
Fronting Kona Alii	25	No	Yes (3)
Fronting Coconut Grove	32	No	Yes
Near Kahakai Road	45	No	Yes
North of Royal Kona Inn entry	49	No	No
At Walua Road	88	No	No

Notes:

- (1) Sidewalk is within Hale Halawai grounds.
- (2) Portion of sidewalk within private property.
- (3) Sidewalk in private property.

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## **2. PROJECT DESCRIPTION AND ALTERNATIVES CONSIDERED**

### **2.1 Project Description**

The County intends to develop the Alii Drive Improvements in two phases, as funding becomes available. The two phases would be:

**Phase 1** View Plane Enhancements – Undergrounding of Overhead Utilities

**Phase 2** Pedestrian, Bicycle and Landscaping Enhancements and Seawall Extension – Improving Alii Drive

#### **2.1.1 Phase 1 - View Plane Enhancements – Undergrounding of Overhead Utilities**

Underground placement of the utility systems (electrical, telephone and cable systems) within the project limits will improve the travelways and pedestrian and bicyclist passage along Alii Drive. In addition, removal of the overhead lines would enhance the views by removing the cluttered look along this densely developed area of Kailua-Kona.

Currently, there are utility poles in the travel lane that must be avoided when entering and exiting the parking stalls fronting Hale Halawai. There are also utility poles at the edge of the pedestrian walkway fronting Hale Halawai. Although these poles are not within the walkway, their removal would open up the entire area fronting Hale Halawai and enhance the pedestrian walking experience within this portion of the project limits.

Further south in the project limits, there are utility poles in the makai walkway near the southern end of the Restaurant Row complex. Pedestrians walking in this area must often walk around the utility poles, including walking off of the raised sidewalk and into the travel lane, to continue going south.

The makai center section of project limits along Oneo Bay also contains utility poles within the shoulder/designated pedestrian walkway of Alii Drive. The

makai center section does not contain a raised sidewalk and pedestrians must also walk around the utility poles.

The County has worked with the State of Hawaii Department of Transportation (DOT) to secure their approval for the underground placement of utilities which will improve pedestrian movements and scenic views. Appendix A shows this documentation.

Underground placement of the utility lines was presented and discussed at the public meeting. There was clear agreement among the participants in support of the underground placement of the utility lines. Figures 2-1 and 2-2 show the preliminary alignment of the underground system. Photos 1 to 4 show photographic views before removal of the overhead lines and utility poles and photographic simulation after their removal.

Conversion of the existing overhead lines to an underground system will require construction of new underground electric power, telephone and cable television backbone distribution systems and customer service lines underground.

Electrical service equipment, telephone and cable service at buildings currently receiving overhead service, must be replaced with service equipment capable of receiving underground electrical service.

Street lights will consist of light poles with new luminaries. The light poles will be supported on foundations at sidewalk level and will be served via underground circuits. The existing overhead lines will be removed after the underground system is completed.

Since the existing overhead lines are located on the makai side of the Alii Drive right-of-way, to maintain service during construction, installation of the proposed electric, telephone and CATV services would be located underground along the mauka side of Alii Drive within the project limits.



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

PRELIMINARY ALIGNMENT OF UNDERGROUND SYSTEM

FIGURE

2-1



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUJA ROAD

PRELIMINARY ALIGNMENT OF UNDERGROUND SYSTEM



Photo 1: View fronting Restaurant Row with utility poles and overhead lines.



Photo 2: View fronting Restaurant Row without utility poles and overhead lines.

**ALII DRIVE IMPROVEMENTS ALONG ONEO BAY  
HUALALAI ROAD TO WALUA ROAD**

**PHOTOS**

Photos  
1-2



Photo 3: View along Oneo Bay towards Royal Kona Inn with utility poles and overhead lines.

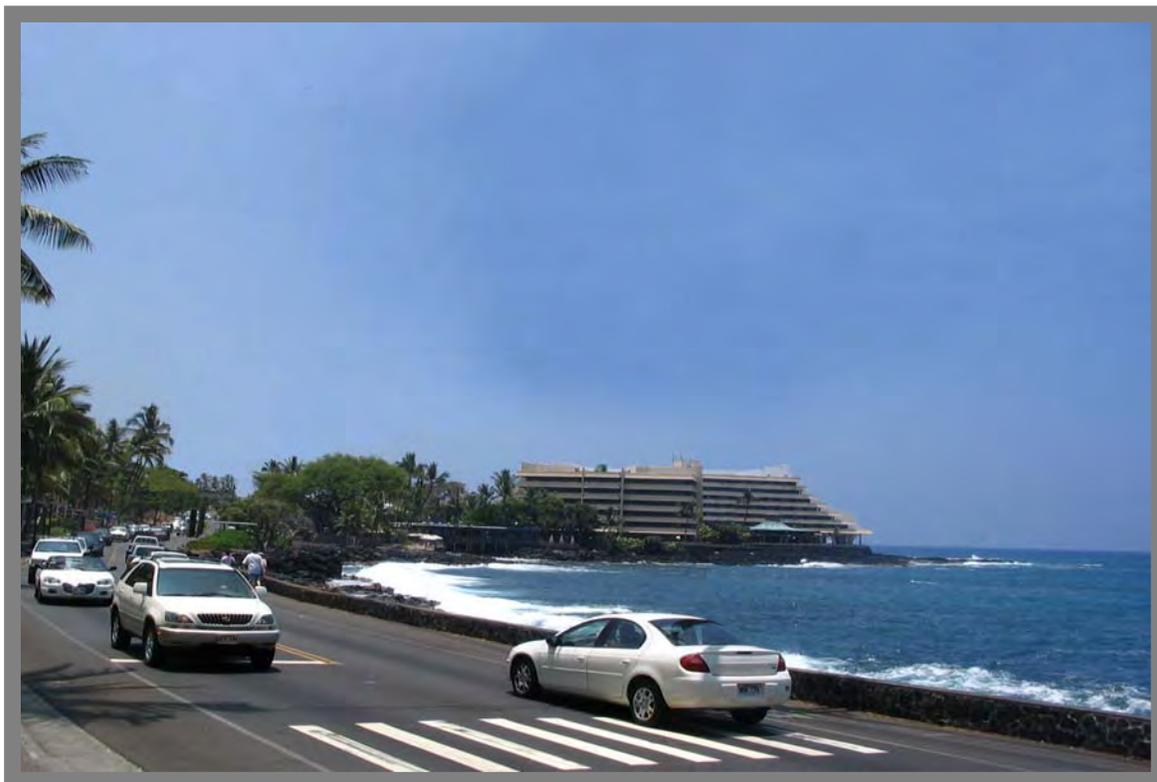


Photo 4: View along Oneo Bay towards Royal Kona Inn without utility poles and overhead lines.

**ALII DRIVE IMPROVEMENTS ALONG ONEO BAY  
HUALALAI ROAD TO WALUA ROAD**

**PHOTOS**

Photos  
3-4

The underground duct system will be installed under the Alii Drive roadway. The electric power underground duct system will consist of conduits, manholes and handholes. Switchgear pads and transformer pads are required at grade level.

Easements will be required for installation of the underground raceways, transformer pads, switchgear pads, CATV power supply pads, etc. due to the varying width, of the Alii Drive right-of-way.

Trenching would be used for placement of the duct system for the utility lines. Preliminary planning shows the trenching width of about 3 feet and would have a total depth of about 4 feet. The design of the trenching, including the length of each segment, will meet County of Hawaii standards.

## **2.1.2 Phase 2 - Pedestrian, Bicycle and Landscaping Enhancements Sea Wall Extension – Improving of Alii Drive**

### **2.1.2.1 Pedestrian and Bicycle Enhancements**

The center section of the project limits include a portion where pedestrians must walk along the 6-foot wide at-grade shoulder/pedestrian walkway separated from vehicles only by a painted white line. A raised pedestrian sidewalk is not provided along this approximately 1,030-foot long section of the project limits. In addition, pedestrians must share this at-grade shoulder/pedestrian walkway with bicyclists, skateboarders, and others. Persons with disabilities on wheel chairs also must use the at-grade shoulder/pedestrian walkway.

A new 10 foot wide walkway is planned to accommodate pedestrians and bicyclists. The walkway space would be designed to American With Disabilities Act (ADA) requirements. A railing would be added along the entire length of the improvement to meet ADA and County of Hawaii code requirements. The railing would extend 3 feet 6 inches (42 inches) above the grade of walkway and would have rails centered at 4 inches apart.

### **2.1.2.2 Seawall Extension**

Since this section of the project limits is located next to the existing seawall, the most feasible seawall would be construction of a new parallel seawall in front or

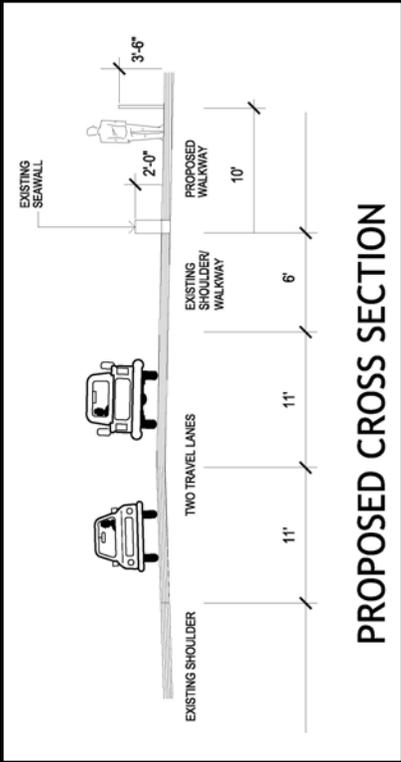
makai of the existing one. The new seawall would be sited to provide a 10-foot wide pathway for bicycles and pedestrians. This section would be designed to ADA requirements.

The new seawall would be a gravity type retaining wall, constructed of grout rubble masonry (GRM), with stone riprap protection at the toe of the wall to protect the wall base from scouring. At the location of seawall, the shoreline is mostly rocky, consisting primarily of basalt boulders and cobbles, and irregular basalt outcrops. The area appears to be underlain by basalt lava substrate that extends offshore, and the ground elevation is slightly above mean higher high water (MHHW) level. Figure 2-3 shows the gravity wall concept.

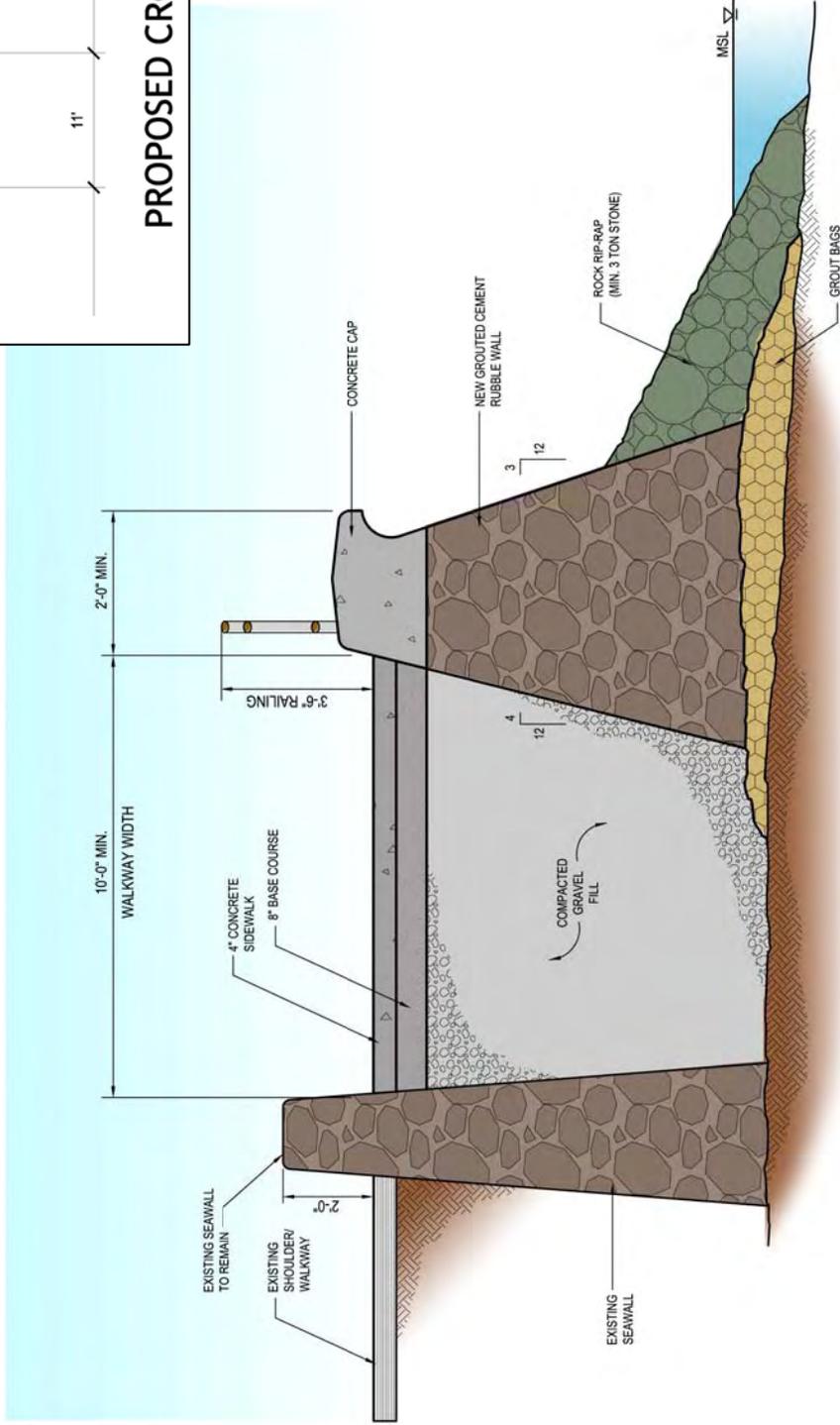
Locally available stones would be utilized for the wall construction, if its quality is proven to be usable. The ground surface would be cleared of boulders and cobbles down to the underlain lava rock substrata, and built up to a level above the mean higher high water (MHHW) mark with grout bags of cement mortar as base for the grout rubble masonry wall.

The GRM wall will have a 3 horizontal to 12 vertical slope at the sea side, a 4 horizontal to 12 vertical slope at the opposite side, and a 2 feet wide concrete cap, shaped to deflect seaward the wave runup, on top of the GRM wall. The metal railing would set on top to the concrete cap. The space between the new GRM wall and existing seawall will be backfilled with granular materials, and a base course lain on top for the new concrete walkway. The new walkway will match the existing shoulder/walkway elevation, which varies from +9.00 to +11.00 mean sea level (msl). The top of the concrete cap of the seawall will vary from +10.00 to +12.00 msl. This top elevation height would be sufficient to provide some degree of overtopping protection from annual and typical 10-year wave conditions which show a runup elevation of slightly above +10.0 msl. Overtopping may occur during storm wave conditions, which show a runup elevation of +15.6 msl.

Figure 2-3 Gravity Wall Concept



**PROPOSED CROSS SECTION**



**ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUJA ROAD**

**GRAVITY WALL CONCEPT**

**FIGURE**

**2-3**

The preliminary planning shows construction of the seawall will be completed in segments and will be done from the shore, using excavators, loaders, and cranes. Construction of the seawall will not be from the ocean side, since the area makai of the seawall is shallow and a barge/boat cannot be accommodated.

**2.1.2.2.1 Seawall Layout Plan**

The new seawall would be constructed in front of or makai of the existing seawall and would extend to about 641 feet along the shoreline. The new seawall would start at the southern end of TMK: 7-5-008:017, the parcel with the small park, and extend to the intersection of Alii Drive and Kahakai Road. It would include - two segments on areas of firm land makai of the existing seawall which include the walkway without the sea wall. Figure 2-4 shows the seawall layout plan.

The total length of the new walkway would consist of the following:

New walkway with seawall:	Approximately 417 feet
New walkway on firm land:	Approximately 224 feet
Total length	Approximately 641 feet

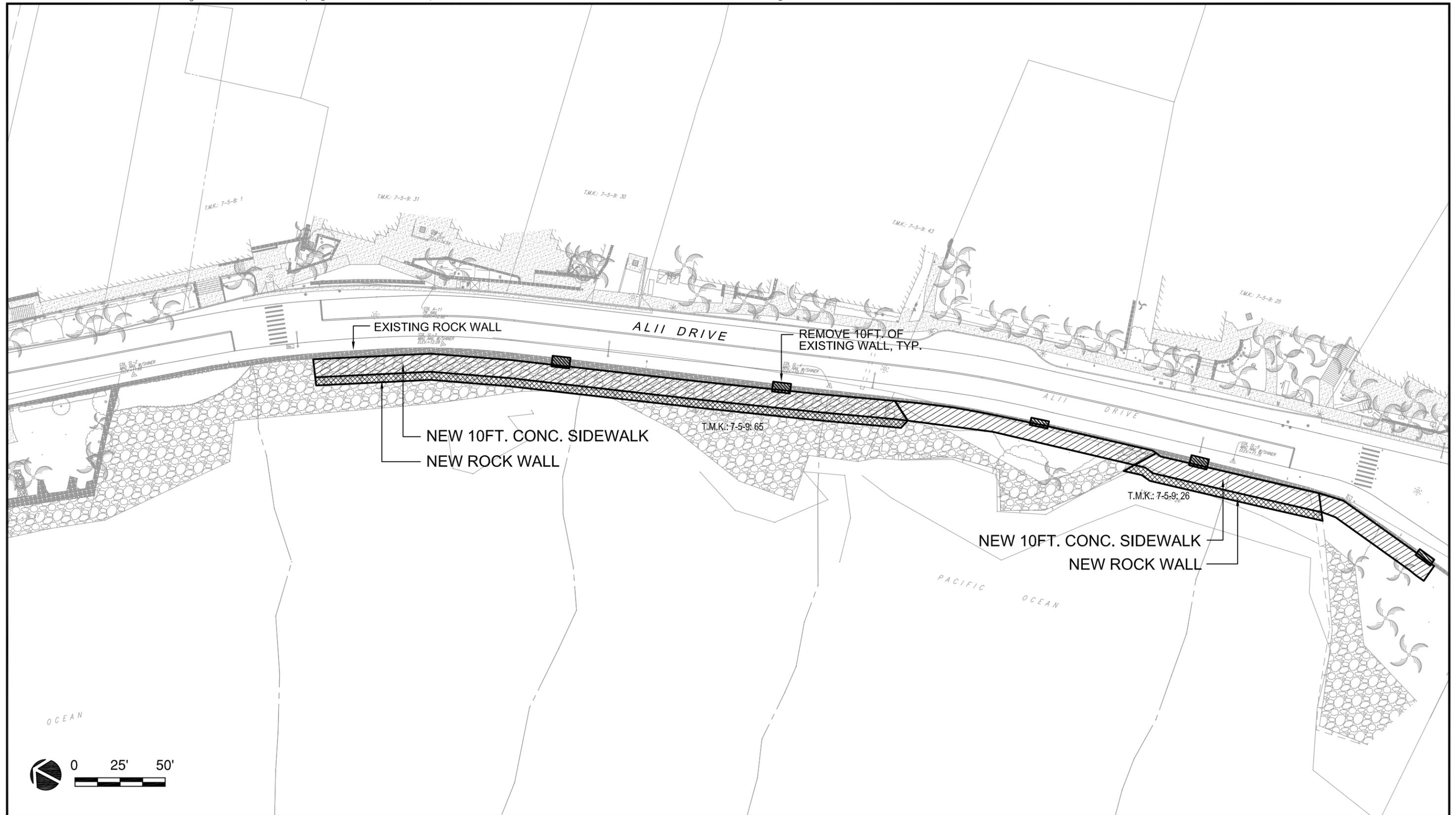
Two parcels would be affected:

- TMK: 7-5-009: 026 State of Hawaii
- TMK: 7-5-009:065 LRG Real Estate

The north end of the seawall has been sited to avoid affecting the archaeological site identified for preservation in-place. Although the mapped location is shown as over 50 feet makai of the existing seawall, it may be affected by construction activities. As such, the new seawall is sited to start approximately 50 to 75 feet south of the parcel at the small park. The end of the new seawall would have to be adjusted to account for starting on the shoreline, not on firm land.

**2.1.2.3 Landscape Enhancements**

Landscaping and other scenic beautification are one of the twelve qualifying Transportation Enhancement (TE) activities included in Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU). Currently, almost the entire length of project limits consists of paved



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

SEAWALL LAYOUT PLAN

FIGURE  
2-4

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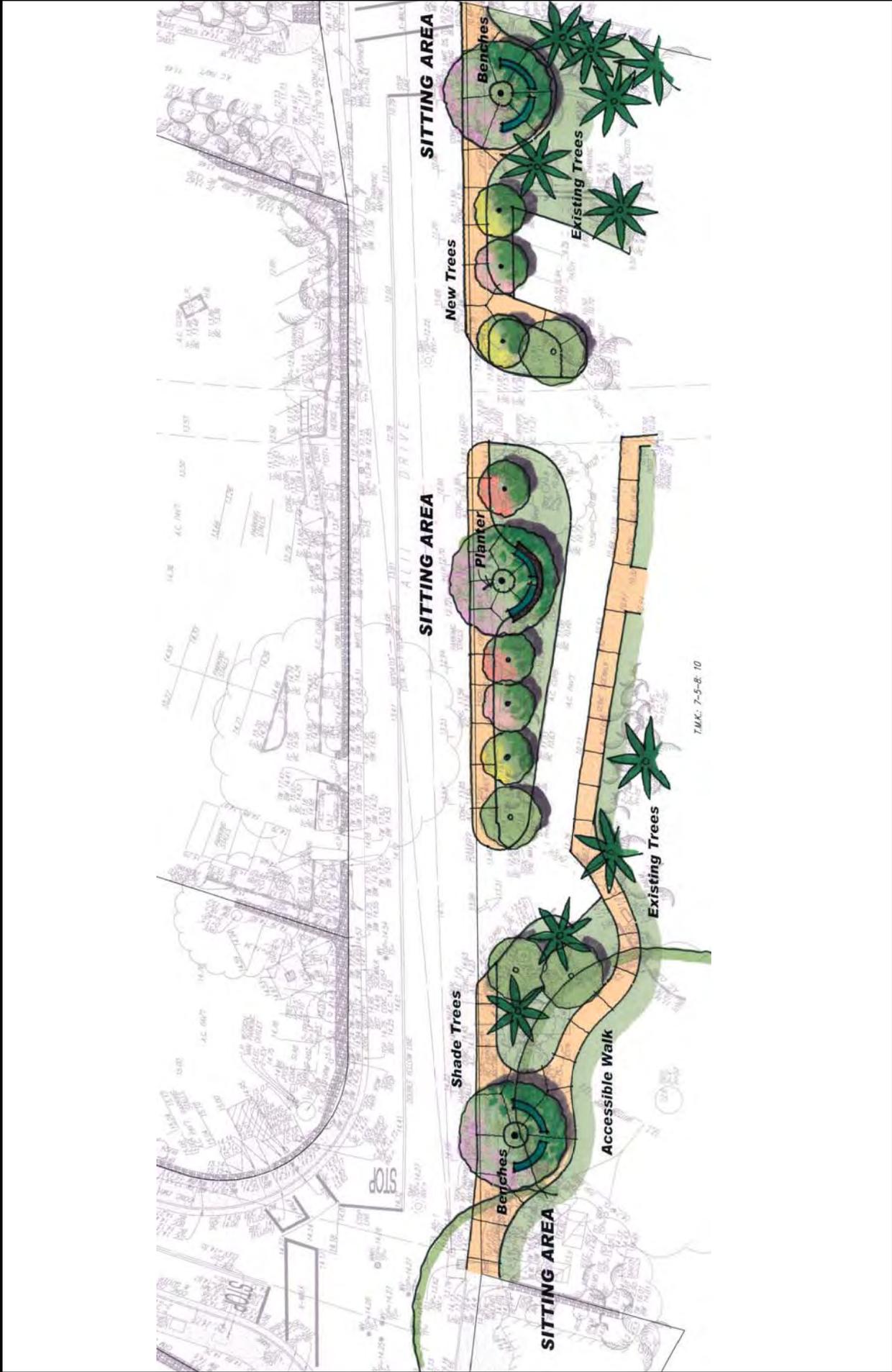
surfaces without designated places where pedestrians could sit under shade trees and enjoy the setting of this area of Kailua-Kona. The narrow right-of-way makes it difficult to accommodate landscaping enhancements within the existing right-of-way of Alii Drive.

To provide an area for landscaping enhancements, preliminary discussions have been undertaken with the County of Hawaii Department of Parks and Recreation (DP&R) to include landscaping enhancements to the walkway fronting Hale Halawai. In 2001, DP&R removed a low rock wall which fronted the entire length of the Hale Halawai parcel. The rock wall was outside of the Alii Drive right-of-way and located entirely within the DP&R parcel. Removal of the rock wall left open areas along the sidewalk to plant landscaping and to provide benches for pedestrians to rest while walking along Alii Drive. Figure 2-5 shows landscape enhancement plan. In early 2008 DP&R upgraded the landscaping and improved the walkways fronting Hale Halawai.

The landscaping enhancements would consist of various species of shade trees *Plumeria* (*Plumeria sp.*); Beach Heliotrope (*Messerschmidia argentea*); and Silver Buttonwood (*Conocarpus erecta*) and other low maintenance planted materials and benches placed under the trees. Most of these plants are listed in the Kailua Village Design Plan 1988. An accessible walkway would connect the plantings and provide a separate walking path along Alii Drive. The landscaping enhancements would be placed in three sections to match the current configuration of the access driveway. Root barriers would be installed to minimize potential damage from roots to adjacent areas.

In addition to the landscaping enhancements, benches would be placed in a semi-circular layout and set back from the walkway to allow an unobstructed passage along the walkway. A tree would be planted in the center of the semi-circle to provide space between the pedestrians and those sitting on the benches. The benches would not have backs to minimize the threat of damage. Figure 2-6 shows a character sketch of enhancement plan.

In addition, a concept was developed to place street trees in planting islands at the ends of the parking stalls fronting Hale Halawai. The street trees would also



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

FIGURE 2-5

PEDESTRIAN ENHANCEMENT HALE HALAWAI



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

FIGURE

2-6

CHARACTER SKETCH ENHANCEMENT PLAN

enhance the pedestrian experience while walking along Alii Drive. The landscaping enhancements would consist of Kou (*Cordia subcordata*), a native species, and Royal Poinciana (*Delonix regia*). These plants are also listed in the Kailua Village Design Plan 1988. Figure 2-7 shows the street tree plan. Figure 2-8 shows a character sketch of the street tree plan.

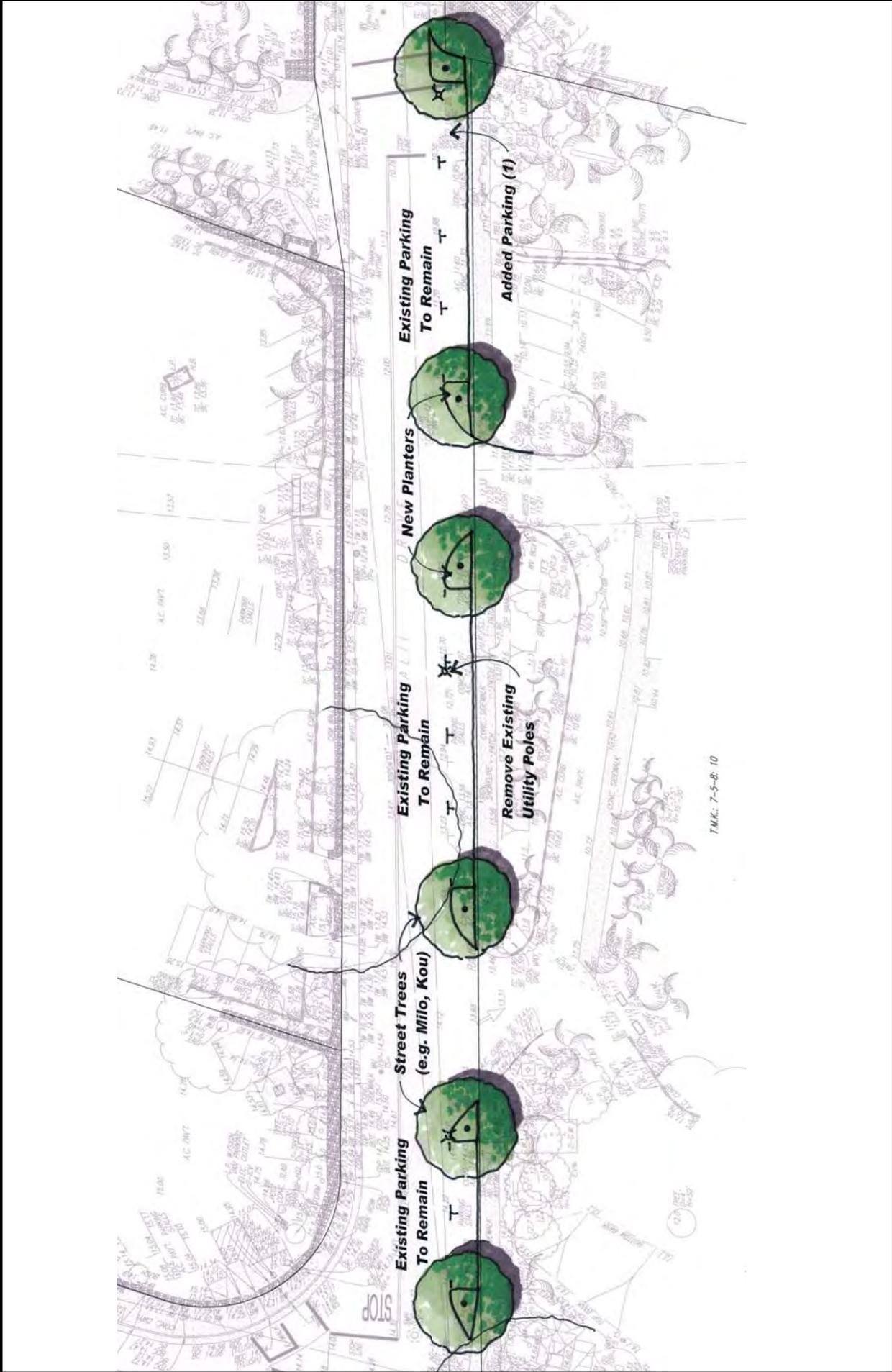
## 2.2 Preliminary Construction Cost Estimate Summary

The preliminary planning level construction cost estimate for the Phase 1 and Phase 2 improvements would be \$8,579,500, as shown in Table 2-1. Phase 1 will be funded by TE funds only and Phase 2 will be funded by TE and/or other qualifying FHWA funding sources. The proposed project will be funded using County, State and Federal funds.

<b>Table 2-1</b>	
<b>Preliminary Construction Cost Estimate</b>	
<b>Improvement</b>	<b>Estimated Cost</b>
<b>Phase 1</b>	
Electrical conversion	\$4,800,000
<b>Phase 2</b>	
New Gravity Seawall and sidewalk	\$3,599,500 (*)
Landscape enhancements	\$180,000
<b>TOTAL</b>	<b>\$8,579,500</b>
(*) Excludes contractor mobilization/demobilization costs.	

### 2.2.1 Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU)

Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU), was signed by the President on August 10, 2005. The SAFETEA-LU maintains the structure and funding balance established in 1991's Intermodal Surface Transportation Efficiency Act (ISTEA) and continued in Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21). SAFETEA-LU was designed to improve and maintain the transportation infrastructure in the United



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

STREET TREE PLAN

FIGURE

2-7



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY – HUALALAI ROAD TO WALUA ROAD

CHARACTER SKETCH – STREET TREE PLAN

FIGURE

2-8

States, especially the highway and interstate road system. SAFETEA-LU also retained the provisions of the Transportation Enhancement (TE) projects.

The County intends to fund the improvements with SAFETEA-LU Transportation Enhancement (TE) funds. As a result, the improvements need to be among the qualifying activities, as described by SAFETEA-LU.

### **2.3 Statewide Transportation Improvement Program**

The Hawaii Statewide Transportation Improvement Program (STIP) provides a multi-year listing of the State and County projects, including the County of Hawaii, and identifies those projects slated for federal funding. It is a multi-modal transportation improvement program that is developed utilizing existing transportation plans and policies, and current highway, transit and transportation programming processes. The STIP delineates the funding categories and the federal and local share required for each project. Although projects are on the STIP, it does not necessarily mean those projects will be planned, designed, or constructed within the fiscal period due to unforeseen occurrences such as project readiness or project priorities.

With the passage of SAFETEA-LU, the STIP is now a four-year programming implementation document that identifies State and County transportation projects statewide, to be funded, in part, with Federal Highway and Transit funds.

Regionally significant projects requiring an action by the Federal Highway Administration or the Federal Transit Administration should be included in the STIP, even when Federal Highway or Transit funds are not used.

In May 2009, the State DOT published the most recent STIP, Revision #7 for Fiscal Year 2008 – 2013, which includes the Alii Drive Improvements Along Oneo Bay project.

### **2.4 Project Schedule**

The Alii Drive Improvements would be funded by the State of Hawaii Department of Transportation (DOT). However, due to other funding commitments, Transportation Enhancement funds for project construction may not be available

prior to FY 2009. Phasing the project, as proposed, would allow the County and the State greater flexibility in meeting the funding availability.

## **2.5 Alternatives to the Proposed Action**

### **2.5.1 No Action Alternative**

The no action alternative would entail not proceeding with the improvements. Under this scenario, no improvements would take place within the project limits, and the existing corridor would continue to be utilized by the public under its current condition.

The no action alternative would also mean that the current walkways would not be improved by removing the utility poles and the seawall would not be constructed. Pedestrians would continue to share the shoulder/pedestrian walkway with bicyclists, skateboarders and others. Persons with disabilities on wheel chairs also must continue using the shoulder/pedestrian walkway. The utility poles located within the designated walkways will remain which forces pedestrians to walk around the utility poles.

### **2.5.2 Alternatives Concepts Considered**

Design or construction drawings of the existing seawall are not available. Further, the seaward face of the existing seawall shows signs of undermining and voids which makes it difficult to consider use of the wall in its present configuration without modification or rehabilitation. Thus, use of the existing seawall to construct a cantilevered extension was not considered as a viable alternative.

Based on these findings, various alternatives were considered to provide additional walkway space in the area of the seawall. The most feasible option would be construction of a new seawall makai of the existing seawall. The new walkway surface would match the grade of the adjacent shoulder/pedestrian walkway. This option would retain the existing seawall in-place to provide space for construction equipment.

### **2.5.2.1 Seawall Extension**

Two types of seawalls were considered for the extended walkway.

#### **1. Gravity Wall (Proposed)**

The new seawall would be a gravity type retaining wall, constructed of grout rubble masonry (GRM), with stone riprap protection at the toe of the wall to protect the wall base from scouring, due to wave action and storm conditions (see Section 2.1).

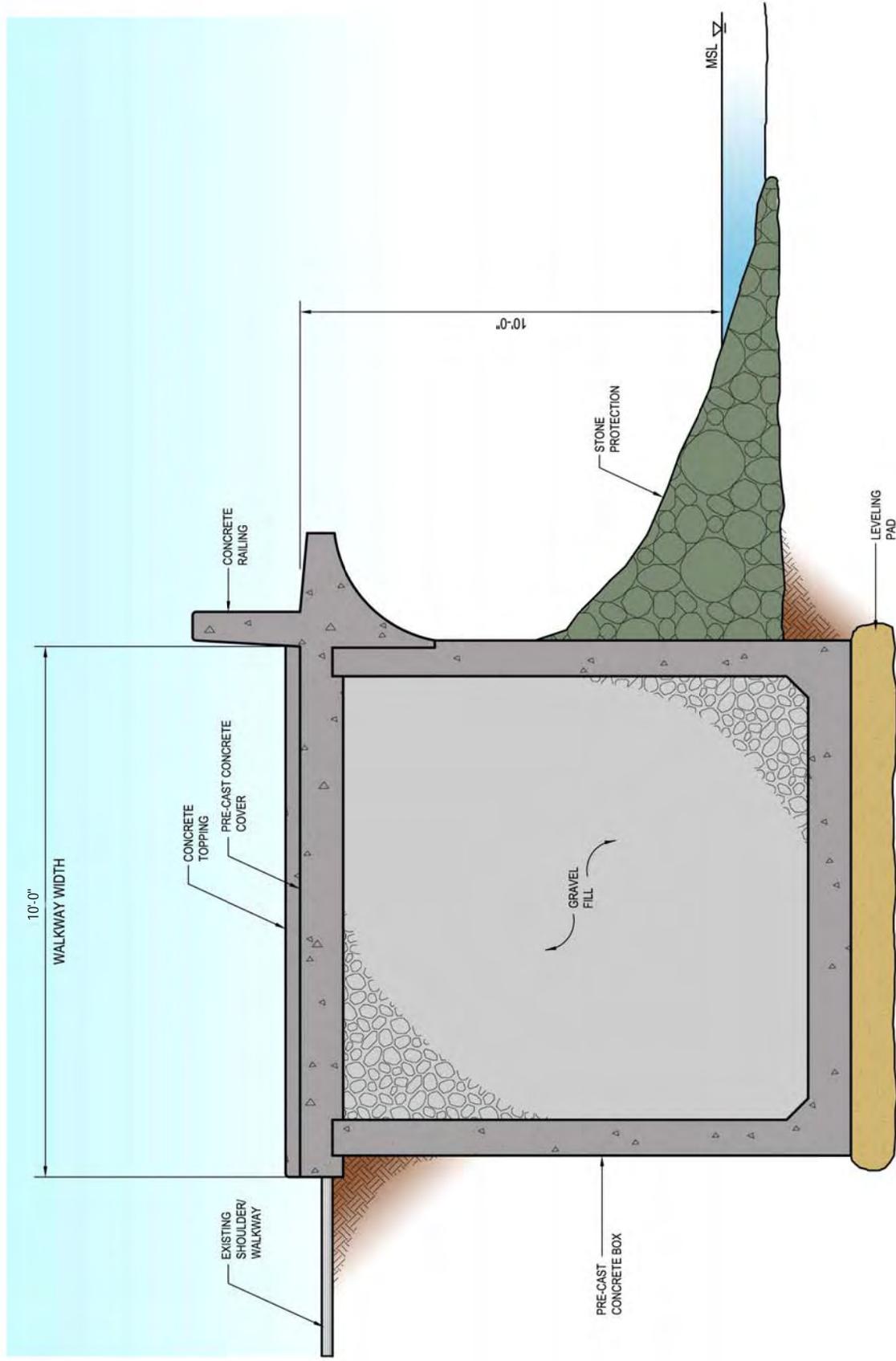
#### **2. Precast Concrete Box**

An alternative considered the use of a precast concrete box filled with gravel. This box would be placed makai or in front of the existing seawall, filled with gravel, capped with precast concrete cover, and then topped with a level surface to meet ADA slope requirements. Shore protection consisting of rocks, basalt boulders and cobbles similar to the existing conditions would be placed makai of the box to provide protection against wave and storm conditions. A recurved section could be added to the top of the box to provide wave runup protection. The weight of the gravel fill would be sufficient to anchor the precast box. Figure 2-9 shows the precast box concept.

The precast box has several advantages and disadvantages. The advantage of the precast box is that the box could be precast off-site and then trucked to the site and placed in front of the existing seawall. The existing seawall would be retained in its current condition.

The disadvantage of precast box is the need to connect or tie together the boxes along the entire length of the improvement to prevent their movement during storm conditions. Further, although a concrete topping would be placed on the top cover, all of the boxes would have to be fairly level to achieve a smooth pedestrian walking surface. Given that the Alii Drive shoreline consists primarily of an irregular lava basalt substrate with boulders and cobbles, it would be difficult to achieve a level foundation upon which to place the precast boxes. To achieve a level foundation, it would entail excavating a place for a leveling pad. This work would have to be done in

wet conditions along the shoreline. Based on these considerations, the precast concrete box was not considered a viable concept.



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

PRECAST BOX CONCEPT

FIGURE

2-9

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### **3. AFFECTED ENVIRONMENT**

#### **3.1 Project Limits and Surrounding Land Uses**

There are a variety of land uses within the project limits, including County of Hawaii public facilities, complexes containing restaurants and retail establishments, churches, offices, residential units, and hotels. The northern section contains the Hale Halawai, the Restaurant Row complex on the makai side and two parking lots, two churches, the Roman Catholic Church and the Kealaokamalamalama Church, and the Kona Islander Inn on the mauka side.

Hale Halawai, a County of Hawaii public facility under the control of the County of Hawaii Department of Parks and Recreation (DP&R), is located on a 3.20-acre parcel and provides open lawn areas on both the north and south side of the existing enclosed facility. DP&R uses the Hale Halawai facility for a number of recreation activities and conducts programs during the day and evening hours. In early 2008 DP&R upgraded the landscaping and improved the walkways fronting Hale Halawai. In August 2008, the County of Hawaii opened the new police ministration in Hale Halawai. The County hopes the presence of the ministration will deter crime in the immediate vicinity.

The Hale Halawai frontage on Alii Drive is divided into three sections, north, center and south. A one-way loop driveway allows vehicles to enter from the north, loop the center section, and exit from the south. The north and center section of the frontage is planted with grass and contains palms and coconut trees. A parking lot is located between the facility and the lawn area adjacent to the Restaurant Row complex. The driveway and parking lot are used by both private and commercial vehicles for short-term parking to drop off passengers and as a turn-around point. It was noted that commercial vehicles also use the driveway and parking lot to park while making deliveries to nearby businesses. An easement for the Keopu Channel Improvement crosses the Hale Halawai parcel near the southern boundary.

The portion mauka of Hale Halawai contains two parking lots and the frontage for the Roman Catholic Church parcel.

The center section of the project limits contains Oneo Bay and two small parcels of firm land on the makai side, and the Kona Alii residential complex, the Alii Sunset Plaza and Coconut Grove shopping/restaurant complexes on the mauka side. The driveway at the south end of the Coconut Grove complex allows left turns into the mauka parking lot from the southbound Alii Drive. This parking lot also has access onto Kuakini Highway providing the only current mauka-makai connection between Alii Drive and Kuakini Highway.

The center, makai section along Oneo Bay provides one of the most scenic ocean views along the entire length of Alii Drive for both pedestrians and drivers. The existing low sea wall allows clear views of the ocean and activities in nearshore waters and the cruise ships anchored off-shore.

The south section contains the intersection with Kahakai Road and the parking lot for the Royal Kona Resort on the makai side and a currently undeveloped parcel and the Kona Billfisher on the mauka side.

The intersection of Alii Drive and Walua Road is a highly skewed T-intersection. The sharp angle of the intersection makes it difficult for northbound drivers on Alii Drive to make a right turn onto Walua Road. This movement is especially difficult for larger vehicles when other vehicles are parked waiting to enter Alii Drive from Walua Road. The small turning radius and grade change limits this movement to primarily passenger size vehicles. Larger vehicles northbound on Alii Drive must wait for vehicles to clear the intersection to make the turn onto mauka-bound Walua Road or they do not attempt to make this movement and must find an alternate route.

With the exception of the currently undeveloped parcel near the southern end, the land areas along the project limits are fully developed to the edge of the right-of-way with commercial, retail, hotel, residential, and other uses.

### **3.2 Project Limits Land Ownership**

There are a total of 37 parcels, including the State of Hawaii and the County of Hawaii parcels, within the project limits. According to the County of Hawaii tax records, the parcels are under a variety of types of ownership including

corporations, trusts, churches, and various other types of ownerships. The owners are primarily located in Hawaii, including in the County of Hawaii and City and County of Honolulu. Table 3-1 shows the tax map keys (TMK) and ownership names (see Figure 3-1).

### **3.3 Climate**

The climate of North Kona can be described as moderately dry and tropical. Average annual rainfall ranges from 20 to 50 inches and with temperatures ranging in the 60's to the 80's Fahrenheit. Kona is typically sheltered from the north-easterly tending trade winds, but often experiences a diurnal cycle of daytime sea breezes and nighttime land breezes. Approximately 30% of the time, more frequent in winter, the Kona side of Hawaii Island experiences so-called Kona winds, from the west and southwest (County of Hawaii Department of Public Works, July 2005).

### **3.4 Geology and Topography**

The island of Hawaii was formed from the coalescence of five volcanoes – Kohala, Mauna Kea, Hualalai, Mauna Loa and Kilauea. Kailua-Kona lies at the base of the dormant Hualalai Volcano (Juvik & Juvik, 1998).

The project site is located on western slope of Hualalai, a dormant shield-type of volcano that last erupted in 1800-1801 along its northwest rift zone. The Hualalai Volcano represents the major geologic feature of the area near the project site.

The western slopes of Hualalai Volcano consist predominantly of alkalic olivine basalt flows from the northwest rift zone. The basalt flows are typically thin-bedded, dip 10 to 15 percent, and average 4 to 5 feet in thickness on the upper slopes. The flows consist of both Pahoehoe and Aa types and belong to the prehistoric member (Holocene age of the Hualalai volcanic series).

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ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

TAX MAP KEYS

FIGURE

3-1

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<b>Table 3-1 Land Ownership</b>			
<b>TMK</b>	<b>Owner</b>	<b>City</b>	<b>State</b>
75008005	Kealaokamalamalama Church	Honolulu	HI
75008006	Roman Catholic Church	Honolulu	HI
75008009	Watumull Properties Corp	Honolulu	HI
75008011	Watumull Properties Corp	Honolulu	HI
75008012	Inter-Island Resorts Ltd	Hilo	HI
75008017	Kealaokamalamalama Church TR	Honolulu	HI
75008019	Watumull Properties Corp	Honolulu	HI
75008022	Inter-Island Resorts Ltd	Hilo	HI
75009011	Okabayashi, Margaret M.K.	Kaneohe	HI
75009011	Pleasant Travel Service	Westlake Village	CA
75009014	Kamehameha Schools	Honolulu	HI
75009017	Olu Kai Ltd	Kailua-Kona	HI
75009018	Olu Kai Ltd	Kailua-Kona	HI
75009020	Kamehameha Schools	Honolulu	HI
75009021	Kamehameha Schools	Honolulu	HI
75009022	Cascavilla Properties Inc.	Aiea	HI
75009023	KPC Villages LLC	Los Angeles	CA
75009025	LRG Real Estate LP	Kamuela	HI
75009026	State of Hawaii		
75009027	Anekona LLC	Kailua-Kona	HI
75009028	Anekona LLC	Kailua-Kona	HI
75009030	Kona View Plaza	Beverly Hills	CA
75009031	Kona View Plaza	Beverly Hills	CA
75009034	R & S Partnership Unlimited	Waikoloa	HI
75009039	Hirata, Ronald H	Kailua-Kona	HI
75009040	Daikyo Pacific Inc.	Honolulu	HI
75009043	Greenwell, Radcliffe	Kamuela	HI
75009047	Pleasant Travel Service	Westlake Village	CA
Continue			

<b>Table 3-1 (cont'd)</b>			
<b>Land Ownership</b>			
<b>TMK</b>	<b>Owner</b>	<b>City</b>	<b>State</b>
75009065	LRG Real Estate LP	Kamuela	HI
75009066	State of Hawaii		
75008001	Kona Alii Condominium	Kailua-Kona	HI
75008003	Kona Islander Inn	Kailua-Kona	HI
75009003	Kona Pacific	Kailua-Kona	HI
75009008	Royal Kona Resort	Kailua-Kona	HI
75009009	TRIAD Management	Kailua-Kona	HI
75009010	The Kona Billfisher	Kailua-Kona	HI

### 3.5 Soils and Agricultural Lands

#### 3.5.1 Soils

According to the U.S. Natural Resources Conservation Services (1972), the following soil types are found in the project area:

- Wahiawa extremely stony silt loam, 6 to 12 percent slopes (WHC) consists of shallow, well-drained silt loams that formed in volcanic ash. This soil is low on the leeward side of Hualalai and Mauna Loa. In a representative profile the surface layer is dark brown extremely stony silt loam about 4 inches thick. The subsoil is dark-brown very stony silt about 14 inches thick.
- Punaluu extremely rock peat, 6 to 20 percent slope (rPYD) consists of well-drained, organic soils over pahoehoe lava bedrock. These soils gently sloping to moderately steep. This soil is low on the leeward side of Mauna Loa. Rock outcrops occupy 40 to 50 percent of the surface. In a representative profile the surface layer is black lava bedrock. This soil is medium acid.

### **3.5.2 Agricultural Lands**

In 1975, the U.S. Department of Agriculture Soil Conservation Service (now Natural Resources Conservation Service) initiated a nationwide inventory of important farmlands. When completed, the inventory included three categories “prime”, “unique”, and “other farmlands of state-wide and local importance”. This classification was later adopted by the State of Hawaii Department of Agriculture under the title “Agricultural Lands of Importance to the State of Hawaii” (ALISH).

The ALISH system defines “prime agricultural land” as the best suited for food, forage, and timber crops. “Unique agricultural land” is defined as land other than prime, used for the production of high-value food crops. “Other agricultural land” is defined as land used for the production of food, feed, fiber and forage crops, but not classified as “prime” or “unique”.

The project area is not classified, according to the ALISH system. The project area is fully developed with urban type uses.

### **3.6 Hazardous Wastes**

There are no known uses, such as gas/service stations within the project limits that would create hazardous wastes. In addition, industrial type facilities are not found within or along the project limits.

### **3.7 Volcanic Hazards**

The U.S. Geological Survey established nine hazard zones for the island of Hawaii. Hazard zones from lava flows are primarily based on the location and frequency of both historic and prehistoric eruptions. Zone 1 is the area of greatest hazard and Zone 9 is of the least hazard. The project site is located within Zone 4.

Seismically, the island of Hawaii is one of the most active areas in the world, with more destructive earthquakes occurring here than in any other comparably sized area in the United States. The record of earthquake intensities on the Island of Hawaii is fairly complete for the past 166 years. Based on this record, the project site lies within the occurrence zone of Intensity VIII earthquakes, corresponding to the Mercalli Intensity Scale. Intensity VIII is the second highest on the scale.

### **3.8 Coastal Environment**

A coastal engineering analysis was undertaken for the approximately 1,000-foot long stretch of Alii Drive along Oneo Bay, where the road is immediately adjacent to the shoreline. The analysis is to examine development of a functional concept plan for roadway/walkway improvements along Oneo Bay. Specific work tasks included a physical description of existing shoreline and nearshore conditions, description of the oceanographic setting, analysis of oceanographic design parameters for seawall improvements, and evaluation of shoreline improvement alternatives. This section is a summary of the key findings from the Coastal Engineering Analysis conducted by Sea Engineering, Inc. The complete report is in Appendix B.

The shoreline in this section of Alii Drive is mostly rocky, consisting primarily of basalt boulders and cobbles, and irregular basalt outcrops. The entire area appears to be underlain by basalt lava substrate that extends offshore. The travel way lies at an elevation of 9 to 12 feet mean sea level (msl), and is protected from the sea by a concrete rubble masonry (CRM) seawall that rises about 2 feet above the road elevation. Sea Engineering, in conjunction with the project surveyors, completed 5 survey profiles in the project area perpendicular to the coastline, extending from the seawall to 300 to 400 feet offshore.

#### **3.8.1 Nearshore Conditions**

There is no protective fringing reef offshore of this section of project limits. The nearshore bottom is composed entirely of a hard basalt lava substrate with scattered boulders and cobbles close to shore. Between the shoreline and about the 10-foot water depth, the lava bottom appears scoured and smooth, with relief of 1 to 3 feet, and there is little coral growth. This indicates that this zone experiences significant wave energy at times that is capable of scouring away loose and irregular bottom features such as coral. Close to the shoreline, there are scattered boulders and cobbles lying on the basalt lava. Beyond the 10-foot water depth, small coral outcrops, less than 1 foot in diameter are sparsely scattered on the bottom.

The lava substrate contains channels, ridges and ledges with typical small-scale relief of 1 to 3 feet. A typical bottom profile extending to about the 100-foot water depth shows that between the 10- and 70-foot water depths, the bottom slope is gradual, between 1V:50H to 1V:33H (1-foot vertical to 50 feet horizontal to 1-foot vertical to 33 feet horizontal). Beyond the 70-foot water depth the slope steepens to about 1V:10H (1-foot vertical to 10 feet horizontal).

### **3.8.2 Tides**

The tides in Hawaii are semi-diurnal with pronounced diurnal inequalities; that is, there are two tidal cycles per day with unequal water level ranges. *Tide Tables 2003*, which is based on tide data from U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey (2003), shows that the mean tide range is 1.4 feet and the diurnal range is 2.1 feet at Kailua-Kona.

In the past, there have been a number of recorded tropical storms and hurricanes, which have approached the Hawaiian Islands. Most of these storms passed well south of the islands, staying far enough offshore to only cause high surf or heavy rainfall as they passed, or weakened in intensity as they reached Hawaii. However, in the last 50 years, there have been notable exceptions, Hurricanes Hiki, Dela, Nina and Fico passed within about 200 miles of the islands. Hurricane Susan, with sustained wind speeds estimated at 120 knots, was pointed directly at the Island of Hawaii approaching from the southeast but dissipated before coming within 200 miles of the island. Although Hurricane Iwa passed within 30 miles of Kauai, and Hurricanes Dot and Iniki directly passed over Kauai, there has been no direct hurricane strike on the Island of Hawaii in the past 50 years.

