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513243

May 6, 2013

Mr. Gary Gill, Acting Director
Office of Environmental Quality Control
Department of Health
State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Mauna Lahilahi Beach Park Rock Revetment
Draft Environmental Assessment
TMK: 8-5-017:005 (and portions of parcels 4, 6, and 7)

With this letter, the City and County of Honolulu, Department of Design and Construction, hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Mauna Lahilahi Beach Park Rock Revetment for publication in the next available edition of the Environmental Notice.

The City and County of Honolulu, Department of Design and Construction, anticipates a Finding of No Significant Impact (FONSI) based on the information and assessment provided in this DEA.

Enclosed is a completed OEQC Publication Form, one copy of the DEA-AFONSI, an Adobe Acrobat PDF file of the DEA, and an electronic copy of the publication form in MS Word. Simultaneously with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact Terry Hildebrand at 768-8401 or by email at thildebrand@honolulu.gov.

Very truly yours,

for Chris T. Takashige, P.E., CCM
Director

CTT:li

Enclosures

APPLICANT ACTIONS
SECTION 343-5(C), HRS
PUBLICATION FORM (JULY 2012 REVISION)

Project Name:
Mauna Lahilahi Beach Park Rock Revetment

Island: Oahu

District: Wai`anae

TMK: **8-5-017:005 (and portions of parcels 4, 6, and 7)**

Permits: Possible permits include:
1. Department of the Army Section 10/404 permit
2. State of Hawai'i Department of Health, Section 401, Water Quality Certification
3. Department of Business, Economic Development and Tourism, Office of Planning, Coastal Zone Management (CZM) Federal Consistency
4. Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, Conservation District Use Permit
5. DLNR Chapter 6E-8 Historic Preservation Review

Approving Agency:
Mr. Chris T. Takashige, P.E., Director
City and County of Honolulu
Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, Hawaii 96813
Phone: (808) 768-8480

Applicant:
Mr. Clifford Lau, P.E., Chief
Facilities Division
Department of Design and Construction
650 South King Street, 11th Floor
Honolulu, Hawaii 96813
Phone: (808) 768-8483

Consultant:
Dayananda Vithanage, P.E., Ph.D.
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96816
Phone: (808) 531-3017

Status (check one only):

_**X**_DEA-AFNSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqc@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
__FEA-FONSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.

__FEA-EISPN	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqc@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
___ Act 172-12 EISPN	Submit the approving agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqc@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The approving agency simultaneous transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the applicant. No comment period ensues upon publication in the periodic bulletin.
__Statutory hammer Acceptance	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it failed to timely make a determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and that the applicant's FEIS is deemed accepted as a matter of law.
__Section 11-200-27 Determination	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page)**:**

The City and County of Honolulu, Department of Design and Construction, is planning to construct a coastal rock revetment at the Mauna Lahilahi Beach Park in Waiʻanae on the island of Oʻahu, Hawaiʻi. The proposed rock revetment would be built to replace the temporary sandbag revetment along the shoreline to minimize erosion of the beach park's lateral access path and the Mākaha Surfside property. The revetment will extend seaward from the shoreline to slow and drain water from overtopping waves. The revetment will run from the northwest corner of the cove to a point past the southern gate at the Mākaha Surfside. The revetment will be constructed with available armor stone. A filter of smaller stones and geotextile fabric will be placed under the revetment to minimize sand/soil loss from the backshore area.

Draft Environmental Assessment
Mauna Lahilahi Beach Park Rock Revetment

Wai‘anae, Oahu, Hawaii

Prepared for:
City and County of Honolulu
Department of Design and Construction

Prepared by:
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, Hawaii 96813

April 2013

oceanit
innovation through engineering & scientific excellence

Mauna Lahilahi Beach Park Rock Revetment

Draft Environmental Assessment

Contract F-73950

April 2013

Prepared For:

Department of Design and Construction

650 South King Street

Honolulu, HI 96813

Prepared By:

Oceanit

828 Fort Street Mall, Ste. 600

Honolulu, HI 96813

Contact:

Mr. Clifford Lau, Chief

Facilities Division

Department of Design and Construction
(808) 768-8483

Contact:

Dayananda Vithanage, P.E., Ph.D.

Director of Engineering

Oceanit
(808) 531-301

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1. INTRODUCTION

1.1 General Information

This Draft Environmental Assessment (DEA) is prepared in accordance with Chapter 343 of the Hawai'i Revised Statues (HRS § 343) for a proposed rock revetment at Mauna Lahilahi Beach Park in Wai'anae on the island of O'ahu, Hawai'i. The proposed rock revetment would be built to replace the temporary sandbag revetment along the shoreline to minimize erosion of the lateral access path and the Mākaha Surfside property. An existing breakwater was constructed in June and July of 2003 (referred to as the "existing breakwater" herein) at Mauna Lahilahi Beach Park. The environmental assessment for the breakwater, the Final Environmental Assessment for Proposed Shore Protection at Mauna Lahilahi Beach Park (Oceanit 2001), is incorporated herein by extensive reference for those data and analyses that remain unchanged. References from the 2001 EA are also made to illustrate the baseline for data and analyses that require significant updating.

Project Name:	**Mauna Lahilahi Beach Park Rock Revetment**
Location:	Wai'anae, O'ahu, Hawai'i
Tax Map Key (TMK):	8-5-017:005 (and portions of parcels 4, 6, and 7)
Proposing Agency:	Department of Design and Construction City and County of Honolulu 650 South King Street Honolulu, HI 96813
Consultant:	Oceanit Laboratories, Inc.
Landowner:	State of Hawai'i Department of Land and Natural Resources (submerged lands) and City and County of Honolulu
Land Area:	Approximately 8,000 square feet from the certified shoreline to the Mākaha Surfside property line
State Land Use District:	*Conservation* for submerged lands
Conservation Subzone:	*Protected*
County Development Plan:	*Park* along shoreline area. No designation for submerged lands.
City and County of Honolulu Zoning:	*Preservation General (P-2)* along shoreline. No designation for submerged lands.
Special Management Area:	No determination has been made whether a Special Management Area (SMA) Use Permit is required.

Permits/Approvals Requested:	Department of the Army Section 10/404 permit State of Hawai'i Department of Health, Section 401, Water Quality Certification Department of Business, Economic Development and Tourism, Office of Planning, Coastal Zone Management (CZM) Federal Consistency Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, Conservation District Use Permit DLNR State Historic Preservation Review
Approving Agency:	City and County of Honolulu, Department of Design and Construction
Anticipated Determination:	Finding of No Significant Impact (FONSI)

1.2 Location

The proposed construction site is in a small cove off Mauna Lahilahi Beach Park in Wai'anae, O'ahu, Hawai'i (Figure 1-1). The project site address is 85-101 C Farrington Highway, Wai'anae, Hawai'i 96792. The TMK for the site is 8-5-017:005.

1.3 Land Ownership

Mauna Lahilahi Beach Park land at the project site is managed by the Department of Parks and Recreation of the City and County of Honolulu under Executive Order 3452.[1] A small pocket beach located at the southeast end of the park and protected by the existing breakwater fronts the Mākaha Surfside Apartments (TMK: 8-5-017:008). The project area is within the Urban State Land Use District, as shown in Figure 1-2. However, the beach park and the Mākaha Surfside Apartments are located in two different zones. As shown in Figure 1-3, the beach park is located within the General Preservation (P-2) zone. The formerly dry land area is mostly in the water. Mākaha Surfside Apartments, adjacent to the beach park, is zoned as Low-density Apartment (A-1). The submerged lands where the toe of the rock revetment will be constructed are under the jurisdiction of the State Department of Land and Natural Resources.

[1] Executive Order 3452 may be found online at http://hawaii.gov/gov/news/executive-orders