### **3.8.3 Typical Waves**

Four primary wave types describe the general Hawaiian wave climate: Northeast tradewind waves, North Pacific swell, south swell, and Kona storm waves. Oneo Bay is well sheltered from the Northeast tradewind waves by the island itself, and partially sheltered from North Pacific swell by the Hawaiian Island chain. North Pacific swell diffracts around the island with only a portion of its deepwater energy reaching Oneo Bay. Although the south swell directly approaches Oneo

Bay in deepwater, it approaches the shore very obliquely in the vicinity of Oneo Bay. Due to the oblique wave angle in the nearshore water, the waves are significantly affected by wave refraction, which reduces their wave energy as they approach the shore. Conversely, Kona storm waves and locally generated wind waves, approaching the coast in the area of Oneo Bay more directly with less wave refraction effect. The term swell used herein refers to waves generated by distant storms, which propagate toward Hawaii (relatively long period waves), and wind waves are shorter period waves generated locally by wind and storms in the Hawaiian waters.

South swell approaches from the southeast through southwest, with typical heights of 1 to 4 feet and periods of 12 to 22 seconds. Kona storm waves are generated by winds associated with local fronts or low-pressure system and have typical periods ranging from 6 to 10 seconds and deepwater wave heights up to 10 to 15 feet. These waves generally approach from the south to west.

#### **3.8.4 Wave Runup**

Wave runup is a vertical height above the stillwater level to which an incident wave will run up a face of a structure. This is an important design parameter for any proposed improvements to shoreline along Oneo Bay; shore protection alternatives should prevent excessive runup that may impact pedestrians and vehicles. The runup depends on the type of structure and the design conditions outlined previously. The wave runup was determined for the four types of structures, using results of small-scale laboratory tests for regular wave runup, which are reported in the U.S. Army Corps of Engineers Shore Protection Manual (1984). The four types of structures considered are a vertical seawall, a stone revetment with a slope of 1V:1.5H, a concrete stepped-face seawall with a slope of 1V:1.5H and a concrete recurved-face seawall. The results are summarized in Table 3-2, and include the stillwater level rise.

The results indicate that both the vertical wall and the recurved-face seawall are effective in limiting the wave runup below the typical Alii Drive travel lane elevation of +11 feet during the annual wind wave and 10-year wave conditions; only during rare storm events does the wave runup exceed the +11-foot elevation. Even during storm conditions, the computed runup on the recurved

seawall is only +11.5 feet. The stone revetment and the stepped-face seawall, on the other hand, permit excessive runup, even during annual conditions.

	Annual Wind Wave	Typical 10-Year Wave	Storm Wave
Vertical Wall	10.2	10.6	15.6
Stone Revetment	13.9	17.1	22.2
Stepped-Face Seawall	14.4	16.6	22.9
Recurved-Face Seawall	6.9	9.5	11.5

### **3.9 Hydrology**

#### **3.9.1 Ground Water**

The island of Hawaii is divided into nine water sectors, which in total are comprised of approximately 24 aquifer systems. The project area overlies the Keauhou aquifer system, a component of the Hualalai Aquifer Sector. The Hualalai Aquifer has a sustainable yield of 56 million gallons per day (MGD), of which 38 MGD is attributed to the Keauhou aquifer system (CWRM, August 28, 2008).

According to the map available at the Environmental Protection Agency's (EPA) Source Water Protection website, the project site is not located within the EPA-designated Sole Source Aquifer.

#### **3.9.2 Surface Water**

Kailua-Kona Stream, located 1,085 feet mauka of project site is a perennial stream. Waiaha Stream is an intermittent stream located approximately 6,484 feet from the southern point of the project site.

According to the Wild and Scenic Rivers Act (P.L. 90-542, as amended) (16 U.S.C. 1271-1287) found at the National Wild and Scenic Rivers website, no rivers in Hawaii have been designated as components of the National Wild and Scenic Rivers System.

### 3.9.3 Coastal Waters

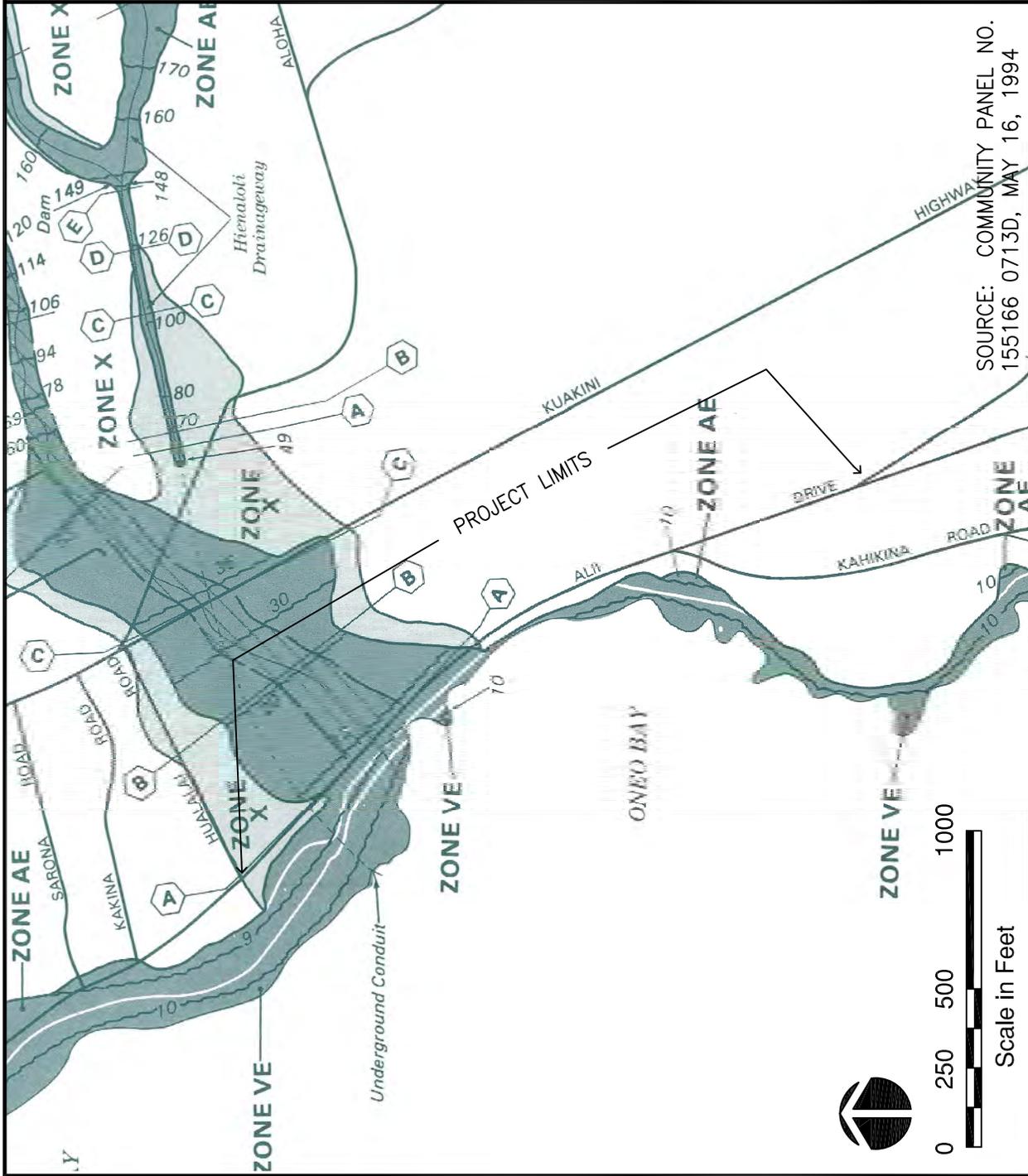
The coastal waters beyond the project's shoreline are classified as "AA" marine waters by State DOH Administrative Rules, Title 11, Chapter 54, "Water Quality Standards". Class AA marine waters are recognized by DOH with the objective that "their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions".

The Coastal Barrier Resources Act (CBRA) (1990, as amended) strives to protect ecologically sensitive, geologically vulnerable, and the scenic and recreational values of barrier islands along the East Coast, Gulf of Mexico, and Great Lakes of the U.S. The primary authority in the implementation of this act is the USFWS. According to CBRA, Hawaii has no areas within the Coastal Barrier Resources System.

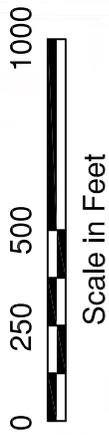
### 3.10 Flood Hazard

Based on the Flood Insurance Rate Map (FIRM), Community Panel Number 155166 0713 D (revised May 16, 1994) the project site is located within the following four zones (see Figure 3-2):

- Approximately 250 feet at the northern end of the project limits is in Zone X, Areas of 500-Year flood;
- About 700 feet is located in Zone AE Special Flood Hazard Areas Inundated by 100-Year Flood, base flood elevations determined. After this segment about 50 feet is located in Zone X.
- The remaining 1,440 feet is in Zone X Other Areas, Areas determined to be outside 500-year flood plain.
- The area makai of Alii Drive is located in Zone VE Special Flood Hazard Areas Inundated by 100-Year Flood, Coastal flood with velocity hazard (wave action); base flood elevation determined.



SOURCE: COMMUNITY PANEL NO. 155166 0713D, MAY 16, 1994



### LEGEND

**SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD**

- ZONE A** No base flood elevations determined.
- ZONE AE** Base flood elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

**FLOODWAY AREAS IN ZONE AE**

**OTHER FLOOD AREAS**

- ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

**OTHER AREAS**

- ZONE X** Areas determined to be outside 500-year flood plain.
- ZONE D** Areas in which flood hazards are undetermined.

**Flood Boundary** (solid line)

**Floodway Boundary** (dashed line)

**Zone D Boundary** (dotted line)

**Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Flood Hazard Zones, Coastal Base Flood Elevations Within Special Flood Hazard Zones.** (thick solid line)

**Base Flood Elevation Line; Elevation in Feet\*** (line with 'D' markers)

**Cross Section Line** (line with 'E' markers)

**Base Flood Elevation in Feet Where Uniform Within Zone\*** (line with 'D' markers)

**Elevation Reference Mark** (RM7 X)

\*Referenced to the National Geodetic Vertical Datum of 1929

### NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding. Features shown on this map are of a general nature and are not to scale. Features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1, 30, AE, AH, AO, A99, V, V1, 30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUVA ROAD

# FLOOD INSURANCE MAP

### **3.11 Biological Resources**

#### **3.11.1 Flora and Fauna**

The existing vegetation on the project site consists primarily of non-native species which for the most part have been planted for landscaping purposes. The most common species are coconut palms, bouganvillia, and plumeria trees. No federally protected, threatened or endangered species of plants or animals are known to occur on or along the project site.

According to the maps contained in the Critical Habitat Portal available at the U.S. Fish & Wildlife Service's (USFWS) website, the project site is not located within the USFWS-designated Critical Habitat for any endangered species. The USFWS and National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) conferred there are no designated critical habitats in or near the project area (see Appendices C and D).

Domestic pets, feral animals and rodents are assumed to comprise the majority of mammalian species inhabiting the project site. Birds that can be seen in this area are sparrows, bulbuls, pigeons, and doves. All bird species likely to be found within the project site are introduced species. Section 7 Consultation with USFWS and NOAA-NMFS will be initiated as part of the Draft EA process.

#### **3.12 Marine Resources and Water Quality**

Marine resources and water quality studies were undertaken along Oneo Bay to determine near and off-shore conditions. This section is a summary of the key findings from the studies conducted by AECOS, Inc. The complete report is in Appendix E.

The AECOS, Inc. biologists walked the shoreline and snorkeled the area to identify coastal and marine flora and fauna and collect water samples. The survey area extended approximately 0.5 km (0.3 mi) from Bubba Gump's Restaurant to the Royal Kona Resort. The coastal survey included the land from the *makai* side of Alii Drive through the littoral zone and included tidepools at the shore. The marine survey extended offshore about 100 m (333 ft). Surveyed depths ranged from less than 0.3 m (1 ft) to over 10 m (33 ft).

The coastal survey involved walking along the shoreline and noting habitat types and species of plants living there. For the marine survey, snorkeling gear was used to inventory species of fish, algae, coral, and other invertebrates and estimate relative abundances of the prominent species.

Water samples were collected along two transects (north and south) at three distances (1 m, 10 m, and 50 m) from the shore. Some of the parameters were measured by field meter and others in water samples collected in appropriate containers and taken to the AECOS, Inc. Laboratory in Kaneohe.

### **3.12.1 Coastal Strand**

A limited number of species are capable of adapting to the harsh conditions of the coastal strand found along Oneo Bay. Most of the species observed in the survey area are native or early Polynesian introductions to Hawaii. The plants observed include: indigenous *pohuehue* or beach morning glory (*Ipomoea pes-caprae*) and *naupaka kahakai* (*Scaevola taccada*); early Polynesian introduction *niu* or coconut palm (*Cocos nucifera*); and two alien or naturalized species: tree heliotrope (*Tournefortia argentea*) and false *kamani* (*Terminalia catappa*). None of the plants encountered are listed as threatened or endangered, or otherwise would be considered rare or special by the State or Federal governments (DLNR, 1998; Federal Register, 1999a,b, 2001).

### **3.12.2 Marine Resources**

Much of the Kailua-Kona coast, including Oneo Bay, is designated as a fish replenishment area (FRA) by the State of Hawaii Department of Land and Natural Resources. The FRA designation closes an area to aquarium fishing.

Oneo Bay has a relatively narrow fringing or apron reef along most of the shoreline. Lobe coral (*Porites lobata*) colonies dominate this reef throughout the Bay. Cauliflower coral (*Pocillopora meandrina*) colonies become more common in the southern half. Coral coverage is fairly dense on the deeper portions of the reef (between 20 and 70 percent coverage), but in areas exposed to heavy wave action, the substratum is bare or dominated by the coralline red alga, *Jania* sp.

The fishes and macroinvertebrates observed in the survey area are typical for this type of environment - an energetic surge zone in an otherwise protected bay. Various surgeonfish, parrotfish, and butterflyfish dominate the fauna. Most of the targeted aquarium fishes (Tissot, et al, 2002) are abundant or common in Oneo Bay, including achilles tang (*Acanthurus achilles*), yellow tang (*Zebrasoma flavescens*), butterfly fish (*Forcipiger* spp., *Chaetodon quadrimaculatus*, *C. ornatissimus*, *C. multicolor*), Moorish idol (*Zanclus cornutus*), goldring surgeonfish (*Ctenochaetus strigosus*), and orangespine unicornfish (*Naso lituratus*). No angelfishes were observed.

Two protected species are known from this area: the *opihi* and the green sea turtle. The *opihi* is not a listed species nor a candidate for listing under Federal endangered species rules. The *honu* or Pacific green sea turtle is protected by both State and Federal endangered species laws. Endangered Species Act (ESA) listed species under NMFS jurisdiction that may occur in waters or shorelines around the project area include the threatened green sea turtle, endangered hawksbill turtle, humpback whale, and Hawaiian monk seal (see Appendix D). Section 7 Consultation with USFWS and NOAA-NMFS will be initiated as part of the Draft EA process.

### 3.12.3 Water Quality

The nearshore waters of Oneo Bay are well mixed by constant wave action. The samples collected indicate that the quality of the water in Oneo Bay is good, although possibly slightly enriched by nutrients as compared to the water quality standards. Numerous groundwater seeps were noted throughout the study site by observing schlieren effects in the water column and sensible perception of cool water pockets. The values measured for the standard parameters of temperature and salinity are typical for marine waters that receive some freshwater influence; these values are slightly lower than they might be if they were not influenced by. The pH and DO (dissolved oxygen) values are what would be expected in nearshore waters. Ammonia was not detected in any of the samples.

### **3.13 Scenic Characteristics**

The section of Alii Drive along Oneo Bay within the project limits provides scenic ocean views for both pedestrians and drivers. The existing low sea wall allows clear views of the ocean and activities in nearshore waters and the cruise ships anchored off-shore. This segment is one of the relatively few locations along Alii Drive that allows pedestrians and drivers an unobstructed view of the ocean.

### **3.14 Traffic**

Alii Drive between Hualalai Road and Walua Road accommodates two-way traffic on 11-foot wide travel lanes. All types of vehicles, including commercial delivery trucks, heavy trucks and large tour buses, are accommodated on the travel lanes. The posted speed limit is 15 miles per hour for this section of Alii Drive.

Parking along the Alii Drive right-of-way is limited to a short stretch fronting Hale Halawai. A total of 9 parallel parking stalls are available in this section. These parking stalls are not metered.

Raised pedestrian sidewalks are located on the makai side of Alii Drive from Hualalai Road to the southern end of the Restaurant Row complex, or for about 600 feet, approximately 25 percent of the project limits. The pedestrian walkway is designed with a painted white line adjacent to the travel lanes for the remainder of the makai side project limits. Photos 5 to 8 show existing conditions.

The mauka raised pedestrian sidewalk extends from Alii Sunset Plaza to the area fronting the Coconut Grove complex. The pedestrian walkway on the mauka side is also designated with a painted white line adjacent to the travel lane. The pedestrian walkway is especially narrow near the Kona Alii residential complex and the parking lot north of the entry road to the Roman Catholic Church parcel.

There are a total of four pedestrian crosswalks within the project limits. The southern most crosswalk includes a flashing yellow light system embedded at the ends of the marked crosswalk. Two pedestrian activated switches, one on each side of the road, are located at the ends of the crosswalk. Two pole mounted

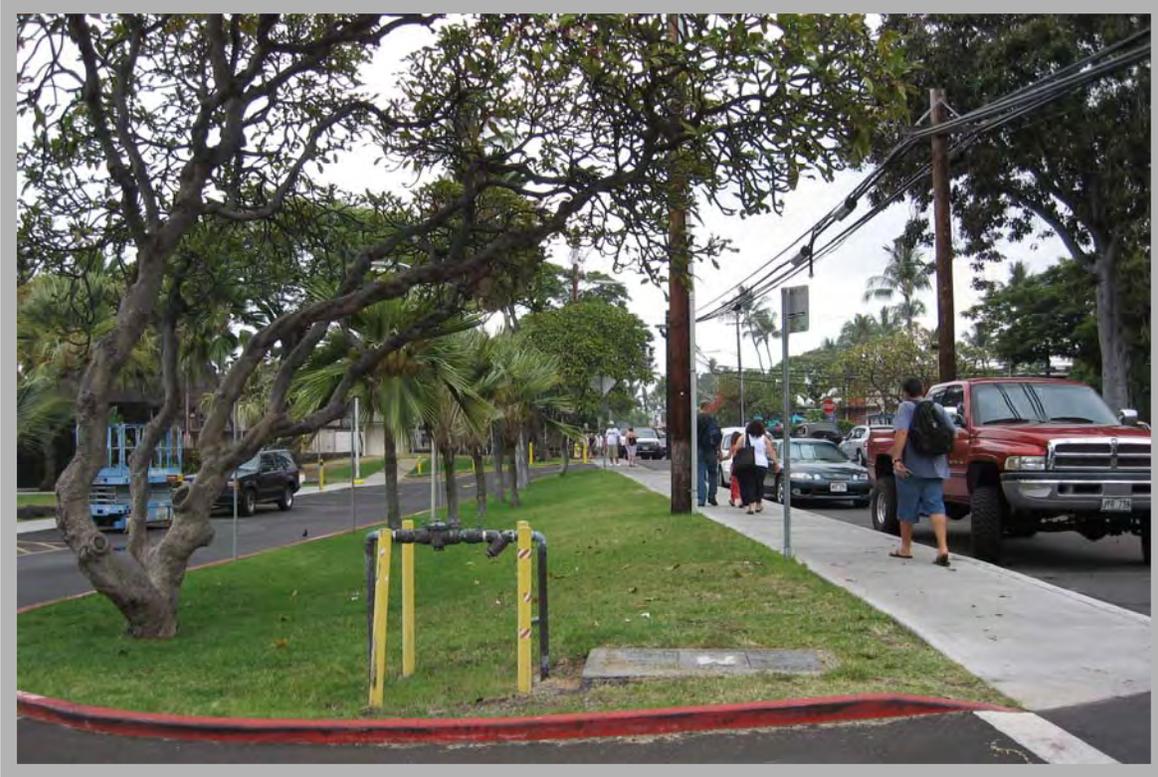


Photo 5: Fronting Hale Halawai – Center section (makai side, facing north).



Photo 6: Seawall along Oneo Bay with fast lands (facing south).

**ALII DRIVE IMPROVEMENTS ALONG ONEO BAY  
HUALALAI ROAD TO WALUA ROAD**

**PHOTOS**

Photos  
5-6



Photo 7: Seawall along Oneo Bay during storm conditions. Source: West Hawaii Today, January 16, 2004.



Photo 8: Base of seawall showing rocky conditions

**ALII DRIVE IMPROVEMENTS ALONG ONEO BAY  
HUALALAI ROAD TO WALUA ROAD**

**PHOTOS**

Photos  
7-8

flashing yellow lights, one in each direction, warn drivers that pedestrians are crossing the roadway.

### **3.15 Air Quality**

As required by the Clean Air Act, National Ambient Air Quality Standards (AAQS) were established by the U.S. Environmental Protection Agency (USEPA) for seven major air pollutants: carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), ozone (O<sub>3</sub>), particulate matter smaller than 10 microns (PM<sub>10</sub>) and particulate matter smaller than 2.5 microns (PM<sub>2.5</sub>), sulfur dioxides (SO<sub>x</sub>), and lead. The State of Hawaii has also established its own standards for these pollutants. The State AAQS are considerably more stringent than the National AAQS.

Air quality in the project area is currently mostly affected by emissions from mobile sources and natural resources. The primary mobile sources of emission are all types of vehicles which generate pollutants, primarily NO<sub>x</sub> and CO, when traveling or idling. Typically, these pollutants occur near the source and when the vehicles are present.

Volcanic emissions of sulfur dioxide convert into particulate sulfate that causes a volcanic haze (vog) to blanket the area during occasional episodes when wind speeds are low. In most cases, vog levels decrease with higher wind speeds, such as those associated with tradewinds.

The State of Hawaii operates a network of air quality monitoring stations around the State. There are seven quality monitoring stations on the island of Hawaii. The State DOH's nearest air quality monitoring station is located about eight miles away in South Kona on the grounds of Konawaena Elementary School. This station monitors vog in the Kona area and samples SO<sub>2</sub> and PM<sub>2.5</sub>. Regional air quality on Hawaii Island and in the State is generally characterized as relatively clean and low in pollution. The pollutant levels remain well below both State and Federal ambient air quality standards for all pollutants monitored. The State DOH's 5-year trends of air quality data for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, and CO from 2003 to 2007 indicate levels are within standards which further confirm this determination (State DOH, October 2008).

### **3.16 Noise**

Predominant sources of noise include vehicles traveling along Alii Drive within the project limits. Noise would also be associated with pedestrians and recreational users along the project limits.

### **3.17 Archaeological and Cultural Resources**

An archeological inventory survey of the project limits was conducted to determine archaeological resources and identify possible constraints to improvements which might be proposed. This section is a summary of the key findings from the studies conducted by Haun & Associates, Keaau, Hawaii. The complete report is in Appendix F.

The survey area extended to approximately 50 feet from the edge of the travel lane on either side of Alii Drive roadway. The objective of the survey was to satisfy historic preservation regulatory review requirements of the State of Hawaii Department of Land and Natural Resources (DLNR) State Historic Preservation Division (SHPD).

The survey identified three sites with nine features. The identified sites are comprised of one single feature site (Site 24019) and two complexes of features (Site 24020 and 24021). The features consist of a wall, an enclosure, two subsurface cultural deposits, three papamu, and two petroglyphs. Figure 3-3 shows the archaeological site location map.

Based on previous archeological work and historic documentary research, the identified sites and features conform to the site and feature types expected in the kula zone of the Kona Field System. The Site 24019 wall is a relatively high and core-filled indicating a probable association with cattle ranching. The wall may have been initially constructed in the mid-to late 1880s, and probably was used and maintained until the mid-1900s. The enclosure at Site 24020 is probably a historic habitation based on its relationship to the Site 24019 ranch wall, portable remains, and interior pavement. Site 24021 is a probable prehistoric to early historic site and consists of petroglyphs and papamu.

All three sites are assessed as significant of their informational content. The sites have yielded information important for understanding late prehistoric to historic land use. The site 24021 petroglyphs are additionally assessed as significant as a good site type example. The mapping, written description, and photography at site 24019 adequately document it and no further work or preservation is recommended. Site 24020 retains the potential to yield information important for understanding prehistoric land use and is recommended for mitigation through data recovery. The work would be done in accordance with a Data Recovery Plan prepared for DLNR SHPD review and approval.

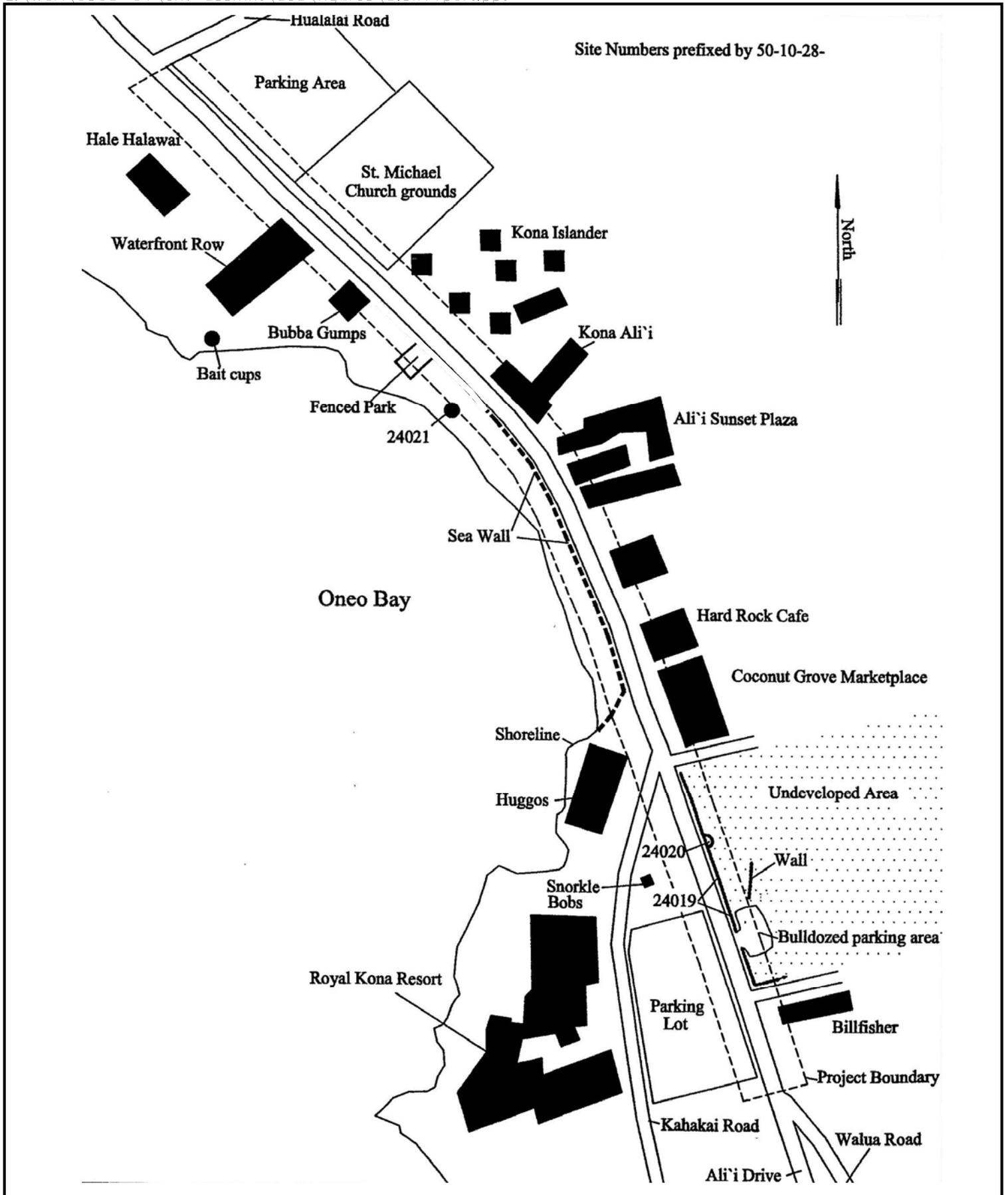
Section 106 Consultation will be initiated as part of the Draft EA process.

### **3.18 Socioeconomic Considerations**

The Alii Drive Improvements project site is located along the Kona Coast within the Kailua Census Designated Place (CDP). The 2000 Census provides information about the CDP, which is a designation used by the U.S. Census

Bureau to collect data on a community basis. The State and the County of Hawaii do not provide similar information for their population estimates. As such, the 2000 Census is the most recent information about Kailua.

A comparison between Kailua CDP and the County of Hawaii shows: 1) The Kailua CDP represents about 6.6 percent of the total County population; 2) The percentage of white population in the Kailua CDP is higher than the percentage of the County; 3) The percentage of Native Hawaiian and Pacific Islanders in the Kailua CDP is about one-half of the percentage of the County; 4) The percentage of the population in the labor force is higher in the Kailua CDP and in the County; 5) The median family income for the Kailua CDP is about 0.4% higher than the County.



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY –  
HUALALAI ROAD TO WALUA ROAD

ARCHAEOLOGICAL SITE LOCATION MAP

Figure  
3-3

<b>Table 3-3: Demographic Characteristics: Kailua CDP, 2000</b>				
<b>Subject</b>	<b>Kailua CDP</b>		<b>County of Hawaii</b>	
	<b>Number</b>	<b>Percent</b>	<b>Number</b>	<b>Percent</b>
<b>Total population</b>	<b>9,870</b>	<b>100.00</b>	<b>148,677</b>	<b>100.00</b>
<b>AGE</b>				
Under 5 Years	747	7.6	9,130	6.1
18 years and over	7,172	72.7	109,825	73.9
65 years and over	985	10.0	20,119	13.5
Median age (years)	35.5	--	38.6	--
<b>RACE (one race)</b>				
White	3,815	38.7	46,904	31.5
Black or African American	45	0.5	698	0.5
American Indian and Alaska Native	45	0.5	666	0.5
Asian	1,804	18.3	16,724	11.2
Native Hawaiian and other Pacific Islander	1,299	13.2	39,702	26.7
Some Other Race	190	1.9	1,695	1.1
<b>PERCENT IN LABOR FORCE (population 16 years and over)</b>	5,283	71.1	70,791	61.7
<b>MEDIAN FAMILY INCOME IN 1999 (dollars)</b>	46,657	--	46,480	--
<i>Source: Census 2000, U.S Census Bureau</i>				

### 3.19 Infrastructure

#### 3.19.1 Water

The County of Hawaii Department of Water Supply (DWS) provides water service to the properties along the alignment within the project limits.

#### 3.19.2 Sewer

The properties along the alignment are connected to the County Sewer System. Wastewater generated along the project site is conveyed by a series of sewer lines and pump stations to the Kealakehe Wastewater Treatment Plant. There is a sewer line under Alii Drive within the project limits. The County of Hawaii

Department of Environmental Management (DEM) would like to determine missing sewer laterals and subouts and include them as part of the improvements. However, due to the limited types of improvements which can be funded under the TE program, DEM will have to provide separate funding for the sewer improvements.

### **3.19.3 Electrical, Telephone and Cable Television Systems**

The existing electric power and telecommunication facilities on Alii Drive are installed overhead on wood poles. These overhead lines serve as the main electric power, telephone and cable television distribution systems on Alii Drive, between Kailua-Kona and Keauhou. Residential and commercial buildings located along and in the proximity of Alii Drive obtain all of their electric power, telephone and cable television services from these overhead lines.

The wood cross arms at the top of the wood poles support three horizontally spaced bare aluminum conductors energized at 12,470 volts. This circuit is Hawaii Electric Light Company's (HELCO) primary distribution backbone along Alii Drive between Kailua-Kona and Keauhou. Some of the wood poles support gray cylindrical cans of various sizes just below the 12,470 volt lines. These cylindrical cans are distribution transformers. Aerial electrical secondary conductors are supported below the transformers and are attached directly to the wood poles.

The County of Hawaii street lights are presently mounted on bracket arms attached to the wood poles.

Telephone and cable television cables are attached to the wood poles at a minimum of six feet below the electrical secondary cables. The telephone cables and cable television cables are Hawaiian Telcom's and Oceanic Time Warner Cable's distribution backbone system along Alii Drive. These cables are either supported on wood cross arms or attached directly to the wood poles.

Electric power, telephone and cable television services are predominantly overhead. In some cases, these services are installed in underground PVC or galvanized steel pipe conduits via vertical risers at the wood poles. These

conduits allow service cables to run underground from the overhead line on the pole to a building's point of service attachment.

Underground placement of the utility poles within the project limits provides an excellent opportunity to enhance and improve the travel and walk ways along Alii Drive. In addition, removal of the overhead lines would greatly enhance the views by removing the cluttered look along this densely developed area of Kailua-Kona.

## **4. ENVIRONMENTAL CONSEQUENCES**

### **4.1 Climate**

#### **4.1.1 No Action Alternative**

Under the No Action Alternative, no construction emissions would occur and the air quality around the project site area would remain the same.

#### **4.1.2 Proposed Action**

The proposed improvements will not affect regional climate.

### **4.2 Geology and Topography**

#### **4.2.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and the topography around the project site area would remain the same.

#### **4.2.2 Proposed Action**

Construction of the proposed improvements will require excavation of a trench for placement of the underground electrical and related systems. The total depth of the trench will be about 4 feet deep and about 3 feet wide to allow placement of the conduits. Once the systems have been installed and tested, the excavated trench will be backfilled with approved material and the area will be restored to its former use. No impact on the geology or overall topography of the project site is anticipated during the construction of the proposed improvements.

Trenching to a depth of 4 feet will not create an adverse impact to the geology or overall topography in this area of Kailua-Kona. Similarly, construction of the seawall will not create an adverse impact to the geology.

### **4.3 Soils and Agricultural Lands**

#### **4.3.1 Soils**

##### **4.3.1.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and the soil conditions around the project site area would remain the same.

##### **4.3.1.2 Proposed Action**

No adverse impacts on soils at the project site are anticipated with the proposed improvements as most of the affected area consists of paved roadway, for the electrical system, or will be constructed of fill material for the gravity seawall. In addition, excavation activities associated with construction of the proposed project will be regulated by the County's grading ordinance.

#### **4.3.2 Agricultural Lands**

##### **4.3.2.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and the soil conditions around the project site area would remain the same.

##### **4.3.2.2 Proposed Action**

The project site is fully developed with urban type uses and the area is not classified in the ALISH maps. The underground electrical system will be constructed within the travel way of Alii Drive. The new gravity seawall will be constructed makai of the existing roadway. Neither area contains agricultural uses. No adverse impacts on agricultural lands are anticipated with the proposed improvements.

### **4.4 Hazardous Wastes**

#### **4.4.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

#### **4.4.2 Proposed Action**

The proposed project will not introduce hazardous waste materials to the project area.

#### **4.5 Volcanic Hazards**

##### **4.5.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

##### **4.5.2 Proposed Action**

Mauna Loa will continue to erupt in the future, perhaps every few decades. The project site and surrounding areas are subject to risks associated with such eruptions and associated lava flows, although no flows have occurred in the recent past.

To protect structures subject to seismic activity, the County of Hawaii in 1991 adopted the International Conference of Building Officials' (ICBO) Uniform Building Code (UBC). The purpose of the seismic provisions in the UBC is primarily to safeguard against major structural failures and loss of life, not to limit damage or maintain functions. Structures are to be designed and constructed as a minimum to resist the effects of ground motions from seismic events. The site seismic hazard characteristics in the UBC are based on the seismic zone and proximity of the site to active seismic sources. The proposed project will be constructed to those standards.

#### **4.6 Coastal Environment**

##### **4.6.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

##### **4.6.2 Proposed Action**

Due to the rocky nature of the shoreline and seafloor, there should be minimal physical impacts from the new gravity seawall along the Oneo Bay shoreline.

The aquatic resources study showed there is no sand transport in the near shore area of Oneo Bay. Also, coral growth is sparse in the nearshore because of the high wave energy that can impact the coast. Along the two shoreline segments where the seawall is close to 10 feet from the water, proposed improvements entails work in navigable waters, will require a permit issued by the U.S. Army Corps and a water quality certification from the State Department of Health.

In addition, the coastal strand surveys revealed the preserve of native and early Polynesian introduced plant species. None of the plant species encountered in the survey are listed as threatened or endangered, or otherwise considered rare or special by the USFWS or by the Department of Land and Natural Resources (DLNR). See also Section 3.11.

Lastly, the marine resources survey found the fishes and macroinvertebrates typical for an energetic surge zone in an otherwise protected bay, none of the plants or animal species encountered are listed as threatened or endangered by the USFWS or DLNR. See also Section 3.11.

## **4.7 Hydrology**

### **4.7.1 Ground Water**

#### **4.7.1.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

#### **4.7.1.2 Proposed Action**

Construction activities are not likely to introduce to, nor release from the soil any materials which could adversely affect groundwater, including groundwater sources for domestic use. No adverse impacts to groundwater underlying the project site are anticipated during construction of the underground electrical systems or the gravity seawall.

Construction material wastes will be appropriately disposed at off-site areas and prevented from leaching into receiving bodies of water. Dewatering is not anticipated for this project.

## **4.7.2 Surface Water**

### **4.7.2.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

### **4.7.2.2 Proposed Action**

No adverse impacts to streams or natural drainage systems at the project site are anticipated with the proposed improvements. Excavation activities associated with the underground electrical will be regulated by the County's sediment and erosion control ordinance and the National Pollutant Discharge Elimination System (NPDES) permit requirements administered by the Department of Health (DOH). The ordinance and NPDES permit will establish the necessary measures to prevent adverse impacts from surface runoff during construction. The measures are to capture and contain sediment from trenching activities within the construction area.

Construction materials wastes will be appropriately disposed of and must also be prevented from leaching into receiving bodies of water.

## **4.7.3 Coastal Waters**

### **4.7.3.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

### **4.7.3.2 Proposed Action**

Minor impacts to coastal waters at the project site are anticipated with the proposed improvements. Construction of the new gravity seawall will be done from the shore. During construction, the contractor will be required to place a silt

curtain parallel to the shoreline to contain any silt or other material which might be released by the construction.

Typically, the silt curtain consists of a floating boom or other flotation device, a fabric curtain, and weights at the bottom of the curtain. The curtain will contain silt and other debris within the floating section so that the material is not released to coastal waters. Use of a silt curtain is generally accepted as a method to contain silt and debris during construction along the shoreline.

Trenching activities associated with the underground electrical will need to meet County of Hawaii standards and be subject to the County Erosion and Sedimentation Control Ordinance. In addition, the trenching will be subject to the NPDES permit requirements administered by the DOH.

Excess excavated construction materials not used as backfill will be appropriately disposed of off-site. Disposal off-site will ensure no adverse impacts to off-shore waters.

Construction materials wastes will be appropriately disposed of at an approved off-site location and must also be prevented from leaching into receiving bodies of water.

## **4.8 Flood Hazard**

### **4.8.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

### **4.8.2 Proposed Action**

Long-term impacts on the risk of flood hazard due to the proposed improvements are not anticipated. Once placement of the underground utility system is complete, the trench will be backfilled and the roadway returned to existing conditions. Thus, there will be no change to base elevation conditions. Based on this, there should be no change to the existing flood hazard conditions along Alii Drive.

The gravity seawall will be constructed makai of the existing seawall and will include a re-curved concrete cap, to minimize over topping during high wave conditions. Based on this, there should be no change to the coastal flood hazard conditions.

## **4.9 Biological Resources**

### **4.9.1 Flora and Fauna**

#### **4.9.1.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. There would be no impacts to flora and fauna in the area.

#### **4.9.1.2 Proposed Action**

Since the project site does not provide a unique habitat in the area, no impacts on floral and faunal species are anticipated. No candidate, proposed, or listed threatened or endangered species will be disturbed. The incorporation of landscaping following construction will re-attract birds such as those presently found on the site.

The underground placement of the electrical and other systems would require removal and replacement of the light poles with new luminaries. To reduce the possibility that seabirds flying at night may be disoriented by street lights and collide with man-made structures, external lighting needs to be shielded. This mitigation would minimize the threat of disorientation of birds. The County of Hawaii Code Chapter 14, Article 9, applies to the installation of outdoor lighting fixtures within the County. Under Chapter 14, Class II lighting means all outdoor lighting used for illumination of walkways and roadways. The Code further sets forth shielding requirements for the lighting. DLNR, Division Forestry and Wildlife also provides guidelines for related lighting fixtures.

## **4.10 Marine Resources and Water Quality**

### **4.10.1 Coastal Strand**

#### **4.10.1.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. There would be no impacts to the coastal strand.

#### **4.10.1.2 Proposed Action**

Temporary sediment control measures will be used during construction of the underground electrical trenching to prevent runoff to nearby areas, including to the adjacent parcels and to off-shore areas. These mitigation measures will include placement of a silt fence or gravel or sand bags around the excavated areas to prevent surface runoff into adjacent areas. The sediment control measures will contain surface flows within the project site during the construction period, and/or remove sediment from surface flows.

During construction of the seawall, the contractor will need to place a floating boom and silt curtain parallel to the shoreline to contain any silt or other material which might be released by the construction. The following Best Management Practices (BMPs) could also be incorporated:

- Any construction-related debris that may pose entanglement hazard to marine protected species should be removed from the project site.
- Areas used for storage of construction material should be enclosed by silt fences or other measures to ensure containment of runoff.
- Discharge of material should be contained to protect nearby marine waters.

Construction of the underground utility system will occur within the roadway of Alii Drive. The temporary sediment control measures such as silt fences or gravel or sandbags, will be used to trap silt in surface flows from entering coastal

waters. Moreover, since the trenching work will most likely be done in short sections, there should not be impacts from runoff to coastal waters.

The gravity seawall will be constructed makai of the existing seawall. During construction of the seawall, floating booms and silt curtains will be used to protect against silt and debris from entering the coastal waters. This mitigation measure will protect marine resources found in Oneo Bay.

#### **4.10.2 Marine Resources**

##### **4.10.2.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. There would be no impacts to marine resources.

##### **4.10.2.2 Proposed Action**

Temporary sediment control measures will be used during construction of the underground electrical trenching to prevent runoff to nearby areas, including to the adjacent parcels and to off-shore areas. These mitigation measures will include placement of a silt fence or gravel or sand bags around the excavated areas to prevent surface runoff into adjacent areas. The sediment control measures will contain surface flows within the project site during the construction period, and/or remove sediment from surface flows.

During construction of the seawall, the contractor will need to place a floating boom and silt curtain parallel to the shoreline to contain any silt or other material which might be released by the construction. The following BMPs could also be incorporated:

- Any construction-related debris that may pose entanglement hazard to marine protected species should be removed from the project site.
- Areas used for storage of construction material should be enclosed by silt fences or other measures to ensure containment of runoff.

- Discharge of material should be contained to protect nearby marine waters.

Construction of the underground utility system will occur within the roadway of Alii Drive. The temporary sediment control measures such as silt fences or gravel or sandbags, will be used to trap silt in surface flows from entering coastal waters. Moreover, since the trenching work will most likely be done in short sections, there should not be impacts from runoff to coastal waters.

The gravity seawall will be constructed makai of the existing seawall. During construction of the seawall, floating booms and silt curtains will be used to protect against silt and debris from entering the coastal waters. This mitigation measure will protect marine resources found in Oneo Bay.

### **4.10.3 Water Quality**

#### **4.10.3.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. There would be no impacts to water quality.

#### **4.10.3.2 Proposed Action**

Temporary sediment control measures will be used during construction of the underground electrical trenching to prevent runoff to nearby areas, including to the adjacent parcels and to off-shore areas. These mitigation measures will include placement of a silt fence or gravel or sand bags around the excavated areas to prevent surface runoff into adjacent areas. The sediment control measures will contain silt materials within the project site during the construction period, and/or remove sediment from surface flows.

Construction of the underground utility system will occur within the roadway of Alii Drive. The temporary sediment control measures such as silt fences or gravel or sandbags, will be used to trap silt in surface flows from entering coastal waters. Moreover, since the trenching work will most likely be done in short sections, there should not be impacts from runoff to coastal waters.

During construction of the seawall, the contractor will need to place a floating boom and silt curtain parallel to the shoreline to contain any silt or other material which might be released by the construction. The following BMPs could also be incorporated:

- Any construction-related debris that may pose entanglement hazard to marine protected species should be removed from the project site.
- Areas used for storage of construction material should be enclosed by silt fences or other measures to ensure containment of runoff.
- Discharge of material should be contained to protect nearby marine waters.

The gravity seawall will be constructed makai of the existing seawall. During construction of the seawall, floating booms and silt curtains will be used to protect against silt and debris from entering the coastal waters. This mitigation measure will protect marine resources found in Oneo Bay.

#### **4.11 Scenic Characteristics**

##### **4.11.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. The existing utility poles and overhead lines along the makai side of Alii Drive will continue to create a cluttered look and detract from the scenic views, especially along Oneo Bay.

##### **4.11.2 Proposed Action**

The underground placement of utility lines within the project limits provides an excellent opportunity to enhance the scenic character of this area of Kailua-Kona, and to improve the travel and walk ways along Alii Drive. Removal of the utility poles and overhead lines would greatly enhance the views by removing the cluttered look along this densely developed area of Kailua-Kona.

As previously discussed, the existing utility poles at several locations are located within the pedestrian walkway. This condition often forces pedestrians to use the

travel way when encountering others using the walkway. Thus, in addition to enhancing scenic conditions, removal of the utility poles would greatly enhance and improve pedestrian movement along Alii Drive.

## **4.12 Traffic**

### **4.12.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. There would be no impacts to traffic.

### **4.12.2 Proposed Action**

Traffic impacts related to construction activities will occur while equipment and materials are moved to the project site and during underground placement of the utilities and construction of the seawall. However, this traffic will be short-term, occurring during the construction period. The construction plans will require traffic control plans during the design phase of the project that will outline the steps needed to minimize congestion and maintain access, including the possibility of night work, to adjacent properties at all times during construction.

Alii Drive provides the north-south access to the coastal areas of Kailua-Kona. The underground electrical work will require closure of sections of Alii Drive to construct the trenching and to place the underground system. During this work, one of the lanes along Alii Drive will have to be closed to travel in the area of construction to allow the contractor a work area. Traffic control would include personnel to control vehicle movements during the time of construction.

Similarly, construction of the seawall will be done from the shore. This will require closure of segments of the makai lane along Oneo Bay while construction takes place. The construction plans for the seawalls will require traffic control plans to maintain traffic flow. Once construction is complete, traffic flow along Alii Drive can be returned to its current conditions.

Freight and passenger loading zones will be kept available during construction.

Once construction is complete, the improvements would not result in the generation of additional vehicle traffic. The improvements would not result in land use changes which would generate in additional vehicle trips along Alii Drive.

## **4.13 Air Quality**

### **4.13.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. There would be no impacts to air quality.

### **4.13.2 Proposed Action**

Potential short-term adverse air-quality impacts during construction include: 1) generation of fugitive dust from vehicle movement and soil excavation; and 2) exhaust emissions from on-site construction equipment and from construction workers' vehicles traveling to and from the project site. These adverse impacts will be short-term during the period of construction.

Dust control measures stipulated by State DOH Administrative Rules, Title 11, Chapter 60, "Air Pollution Control" regulations will be employed during the construction period. These controls consist of wetting down loose soil areas with water, or suitable chemicals; good housekeeping on the job site; and restoration of disturbed areas as soon as possible. Nevertheless, the properties which are anticipated to be affected by air quality impacts during construction are the residences and businesses located within the project limits.

Emissions from construction equipment, trucks and commuting construction workers are not anticipated to significantly impact ambient air quality due to the relatively low level of vehicular activity in comparison to existing traffic conditions. Slow-moving construction vehicles, however, can disrupt peak-hour traffic, increasing congestion and resulting vehicular emissions. Traffic congestion and resulting emissions will be mitigated by transporting slower construction equipment during off-peak traffic hours.

Nitrogen oxide emissions from diesel engines can be relatively high compared to gasoline-powered equipment emissions, but the standard for nitrogen oxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, on the other hand, are very low and should be relatively insignificant compared to normal vehicular emissions from nearby roads.

In the long-term, operation of the proposed improvements will have no minor impact on air quality in the vicinity of the project site.

The proposed improvements would not result in generation of additional vehicular traffic which would generate air pollutants regulated under both State and Federal standards. Carbon monoxide emissions are primarily associated with vehicular traffic which would not be generated by the proposed improvements.

#### **4.14 Noise**

##### **4.14.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

##### **4.14.2 Proposed Action**

In the short-term, noise from construction activities will likely be unavoidable during the entire construction period. Construction will involve excavation for the underground utilities and construction of the seawall. The various construction phases of the project may increase noise levels during construction, which may impact nearby residents and businesses.

Construction noise impacts will be mitigated somewhat by compliance with provisions of the State DOH Administrative Rules, Title 11, Chapter 46, "Community Noise Control" noise control regulations. The permit allows construction to occur from Monday to Friday between 7:00 am until 6:00 pm. Also, the Noise Control Rules set forth the hours of heavy equipment operation and noise curfew times. Otherwise, these rules require a noise permit

(depending on the construction period) if the noise levels from construction activities are expected to exceed the allowable limits set forth in Chapter 46 Rules. Heavy vehicles required for construction must comply with Title, 11 Administrative Rules, Chapter 42, and “Vehicular Noise Control for Oahu.” It shall be the contractor’s responsibility to minimize noise by properly maintaining noise mufflers and other noise-attenuating equipment, and to maintain noise levels within regulatory limits.

In the long-term, the underground utilities will result in no change to the noise levels of this area in Kailua-Kona.

#### **4.15 Archaeological and Cultural Resources**

##### **4.15.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. There would be no impacts to archaeological or cultural resources.

##### **4.15.2 Proposed Action**

The findings of the archaeological inventory survey recommends preservation of Site 24021, petroglyphs and papamu located on the rocky shoreline near the northern end of the existing seawall along Oneo Bay. The proposed seawall has been sited to avoid adverse effects on Site 24021.

Site 24019 and 24020 are located outside of the travel way of Alii Drive. Thus, construction of the underground electrical lines should not affect these sites.

It is also recommended that the initial excavations be monitored because of the potential presence of cultural deposits. The monitoring would be guided by a Monitoring Plan prepared for DLNR SHPD review and approval.

## 4.16 Socioeconomic Considerations

### 4.16.1 No Action Alternative

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same. There would be no socioeconomic impacts.

### 4.16.2 Proposed Action

No impacts on the population in North Kona are anticipated as a result of the proposed project.

In the short term, the construction of the underground lines and seawall may impact businesses along Alii Drive between Hualalai Road and Walua Road, by creating short-term traffic congestion during construction activities, which may deter customers/visitors. Once completed, the removal of the utility poles and overhead lines will enhance pedestrian movements along Alii Drive, which would attract visitors to the area. A higher level of pedestrian activity would provide opportunities for businesses to attract potential customers. The project would have a positive impact by creating construction and construction support jobs.

**Environmental Justice:** Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority and Low Income Populations” signed February 11, 1994, requires Federal agencies to identify and avoid, minimize, or mitigate “disproportionately high and adverse” effects of Federal projects on the health and environment of minority and low income populations.

Table 3-3 “Demographic Characteristics: 2000” describes the population in the Kailua CDP district as 38.7 percent white, compared to 31.5 percent for the County. Asian, Native Hawaiian and Other Pacific Islander comprise 31.4 percent in the Kailua CDP compared to 38.0 percent of the County. Thus, the Alii Drive Improvements would not create a disproportionately high affect on minority populations. Similarly, since the 2000 median income for Kailua CDP is almost the same as the County.

In the short-term businesses located along Alii Drive between Hualalai Road and Walua Road will be affected. Alii Drive is a public road used by the entire population along this area of Kailua-Kona. Underground placement of the utilities and construction of the seawall will be equally available to the entire population. Thus, it is not expected that any minority or low-income populations will experience disproportionate short-term or long-term adverse effects from the proposed project.

With respect to the public participation requirement, public participation was solicited through a public meeting on July 1, 2004 (see Section 7.1)

Potential short-term air quality impacts during construction include generation of fugitive dust and exhaust emissions. During construction, noise from construction activities will likely be unavoidable. Sections 3-15 and 3-16 have detailed information regarding existing conditions, impacts and mitigation measures. The proposed improvements will pose no health risks.

Although surrounding businesses along the project corridor will be affected in the short-term due to construction, all of the relevant provisions of EO 12898 have been satisfied. Public participation was solicited, there are no health risks, and impacts have been avoided, minimized, and mitigated. Therefore, there will be no disproportionate impact to minority and low-income populations.

## **4.17 Infrastructure**

### **4.17.1 Water**

#### **4.17.1.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

#### **4.17.1.2 Proposed Action**

No water service is required for the proposed project. No adverse impacts are anticipated on the existing water system as a result of the construction and operation of the proposed project. Close coordination will be maintained with the

DWS to ensure that the water system will not be adversely impacted by underground placement of the utility lines and to minimize interruption of water services to adjacent areas.

#### **4.17.2 Sewer**

##### **4.17.2.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

##### **4.17.2.2 Proposed Action**

No wastewater service is required for the proposed project. No adverse impacts are anticipated on the existing wastewater system as a result of the construction and operation of the proposed project. Close coordination will be maintained with the DEM during design and construction, to ensure that the sewer system will not be adversely impacted and to minimize interruption of sewer services to adjacent areas.

#### **4.17.3 Electrical, Telephone and Cable Television Systems**

##### **4.17.3.1 No Action Alternative**

Under the No Action Alternative, no construction would occur and conditions around the project site area would remain the same.

##### **4.17.3.2 Proposed Action**

Conversion of the existing overhead lines to an underground system will require construction of new underground electric power, telephone and cable television backbone distribution systems and customer service lines underground. The existing overhead lines will be removed after the underground system is completed.

During design and construction, close coordination will be maintained with HELCO, County DWS and Hawaiian Telcom to ensure that services will not be adversely impacted and to minimize interruption of service to adjacent areas.

Based on this, adverse impacts are not anticipated to the existing electrical, telephone, and cable services as a result of the proposed improvements.

Streetlights will consist of light poles with new luminaries. To reduce the possibility that birds may be disoriented by external lights and collide with man-made structures, it is recommended that any external lighting be shielded. This mitigation would minimize the threat of disorientation of birds. The replacement luminaries will meet County of Hawaii standards (Hawaii County Code Chapter 14 General Welfare Section 14-50 Outdoor Lighting) and DLNR, Division Forestry and Wildlife, guidelines.

Easements will be required for installation of the underground utilities due to the varying width, of the Alii Drive right-of-way.

#### **4.18 Cumulative and Secondary Impacts**

##### **4.18.1 Cumulative Impacts**

Cumulative impacts are effects on the environment which result from the incremental impact of a project when added to past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individual minor but collectively significant projects taking place over a period of time.

This assessment results discussed incorporated the two phases planned to be implemented for the proposed improvements to Alii Drive which involves the underground placement of utility lines and landscape enhancements and the seawall extension.

A residential and retail project located immediately south of Coconut Grove along Alii Drive, has received zoning and special management area approval. The project design was reviewed by the Kailua Village Design Commission.

The County is also proposing to extend Nani Kailua Drive from Hualalai Road to Alii Drive in two phases (makai and mauka phase). The priority is to construct the makai segment from Alii Drive (terminus located between Walua Road and Kahakai Road) to Kuakini Highway. The County is currently in the planning

phase of the project and anticipates completing the EA and preliminary engineering designs by June 2010. This road will provide a much needed mauka-makai access for Kailua Village.

In the event that both projects begin construction around the same time, the County shall coordinate with the appropriate agencies the minimize any impacts to the surrounding area. No significant cumulative impacts are anticipated as a result of the proposed project.

#### **4.18.2 Secondary Impacts**

Secondary Impacts, or indirect effects, are effects which are caused by an action and are later in time or farther removed from distance, but are still reasonably foreseeable. Such efforts may include growth inducing impacts and other effects related to changes in land use patterns, population density or growth rate, and related effects on air, water, and other natural systems. The proposed improvements are expected to have minimal secondary impacts on resident population, land use patterns, public facilities and infrastructure, and the natural environment.

Construction of this project is expected to generate only minor short-term impacts associated with these activities. Creation of short-term construction jobs are not expected to generate a substantial number of workers. It is anticipated that local contractors on Hawaii or within the State of Hawaii would likely be used for the project's construction. These workers would thus have minimal if any effect on the County's residential population or housing demand.

The project involves improvements to the corridor, therefore minimal secondary effects to infrastructure are expected. Thus, improvements would provide needed facilities making such areas more attractive to the public, accessible, and convenient for various users. The improvements would not increase use of the corridor and would not generate substantial secondary affects increasing infrastructure demands, necessitating off-site improvements, constraining public facilities, or influence population growth. The project objectives are intended to enhance the viewing along Alii Drive and provide additional space for the public to use.

This project should not affect the County's resident population growth projected within the region, and thus not generate the associated secondary effects on infrastructure, public facilities, and housing. Although the improvements would enhance this area, these improvements would not greatly influence decisions for people choosing to in-migrate to Hawaii or the Kailua-Kona area.

#### **4.19 Compliance With Federal Requirements**

Development of the Alii Drive Improvements project would include use of Federal funds through the U.S. Department of Transportation, FHWA. Consequently, this project needs to be consistent with various Federal statutory and regulatory requirements.

##### **4.19.1 Section 106 Consultation, National Historic Preservation Act**

This project is considered a Federal "undertaking" subject to Section 106 consultation under the National Historic Preservation Act (NHPA), as amended (16 U.S.C. 470(f)). Section 106 consultation procedures are defined by the Advisory Council on Historic Preservation (ACHP) under the regulations 36 CFR Part 800, Protection of Historic Properties.

Section 3-17 discusses the results of an archaeological inventory survey conducted within the project limits. The archaeological inventory survey results identified historic sites within the project limits and in adjacent areas. These sites include cultural deposits, papamu, and petroglyphs. Section 3-17 discusses these features in greater detail.

Section 106 consultation will be initiated as part of the Draft EA process.

##### **4.19.1.1 Impacts and Mitigation Measures**

The archaeological inventory survey recommends preservation of Site 24021. The location of the seawall has been sited to avoid adverse effects on Site 24021. Site 24019 and 24020 are located outside of the travel way of Alii Drive. Thus, construction of the underground utility services should not affect these sites.

#### **4.19.2 Section 7 Consultation, Endangered Species Act**

This project is considered a Federal Action and subject to consultation under the Endangered Species Act, as amended (16 U.S.C. Sec. 1531). Section 7 of the ESA requires consultation with the USFWS and National Marine Fisheries. Consultation will be required with the National Marine Fisheries and USFWS.

Section 7 consultation will be initiated as part of the Draft EA process.

##### **4.19.2.1 Impacts and Mitigation Measures**

Since the project site does not provide a unique habitat in the area, no adverse impacts on floral and faunal species are anticipated. No candidate, proposed, or listed threatened or endangered species will be disturbed. The incorporation of landscaping following construction will re-attract birds such as those presently found on the site.

The underground placement of the electrical and other systems would also include removal and replacement of the light poles with new luminaries. To reduce the possibility that birds may be disoriented by external lights and collide with man-made structures, it is recommended that any external lighting be shielded. This mitigation would minimize the threat of disorientation of birds. The replacement luminaries will meet County standards (Hawaii County Code Chapter 14 General Welfare Section 14-50 Outdoor Lighting) and DLNR, Forestry and Wildlife guidelines.

#### **4.19.3 Executive Order 11990 Protection of Wetlands**

In 1977, Executive Order 11990 was issued to “minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.” Executive Order 11990 requires Federal agencies, in their planning actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided.

##### **4.19.3.1 Impacts and Mitigation Measures**

There are no wetlands present within the project limits that would be affected by the Alii Drive Improvements. Consequently, the project would not affect or result in the loss or destruction of wetlands.

#### **4.19.4 Executive Order 11988 Floodplain Management**

Executive Order 11988 (May 1977) requires Federal agencies to avoid the extent possible the long and short-term impacts associated with the occupancy and modifications of floodplains. It also requires agencies to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

##### **4.19.4.1 Impacts and Mitigation Measures**

The project area is along the shoreline and located within designated floodplains based upon the FIRM. As discussed in Section 3-10, the proposed improvements should not have significant impact on these floodplains nor alter floodplains in the surrounding area.

Long-term impacts on the risk of flood hazard due to the proposed improvements are not anticipated. Once placement of the underground utility system is complete, the trench will be backfilled and the roadway returned to existing conditions. Thus, there will be no change to base elevation conditions. Based on this, there should be no change to the existing flood hazard conditions along Alii Drive.

The gravity seawall will be constructed makai of the existing seawall and will include a re-curved concrete cap, to minimize outcropping during high wave conditions. Based on this, there should be no change to the coastal flood hazard conditions.

##### **4.19.5 Coastal Zone Management Act**

The purpose of the Coastal Zone Management Act (CZMA) of 1972, as amended (16 U.S.C. §1451 et seq.) is to encourage States to manage and conserve coastal areas as a unique, irreplaceable resource. Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs.

The State's Coastal Zone Management policies and regulations are prescribed under Chapter 205A, Hawaii Revised Statutes. The coastal zone management area is defined to include all lands of the State and the area extending seaward from the shoreline to the limit of the State's management authority. As a result, the project corridor is within the CZM area and subject to being consistent with the CZM program objectives and policies. In summary, the project would be consistent with these objectives and policies as discussed in Section 5.3.5.

#### **4.19.6 Section 4(f) Evaluation of the DOT Act**

Section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C. 303 and 23 U.S.C. 138 (referred to as Section 4(f)) permits the use of publicly owned park land, recreational area, wildlife and waterfowl refuge, or land of an historic site of National, State, or local significance for a transportation project only if: 1) there is no prudent and feasible alternative to using that land; and 2) the project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use. The purpose of Section 4(f) requirements is to preserve significant parkland recreation areas, refuges, and historic and archaeological sites by limiting the circumstances under which such land can be used for transportation projects.

##### **4.19.6.1 Impacts and Mitigation Measures**

The proposed improvements would not result in a taking of public park land for transportation or highway purposes. The landscape enhancements within the Hale Halawai area would remain for public recreational purposes and would not change the public use of the property. The landscape enhancements would not result in taking or constructive use as defined by Section 4(f).

Site 24021 is recommended for preservation. The location of the seawall has been sited to avoid adverse effects on Site 24021. Site 24019 and 24020 are located outside of the travel way of Alii Drive. Thus, construction of the underground electrical should not affect these sites.

## 5. RELATIONSHIP TO LAND USE, POLICIES AND CONTROLS

### 5.1 Hawaii State Plan

The Hawaii State Plan, adopted in 1978 and revised in 1988, now set forth as Chapter 226, Hawaii Revised Statutes, Hawaii State Planning Act, states, among a number of purposes, that the plan shall serve as a guide for the future long-range development of the State; identify the goals, objectives, policies, and priorities for the State; provide a basis for determining priorities and allocating limited resources. The Alii Drive Improvements project supports and is consistent with the following State Plan objectives and policies:

Section 226-12 Objective and policies for the physical environment – scenic, natural beauty, and historic resources.

*(b)(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.*

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

The purpose for the Alii Drive Improvements project is to provide pedestrian, landscaping, and scenic view improvements along Alii Drive from Hualalai Road to Walua Road. The project proposes to add a new 10-foot concrete sidewalk and places utility lines underground. The proposed project will improve pedestrian access and improve the scenic views by removing utility poles and overhead utility lines.

Section 226-17 Objective and policies for facility systems – transportation.

*(b)(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment.*

Alii Drive, is used by motorists to reach retail, commercial, resort, recreational, and residential areas south of Kailua Village. The adjacent sidewalks along Alii

Drive are used by pedestrians to reach a number of retail and commercial businesses in this densely developed section of Kailua-Kona. The purpose for the Alii Drive Improvements project is to provide pedestrian, landscaping, and scenic view improvements along Alii Drive from Hualalai Road to Walua Road. This project provides an opportunity for the County of Hawaii to identify and implement pedestrian, landscaping, and scenic enhancements to Alii Drive.

## **5.2 State Land Use District**

The Hawaii Land Use Law of Chapter 205, Hawaii Revised Statutes, classifies all land in the State into four land use districts: Urban, Agriculture, Conservation, and Rural. The land within the project limits is located in the Urban District classification (see Figure 5-1).

## **5.3 County of Hawaii**

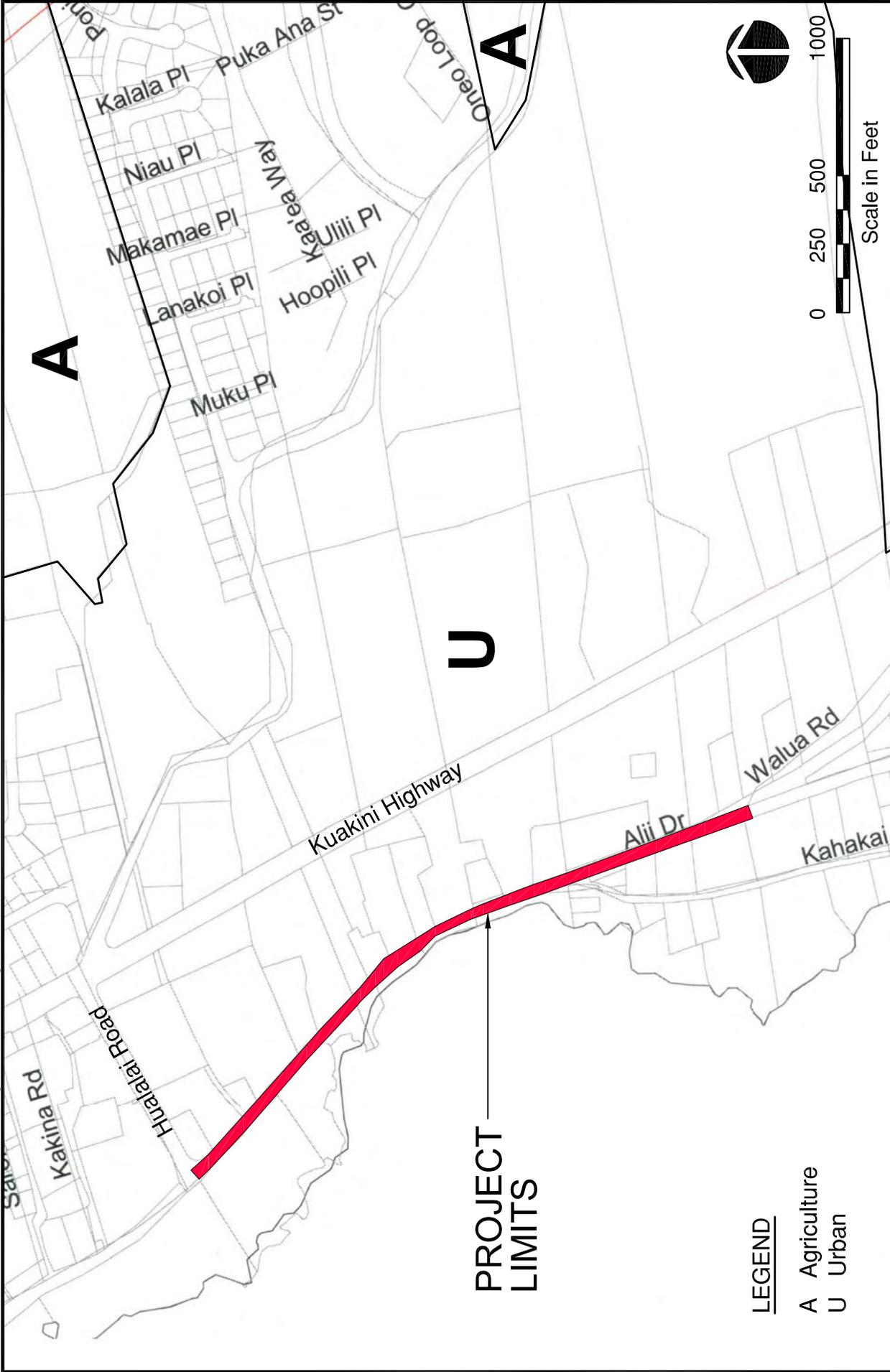
### **5.3.1 County of Hawaii General Plan**

The County of Hawaii General Plan is a policy document for the long-range comprehensive development of the island of Hawaii and also provides the direction for future growth of the County. The current General Plan was adopted as Ordinance 05-25 which became effective on February 9, 2005 and repeals the previous plan adopted on November 14, 1989.

The General Plan included an assessment of the General Plan elements relative to new data, laws, and methods of analysis. Each study element was then analyzed and evaluated in relation to all other elements, County and district goals, and the land use pattern. A total of 21 study elements are set forth in the General Plan. The proposed improvements are in consonance with the following objectives and policies of the General Plan:

#### *Natural Beauty*

*Policy a: Increase public pedestrian access opportunities to scenic places and vistas.*



ALII DRIVE IMPROVEMENTS ALONG ONEO BAY HUALALAI ROAD TO WALUA ROAD

# STATE LAND USE DISTRICT MAP

FIGURE 5-1

*Policy b: Develop and establish view plan regulations to preserve and enhance views of scenic or prominent landscapes from specific locations, and coastal aesthetic values.*

Comment: The purpose for the Alii Drive Improvements project is to provide pedestrian, landscaping, and scenic view improvements along Alii Drive from Hualalai Road to Walua Road. The project proposes to add a new 10-foot concrete sidewalk and place utility lines underground. The proposed project will improve pedestrian access and improve the scenic views by removing the overhead utility lines.

#### Recreation

*Policy o: Develop facilities and safe pathway systems for walking, jogging, and biking activities.*

Comment: The purpose for the Alii Drive Improvements project is to provide pedestrian, landscaping, and scenic view improvements along Alii Drive from Hualalai Road to Walua Road. The project proposes to add a new 10-foot concrete sidewalk to accommodate pedestrians and bicyclists. The walkway space will be designed to American with Disabilities Act (ADA) requirements. The proposed project will improve pedestrian access by removing the utility poles.

#### Transportation – Roadways

*Policy n: Encourage the development of walkways, jogging and bicycle paths within designated areas of the community.*

Comment: The purpose for the Alii Drive Improvements project is to provide pedestrian, landscaping, and scenic view improvements along Alii Drive from Hualalai Road to Walua Road. The project proposes to add a new 10-foot concrete sidewalk to accommodate pedestrians and bicyclists. The walkway space will be designed to ADA requirements. The proposed project will improve pedestrian access by removing the utility poles.

### **5.3.2 Kona Community Development Plan**

The County of Hawaii General Plan requires that community development plans be adopted by the County Council for each judicial district in the County. It is intended to provide detail to the elements presented in the General Plan and emphasize those elements most relevant to the issues and conditions of the specific area plan.

The County Council recently approved the Kona Community Development Plan in September 2008. An objective of the Kona CDP is to develop a multi-modal transportation system to encourage walking, biking, transit and other non-vehicular modes of travel. This multi-modal system also needs to be attractive, safe, and accessible. The Kona CDP designates Alii Drive, from Hualalai Road to Walua Road as a secondary transit route and pedestrian route (sidewalk exclusive for pedestrians).

Comment: The purpose for the Alii Drive Improvements project is to provide safe pedestrian access, landscaping, and scenic views along Alii Drive from Hualalai Road to Walua Road. The project proposes to add a new 10-foot concrete sidewalk to accommodate pedestrians and bicyclists. The walkway space will be designed to ADA requirements. The proposed project will improve pedestrian access and improve the scenic views by removing the overhead utility lines.

### **5.3.3 County of Hawaii Zoning**

The County of Hawaii zoning is primarily Resort/Hotel District (V), along the project limits. There are two exceptions to this zoning, Hale Halawai and the makai side of the Alii Drive along Oneo Bay which have Open zoning designation, and near Walua Road which has RM multi-family designation.

### **5.3.4 Kailua Village Design Plan**

In 1988, the County of Hawaii prepared the Kailua Village Design Plan to guide the Kailua Village Design Commission, the County of Hawaii Planning Department, the Planning Commission, the County council and other governmental agencies in addressing urban design issues for Kailua Village. The Kailua Village Special District extends from the Old Kona Industrial area on the north, to the Walua Road-Kuakini Highway intersection on the south, and to

lands between the shoreline and Queen Kaahumanu Highway, which would encompass the project limits.

Circulation:

The 1988 Plan proposed actions to affect the circulation patterns. The actions aimed to (1) implement the Alii Drive and Kuakini Highway proposals noted in the 1976 Plan with some right-of-way modifications; (2) divert north and south bound traffic not having the Village as a destination onto Queen Kaahumanu Highway; (3) provide alternative routes alleviating the anticipated increase traffic volume at the Queen Kaahumanu Highway and Palani Road intersection; and (4) accommodate the pedestrian.

In the discussion of pedestrians, the 1988 Plan noted in the Village, Hualalai Road, Alii Drive, Kuakini Highway, and Likana Road would have sidewalks. However, these sidewalks generally do not favor the pedestrian as they are characterized by inconsistencies in width, paving material, separation from vehicular traffic and orientation.

The 1988 Plan included a number of circulation proposals to improve the pedestrian environment and visual experience along the Village streets. One of the proposals was to “move the roadway pavement of Alii Drive in the vicinity of Oneo Bay within the present right-of-way to widen the makai sidewalk area and construct pedestrian safety barriers”.

Comment: The purpose for the Alii Drive Improvements project is to provide safe pedestrian access, landscaping, and scenic views along Alii Drive from Hualalai Road to Walua Road. The project proposes to add a new 10-foot concrete sidewalk to accommodate pedestrians and bicyclists. The walkway space will be designed to ADA requirements. The proposed project will improve pedestrian access and improve the scenic views by removing the overhead utility lines.

Special Design Treatment Areas

Landscape features, particularly along Alii Drive, symbolize a major attribute in capturing and retaining the “Kona Way of Life”. The trees and plants are an important ingredient in unifying the diverse activities along this shoreline area

and creating a casual and intimate environment for both pedestrians and patrons of businesses.

The 1988 Plan identifies several areas where special treatments, such as landscaping would be the prominent environmental trait, and Alii Drive is one of the areas that have been singled out. The following were proposed in the 1988 Plan.

- *Present segments of Alii Drive along the seawall and Oneo Bay provide an opportunity for a pleasant pedestrian experience. Appropriate pedestrian and landscaping improvements can integrate these two segments of Alii Drive into a pleasurable, shaded, and safe pedestrian experience along Alii Drive.*
- *Alii Drive from Hualalai Road to Huggo's Restaurant lacks any cohesive or distinctive character conducive to a pleasant pedestrian experience. This section of Alii Drive is used extensively by tourists and residents approaching the Village core from the Kona Hilton Hotel area. There is an absence of shade trees and an inadequate pedestrian walkway through this section of the Village.*
- *The pedestrian walkway along Oneo Bay could be improved by moving the roadway pavement mauka within the present right-of-way to widen the makai walkway and creating a planter areas for coconut trees. This proposal would require omitting any sidewalk on the mauka side of Alii Drive unless sidewalks were provided inside private property lines in this are. Crosswalks could be provided at selected locations.*

Comment: The purpose for the Alii Drive Improvements project is to provide safe pedestrian access, landscaping, and scenic views along Alii Drive from Hualalai Road to Walua Road. The project proposes to add a new 10-foot concrete sidewalk to accommodate pedestrians and bicyclists. The walkway space will be designed to ADA requirements. The proposed project will improve pedestrian access and improve the scenic views by removing the overhead utility lines.

The landscaping proposed are plants that are in the "suggested plant list" in the 1988 Plan.

### **5.3.5 County of Hawaii Special Management Area**

The Coastal Zone Management Act contains the general objectives and policies upon which all counties within the State have structured specific legislation which created Special Management Areas (SMA). Any development within the Special Management Area boundary requires a SMA Use permit which is administered by the County of Hawaii. The proposed project site is located within the County's SMA. The proposed project is, nevertheless, in consonance with the following applicable objectives, policies and guidelines for the issuance of the SMA permit:

#### **Recreational Resources**

*Objective: Provide coastal recreational opportunities accessible to the public.*

*Policy B (iii): Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value*

Comment: The purpose for the Alii Drive Improvements project is to provide safe pedestrian access, landscaping, and scenic views along Alii Drive from Hualalai Road to Walua Road. The project proposes to add a new 10-foot concrete sidewalk to accommodate pedestrians and bicyclists. The walkway space will be designed to ADA requirements. The proposed project will improve pedestrian access and improve the scenic views by removing the overhead utility lines.

The proposed project will not affect recreational activities off-shore.

#### **Historic Resources**

*Objective: Protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*

*Policy A: Identify and analyze significant archaeological resources*

*Policy B: Maximize information retention through preservation of remains and artifacts or salvage operations; and*

*Policy C: Support state goals for protection, restoration, interpretation, and display of historic resources.*

Comment: An archeological inventory survey of the project limits was conducted to determine archaeological resources and identify possible constraints to improvements which might be proposed (see Section 3.15).

The survey identified three sites with nine features. The identified sites are comprised of one single feature site (Site 24019) and two complexes of features (Site 24020 and 24021). The features consist of a wall, an enclosure, two subsurface cultural deposits, three papamu, and two petroglyphs (as shown in Figure 3-3).

Site 24021 is recommended for preservation. The location of the seawall has been sited to avoid adverse effects on Site 24021. Sites 24019 and 24020 are located outside of the travel way of Alii Drive. Thus, construction of the underground electrical should not affect these sites.

It is also recommended that the initial excavations of any future development be monitored because of the potential presence of cultural deposits. The monitoring would be guided by a Monitoring Plan prepared for DLNR SHPD review and approval.

### **Scenic and Open Space Resources**

*Objective: Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.*

*Policy A: Identify valued scenic resources in the coastal zone management area*

*Policy B: Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.*

*Policy C: Preserve, maintain and where desirable, improve and restore shoreline open space and scenic resources.*

Comment: The purpose for the Alii Drive Improvements project is to provide safe pedestrian access, landscaping, and scenic views along Alii Drive from Hualalai Road to Walua Road. The proposed project will improve pedestrian access and improve the scenic views by removing the overhead utility lines.

### **Coastal Ecosystems**

*Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.*

*Policy A: Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources.*

Comment: Excavation activities associated with construction of the proposed improvements will be regulated by the County's Sediment and Erosion Control Standards and Guidelines and the NPDES permit requirements administered by DOH. The grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities. A NPDES Individual Permit for Storm Water Associated With Construction Activity will be required to control storm water discharges should the area of soil disturbance from activities such as clearing and grubbing, grading and stockpiling be in excess of 1 acre. The permit requires compliance with a BMP plan, which, in turn, requires compliance with County ordinances. The BMP plan typically includes appropriate structural or non-structural mitigative methods that would control the discharge of storm water runoff resulting from construction activities.

### **Economic Uses**

*Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.*

*Policy B: Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed,*

*and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area.*

Comment: In the short-term, the proposed improvements may affect the retail/commercial stores located along Alii Drive, between Hualalai and Walua Roads. The proposed project would provide short-term benefits in the form of construction jobs. In the long-term, the proposed project will have no adverse effects on the economy of Kona. The proposed project will enhance the pedestrian experience along this segment of Alii Drive.

### **Coastal Hazards**

*Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.*

*Policy A: Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards*

Comment: Due to the rocky nature of the shoreline and seafloor, there should be minimal physical impacts from the new gravity seawall along the Oneo Bay shoreline. The aquatic resources study showed there is no sand transport in the near shore area of Oneo Bay. Also, coral growth is sparse in the nearshore because of the high wave energy that can impact the coast. Along the two shoreline segments where the seawall is close to 10 feet from the water, proposed improvements entails work in navigable waters, will require U.S. Army Corps and State Department of Health permit requirements.

### **Managing Development**

*Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.*

*Policy B: Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements.*

*Policy C: Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle*

*and in terms understandable to the public to facilitate public participation in the planning and review process.*

Comment: In compliance with the SMA Rules and Regulations of the County of Hawaii, required documentation will be filed with the County's Department of Planning in conjunction with the SMA permit application which will be subject to a public hearing and decision by the County Council.

Preparation and processing of this environmental assessment is intended to communicate potential short and long-term impacts of the proposed project.

### **Public Participation**

*Objective: Stimulate public awareness, education, and participation in coastal management.*

*Policy B: Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organization concerned with coastal issues, developments, and government activities.*

Comment: The public will be afforded an opportunity to review and comment on the EA pursuant to the requirements of Chapter 343 Hawaii Revised Statutes and Section 11-200 of Title 11 Department of Health Administrative Rules. In addition, the public participation objective will be addressed during the process of the SMA Permit which will include public notification, as well as a public hearing. On July 1, 2004, a public meeting was held at the King Kamehameha Hotel to discuss the Alii Drive Improvements project and solicit comments regarding the proposed improvements (see Section 7.1).

### **Beach Protection**

*Objective: Protect beaches for public use and recreation.*

*Policy A: Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion.*

*Policy C: Minimize the construction of public erosion-protection structures seaward of the shoreline.*

Comment: The project is not anticipated to adversely impact any beaches or shoreline resources.

**Marine Resources**

*Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.*

*Policy D: Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources.*

Comment: The project is not anticipated to adversely impact any marine resources.

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## **6. FINDINGS AND ANTICIPATED DETERMINATION**

To determine whether a proposed action may have a significant effect on the environment, the State Approving Agency and Federal Lead Agency need to consider every phase of the action, the expected primary and secondary consequences, cumulative effect, and the short and long-term effects. The Approving Agency's review and evaluation of the proposed action's effect on the environment would result in a determination whether 1) the action would have a significant effect on the environment, and an Environmental Impact Statement Preparation Notice should be issued, or 2) the action would not have a significant effect warranting a Finding of No Significant Impact (FONSI).

### **6.1 Preliminary Findings Under State Chapter 343, HRS**

This section discusses the results of the assessment conducted for the proposed project in relation to the 13 Significance Criteria prescribed under the State Department of Health's Administrative Rules Title 11, Chapter 200. The purpose of this assessment was to consider the "significance" of potential environmental effects which includes the sum of effects on the quality of the environment along with the overall and cumulative effects. The resulting findings are discussed below.

- 1) *Involve an irrevocable commitment to loss or destruction of any natural or cultural resources;*

The proposed project limits does not provide habitat for Federal or State of Hawaii listed or candidate threatened or endangered species of flora or fauna. Thus, the proposed improvements will not result in the loss or destruction of natural resources.

An archeological inventory survey of the project limits was conducted to determine archaeological resources and identify possible constraints to improvements, which might be proposed (see Section 3.17).

The survey identified three sites with nine features. The identified sites are comprised of one single feature site (Site 24019) and two complexes of features (Site 24020 and 24021). The features consist of a wall, an enclosure, two

subsurface cultural deposits, three papamu, and two petroglyphs (as shown in Figure 3-3).

Site 24021 is recommended for preservation. The location of the seawall has been sited to avoid adverse effects on Site 24021. Site 24019 and 24020 are located outside of the travel way of Aii Drive. Thus, construction of the underground electrical should not affect these sites.

It is also recommended that the initial excavations of any future development be monitored because of the potential presence of cultural deposits. The monitoring would be guided by a Monitoring Plan prepared for DLNR SHPD review and approval.

2) *Curtail the range of beneficial uses of the environment;*

The proposed improvements will use lands which are currently developed.

3) *Conflict with the State's long-term environmental policies or goals as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;*

The proposed improvements do not conflict with long-term environmental policies, goals, and guidelines of the State of Hawaii. As presented in this EA, the project's potential adverse impacts are associated with short-term construction-related activities and can be mitigated through adherence to standard construction mitigation practices.

4) *Substantially affect the economic or social welfare of the community or state;*

In the short-term, the proposed improvements may affect the retail/commercial stores located along Aii Drive, between Hualalai and Walua Roads. The proposed project would provide short-term benefits in the form of construction jobs. In the long-term, the proposed project will have no adverse effects on the economy of Kona. The proposed project will enhance the pedestrian experience along this segment of Aii Drive.

5) *Substantially affect public health;*

No impacts to the public's health and welfare are anticipated.

6) *Involve substantial secondary impacts, such as population changes or effects on public facilities;*

No secondary impacts are anticipated with the construction or operation of the proposed project.

7) *Involve a substantial degradation of environmental quality;*

Construction activities associated with the proposed improvements are anticipated to result in short-term impacts to noise, air quality, and traffic in the immediate project vicinity. With the incorporation of the recommended mitigation measures prior to and during construction period, the project will not degrade environmental quality.

The proposed project limits does not provide habitat for Federal or State of Hawaii listed or candidate threatened or endangered species of flora or fauna. Thus, the proposed improvements will not result in the loss or destruction of natural resources.

Site 24021 is recommended for preservation. The location of the seawall has been sited to avoid adverse effects on Site 24021. Site 24019 and 24020 are located outside of the travel way of Alii Drive. Thus, construction of the underground electrical should not affect these sites.

It is also recommended that the initial excavations of any future development be monitored because of the potential presence of cultural deposits. The monitoring would be guided by a Monitoring Plan prepared for DLNR SHPD review and approval.

No significant impacts to coastal waters at the project site are anticipated with the proposed improvements. Excavation and grading activities associated with the proposed improvements will be regulated by the County's grading ordinance and the National Pollutant Discharge Elimination System (NPDES) permit requirement administered by the DOH.

Construction materials wastes will be appropriately disposed of and must also be prevented from leaching into receiving bodies of water.

- 8) *Have a cumulative effect upon the environment or involves a commitment for larger actions;*

The proposed improvements are not anticipated to have a considerable cumulative effect upon the environment.

- 9) *Affect a rare, threatened or endangered species;*

The proposed project limits does not provide habitat for Federal or State of Hawaii listed or candidate threatened or endangered species of flora or fauna. Thus, the proposed improvements will not result in the loss or destruction of natural resources.

- 10) *Detrimentially affect air or water quality or ambient noise levels;*

Operation of construction equipment would increase noise and exhaust emission levels in the immediate vicinity of the project site. After the construction is completed the proposed project will contribute almost no additional noise or air emissions to the local area.

- 11) *Affects or likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, beach, erosion-prone area, geographically hazardous land, estuary, fresh water or coastal water;*

Long-term impacts on the risk of flood hazard due to the proposed improvements are not anticipated. Once placement of the underground utility system is complete, the trench will be backfilled and the roadway returned to existing conditions. Thus, there will be no change to base elevation conditions. Based on this, there should be no change to the existing flood hazard conditions along Alii Drive.

The gravity seawall will be constructed makai of the existing seawall and will include a re-curved concrete cap, to minimize outcropping during high wave conditions. Based on this, there should be no change to the coastal flood hazard conditions.

- 12) *Substantially affect scenic vistas and viewplanes identified in county or state plans or studies;*

The existing utility poles and overhead lines along the makai side of Alii drive creates a cluttered look and detracts from the scenic views especially along Oneo Bay. The underground placement of the lines within the project limits provides an excellent opportunity to enhance and improve the travel and walk ways along Alii Drive. In addition, the removal of the overhead lines would greatly enhance the views by removing the cluttered look along this densely developed area of Kailua-Kona.

- 13) *Require substantial energy consumption.*

Construction and operation will not require substantial increase in energy and consumption

## **6.2 Federal Determination**

**Section 4(f) of the Department of Transportation Act (49 U.S.C. §303):** The proposed project will not require the use of publicly owned land of a park, recreation area, or wildlife and waterfowl refuges.

**Land and Water Conservation Fund Act (PL 88-578; 16 U.S.C. §4601-4604):**

The project limits do not include lands which involve funds from the Lands and Water Conservation Fund Act.

**Endangered Species Act (as amended, 16 U.S.C. §1531 et seq.):** The project site does not provide unique habitat in the area. No significant impacts on floral and faunal species are anticipated.

**U.S. Department of Transportation Coast Guard Permit:** The U.S. Department of Transportation U.S. Coast Guard reviews plans for projects which are constructed across reaches of navigable waterways. Under 33 CFR Part 115.70, the Commandant of the Coast Guard has been given advanced approval to the locations and plans of bridges to be constructed across reaches of waterway navigable in law, but not actually navigated other than by logs, log rafts, rowboats, canoes, and small motorboats. Projects meeting the criteria for advanced approval will not require a Coast Guard permit. Projects not meeting the criteria will require a permit from the Coast Guard. The construction plans will be submitted to the Coast Guard for review.

**Executive Order 11990 Protection of Wetlands:** There are no wetlands along the project limits.

**Executive Order 11988 Floodplain Management:** Based on the Flood Insurance Rate Map (FIRM), Community Panel Number 155166 0713 D (revised May 16, 1994) the project site is located within the following four zones (see Figure 3-2):

- Approximately 250 feet at the northern end of the project limits is in Zone X, Areas of 500-Year flood;
- About 700 feet is located in Zone AE Special Flood Hazard Areas Inundated by 100-Year Flood, base flood elevations determined. After this segment about 50 feet is located in Zone X.
- The remaining 1,440 feet is in Zone X Other Areas, Areas determined to be outside 500-year flood plain.

- The area makai of Alii Drive is located in Zone VE Special Flood Hazard Areas Inundated by 100-Year Flood, Coastal flood with velocity hazard (wave action); base flood elevation determined.

Long-term impacts on the risk of flood hazard due to the proposed improvements are not anticipated. Once placement of the underground utility system is complete, the trench will be backfilled and the roadway returned to existing conditions. Thus, there will be no change to base elevation conditions. Based on this, there should be no change to the existing flood hazard conditions along Alii Drive.

The gravity seawall will be constructed makai of the existing seawall and will include a re-curved concrete cap, to minimize outcropping during high wave conditions. Based on this, there should be no change to the coastal flood hazard conditions.

**Executive Order 12898 Environmental Justice in Minority Populations and Low Income Populations:** The proposed project will improve the character of the area and will not result in adverse environmental impacts affecting the surrounding community. Therefore, no disproportionate adverse impacts on any group of identifiable by factors such as race, ethnicity, or socio-economic is anticipated.

**Subchapter V, Federally Assisted Programs (42 U.S.C. §2000d):** Adherence to the requirements of 42 U.S.C. 2000d should be considered in the preliminary planning and priority to the funding for any highway improvements. Funding for projects should be implemented to ensure that the priority does not exclude or subject any person or persons to discrimination for any Federally funded project.

**State of Hawaii Department of Business, Economic Development & Tourism, Office of Planning Coastal Zone Management Consistency Determination:** A Federal agency activity within the coastal zone that affects any land or water use or natural resource of the coastal zone is required to be carried out in a manner consistent with the state's management program. The FHWA, as a Federal agency, is required to provide a Consistency Determination

(16 U.S.C. 33 Section 1456) to the DBEDT Office of Planning before final approval of a project.

**Sole Source Aquifers (Section 1424(e) of Safe Drinking Water Act (PL 93-523, 42 U.S.C. 300 et Seq.):** According to the Sole Source Aquifer Map for Region 9 found at the Environmental Protection Agency's (EPA) website, the project site is not located within the EPA-designated Sole Source Aquifer area.

**Wild and Scenic Rivers Act (P.L. 90-542, as amended; 16 U.S.C. 1271-1287):** According to the Wild and Scenic Rivers Act found at the National Wild and Scenic Rivers website, no rivers in Hawaii have been designated as components of the National Wild and Scenic Rivers System.

**Clean Air Act(42 U.S.C. 7401-7671(q)):** According to the State Department of Health's (DOH) 2007 Annual Summary Hawaii Air Quality Data, "Air quality in the State of Hawaii continues to be one of the best in the nation and criteria pollutant levels remain well below state and federal ambient air quality standards." No air pollutants that may be generated at the project site are anticipated to exceed federal or State ambient air quality standards in the vicinity.

**Farmland Protection Policy Act (PL 97-98; 7 U.S.C. 4201):** The project site is not used for agricultural production.

## **7. LIST OF REQUIRED PERMIT APPROVALS**

### **Federal:**

U.S. Army Corps

### **State:**

Department of Health, NPDES Individual Permit

Conservation District Use Permit

### **County:**

Special Management Area Permit

Shoreline Setback Variance

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## 8. CONSULTATION

### 8.1 Public Meeting

On July 1, 2004, a public meeting was held at the King Kamehameha Hotel to discuss the Alii Drive Improvements project and solicit comments regarding the proposed improvements. Prior to the public meeting, notices were mailed to the landowners, property managers, and other interested parties to notify them of the time and place of the meeting. In addition, a County news release about the project and the meeting was sent to the local newspapers and other media.

The public meeting was well attended with a total of about 40-45 attendees. The public notice and meeting notes are included in Appendix G.

### 8.2 Pre-Assessment Consultation

The following agencies were consulted during the pre-assessment phase of the Draft Environmental Assessment. Each agency was sent a copy of a project summary and a request for their written comments on the project. Of those who formally replied, some had no comments, while other provided substantive comments as indicated by the ✓ and, ✓✓ respectively. All written comments are reproduced herein. All written comments and responses are reproduced in Appendix H.

#### Federal Agencies

U.S. Department of the Army Corps of Engineers  
U.S. Fish and Wildlife Service

#### State Agencies

Department of Land and Natural Resources, Historic Preservation Division  
Department of Land and Natural Resources, Land Division  
Department of Land and Natural Resources, Commission on Water Resource Management  
Department of Health  
Department of Transportation ✓✓

#### County Agencies

Department Environmental Management ✓✓  
Department of Parks and Recreation  
Planning Department ✓✓  
Department of Research and Development  
Police Department ✓

Fire Department✓  
Department of Water Supply✓

Others

Hawaii Electric Light Company  
Hawaiian Telcom  
Oceanic Time Warner Cable

**8.3 Parties Consulted During Draft EA**

The following agencies and organizations will be consulted and comments solicited for the Draft EA.

Federal

U.S. Department of the Army Corps of Engineers  
U.S. Fish and Wildlife Service  
U.S. Geological Survey  
National Oceanic and Atmospheric Administration, National Marine Fisheries Service  
U.S. Coast Guard

State Agencies

Civil Defense  
Department of Business, Economic Development and Tourism (DBEDT)  
Office of Planning, DBEDT  
Department of Hawaiian Home Lands  
Department of Health (DOH)  
Environmental Planning Office, DOH  
Environmental Management, DOH  
Department of Land and Natural Resources (DLNR)  
State Historic Preservation Division, DLNR  
SHPD, Hawaii Island Office, DLNR

Land Division, Hawaii District, DLNR  
Department of Transportation  
Office of Hawaiian Affairs  
Office of Environmental Quality Control, DOH

County of Hawaii Agencies

Civil Defense

Department of Environmental Management

Fire Department

Department of Parks and Recreation

Planning Department

Police Department

Department of Water Supply

Officials

Senator Josh Green, M.D.

Representative Denny Coffman

Representative Cindy Evans

Councilwoman Brenda Ford

Public Utilities

Hawaii Electric Light Company

Organizations

Kona Kohala Chamber of Commerce

Kona Traffic Safety Committee

Kailua Village Business Improvement District

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21. Executive Order 11988 Floodplain Management, May 24, 1977, 42 FR 26971.

22. Executive Order 12898 Environmental Justice in Minority Populations and Low Income Populations, February 11, 1994, 59 FR 7629.

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# Appendix A

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Requesting Approval for Underground  
Placement of Utilities,  
County of Hawaii, April 16, 2001

JÁ LINGLE  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
869 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813-5097

MAY 2 5 2004

RODNEY K. HARAGA  
DIRECTOR

Deputy Director  
BRUCE C. MCCURE  
LINDSEY M. WATERS  
LINDSEY M. WATERS  
BRANKA S. BERGUCHI

IN REPLY REFER TO:

HWY-DD 2.4129

Mr. Bruce C. McClure, P.E., Director  
Department of Public Works  
County of Hawaii  
Aupuni Center  
101 Pauahi Street, Suite 7  
Hilo, Hawaii 96720-4224

Attention: Mr. Galen Kuba

Dear Mr. McClure:

Subject: Alii Drive Improvements Along Oneo Bay (Hualalai to Waiua Road)  
Undergrounding of Utilities  
FHWA Transportation Enhancement Program  
Federal-Aid Project No. STP-0186(2)

Your request for concurrence to allow undergrounding of the existing overhead utilities of the subject project is granted on the following basis:

1. Limited right-of-way to accommodate pedestrian facilities on both sides of the road.
2. Undergrounding of the utility poles is a safety corrective measure to reduce roadside hazards and to comply with the current ADA requirements.

If you have any questions, please contact Ursula Calbero of our Design Section, Design Branch, Highways Division and reference HWY-DD 2.4129 as noted above.

Very truly yours,

RODNEY K. HARAGA  
Director of Transportation

c: FHWA (C. Chew)  
Kona Traffic Safety Committee  
Wilson Okamoto Corporation (John Sakaguchi)

Berry Kim  
1/6/04



County of Hawaii  
DEPARTMENT OF PUBLIC WORKS

Aupuni Center  
101 Pauahi Street, Suite 7 - Hilo, Hawaii 96720-4224  
(808) 961-6321 Fax (808) 961-6360

April 14, 2004

MR. RODNEY HARAGA  
DIRECTOR OF TRANSPORTATION  
869 PUNCHBOWL STREET  
HONOLULU HI 96813-5097

SUBJECT: ALII DRIVE IMPROVEMENTS ALONG ONEO BAY (Hualalai to Waiua Road)  
UNDERGROUNDING OF UTILITIES  
FHWA Transportation Enhancement Program  
Federal Aid Project No. STP-0186(2)

Alii Drive along Oneo Bay is the primary travel way for residents and visitors to see this portion of the Kona coast, and presents a unique opportunity for the County to provide a transportation enhancement project. From a public perspective, undergrounding of the existing overhead utilities is a critical element for this enhancement project. As such, in accordance with DIR 1.009 dated February 15, 2001 we are asking for your concurrence to allow this undergrounding work before we proceed with our public involvement process and the development of our Environmental Assessment. We are making this request based on the following:

1. Alii Drive along Oneo Bay has an extremely narrow right-of-way. With the ocean on one side and existing developments on the other, the right-of-way is too narrow (30-foot wide average width) to support pedestrian facilities on both sides of the road. The right-of-way presently contains a 23-foot wide pavement and a 6-foot wide paved shoulder on the ocean side with no County owned shoulders or pedestrian facilities on the opposite side. However, a private walkway, used by the public, does exist on the maaka side within private properties.
2. There are twenty-nine (29) utility poles within the project limits. Sixteen (16) poles are in the paved roadway or shoulders with seven (7) poles causing non-compliance with ADA accessible route requirements.

County of Hawaii is an Equal Opportunity Provider and Employer.  
Complaints of discrimination should be sent to USDA, Director, Office of Civil Rights, Washington, D.C. 20250-9410  
Or call (202) 720-5964 (voice and TDD)

H:\Engineering Division Data\Commitment Services\Project\Oneo Bay TE Project\Letters 04\_wpd\file1

6468-01

Bruce C. McClure  
Director  
Ronald K. Takahashi  
Deputy Director

BT  
7/6

cc: HMIUWA,  
VA FAX  
4/27/04

RECEIVED  
JUN - APR 15 2004  
WILSON OKAMOTO CORPORATION

RECEIVED  
MAY 27 2004  
WILSON OKAMOTO CORPORATION

cc: H MIUWA, VIA  
FAX 6/2/04

JS

BT  
PP

6/1/04

Mr. Rodney Haraga  
April 14, 2004  
Page 2 of 2

Harry Kim  
Mayor



Dennis K. W. Lee  
Director  
Jiro A. Sumada  
Deputy Director

## County of Hawaii

DEPARTMENT OF PUBLIC WORKS  
25 Aupuni Street, Room 302 - Hilo, Hawaii 96720-4232  
(808) 961-8321 • Fax: (808) 961-8639

RECEIVED  
APR 18 2004

WILSON OKAMOTO & ASSOC., INC

April 16, 2001

BRIAN K MINAAI  
DIRECTOR OF TRANSPORTATION  
869 PUNCHBOWL STREET  
HONOLULU HI 96813-5097

SUBJECT: ALII DR IMPROVEMENTS ALONG ONEO BAY (Hualalai to Waiua Road)  
FHWA Transportation Enhancement Program  
Federal Aid Project No. STP-0186(2)

3. FHWA has concurred that undergrounding of the utility poles is a safety corrective measure to reduce roadside hazards and to meet current ADA requirements for this project.

4 Relocation of the existing poles would require extensive land acquisition and/or construction of a new seawall to provide necessary roadside clearances. Neither cost was included in our budget estimates.

5. Lastly, relocation of the poles will probably be rejected by the public as undergrounding was specifically identified in our TE application to improve pedestrian safety and enhance the visual quality of Oneo Bay from Alii Drive. Enclosed is a copy of our original application along with letters of support for the project.

A prompt response will be appreciated as we are in the process of scheduling a public meeting.

Should you have any questions, please contact Galen Kuba of my staff at (808)961-8422.

*Bruce C. McClure*  
BRUCE C. MCCLURE, P. E.  
Director of Public Works

Enclosures

c: FHWA - Clifford Chu  
Kona Traffic Safety Committee  
Wilson Okamoto - John Sakaguchi

Recently, it had been brought to our attention that the State DOT may not approve the burial of overhead utilities for certain TEA21 projects. Because elimination of overhead lines is absolutely necessary for the improvement of the view plane over Onco Bay and the enhancement of pedestrian and bicycle facilities through this narrow section of Alii Drive, we request your confirmation that this is still a valid FHWA project.

As a transportation enhancement project, we believe that it is more than appropriate to fund the burial of unsightly overhead lines in areas such as Onco bay.

Because we are in the fee negotiation process with a consultant, a prompt response will be sincerely appreciated. If you have any questions, please contact Galen Kuba at 961-8327.

*Dennis K. W. Lee*  
DENNIS K. W. LEE, P.E.  
Director of Public Works

c: Councilman Tyler  
Wilson Okamoto & Assoc.  
Eng

BENJAMIN J. CAYETANO  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
669 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813-6097  
MAY 9 - 2001

BRIAN K. MINAIAI  
DIRECTOR  
DEPUTY DIRECTORS  
JAMES C. CHAN  
JASMINE Y. URASAKI

IN REPLY REFER TO:  
HWY-DD 2.2725

Mr. Dennis K. W. Lee, Director  
County of Hawaii  
Department of Public Works  
25 Aupuni Street, Room 202  
Hilo, Hawaii 96720-4252

Dear Mr. Lee:

Subject: Alii Drive Improvements Along Onea Bay, Hualalai to Waiua Road  
Federal-Aid Project No. STP-0186(2)

Thank you for your concern on the undergrounding of utilities for the subject project. The Departmental policy on this matter is governed by the Hawaii Revised Statutes §264-33.5. Under the statute the Director shall allow for undergrounding of utilities if federal highway funds are available for the cost differential between underground and overhead facilities.

Please submit a write-up as explained in the attached copy of our policy (DIR 1.009, dated February 15, 2001). The merits in providing the undergrounding of utilities should also include the safety and maintenance cost-effectiveness due to undergrounding.

If there are any questions, please contact Pratt Kinimaka, Acting Administrator, at 587-2220.

Very truly yours,

*Brian K. Minaiiai*  
BRIAN K. MINAIAI  
Director of Transportation

Attachment

6468-01  
RECEIVED  
FEB 22 2001  
DEPARTMENT OF TRANSPORTATION  
HIGHWAY DD

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION

FEB 16 9 25 AM '01  
DEPT. OF TRANSPORTATION  
HIGHWAYS DIVISION

MEMORANDUM  
February 15, 2001

TO: HWY-DD  
FROM: HWY-D

COPY

DIR 1.009

RECEIVED  
01 FEB 21 10:15  
DESIGN BRANCH  
HIGHWAYS DIVISION  
DEPT. OF TRANSPORTATION

TO: HWY BRANCHES AND DISTRICTS  
FROM: DIR *Brian Minaiiai*  
SUBJECT: POLICY ON UNDERGROUNDING OF UTILITIES

Effective immediately, project managers are not authorized to incorporate the undergrounding of utilities within their respective projects without concurrence from my office. Please be informed that for any project to be considered for the undergrounding of utilities, a write up needs to be provided to warrant such a request. In the write up, please include the following discussions and facts:

1. Design and construction estimate for the project without undergrounding of utilities. Also, provide the funding source;
2. Design and construction estimate for the project with undergrounding of utilities. Also, provide the funding source;
3. A discussion on why the project merits to have undergrounding of utilities incorporated in lieu of overhead replacements; and
4. Any other information to factually support the request.