Figure 1-1. Location Map

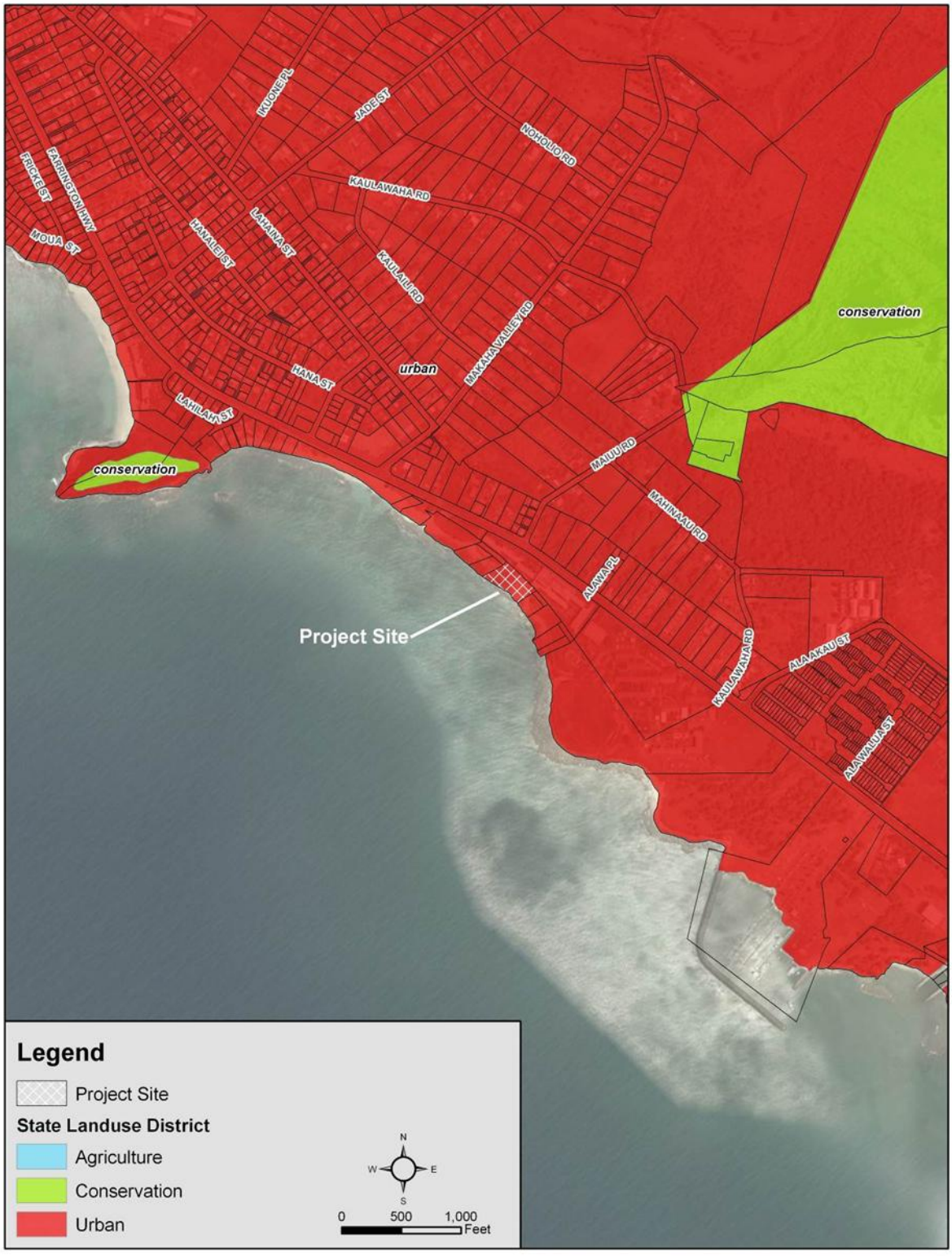


Figure 1-2. State Land Use Designation

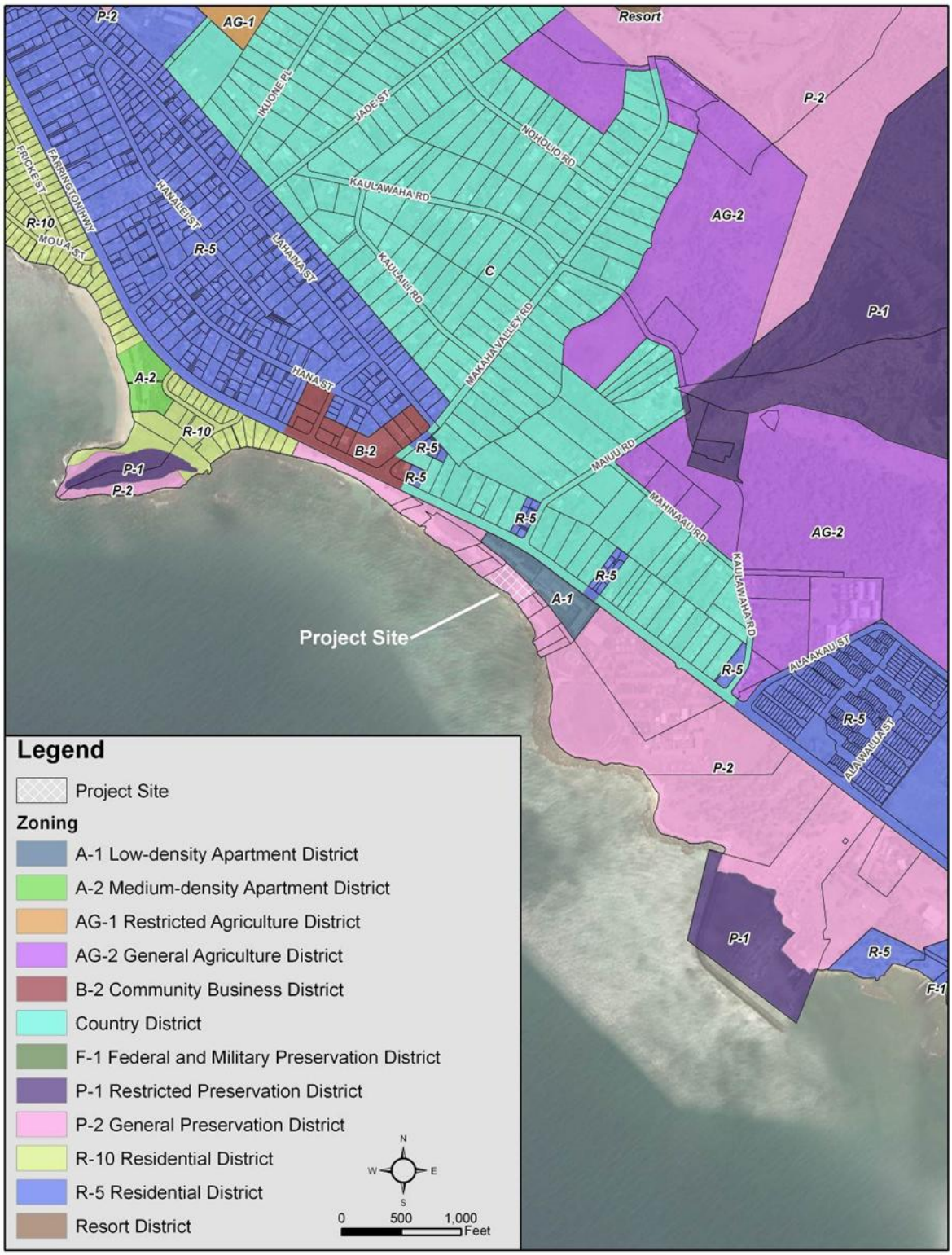


Figure 1-3. City and County Zoning LUO Map

1.4 Identification of Proposing Agency

The City and County of Honolulu, Department of Design and Construction, is the project applicant.

Contact: Mr. Clifford Lau, Chief
Facilities Division
Department of Design and Construction
City and County of Honolulu
650 South King Street
Honolulu, Hawai'i 96813
Phone: (808) 768-8483

1.5 Identification of Environmental Consultant

The environmental consultant is Oceanit Laboratories, Inc.

Contact: Dayananda Vithanage, P.E., Ph.D, Director of Engineering
Oceanit Laboratories, Inc.
828 Fort Street Mall, Suite 600
Honolulu, HI 96813
Phone: (808) 531-3017
Fax: (808) 531-3177

1.6 Identification of Approving Agency

The City and County of Honolulu Department of Design and Construction is the approving agency.

Contact: Chris T. Takashige, P.E., Director
Department of Design and Construction
City and County of Honolulu
650 South King Street
Honolulu, Hawai'i 96813
Phone: (808) 768-8480

1.7 Compliance with Applicable Environmental Laws

This Environmental Assessment (EA) is prepared in accordance with the provisions of Chapter 343, Hawai'i Revised Statues (HRS §343). "Triggers" established in Section 343-5, HRS require preparation of either an Environmental Assessment (EA) or an Environmental Impact Statement. The triggers for this EA are the following:

- use of state or county lands or funds;
- use of any land classified as Conservation District by state law (see Figure 1-3).