Thank you for your cooperation and attention on this matter.

cc: PPB, DEP-G, DEP-J, DIR-P

cc: *Branches & Districts 4/20/01 mtg*



# Appendix B

---

Coastal Engineering Analysis for Alii Drive  
Improvements at Oneo Bay, Kailua-Kona, Hawaii

Sea Engineering, Inc.  
July 2005

CAB-01

4/7/04

GFM

copy

Table of Contents

1.0 INTRODUCTION ..... 1

2.0 EXISTING SHORELINE AND NEARSHORE CONDITIONS ..... 3

2.1 SHORELINE ..... 3

2.2 NEARSHORE CONDITIONS ..... 7

3.0 OCEANOGRAPHIC PARAMETERS ..... 12

3.1 TIDES ..... 12

3.2 WINDS ..... 12

3.3 STORMS ..... 19

3.4 TYPICAL WAVES ..... 19

3.5 STORM WAVES ..... 23

4.0 SEAWALL IMPROVEMENT DESIGN CRITERIA ..... 24

4.1 DEEPWATER DESIGN WAVES ..... 24

4.2 NEARSHORE STILL WATER LEVEL RISE ..... 25

4.3 NEARSHORE DESIGN WAVE HEIGHTS ..... 25

4.4 SHORE PROTECTION ALTERNATIVES ..... 26

4.5 WAVE RUNUP ..... 27

4.6 WAVE FORCE ON VERTICAL WALL AND STONE SIZE FOR REVETMENT ..... 29

5.0 SUMMARY ..... 30

REFERENCES ..... 31

PHOTOGRAPHS ..... 32

COASTAL ENGINEERING ANALYSIS FOR  
 ALI'I DRIVE IMPROVEMENTS AT ONEO BAY  
 KAILUA-KONA, HAWAII

June 2003

Prepared for:

Wilson Okamoto & Associates, Inc.  
 1907 South Beretania Street  
 Honolulu, Hawaii 96826

Submitted by:

Sea Engineering, Inc.  
 Makai Research Pier  
 Waiananalo, Hawaii 96795

List of Figures

FIGURE 1. AERIAL PHOTOGRAPH OF PROJECT SITE ..... 2

FIGURE 2. SURVEY PLAN OF PROJECT SITE ..... 4

FIGURE 3. PROFILE 1 ..... 5

FIGURE 4. PROFILE 2 ..... 6

FIGURE 5. PROFILE 3 ..... 8

FIGURE 6. PROFILE 4 ..... 9

FIGURE 7. PROFILE 5 ..... 10

FIGURE 8. A TYPICAL BOTTOM PROFILE ..... 11

FIGURE 9. ANNUAL WIND SPEEDS VS. DIRECTIONS ..... 16

FIGURE 10. ANNUAL WIND SPEEDS VS. DIRECTIONS FOR HOUR 0400 TO 0600 ..... 17

FIGURE 11. ANNUAL WIND SPEEDS VS. DIRECTIONS FOR HOUR 1400 TO 1600 ..... 18

FIGURE 12. A TYPICAL RECURVED-FACE SEAWALL ..... 28

List of Tables

TABLE 1 – ANNUAL WIND PERCENT FREQUENCY ..... 14  
 TABLE 2 – MONTHLY WIND SUMMARY: SEASONAL WIND VARIATIONS AT KEAHOLE AIRPORT, KAILUA KONA ..... 15  
 TABLE 3 – ANNUAL WIND SUMMARY: HOURLY WIND VARIATIONS AT KEAHOLE AIRPORT, KAILUA KONA ..... 15  
 TABLE 4 – WAVE PERCENT FREQUENCY OFF BARBERS POINT, OAHU ..... 20  
 TABLE 5 – WAVE PERCENT FREQUENCY OFF KEAHOLE POINT, HAWAII ..... 21  
 TABLE 6 – WAVE HEIGHT FREQUENCIES (%) AT TWO WATER DEPTH LOCATIONS ..... 22  
 TABLE 7 – WAVE PERIOD FREQUENCIES (%) AT TWO WATER DEPTH LOCATIONS ..... 22  
 TABLE 8 – HISTORIC STORM WAVE CHARACTERISTICS ..... 23  
 TABLE 9 – SELECTED EXTREME DEEPWATER WAVE CHARACTERISTICS ..... 24  
 TABLE 10 – STILLWATER LEVEL RISE ABOVE MSL FOR SELECTED WAVE EVENTS IN FEET ..... 25  
 TABLE 11 – NEARSHORE WAVE HEIGHTS FOR SELECTED WAVE EVENTS IN FEET ..... 26  
 TABLE 12 – WAVE RUNUP ELEVATIONS IN FEET ABOVE MSL ..... 27  
 TABLE 13 – WAVE FORCE ON VERTICAL WALL ..... 29  
 TABLE 14 – STONE SIZE FOR REVETMENT ..... 29

1.0 INTRODUCTION

The project site, Ali'i Drive at Oneo Bay, is located in Kailua-Kona on the west coast of the Island of Hawaii. Ali'i Drive runs parallel to the shore through Kailua-Kona town and is heavily utilized by vehicular and pedestrian traffic. In the vicinity of Oneo Bay the roadway is narrow, and pedestrians essentially walk on the roadway shoulder, separated from vehicle traffic by only a white line. Figure 1 shows an aerial photograph of the project site. Development of this area is underway, and pedestrian traffic is expected to increase. As part of the overall Ali'i Drive improvement project, a new walkway is desired on the makai (ocean) side of the roadway. Since the roadway at Oneo Bay is immediately adjacent to the rocky shoreline, walkway improvements will have to extend seaward of the existing concrete-rubble-masonry (CRM) seawall bordering the existing roadway.

Sea Engineering, Inc. has been contracted to assist Wilson Okamoto & Associates, Inc. with development of a functional concept plan for roadway/walkway improvements along Oneo Bay. Specific work tasks include a physical description of existing shoreline and nearshore conditions, description of the oceanographic setting, analysis of oceanographic design parameters for seawall improvements, and evaluation of shoreline improvement alternatives.

## 2.0 EXISTING SHORELINE AND NEARSHORE CONDITIONS

### 2.1 Shoreline

The project site is an approximately 1000-foot long stretch of Ali'i Drive at Oreo Bay, where the road is immediately adjacent to the shoreline. The shoreline in this area is mostly rocky, consisting primarily of basalt boulders and cobbles, and irregular basalt outcrops. The entire area appears to be underlain by basalt lava substrate that extends offshore. The road is at an elevation of 9 to 12 feet, and is protected from the sea by a CRM seawall that rises about 2 feet above the road elevation. Sea Engineering, in conjunction with the project surveyors, completed 5 survey profiles in the project area perpendicular to the coastline, extending from the seawall to 300 to 400 feet offshore. Figure 2 presents the survey plan of the project area and the profile locations. The shoreline can be subdivided into 6 segments with different characteristics. The boundaries of each segment are illustrated in Figure 2. Each segment is described below, proceeding from the south to the north.

**Segment 1** – The southernmost 100 feet of shoreline in the project site consists of boulders and cobbles bounded on either side by a basalt outcrop (Photo 1). The cobbles and boulders range in size from 4 inches to 2 feet, with an average size of 1 foot. The composition is primarily basalt. Coral cobbles are sparsely scattered among the basalt. The cobbles and boulders extend a distance of about 20-25 feet from the waterline to the base of the seawall at an elevation of about 5 feet. The wall rises to an elevation of about 13.5 feet; the road elevation is about 12 feet. A 6-foot long section of the wall is undetermined (Photo 2) in this shoreline segment. Horizontal cracking along the bottom 1 to 2 feet of the wall is also prevalent in this area. A small patch of sand is located at the north end of the boulders. Bounding both sides of the boulder beach are basalt outcrops that protrude seaward. The outcrops have been built up artificially to elevations of 8 to 10 feet with large basalt blocks and stones up to 6 feet long, and backfilled on the landward side.

The offshore bottom is composed of hard, basalt lava with scattered boulders and cobbles. Figure 3 shows the profile measured at this location. Approximately 240 feet seaward of the seawall, the water depth is about 10 feet. A further 100 feet offshore, there is a submerged outcrop, and the water depth is only 2 to 4 feet.

**Segment 2** – This segment is about 300 feet long and consists of a basalt outcrop extending 23 to 80 feet seaward of the seawall. In the southern half of this segment, large basalt rocks up to 6 feet long and backfill have been placed on the outcrop to create a small patch of land with grass and trees, at an elevation of about 10 feet. Photo 3 shows these large rocks. The northern half of the segment consists of a natural basalt outcrop with scattered boulders extending from the waterline to the base of the wall (Photo 4). The maximum width of the outcrop between the waterline and the seawall is 80 feet. Figure 4 shows the profile measured at this location. The water is 5 feet deep about 150 feet from the seawall, and 10 feet deep about 230 feet from the seawall.

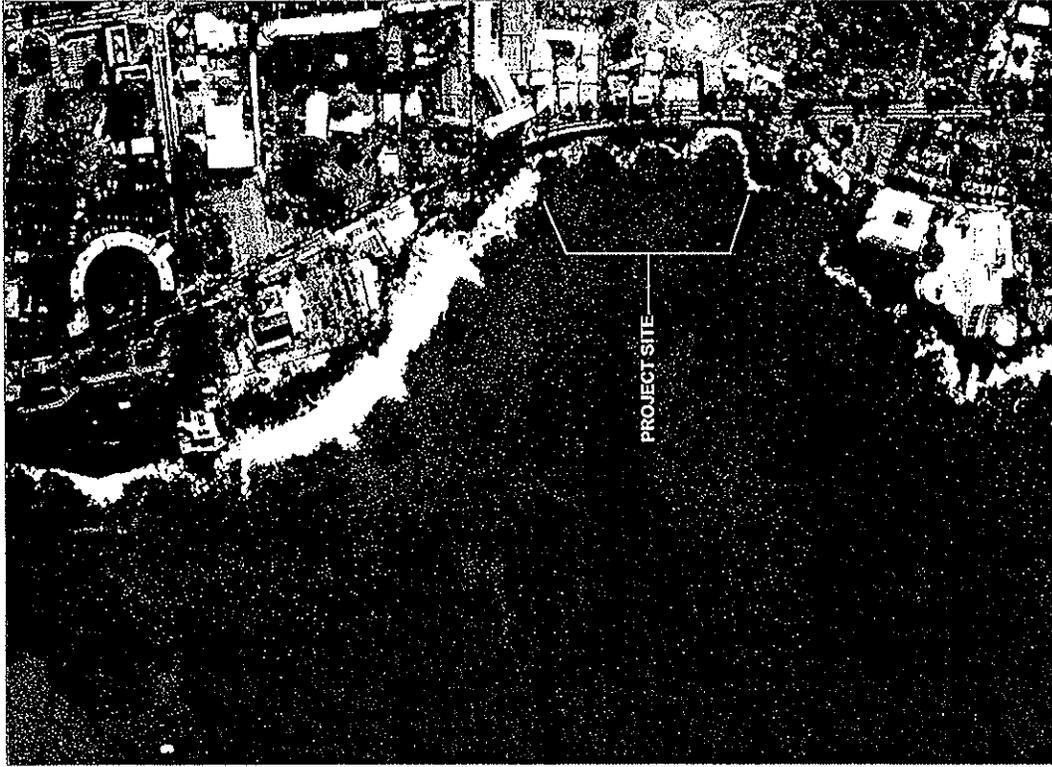


Figure 1. Aerial Photograph of Project Site

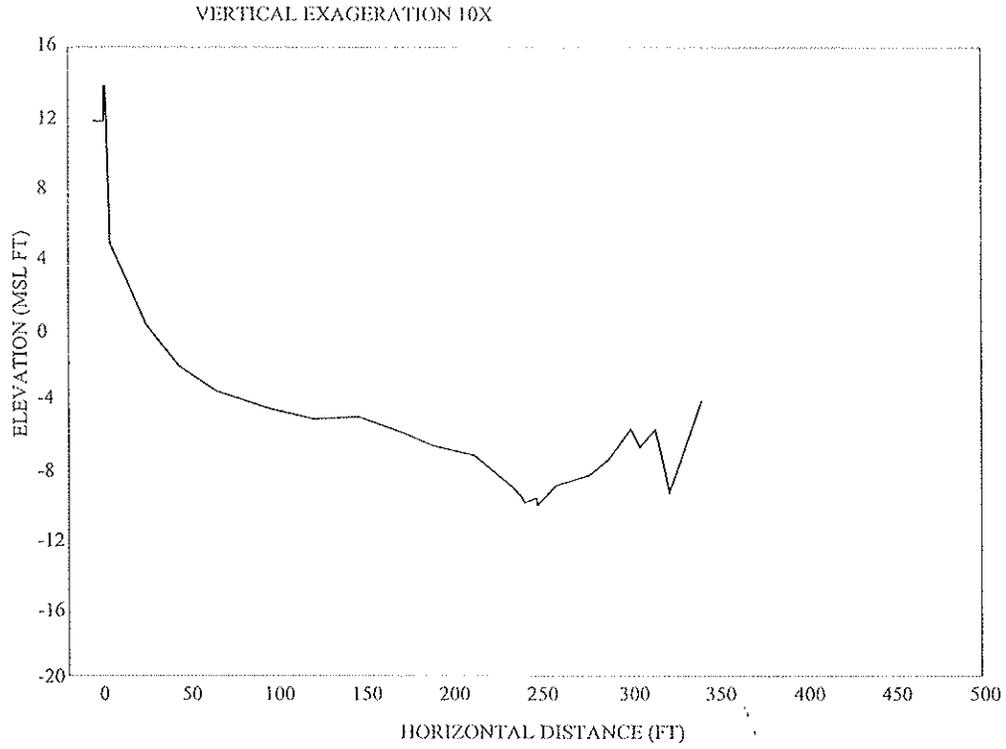


Figure 3. Profile 1

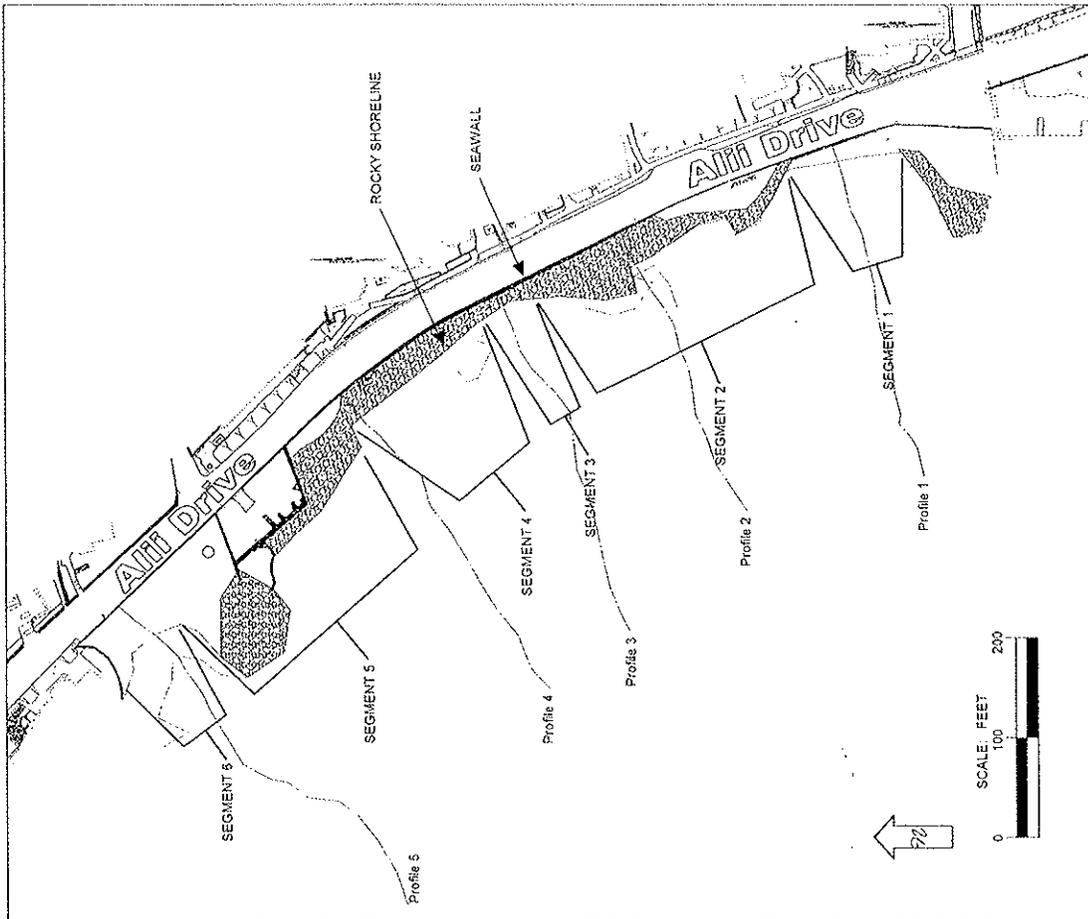


Figure 2. Survey Plan of Project Site

**Segment 3** - This segment, similar to Segment 1, is a 50-foot long stretch of basalt boulder beach, about 10 to 20 feet wide, extending from the base of the wall to the waterline (Photo 5). The elevation of the base of the wall is only 3 to 4 feet, and at the narrowest point, the wall is only about 10 feet from the waterline. There appears to be slight undermining of the wall. The boulders extend into the water, where a basalt bench emerges also. The elevation of the top of the wall is about 12.7 feet, and the road elevation is about 11 feet. Figure 5 shows the profile measured at this location. The water is 5 feet deep only 80 feet from the seawall, and 9 feet deep about 130 feet from the seawall.

**Segment 4** - Segment 4 is approximately 200 feet long and consists of a solid basalt outcrop approximately 20 to 40 feet wide from the base of the wall to the waterline (Photo 6). Boulders 1 to 3 feet in diameter are scattered on top of the outcrop. The elevation of the outcrop at the base of the wall is 5 to 8 feet. Figure 6 presents the shoreline profile measured in this location. The water is 6 feet deep about 110 feet from the seawall, but does not reach 10 feet deep until about 270 feet from the wall.

**Segment 5** - The 300 feet of shoreline in this segment consists of basalt outcrops extending 60 to nearly 200 feet seaward of the wall (Photo 7). Stable vegetation has colonized much of the landward side of the outcrop, and a small grassy park with coconut trees has been developed on top of the outcrop (Photo 7). The park is about 90 feet long, extends 60 feet seaward of the wall, and has a ground elevation of about 7 feet. It is enclosed by a small rock wall about 2 feet high.

**Segment 6** - The northernmost 50 feet of the project site consists of sand/cobble beach about 40 feet wide, extending from the waterline, to an elevation of about 7 feet at the base of the wall (Photo 8). The beach is perched behind a shallow rock bench that extends seaward 75 feet (Photo 9). Figure 7 shows the profile at this location, and shows that the water is less than 3 feet deep 140 feet seaward of the wall. This shallow basalt bench protects the beach from erosion. At the north end of the beach, the shoreline juts seaward, away from the road.

## 2.2 Nearshore Conditions

There is no protective fringing reef offshore of the project site. The nearshore bottom is composed entirely of a hard basalt lava substrate with scattered boulders and cobbles close to shore. This is evident in the aerial photograph shown in Figure 1, and Photos 10 to 13. Between the shoreline and about the 10-foot water depth, the lava bottom appears scoured and smooth, with relief of 1 to 3 feet, and there is little coral growth (Photo 11). This indicates that this zone experiences significant wave energy at times that is capable of scouring away loose and irregular bottom features such as coral. Close to the shoreline, there are scattered boulders and cobbles lying on the basalt lava (Photo 10). Beyond the 10-foot water depth, small coral outcrops, less than 1 foot in diameter are sparsely scattered on the bottom (Photo 12).

The lava substrate contains channels, ridges and ledges with typical small-scale relief of 1 to 3 feet (Photo 13). Figure 8 show a typical bottom profile extending to about the 100-foot water depth. Between the 10- and 70-foot water depths, the bottom slope is gradual, between 1V:50H to 1V:33H. Beyond the 70-foot water depth the slope steepens to about 1V:10H.

VERTICAL EXAGGERATION 10X

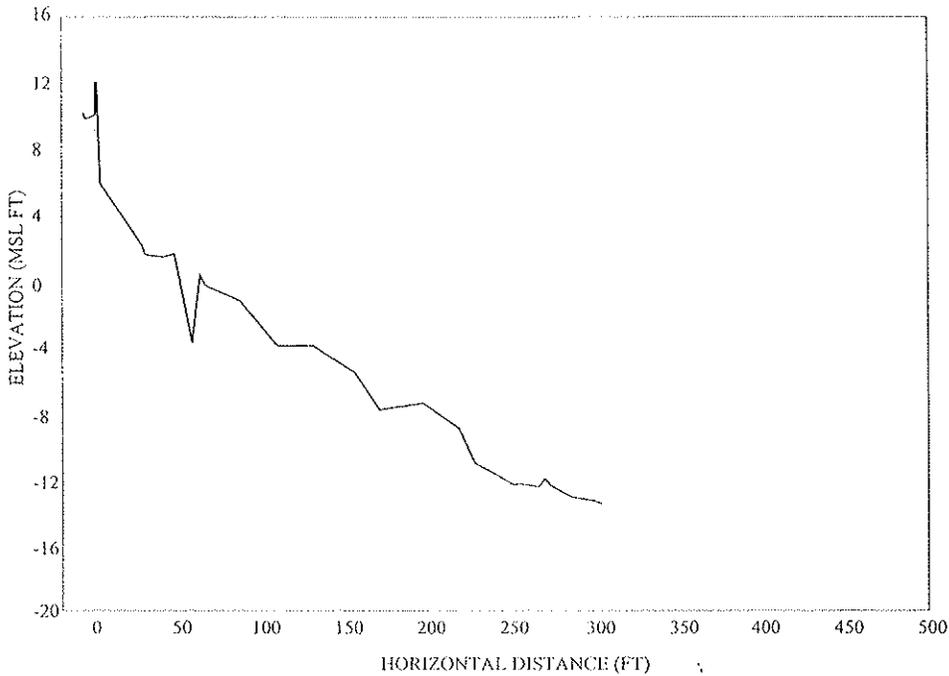


Figure 4. Profile 2

VERTICAL EXAGERATION 10X

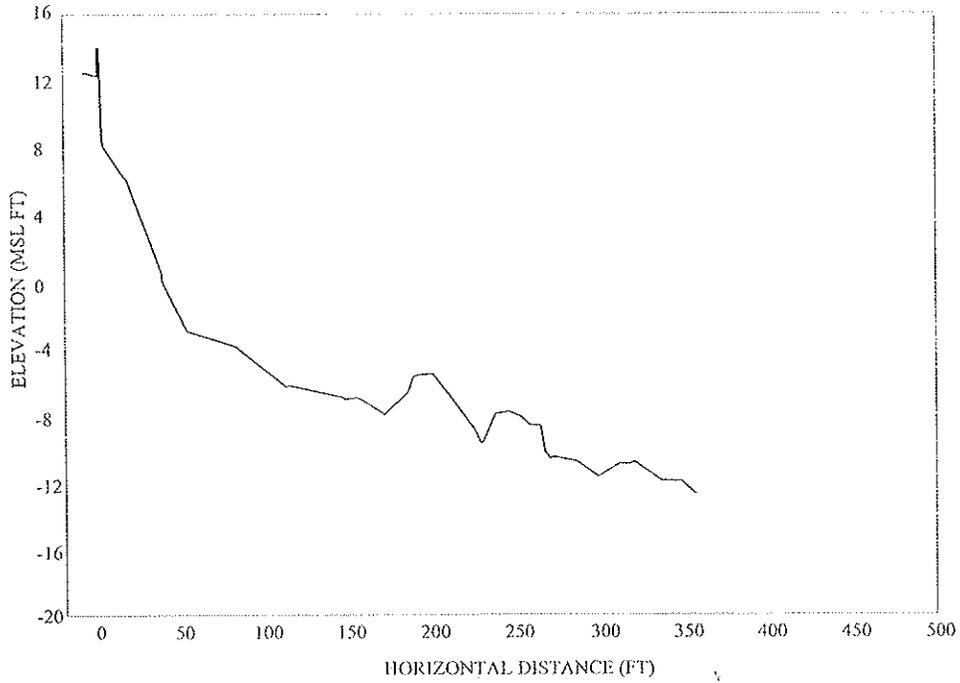


Figure 6. Profile 4

VERTICAL EXAGERATION 10X

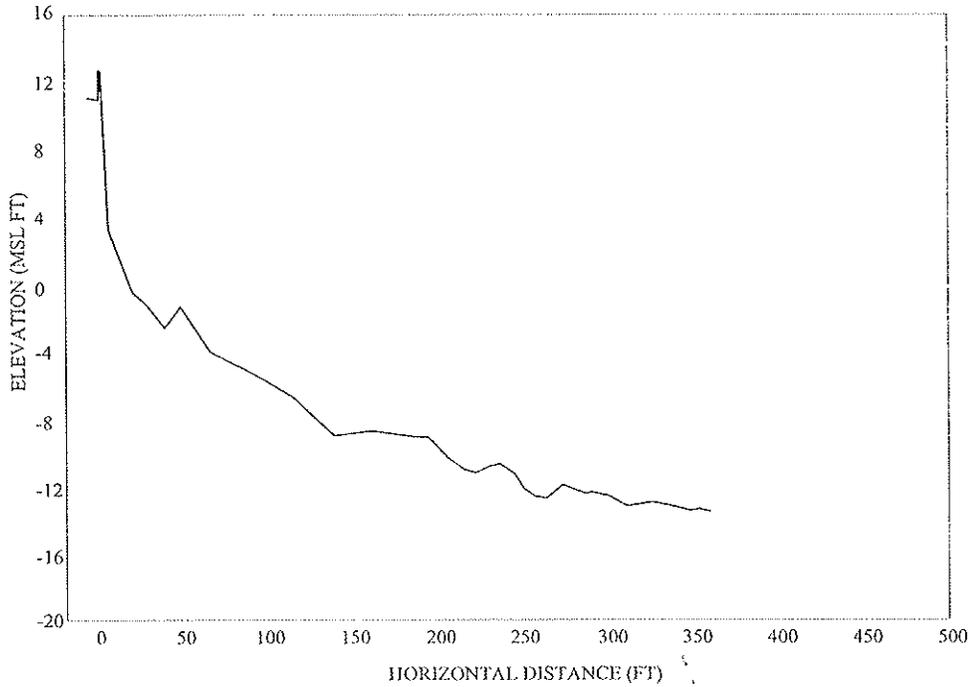


Figure 5. Profile 3

VERTICAL EXAGGERATION 10X

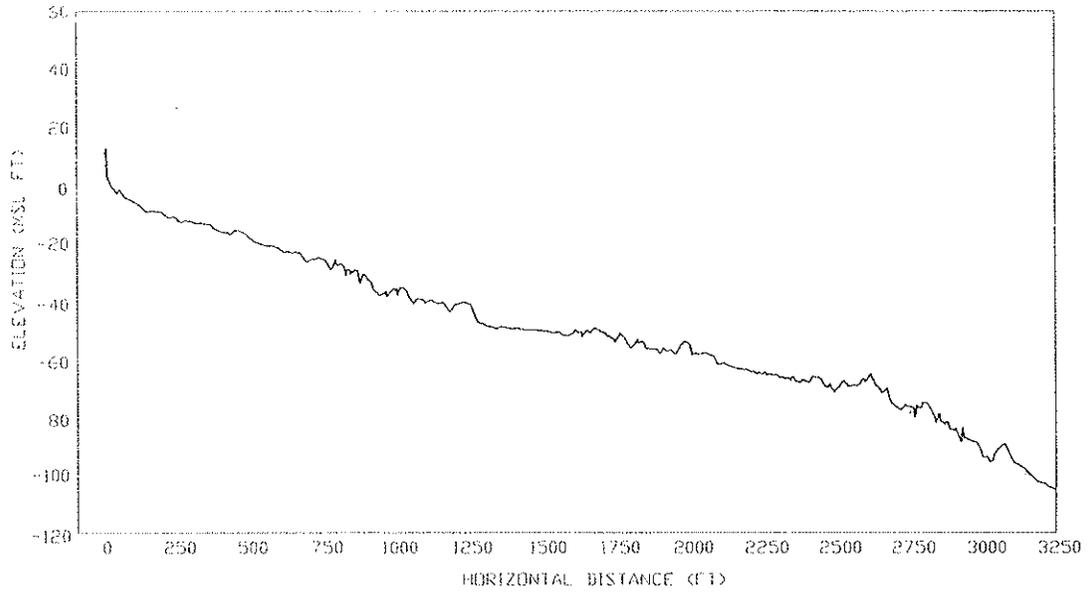


Figure 8. A Typical Bottom Profile

VERTICAL EXAGGERATION 10X

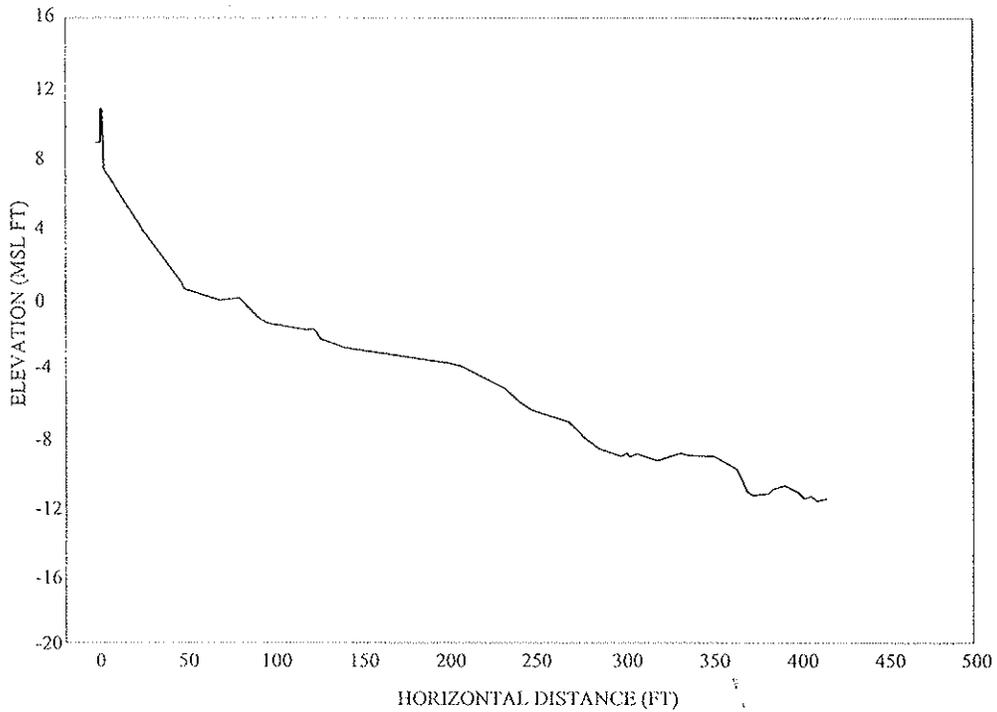


Figure 7. Profile 5

### 3.0 OCEANOGRAPHIC PARAMETERS

#### 3.1 Tides

The tides in Hawaii are semi-diurnal with pronounced diurnal inequalities; that is, there are two tidal cycles per day with unequal water level ranges. *Tide Tables 2003*, which is based on tide data from U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Survey (2003), shows that the mean tide range is 1.4 feet and the diurnal range is 2.1 feet at Kailua-Kona. The tidal data are as follows:

Type	In Feet
Mean Higher High Water	1.2
Mean High Water	0.7
Mean Sea Level (MSL)	0.0
Mean Low Water	-0.7
Mean Lower Low Water	-0.9

In this report elevations are referenced to a mean sea level (MSL) datum.

#### 3.2 Winds

The general wind climate in Hawaii is primarily characterized by the year-around northeast tradewinds. During the summer months the tradewinds predominate, blowing out of the northeast 80 percent of the time. During the winter season the tradewinds weaken and the occurrence of southerly or westerly winds increase as a result of localized low-pressure systems.

Winds for the project site were evaluated by analyzing hourly wind data during year 2000 as recorded at Kailua-Kona Keahole Airport, about 8 miles northwest of Oneo Bay. The weather station is located on the west coast of the Island of Hawaii, leeward of Mauna Loa. The trade winds do not flow over the top of Mauna Loa and do not appear in the Kona area (Haraguchi, 1979). Without the effects of the year-around persistent trade winds, land and sea breezes are expected to be the dominant wind characteristics in the Kona area. Land and sea breezes are locally developed due to the temperature differential between land and sea. The sea breeze develops during the day as the land becomes warmer than the ocean, and the cooler and heavier ocean air flows inland and replaces the warmer and lighter land air. At night the differences in air temperatures reverse and consequently the land breeze develops.

Tables 1 through 3, and Figures 9 to 11 present wind data for Kailua-Kona Keahole Airport, which is located about 8 miles north of the project site. Table 1 and Figure 9 summarize the annual frequency of occurrence of a range of wind speeds from each of 16 directional sectors. The average wind speed in year 2000 was 3.4 m/s and the maximum speed was 12.4 m/s. Approximately 80 percent of winds were nearly equally distributed in directional sectors from east through west clockwise, with a frequency range of 7 to 9 percent, except south-southeast (4.2 percent). The seasonal wind variations were summarized in Table 2. There are only slight

seasonal variations. Table 2 shows similar year-around values in maximum speeds and average speeds, and in frequency of occurrence of calm winds, and variable winds. There are slightly more frequent sea breezes (westerly winds) in summer months and land breezes (easterly winds) in winter months, due to differences in the length of solar heating hours between those seasons. Although the most frequent wind directions reverses between summer and winter, the maximum speeds as well as the average speeds are nearly similar.

The hourly wind variations are summarized in Table 3. Figure 10 shows the annual average wind speed and direction from 4 to 6 a.m., while Figure 11 shows the annual average wind speed and direction from 4 to 6 p.m. The table and figures clearly indicate the dominance of land and sea breezes in this area. During the day stronger and more persistent sea breezes (westerly winds) prevail, while during the night, weaker and less persistent land breezes prevail. Calm winds are less than one percent during the day and nearly 10 percent during the night. Average speeds between 4 to 6 p.m. are 4.7 m/s, while between 4 to 6 a.m. average speeds are only 2.5 m/s.

Table 2 – Monthly Wind Summary: Seasonal Wind Variations At Keahole Airport, Kailua Kona

Month	Maximum Speed (m/s)	Average Speed (m/s)	Standard Deviation (m/s)	Calm Wind (%)	Variable Wind (%)	Most Frequent Wind Direction			
						Direction	Frequency (%)	Maximum Speed (m/s)	Average Speed (m/s)
January	11.3	3.4	1.7	5.7	2.2	E	10.8	5.7	2.5
February	9.3	3.3	1.5	4.3	1.3	SE	9.7	5.1	3.4
March	8.2	3.4	1.5	4.5	1.8	W	12.3	5.7	4.1
April	11.8	3.6	1.8	6.0	2.4	W	9.7	6.7	4.2
May	7.7	3.6	1.5	3.8	1.5	W	15.5	6.7	4.0
June	11.3	3.5	1.7	6.2	2.3	WSW	12.4	6.7	4.2
July	10.8	3.6	1.7	5.1	2.5	SSW	10.7	6.7	4.4
August	11.3	3.6	1.8	6.2	2.6	SSW	12.1	7.7	4.9
September	10.8	3.4	1.7	7.6	1.6	WSW	10.8	6.7	4.3
October	9.8	3.5	1.6	5.5	2.5	ESE	10.7	4.6	3.0
November	12.4	3.2	1.7	8.2	1.4	ESE	11.7	4.6	2.8
December	9.3	3.2	1.5	6.2	0.8	E	12.6	6.2	2.3

Table 3 – Annual Wind Summary: Hourly Wind Variations At Keahole Airport, Kailua Kona

Time	Maximum Speed (m/s)	Average Speed (m/s)	Standard Deviation (m/s)	Calm Wind (%)	Variable Wind (%)	Most Frequent Wind Direction			
						Direction	Frequency (%)	Maximum Speed (m/s)	Average Speed (m/s)
0000-0200	8.8	2.7	1.4	9.9	1.0	E	17.4	6.2	2.5
0200-0400	8.8	2.5	1.3	9.1	1.1	E	21.3	6.2	2.4
0400-0600	8.8	2.5	1.2	8.4	1.5	E	24.5	6.7	2.4
0600-0800	11.3	2.5	1.4	11.9	3.4	SE	15.6	5.1	3.0
0800-1000	11.8	3.6	1.6	4.8	5.5	SSW	17.7	6.7	4.2
1000-1200	12.4	4.7	1.3	0.5	1.6	W	21.6	6.7	4.0
1200-1400	10.3	5.0	1.0	0.3	0.5	WSW	27.8	6.7	4.9
1400-1600	10.8	4.7	1.1	0.1	0.5	W	24.0	6.2	4.2
1600-1800	10.3	4.1	1.4	0.8	2.9	WSW	17.0	6.7	3.8
1800-2000	11.3	3.3	1.6	5.9	1.7	S	22.2	6.7	3.8
2000-2200	9.8	3.0	1.5	7.3	1.7	SE	16.1	7.2	3.4
2200-2400	10.8	2.8	1.4	9.1	1.2	ESE	18.3	5.1	2.8

Table 1 – Annual Wind Percent Frequency

ANNUAL WIND SPEEDS VS DIRECTIONS  
(01/01/00 - 12/31/00: Kailua Kona Keahole Airport at 19.7N, 156.1W)

M/S	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRB	TOTAL
0-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-2	0.3	0.2	0.5	0.9	1.5	0.9	0.5	0.3	0.4	0.1	0.2	0.2	0.3	0.2	0.1	0.1	0.9	7.6
2-3	0.7	0.6	1.2	2.3	4.4	3.6	2.3	1.1	1.3	0.9	0.9	0.8	1.2	0.6	0.3	0.3	0.7	23.2
3-4	0.7	0.6	1.1	1.0	1.5	3.3	3.2	1.4	1.7	1.5	1.8	2.0	3.2	1.0	0.6	0.5	0.2	25.2
4-5	0.5	0.4	0.6	0.3	0.4	0.6	1.7	1.0	1.7	2.1	2.4	3.0	3.4	1.1	0.6	0.5	0.0	20.3
5-6	0.3	0.2	0.4	0.2	0.1	0.0	0.3	0.3	1.2	2.1	2.3	2.2	1.2	0.4	0.3	0.4	0.0	12.0
6-7	0.2	0.2	0.2	0.1	0.1	0.0	0.1	0.1	0.7	1.1	0.5	0.4	0.1	0.1	0.1	0.2	0.0	4.2
7-8	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	1.0
8-9	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
9-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
10-11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
11-12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
12 <	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CALM																		5.8
INDET																		0.1
TOTAL %	2.8	2.3	4.5	5.0	8.1	8.4	8.0	4.2	7.2	7.9	8.2	8.6	9.4	3.3	2.0	2.1	1.9	100.0
AVE SPD	3.8	3.9	3.8	2.9	2.5	2.8	3.3	3.4	4.1	4.6	4.3	4.3	3.8	3.8	4.0	4.2	2.0	3.4
MAX SPD	11.8	11.3	11.3	11.3	7.2	7.7	7.2	7.7	11.8	9.8	11.3	12.4	6.7	7.2	7.2	10.3	3.1	12.4
STD DEV	1.9	1.9	1.9	1.6	0.9	0.8	1.0	1.2	1.6	1.4	1.3	1.1	1.0	1.1	1.2	1.6	0.5	1.6

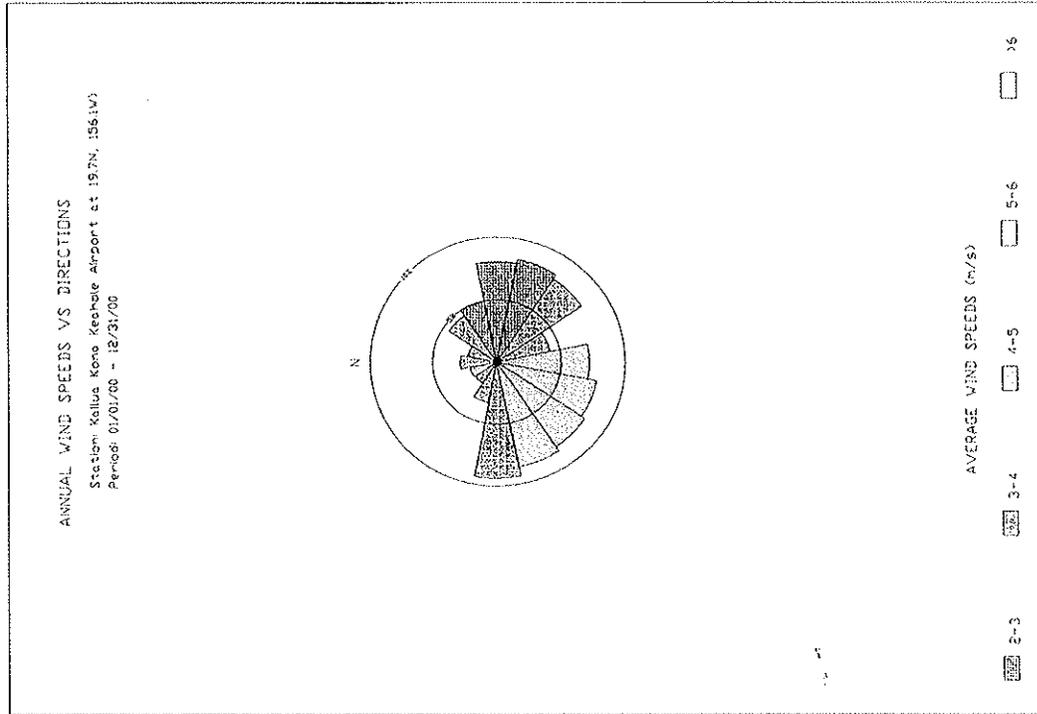


Figure 9. Annual Wind Speeds vs. Directions

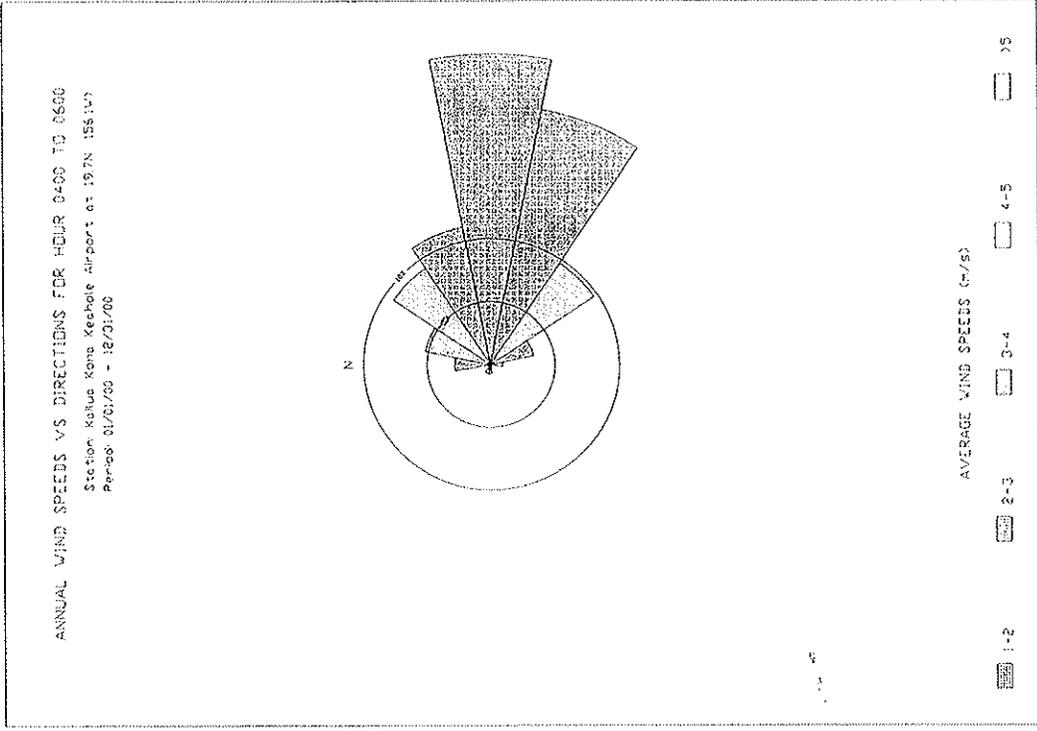


Figure 10. Annual Wind Speeds vs. Directions for Hour 0400 to 0600

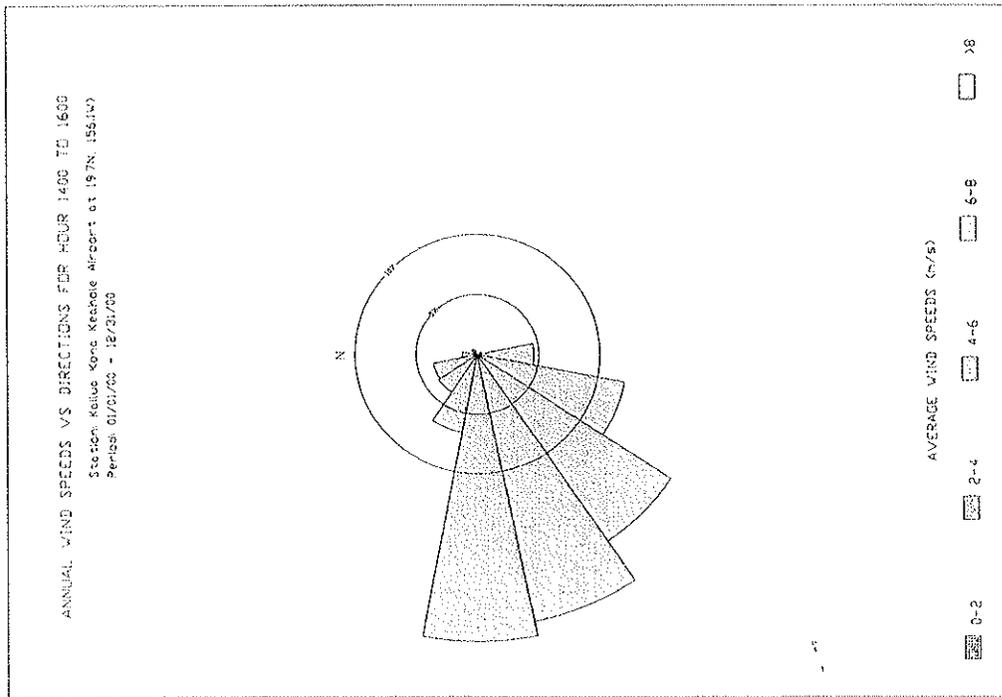


Figure 11. Annual Wind Speeds vs. Directions for Hour 1400 to 1600

### 3.3 Storms

There are many recorded tropical storms and hurricanes, which have approached the Hawaiian Islands in the past. Most of these storms passed well south of the islands, staying far enough offshore to only cause high surf or heavy rainfall as they passed, or weakened in intensity as they reached Hawaii. However, there have been notable exceptions. In the last about 50 years, Hurricanes Hiki, Dola, Nina and Fico passed within about 200 miles of the islands. Hurricane Susan, with sustained wind speeds estimated at 120 knots, was pointed directly at the Island of Hawaii approaching from the southeast but dissipated before coming within 200 miles of the island. Although Iwa passed within 30 miles of Kauai, and Dot and Iniki directly passed over Kauai, there has been no direct hurricane strike on the Island of Hawaii in the past 50 years.

### 3.4 Typical Waves

Four primary wave types can describe the general Hawaiian wave climate: Northeast tradewind waves, North Pacific swell, south swell and Kona storm waves. The project site at Ono Bay is well sheltered from the northeast tradewind waves by the island itself, and partially sheltered from North Pacific swell by the Hawaiian island chain. North Pacific swell diffracts around the island with only a portion of its deepwater energy reaching the project area. Although south swell directly approaches the project site in deepwater, it approaches the shore very obliquely in the vicinity of Ono Bay. Because of the oblique wave angle in the nearshore water, the waves are significantly affected by wave refraction, which reduces their wave energy as they approach the shore. Kona storm waves and locally generated wind waves, on the other hand, approach the coast in the project area more directly with less wave refraction effect. The term swell used herein refers to waves generated by distant storms, which propagate toward Hawaii (relatively long period waves), and wind waves are shorter period waves generated locally by wind and storms in the Hawaiian waters.

South swell approaches from the southeast through southwest, with typical heights of 1 to 4 feet and periods of 12 to 22 seconds. Kona storm waves are generated by winds associated with local fronts or low-pressure system and have typical periods ranging from 6 to 10 seconds and deepwater wave heights up to 10 to 15 feet. These waves generally approach from the south to west.

Wave data collected at two locations have been evaluated for this analysis. These data are considered to reasonably represent wave conditions for the project area. One source is data recorded off Barbers Point, on the southwest coast of Oahu, from a wavereider buoy in a water depth of 600 feet. The second source is wave data also from a wave-rider buoy, which was moored on the north side of Keahole Point, Island of Hawaii, in a water depth of 130 feet. The Barbers Point buoy off the west coast of the Island of Oahu had reasonably similar wave exposure directions to those of the project area, and this wave data is considered representative of deepwater wave conditions for the project area. Keahole Point is located on the west coast of the Island of Hawaii, and the wave data from these sites represents typical wave conditions in the project area in intermediate water depths. The Barbers Point data provides the total of about two and a half years of wave records during a 4.5-year period between 1986 and 1990. The Keahole Point data is a one-year record between 1984 and 1985.

Table 5 - Wave Percent Frequency Off Keahole Point, Hawaii  
(Water Depth: 130 feet)

Height (feet)	Period: January 1985									
	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	Total
0-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-2	0.0	0.0	1.5	4.5	6.1	0.0	0.0	0.0	0.0	12.1
2-3	0.0	0.0	4.5	6.1	22.7	3.0	0.0	0.0	0.0	36.4
3-4	0.0	0.0	0.0	1.5	6.1	10.6	0.0	0.0	0.0	18.2
4-5	0.0	0.0	0.0	0.0	4.5	6.1	1.5	0.0	0.0	15.2
5-6	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	3.0
6-7	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	7.5
7-8	0.0	0.0	3.0	4.5	0.0	0.0	0.0	0.0	0.0	7.5
8-9	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	3.0
9-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	9.1	30.3	39.4	19.7	1.5	0.0	0.0	100.0

Height (feet)	Period: July 1984									
	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	Total
0-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-2	0.0	9.2	20.0	6.2	0.0	0.0	1.5	0.0	0.0	36.9
2-3	0.0	3.1	12.3	15.4	12.3	0.0	0.0	0.0	0.0	43.1
3-4	0.0	0.0	4.6	4.6	1.5	1.5	0.0	0.0	0.0	12.3
4-5	0.0	0.0	0.0	1.5	4.6	0.0	1.5	0.0	0.0	7.7
5-6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	12.3	36.9	27.7	18.5	1.5	3.1	0.0	0.0	100.0

Height (feet)	Period: June 1984 - May 1985									
	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	Total
0-1	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-2	0.00	4.5	23.9	14.3	4.3	0.1	0.1	0.0	0.0	47.3
2-3	0.00	3.6	15.5	9.7	7.9	1.9	0.0	0.0	0.0	39.6
3-4	0.00	0.4	2.2	1.2	0.9	2.0	0.0	0.0	0.0	6.7
4-5	0.00	0.0	0.4	1.0	1.1	1.5	0.5	0.0	0.0	4.5
5-6	0.00	0.0	0.0	0.1	0.0	0.5	0.1	0.0	0.0	0.7
6-7	0.00	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2
7-8	0.00	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.6
8-9	0.00	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2
9-10	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.00	8.6	43.3	27.2	14.3	6.0	0.7	0.0	0.0	100.0

Tables 4 and 5 present wave histograms for the two sources, and Tables 6 and 7 give histogram summaries of wave heights and periods. In deepwater off Barbers Point, a swell with a wave period range of 14 to 18 seconds corresponds to the highest waves, ranging from 9 to 10 feet in height. In intermediate depth water off Keahole Point, the maximum wave height was 8 to 9 feet with a wave period range of 8 to 10 seconds.

Table 4 - Wave Percent Frequency Off Barbers Point, Oahu

Height (feet)	Period: June 1986 - January 1990, Water Depth: 600 feet, Total No. of Data: 3838									
	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-22	Total
0-1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
1-2	0.0	0.6	1.4	1.2	1.3	1.7	0.3	0.2	0.0	6.6
2-3	0.0	2.3	13.9	8.0	8.1	10.0	4.8	1.2	0.3	48.4
3-4	0.0	1.0	5.8	3.8	4.9	6.5	4.8	1.6	0.3	28.7
4-5	0.0	0.2	1.2	1.0	1.4	2.6	2.3	0.7	0.1	9.4
5-6	0.0	0.0	0.4	0.4	0.8	0.9	1.0	0.2	0.1	3.8
6-7	0.0	0.0	0.3	0.2	0.3	0.2	0.6	0.1	0.1	1.7
7-8	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.8
8-9	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.3
9-10	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
10-11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	1.0	4.2	14.0	22.1	16.8	14.7	23.2	4.0	100.0

Table 6 – Wave Height Frequencies (%) at Two Water Depth Locations

Wave Height (feet)	Location	
	Barbers Point (Depth=600 ft)	Keahole Point (Depth=130 ft)
0-1	0.1	0.0
1-2	6.6	47.3
2-3	48.4	39.6
3-4	28.7	6.7
4-5	9.4	4.5
5-6	3.8	0.7
6-7	1.7	0.2
7-8	0.8	0.6
8-9	0.3	0.2
9-10	0.1	0.0
Total	100.0	100.0

Table 7 – Wave Period Frequencies (%) at Two Water Depth Locations

Wave Period (sec.)	Location	
	Barbers Point (Depth=600 ft)	Keahole Point (Depth=130 ft)
2-4	0.0	0.0
4-6	1.0	8.6
6-8	4.2	43.3
8-10	14.0	27.2
10-12	22.1	14.3
12-14	16.8	6.0
14-16	14.7	0.7
16-18	23.2	0.0
18-22	4.0	0.0
Total	100.0	100.0

### 3.5 Storm Waves

The project area is also exposed to severe wave attacks from passing tropical storms and hurricanes. The U.S. Army Corps of Engineers (1967) hindcasted wave heights generated by 17 severe storms during the period from 1947 - 1965, and seven of these affected the south and/or west shores of the islands. Marine Advisers (1963) also hindcasted deepwater wave conditions off the west coasts of Lanai and Molokai produced by the ten worst storms during the 15-year period from 1947 to 1961. Sea Engineering, Inc. hindcasted the deepwater wave characteristics for the Kona storm of January 1980, and the Hurricane Iwa (1982) deepwater wave heights near the project area. Storm wave data from these sources are summarized in Table 8.

Table 8 – Historic Storm Wave Characteristics

Date	Wave Height (feet)	Deepwater Wave Period (seconds)	Deepwater Approach Direction
12/20/55	14.8	11	West
09/05/57 (Della)	18.9	21	West
12/02/57 (Nina)	20.0	13	South & West
01/18/59	14.0	10	South & West
08/06/59 (Dot)	22.5	12	South & West
01/07/62	13.6	11	South & West
01/17/63	12.0	10	Southwest
01/11/80	17.0	9	Southwest
11/23/82 (Iwa)	14.0	14	Southwest

#### 4.0 SEAWALL IMPROVEMENT DESIGN CRITERIA

Determining the oceanographic design criteria necessary for the shoreline improvements requires the following steps:

- Evaluating the deep water wave types and sizes that may impact the project site;
- Transforming those deep water waves to shallow water waves at the shoreline;
- Calculating the water level rise at the shoreline due to tides, storm surge and wave setup; and
- Computing wave runup and wave forces on the wall.

#### 4.1 Deepwater Design Waves

Three wave conditions are considered for the seawall design, which are an annually occurring wave, a 10-year wave and a severe storm wave. Wave data measured at the Barbers Point wave gauge were used for the deepwater wave analysis. The Barbers Point gauge has a similar wave exposure to that of the project site. The project site is exposed to waves from a directional sector between south and northwest, clockwise, while the Barbers Point gauge is exposed to a sector between east-southeast and northwest, clockwise. Based on this data, statistical deepwater wave heights of 9 feet and 10 feet were determined for one-year and 10-year return periods, respectively, by using a Gumbel's asymptotic distribution. Wave periods for the annual (one-year) and 10-year wave heights were estimated to be 8 seconds and 15 seconds, respectively, by examining the wave data histograms (Tables 4 and 5). The annual wave conditions were considered to be locally generated wind waves and the 10-year wave conditions were most likely swell conditions.

Typical extreme storm wave conditions were estimated to be 20 feet in height with a wave period of 13 seconds, based on the historical storm wave conditions given in Table 8. The selected design deepwater wave conditions are summarized in Table 9, including the estimated annual and 10-year waves based on Barbers Point wave data, and a typical severe storm wave approaching the south or west coast.

Table 9 – Selected Extreme Deepwater Wave Characteristics  
For the Project Area

Wave Type	Wave Height (feet)	Wave Period (seconds)
Annual Wind Wave	9	8
10-year wave	10	15
Typical extreme storm wave	20	13

#### 4.2 Nearshore Stillwater Level Rise

The stillwater rise at the shoreline is due to astronomical tide, storm surge and wave setup. Storm surge includes water level rise due to atmospheric pressure reduction and due to the wind stress, which piles water up against the shore. Wave setup is caused landward of the breaker zone by the mass transport of water toward the shoreline by breaking waves. All these components were considered to determine the total stillwater level rise. Storm surge is applied to only the storm event and not applied to the annual wind wave and 10-year swell conditions. Since a direct hurricane attack is an extremely rare event at the project site, a pressure setup was estimated as 0.5 feet for a storm passing off the Island of Hawaii, corresponding to a local low-pressure storm front with an atmospheric pressure of 998 mbs. Wind setup was assumed negligible due to deepwater very close to the shore.

Wave setup is directly influenced by the bottom profile in the nearshore area of the study site. The wave setup was calculated along a shoreline transect, whose nearshore bottom profile was measured, supplemented with water depth data from the U.S. Army Engineer Joint Airborne Lidar survey for the vicinity of the project site (Figure 8). A typical bottom slope over the surf zone was estimated as 1V:25H from the bathymetric data, and this slope was used for wave setup analysis.

An astronomical tide of 1.2 feet (mean higher high water) was used as the design tide condition. A summary of stillwater level rise components and the resulting design stillwater level rise is given in Table 10.

Table 10 – Stillwater Level Rise Above MSL for Selected Wave Events in Feet

	Annual Wind Wave	Typical 10-Year Wave	Storm Wave
Astronomical Tide	1.2	1.2	1.2
Storm Surge	0	0	0.5
Wave Setup	1.3	1.6	2.7
Total Stillwater Level	2.5	2.8	4.4

#### 4.3 Nearshore Design Wave Heights

The nearshore design wave heights depend on the water depth near the structure. Five bottom profiles were surveyed along the shoreline at the project site, which are shown in Figures 3 to 7. A typical seaward bottom slope along the shoreline is 1V:10H. Nearshore wave heights for the seawall design have been determined using Profile 3, which is located at the mid-point of the project shoreline and provides the largest wave due to the deepest water depth at the structure among the surveyed profiles. For this analysis, we assumed that the shoreline structure would be located about 10 feet seaward of the existing seawall. Based on Profile 3, a conservative estimate of the water depth at the toe of the new structure is -1 feet. Considering a water depth

of -1.0 feet at the seawall toe, the design breaking wave heights and their equivalent deepwater wave heights at the seawall were determined for the three selected deepwater waves. These are summarized in Table 11.

Table 11 - Nearshore Wave Heights for Selected Wave Events in Feet

	Annual Wind Wave	Typical 10-Year Wave	Storm Wave
Breaker Height	7.0	8.4	11.3
Equivalent Deepwater Wave Height	4.3	3.4	5.9
Total Water Depth at Structure	3.5	3.8	5.4

#### 4.4 Shore Protection Alternatives

Seawalls - Seawalls are vertical or sloping reinforced concrete or grouted masonry walls used to protect the land from wave damage, with use as a retaining wall a secondary consideration. Seawalls have a stepped, vertical, or recurved seaward face. A seawall, if properly designed and constructed, is a proven, long lasting, relatively low maintenance shore protection method. They have the advantage of requiring limited horizontal space along the shoreline. However the near vertical seaward faces of seawalls result in very little wave energy dissipation. The walls are often stepped or recurved to reduce resulting problems of wave overtopping and spray. Wave energy is deflected both upward and downward, and also a large amount of wave energy is reflected seaward. The downward component can cause scour at the base of the wall, particularly in shallow waters, and the reflected waves can inhibit beach formation in front of the wall. Seawalls are not flexible structures, and their structural stability is dependant on the stability of their foundation.

**Retreatment** - A revetment is a sloped structure built of wave resistant materials. The most common method of revetment construction is to place an armor layer of stone, sized according to the design wave height, over an underlayer and bedding layer designed to distribute the weight of the armor layer and to prevent loss of the shoreline material through voids in the revetment. In Hawaii, almost all revetments are constructed of basalt boulders. Limestone boulders can be used, but the lesser density of limestone requires a larger boulder size for a given site. Toe protection can be provided by excavating to place the toe on solid substrate where possible, constructing the foundation as much as practicable below the maximum of depth of anticipated scour, or extending the toe to provide excess stone and extra wave protection. Properly designed rock revetments are durable, flexible, and highly resistant to wave damage. Should toe scour occur, the structure can settle and readjust without major failure. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs. The rough and porous surface and flatter slope absorb more wave energy than smooth vertical walls, thus reducing wave reflection, runup and overtopping. The steepest practical revetment slope is 1V on 1.5H, therefore revetments have a large footprint than vertical seawalls.

#### 4.5 Wave Runup

Wave runup is a vertical height above the stillwater level to which an incident wave will run up a face of a structure. This is an important design parameter for any proposed improvements to Ali'i Drive; shore protection alternatives should prevent excessive runup that may impact pedestrians and vehicles. The runup depends on the type of structure and the design conditions outlined previously. The wave runup was determined for the four types of structures described in the previous section, using results of small-scale laboratory tests for regular wave runup, which are reported in the U.S. Army Corps of Engineers Shore Protection Manual (1984). The four types of structures considered are a vertical seawall, a stone revetment with a slope of 1V:1.5H, a concrete stepped-face seawall with a slope of 1V:1.5H and a concrete recurved-face seawall. Figure 12 shows a typical recurved-face seawall. The results are summarized in Table 12, and include the stillwater level rise.

Table 12 - Wave Runup Elevations in Feet Above MSL

	Annual Wind Wave	Typical 10-Year Wave	Storm Wave
Vertical Wall	10.2	10.8	15.6
Stone Revetment	13.9	17.1	22.2
Stepped-Face Seawall	14.4	16.6	22.9
Recurved-Face Seawall	6.9	9.5	11.5

The results indicate that both the vertical wall and the recurved-face seawall are effective in limiting the wave runup below the typical road elevation of +11 feet during the annual wind wave and 10-year wave conditions; only during rare storm events does the wave runup exceed the 11-foot elevation. Even during storm conditions, the computed runup on the recurved seawall is only 11.5 feet. The stone revetment and the stepped-face seawall, on the other hand, permit excessive runup, even during annual conditions.

Only limited studies have been completed on runup on recurved-face seawalls. Thus, the computations listed in Table 12 are based on a limited data set. Serious consideration of this alternative would require additional analyses, perhaps including physical model studies.

4.6 Wave Force on Vertical Wall and Stone Size for Revetment

Wave forces on the vertical seawall were determined by considering that the breaking waves directly impact the seawall. The total force is a combination of the dynamic and hydrostatic forces. The over-turning moment was determined around the structure toe, which was at 1.0 foot below mean sea level. The calculated wave forces are summarized in Table 13.

Armor stone sizes were calculated for the revetment with the following structure features:

- Structure slope = 1V:1.5H
- Number of layers = 2
- Stone characteristics = Rough and angular
- Unit weight of armor stone = 160 lbs/qr.
- Stone placement = Random

The calculated stone weights and sizes are given in Table 14.

Table 13 – Wave Force on Vertical Wall

	Annual Wind Wave	Typical 10-Year Wave	Storm Wave
Total Force (kips/ft)	4.7	4.3	9.6
Moment (Kips-ft/ft)	14.6	14.0	43.0

Table 14 – Stone Size for Revetment

	Annual Wind Wave	Typical 10-Year Wave	Storm Wave
Stone Weight (tons)	2.7	4.7	11.4
Stone Diameter (ft)	3.7	4.5	6.0

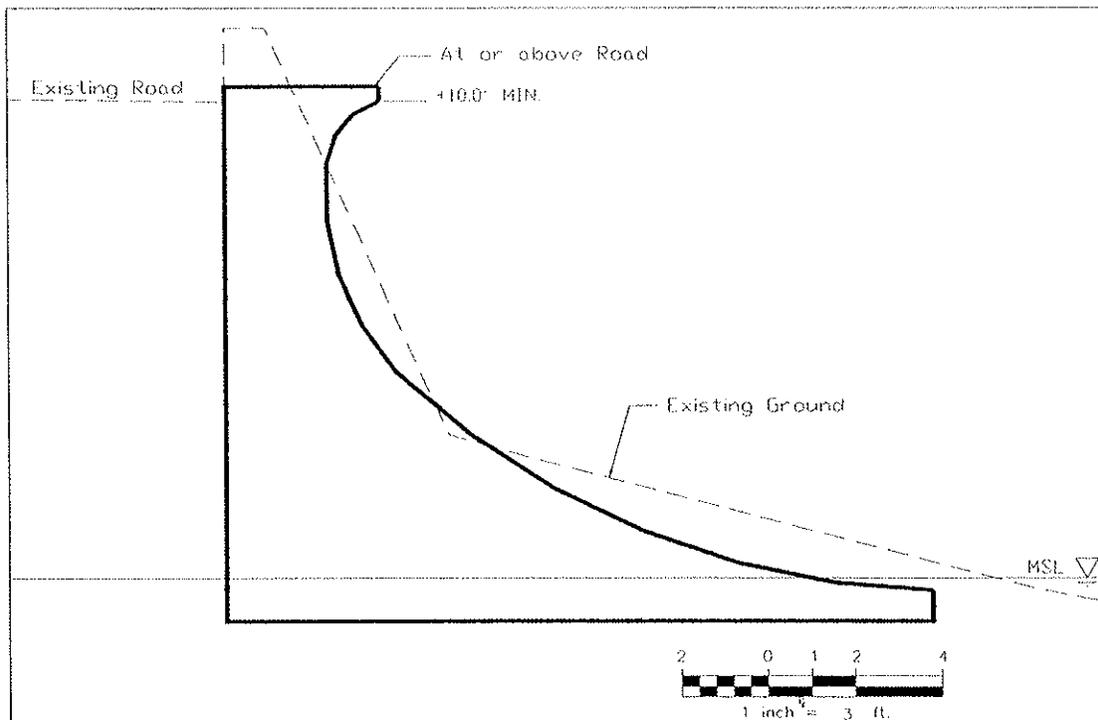


Figure 12. A Typical Recurved-Face Seawall

## 5.0 SUMMARY

The project shoreline consists of basalt outcrops and boulders. There is no protective fringing reef, and a hard basalt lava seafloor extends offshore in the entire area. There is little or no coral close to shore, inside 10-foot depth, and the basalt seafloor appears scoured smooth. The rock and boulder composition of the shoreline and scoured appearance of the seafloor are evidence that significant wave energy impacts this area. Along the two segments of the shoreline with boulder beaches, Segments 1 and 3, the existing wall is little more than 10 feet from the waterline, and the base of the wall is at an elevation of only 3 to 5 feet. There is some evidence of undermining of the wall in these spots. Along the other segments of the shoreline, wide basalt outcrops offer substantial protection to the seawall and road.

Because of the rocky nature of the shoreline and seafloor, there should be minimal physical impacts from proposed improvements to the shoreline in the project site. There is no sand transport in the area, and therefore, no erosion considerations. Also coral growth is sparse in the nearshore because of the high wave energy that can impact the coast. Along the two shoreline segments where the wall is close to 10 feet from the water, proposed improvements may entail work in navigable waters, and trigger U.S. Army Corps and Department of Health permit requirements.

The design breaking wave heights at the shoreline in the project area are 7 feet for an annually occurring wave, 8.4 feet for the 10-year wave, and 11.3 feet for a severe storm. Runup calculations using these wave conditions for four shore protection alternatives indicate that a recurved face seawall and a vertical seawall are the best options for preventing wave runup to road level. Both of these walls limit runup below 11 feet for the annual and 10-year waves, and the recurved-face seawall is calculated to have runup of only 11.5 feet during a severe storm. The revetment and stepped seawalls, on the other hand, are calculated to result in excessive runup even during annual waves.

## REFERENCES

- Haraguchi, Paul, 1979, Weather in Hawaiian Waters, Pacific Weather, Inc., Honolulu, Hawaii.
- Lighthouse Press, 2003. *Tide Tables 2003, Central and Western Pacific Ocean and Indian Ocean*.
- Marine Advisors, Inc., 1963. *Severe Storm Wave Characteristics in the Hawaiian Islands (1947-1961)*, prepared for the Department of Transportation, State of Hawaii.
- U.S. Army Engineer Waterways Experimental Station, Coastal Engineering Research Center, 1984. *Shore Protection Manual*.
- U.S. Army Engineer District, Honolulu, 1967, Report on Survey of the Coasts of the Hawaiian Islands, Harbors for Light-Drift Vessels.



Photo 3. Large Basalt Rocks and Backfill, Segment 2



Photo 4. Natural Basalt Outcrop and Boulders, Segment 2



Photo 5. Basalt Boulder Shoreline, Segment 3



Photo 6. Basalt Outcrop and Boulders, Segment 4

PHOTOGRAPHS

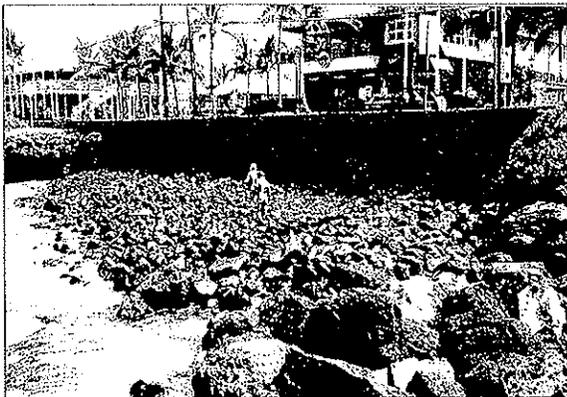


Photo 1. Boulder and Cobble Shoreline, Segment 1



Photo 2. Undermined Section of Wall, Segment 1

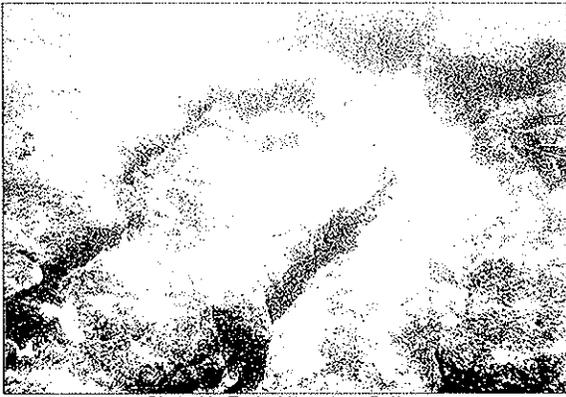


Photo 11. Typical Nearshore Bottom

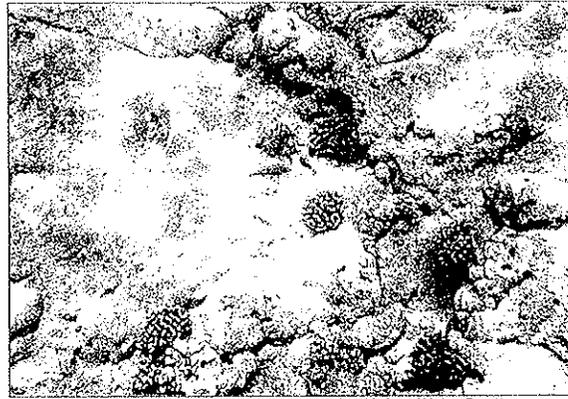


Photo 12. Typical Bottom beyond the 10-foot Water Depth



Photo 13. Small Ledge



Photo 7. Wide Basalt Shoreline with Small Park, Segment 5



Photo 8. Sand and Cobble Beach, Segment 6



Photo 9. Shallow Rock Bench, Segment 6

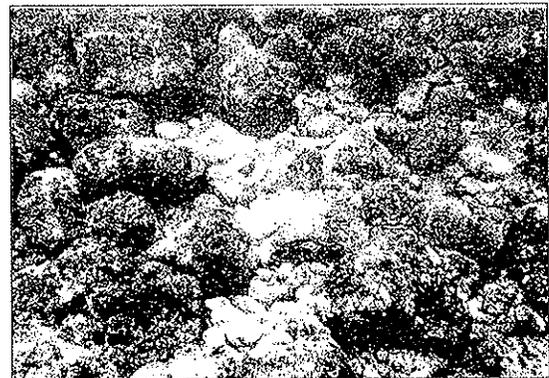


Photo 10. Basalt and Boulder Bottom Close to Shore

# Appendix C

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Letter from U.S. Fish & Wildlife Service,  
August 14, 2006



## 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-SP-655

Bruce C. McClure, P.E.  
County of Hawai'i  
Department of Public Works  
Aupuni Center  
101 Pauahi Street, Suite 7  
Hilo Hawai'i 96720-4224

6468-01  
8/22/06  
AUG 14 2006

Dear Mr. McClure:

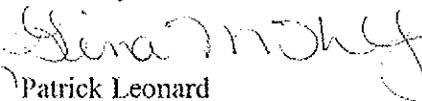
Thank you for your letter Dated August 4, 2006, requesting a list of threatened and endangered species that may occur in the vicinity of the proposed road work on Ali'i Drive between Hualālai Road and Walua Road in Kailua-Kona on the island of Hawai'i. Your letter was received in our office on August 7, 2006. The proposed project is for construction of a new rock seawall and concrete sidewalk along the ocean side of Ali'i Drive in the immediate vicinity of Oneo Bay. Funds for the proposed project are provided by the Federal Highway Administration, the Hawai'i Department of Transportation, and the County of Hawai'i Department of Public Works.

We reviewed the information you provided and pertinent information in our files, including data compiled by the Hawai'i Mapping and Biodiversity Program. Information from these sources show no designated critical habitats in or near the proposed project area. However, there have been sightings of Newell's shearwater (*Puffinus auricularis newelli*; 'a'o) and Hawaiian hoary bat (*Lasiurus cinereus semotus*; 'ōpe'ape'a) in the vicinity of the proposed project area. Both are listed as endangered species under the Federal Endangered Species Act. It is unlikely that the proposed construction activities along Ali'i Drive will affect these federally listed species.

The aquatic resource survey that accompanied your letter indicates that the green sea turtle (*Chelonia mydas*; honu) may occur in Oneo Bay. Green sea turtles are not known to nest within the proposed project area. We suggest that you contact the National Marine Fisheries Service regarding potential impacts to the green sea turtles in the bay.

We appreciate your efforts to conserve endangered species. If you have questions, please contact Patrice Ashfield of my staff (phone: 808/792-9400; fax: 808/792-9581).

Sincerely,

  
Patrick Leonard  
Field Supervisor

TAKE PRIDE  
IN AMERICA 

## Appendix D

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Letters from NOAA, National Marine Fisheries,  
September 7, 2006 and October 4, 2006



U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Pacific Islands Regional Office  
1601 Kapiolani Blvd., Suite 1110  
Honolulu, Hawaii 96814-4700  
(808) 944-2200 • Fax (808) 973-2941

SEP 07 2006

668-01  
9/8/06  
IF  
FILE

Mr. Bruce C. McClure, P.E.  
Director  
County of Hawaii, Department of Public Works  
Aupuni Center  
101 Pauahi Street, Suite 7  
Hilo, HI 96720-4224

Dear Mr. McClure:

This letter responds to your August 4, 2006 letter received by our office on August 7, 2006, regarding the Ali'i Drive improvements project along Oneo Bay, between Hualalai Road and Walua Road, in Kailua-Kona, Hawaii. You requested information on listed species under our jurisdiction that may be affected by the project. National Marine Fisheries Service (NMFS) Pacific Islands Regional Office Protected Resources Division provides the following information under our statutory authorities under the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. §1531 *et seq.*), and the Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1361 *et seq.*).

Your letter indicated that proposed projects include a pedestrian walkway to be cantilevered over the existing seawall, under-grounding of utilities, pedestrian sidewalks, bikes lanes, and other beautification features. ESA-listed species under our jurisdiction that may occur in waters or shorelines around the project area include the threatened green sea turtle (*Chelonia mydas*), and the endangered hawksbill sea turtle (*Eretmochelys imbricata*), humpback whale (*Megaptera novaeangliae*), and Hawaiian monk seal (*Monachus schauinslandi*). No candidate marine species are proposed and critical habitat has not been designated or proposed for any listed species under NMFS's jurisdiction on the island of Hawaii. A complete list of Hawaii's marine protected species under NMFS's jurisdiction is also enclosed for your review.

Finally, we encourage the County of Hawaii Department of Public Works, Hawaii Department of Transportation, and the Federal Highway Administration to initiate ESA Section 7 consultation with NMFS. This will ensure potential impacts on marine protected species are adequately addressed.



Thank you for working with NMFS to protect our nation's living marine resources. Should you have any other questions regarding this project or the consultation process, please contact Krista Graham on my staff at (808) 944-2238, or at the email address [krista.graham@noaa.gov](mailto:krista.graham@noaa.gov). Please refer to consultation #: I-PI-06-526-CY.

Sincerely,

A handwritten signature in black ink, appearing to read "Chris E. Yates", with a long horizontal flourish extending to the right.

Chris E. Yates  
Assistant Regional Administrator  
For Protected Resources

**HAWAII MARINE PROTECTED SPECIES**  
National Marine Fisheries Service, Pacific Islands Regional Office

**MARINE MAMMALS**

All marine mammals are protected under the Marine Mammal Protection Act. Those in *ITALICIZED CAPITALS* are also listed as endangered under the Endangered Species Act.

<u>Common Name</u>	<u>Scientific Name</u>
<i>HAWAIIAN MONK SEAL</i>	<i>Monachus schauinslandi</i>
<i>HUMPBACK WHALE</i>	<i>Megaptera novaeangliae</i>
<i>SPERM WHALE</i>	<i>Physeter macrocephalus</i>
<i>BLUE WHALE</i>	<i>Balaenoptera musculus</i>
<i>FIN WHALE</i>	<i>Balaenoptera physalus</i>
Common Dolphin	<i>Delphinus delphis</i>
Northern Elephant Seal	<i>Mirounga angustirostris</i>
Rough-Toothed Dolphin	<i>Steno bredanensis</i>
Risso's Dolphin	<i>Grampus griseus</i>
Bottlenose Dolphin	<i>Tursiops truncatus</i>
Pantropical Spotted Dolphin	<i>Stenella attenuata</i>
Spinner Dolphin	<i>Stenella longirostris</i>
Striped Dolphin	<i>Stenella coeruleoalba</i>
Melon-Headed Whale	<i>Peponocephala electra</i>
Pygmy Killer Whale	<i>Feresa attenuata</i>
False Killer Whale	<i>Pseudorca crassidens</i>
Killer Whale	<i>Orcinus orca</i>
Short-Finned Pilot Whale	<i>Globicephala macrorhynchus</i>
Blainville's Beaked Whale	<i>Mesoplodon densirostris</i>
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>
Pygmy Sperm Whale	<i>Kogia breviceps</i>
Dwarf Sperm Whale	<i>Kogia sima</i>
Bryde's Whale	<i>Balaenoptera edeni</i>
Fraser's Dolphin	<i>Lagenodelphis hosei</i>

**SEA TURTLES**

All sea turtles are protected under the Endangered Species Act. Those in *italics* are listed as endangered, while those in normal lettering are listed as threatened.

<u>Common Name</u>	<u>Scientific Name</u>
<i>LEATHERBACK TURTLE</i>	<i>Dermochelys coriacea</i>
<i>HAWKSBILL TURTLE</i>	<i>Eretmochelys imbricata</i>
GREEN TURTLE	<i>Chelonia mydas</i>
OLIVE RIDLEY TURTLE	<i>Lepidochelys olivacea</i>
LOGGERHEAD TURTLE	<i>Caretta caretta</i>

*Last updated July 2004*



U.S. DEPARTMENT OF COMMERCE  
 National Oceanic and Atmospheric Administration  
 NATIONAL MARINE FISHERIES SERVICE  
 Pacific Islands Regional Office  
 1601 Kapiolani Blvd., Suite 1110  
 Honolulu, Hawaii 96814-4733  
 (808) 944-2200 • Fax: (808) 973-2941

6468-01

10/6/06  
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OCT 04 2006

[Handwritten initials] FILE

RECEIVED  
 OCT 08 2006  
 WILSON OKOMOTO CORPORATION

Mr. Bruce C. McClure, P.E.  
 Director  
 County of Hawaii, Department of Public Works  
 Aupuni Center  
 101 Pauahi Street, Suite 7  
 Hilo, HI 96720-4224

Dear Mr. McClure:

This letter responds to information requested in your August 4, 2006 letter regarding the Ali'i Drive improvements project along Oneo Bay, between Hualalai Road and Walua Road, in Kailua-Kona, Hawaii. You initially requested information on: 1) listed species that may be potentially affected by the proposed project; 2) locations of listed species in the project vicinity; and 3) the Section 7 Consultation process under the Endangered Species Act (ESA). The National Marine Fisheries Service (NMFS) Pacific Islands Regional Office Protected Resources Division provided ESA-listed marine protected species information to you in our letter dated September 7, 2006. On September 8, 2006, your consultant, Mr. John Sakaguchi of Wilson Okomoto Corporation, contacted our office for remaining information under items 2 and 3. We provide the requested information under our statutory authorities under the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. §1531 *et seq.*).

Based on available information in our files and from staff highly familiar with marine protected species, threatened green sea turtles (*Chelonia mydas*) and endangered hawksbill sea turtles (*Eretmochelys imbricata*) are known to occur in the project vicinity. Although green and hawksbill turtles do not use the limited sandy beach areas for nesting, hawksbill turtles do migrate along the bay's coastline on route to the island of Maui. The bay also provides suitable foraging and resting habitat for green sea turtles.

Although our files lack documented sightings of the endangered Hawaiian monk seal (*Monachus schluinslandi*), the species is known to haul out onto lava outcroppings, rocky ledges, and sandy patches. Given the extent of the lava outcrops and lava boulders, we cannot conclusively state monk seals do not occur in the project vicinity. However, we can assume a low probability of monk seal use of Oneo Bay given no known reports of seal sightings in this highly frequented tourist area. Endangered humpback whales (*Megaptera novaeangliae*) occur in deeper waters beyond the nearshore environment and therefore do not overlap with the project location.



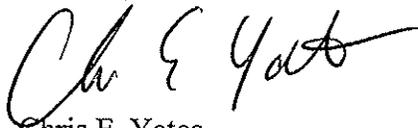
Regarding the Section 7 Consultation process, Section 7(a) 2 of the ESA requires all Federal agencies to insure that any action authorized, funded or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species. As the Federal Highways Administration provides federal funds for this project, we recommend it conduct interagency consultation with NMFS. Necessary project information to facilitate the consultation process include:

1. A description of the proposed action, including structural design, the time frame for project construction, methods of construction and installation, and the application of Best Management Practices and conservation measures to further minimize project effects to marine protected species, as appropriate;
2. A description of the specific area affected by the action;
3. A description of the listed species/critical habitat that may be affected, including direct, indirect and cumulative effects from the proposed action;
4. Relevant reports prepared on the proposal; and
5. Other relevant studies or available information.

Following receipt of the above information from the Federal action agency, we will determine whether the information is adequate to conduct our analyses of project effects to marine protected species. We will then transmit the outcome of our findings through written correspondence to the Federal action agency.

Thank you for working with NMFS to protect our nation's living marine resources. Should you have any other questions regarding this project or the consultation process, please contact Krista Graham on my staff at (808) 944-2238, or at the email address [krista.graham@noaa.gov](mailto:krista.graham@noaa.gov). Please refer to consultation #: I-PI-06-526-CY.

Sincerely,



Chris E. Yates  
Assistant Regional Administrator  
For Protected Resources

Cc: Ms. Richelle Takara, FHWA  
Mr. John Sakaguchi, Wilson Okomoto Corporation  
Mr. Galen Kuba, Public Works Engineering Design

# Appendix E

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Aquatic Resources Survey for the Alii  
Drive Improvements Project at Oneo  
Bay, Kailua-Kona, Hawaii

AECOS, Inc.  
July 2003

## Aquatic resources survey for the Ali 'i Drive improvement project at Oneo Bay, Kailua-Kona, Hawai 'i

July 10, 2003

Revised DRAFT

AECOS No. 1031

Susan Burr  
AECOS, Inc.  
45-939 Kamehameha Highway, No. 104  
Kaneohe, Hawai 'i 96744  
Phone: (808) 234-7770 Fax: (808) 234-7775 Email: aecos@aecos.com

### Introduction

Ali 'i Drive is the main thoroughfare for downtown Kailua-Kona on the Island of Hawai 'i. It begins near the Kailua Pier and runs south for six miles along the coast of Kailua Bay and Oneo Bay until just north of Keaou Bay. The priority enhancement project for Kailua Village involves over three million dollars in improvements to Ali 'i Drive in the vicinity of Oneo Bay. Proposed projects include a pedestrian walkway to be cantilevered over the existing seawall, under-grounding of utilities, pedestrian sidewalks, bike lanes, and other beautification features.

This report presents the results of a survey of the coastline and nearshore environment of Oneo Bay adjacent to Ali 'i Drive for the purpose of assessing potential impacts of the road improvement project on the biological resources.

### Survey Methods

The field reconnaissance survey for this project was conducted on April 24, 2003 by two AECOS biologists, Susan Burr and Steve Wallace, who walked the shoreline and snorkeled the area to identify coastal and marine flora and fauna and collect water samples. The survey area extended approximately 0.5 km (0.3 mi) from Bubba Gump's Restaurant to the Royal Kona Resort. The coastal survey included the land from the makai side of Ali 'i Drive through the littoral zone and included tidepools at the shore. The marine survey extended offshore about 100 m (333 ft). Surveyed depths ranged from less than 0.3 m (1 ft) to over 10 m (33 ft).

The coastal survey involved walking along the shoreline and noting habitat types and species of plants living there. For the marine survey, snorkeling gear was used to inventory species of fish, algae, coral, and other invertebrates and estimate relative abundances of the prominent species.

\* Report prepared for Wilson Okamoto and Associates, Inc. for an environmental assessment. This report will become part of the public record.

Water samples were collected along two transects (north and south) at three distances (1 m, 10 m, and 50m) from the shore (see Figure 1). Some parameters were measured by field meter and others in water samples collected in appropriate containers and taken to the AECOS Laboratory in Kaneohe (Laboratory Log No. 17311). Table 1 lists field instruments and analytical methods used with these samples.

Table 1. Analytical methods and instruments used for the April 24, 2003 water quality sampling of Oneo Bay, Kailua-Kona, Hawai 'i.

Analysis	Method	Reference	Instrument
Ammonia	alkaline phenol	Koroleff in Grasshoff et al. (1986)	Technicon AutoAnalyzer II
Chlorophyll <i>a</i>	10200 H	Standard Methods, 18 <sup>th</sup> Edition (1992)	Turner Model 112 fluorometer
Dissolved Oxygen	EPA 360.1	EPA (1979)	YSI Model 85 DO meter
Nitrate + Nitrite	EPA 353.2	EPA (1993)	Technicon AutoAnalyzer II
Salinity	bench salinometer	Grasshoff in Grasshoff et al. (1986)	AGE Model 2100 salinometer
Temperature	thermister calibrated to NBS cert. Thermometer (EPA 170.1)	EPA (1979)	YSI Model 85 DO meter
Total Nitrogen	persulfate digestion (EPA 358.2)	D'Elia et al. (1977) / EPA (1993)	Technicon AutoAnalyzer II
Total Phosphorus	persulfate digestion / EPA 365.1	Koroleff in Grasshoff et al. (1986) / EPA (1993)	Technicon AutoAnalyzer II
Total Suspended Solids	Method 2540D (EPA 160.2)	Standard Methods 18 <sup>th</sup> Edition (1992); EPA (1979)	Mettler H31 balance
Turbidity	Method 2130B (EPA 180.1)	Standard Methods 18 <sup>th</sup> Edition (1992); EPA (1993)	Hach 2100P Turbidimeter

D'Elia, C.F., P.A. Stendler, & N. Corwin. 1977. *Limnol. Occurrence*: 23(4): 766-768.  
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### Environment Description

Oneo Bay is located southeast of Kailua-Kona village, at the base of the 8,271 foot Mt. Hualalai. Oneo Bay is bounded by two lava outcrop headlands that separate it from Kailua Bay proper. Kailua Bay is an important port for West Hawai 'i; it regularly receives cruise ships, fishing vessels, and recreational vessels. It is also the home port for many commercial adventure vessels that operate in Kailua Bay and along the Kona Coast. Ali 'i Drive and its associated

shoreline protection structures are immediately mauka on the east side of Oneo Bay. The deepest point of Oneo Bay is 9 m (29 ft), whereas the deepest point of Kailua Bay is 25 m (81 ft). Most of Oneo Bay is fairly shallow at less than 5.5 m (18 ft).

The Royal Kona Hotel is built on the lava headland at the southern point of Oneo Bay. The lava shoreline is steep here and numerous tidepools mark the transition between the littoral and reef zones. Just north of the hotel, a small sandy beach fronts Huggo's Restaurant with some coconut palms or niu (*Cocos nucifera*) and *naupaka kaihakai* (*Scaevola sericea*) growing along the shoreline. Ali 'i Drive abuts the north-south margin of Oneo Bay. The road is protected from the force of the waves and ocean swells by seawalls and lava boulders (Figure 2a). Coconut palms, *naupaka*, and tree heliotrope (*Tournefortia argentea*) grow in a few places along the edges of these reinforcements. The *makai* margin consists of either rubble or water-levleled lava benches through the northern edge of the bay. A small grassy lawn is located between Ali 'i Drive and Oneo Bay at the northern end of the bay. A shallow bathing pool has been created by placement of boulders in the nearshore waters. North of this bathing pool is another sandy beach with various coastal plants including beach morning glory or *pohuehue* (*Pomoea pes-caprae*), coconut palms, tree heliotrope, false *kamani* (*Terminalia catappa*), and *naupaka* (Figure 2b). A seawall protects a restaurant located on the northern edge of Oneo Bay. The lava shoreline then steepens to the lava headland of the northern point.

Offshore, the lava ledge slopes downward gradually, supporting a fringing reef throughout the bay. Tissot et al. (2002) estimated there is over 70 percent coral coverage in South Oneo Bay at a depth between 10 and 18 m. This is high when compared with other sites along the Kona Coast and attributed by these authors to the relatively sheltered conditions. In deeper water towards the center the bay, the bottom is primarily sand.

No surface streams or storm drains discharge into Oneo Bay, although a significant amount of groundwater naturally discharges into the shallow waters of the bay.

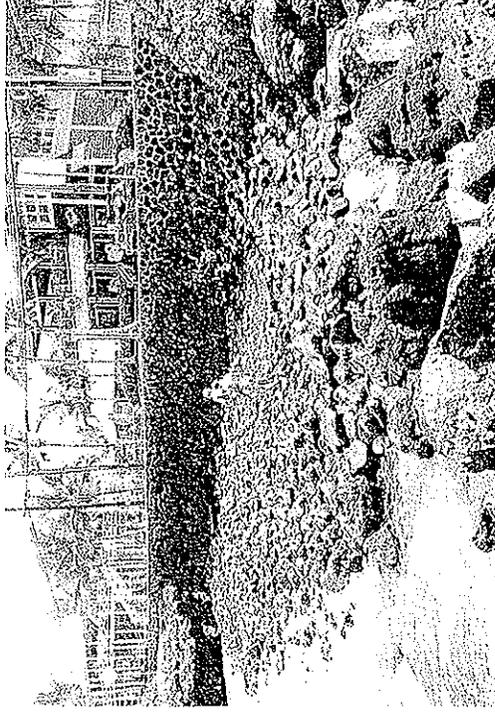
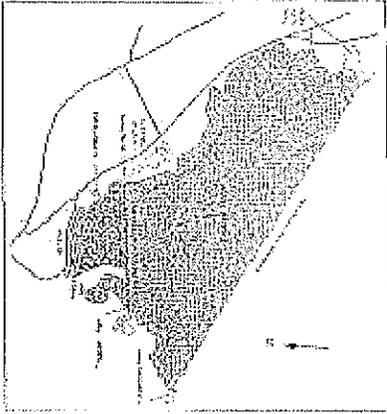


Figure 2a. (upper). Ali 'i Drive seawall and boulders. Figure 2b (lower). Northern-most sandy beach of Oneo Bay.

**Fishery Zones**

The Kailua Bay Fishery Management Area (FMA) encompasses the portions of Kailua and Ono bays within a straight line drawn from Kukailimoku Point to the seawall of the Royal Kona Resort. Zone A is the northwestern portion of the bay from Thurston Point to the corner of the seawall at Wiha Point. Zone B is the remaining portion of the bay seaward of Zone A (Figure 3). Ono Bay is within Zone B. Fishing is prohibited in the FMA, except as is allowed for in the regulations (DLNR, 1995).

Figure 3. Kailua Bay Fisheries Management Area, Hawaii (DLNR, 1995).



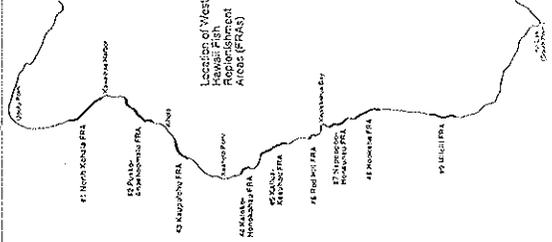
Map of Kailua Bay Fisheries Management Area Hawaii DLNR 1995

Additionally, HAR §13-58 created the Kona Coast Fishery Management Area to prohibit the collection of aquarium fish in various zones along the Kona Coast of the Big Island (DLNR, 2001). The Kailua Bay Zone of the Kona Coast FMA is bounded by two lines extending seaward from Kukailimoku Point and the former swimming pool fronting the Kona Inn Shopping Village and does not include Ono Bay.

Finally, in 1999 the West Hawaii Regional Fishery Management Area was established (HAR §13-60.3), which consists of nine fish replenishment areas (FRAs) and covers approximately 35 percent of the West Hawaii shoreline (DLNR, 1999). The FRAs came into effect on January 1, 2000 and have been officially closed to aquarium fishing since then. All FRAs extend from the shoreline to a depth of 100 fathoms or 600 feet. The Kailua-Keauhou FRA, which includes Ono Bay, is bounded by the south boundary of the Kailua Bay Kona Coast FMA and the north boundary of the Keauhou FMA, approximately 6.5 miles long (Figure 4). Taking of aquatic life for commercial or non-commercial aquarium purposes is prohibited in these areas, as is fish

feeding (DLNR, 1999). Tissot et al. (2002) found that aquarium fishes have increased significantly (0.8%) in the FRAs relative to controls since their closure to aquarium collection on January 1, 2000.

Figure 4. West Hawaii Fish Replenishment Areas (DLNR, 1999).



**Ono Bay**

**Coastal Strand**

A limited number of species are capable of adapting to the harsh conditions of the coastal strand. Most of the species observed in the survey area are native or early Polynesian introductions to Hawai'i. The plants observed include: indigenous *Pohouliue* or beach morning glory (*Ipomoea pes-caprae*) and *naupaka kahakani* (*Scaevola toecadae*); early Polynesian introduction *niu* or coconut palm (*Cocos nucifera*); and two alien or naturalized species: tree heliotrope (*Tournefortia argentea*) and false *kamani* (*Terminalia catappa*). None of the plants encountered is listed as threatened or endangered, or otherwise would be considered rare or special by the State or Federal governments (DLNR, 1998; Federal Register, 1999a,b,2001).

**Fringing Reef**

A listing of marine plants and animals found near the project site is provided in Table 2.

Table 2. Checklist of aquatic biota observed off Ali'i Drive in the nearshore environment of Oneo Bay.

Species	Common name	Reef	Littoral
<b>CHLOROPHYTA</b>	<b>ALGAE</b>		
<i>Ulva expansa</i>	green algae	C	
<b>PHAEOPHYTA</b>	brown algae	C	
<i>Dictyota acutifolia</i>		C	
<i>Sargassum echinocarpum</i> J. Agardh		C	
<b>RHODOPHYTA</b>	red algae		
<i>Jania</i> sp.		A	
<i>Porolithon gardineri</i> (Fensholt) Foslie	coralline algae	A	
<i>Porolithon onkodes</i> (Heyenrich) Foslie	coralline algae	A	
	<b>INVERTEBRATES</b>		
<b>Cnidaria, Anthozoa</b>	glass anemone	U	
<b>Actiniaria, Aiptisiidae</b>	blue-gray zoanthid	U	
<i>Aiptasia pulchella</i> Caullery	cauliflower coral	A	
<b>Zoanthinaria, Zoanthidae</b>	anther coral	R	
<i>Palythoa caesia</i> Dana	rice coral	C	
<b>Scleractinia, Pocilloporidae</b>	blue rice coral	U	
<i>Pocillopora meandrina</i> Dana	spreading coral	C	
<i>Pocillopora eydouxi</i> Milne-Edwards & Haime	lobe coral	A	
<b>Scleractinia, Acroporidae</b>	corrugated coral	U	
<i>Montipora capitata</i> (Dana)	ocellated coral	U	
<i>Montipora flabellata</i> Stueder	'opipi, limpet	C	
<i>Montipora patula</i> Verill	cowry	U	
<b>Scleractinia, Poritidae</b>	black nerite		A
<i>Porites lobata</i> Dana	dotted periwinkle		A
<b>Scleractinia, Agariciidae</b>	grape morula	U	
<i>Pseudoverticillium</i> Verill	variable worm snail		U
<b>Scleractinia, Faviidae</b>	muschel		U
<i>Cyathostrea ocellifera</i> (Dana)			
<b>Mollusca, Gastropoda, Prosobranchia</b>			
<b>Patellidae</b>			
<i>Cellana</i> sp.			
<b>Cypraeidae</b>			
<i>Cypraea</i> sp.			
<b>Neritidae</b>			
<i>Nerita picea</i> (Recluz)			
<b>Littorinidae</b>			
<i>Littoraria pinnata</i> (Wood)			
<b>Thaididae</b>			
<i>Morula uva</i> Roding			
<b>Vermetidae</b>			
<i>Serpulorbis variabilis</i> (Hedfield & Kay)			
<b>Mollusca, Bivalvia</b>			
<b>Mytilidae</b>			
unidentified			
<b>Arthropoda, Crustacea, Decapoda</b>			

Species	Common name	Reef	Littoral
<b>ALPHEIDAE</b>			
<i>Alpheus deuteropus</i> Hilgendorf	snapping shrimp (in <i>P. lobata</i> )	U	
<b>DIOGENIDAE</b>			
<i>Galathea</i> sp.	hermit crab	C	
<b>GRAPSIDAE</b>			
<i>Grapsus tenuirostris</i> (Herbst)	thin-shelled rock crab	C	A
<i>Percnon planissimum</i> (Herbst)	flat rock crab	C	
<b>ECHINODERMATA, OPHUROIDEA</b>			
<b>OPHOCOMIDAE</b>	brittle star	U	
<b>ECHINODERMATA, ECHINOIDEA</b>			
<b>DIADEMATIDAE</b>	banded urchin	U	
<b>ECHINOMETRIDAE</b>			
<i>Colobocentrotus atratus</i> (L.)	helmet urchin	A	
<i>Echinometra mathaei</i> (de Blainville)	rock-boring urchin	A	
<i>Heterocentrotus mammillatus</i> (L.)	red pencil urchin	U	
<b>TOXOPNEUSTIDAE</b>			
<i>Tripanus testudinum</i> (L.)	collector urchin	C	
<b>ECHINODERMATA, HOLOTHUROIDEA</b>			
<b>ACTINOFODA, HOLOTHURIDAE</b>			
<i>Aequiops mauritiana</i> (Quoy & Gaimard)	white-spotted sea cucumber	C	
<i>Holothuria atra</i> Jaeger	black sea cucumber	R	
<i>Holothuria cinerascens</i> Brandt	ashy sea cucumber	R	
	<b>VERTEBRATES</b>		
	fishes		
<b>VERTEBRATA, PICES</b>			
<b>MURAENIDAE</b>			
<i>Gymnothorax</i> sp.	moray eel	U	
<b>FISTULARIIDAE</b>			
<i>Fistularia commersonii</i> Rüppell	coronetfish	R	
<b>SERRANIDAE</b>			
<i>Cephalopholis argus</i> Bloch & Schneider	peacock grouper	R	
<b>CIRRHITIDAE</b>			
<i>Paracirrhites forsteri</i> (Bloch & Schneider)	blackside hawkfish	U	
<b>MULLIDAE</b>			
<i>Mulloidichthys flavolineatus</i> (Lacepede)	yellowstripe goatfish	C	
<i>Mulloidichthys varicolenis</i> (Valenciennes)	yellowfin goatfish	C	
<b>CHAETODONTIDAE</b>			
<i>Chaetodon auriga</i> Fossika	threadfin butterflyfish	A	
<i>Chaetodon lunata</i> (Lacepede)	reef butterflyfish	A	
<i>Chaetodon multicinctus</i> Garret	multiband butterflyfish	C	
<i>Chaetodon ornatissimus</i> Cuvier	ornate butterflyfish	C	
<i>Chaetodon quadrimaculatus</i> Gray	fourspot butterflyfish	A	
<i>Chaetodon unimaculatus</i> Bloch	teardrop butterflyfish	A	
<i>Forcipiger flavissimus</i> Jordan & McGregor	forcepsfish	C	
<i>Forcipiger longirostris</i> Broussonet	longnose butterflyfish	C	
<b>POMOCENTRIDAE</b>			
<i>Abudefduf abdominalis</i> (Quoy & Gaimard)	Hawaiian sergeant	A	
<i>Abudefduf sordidus</i> (Forsskal)	blackspot sergeant	A	
<b>LABRIDAE</b>			
<i>Gomphosus varius</i> Lacepede	bird wrasse	U	
<i>Labroides philliphaugus</i> Randall	cleaner wrasse	U	
<i>Thalassoma duperrey</i> (Quoy & Gaimard)	saddle wrasse	C	
	<b>SCARIDAE</b>		

Species	Common name	Reef	Littoral
<i>Chlorurus sordidus</i> (Forskal)	bullethead parrotfish	C	
<i>Scarus rubriviolaceus</i> Bleeker	redlip parrotfish	C	
ZANCLIDAE			
<i>Zanclus cornutus</i> (L.)	Moorish idol	C	
ACANTHURIDAE			
<i>Acanthurus achilles</i> Shaw	achilles tang	A	
<i>Acanthurus nigrofasciatus</i> Foster & Schneider	whitespotted surgeonfish	C	
<i>Acanthurus nigrofuscatus</i> Valenciennes	bluelined surgeonfish	C	
<i>Acanthurus olivaceus</i> Foster & Schneider	orangeband surgeonfish	C	
<i>Acanthurus triostegus</i> (L.)	convict surgeonfish	A	
<i>Ctenochaetus hawaiiensis</i> Randall	black surgeonfish	U	
<i>Ctenochaetus strigosus</i> (Bennett)	goldring surgeonfish	C	
<i>Naso lituratus</i> (Foster & Schneider)	orangespine unicornfish	A	
<i>Naso unicornis</i> (Forskal)	bluespine unicornfish	C	
<i>Zebrasoma flavescens</i> (Bennett)	yellow tang	A	
BALISTIDAE			
<i>Melichthys vidua</i> (Schneider)	pinktail durgon	A	
<i>Rhinocentrus rectangulatus</i> (Sech & Schneider)	reef triggerfish	U	
OSTRACIDAE			
<i>Ostracion meleagris</i> (Shaw & Nedder)	spotted boxfish	U	
DIODONTIDAE			
<i>Diodon hystrix</i> L	porcupinefish	R	
VERTEBRATA, REPTILIA	reptiles		
CHELONIDAE			
<i>Chelonia mydas</i> (L.)	honu, green sea turtle	U	

KEY TO SYMBOLS USED IN TABLE 2:

Abundance categories:

- R - Rare - only one or two individuals seen.
- U - Uncommon - three to six individuals observed.
- C - Common - six to twelve individuals observed.
- A - Abundant - found in large numbers and widely distributed (more than twelve individuals observed)

QC: All listed species were observed in the field by aquatic biologists on April 24, 2003.

Oheo Bay has a relatively narrow fringing or apron reef along most of the shoreline (Figure 5a). Porites lobata coral colonies dominate this reef throughout the bay. Pocillopora meandrina coral colonies become more common in the southern half. Coral coverage is fairly dense on the deeper portions of the reef (between 20 and 70 percent coverage), but in areas exposed to heavy wave action, the substratum is bare or dominated by the coralline red alga, Jania sp.

The fishes and macroinvertebrates observed in the survey area are typical for this type of environment - an energetic surge zone in an otherwise protected bay. Various surgeonfish, parrotfish, and butterflyfish dominate the fauna (Figure 5b). Most of the targeted aquarium fishes (Tissot, et al, 2002) are abundant or common in Oheo Bay, including achilles tang (*Acanthurus achilles*), yellow tang (*Zebrasoma flavescens*), butterfly fish (*Forcipiger* spp., *Chaetodon quadrimaculatus*, *C. ornatissimus*, *C. multicinctus*), Moorish idol (*Zanclus cornutus*), goldring surgeonfish (*Ctenochaetus strigosus*), and orangespine unicornfish (*Naso lituratus*). No angelfishes were observed; however, this may be due to the fact that this group of

fish was simply overlooked by the observers, or that they occur in low numbers and were missed by the survey.

Water Quality

The primary purpose of these water quality data is to characterize existing marine conditions and not to set baseline values or determine compliance with the Hawaii's Water Quality Standards for West Hawaii'i (Table 3; DOH, 2000). The criteria for turbidity, nutrients, and chlorophyll  $\alpha$  are based upon geometric mean values, which require a minimum of three separate samples to compute; the criteria for total nitrogen and total phosphorus are given as the dissolved fraction; and the sampling protocol to determine compliance with the standards requires the samples to be collected along a transect at distances of 1, 10, 50, 100, and 500 meters from the shoreline at least three times on different dates. Thus, this single set of data is not strictly comparable with all State criteria. Nonetheless, the results can be evaluated against the water quality standards as long as these limitations are realized.

Table 3. State of Hawaii geometric mean criteria for West Hawaii'i nearshore waters (DOH, 2003).

Ammonium (ug N/l)	Nitrate + nitrite (ug N/l)	Total Dissolved N (ug N/l)	Total Dissolved P (ug P/l)	Chlorophyll $\alpha$ (ug N/l)	Turbidity NTU
2.50	4.50	100.00	12.50	0.30	0.10

- pH shall not vary more than 0.5 units from 8.1.
- Dissolved oxygen shall not be less than 75% saturation.
- Temperature shall not vary more than 1 °C from ambient.
- Salinity shall not vary more than 10% from ambient.