1.8 Identification of Agencies Consulted

Agencies and agency documents consulted in the preparation of this EA and the previous EA in 2001 are as follows:

Federal

Department of the Army, Corps of Engineers Pacific Ocean Division

State Agencies

- Department of Land & Natural Resources
  - Office of Conservation and Coastal Lands
  - State Historic Preservation Office
- Department of Health
  - Clean Water Branch
- Department of Business, Economic Development, and Tourism
  - Coastal Zone Management Program

City and County of Honolulu

- Department of Parks and Recreation
- Department of Design and Construction
- Department of Planning and Permitting

Community Groups or Members:

- Mākaha Surfside Association of Apartment Owners (AOAO)
- Waiʻanae Coast Neighborhood Board No. 24
- Mr. Alika Silva
- The Badayos Family
- Mr. William Aila

2. ALTERNATIVES

2.1 Description of Alternatives

The following alternative erosion control methods were considered before selecting the proposed rock revetment.

2.1.1 No Action Alternative

The eroded embankment is within 10 feet of the Mākaha Surfside property, and without protection the ongoing erosion and wave inundation at the north end of the property will continue. Without the existing sandbag revetment, erosion would reach into the Mākaha Surfside property as it has several times previously. The sandbag revetment requires periodic repairs and maintenance to provide continued protection. Further erosion could eliminate lateral access between the north end and south end of the beach park. Flooding of the backshore area would continue to occur during periods of high surf.

2.1.2 Inner Breakwater

One of the alternatives considered is a second short breakwater that would run inside of and parallel to the existing breakwater. It is feasible to place the breakwater outside the existing breakwater, but this area contains much more marine life than the inside location. The inner breakwater will partially intercept the waves that are entering the area on the north end of the cove. The breakwater would be placed to allow free flow of water in and out of the protected area. Additional sand could be placed along the shoreline inside the new breakwater. Based on model studies, some of the sand will move to the north inside the new breakwater where waves previously prevented sand accumulation.

2.1.3 Enclose and Fill Cove

An alternative that would stop the erosion and protect the inland area is to build a rock structure across the mouth of the cove and fill the cove with rock or sand. This alternative is environmentally unacceptable because marine life, including coral, live in the cove.

2.1.4 Shore Protection Rock Revetment

There is a temporary sandbag revetment built along the shoreline to minimize erosion of the lateral access path and the Mākaha Surfside property. This alternative will replace the sandbag revetment with a properly designed rock revetment. To be effective in stopping waves, a rock revetment would have to be moved seaward and built higher to dissipate the wave and to allow for run-up water to return back to sea. The objective of a revetment is to minimize property damage caused by waves that enter the cove and overtop the embankment.

3. PROJECT DESCRIPTION

3.1 Selected Alternative Description

A rock revetment along the inner shoreline is the selected alternative. The revetment will extend seaward from the shoreline to slow and drain water from overtopping waves. The revetment will run from the northwest corner of the cove to a point past the southern gate at the Mākaha Surfside. The revetment will be constructed with available armor stone. A filter of smaller stones and geotextile fabric will be placed under the revetment to minimize sand/soil loss from the backshore area.

3.2 History of Project Area

The project area is in a small cove or pocket beach fronting the Mākaha Surfside Apartments. Park area between the Mākaha Surfside property line and the shoreline was placed under the control of the City and County of Honolulu Department of Parks and Recreation via State Executive Order 3452. Located on the leeward coast of O'ahu, Mauna Lahilahi Beach Park is subject to waves from Kona storms, southern swells, and North Pacific swells. The site is exposed to waves from the west-northwest (WNW) to the south-southeast (SSE). A large area of City and County park land and beach has been lost to shoreline erosion since 1949. Currently, the cove is approximately 350 feet long and 250 feet wide. Water depth at the mouth of the cove is approximately 6 feet below mean sea level (MSL). A rock breakwater constructed in 2003 shelters a sand-nourished pocket beach (Oceanit 2001). The shoreline on either side of the cove is a relatively level limestone bench raised several feet above sea level. The substrate at the sides and bottom of the cove is hard limestone covered with sand and rubble. Both flanking sides of the cove are steep rocky areas with little sand cover.