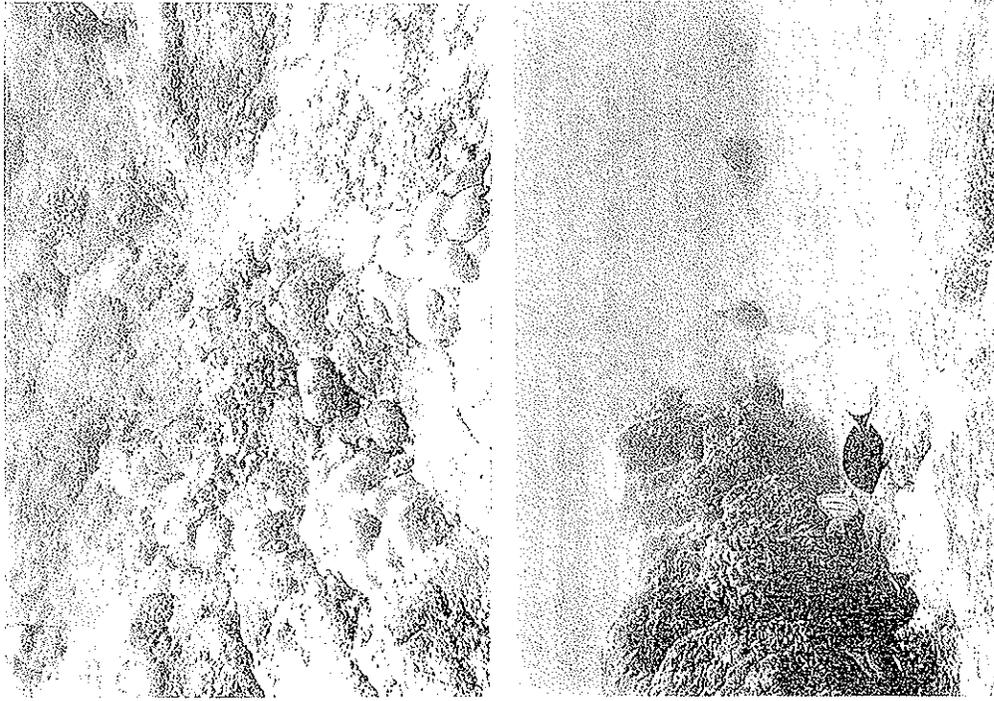


Figure 3a. (upper). Typical substrate of Oneco Bay fringing reef. *Porites lobata* and *Pocillopora meandrina* are the dominate species of coral. Figure 3b (lower). Typical surgeonfishes found in the surge zone of Oneco Bay.

The nearshore waters of Oneco Bay are well mixed by constant wave action. The samples collected on April 24 indicate that the quality of the water in Oneco Bay is good (Table 4), although possibly slightly enriched by nutrients as compared to the water quality standards. We noticed numerous groundwater seeps throughout the study site by observing schlieren effects in the water column and sensible perception of cool water pockets. The values measured for the standard parameters of temperature and salinity are typical for marine waters that receive some freshwater influence; these values are slightly lower than they might be if they were not influenced by. The pH and DO values are what would be expected in nearshore waters. Ammonia was not detected in any of the samples.

Table 4. Water quality characteristics of Oneco Bay from samples taken on April 24, 2003.

	Time sampled	Temp. (°C)	Salinity ‰	DO (mg/l)	DO % sat	pH (pH units)	Turbidity (ntu)
<b>South Transect</b>							
1 m	1145	26.7	33.509	5.76	88	8.16	1.67
10 m	1150	25.9	34.105	6.20	93	8.22	0.83
50 m	1145	26.2	34.188	6.00	91	8.13	1.22
<b>North Transect</b>							
1 m	1205	26.8	33.915	6.11	93	8.37	1.01
10 m	1210	26.3	33.689	5.69	86	8.22	0.21
50 m	1205	26.3	34.256	5.28	80	8.15	0.24
<b>South Transect</b>							
1 m		24	<1	211	11	19	0.56
10 m		17	<1	178	10	16	0.25
50 m		26	<1	166	12	16	0.25
<b>North Transect</b>							
1 m		24	<1	190	8	21	0.62
10 m		58	<1	211	11	21	0.46
50 m		48	<1	206	10	19	0.28
		Nitrate + nitrite (µg N/l)	Ammonia (µg N/l)	Total N (µg N/l)	Ortho-phosphate (µg P/l)	Total P (µg P/l)	Chl α (µg/l)

The clarity of the water as measured by turbidity is good. The offshore samples, particularly from the north transect, have lower turbidity levels than the inshore samples. Chlorophyll α values follow the same trend as the turbidity values.

The total phosphorus levels are slightly high (16 - 21 µg/L), although the concentration measured by the lab includes the particulate fraction as well as the dissolved fraction (inorganic and organic), as opposed to the 12.50 µg/L criterion established for total dissolved phosphorus in the water quality standards. About half of the reported total phosphorus concentration is from orthophosphate, indicating that the source of much of this nutrient is from over-fertilization somewhere in the watershed. Nitrite + nitrate and total nitrogen (particulate and

dissolved) levels measured in Oneo Bay are moderately high, indicating the groundwater seeps influence the quality of the nearshore waters. The waters of Oneo Bay are well mixed and it does not appear that the nutrient enrichment is causing eutrophication.

Turbidity, chlorophyll *a*, nitrate + nitrite, orthophosphate, total N, and total P, appear to be slightly elevated from the levels specified as criteria in the standards for West Hawaii I. However, if additional offshore samples along the transects are collected and the samples are collected over a longer period of time, as required by the regulations to determine compliance, the geometric mean values for these parameters might comply with the regulations. Either way, there does not currently appear to be a water quality problem in Oneo Bay.

### Assessment

#### Coastal impacts

No threatened or endangered plants or animals listed in the Federal Register (1999a, 1999b, and 2001) were observed on the coast in the survey area.

The strand vegetation is not extensive in the survey area and the boulder beaches, lava outcrops, seawalls, and proximity of the road to the ocean limit the extent to which the vegetation can grow. The trees (false *kamani*, coconuts, etc.) and other vegetation (*naupaka* and beach morning glory) growing on the edges of the pocket beaches should either be retained or replanted after construction if disturbed. Additional trees could be planted in other suitable locations throughout the area to provide shade for the sidewalk and to enhance the natural look of the area. Native or early Polynesian introduction coastal trees such as *hala* (*Pandanus tectorius*), *milo* (*Thespesia populnea*), *kamani* (*Calophyllum inophyllum*), or *kou* (*Cordia subcordata*) might do well here.

#### Offshore impacts

Oneo Bay has a narrow fringing reef that gives way to a deeper, although still fairly shallow, sandy bottom. A healthy coral reef community is supported in Oneo Bay. The protected nature of the bay and proximity to an easy entrance spot near Kailua pier make Oneo Bay a popular place for snorkeling and swimming. People also shore-cast off the seawall (within the limitations of the fishery regulations). Because it is a fishery reserve, there are many small colorful fish in the bay that might otherwise be absent because they were collected for the aquarium trade.

Two protected species are known from this area: the 'opihi and the green sea turtle. The State of Hawaii has a prohibition on taking 'opihi under a certain size for purposes of selling the meat without a permit (DLNR, 1981). However, this rule does not protect the species from either catches for personal use or from other sorts of destruction. The 'opihi is not a listed species nor a candidate for listing under Federal endangered species rules (Federal Register, 1999a, 1999b, and 2001).

The honu or Pacific green sea turtle (*Chelonia mydas*) is protected by both State and Federal endangered species laws. The honu is listed as a threatened species by Department of Land and Natural Resources (DLNR, 1998) and U.S. Fish and Wildlife Service (Federal Register, 1999a, 1999b, and 2001). Oneo Bay provides habitat for this threatened species.

It is not anticipated that the proposed development will have much, if any, impact upon existing marine resources. No structures are proposed to be constructed off the shoreline. During construction, best management practices (BMPs) should be employed to keep runoff from entering the water, construction debris should not be stored on the shoreline and should be prevented from entering the water, coastal vegetation should not be removed if possible and should be replaced after construction if it is removed. Additional native or Polynesian introduction trees could be planted around the sidewalk to provide shade and increase coastal habitat in the area.

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# Appendix F

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Archaeological Inventory Survey Alii  
Drive Improvements Projects, Lands of  
Hienaloli 1 – 6, Auhaukeae 1 – 2,  
and Puaa 1 – 2, North Kona District,  
Island of Hawaii

Haun & Associates  
July 2005 (Revised December 2006)

ARCHAEOLOGICAL INVENTORY SURVEY  
ALI'I DRIVE IMPROVEMENTS PROJECT

LANDS OF HIENALOLI 1-6, AUHAUKEA'E 1-2, AND PUA'A 1-2

NORTH KONA DISTRICT, ISLAND OF HAWAI'I

(TMK: 7-5-8: por. 001, 003, 005, 006, 009, 011, 012, 017, 019, 022;  
and TMK: 7-5-9: por. 003, 008-012, 014, 017, 018, 020-023, 025,  
027, 028, 030, 031, 034, 039, 040, 043, 047, 065)

ARCHAEOLOGICAL INVENTORY SURVEY

ALI'I DRIVE IMPROVEMENTS PROJECT

LANDS OF HIENALOLI 1-6, AUHAUKEA'E 1-2 AND  
PUA'A 1-2

NORTH KONA DISTRICT, ISLAND OF HAWAI'I

(TMK: 7-5-8: por. 001, 003, 005, 006, 009, 011, 012,  
017, 019, 022; and TMK: 7-5-9: por. 003, 008-012,  
014, 017, 018, 020-023, 025, 027, 028, 030, 031, 034,  
039, 040, 043, 047, 065)

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# SUMMARY

Hauu & Associates conducted an archaeological inventory survey of a c. 7.35-acre parcel located in the Lands of Hialeah 1-6, Ahukaa'e 1-2, and Pua'a 1-2, North Kona District, Island of Hawaii (TMK: 7-5-8: por. 001, 003, 005, 006, 009, 011, 012, 017, 019, 022; TMK: 7-5-9: por. 003, 008-012, 014, 017, 018, 020-023, 025, 027, 028, 030, 031, 034, 039, 040, 043, 047, 065). The objective of the survey was to satisfy historic preservation regulatory review requirements of the National Historic Preservation Act of 1966, and amended, and its implementing regulations (36 CFR § 800); and the inventory survey requirements of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD), as contained within Hawaii Administrative Rules, Title 13, DLNR, Subtitle 13, State Historic Preservation Rules.

The survey identified three sites with nine features. The sites are comprised of a single feature site (Site 24019) and two complexes of features (Sites 24020 and 24021). The features consist of a wall, an enclosure, two subsurface cultural deposits, three *papaui* and two petroglyphs. Functionally, the features consist of recreation (n=3), rock art (2), livestock control (1), and habitation (3).

The identified sites and features conform to the site and feature types expected in the *kūia* zone of the Kona Field System based on previous archaeological work and historic documentary research. Probable prehistoric to early historic sites consist of petroglyphs and *papaui* at Site 24021 and a truncated subsurface cultural deposit at Site 24020 (Features B and C). The Site 24019 wall is relatively high and core-filled indicating a probable association with cattle ranching. The wall may have been initially constructed in the mid- to late 1800s, and probably was used and maintained until at least the mid-1900s. The enclosure at Site 24020 (Feature A) probably is a historic habitation based on its relationship to the Site 24019 ranch wall, portable remains, and interior pavement.

All three sites are assessed as significant for their informant content. The sites have yielded information important for understanding late prehistoric to historic land use. The Site 24021 petroglyphs are additionally assessed as significant as a good site type example. The planned road improvements have been designed to avoid any impact to the identified sites. The properties where the sites are situated will remain in the current ownership and will not be acquired for the road improvements project. Site 24021 is situated on State land bordering the ocean and the remaining two sites are on private property. Site 24021 is recommended for preservation. The mapping, written description, and photography at Site 24019 adequately document it and no further archaeological work is recommended. Site 24020 retains the potential to yield information important for understanding prehistoric and historic land use. The site is recommended for either preservation or data recovery depending upon the nature of future private development plans. It is also recommended that the initial excavations of road improvements project be monitored because of the potential presence of buried cultural deposits. The monitoring would be guided by a Monitoring Plan prepared for DLNR-SHPD review and approval.

# CONTENTS

Introduction	1
Scope of Work	1
Project Area Description	1
Methods	4
Archaeological and Historical Background	4
Historical Documentary Research	4
Previous Archaeological Work	17
Project Expectations	22
Findings	23
Conclusion	34
Discussion	34
Significance Assessments	34
Recommended Treatments	34
References	35
ILLUSTRATIONS	
Figure 1. Portion of USGS Kailua Quadrangle Showing Survey Area	2
Figure 2. Project Area Overview -- Developed Portions	3
Figure 3. Project Area Overview -- Undeveloped Portion	3
Figure 4. Ahupua'a Boundaries and Land Commission Awards	5
Figure 5. Portion of J.S. Emerson and S.M. Kanakanui 1880 Map of Kailua Town and Vicinity	13
Figure 6. Portion of Emerson's circa 1880 Map of Kailua	14
Figure 7. Portion of Jackson's 1883 Map of Kailua Bay	15
Figure 8. Portion of Early 1900s Map of Kailua	16
Figure 9. Portion of 1928 USGS Quadrangle	18
Figure 10. Previous Archaeological Work	20
Figure 11. Site Location Map	24
Figure 12. Plan Map of Sites 24019 and 24020 and Location of Shovel Test	25
Figure 13. Site 24019 Wall	26
Figure 14. Site 24020 Enclosure	26

## ILLUSTRATIONS (cont.)

Figure 15	Shovel Test Stratigraphy	30	
Figure 16	Site 24021 Plan Map	31	
Figure 17	Site 24021, Feature A, B and E	Papamu	32
Figure 18	Site 24021, Feature C and D	Petroglyphs	32

## TABLES

Table 1.	Land Commission Award Claims	7
Table 2.	Summary of Previous Archaeological Work	19
Table 3.	Summary of Shovel Testing Results	28

## INTRODUCTION

At the request of Wilson Okamoto Corporation, Haun & Associates conducted an archaeological inventory survey of a c. 7.35-acre parcel located in the Lands of Hiinaloi 1-6, Auhakea'e 1-2, and Pua'a 1-2, North Kona District, Island of Hawaii'i (Figure 1). The narrow project area extends through numerous tax map parcels TMK: (3) 7-5-8; por. 001, 003, 005, 006, 009, 011, 012, 017, 019, 022; and TMK: 7-5-9; por. 003, 008-012, 014, 017, 018, 020-023, 025, 027, 028, 030, 031, 034, 039, 040, 043, 047, 065). The objective of the survey was to satisfy historic preservation regulatory review requirements of the National Historic Preservation Act of 1966, and amended, and its implementing regulations (36 CFR § 800), and the inventory survey requirements of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD), as contained within Hawaii Administrative Rules, Title 13, DLNR, Subtitle 13, State Historic Preservation Rules (2003).

The survey fieldwork was conducted April 17-18, 2003, under the direction of Dr. Alan Haun. Described in this final report are the project scope of work, field methods, background information, survey findings, and significance assessments of the sites with recommended further treatments.

## Scope of Work

Based on DLNR-SHPD rules for inventory surveys, the following specific tasks were determined to constitute an appropriate scope of work for the project:

1. Conduct background review and research of existing archaeological and historical documentary literature relating to the project area and its immediate vicinity--including examination of Land Commission Awards, *ahupua'a* records, historic maps, archival materials, archaeological reports, and other historical sources.
2. Conduct a high intensity, 100% pedestrian survey coverage of the project area;
3. Conduct detailed recording of all potentially significant sites including scaled plan drawings, written descriptions, and photographs, as appropriate;
4. Conduct limited subsurface testing (manual excavation) at selected sites (a) to determine the presence or absence of potentially significant buried cultural deposits or features, and (b) to obtain suitable samples for radiocarbon age determination analyses;
5. Analyze background research and field data; and
6. Prepare and submit Final Report.

## Project Area Description

The project area consists of a c. 7.35-acre corridor that parallels the inland and seaward sides of Ali'i Drive. The corridor is 50 feet wide (15.2 m) on both sides of the existing road, originating at the intersection with Hualalai Road in the north and extending c. 2,301 ft (735 m) in a roughly southeasterly direction, terminating at Waiea Road in the south.

The majority of the corridor along the seaward side of the road is comprised of bare coastal pahoehoe lava, separated by a modern seawall (Figure 2). Most of the land bordering the road has been impacted by building construction and is occupied by a number of establishments including the Coconut Grove Market Place, the Hard Rock Café, the Ali'i Sunset Plaza, the Kona Ali'i, the Kona Islander, Saint Michael Church, Bibba Gumps restaurant and several parking areas. A c. 150.0 m long undeveloped section of land is present along the inland side of the road at the southern end of the project area (Figure 3). A bulldozed parking lot is located in the southern portion of this undeveloped area (see Figure 1).

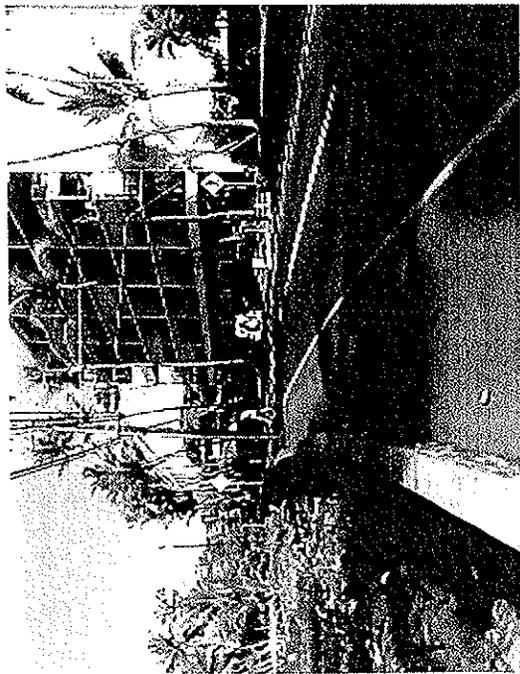


Figure 2. Project Area Overview, Developed Portion, view to north



Figure 3. Project Area Overview, Undeveloped Portions, view to north

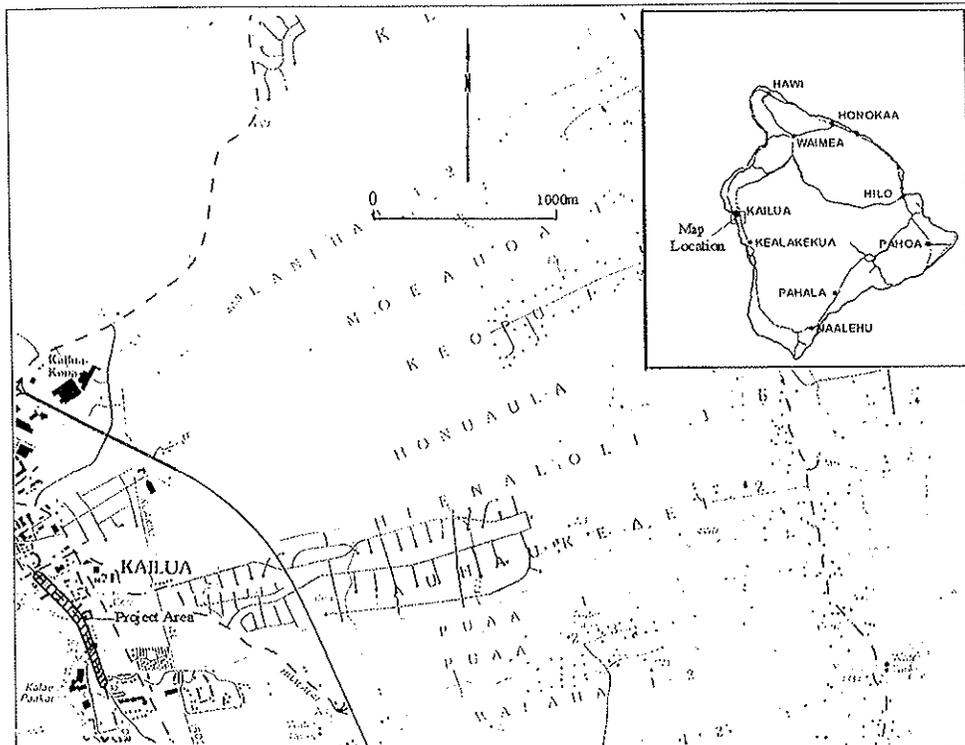


Figure 1. Portion of USGS Kailua Quadrangle showing Project Area

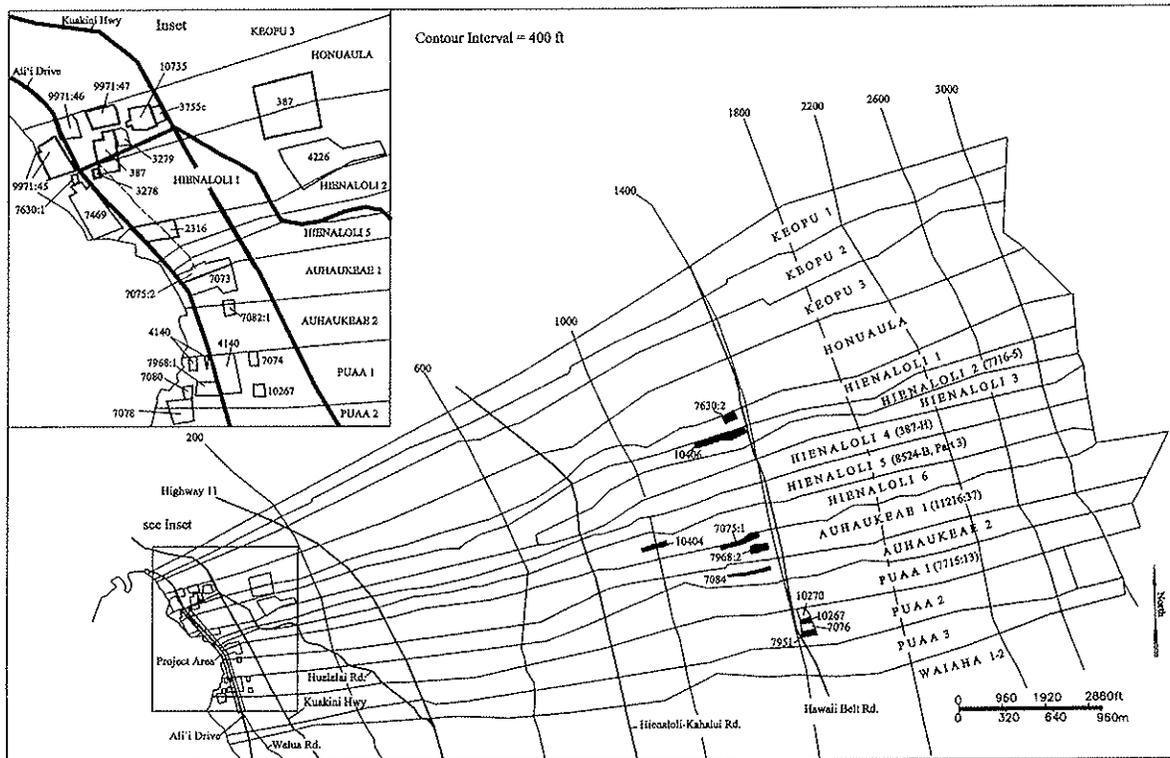


Figure 4. Ahupua'a Boundaries and Land Commission Awards

The project area ranges in elevation from 5-10 ft. The soil in this area is comprised of Punahou extremely rocky peat on 6-20 % slopes (Sato et al. 1973:48). This soil is typified by a thin (4") black peat over paleochlorite bedrock, with 40-50% of the ground surface occupied by rock outcrops. This soil evidences a rapid permeability, a slow runoff and slight erosional hazard. Sato et al. indicate that this soil is most commonly used for pasturage (91973:48). The lava substrate in this area consists of Holocene flows from Hualalai Volcano (Wolfe and Morris 2001). The vegetation in the undeveloped portion of the project area is dominated by *koa haole* (*Leucaena leucocaphala* [Lam.] de Wit), with scattered *kiawe* (*Prosopis pallida* [Humb. & Bonpl. Ex Willd.] HBK.), *panini* cactus (*Opuntia megacantha* Salm-Dyck), and grasses and vines. The developed portions contain landscaped vegetation and grass lawns.

## Methods

The undeveloped portion of the parcel and the bare lava area seaward of Ali'i Drive was subjected to a 100% surface examination with surveyors spaced at 5 m intervals. Transects were oriented parallel to Ali'i Drive. Ground surface visibility was excellent. The developed portions of the project area were subjected to a cursory examination to determine if extant surface structures were present. The identified sites and features were flagged with pink and blue flagging tape and their locations plotted on a scaled project area map. The sites were subjected to detailed recording consisting of the preparation of scaled plan maps, the completion of standardized site/feature forms, and photographic documentation. A metal site tag was placed at each site and the tag's location was plotted on the scaled plan maps. The location of all sites and features was determined by using a Garmin Global Positioning System (GPS) III+. The accuracy of this GPS device for a single point is +/- 15 m. This accuracy is increased to less than c. 3-5 meters by taking multiple points including property corners and overlying the plotted points on a scaled map using AutoCAD software.

Subsurface testing consisted of the excavation of 10 shovel tests located in the undeveloped portion of the project area inland of Ali'i Drive. It was hoped that additional subsurface testing could be undertaken in a grass lawn area within the Saint Michael Church property, but access to this area for testing was denied by the church. The shovel tests were excavated in stratigraphic layers and were dug to bedrock. Standardized excavation records were prepared after the completion of each stratigraphic layer. The soil removed during the excavations was screened through 1/2" mesh. Portable remains collected were placed in paper bags labeled with the appropriate provenience information. Following the excavation of the shovel tests, a section drawing depicting the stratigraphy was prepared and the tests were backfilled. Recovered cultural remains were transported to Haun & Associates laboratory for analysis. Artifacts will be analyzed to determine type (fishhook, adze, etc.), condition/degree of completion, and material. Metric measurements will include weight, length, width, and thickness. Food remains will be identified to the family level, or to the genus/species level, if possible. Total weight and number of identified specimens (NISF) will be tabulated. All recovered materials will be tabulated by provenience.

## ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

### Historical Documentary Research

The project area spans the *ahupua'a* of Hienaloli 1-6, 'Auhaukaea'e 1-2, and Pua'a 1-2 (Figure 4). Maly (1996) conducted historical documentary research for a parcel in Hienaloli 3 and 4. One reference cited by Maly notes that the *ahupua'a* from Lanihau to Puapua'a, which include the project area, provided the food and natural resources to support a 13<sup>th</sup> century high chief named Pih-e-Ka area (Pih). Maly translated portions of *Ka 'ao Ho'oniua Pu'aniwa No Ka-Miki* (The Heart Stirring Story of Ka-Miki) a legendary account of two supernatural brothers, *Ka-Miki* and *Maka-i'ole*, who traveled around the island of Hawaii. The account was published in serial form between 1914 and 1917 in a Hawaiian newspaper, *Ka Hoku o Hanalei*. According to Maly, the account was recorded by Hawaiian historians John Wise and J.W.J. Kihne. Based on Maly's translation and study of the account:

The story is set in about the 13th century, in the time of *Pih-e-Ka'aoia* (Pih), sovereign chief of all Kona, the narrative identifies the lands between Lanihau (Kaihua) and

Table 1. Land Commission Award Claims

LCA	Claimant	Spans claimed	Spans awarded	Other Claims	Section No.	Ahupua'a	ITI	Land Use	Boundary Mahele	Boundary Kau	Boundary Makai	Boundary Kohala	Date Rec'd	Given	Acres	Royal Patent	Source	Comment
3611	American Board of Missions	3	3	many		Honalo 1, Honalo 4, Honalo 5									402.04	1600/1630	FR 45/2, 47/2, NR 135/3, 142/3, HT 462/3, 463/2	4 spans awarded including all of Honalo 4
						Honalo 6	ND	low yard	ND	ND	ND	ND	ND	ND				5 c parcels in Honalo 5 Honalo 1 with cave called La'aleha
						Honalo 6	ND	house lot (enclosed)	ND	ND	ND	ND	1824	Kuakini				
						Honalo 4	entire ahupua'a	ND	ND	ND	ND	ND	ND	Kaahumanu				
10591	T.C.D. Reeko	1	0	many		Honalo 6	entire ahupua'a	ND	ND	ND	ND	ND	ND	father	0.60	none	FR 67/2, NR 573/2	John Young 1824
2292	Kamohiwa, wahua	2	0	8									ND	ND	0.60	none	NR 433/3	awarded land under LCA 4140
						Auhaukeae	entire ahupua'a	ND	ND	ND	ND	ND						
						Puaa	entire ahupua'a	ND	ND	ND	ND	ND						
2316	Haleolane	1	1	0		Honalo 4	ND	house lot, 3 houses (enclosed)	ND	ND	Kupoua	Catholics lot	1814	Kuakini times	0.79	7668	NR 443/3, 555/4	
2334	Kupua	1	1	0	none	Honalo 4	ND	house lot, 3 houses (enclosed)	Haleolane	side land	leap	Koimahaia	Kam 1 times	parents	0.45	2344, 1560	NR 456/3, HT 759/3, 555/4	
3202	Samuel Rice	1	0	4		Honalo 6	Kohala	house lot?	ND	Puapua 1b	leap	Kahalo 11	1814	Kam 1	0.00	none	FR 166/2, FT 146/2, 59/3, 66/3	
3276	Waiketa	1	1	0	none	Honalo 1	ND	house lot (enclosed)	lehoiki	lehoiki	lehoiki	lehoiki	1844	Lapa'au	0.17	none	NR 377/8, HT 561/4	
3270	Waiwale	1	1	0		Honalo 5	ND	house lot (enclosed), 3 houses? sleeping quarters, meeting house	foot path	street	Dr. Andrews lot	uplands road	Kam 1 time	grandparents	0.43	8324	NR 377/8, 520/4	
3478	Iona Kama	1	0	0		Puaa 2	Kaawa	house lot, wife's share	ND	ND	ND	ND	ND	parents	0.00	none	NR 160/8	
3755	Wahonui	1	0	0		Honalo 4	ND	ND	ND	ND	ND	ND	ND	ND	0.00	ND	NR 378/8, HT 551/4	see LCA 3755C
3755C	Wahonui	1	1	0		Honalo 4	Leleokohu	house lot (enclosed)	side land	upland	Pupua	Kua	1829 or 1839	Kaua	0.41	6539	NR 378/8, HT 551/4	
3667	Thomas Hopu	1	0	0	none	Honalo 5	ND	house lot	ND	ND	ND	ND	Kam 1	0.00	none	NR 171/8		
4042	A. Waiwale	1	0	0		Honalo 4	ND	ND	ND	ND	ND	ND	ND	ND	0.00	none	NR 172/8	
4113	Kahua	1	0	0	none	Auhaukeae 2	lepa	2 cultivated parcels	ND	ND	ND	ND	Kam 1 times	Kamahaia	0.60	none	NR 172/8, HT 672/8, NR 506/6, FT 509, 510/3, HT 557/8	
4140	Kamamawa, wahua	5	2										Kam 1 times	father	0.60	none		
					1	Auhaukeae	house lot		Keakulua	street	gov't road	Kepae						
					2	Auhaukeae	enclosed lot		Kuakini	gov't road	Keakulua							
					3	Puaa	house lot, 3 houses		Kuakini	lepa	lepa	Kam 1 times	father	2.10	2152	NR 141/8, HT 501/4, 646/8	awarded two spans in Puaa	
					4	Auhaukeae	house lot in upland		lepa	lepa	lepa	lepa						
4226	Kuaa	2	1	0									1842	Keakulua	1.08	7094	NR 355/8, HT 552/4	
					1	Honalo 2	Luas	house lot, 1 house (enclosed)	lepa	lepa	lepa	lepa						
					2	Honalo 4	Hueu	house lot, 2 houses	lepa	lepa	lepa	lepa						

Paapua as an integral component of Pili's royal domain. Pili was a great advocate of contests in debating, fighting, and contests of physical strength, and Hinakahu at Paapua was the site of the chief's longhouses and contest field, which supported those activities. While Pili was at Hinakahu he was supported by the agricultural and natural resources of the surrounding ahupua'a, including Kahului, Wa'aha, Pua'a, Auhaukeae, Hinalo'i (Hinalo'i), Honua'ula, Keopu, Moenaua, and Lanikau. Pili's royal compound was at Niimahu, his canoe fleets were harbored at Ono, and his wealth-houses (where tribute was kept until it was needed) were situated at Auhaukeae (1996:A-2).

Early events documented in the Kona regional traditional history are associated with 'Umi-a-Liloa. Hawaii was first unified under the rule of 'Umi-a-Liloa and Kona was selected as a dwelling place of chiefs (Kamakau 1961). The area lies within the realm of the traditional Hawaiian political authority that was centered in the Kailua-Keolu area from at least the 15<sup>th</sup> century to the reign of Kamehameha I. With the arrival of Kamehameha I and his court in Kona, the area between Kamakohou (on the north side of the present-day Kailua pier) and Paapua became an extended royal center, a hub of activity that focused on the support of the king and his large court. According to Kamakau:

...at Kamakohou could be seen at night the sparkle of lights reflected in the sea like diamonds, from the homes of the chiefs from Kahalo [in Puapua'aiki] to Lanikau. The number of chiefs and lesser chiefs reached into the thousands (1961:221-222).

The earliest detailed historic account of the area south of Kailua Town including the project area *ahupua'a* comes from English missionary William Ellis.

Leaving Kailua [Kailua], we passed through the villages thickly scattered along the shore to the southward. The country around looked unusually green and cheerful, owing to the frequent rains, which for some months have fallen on this side of the island. Even the barren lava, over which we traveled, seemed to veil its sterility beneath frequent tufts of tan waving grass, or spreading shrubs and flowers.

The sides of the hills, laid out for a considerable extent in gardens and fields, and generally cultivated with potatoes, and other vegetables, were beautiful.

The number of heiaus, and depositories of the dead, which we passed, convinced us that this part of the island must formerly have been populous. The latter were built with fragments of lava, laid up evenly on the outside, generally about eight feet long, from four to six broad, and about four feet high. Some appeared very ancient, others had evidently been standing but a few years. (Ellis 1963:72-3)

During the *Mahale*, Hienaloli 4 and two parcels spanning the Honua'ula-Hienaloli 1 boundary were awarded to the American Protestant Mission under Land Commission Award (LCA) 387. The supporting testimony by Rev. Asa Thurston indicates that the Kailua Mission lands were received by verbal gift from Ka ahumanu I in 1824. William Leleiohoku, grandson of Kamehameha I and Hawaii Island Governor, received Moenaua 2 and three parcels in Honua'ula near the coast (LCA 9971). Ruth Keelikolani, an heir to Ka ahumanu, received Hienaloli 2 (LCA 7716). Isaac Davis's daughter Mary Peke received Hienaloli 5 (LCA 8524-B). 'Auhaukeae 1 was awarded to Mfikahele Keakouhiki (LCA 11216:37), granddaughter of Kamehameha I and one of Liholiho's (Kamehameha II) wives. Lot Kapuwaia (Kamehameha V) received Pua'a 1 (LCA 7715:13). The government retained 'Auhaukeae 2, Pua'a 2, and Hienaloli 1, 2, and 6. All of these large awards excluded *kulekua* parcels.

The Waikona 'Aina Mahele Database (Waikona 'Aina Corp. 2000), which is a compilation of data from the Indices of Awards (Indices 1929), Native Register (NR n.d.), Native Testimony (NT n.d.), Foreign Register (FR n.d.) and Foreign Testimony (FT n.d.); lists a total of 68 claims for 138 parcels for Honua'ula, Hienaloli 1-6, 'Auhaukeae 1-2, and Pua'a 1-2. Forty-two parcels were awarded to 32 claimants. Table 1 summarizes the LCA records and Figure 4 shows the locations of all except three of the awarded LCAs. LCAs 2334, 7953, and 10698 are not shown on current tax maps.

Table 1. Land Commission Award Claims (cont.)

LCA	Claimant	Arens claimed	Arens awarded	Other claims	Section No.	Ahupua'a	II	Land Use	Boundary Makua	Boundary Kaa	Boundary Makai	Boundary Kohala	Date Rec'd	Given	Acres	Royal Patent	Sources	Comment	
					4			1870, 6 cultivated kapa, one house	Kuae	Konohiko	Pupuka	Taina							
					5			1 uncultivated kapa	Taka	Konohiko	Pupuka	Konohiko						beside highway	
7370	Kashonana	5	0	0		Honohou	Esoum	2 ponds kapa	Id	Id	N/D	N/D	1833	Holona	0.00	none	NR 433-0, NT 528-4	part of kapa in the Kua	
7469	Kaupa	2	1	0	none								1/2 of title of Kaupua	ancestors			NR 440-0, NT 519-4		
						Honohou 1	Kaumeo	partly enclosed house lot, 3 houses	Id	Id	Id	Id			0.00	none			
						Honohou 2	N/D		Wa'aka's	Paina	Maka	Id			0.28	7618			
7478	Kuaa	7	0	0		Honohou 5	Trice Is	ground, sweet potato, lano kapa, 4 ponds & 2 ponds cetera					1826	Kaakana	0.00	none	NR 441-0, NT 559-4		
					1			2 cultivated kapa	Konohiko	Konohiko	Id	Honohou 4							
					2			5 partly cultivated kapa	Id	Konohiko	Konohiko	Honohou 4							
					3			partly cultivated, enclosed kapa	Pupuka	Honohou 6	Id	Id							
					4			cultivated kapa	Konohiko	Pupuka	Id	Honohou 4							
					5			partly cultivated, enclosed lot	Konohiko	Pupuka	Konohiko	Kaunopu							
					6			uncultivated farm ground	Konohiko	Honohou 6	Konohiko	Honohou 6							
					7			uncultivated farm area	Konohiko	Honohou 8	Konohiko	Honohou 4							
7490	Kaunopu	2	0	0		Honohou 5	Kamuku						1829	Kuae	0.00	none	NR 442-0, NT 509-4		
					1			cultivated land	Honohou 5	Kamuku	Konohiko	Honohou 4							
					2			3 cultivated kapa	Pupuka	Konohiko	Konohiko	Honohou 4							
7620	Kaunopu	2	2	0	none										1.23	7620	NR 445-0, NT 519-4	2 apana awarded	
						Honohou 2	Papawala	18 kapa											
						Honohou 3	Ida	11 kapa											
7715	Lot Kapuwaiwa	1	1	many	13	Puaa 1	Ida	N/D	N/D	N/D	N/D	N/D	1848	King	N/D	7845	NR 449-0, NT 244-10	awarded entire ahupua'a	
7716H	Ruth Keiwaiani	1	1	5	5	Honohou 2	Ida	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	none	NR 445-0, NT 415-0	awarded Honohou 2	
7892	Keawepoua	2	0	0		Honohou 4													
								21 kapa, 2 ponds, 10 kapa	N/D	N/D	N/D	N/D	N/D			0.00	none	NR 511-0	
								10 kapa	N/D	N/D	N/D	N/D	N/D			0.00	none	NR 512-0	
7902	Keawehalani	2	0	0		Puaa													
								Ida	Konohiko	Kamuku 4	Kelaha	Ida 2							
								Ida	N/D	N/D	N/D	N/D							
7916	Kaunopu	2	0	0		Puaa 2													
								Ida	N/D	N/D	N/D	N/D							
								Ida	N/D	N/D	N/D	N/D							
7917	Kaunopu	1	0	0		Puaa 2													
7951	Kaunopu (wahine)	2	1	0		Puaa 2													
								Ida	N/D	N/D	N/D	N/D	1819	Wakau	0.88	6106	NR 517-0, NT 547-0		
7953	Kaunopu	1	1	0	none	Auhoulee 2	Puhau, Ika	6 kapa	Konohiko	Konohiko	Konohiko	Konohiko	Line of Kua'ana	Kama'ana	2.00	7890	NR 517-0, NT 477-0	Kaunopu was a Konohiko	
7968	Keawehani	3	2	1		Auhoulee 1 & 2							1843	Kama'ana	1.94	6183, 7875	NR 454-0, NT 559-4	Also claimed kapa lot in Puaa	

Table 1. Land Commission Award Claims (cont.)

LCA	Claimant	Arens claimed	Arens awarded	Other claims	Section No.	Ahupua'a	II	Land Use	Boundary Makua	Boundary Kaa	Boundary Makai	Boundary Kohala	Date Rec'd	Given	Acres	Royal Patent	Sources	Comment
5320H	Asa Kaeo	1	0	3		Honohou	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.00	none	NR 36-5	
6170	Kealahou	1	0	0	none	Honohou	N/D	house lot	N/D	N/D	N/D	N/D	Kam 1 times	N/D	0.00	none	NR 188-0, NT 648-0	
6435	Keawehou	1	0	0	none	Honohou	N/D	house lot (enclosed)	N/D	N/D	N/D	N/D	N/D	Kaunopu	0.00	none	NR 201-0, NT 678-0	
7073	Kapa	8	2	2	1	Auhoulee	N/D	house lot (enclosed)	Id	Kelaha & fo'ia Is	beach	Kaunopu	N/D	Kaunopu	1.92	none	NR 414-0, NT 501-4, 646-8	awarded 2 apana in Auhoulee, more in Kaunopu
7074	Kaunopu	2	1	0		Puaa 1	N/D											
					1			house lot (enclosed) 3 houses	Id	Id	Kama'ana	Id						
					2			house lot (enclosed) no house	Id	Id	Kama'ana	Id						
7075	Kaunopu	1	2	4									Kam 1 times	parents	2.28	3527	NR 416-4, NT 852-7	Kapa was schoolteacher. Awarded 1 apana each in Honohou and Auhoulee
					1	Auhoulee	Kaunopu	5 cultivated kapa	highway	Ida	Waiwale	Kama'ana						Kaunopu Zone of Kona Fido Syst
					2	Auhoulee	Kaunopu	2 uncultivated kapa	Konohiko	gov't property	vacant land	vacant land						Kaunopu Zone of Kona Fido Syst
					3	Auhoulee	Kaunopu	4 uncultivated kapa	Id	Id	Id	Kama'ana						
					4	Auhoulee	Kaunopu	partly cultivated kapa	street	gov't land	Id	Id						
					5	Honohou 6	N/D	house lot, 2 houses (enclosed)	vacant land	Kapa	street	Makaha	Kam 1 times					
7076	Kapa	4	1	0		Puaa 2	Ohu	Kaunopu kapa	N/D	N/D	N/D	N/D	N/D	grandparents	1.10	6105	NR 416-4, NT 532-4	Given members 4 parcels
7078	Kapa	1	1	0		Puaa 2	N/D	house lot (enclosed)	N/D	N/D	N/D	N/D	Kam 1 times	parents	0.76	4357	NR 417-4, NT 501-4	
7080	Kaunopu	1	1	0		Puaa 1	N/D	house lot	road	road	beach	Id	N/D	parents	0.18	8521	NR 417-4, NT 528-4	
7082	Kealahou	1	1	0		Auhoulee 2	Ida	house lot (enclosed), cultivated parcel	Id	Id	Id	Id	1825	Kama'ana	1.97	6445	NR 416-4, NT 553-4	awarded 2 apana in Auhoulee
7084	Kaunopu	7	1	0									1846	Kaunopu	1.00	4061	NR 416-0, NT 513-4	awarded 1 apana in Auhoulee
						Auhoulee 2	N/D	house lot (kapa)	N/D	N/D	N/D	N/D						
						Auhoulee 2	N/D	Ida paika	N/D	N/D	N/D	N/D						
						Auhoulee 2	N/D	keolu kapa	N/D	N/D	N/D	N/D						
						Auhoulee 2	N/D	paika	N/D	N/D	N/D	N/D						
						Auhoulee 2	N/D	paika ma'uka	Kaunopu	Ohu	highway/Pahau	Ida						
						Auhoulee 2	Kama'ana	Ida	N/D	N/D	N/D	N/D						
						Puaa 1	N/D	Ida	N/D	N/D	N/D	N/D						
7377	Kaunopu	5	0	0		Honohou 5	Ida Is						1826	Kapa	0.00	none	NR 432-0, NT 502-4	
					1			partly cultivated kapa	Id	Kelaha 1	Konohiko	Konohiko						
					2			12 cultivated kapa	Id	Konohiko	Konohiko	Kapa						
					3			4 partly cultivated kapa	Kama'ana	Konohiko	Konohiko	Konohiko						

Table 1. Land Commission Award Claims (cont.)

LCA	Claimant	Apana claimed	Apana awarded	Other claims	Section No.	Ahupua'a	ISI	Land Use	Boundary Hauka	Boundary Kau	Boundary Makai	Boundary Kohala	Date Rec'd	Given	Acres	Royal Patent	Sources	Comment
10270	Makou	2	1	0	4	Puaa 2		house lot (enclosed)	Konekalo	Kahuana	Kahuana	Konekalo	1824	Wife	1.00	8050	HR 588v8, NT 627v8	awarded 1 spane
10292	Makou	1	0	0		Ahaukaha		Umanu Kaewa N/D	Konekalo Konekalo N/D	Konekalo Konekalo N/D	Konekalo Konekalo N/D	N/D	N/D	0.00	none	HR 589v8		
10404	Honoua	2	1	0	none			76 kapa 2 sweet potato 10000 2 uncultivated kapa	N/D	N/D	N/D	N/D	Emp Mokuahana Lei Chapel etc	Makou	1.75	4783	HR 481v8, NT 556v4	awarded 1 spane in Honoua 6
10406	Nakou	1	1	0	1	Honoua 2	Hoa	0 kapa 1 sweet potato, 1 cottage	Kapule	Uua	Kapule	Uua	1847	Kapule	2.30	4049	HR 480v8, NT 537v4	
10598	Pupuka	0	1	0		Honoua 5	N/D					1876	Kua	2.06	none	HR 483v8, NT 556v4		
					1			6 partially cultivated kapa, 1 cottage	Konekalo	Honoua 6	Kua	Kua						
					2			7 cultivated kapa	Konekalo	Honoua 6	Konekalo	Kua						
					3			8 partially cultivated kapa	Konekalo	Honoua 6	Konekalo	Kua						
					4			1 uncultivated kapa	Konekalo	Honoua 6	Konekalo	Kua						
					5			1 cultivated kapa	Idle land	Honoua 6	Konekalo	Honoua 4						
					6			4 kapa	Konekalo	Kua	Konekalo	Honoua 4						
10735	Pupuka	1	0	1	1	Honoua 3	N/D	5 cultivated kapa	Konekalo	Honoua 4	Honoua 2	N/D	grandparents	1.14	none	HR 487v8, NT 573v4		
10735	Pupuka	1	1	1	2	Honoua	Kamuku	house lot (enclosed) 5 houses, 1 stone house, kapa	Wahine	Mokuahana Street	Konekalo	Idle	N/D	Makou	1.14	none	HR 487v8, NT 573v4	
10773	Pupuka	1	0	0		Honoua	N/D	house lot, 100 trees	N/D	N/D	N/D	N/D	Kam I line	Kupuna	0.00	none	HR 488v8	
10881	Wahakana	1	0	0	none	Honoua 6	Idle, Kamuku 4	10 kapa 100 trees, 5 RDM	N/D	N/D	N/D	N/D	N/D	N/D	0.00	none	HR 606v8	
11073	Adane	1	0	1	none	Honoua	N/D	house lot (enclosed), 1ma	N/D	N/D	N/D	N/D	N/D	Makou & Kauai	0.00	none	HR 610v8, NT 551v8	Dr. Seth Andrews' residence
						Honoua/ Honoua 1	N/D	house lot (enclosed), 1ma	N/D	N/D	N/D	N/D	1824	Governor Adams	1.48			Asa Thurston's residence
						Honoua/ Honoua 1	N/D	house lot	N/D	N/D	N/D	N/D	1824	Kaahumanu I	5.26			awarded entire ahupua'a
11216	Makouhale Kekuono	1	1	many	37	Ahaukaha 1	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	334.00	7550	NT 334v10	

Table 1. Land Commission Award Claims (cont.)

LCA	Claimant	Apana claimed	Apana awarded	Other claims	Section No.	Ahupua'a	ISI	Land Use	Boundary Hauka	Boundary Kau	Boundary Makai	Boundary Kohala	Date Rec'd	Given	Acres	Royal Patent	Sources	Comment
					1			5 cultivated kapa	Ali	Idle land	road	road to sea						
					2			1 cultivated kapa	road	Kua	Konekalo	road to sea						
					3	Makou		1 cultivated kapa	Idle land	Ali	Idle land	Idle land						
7081	Puriana	2	0	0		Honoua	Puriana	10 partially cultivated kapa, 6 breadfruit trees, 1 100's tree, 1 kapa tree	Honoua	Konekalo	Hau	Konekalo	Kam I line	Puriana	0.00	none	HR 455v8, 562v4	
7083	Puriana	0	0	0	none	Honoua 2, Honoua 3	Mokuku 2- 4, Makou, Puaa	house lot (enclosed), 22 kapa	Kua	Konekalo	Honoua 2	Konekalo	before Kam I	Puriana	0.00	none	HR 521v8, NT 676v8	boundary is for 22 kapa
8147	Thomas Hogo	1	0	1	none	Honoua 1	N/A	N/D	forest	Honoua 2	sea	Honoua	1820	Kam I	0.00	none	HR 526v8	claimed entire ahupua'a
8108	Huru	2	0	0		Honoua		22 kapa 2 kapa	N/D	N/D	N/D	N/D	1841	Puriana	0.00	none	HR 455v8, NT 521v4	
8212	Halekane	1	0	0	none	Honoua	N/A	N/D	mountain	Rev. Thurston	ocean	Honoua of Konekalo	N/D	Konekalo	0.00	none	HR 670v8	claimed entire ahupua'a as the land
85240	Peha	1	1	0	none	Honoua 5	N/A	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	5707, 8447, 8562	HR 710v8	awarded Honoua 5
9197	Konekalo	2	0	0		Honoua	Konekalo	31 kapa					N/D	parents	0.00	none	HR 463v8, NT 535v4	
					1			cultivated kapa	Konekalo	Konekalo	Konekalo	Konekalo						
					2			house lot (enclosed)	Idle land	street	merging street	street						
9190	Konekalo	1	0	0		Honoua	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.00	none	HR 484v8	
9254	Konekalo	1	0	0		Ahaukaha 1	Puaa	cultivated land	Makou	Idle	Puaa	Ahaukaha	N/D	Kupuna	0.00	n	HR 547v8	
9552	T. Lapaokai	1	0	1	none	Honoua 3	N/D	12 kapa, 1 cottage, 1 kapa	Gov't road	Kua	Puriana	Honoua 2	N/D	ancestors	0.00	none	HR 501v8, NT 670v8	
99711	Wm. Lelehu	3	3	22		Honoua	N/D						1847	Konekalo	2.84	6094, 6683	HR 502v8, NT 430v10, 433, 436v10	2 spane of 2.84 acres, no data on other lot
					45			N/D	gov't road	vacant land	sea	sea, beach	1834	Konekalo				
					46			N/D	vacant land	vacant land	gov't road	small road	1837 or 1838	Konekalo				
					47			house lot	a land	Idle	small road	Idle	1834	Konekalo				
10012	Lee	1	0	0		Ahaukaha 4							N/D	Kupuna	0.00	none	HR 582v8	
								partially cultivated kapa	Wahakana	Ahaukaha	Konekalo	Ahaukaha 2						
								3 kapa	N/D	N/D	N/D	N/D						
10244	Makou	3	0	0		Honoua 6							N/D	Papahe	0.00	none	HR 586v8, NT 689v4	
					1			3 kapa	Konekalo	Ahaukaha	Konekalo	Konekalo						
					2			house lot	Konekalo	Ahaukaha	Konekalo	Konekalo						
					3			3 potato plots	Konekalo	Ahaukaha	Konekalo	Konekalo						
10245	Makou	1	0	0	none	Honoua 6	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.00	none	HR 566v8, NT 689v4	
10267	Mokouhale	4	2	0		Puaa 2	Ohu						1847	Konekalo	0.69	5000	HR 477v8, NT 534v4	awarded two spane in Puaa
					1			1 cultivated kapa	Konekalo	Ohu 3	Makou	Ohu 1						
					2			1 cultivated kapa	Makou	Ohu	Papahe	Ohu						
					3			3 cultivated kapa	Konekalo	Ohu	Papahe	Ohu						

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The awarded *kulaena* parcels range from 0.17 to 5.26 acres in area with an average of 1.4 acres. The claim testimonies refer to 381 agricultural plots variously described as *kikipai*, *maia*, *pauike*, plots, and patches. In several cases the plots are described by reference to the Kona Field System zone were they were situated (i.e., *kala*, *kalanika*). Named crops include potatoes (6 plots), sweet potatoes (10), taro (18), coffee (5), gourd (1), pasture (1), and grass (1). Named trees include seven breadfruit, two *koa*, two coconut, one *hūka*, and one *ohia*.

The claims mention a total of 36 house lots with at least 58 houses of which one is described as being constructed of stone. Twenty of the lots were enclosed by stone walls. One LCA claim (3279) mentions two sleeping quarters and a meetinghouse. The testimony for LCA 11073 awarded to Aikane mentions a lime kiln. The grave of the claimant Ioane Kalama's wife was present in his house lot claim (LCA 3479).

The awarded *kulaena* LCA parcels are clustered in two areas: one at the coast and the other between c. 1,200 ft and 1,500 ft elevation (see Figure 4). Most of the coastal parcels were house lots. Emerson and Kanakani's 1880 map (Figure 5) of Kailua Town and vicinity shows the southern half of the cluster of LCAs at the coast. On Emerson's 1880s map of Kailua (Figure 6) the lower forest edge is depicted at approximately 700 ft elevation and the area inland of the forest edge is described as consisting of "various lavas with considerable soil." The ruins of the Greenwell house are shown in upland Hienalohi 5 and a Catholic Church is shown just inland of the coastal road in Hienalohi.

Between 1832 and 1866 government lands in the area were sold as land grants. The following summary of grants comes from Figures 5 and 6 and Kelly (1983). Government lands in 'Auhaukea'e 2 were sold as grants to J. Cole (Grant 1746), J. W. Nahe (1985; 56 ac), Nuuanu (986; 11 ac), Kazea (984; 15.5 ac), Hoopihi (1567), and Kamahai (1732). Hienalohi 3 lands were conveyed to S. Haamio (Grant 980; 58 ac), and Kuapa (978; 41 ac). Hienalohi 6 was sold to Maewa (Grant 971; 6 ac), Kawelo (Grant 1752), and Kapahua (Grant 1572).