The cove at Mauna Lahilahi Beach was relatively stable until some time after 1949 when the beach began receding shoreward. The beach was still relatively wide in 1970 as shown in Figure 3-1, which provides a photo and topographic map of the beach area. However, the beach continued to erode in the 1970s. Hurricanes Iwa in 1982 and Iniki in 1992 caused nearly $2 million in damage to the Mākaha Surfside Apartments and eroded much of the beach fronting the property (Figures 3-2, 3-3, and 3-4). Overall, the shoreline within the pocket beach project area receded nearly 200 feet between 1949 and 1996 as can be seen in Figure 3-5. Aerial photos (Figures 3-6, 3-7, and 3-8) show progressive shoreline changes. An estimated 48,900 square feet of City & County park land (Preservation land) presently valued at approximately $248,700 was lost to shoreline erosion between the early 1970s and 1996. The commercial value of the lost land, if it could be used for apartments, would be about $2 million. The top of the bank eroded through the fence into the Mākaha Surfside property before a sandbag revetment was constructed during the late 1990s. The existing breakwater was constructed and 10,000 cubic yards of beach sand were placed in 2003 (Figures 3-8, 3-9, and 3-10). The sandbag revetment was removed when the beach was nourished. Since 2003, the nourished sand has been pushed to the south between the breakwater and the shoreline embankment leaving the backshore at the cove's northeast corner exposed to further erosion by waves moving through the gap between the existing

breakwater and rocky shoreline. An access road that formerly ran along the edge of the park property was entirely lost to erosion, and the sandbag revetment had to be rebuilt. From 2003 through 2008, high winter waves damaged the sandbag revetment requiring extensive repairs several times (see Figures 3-10i and 3-10j). Some of the sand at the south end migrated through the porous rock breakwater and moved offshore or onto the shoreline farther south.

From 2003 through 2008, the beach and breakwater were monitored and surveyed periodically to record transformation and condition. The final monitoring run was in October 2008. Surveyed transects through the beach and breakwater showing depth measurements are shown in Figure 3-11.

3.3 Purpose and Need for Proposed Project

The purpose for the proposed project is to minimize shoreline erosion and reduce property damage caused by waves that enter the cove at the south end of Mauna Lahilahi Beach Park. In 2011, the City and County of Honolulu (CCH) decided to construct a new rock revetment along the inner shoreline of the cove across from the gap in the existing breakwater. The proposed revetment is discussed in Section 3.4. Alternatives to this revetment are given in Section 2.

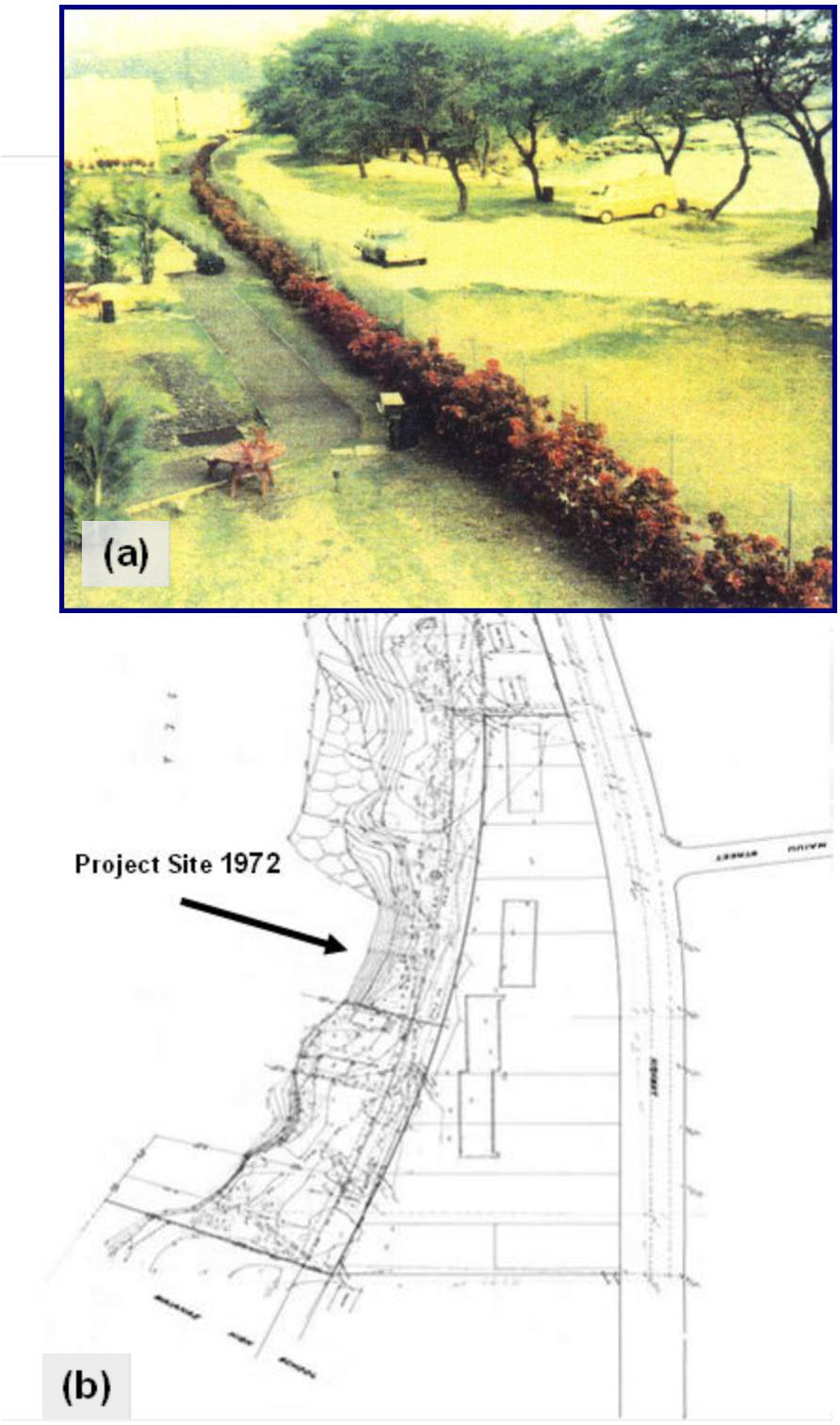


Figure 3-1. (a) Mauna Lahilahi Cove Beach in 1970, (b) Topographic Map in 1972

(Division of Land Survey & Acquisition);
Oriented WNW Along Shoreline

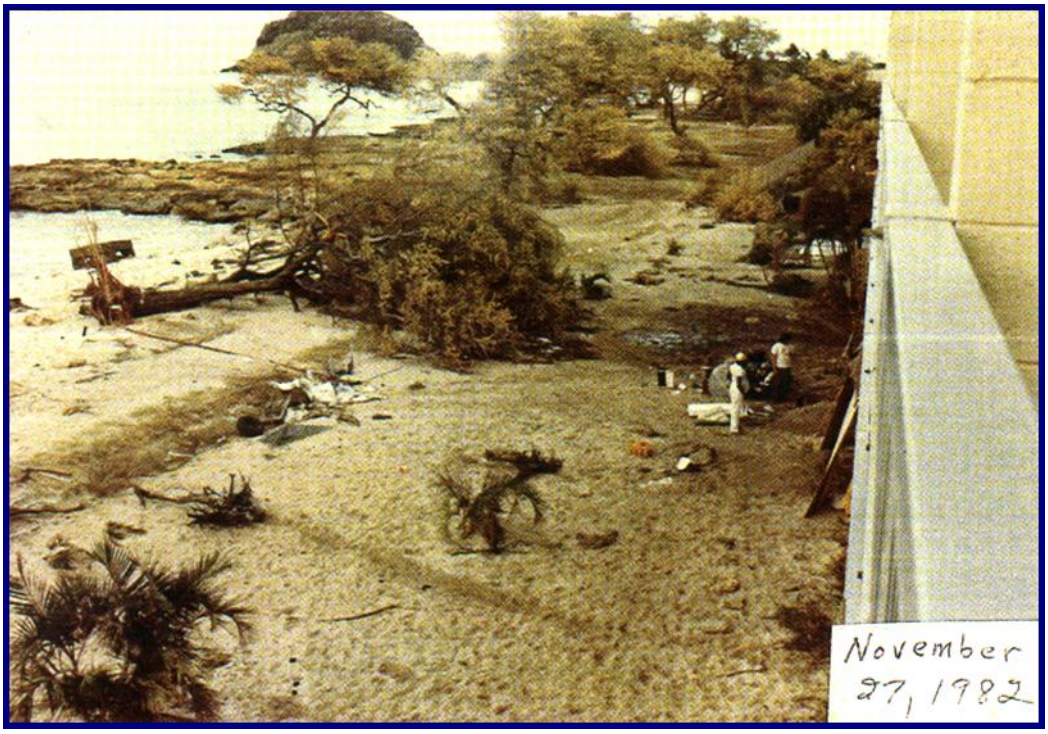


Figure 3-2. Photo of Mauna Lahilahi Project Area in November 27, 1982 Following Hurricane Iwa; Oriented NW along Shoreline.