In Pua 2 the land inland of the Kuakini Wall was divided into a series of three parcels that consisted of Grant 1744 to Kabaunaele (seaward), Grant 982 to Naipuwailuna (middle; 60 ac), and Grant 986 to Pupule (inland; 103 ac). Seaward of the wall were three parallel grants: Grant 7489 to D. P. Naahila (6.98 ac), Grant 4100, Apama 2 (6.8 ac), and Grant 4037, Apama 2, to J. Kaeanoku. The seaward portions of these three grants were separated by the coastal government road. The coastal portions were designated Apama 1 for each grant.

Figure 7 is a portion of Jackson's 1883 map of Kailua Bay. The map shows the Rev. Thurston's house that was situated within the LCA 387 parcel nearest the coast straddling the Honoala-Hienalohi 1 boundary (see Figure 4). The road leading to the house is in approximately the same location as today's Hualalai Road. The map shows the Roman Catholic Church that is still present. At least three houses, one enclosed by a wall, and a grove of coconuts are shown on the inland side of the coastal road south of the church. A large walled enclosure is depicted on the seaward side of the road opposite the Catholic Church. Inside the enclosure is labeled "Ruins of Old Prison".

Figure 8 is a portion of an early 1900s map of Kailua. The map shows Hualalai Road and a portion of the coastal road that corresponds to the project area. The map shows a series of walled compounds along the inland side of the road. Six houses, the Catholic Church and an associated pavilion, and another church are shown. On the seaward side of the road near the Hualalai Road intersection several structures are depicted consisting of a court house, garage, cottage, jail, and two houses.

Historical research was conducted by Devereux et al. (1996) and Kelly (1983) document late 1800s to 1900s land use. They report land use including ranching and cultivation of coffee and other crops beginning in the mid-1800s coincident with the decline of the Hawaiian population. Immigrant agricultural laborers from Asia, especially Japan, provided a work force for the cultivation of sugar cane and coffee. Hienalohi was planted in sugar cane up to 700 ft elevation by the early 1900s.

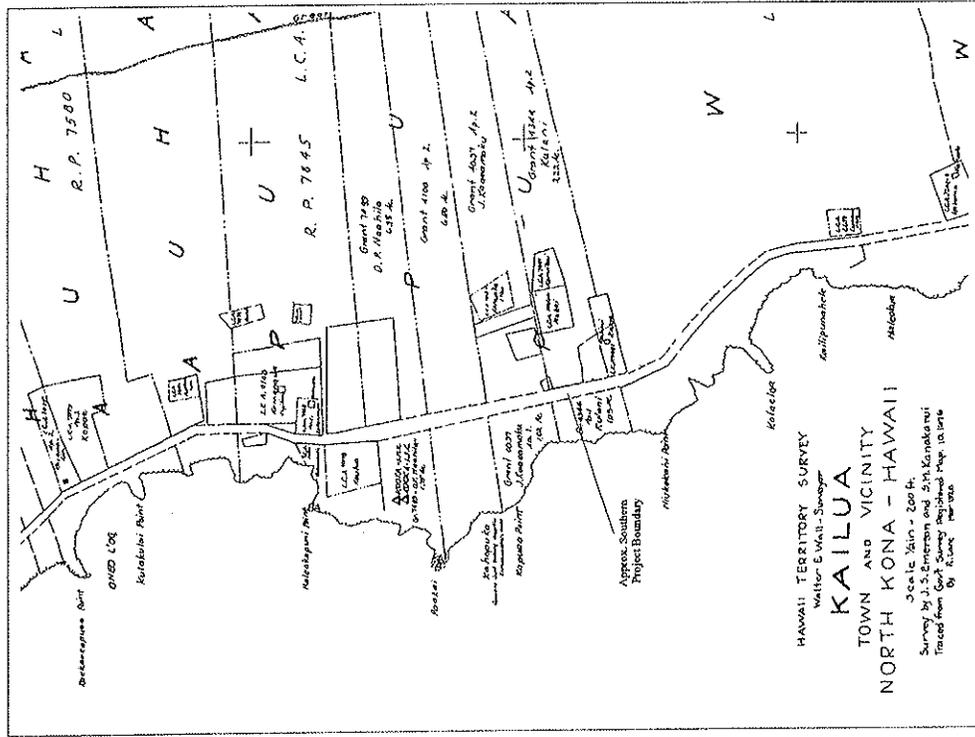


Figure 5. Portion of c. 1880s Emerson and Kanakani Map (from Head et al. 1994)

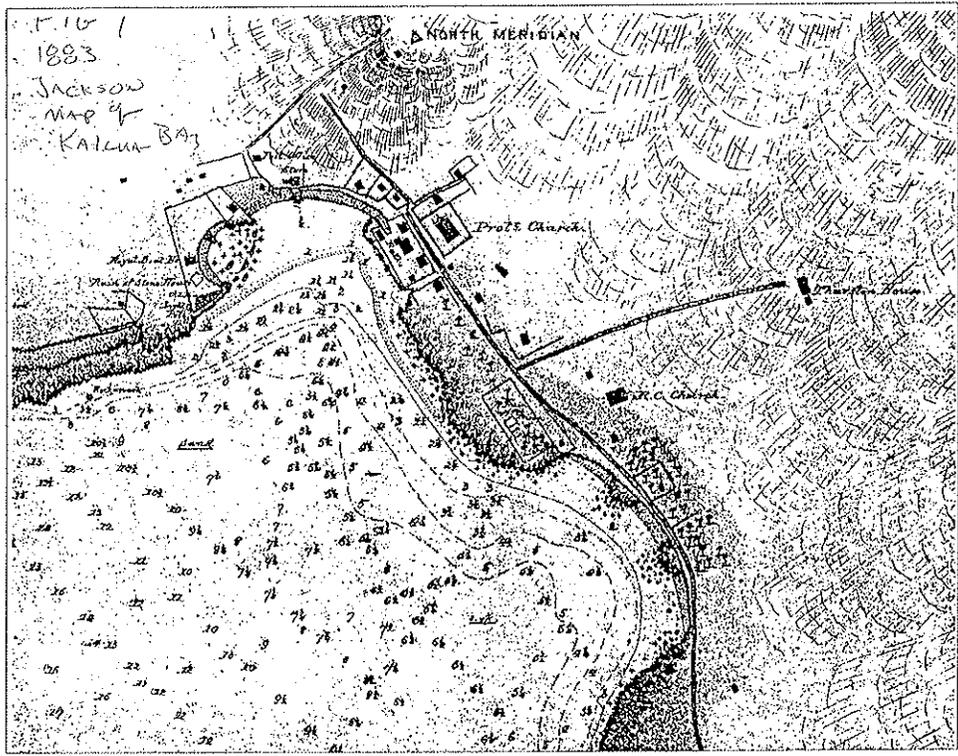


Figure 7. Portion of Jackson's 1883 Map of Kailua Bay

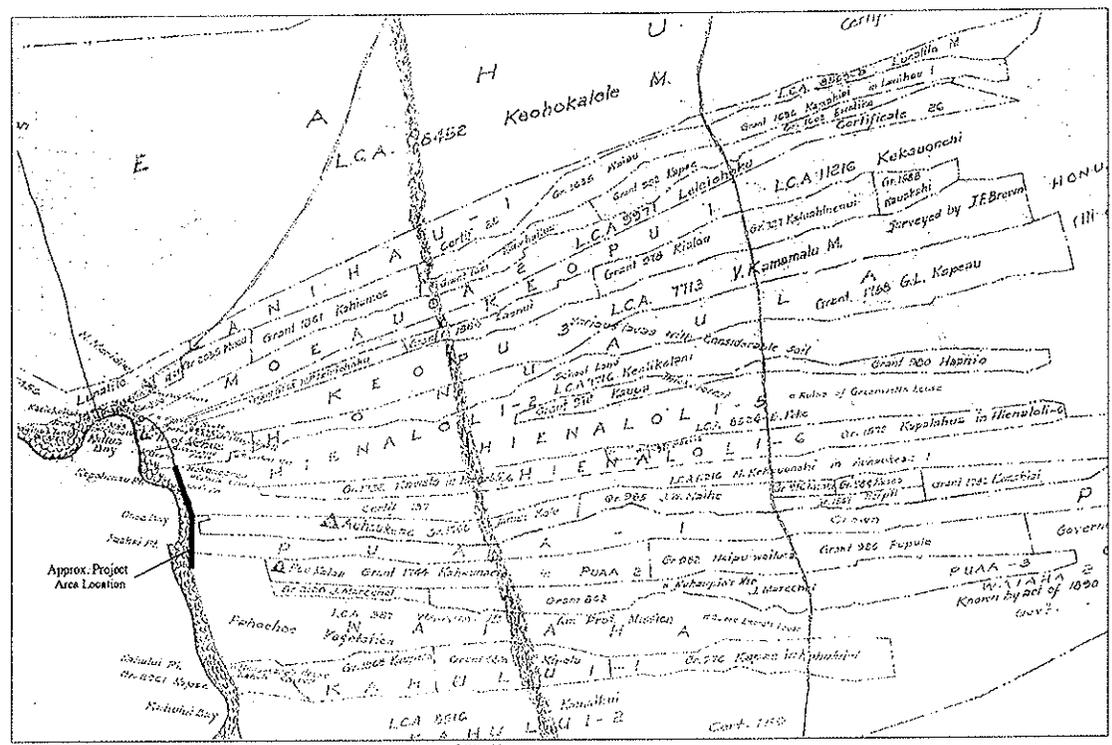


Figure 6. Portion of Emerson's circa 1880 Map of Kailua

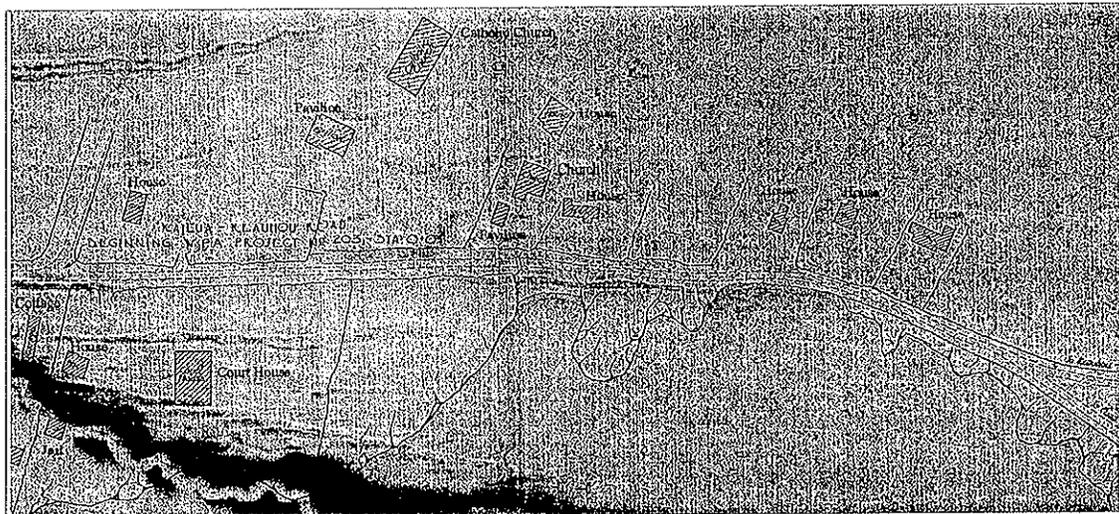


Figure 8. Portion of Early 1900s Map of Kailua

Figure 9, a 1928 map of Kailua, shows a series of houses along the inland side of the coastal road in the project area vicinity and the Kona Sugar Company railroad crossing the inland portions of Heinaloli, 'Auhauka'e, and Puaa. The Kona Sugar Company was established in 1898 and it was incorporated the following year (Conde and Best 1973). Construction of a railroad began in 1901 by the West Hawai'i Railway Company. The railroad was constructed to transport sugar cane to the Kailua Sugar Company Mill situated in Waialua. The railroad was no longer in operation by the end of 1926. Following the decline of sugar in the 1920s and 1930s, cattle ranching and coffee cultivation became the dominant forms of land use. The Cornes family leased government lands in the project area *ahupua'a* for cattle ranching beginning in the early 1900s (Kelly 1983). The family purchased the Kona Sugar Company lands and mill in 1927.

Today, a modern seawall and sidewalk extend along the central seaward portion of the project area. Much of the remaining land along the Ali'i Drive is occupied by a number of establishments including the Coconut Grove Market Place, the Hard Rock Cafe, the Ali'i Sunset Plaza, the Kona Ali'i, the Kona Islander, Saint Michael Church, Bubba Gump's restaurant and several parking areas. The only land bordering the project area that is not either landscaped or developed is a c. 150 m long area on the inland side of the corridor opposite Huggo's and the Royal Kona Resort.

Several days after a July 1, 2004 public meeting for the project, Alan Haun met on site with Mr. Lincoln K. Akana Jr., who lives adjacent to the project area. Mr. Akana attended the meeting and was the only attendee who had historic preservation concerns about the project. He pointed out several stones along the shoreline that had lines of holes resembling *papamu* and two petroglyphs. These features had been documented during the inventory survey fieldwork as features of Site 24021. Mr. Akana expressed his feeling that these stones need to be protected. He also pointed out a c. 60 cm long oblong stone lying beside the gate inside a fenced park opposite the Kona Islander Inn that belongs to his family. (see Figure 1). He said the stone had a cup shaped depression on one end and it used to be positioned upright. He said it was a *kaula*, or god stone that was used to by fisherman.

### Previous Archaeological Research

A search of DLNR-SHPD archaeological report database and other sources identified nearly 40 studies for the project area *ahupua'a*. Stokes (Stokes 1991) and Reinecke (n.d.) conducted the first archaeological surveys of Kona. Stokes reported two *heiau* in project area *ahupua'a*, Kalopua Heiau was situated two miles inland in Pua'a 1. The site was a disturbed pile of stones in 1906. The *heiau* was said to have been built by Alapa'i and Stokes speculated that it was probably "a walled *heiau* of three divisions." (Stokes 1991:50). Haleoku Heiau was reported, but not relocated by Stokes. The *heiau*, also said to have been built by Alapa'i, reportedly was situated in 'Auhauka'e 2 "just north of the *hau* grove north of Kalopua Heiau." (1991:56).

Reinecke (n.d.) conducted an archaeological survey along the coast in 1930. His survey is the only previous study that included the project area. He identified two sites in Heinaloli, Laniakea Cave and an "indistinct" site of unidentified type (Site 72) situated seaward of Ali'i Drive. Laniakea Cave is mentioned as being present on one of the Heinaloli parcels awarded to the American Board of Missionaries (LCA 387).

Table 2 summarizes thirty-six inventory surveys and data recovery projects conducted subsequent to Stokes and Reinecke. Figure 10 shows the locations of the projects. The projects in Table 2 cover over 400 acres identifying 167 sites with 561 features. To aid in reconstructing settlement patterns, features were quantified by probable age and function, and the studies are ordered by elevation. Traditional Hawaiian features were categorized as habitation, agricultural, burial (including possible burials), and ritual. Features not assignable to these categories were categorized as miscellaneous/indeterminate. Traditional sites in this category include *papamu*, trails, petroglyphs, and *ahu*. Habitation sites are further subdivided into temporary and permanent for studies making this distinction.

Density values are given for sites, features, and habitation and agricultural features. The data are crude primarily because of varying degrees of disturbance, variation in researchers' definitions of sites, and the extent to which agricultural features were documented. Comparison of feature densities reduces prob-

Table 2. Summary of Previous Archaeological Work

Study	Land	Study Type*	Elevation (ft)	Area (ac)	Total sites	Sites/ acre	Total Features	Feas/ acre	Hab Feas	Hab Feas/ acre	Porn Hab Feas	Temp. Hab Feas	Ag Feas	Ag Feas/ acre	Burial Feas	Ritual Feas	Livestock control	Historic Feas	Misc. Indat. Feas
Allen-Wheeler (1991)	Auhoukoo 1	RN	0-40	1.15	1	0.87	3	2.61	1	0.87			1	0.87				1	
Soehren (1970)	Honoloh 2	RN	10-20	5	1	0.20	1	0.20							1				
J. Rosenzweig (1999), M. Rosenzweig and Delmon (1999)	Puaa 1	RNDR	10-35	1.35	1	0.74	5	3.70										5	
Soehren (1979b)	Puaa 1	RN	20-85	4.5	3	0.67	3	0.67	3	0.67									
Soehren (1979a)	Honouliuli and Honoloh 1	RN	30-40	3.85	0														
Welch (1980)	Puaa 2	RN	40-95	2.5	1	0.40	8	3.20	3	1.20			2	0.80		1	1		1
Head et al. (1994)	Puaa 2nd and 3rd and Waiala 1st and 2nd	IN	45-95	2.4	20	8.33	38	15.83	12	5.00	1	11	8	3.33	3	4	5		6
Soehren (1970c), Dordson and Kai (1999)	Honoloh 6th	IN	50-120	4.1	13	3.17	17	4.15	6	1.46			4	0.98			2		5
Barrera (1990/1995)	Honoloh 4	RNDR	60-160	5	7	1.40	7	1.40	2	0.40	1	2			1		3		1
Soehren (1982c)	Puaa 3	RN	100-140	2.7	2	0.74	2	0.74	2	0.74			2						
Bush et al. (2000)	Auhoukoo	IN	110-100	4	3	0.75	23	5.75					21	5.25			2		
Noas and Williams (1999), Clark and Williams (1997), Noas et al. (1998)	Auhoukoo 1-2	INDR	120-160	3	3	1.00	14	4.67	2	0.67			2	8	2.67		2		2
Soehren (1980a)	Puaa 1	RN	150-290	12.9									2	0.07					
Hammatt (1987), Hammatt and Shideler (1987)	Auhoukoo	RN/EX	170-310	28	3	0.11	3	0.11	1	0.04									
Schitt (1984)	Honoloh, Auhoukoo, Puaa	RN	180-190	31	41	1.32	69	2.23	10	0.32			7	35	1.13		11	4	9
Emere et al. (2002)	Puaa 1	IN	234-342	9.2	5	0.54	56	6.09	12	1.30			12	41	4.46		2		1
Bank (1985)	Keolu 1-3, Honouliuli and Honoloh	RN	235-300	4	2	0.50	2	0.50											
Hau and Henry (2001), Hau et al. (2003)	Honoloh 2-6	RNDR	270-740	51	22	0.43	39	0.76	6	0.12	1	5	111	2.18			15	2	
Barrera (1980a)	Puaa 3	RN	360-620	15	0														
Barrera (1980b)	Puaa 3	RN	620-650	5	2	0.40	6	1.20											6+
Henry et al. (1995)	Honoloh 3 and 4	IN	750-1450	49.5	9	0.18	152	3.07	5	0.10	5		145	2.93			2		
Hau and Henry (2000), (2003)	Honoloh 1-2	INDR	750-1460	56	8	0.14	39	0.70						32	0.57	1			6
Doveroux et al. (1999)	Honoloh 1	IN	1200-1250	5	3	0.60	17	3.40					15	3.00			2		
Hau (2000)	Honoloh 2	IN	1255-1483	4.6	1	0.22	17	3.70					11	2.39					6
Von (1991), Kawachi (1994), Halpern and Rosenzweig (1996)	Honoloh 1	RN	1485-2440	80	15	0.19	29+	0.37						22	0.28			6	1
Kawachi (1988)	Puaa 2	RN	1950-1980	35.36	1	0.03	40	1.13	1	0.03			1	38	1.07		1		
<b>Total/Average</b>				<b>426.13</b>	<b>167</b>	<b>1.09</b>	<b>561</b>	<b>2.88</b>	<b>65</b>	<b>0.82</b>	<b>8</b>	<b>42</b>	<b>498</b>	<b>2.00</b>	<b>6</b>	<b>7</b>	<b>55</b>	<b>24</b>	<b>26</b>

\* IN = Inventory Survey, RN = Reconnaissance Survey, DR = Data Recovery, EX = Excavation

19

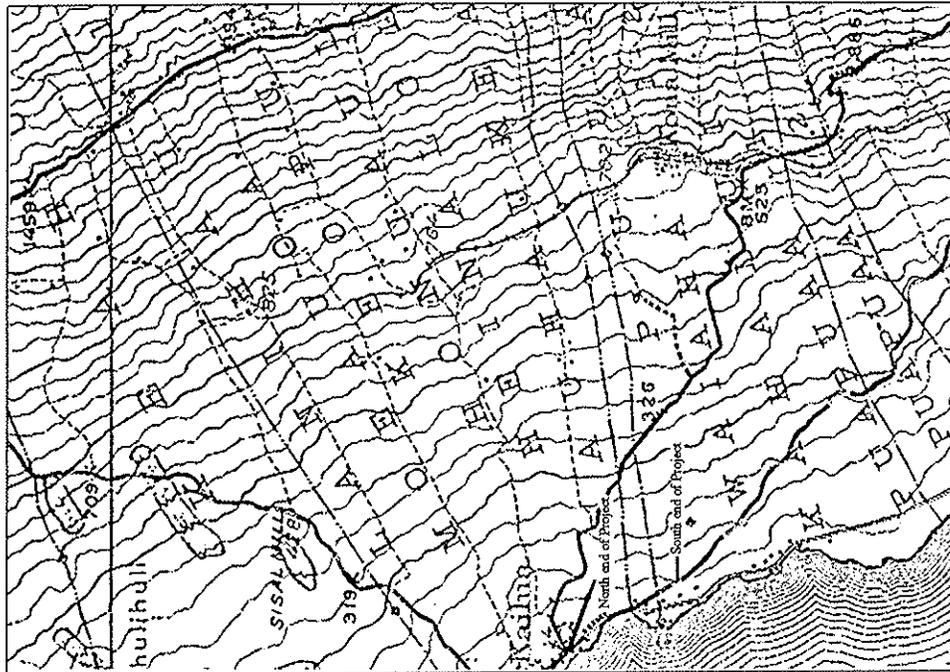


Figure 9. Portion of 1928 USGS Kailua Quadrangle

tems cause by variation in site definition. Overall, the studies have identified 66 habitation features, 474 agricultural features, 2 burials, and 7 ritual features. Historic features were not segregated by function. The majority of the historic features are ranch walls. Overall feature density values range from 0.11 to 15.83 features per acre. Habitation feature density ranges from 0.03 to 5 features per acre with an average of 0.92. Agricultural feature density ranges from 0.07 to 5.25 features per acre with an average of 2.0.

Forty-four radiocarbon age determinations are reported in the studies by Schilt (1984), Haun et al. (2003), Barrera (1995), Hammatt and Shideler (1987), Donham and Kai (1990), Head et al. (1994), Elmore et al. (2002), and Haun and Henry (2003). Eight determinations produced modern results and most of the remainder produced multiple age ranges. When all potential age ranges are examined two span A.D. 1300, 16 include the 1400s, 18 include the 1500s, 27 span the 1600s, and the rest include the 1700s to mid-1900s. The results indicate initial use of the area in the 1300s, followed by a marked increase during the 15<sup>th</sup> and 16<sup>th</sup> centuries. The most intensive use dates to the 1600s.

The project area lies within the *kūia* zone of the Kona Field System, SIFP Site 6601 (Newman 1970, Kelly 1983, Schilt 1984, Cordy 1995). This site extends north to Kau Ahupua'a, south to Honauau, and from the coastline to the forested slopes of Hualalai. The area was intensively cultivated and served as the resource base for the large number of chiefs and retainers that occupied the Kūia-Keanohou coast. The characteristics and general locations of the elevation zones of the system described by Newman (1970) have been confirmed and elaborated on by subsequent ethnohistorical investigations (Kelly 1983). The system is subdivided into four elevation zones.

The *kūia* zone extends from sea level to 500 ft elevation. Cordy (1995) has suggested that the upper limit of this zone may be higher between 600-700 ft elevation. This lower elevation zone traditionally was used for habitation and cultivation of sweet potatoes, paper mulberry (*wauke*), and gourds. Agricultural features, including clearing mounds, planting mounds, plowing depressions, modified outcrops, and planting terraces, are common in this zone (Hammatt and Clark 1980; Hammatt and Folk 1980; Schilt 1984). Habitations are scattered throughout the *kūia*, but they are concentrated along the shoreline portion of the zone (Cordy 1995). The shoreline portion, extending approximately 200 m inland, was the focus of permanent habitation and activities such as burial, canoe storage, ritual, and marine exploitation. Royal centers and chiefly residences were also situated near the shoreline. These complexes included residences for high status individuals and their supporters and attendants, *hūiāu*, places of refuge, *hōliua* slides, and other structures.

The *kūia* *hūi* zone extends from 500 to 1000 ft elevation. The zone was used for cultivating sweet potatoes, paper mulberry, and especially breadfruit. Archaeologically, this zone is not distinguishable from the adjacent *apa'a* zone (Cordy 1995). The *apa'a* zone is situated between 1000 and 2500 ft elevation. This zone traditionally was used for dryland cultivation of taro, sugar cane, sweet potato, and ti. Permanent habitations were present in the *apa'a* zone, but were infrequent (Cordy 1995, Burchard 1995). Dwellings were observed by early historic chroniclers, but most were probably for temporary use in conjunction with agriculture, bird hunting, and collecting of plant resources. Burials and ritual sites are rare in the upper elevation zones (Kawachi 1989).

*Kūia* *hūi* are prominent agricultural features of the *kūia* *hūi* and *apa'a* zones (Cordy 1995; Newman 1970). These are broad, linear piles of rocks built from stones cleared from the adjacent slopes that also served as field boundaries. *Kūia* *hūi* are oriented inland-seaward often interconnected, with perpendicular, soil-retaining walls and terraces forming rectangular grid pattern of fields. *Kūia* *hūi* also served to control rainfall runoff (Kirch 1985). These formal fields contrast with more informal garden areas characterized by scattered agricultural features in very rocky areas, such as young lava flows, and much of the *kūia* zone. The *apa'a* zone extends from 2500 ft to 4000 ft elevation. The zone was associated with banana and plantain cultivation. The archaeological traits of the zone have not been well defined, but temporary habitations were probably present associated with agriculture and exploitation of forest resources (Allen 1984).

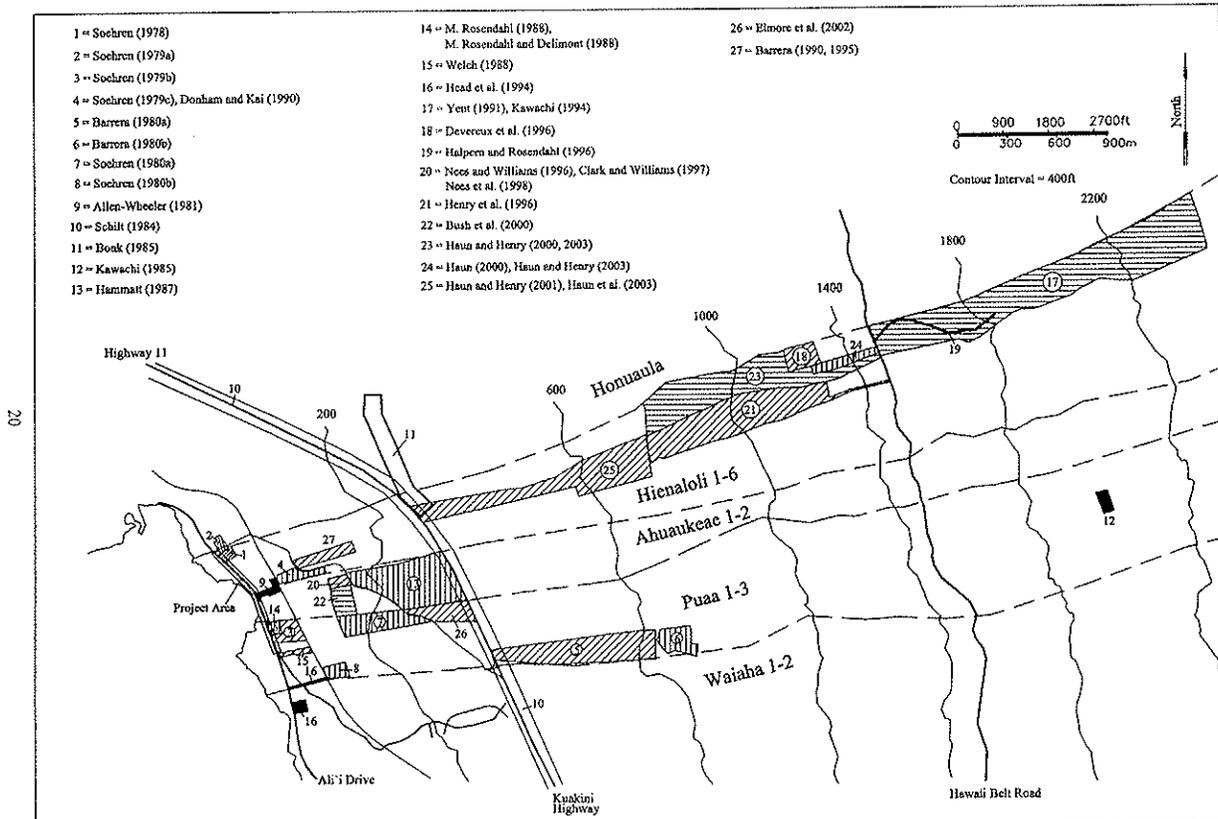


Figure 10. Previous Archaeological Work

## PROJECT EXPECTATIONS

Prehistoric use of the project area is potentially evidenced by relatively rare, scattered temporary habitation sites dating to as early as the mid-first millennium A.D. Such sites should become more common between A.D. 1000 and 1400. Between 1400 and the mid-1600s, temporary habitation sites (caves, overhangs, simple walled shelters), permanent habitations, usually evidenced by complexes of enclosures, terraces, or platforms; trails; and agricultural features, such as terraces, modified outcrops, and mounds, are expected.

Intensive agricultural use is expected from the mid-1600s until the early 1800s. A variety of agricultural features including those mentioned above and *kua iwi*, garden enclosures, and animal pens may be present. Temporary habitations and permanent habitation sites are expected. Burial and religious sites are potentially present. Other potential site types include trails and refuge caves.

Sites dating to the mid- to late 1800s would include the agricultural and habitation sites mentioned above, although in reduced numbers owing to population decrease. Differences in agricultural sites from the previous periods may be evident as a result of a shift to a market-based economy, which presumably would favor cultivated fields as opposed to small garden plots. Walls designed to control cattle and trails or roads for horse and wagon traffic also may be present.

By the beginning of the 1900s, traditional agricultural and habitation sites should be rare. Potential sites include residences, churches, and transportation infrastructure such as roads. Ranching activity, which continued until at least the mid-1900s would be evidenced by walls, corrals, and clearing piles of stone associated with pasture improvement. Modern residential and commercial development has probable obliterated most evidence of past land use described above.

## FINDINGS

The survey identified three sites with nine features (Figure 17). The sites are comprised of a single feature site and two complexes of features. The features consist of a wall, an enclosure, two subsurface cultural deposits, three *popamu* and two petroglyphs. Functionally, the features consist of recreation (n=3), rock art (2), livestock control (1), and habitation (3).

Two additional sites were identified during the study but were not assigned SHPP site numbers because the sites are situated just outside the project area boundaries. The first site consists of a series of 20 circular-shaped depressions that have been pocketed into the coastal pahoehoe flow, located at the northern end of Oneco Bay, to the south of the Waterfront Row complex and 90.0 m seaward of Ali'i Drive. These depressions are situated in an area 21.0 m long (east-west) and 10.0 m wide and vary in size from 0.12 to 0.65 m in diameter and 0.05 to 0.28 m in depth. The size and shape of these depressions, and location adjacent to the coastline suggest they functioned as bait cups for fishing.

The second site consists of a collapsed section of stone wall situated inland of the project area opposite Snorkle Bob's. The wall originates at the northern end of a bulldozed parking area and extends at least 60.0 m to the north. Remaining intact sections indicate that it originally measured 0.9 m wide and 1.2 m tall, built of stacked subangular basalt cobbles and small boulders with a core-filled interior. The height and method of construction of the wall suggests it likely functioned as a livestock control feature.

### Site 24019

Site 24019 (Temporary Field No. T-2) is a stone wall that borders the inland side of Ali'i Drive. The wall originates outside the project area to the east and extends to the west-southwest, paralleling the northern side of the driveway to the Billfisher restaurant. The overall extent of the wall is presented in Figures 11 and 12. It enters the project area corridor 15.2 m inland from Ali'i Drive and extends to the west-southwest for 12.5 m, then angles to the north-northwest, paralleling Ali'i Drive. It continues in this direction for 23.0 m where it has been truncated by the construction of a bulldozed parking area. The wall continues on the northern side of this disturbed area for 102.0 m where it terminates. The northern end of the wall has been impacted by modern construction activity.

The wall is partially collapsed throughout most of its length. Remaining intact sections range in width at the base from 0.9 to 1.1 m and at the top from 0.7 to 0.85 m (Figure 13). The height of the intact sections varies from 0.75 to 1.0 m. The wall is built of stacked subangular and water-rounded basalt cobbles and small boulders, with a core-filled interior of cobbles. Fragments of waterworn coral are also incorporated into the wall's construction and modern debris is scattered along both sides of the wall. Site 24019 is interpreted as a livestock control feature (ranch wall) based on its method of construction. It is altered and in fair condition.

### Site 24020

Site 24020 (Temporary Field No. T-1) consists of an enclosure (Feature A) and two subsurface cultural deposits (Features B and C). Feature A is a roughly D-shaped enclosure constructed against the inland side of the Site 24019 wall (see Figure 12). The enclosure is 8.6 m in length (north-northwest by south-southeast) and 5.05 m wide. The south and portions of the north side of the structure are intact, though the eastern and western ends of the north wall have collapsed. The intact walls vary in width from 0.63 to 0.8 m and in height from 0.6 to 1.25 m. These walls are built of stacked subangular and water-rounded basalt cobbles and small boulders, with a narrow-core-filled interior and faced sides (Figure 14). Examination of the interface between the Site 24019 wall and the Site 24020 walls indicates that the enclosure is built against the wall, post-dating it. The area inland of the site appears to have been disturbed by bulldozer activity.

The interior of the enclosure is comprised of a level soil deposit with scattered wall collapse. An area of sparse waterworn basalt pebbles (*ili ili*) is located in the southern end of the interior. This concentration of *ili ili* are situated in an area 2.0 m long (northeast by southwest) and 1.6 m wide. No other cultural

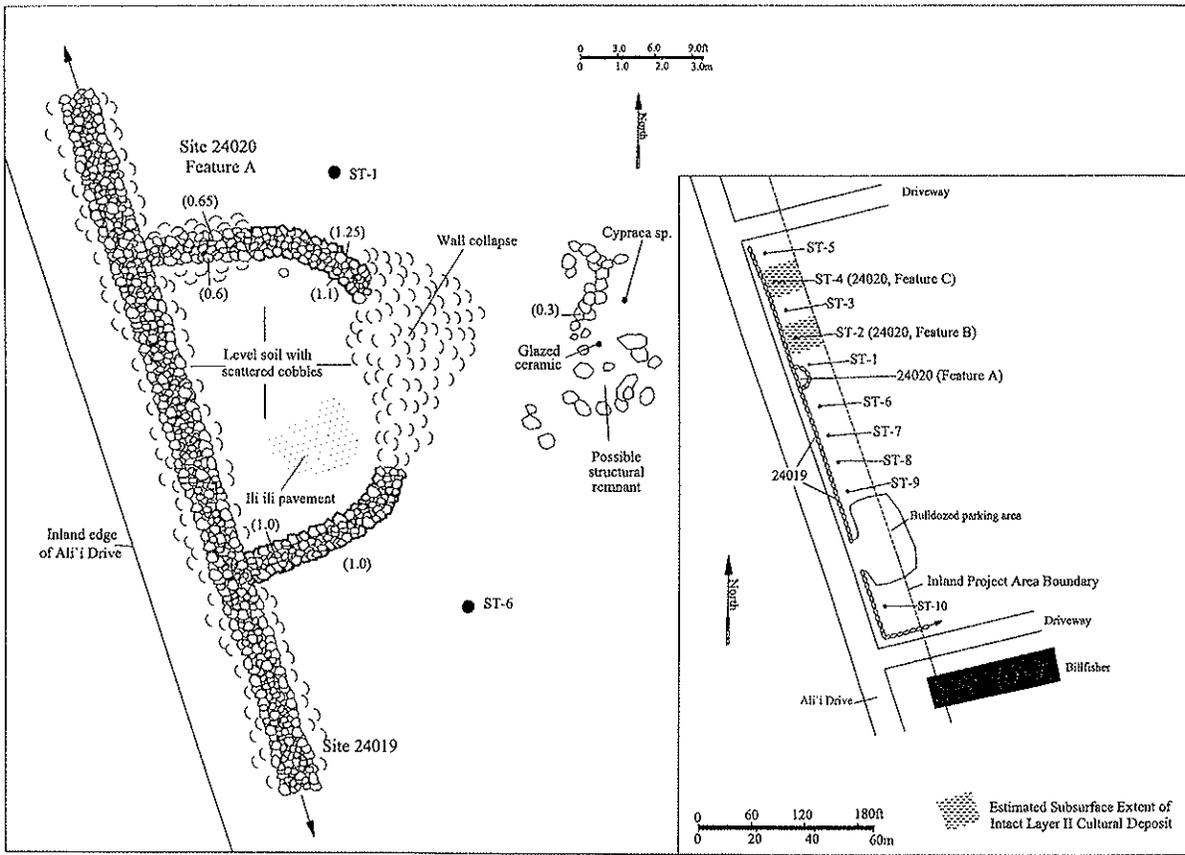


Figure 12. Plan Map of Sites 24019 and 24020, and Location of Shovel Tests

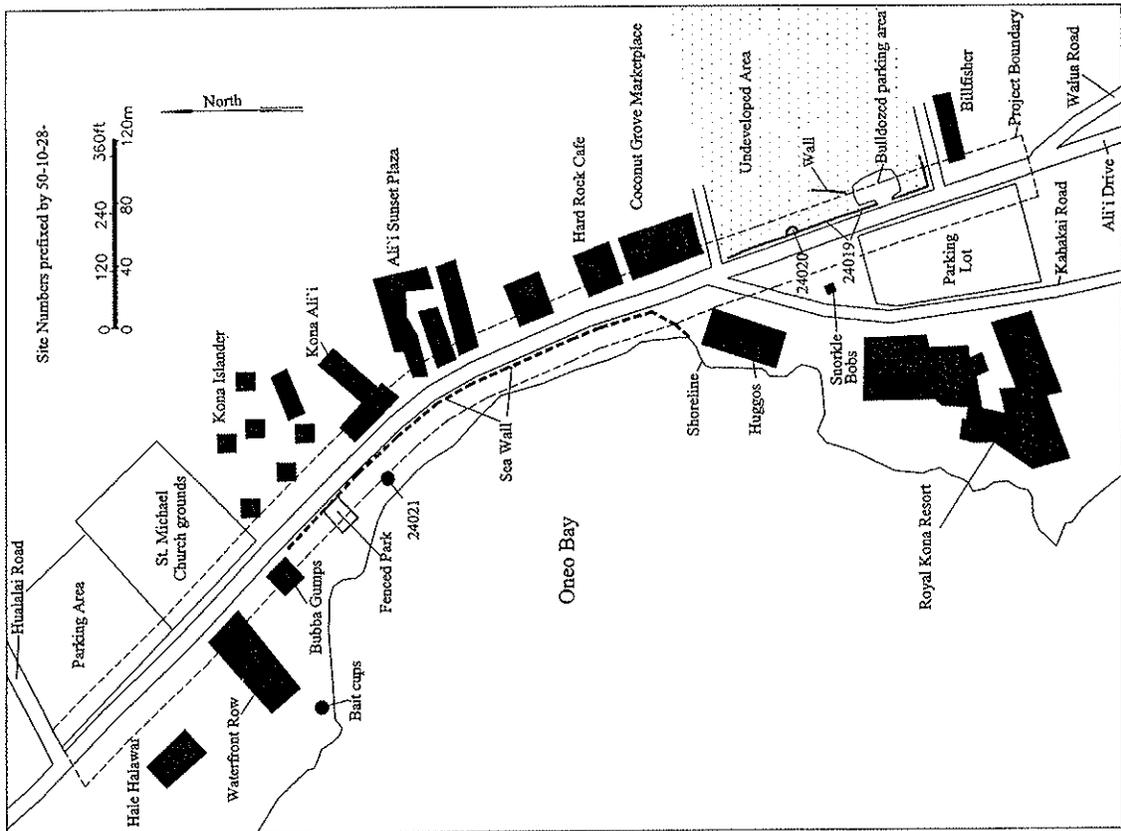


Figure 11. Site Location Map



Figure 13. Site 24019 Wall, view to south



Figure 14. Site 24020 Enclosure, view to southwest

remains were noted. The possible disturbed remnant of a second structure is situated 4.1 m to the east of the enclosure. This possible remnant is comprised of a curvilinear alignment of cobbles and small boulders with overall dimensions of 4.1 m long (north-south) and 1.6 m wide (see *Figure 12*). A fragment of *Cypraea sp.* shell and a glazed ceramic shard were noted. As stated, the area inland of Site 24020 appears to have been once bulldozed and it is possible that this alignment may also represent a low pushpile. The enclosure is interpreted as a historic habitation based on the relationship to the Site 24019 ranch wall, portable remains, and interior pavement.

A series of 10 shovel tests (STs) were excavated along the inland side of Site 24019 and Ali'i Drive, to the north-northwest and south-southeast of Site 24020 (see *Figure 12*). The results of these shovel tests are summarized in *Table 3* and the soil stratigraphy encountered is illustrated in *Figure 15*. The surface layer in nine of the ten STs consisted of a deposit of a dark brown (10YR 3/3) sandy silt (Layer I) that varied in thickness from 0.2 to 0.65 m, averaging 0.35 m thick. In the remaining shovel test (ST-10), the Layer I deposit was overlain by 0.28 m of a pale brown (10YR 6/3) coarse gravel fill that was likely associated with recent construction activity in the area. In each of the ten STs, Layer I contained a mixture of both historic and indigenous cultural remains. The historic/modern material consisted of bottle glass, machine-made nails, glazed ceramics, aluminum foil, rusted metal, plastic and a fragment of a glass bead. The probable indigenous cultural remains were comprised of marine shell, sea urchin, waterworn coral and bivalve shells, small mammal bone, *kukui* nut shells, volcanic glass flakes, and a groundstone fragment. In five of the STs (STs 5, 7-10), bedrock was encountered beneath the Layer I deposit.

A layer of a very dark grayish brown (10YR 3/2) silt (Layer II) was encountered beneath the Layer I deposit in two of the ten STs (STs 2 and 4). This deposit ranged in thickness from 0.35 to 0.55 m and in both STs, was underlain by the Layer III deposit (discussed below). Cultural remains from Layer II consisted of marine shell and *kukui* nut shells. No historic/modern material was recovered from the Layer II deposit.

Layer III consisted of a yellowish brown (10YR 5/4), culturally sterile stony silt that was encountered in five of the ten STs (STs 1-4 and 6). This deposit varied in thickness from 0.03 to 0.1 m, averaging 0.08 m. Bedrock was encountered beneath Layer III in each of the five STs.

The results of shovel testing in the vicinity of Site 24020 indicate that the Layer I deposit likely represents a disturbed prehistoric cultural deposit that has been impacted by historic/modern activity in the area. The Layer II deposit observed in STs 2 and 4 likely represents a truncated, remnant intact prehistoric cultural deposit based on the absence of historic debris. The Layer II deposits encountered in ST-2 and ST-4 are designated Features B and C, respectively. The Layer III deposit is a non-cultural, naturally deposited layer.

### Site 24021

Site 24021 (Temporary Field No. T-3) is a complex of five features located in an area of bare coastal pahoehoe lava on the ocean side of the seawall bordering Ali'i Drive. The features are comprised of three *papamu* (Features A, B and E), and two petroglyphs (Features C and D; *Figure 16*). The site is located within the coastal surf zone and is completely exposed during low tides and covered during times of high tide and high surf. No cultural remains were present at the site. Site 24021 is unaltered and in fair condition.

Feature A is a *papamu* located 1.9 m inland from the shoreline. The *papamu* consists of a series of pecked depressions that encompasses an area 0.98 m long (northeast by southwest) and 0.71 m wide (*Figure 17*). Originally the feature appears to have been comprised of 16 rows of 11 pecked depressions oriented in a north-northwest by south-southeast direction however erosion has obliterated a number of the depressions. The depressions average 0.02 m in diameter by 0.01 m in depth. This feature, along with Features B and E are interpreted as the game board for the Hawaiian game of *konane*, based on its format type.

Feature B is a second *papamu* situated 0.9 m east of Feature A. This feature is also partially eroded but likely originally consisted of 15 rows of 11 depressions in an area 0.66 m long (west-northwest

Table 3. Summary of Shovel Testing Results (cont.)

ST #	Layer	Depth (bs)	Color	Munsell	Texture	Cultural remains/Comments
ST-1	I	0-0.22	Dark brown	10YR 3/3	Sandy silt	White glazed ceramic (n=1, 4.1g), brown bottle glass (n=8, 12.7g), clear bottle glass (n=3, 2.3g), green bottle glass (n=1, 2.6g), <i>Cypraea</i> sp. (n=19, 12.9g), <i>Nerita picea</i> (n=2, 0.6g), <i>Hipponix pilosus</i> (n=10, 0.6g), <i>Murchisonia faniculus</i> (n=1, 1.1g), urchin spine (n=1, 0.7g), unid. marine shell (n=1, 0.1g)
	III	0.22-0.25	Yellowish brown	10YR 5/4	Stony silt	No cultural remains. Terminated on bedrock
ST-2	I	0-0.2	Dark brown	10YR 3/3	Sandy silt	Machine-made nails (n=2, 15.2g), white glazed ceramic (n=5, 16.9g), brown bottle glass (n=2, 6.2g), clear bottle glass (n=5, 3.6g), perforated blue glass bead fragment (n=1, 1.1g, 10mm dia.), <i>Cypraea</i> sp. (n=36, 47.2g), <i>Nerita picea</i> (n=51, 3g), <i>Conus</i> sp. (n=9, 20.4g), <i>Ceolana</i> sp. (n=3, 0.9g), <i>Murchisonia</i> sp. (n=2, 5.1g), <i>Colubraria obscura</i> (n=1, 2.3g), <i>Isognomon</i> sp. (n=2, 0.5g), urchin spine (n=8, 4.8g), urchin body frag (n=4, 0.5g), unid. marine shell (n=4, 2.5g), fish bone (n=1, 1.1g), <i>Kukui</i> nut shell (n=4, 3.1g), basalt groundstone fragment (n=1, 9.4g, 38mm long, 21mm wide, 6mm thick), volcanic glass flake (n=1, 0.3g, 8mm long, 6mm wide, 2 mm thick).
	II	0.2-0.55	Very dark gray/sh brown	10YR 3/2	Silt	<i>Cypraea</i> sp. (n=13, 13.7g), <i>Nerita picea</i> (n=4, 0.9g), <i>Conus</i> sp. (n=6, 4.7g), unid. marine shell (n=3, 2.4g), <i>Kukui</i> nut shell (n=2, 0.9g)
ST-3	I	0-0.45	Dark brown	10YR 3/3	Sandy silt	No cultural remains. Terminated on bedrock
	III	0.55-0.65	Yellowish brown	10YR 5/4	Stony silt	White glazed ceramic (n=6, 22.1g), brown bottle glass (n=22, 19.9g), clear bottle glass (n=14, 11.6g), green bottle glass (n=5, 2.6g), mirror glass (n=1, 0.2g), metal frag (n=1, 2.4g), plastic frag (n=2, 0.3g), <i>Cypraea</i> sp. (n=34, 40.9g), <i>Conus</i> sp. (n=2, 1.0g), <i>Nerita picea</i> (n=16, 4.8g), <i>Ceolana</i> sp. (n=4, 1.6g), <i>Hipponix pilosus</i> (n=4, 0.8g), <i>Isognomon</i> sp. (n=5, 1.8g), unid. marine shell (n=1, 0.2g), urchin spine (n=9, 4.2g), fish bone (n=1, 0.1g), waterworn basalt pebble (n=1, 1.9g), volcanic glass flake (n=4, #1=0.8g, 13mm long, 8mm wide, 6mm thick, #2=0.6g, 12mm long, 11mm wide, 4mm thick, #3=0.4g, 7mm long, 6mm wide, 4mm thick, #4=0.4g, 10mm long, 7mm wide, 4 mm thick)
ST-4	I	0-0.2	Dark brown	10YR 3/3	Sandy silt	No cultural remains. Terminated on bedrock
	II	0.2-0.75	Very dark gray/sh brown	10YR 3/2	Silt	White glazed ceramic (n=1, 0.9g), green bottle glass (n=1, 7.6g), <i>Cypraea</i> sp. (n=20, 32.4g), <i>Conus</i> sp. (n=1, 9.5g), <i>Nerita</i> sp. (n=10, 2.9g), <i>Hipponix pilosus</i> (n=1, 0.1g), <i>Isognomon</i> sp. (n=4, 1.9g), unid. marine shell (n=3, 0.9g), urchin spine (n=6, 5.2g), <i>Kukui</i> nut shell (n=1, 0.8g), waterworn coral pebble (n=5, 5.9g)
ST-5	I	0-0.33	Dark brown	10YR 3/3	Sandy silt	<i>Cypraea</i> sp. (n=11, 7.5g), <i>Nerita picea</i> (n=4, 1.6g), <i>Isognomon</i> sp. (n=1, 0.2g), unid. marine shell (n=1, 0.1g)
	III	0.75-0.78	Yellowish brown	10YR 5/4	Stony silt	No cultural remains. Terminated on bedrock
ST-6	I	0-0.4	Dark brown	10YR 3/3	Sandy silt	Anchor Hawking clear glass bottle (n=1, 210.2g, 147mm long, 73mm wide, 37mm thick - threaded top), clear bottle glass (n=21, 37.7g), green bottle glass (n=2, 36.8g), brown bottle glass (n=5, 3.3g), white bottle glass (n=1, 1.9g), white glazed ceramic (n=4, 6.5g), plastic frag. (n=6, 2.8g), <i>Cypraea</i> sp. (n=12, 14.5g), <i>Nerita picea</i> (n=46, 16.1g), <i>Ceolana</i> sp. (n=8, 4.7g), <i>Isognomon</i> sp. (n=1, 0.2g), <i>Drapa rubusidaeus</i> (n=1, 2.0g), urchin spine (n=4, 1.9g), waterworn coral (n=2, 4.6g) - Terminated on bedrock
	III	0.4-0.5	Yellowish brown	10YR 5/4	Stony silt	No cultural remains. Terminated on bedrock
ST-7	I	0-0.44	Dark brown	10YR 3/3	Sandy silt	Brown bottle glass (n=4, 5.1g), brown glazed ceramic (n=1, 4.9g), metal frag. (n=2, 1.5g), <i>Cypraea</i> sp. (n=18, 20.3g), <i>Nerita picea</i> (n=10, 4.9g), <i>Drapa rubusidaeus</i> (n=1, 0.6g), <i>Conus</i> sp. (n=1, 1.9g), <i>Isognomon</i> sp. (n=22, 5.3g), unid. marine shell (n=4, 3.2g), urchin spine (n=16, 7.9g), urchin body (n=6, 0.9g), <i>Kukui</i> nut shell (n=1, 8.2g), small mammal bone (n=1, 0.3g), waterworn basalt pebble (n=1, 2.5g), waterworn coral (n=1, 1.3g), volcanic glass flake (n=2, #1=0.6g, 11mm long, 10mm wide, 5mm thick, #2=0.7g, 17mm long, 13mm wide, 3mm thick) - Terminated on bedrock
	II	0-0.65	Dark brown	10YR 3/3	Sandy silt	Brown bottle glass (n=1, 1.2g), clear bottle glass (n=1, 1.7g), <i>Cypraea</i> sp. (n=26, 24.5g), <i>Nerita picea</i> (n=4, 1.4g), <i>Conus</i> sp. (n=2, 1.6g), <i>Isognomon</i> sp. (n=7, 1.5g), unid. marine shell (n=2, 1.1g), urchin spine (n=7, 4.7g), waterworn coral (n=2, 8.3g), volcanic glass flake (n=1, 0.1g, 12mm long, 3mm wide, 2mm thick) - Terminated on bedrock
ST-8	I	0-0.25	Dark brown	10YR 3/3	Sandy silt	Green bottle glass (n=2, 1.2g), brown bottle glass (n=1, 0.1g), metal frag. (n=1, 0.5g), <i>Cypraea</i> sp. (n=20, 15.1g), <i>Conus</i> sp. (n=3, 6.4g), unid. marine shell (n=3, 3.4g), urchin spine (n=3, 1.1g), waterworn coral (n=1, 3.6g), volcanic glass flake (n=2, #1=7.5g, 24mm long, 18mm wide, 15mm thick, #2=0.4g, 11mm long, 6mm wide, 4mm thick) - Terminated on bedrock
	III	0-0.28	Pale brown	10YR 6/3	Course gravel	No cultural remains
ST-10	I	0.28-0.67	Dark brown	10YR 3/3	Sandy silt	Clear bottle glass (n=1, 4.3g), <i>Cypraea</i> sp. (n=6, 3.9g), <i>Nerita picea</i> (n=3, 0.8g), <i>Conus</i> sp. (n=2, 1.3g), unid. marine shell (n=2, 1.2g), urchin spine (n=5, 2.7g) - Terminated on bedrock
	III	0.28-0.67	Dark brown	10YR 3/3	Sandy silt	Clear bottle glass (n=1, 4.3g), <i>Cypraea</i> sp. (n=6, 3.9g), <i>Nerita picea</i> (n=3, 0.8g), <i>Conus</i> sp. (n=2, 1.3g), unid. marine shell (n=2, 1.2g), urchin spine (n=5, 2.7g) - Terminated on bedrock

Table 3. Summary of Shovel Testing Results (cont.)

ST #	Layer	Depth (bs)	Color	Munsell	Texture	Cultural remains/Comments
ST-6	I	0-0.4	Dark brown	10YR 3/3	Sandy silt	Brown bottle glass (n=5, 7.9g), green bottle glass (n=2, 2.1g), clear bottle glass (n=1, 0.7g), aluminum foil (n=1, 0.2g), <i>Cypraea</i> sp. (n=13, 3.1g), <i>Hipponix pilosus</i> (n=5, 1.3g), <i>Drapa rubusidaeus</i> (n=12, 4g), <i>Isognomon</i> sp. (n=1, 0.1g), unid. marine shell (n=2, 1.5g), urchin spine (n=31, 1g)
	III	0.4-0.5	Yellowish brown	10YR 5/4	Stony silt	No cultural remains. Terminated on bedrock
ST-7	I	0-0.44	Dark brown	10YR 3/3	Sandy silt	Brown bottle glass (n=4, 5.1g), brown glazed ceramic (n=1, 4.9g), metal frag. (n=2, 1.5g), <i>Cypraea</i> sp. (n=18, 20.3g), <i>Nerita picea</i> (n=10, 4.9g), <i>Drapa rubusidaeus</i> (n=1, 0.6g), <i>Conus</i> sp. (n=1, 1.9g), <i>Isognomon</i> sp. (n=22, 5.3g), unid. marine shell (n=4, 3.2g), urchin spine (n=16, 7.9g), urchin body (n=6, 0.9g), <i>Kukui</i> nut shell (n=1, 8.2g), small mammal bone (n=1, 0.3g), waterworn basalt pebble (n=1, 2.5g), waterworn coral (n=1, 1.3g), volcanic glass flake (n=2, #1=0.6g, 11mm long, 10mm wide, 5mm thick, #2=0.7g, 17mm long, 13mm wide, 3mm thick) - Terminated on bedrock
	II	0-0.65	Dark brown	10YR 3/3	Sandy silt	Brown bottle glass (n=1, 1.2g), clear bottle glass (n=1, 1.7g), <i>Cypraea</i> sp. (n=26, 24.5g), <i>Nerita picea</i> (n=4, 1.4g), <i>Conus</i> sp. (n=2, 1.6g), <i>Isognomon</i> sp. (n=7, 1.5g), unid. marine shell (n=2, 1.1g), urchin spine (n=7, 4.7g), waterworn coral (n=2, 8.3g), volcanic glass flake (n=1, 0.1g, 12mm long, 3mm wide, 2mm thick) - Terminated on bedrock
ST-8	I	0-0.25	Dark brown	10YR 3/3	Sandy silt	Green bottle glass (n=2, 1.2g), brown bottle glass (n=1, 0.1g), metal frag. (n=1, 0.5g), <i>Cypraea</i> sp. (n=20, 15.1g), <i>Conus</i> sp. (n=3, 6.4g), unid. marine shell (n=3, 3.4g), urchin spine (n=3, 1.1g), waterworn coral (n=1, 3.6g), volcanic glass flake (n=2, #1=7.5g, 24mm long, 18mm wide, 15mm thick, #2=0.4g, 11mm long, 6mm wide, 4mm thick) - Terminated on bedrock
	III	0-0.28	Pale brown	10YR 6/3	Course gravel	No cultural remains
ST-10	I	0.28-0.67	Dark brown	10YR 3/3	Sandy silt	Clear bottle glass (n=1, 4.3g), <i>Cypraea</i> sp. (n=6, 3.9g), <i>Nerita picea</i> (n=3, 0.8g), <i>Conus</i> sp. (n=2, 1.3g), unid. marine shell (n=2, 1.2g), urchin spine (n=5, 2.7g) - Terminated on bedrock
	III	0.28-0.67	Dark brown	10YR 3/3	Sandy silt	Clear bottle glass (n=1, 4.3g), <i>Cypraea</i> sp. (n=6, 3.9g), <i>Nerita picea</i> (n=3, 0.8g), <i>Conus</i> sp. (n=2, 1.3g), unid. marine shell (n=2, 1.2g), urchin spine (n=5, 2.7g) - Terminated on bedrock

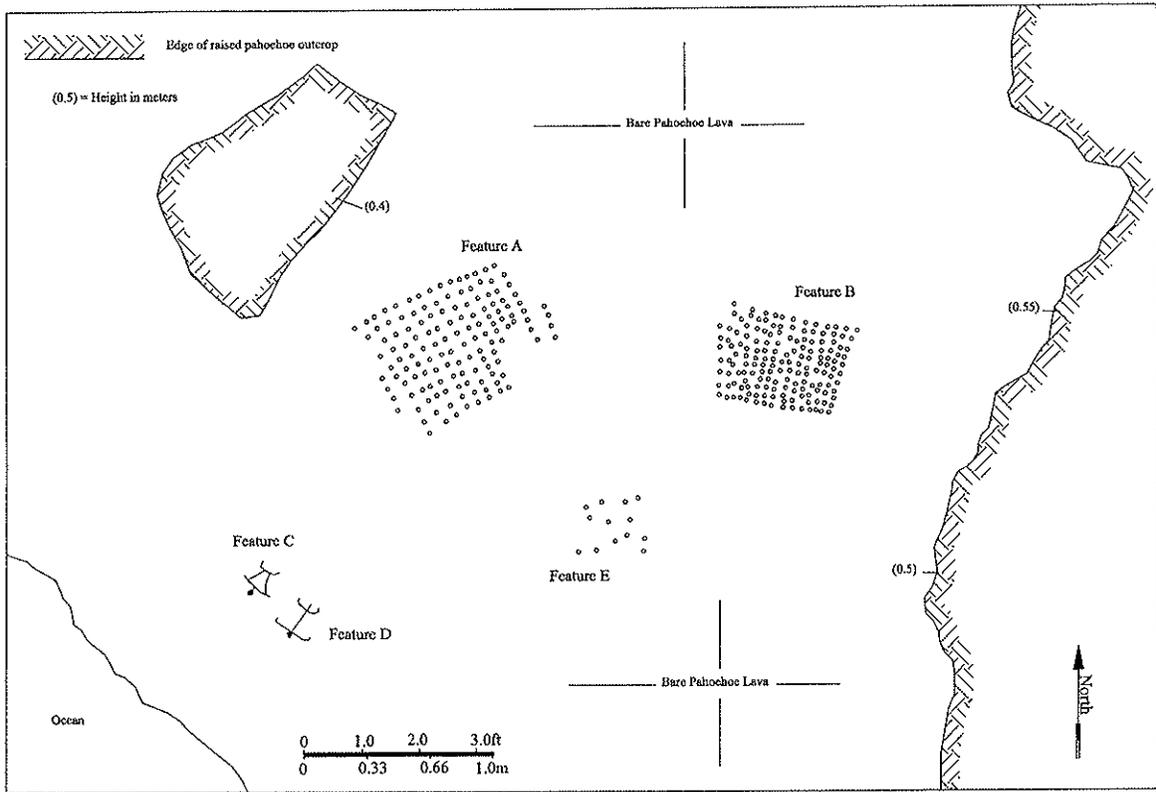


Figure 16. Site 24021 Plan Map

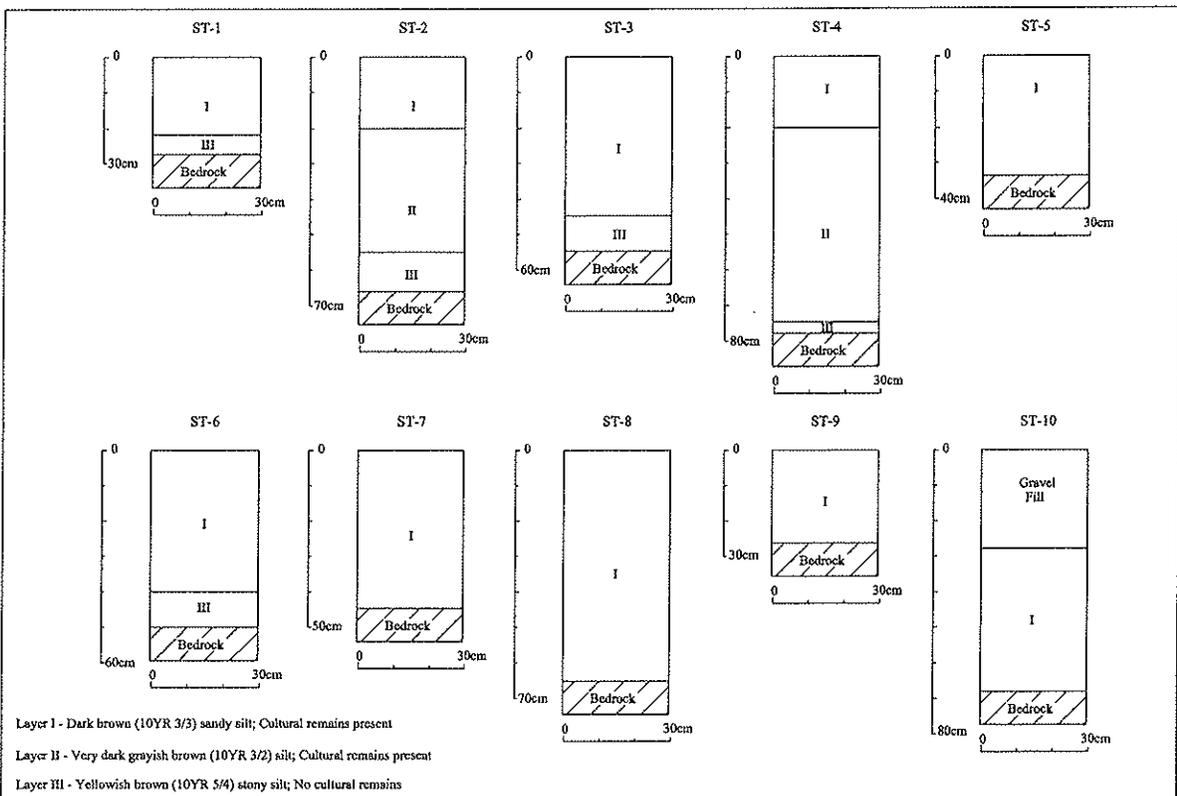


Figure 15. Shovel Test Stratigraphy



Figure 17. Site 24021, Features A, B and E Papamu, view to northwest

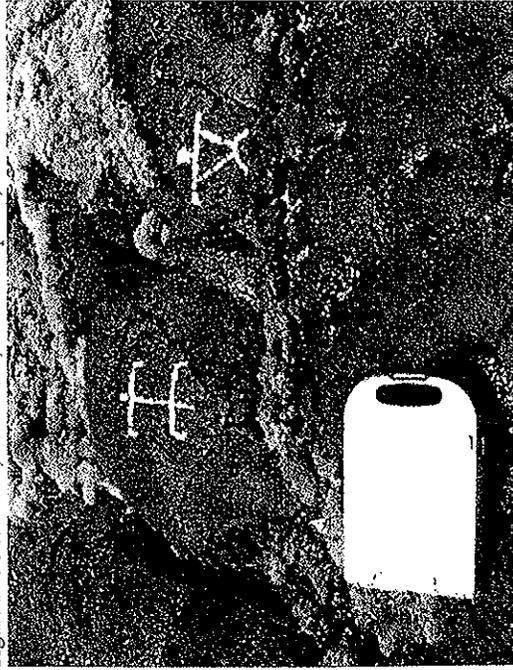


Figure 18. Site 24021, Features C and D Petroglyphs, view to southwest (Digitally enhanced with white outlining)

by east-southeast) and 0.5 m wide (see Figure 17). The depressions range in diameter from 0.02 to 0.03 m and average 0.01 m in depth.

Features C and D are petroglyphs situated 1.1 m southwest of Feature A and 0.78 m inland from the shoreline. Both of the petroglyphs have been pecked into the bare coastal lava flow and both depict complete anthropomorphic images with arms, legs, a torso and a head, with the heads facing the shoreline (Figure 18). Feature C is 0.18 m long and 0.17 m wide, and Feature D is 0.2 m long and 0.19 m wide. These features are interpreted as examples of Hawaiian rock art based on their formal type.

Feature E consists of the possible remnant of a *papamu* located 0.8 m southeast of Feature A (see Figure 17). This feature is comprised of 13 pecked depressions in an area 0.42 m long (east-northeast by west-southwest) and 0.34 m wide. It is unclear if this feature represents an incomplete *papamu* or one that has been severely eroded by wave action.

## CONCLUSION

The identified sites and features conform to the site and feature types expected in the *kala* zone of the Kona Field System based on previous archaeological work and historic documentary research. Probable prehistoric to early historic sites consist of petroglyphs and *papamā* at Site 24021 and a truncated subsurface cultural deposit at Site 24020. The Site 24019 wall is relatively high and core-filled indicating a probable association with cattle ranching. The wall may have been initially constructed in the mid- to late 1800s, and probably was used and maintained until at least the mid-1900s. The enclosure at Site 24020 probably is a historic habitation based on its relationship to the Site 24019 ranch wall, portable remains, and interior pavement.

## Significance Assessments

Sites documented during the survey are assessed for significance based on the criteria for National Register of Historic Places (NRHP), under 36 CFR § 800.4 (c). According to these criteria, a site must possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:

1. Criterion "a". It must be associated with events that have made a significant contribution to the broad patterns of our history;
2. Criterion "b". It must be associated with the lives of persons significant in our past;
3. Criterion "c". It must embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; or
4. Criterion "d". It must have yielded, or may be likely to yield, information important in prehistory or history.

Based on the above criteria, all three sites are assessed as significant under Criterion "d". The sites have yielded information important for understanding late prehistoric to historic land use. The Site 24021 petroglyphs are additionally assessed as significant under Criterion "c" as a good site type example.

## Recommended Treatments

The planned road improvements have been designed to avoid any impact to the identified sites. The properties where the sites are situated will remain in the current ownership and will not be acquired for the road improvements project. Site 24021 is situated on State land bordering the ocean and the remaining two sites are on private property. Site 24021 is recommended for preservation. The mapping, written description, and photography at Site 24019 adequately document it and no further archaeological work is recommended. Site 24020 retains the potential to yield information important for understanding prehistoric and historic land use. The site is recommended for either preservation or data recovery depending upon the nature of future private development plans. It is also recommended that the initial excavations of road improvements project be monitored because of the potential presence of buried cultural deposits. The monitoring would be guided by a Monitoring Plan prepared for DLNR-SHPD review and approval.

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# Appendix G

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Public Meeting Notices and Notes  
July 1, 2004

Harry Kim  
Mayor



County of Hawaii  
DEPARTMENT OF PUBLIC WORKS  
Aupuni Center  
101 Punch Street, Suite 7 • Hilo, Hawaii 96720-4224  
(808) 961-8321 • Fax (808) 961-8630

Bruce C. McClure  
Director  
Ronald K. Takahashi  
Deputy Director

June 9, 2004

NEWS RELEASE

County of Hawaii Department of Public Works  
Public Meeting on the Alii Drive Improvements Along Ono Bay Project

The County of Hawaii Department of Public Works will hold a public meeting to discuss the Alii Drive Improvements Along Ono Bay project (Federal Aid Project No. STP-0186(2)) on Thursday, July 1, 2004, from 7:00pm to 9:00pm at the King Kamehameha Kona Beach Hotel, 75-5660 Palani Road, Kailua-Kona.

The Alii Drive Improvements project is part of the Federal Highway Administration Transportation Enhancement (TE) Program to identify transportation enhancements which can be implemented by the County. The project limits extend along Alii Drive from Hualalai Road to Waula Road and includes the area along Ono Bay. The purpose of the public meeting is to identify issues and concerns, and possible improvement alternatives to pedestrian and bicycle circulation, landscaping, and scenic enhancements for inclusion and discussion in the Environmental Assessment and Preliminary Engineering Report for the project.

For more information contact Galen Kuba, County of Hawaii Department of Public Works in Hilo at 808.961.8422 or Barry Toyota or John Sakaguchi, Wilson Okamoto Corporation in Honolulu at 808.946.2277.

If you require special accommodations or auxiliary aid and/or services to participate in this meeting (i.e. sign language interpreter, large print), please call John Sakaguchi at 808.946.2277.

County of Hawaii is an Equal Opportunity Provider and Employer.

6468-01

JS  
BT

6468-01  
July 29, 2004

WILSON  
OKAMOTO  
CORPORATION



ENGINEERS  
PLANNERS  
769 S. BERETANIA STREET  
HONOLULU, HAWAII 96828  
PHONE: (808) 946-2277  
FAX: (808) 946-2253

PUBLIC MEETING MEMO

MEETING DATE: July 1, 2004  
7:00p to 9:00p

MEETING LOCATION: King Kamehameha Hotel, Meeting Rooms 3 and 4  
Kailua-Kona, Hawaii

PERSONS PRESENT: 40-45 attendees, partial sign in sheet attached.

SUBJECT: Alii Drive Improvements Along Ono Bay project (Federal Aid Project No. STP-0186(2)); Public Meeting #1

PURPOSE: To present existing conditions, preliminary concepts for enhancements, and solicit comments from the public regarding issues and concerns, and the preliminary concepts.

INFORMATION ITEMS:

WOC presented slides showing existing conditions of the project limits, which extend along Alii Drive from Hualalai Road to Waula Road, a distance of about 4,200 feet, including portions along Ono Bay. The pedestrian walkways along the project limits are narrow and include portions located on private property. The Alii Drive project is funded through the Federal Highway Administration (FHWA) Transportation Enhancement (TE) program administered by the State Department of Transportation (DOT). The TE program limits funding to only specific types of projects primarily related to transportation enhancement and excludes traffic improvement projects. The County has obtained State DOT approval for funding underpinning of existing overhead utility lines within the project limits.

WOC presented preliminary concepts for underground placement of the utility lines, landscape and pedestrian enhancements (shade trees and benches) for the area fronting Hale Halawai, and construction of an extended walkway/sea wall along Ono Bay. Underpinning of the utility lines would primarily extend from Hualalai Road to Kainakai Road. The existing lines could remain above ground for the south section to Waula Road.

JS  
12/15/04  
CC: G KUBA,  
VIA e-MAIL  
12/15/04

L:\WQA\6468-01\_ali\_dtpubemg\1\jktk1k7G.doc; 12/15/2004

COMMENTS

1. Pedestrian safety improvements are needed especially in the mauka areas where there is no raised sidewalk.
2. Landscape enhancements, e.g. benches, shade trees, will likely attract loitering, vagrancy, harassment of tourists, and drug dealing. Removal of the rockwalls fronting Hale Halawai (County recreational facility) improved safety in the area. These types of activities, including camping out, moved to the small open sandy area just south of Restaurant Row. The activities moved, they did not cease.
3. Consideration for bicyclists need to be included in the planning and design. Bicycle use and pedestrians should be separated. Also, parking occurs in the area which could be used for bicycle travel.
4. The location of the extended walkway/sea wall needs to be identified. Where will the walkway/sea wall start and end? There are privately owned parcels makai of the existing sea wall.
5. High wave action at Oneo Bay will have an adverse effect on makai side walkway improvements.
6. Utility poles along Alii Drive have fallen in the past. Undergrounding of the utility lines will improve safety.
7. Undergrounding will also increase the space available for pedestrians to walk.
8. Proposed undergrounding of utilities may conflict with existing drainage and waterline infrastructure. Space for the underground lines may be a problem.
9. Undergrounding of utilities will incur high maintenance costs. Development of a maintenance plan for proposed improvements is essential.

10. There are archaeological features along the shoreline of the existing sea wall. The improvements should respect the area and the features. Significant features may dictate design of improvements.
11. The proposed concrete box/sea wall may affect reef plants and animal life.
12. The proposed concrete box/sea wall may encourage sitting along wall and/or railing. This could result in trash being thrown into the ocean.
13. The concrete box/sea wall will need a railing. However, a high railing may obstruct open views of the ocean from vehicles driving along this section. The existing low wall does not obstruct open ocean views from vehicles.
14. Benches should be designed to discourage sleeping (prone) position. This will improve safety.
15. Development of the Coconut Grove commercial area has resulted in increased pedestrian traffic along the mauka side of Alii Drive. This area does not have a sidewalk. There is concern for pedestrian safety.
16. There should be sidewalks on both sides of the street.
17. There is not a safe place for bicycles, pedestrians, and disabled on both sides of the street.
18. Street parking should be removed to permit more space for sidewalks for pedestrians and for bicycles.
19. Planning for the improvements also needs to include a maintenance program.
20. Cars are the problem and take up too much space. The street needs to have one-way traffic so that there is more room for other uses.
21. Existing rockwalls are a unique feature in Kailua village and should be retained.

22. Underground utilities will enhance views of Oneo and Kailua bays.
23. Locate underground utilities midway between Alii Drive and Kuakini Highway. This will take care of concerns about conflicts with other utilities.
24. Include designation of a bike lane.
25. Rest areas and shade trees will provide relief to pedestrian traffic.
26. Proposed concrete box/sea wall will stabilize shoreline.
27. Flashing lights to show the crosswalk are needed at the Coconut Grove area. This could get pedestrians to move off the mauka side of the road.
28. Eliminating on-street parking stalls fronting Hale Halawai will allow construction of a mauka side walkway.
29. Consider need for delivery truck lane.
30. Select low maintenance landscaping for improvements fronting Hale Halawai.
31. Consider 'raised' crosswalks which will slow down vehicular traffic (although this feature may impact bike traffic).
32. One-way traffic patterns have been tried and have failed to improve circulation.
33. Enforcement concerns regarding loitering, vagrancy, and drug dealing should not be a stumbling block for an enhancement project. Loitering, vagrancy, and drug dealing are social problem and should not impede an enhancement project.
34. Consider realigning section of roadway fronting Hale Halawai to provide room for mauka walking lane.
35. Condemn for public purposes portion of parking lot, church, and other properties fronting Alii Drive and relocate rockwalls, etc. to provide mauka walking lane.
36. Property owner is spending \$1,300 per month to have the private property patrolled at night to keep his property safe.
37. The location of the concrete box/sea wall needs to be determined. This is main concern.

TO: HON. JERRY S. SAKAGUCHI

Mr. Galen Kuba  
County of Hawaii  
Department of Public Works  
101 Pauahi Street, Suite 7  
Hilo, Hawaii 96720

Mr. Galen Kuba  
County of Hawaii  
Department of  
101 Pauahi St  
Hilo, Hawaii 9

Thank you for the informative presentation on 7/1/04

*Galen*

Subject: Aili Drive Improvements Along Oneo Bay

Subject: Aili Drive Improvements Along Oneo Bay

I have the following comments on the proposed project:

I have the following comments on the proposed project:

I really like the one way street idea. Or now at all. Perhaps when highway opens up close Aili. Is also think that we should maintain a traditional looking rock wall (put up low rock over cement)

1) Provide for wood-tructured pedestrian traffic, both monkey and waka for the full length of the project. To not do so is negligent and poor job. This is unacceptable!

2) Where these pedestrian improvements cross non-commercial property, please take special care to enhance the condition on those properties to some support rather than opposite from those supports. Having a beautiful pedestrian promenade through a couple of places and paving folks to cross the street even in a crosswalk, will open the whole thing - providing a good feeling again

2) Where these pedestrian improvements cross non-commercial property, please take special care to enhance the condition on those properties to some support rather than opposite from those supports. Having a beautiful pedestrian promenade through a couple of places and paving folks to cross the street even in a crosswalk, will open the whole thing - providing a good feeling again

3) From the place preserve rock walls and other archeological features in the corridor. If a rock wall is in the way - move back and rebuild it properly with them first (attach additional sheets as necessary)

3) From the place preserve rock walls and other archeological features in the corridor. If a rock wall is in the way - move back and rebuild it properly with them first (attach additional sheets as necessary)

OPTIONAL:  
PLEASE PRINT: Name: \_\_\_\_\_ Phone: \_\_\_\_\_  
Organization: \_\_\_\_\_  
Address: \_\_\_\_\_

OPTIONAL:  
PLEASE PRINT: Name: Jeff Turner Phone: 329-9220  
Organization: Kona Outdoor Group  
Address: PO Box 3220 K-K 96745

Please submit your comments County of Hawaii Department of Public Works by August 1, 2004.

Please submit your comments County of Hawaii Department of Public Works by August 1, 2004.



SAVE THE PLANET

6466-01

8/7/04  
B7 CC: CAH, DPW

To the County of Hawaii:

We are very excited about the opportunity and possibility of having the electrical wires underground. There are several reasons why we would like to have the wires placed underground. Safety should be the number one reason why these wires should be placed below the ground. Two years ago there was an incident where I believe four of the poles fell into the ocean due to a car hitting one of them. Due to termite damage and weather damage the other three fell. If these poles fell into the street or walkway people would have been injured or possibly killed. Due to the growing traffic on Alii Drive this will always be a concern while the poles are above ground. With the growth of traffic on Alii Drive the chances of another pole or person being hit has increased and will continue to increase until the lines are placed underground. If the poles Makau side of the street was to fall they could possibly land in the Hard Rock Cafe and again possibly injure our guests or damage our assets. Another concern with the utility poles is high winds and or hurricane weather could knock them down. The last reason we would like to have the utility lines placed underground is that over 60% of our guests comment on how much better the view would be if the utility lines were not there.

We also believe that the county of Hawaii should widen the sidewalks along Alii Drive. Once again the number one reason why we believe these should be widened is guest safety. There are areas along Alii Drive where there is only room for one or two persons to be able to walk down the road. With this much space this does not allow any of our Handicapped guests to feel safe while traveling this portion of Alii Drive. It would be a great benefit for the residents and tourists if you were to widen the walkways along Alii Drive. Thanks for taking the time to listen to our voice and hopefully we can see these changes happen soon.

Mahalo

*Brett Mundy*

Brett McCurdy  
General Manager  
Hard Rock Café Kona

6466-01

7/2/04 B7

Georgette Yaindi  
Ride On Productions  
PON 2174  
Kailua-Kona, HI, HI 96745  
808-329-1504  
gyaindi@earthlink.net  
cc: CAH, DPW

July 1, 2004

Ideas for Bicycle and Pedestrian Improvements Along Onco Bay, Alii Dr.

General Comments

1. It is convenient to speak of bicycle and pedestrian travel in the same breath because they are alternatives to motorized vehicles. However, the requirements for safe, efficient, and enjoyable bicycle transportation and pedestrian travel are not the same.
2. The plan and design for improvements for a small segment of a longer roadway should be part of a vision, plan, and design to improve the entire corridor.
3. Much can be done along this stretch of roadway through enforcement of existing motor vehicle laws, particularly regarding illegal vehicle reconstructions, parking in shoulders, and illegal turns. While speeding is a problem on Alii Dr. and everywhere, vehicle speeds on this fragmented stretch of roadway are generally calm.
4. All of Alii Dr. should be striped according to AAHSTO guidelines, which set lane width to the posted speed limit. In addition to motorist violations identified above, vehicles which meander over the lane stripe or use the shoulder to pass left turning cars pose the greatest hazard to all roadway users on Alii Dr.
5. And lastly, the following ideas presented for specific improvements to increase the safety, efficiency, and enjoyment of bicycle and pedestrian travel also net improvements to motor vehicle flow and safety, as well.

How to Improve Conditions for Bicycle and Pedestrian Transportation along Alii Dr.

The USDOT and nonmotorized transportation experts agree that there are Five E's to improving life for bikes, peds...and cars: The Five E's are: Engineering, Education, Enforcement, Encouragement, and Economy.

First Engineering

- a. Lane width. Lanes should be striped the entire length of Alii Dr. to reflect AAHSTO standards for 15-30 mph speed limits. Two years ago, the standard for 30 mph was 10.5 feet. Narrow travel lanes have been proven to reduce motor vehicle speeds, while also freeing up existing space to widen sidewalks and/or shoulders; this may have changed given the epidemic obesity of American automobiles and trucks. All street markings,

including especially shoulder stripings should be maintained for maximum visibility. Possibly, the size of the shoulder stripe can be widened as well.

b. Raised sidewalks. This is an excellent way to calm cars (and bikes;) while increasing pedestrian safety and enjoyment. This would be an appropriate treatment for all of Ali'i Dr. which is flat and has speed limits nowhere that exceed 30 mph.

c. Road embedded speed limit signage. The new 15 mph heading north at Waiolu St. is an excellent example.

d. Visible High Quality Bicycle racks. Spend some County Bikeway Funds for the purchase of good City of Chicago caliber bike racks. Maybe the cost can be shared by the County and local businesses.

e. Eliminate free public on-street parking at Hale Halewai. The nine spaces there can be easily accommodated in adjacent lots. Convert this space to any of the following: parking for emergency and police vehicles only; delivery trucks; or by special use for temporary loading and unloading for events at Hale Halewai. The sight lines coming out of the Hale Halewai parking lot are severely constrained by the presence of often super-size SUV's and trucks in these parking stalls. In addition, cars attempting to negotiate in or out of one of these spots exacerbate a traffic hazard for all roadway users at an already congested intersection.

f. Employ a consistent system of graphic striping for legal and illegal parking in shoulders. The current practice of putting in hash marks to indicate no parking look more like actual parking stalls. Maybe some X's, or road embedded no parking signs, or orange paint can be used to signify NO PARKING HERE.

g. Increase the size of the off-shoulder to better accommodate motor vehicle parking mauka of Huggo's. Improve sight lines by restricting allowable parking up to an appropriate distance away from the entrance to the parking lot at Dirty Jake's.

h. Keep up routine shoulder sweeping by the County. Kudos to the County. It does a very good job in keeping our roads and shoulders clean!

#### Enforcement

a. Of existing laws: Zero tolerance by HPD of all motor vehicle violations including speeding; and illegal reconstructions, parking, and turns. Issue citations to "wrong-way cyclists" and cyclists who fail to use front and rear lights after dusk.

b. Of new laws. Support legislation at the State Capitol that will:

- 1) establish a ban on cell phone use in moving vehicles;
- 2) extend automatic child endangerment and risk of injury charges to motorists who violate motor vehicle laws with a minor passenger on board;
- 3) enable counties to retain collected motor vehicle fines; and

4) enable counties to deputize citizens to volunteer assist police in issuance of motor vehicle violation citations

#### Encouragement

a. Initiate a Car-Free Ali'i every Sunday morning from the pier to Hualalai Rd.

b. Increase psa's promoting shared roadway use and enjoyment, and the multiple benefits of biking and walking. The Ads that have been running recently in WHH and on the radio sponsored by Ironman/World Triathlon Corporation are excellent.

#### Education

a. Gain cooperation from agencies or require by law rental cars to have mounted on the dash share the road information, and reminders of HPD's Zero Tolerance, with especial caveat's to not pass on the right and stay within the travel lane. Inform visitors why it is so dark on our roadways.

b. Cooperate with local retailers through special campaigns, discounts, and giveaways to increase sales and use of front and rear lights; and retro reflective devices for pedestrians.

#### Economy

a. Establish a bicycle rental business on the pier.

b. Create and Distribute Walking and Bicycling Maps, with Share the Road and Rules of the Road information.

Mr. Galen Kula  
County of Hawaii  
Department of  
101 Pauahi St  
Hilo, Hawaii 9

TO: HHA DAKASUCHI

Thank you for the informative  
presentation on 7/1/04

Subject: Alii Drive Improvements Along Oneo Bay

I have the following comments on the proposed project:

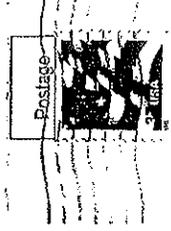
- 1) Provide for wood-trunked pedestrian traffic, both ways and make it for the full length of the project. Do not do as is proposed and paved paths. This is unacceptable!
- 2) Where these pedestrian improvements cross non-commercial property, please take special care to enhance the conditions on those properties to secure support rather than opposition from those occupants. Having a beautiful pedestrian promenade intersect a couple of places and forcing folks to cross the street even in a crosswalk, will spoil the whole thing - penny wise & pound foolish again.
- 3) Have the plant preserve rock walls and other archeological features in the corridor. If a rock wall is in the way - move back and rebuild it properly rather than just removing it altogether.

OPTIONAL:  
PLEASE PRINT: Name: Jeff Turner Phone: 329-9220

Organization: Kona Outdoor Grews  
Address: P.O. Box 3220 K-96745

Please submit your comments County of Hawaii Department of Public Works by August 1, 2004.

(Fold on dotted lines and seal with tape or staple)



Jeffrey Turner  
P.O. Box 3220  
Kailua-Kona, HI 96745

RECEIVED

County of Hawaii  
Department of Public Works  
101 Pauahi Street, Suite 7  
Hilo, Hawaii 96720

Attention: Mr. Galen Kuba

36720+4324

(Fold on dotted lines and seal with tape or staple)

Mr. Galen Kuba  
County of Hawaii  
Department of Public Works  
101 Pauahi Street, Suite 7  
Hilo, Hawaii 96720

Subject: Aili Drive Improvements Along Oneo Bay

I have the following comments on the proposed project:

*I really like the one way street idea. Or now  
at all. Perhaps when highway opens up close Aili.  
I also think that we should maintain a traditional  
looking rock wall (put up concrete over cement)*

(attach additional sheets as necessary)

OPTIONAL:

PLEASE PRINT: Name:

Phone:

Organization:

Address:

Please submit your comments County of Hawaii Department of Public Works by August 1, 2004.

# Appendix H

---

Pre-Assessment Consultation Letters

Harry Kim  
Mayor



**County of Hawaii**  
POLICE DEPARTMENT  
349 Kapiolani Street • Hilo, Hawaii 96720-3998  
(808) 935-5311 • Fax: (808) 961-2389

December 21, 2005

John L. Sakaguchi, AICP, Senior Planner  
Wilson Okamoto Corporation  
1907 S. Beretania Street  
Suite 400  
Honolulu, HI 96826

Dear Mr. Sakaguchi:

This letter is in response to your request for comments on the Ali'i Drive Improvement Project along Oneo Bay. Staff has the following comments:

- Due to Kailua-Kona's extreme traffic issues, the recommendation is that any part of the construction process requiring a total or partial closure of traffic lanes along Ali'i Drive or Haalalal Road be done during night time hours, between 8:00 p.m. and 5:00 a.m.
- Freight and passenger loading zones be incorporated into the final plan and that plans for delivering freight to businesses during the construction process be addressed.
- Based on previous experiences, no public benches be placed on public property or in the public right of way. All benches for the purpose of resting should be on private property. This will allow the property owners to issue trespass warnings to undesirable people using the benches, which is unfeasible on public property.

I appreciate you providing us the opportunity to give input. Should you have any further questions or comments, please contact the Kona District Commander, Captain Paul Kealoha, at 326-4646, extension 249, or our Area II Major, John Dawns, at extension 299.

Sincerely,

LAWRENCE K. MAHUNA  
POLICE CHIEF

JD/fej

"Hawaii's County is an Equal Opportunity Provider and Employer"

6468-01  
January 23, 2006

Chief Lawrence K. Mahuna, Chief of Police  
Police Department  
County of Hawaii  
349 Kapiolani Street  
Hilo, Hawaii 96720

Attention: Capitán Paul Kealoha, Kona District Commander

Subject: Draft Environmental Assessment, Pre-Assessment Consultation;  
Ali'i Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road  
Federal Aid Project No. STP-0186(2); Kailua-Kona, North Kona, Hawaii  
Response to Comment

Dear Chief Mahuna:

Thank you for your December 21, 2005 comment letter to the Pre-Assessment Consultation to the Draft Environmental Assessment for the Ali'i Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road project. Our responses follow

1. The Draft EA will examine the issue of night work for the improvements, including concerns related to construction noise, and those related to traffic congestion.
2. The Draft EA will note that freight and passenger loading zones will need to be kept available during construction of any improvements.
3. At this time, the landscape enhancements, including public benches, would be placed within the County-owned lands of Hale Halawai. However, since this is public land, the Draft EA will examine ways to limit access to the benches.

We appreciate your participation in the Draft EA review process.

If you have any questions, please call me at 808.946.2277.

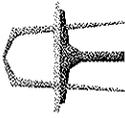
Sincerely,

John L. Sakaguchi, AICP, Senior Planner

JL:Str

cc: G. Kuba, COH DPW, via email

WILSON  
OKAMOTO  
CORPORATION



ENGINEERS  
PLANNERS  
1907 S. BERETANIA ST  
SUITE 400  
HONOLULU, HI 96826  
PH: (808) 946-2277  
FAX: (808) 946-2253

6468-01

Lawrence K. Mahuna  
Police Chief

12/23/05

Harry S. Kubojiri  
Deputy Police Chief

cc: DPN,  
VIA FAX  
12/23/05

RECEIVED  
IN  
DEC 23 2005

WILSON OKAMOTO CORPORATION



DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII  
 345 KEKUAO'A STREET, SUITE 20 • HILO, HAWAII 96720  
 TELEPHONE (808) 961-8050 • FAX (808) 961-8657

January 5, 2006

Mr. John L. Sakaguchi, AICP, Senior Planner  
 Wilson Okamoto Corporation  
 1907 South Beretania Street, Suite 400  
 Honolulu, HI 96826

RECEIVED  
 JAN 16 2006

WILSON OKAMOTO CORPORATION

JS

cc: DPW  
 VIA FAX

**ALIHI DRIVE IMPROVEMENTS ALONG ONEO BAY, HUALALAI  
 ROAD TO WALUA ROAD  
 DRAFT ENVIRONMENTAL ASSESSMENT, PRE-ASSESSMENT CONSULTATION**

Thank you for the opportunity to comment on the aforementioned project. We have no comments to offer at this time; however, we request to have the construction plans reviewed and approved by this Department as it may impact our existing water infrastructure.

Should there be any questions, please contact Ms. Shari Komata of our Water Resources and Planning Branch at 961-8070, extension 252.

Sincerely yours,

Milton D. Pavao, P.E.  
 Manager

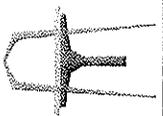
SHK.sco

... Water brings progress...

The Department of Water Supply is an Equal Opportunity provider and employer. To file a complaint of discrimination, write: USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington DC 20250-9410. Or call (202) 720-5964 (voice and TDD).

6468-01  
 January 23, 2006

WILSON  
 OKAMOTO  
 CORPORATION



ENGINEERS  
 PLANNERS  
 1907 S. BERETANIA ST.  
 SUITE 400  
 HONOLULU, HI 96826  
 PH: (808) 961-2277  
 FAX: (808) 961-2253

Mr. Milton D. Pavao, PE Manager  
 Department of Water Supply  
 County of Hawaii  
 345 Kekoa'ao Street, Suite 20  
 Hilo, Hawaii 96720

Attention: Ms. Shari Komata, Water Resources and Planning Branch  
 Subject: Draft Environmental Assessment, Pre-Assessment Consultation;  
 Alihi Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road  
 Federal Aid Project No. STP-0186(2), Kailua-Kona, North Kona, Hawaii  
 Response to Comment

Dear Mr. Pavao:

Thank you for your January 5, 2006 comment letter to the Pre-Assessment Consultation to the Draft Environmental Assessment for the Alihi Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road project.

We will note that you had no comment at this time. However, your office wishes to review the design drawings, when they become available.

We appreciate your participation in the Draft EA review process.

If you have any questions, please call me at 808.946.2277.

Sincerely,

John L. Sakaguchi, AICP, Senior Planner

JLS/ry

cc: G. Kuba, COH DPW, via email

Harry Kim  
Mayor



**County of Hawaii**  
**FIRE DEPARTMENT**  
25 Aupuni Street • Suite 103 • Hilo, Hawaii 96720  
(808) 961-8297 • Fax (808) 961-8296

Darryl J. Oliveira  
Fire Chief

Desmond K. Wery  
Deputy Fire Chief

1/16/06  
*[Signature]*

cc: DPW,  
VIA FAX

RECEIVED  
JAN 13 2006

WILSON OKAMOTO CORPORATION

January 3, 2006

Attention: John L. Sakaguchi, AICP, Senior Planner  
Wilson Okamoto Corporation  
1907 S Beretania Street  
Suite 400  
Honolulu, Hawaii 96826

SUBJECT: DRAFT EA PRE-ASSESSMENT CONSULTATION FOR ALII DRIVE  
IMPROVEMENTS ALONG ONEO BAY, HUALALAI ROAD TO WAULA ROAD  
FEDERAL AID PROJECT NO. STP-0186(2); KAILUA-KONA, HAWAII

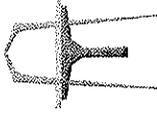
We have no comments to offer at this time in reference to the above-mentioned Pre-Environmental Assessment Consultation.

*[Signature]*  
DARRYL OLIVEIRA  
Fire Chief

DO:lpc

6468-01  
January 23, 2006

WILSON  
OKAMOTO  
CORPORATION



ENGINEERS  
PLANNERS  
1907 S BERETANIA ST  
SUITE 400  
HONOLULU, HI 96826  
PH: (808) 946-2277  
FAX: (808) 946-2253

Chief Darryl Oliveira, Fire Chief  
Fire Department  
County of Hawaii  
25 Aupuni Street, Suite 103  
Hilo, Hawaii 96720

Subject: Draft Environmental Assessment, Pre-Assessment Consultation;  
Alii Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road  
Federal Aid Project No. STP-0186(2); Kailua-Kona, North Kona, Hawaii  
Response to Comment

Dear Chief Oliveira:

Thank you for your January 3, 2006 comment letter to the Pre-Assessment Consultation to the Draft Environmental Assessment for the Alii Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road project.

We will note that you had no comment at this time.

We appreciate your participation in the Draft EA review process.

If you have any questions, please call me at 808.946.2277.

Sincerely,

*[Signature]*

John L. Sakaguchi, AICP, Senior Planner

JLS:ry

cc: G. Kuba, COH DPW, *[Signature]*



6468-01  
January 23, 2006

Harry Kim  
Mayor



**County of Hawaii**

**DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**  
25 Aupuni Street, Room 210 • Hilo, Hawaii 96720-4252  
(808) 961-3083 • Fax (808) 961-3086

December 19, 2005

Mr. John L. Sakaguchi, AICP  
Senior Planner  
Wilson Okamoto Corporation  
1907 S. Beretania St., Suite 400  
Honolulu, HI 96826

**RECEIVED**  
DEC 21 2005

WILSON OKAMOTO CORPORATION

Re: Draft Environmental Assessment, Pre-Assessment Consultation;  
Alii Drive Improvements Along Ono Bay, Hualalai Road to Waula Road  
Federal Aid Project No. STP-0186(2); Kailua-Kona, North Kona, Hawai'i

Dear Sakaguchi,

We have the following comments regarding the proposed project.

Technical Services Section  
There is existing sewer along Alii Drive.

Wastewater Division  
Wastewater Division would like to review preliminary plans to determine if any missing laterals or subouts can be included.

Thank you for allowing us the opportunity to offer input on this project and if we can be of further assistance, please don't hesitate to contact us.

*Nelson Ho*  
Barbara Bell  
DIRECTOR

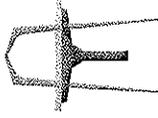
cc: TSS  
WWD  
/H

*Hawai'i County is an equal opportunity provider and employer.*

7765 A

Ms. Barbara Bell, Director  
County of Hawaii  
Environmental Management Department  
25 Aupuni Street, Room 208  
Hilo, Hawaii 96720

**WILSON  
OKAMOTO  
CORPORATION**



**ENGINEERS  
PLANNERS**  
1907 S. BERETANIA ST  
SUITE 400  
HONOLULU, HI 96826  
PH: (808) 946-2277  
FAX: (808) 946-2253

Subject: Draft Environmental Assessment, Pre-Assessment Consultation;  
Alii Drive Improvements Along Ono Bay, Hualalai Road to Waula Road  
Federal Aid Project No. STP-0186(2); Kailua-Kona, North Kona, Hawaii  
Response to Comment

Dear Ms. Bell:

Thank you for your December 19, 2005 comment letter to the Pre-Assessment Consultation to the Draft Environmental Assessment for the Alii Drive Improvements Along Ono Bay, Hualalai Road to Waula Road project. Our responses follow

1. The Draft EA will note the presence of an existing sewer line along Alii Drive within the project limits. The design for the underground electrical line will have to account for the sewer line.
2. The Draft EA will document that the Alii Drive Improvements project is to be funded under the US Department of Transportation Federal Highway Administration (FHWA) Transportation Enhancement (TE) program. The types of improvements eligible for funding under the TE program is limited. However, the Draft EA will note that the Department of Environmental Management would like to determine if missing sewer laterals and subouts can be included as part of the improvements. Please note, given the limited types of improvements which be funded under the TE program, the County may have to fund the subouts.

We appreciate your participation in the Draft EA review process.

If you have any questions, please call me at 808.946.2277.

Sincerely,  
*John L. Sakaguchi*

John L. Sakaguchi, AICP, Senior Planner

JLS/ty

cc: G. Kuba, COH DPW, via *email*

Harry Kim  
Mayor



County of Hawaii  
PLANNING DEPARTMENT  
101 Paahi Street, Suite 3 • Hilo, Hawaii 96720-3043  
(808) 961-8288 • Fax (808) 961-8742

December 22, 2005

Mr. John L. Sakaguchi, AICP  
Wilson Okamoto Corporation  
1907 S. Beretania St., Suite 400  
Honolulu, HI 96826

Dear Mr. Sakaguchi:

Pre-Assessment Consultation for Draft Environmental Assessment (EA)  
Ali'i Drive Improvements Along Ono Bay, Hualalai Road to Waiua Road  
Federal Aid Project No. STP-0186(2)  
Kailua-Kona, North Kona, Hawaii

RECEIVED  
DECEMBER 22 2005  
WILSON OKAMOTO CORPORATION

6468-01  
Christopher J. Yuen  
Director  
12/10/05  
Roy R. Takemoto  
Deputy Director  
cc: DPW  
VIA FAX

Mr. John L. Sakaguchi, AICP  
Page 2  
December 22, 2005

- You have stated that the proposed new seawall "... would include two segments on areas of fast land makai of the existing seawall..." The Draft EA should clearly discuss this proposal and include detailed maps of the proposed construction of said new seawall. A certified shoreline survey will be required for this project.
- Permits that will be required for the proposed project include Special Management Area Permit, Shoreline Setback Variance and probably Conservation District Use Permit since the State owns one of the affected properties makai side of Alii Drive identified as Tax Map Key 7-5-9-26.
- The Draft EA should include maps that can clearly identify all existing and proposed improvements relating to the subject project.

Thank you for the opportunity to provide comments for the Pre-Assessment Consultation. Should you have any questions, please feel free to contact Alice Kawaha of this department at 961-8288, Ext. 203.

Sincerely,

CHRISTOPHER J. YUEN  
Planning Director

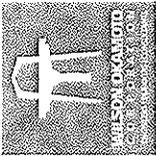
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p:\wpwin60\alicewin\LSakaguchi\_AliiDrImps.doc

xc: Planning Department - Kona Office (Mr. Bennett Mark)

This is in response to your letter dated December 7, 2005, requesting our comments as part of the pre-assessment consultation process for the Draft EA for the proposed Ali'i Drive improvements. We provide you with the following comments:

- The Draft EA should discuss the land use designations, including the General Plan, State Land Use District, County Zoning District, Kailua Village Master Plan. It should also discuss the surrounding uses in the vicinity.
- The proposed improvements are located within the Special Management Area (SMA) and Shoreline Setback Area. Therefore, the Draft EA should discuss the objectives and policies of Chapter 205A, Hawaii Revised Statutes, relating to Special Management Area (SMA) and Shoreline Setback, as well as the Planning Commission Rule No. 9 relating to SMA. The Draft EA should also address any impacts and mitigative measures relating to the coastal environment.

Hawaii's County is an Equal Opportunity Provider and Employer



6468-01  
June 24, 2009

Ms. Bobby Jean Leithead-Todd, Director  
Planning Department  
County of Hawaii  
101 Pauahi Street, Suite 3  
Hilo, Hawaii 96720

Attention: Ms. Alice Kawaha

Subject: Draft Environmental Assessment, Pre-Assessment Consultation,  
Aalii Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road  
Federal Aid Project No. STP-0186(2), Kailua-Kona, North Kona, Hawaii  
Response to Comment

Dear Ms. Leithead-Todd:

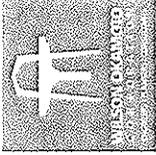
Thank you for your December 22, 2005 comment letter to the Pre-Assessment Consultation to the Draft Environmental Assessment for the Aalii Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road project. Our responses follow:

The Draft EA will include a discussion of the land use designations along the project limits, including the County General Plan, State Land Use District designation, County zoning districts, and the Kailua Village Master Plan. The land uses along the project limits will also be included in the Draft EA.

The Draft EA will note the project limits are located with the Special Management Area (SMA) and Shoreline Setback area. The Draft EA will include a discussion of the relationship of the project to the objectives and policies of Chapter 205 A, Hawaii Revised Statutes, as they relate to the SMA, Shoreline Setback and Planning Commission Rule No. 9. A coastal resources study has been completed to identify coastal and marine resources along the shoreline. The Draft EA will discuss impacts to these resources.

The Draft EA will include a plan showing the extent of the new seawall, including portions to be built makai of the existing wall and portions which will be located on short segments of fast land.

The Draft EA will note the required permits including Special Management Area permit, Shoreline Setback Variance, and Conservation District Use Application (CDUA) permit.



6468-01  
Page 2  
Letter to Ms. Bobby Jean Leithead-Todd  
June 24, 2009

The Draft EA will include necessary maps and drawings to identify existing and proposed improvements and nearby land uses.

We appreciate your participation in the Draft EA review process.

If you have any questions, please call me at 808.946.2277.

Sincerely,

John L. Sakaguchi, AICP, Senior Planner

cc: G. Kuba, COH DPW

LINDA LINGLE  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
869 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813-5097

December 23, 2005

Mr. John L. Sakaguchi, AICP  
Senior Planner  
Wilson Okamoto Corporation  
1907 S. Beretania Street, Suite 400  
Honolulu, Hawaii 96826

Dear Mr. Sakaguchi:

Subject: Draft Environmental Assessment, Pre-Assessment Consultation;  
Alii Drive Improvements Along Oneo Bay – Hualalai Road to Waula Road  
Hawaii County, Federal Aid Project No. STP 0186(2)

Thank you for your early notification of the subject proposed roadway improvement project. Alii Drive is an important road in the Kailua-Kona area and while it is not under our highway jurisdiction, we would like to have our Highways Division be kept apprised of the subject project and its plans and progress for our information and any coordination of work that may be necessary between our highways staff, the Hawaii County staff and your project staff and consultants.

For your information, our Highways staff advises that the FY 2007 STIP includes \$380,000 of Transportation Enhancement (TE) funds for project design and right-of-way. However, due to other funding commitments, TE funds for project construction will probably not be available prior to FY 2009. Also, there will be a need for coordination by your project staff and the County with the FHWA for NEPA compliance and with our Highways staff for State environmental assessment requirements under Chapter 343, HRS. Additionally, any other applicable State and Federal agency requirements will need to be complied with, and the County and project staff should refer to the 2002 AASHTO Roadside Design Guide for recommendations related to the sea wall construction along Alii Drive.

We appreciate the opportunity to provide our comments.

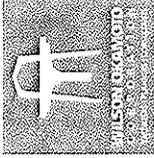
Very truly yours,

RODNEY K. HARAGA  
Director of Transportation

*6466-01*  
BENNETT K. HARAGA  
DIRECTOR  
1/5/06  
cc: D Pd  
VIA FAX  
*JS*

IN REPLY REFER TO:

STP 8.1990



6468-01  
June 19, 2009

Mr. Brennon Morioka, PHD, PE, Director of Transportation  
Department of Transportation  
State of Hawaii  
869 Punchbowl Street  
Honolulu, Hawaii 96813-5097

Subject: Draft Environmental Assessment, Pre-Assessment Consultation;  
Alii Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road  
Federal Aid Project No. STP-0186(2); Kailua-Kona, North Kona, Hawaii  
Response to Comment

Dear Mr. Morioka:

Thank you for your December 23, 2005 comment letter to the Pre-Assessment Consultation to the Draft Environmental Assessment for the Alii Drive Improvements Along Oneo Bay, Hualalai Road to Waula Road project. Our responses follow:

The Draft EA will note that, while Alii Drive is not under State jurisdiction, it remains an important road to serve the Kailua-Kona area.

The Draft EA will note that funding commitments may not make funds available for construction prior to FY 2009. The Draft EA will be prepared to meet the requirements of Chapter 343, Hawaii Revised Statutes, and its related Rules. In addition, coordination will be undertaken with the Federal Highway Administration (FHWA), Hawaii Division to ensure that the Draft EA meets requirements.

The 2002 AASHTO Roadside Design Guide will be consulted for recommendations relayed to seawall construction.

We appreciate your participation in the Draft EA review process.

If you have any questions, please call me at 808.946.2277.

Sincerely,

John L. Sakaguchi, AICP, Senior Planner

cc: G. Kuba, COH DPW

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