Figure 3-3. Photo of Mauna Lahilahi Project Area in 1998; Oriented SE along Shoreline

Figure 3-4. Photo of Mauna Lahilahi Project Area with Sandbags in 2000

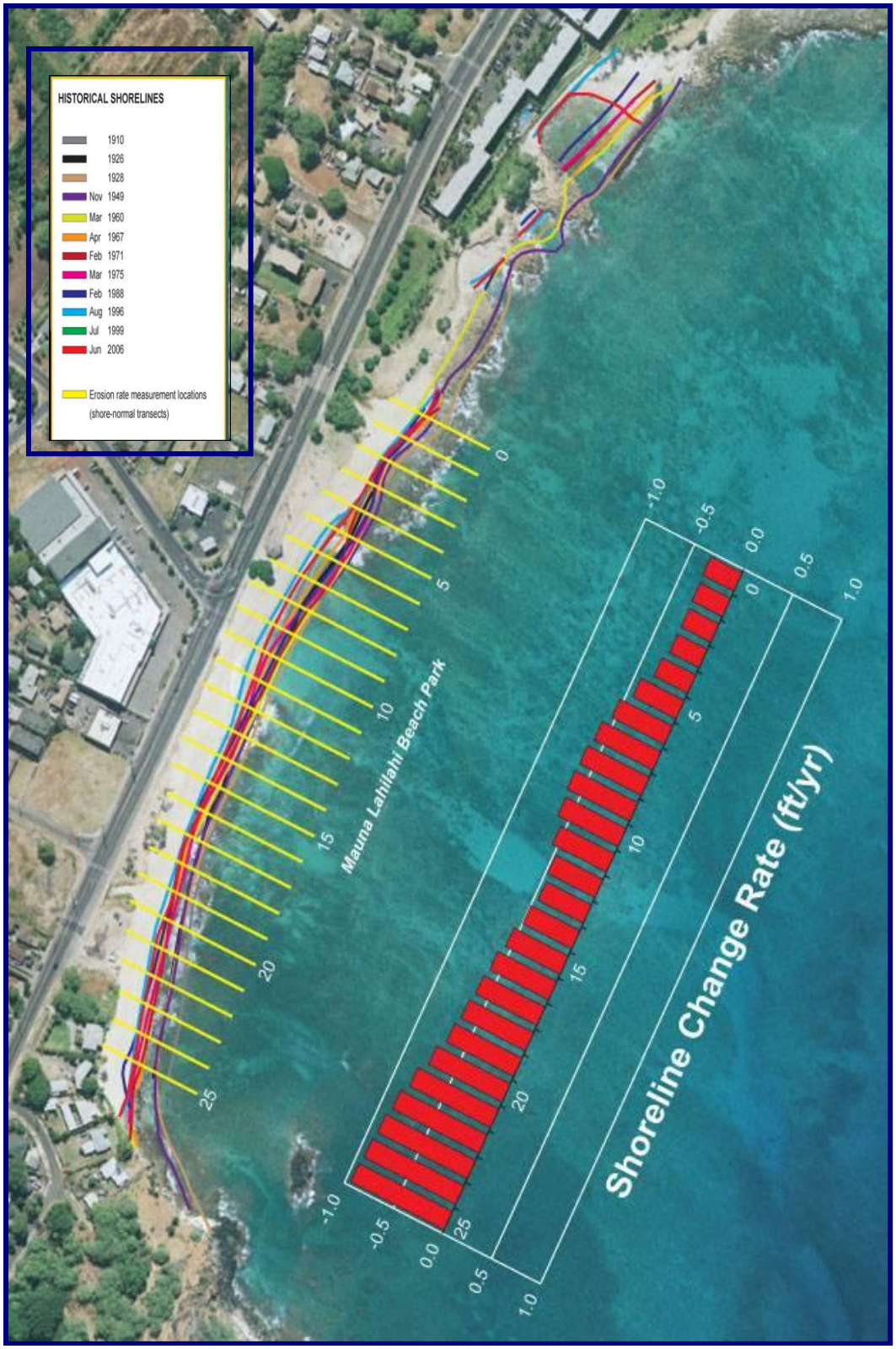


Figure 3-5. Shoreline Erosion Rates

Figure 3-6. Aerial Photo of Mauna Lahilahi Beach Area Following Hurricane Iniki in 1992

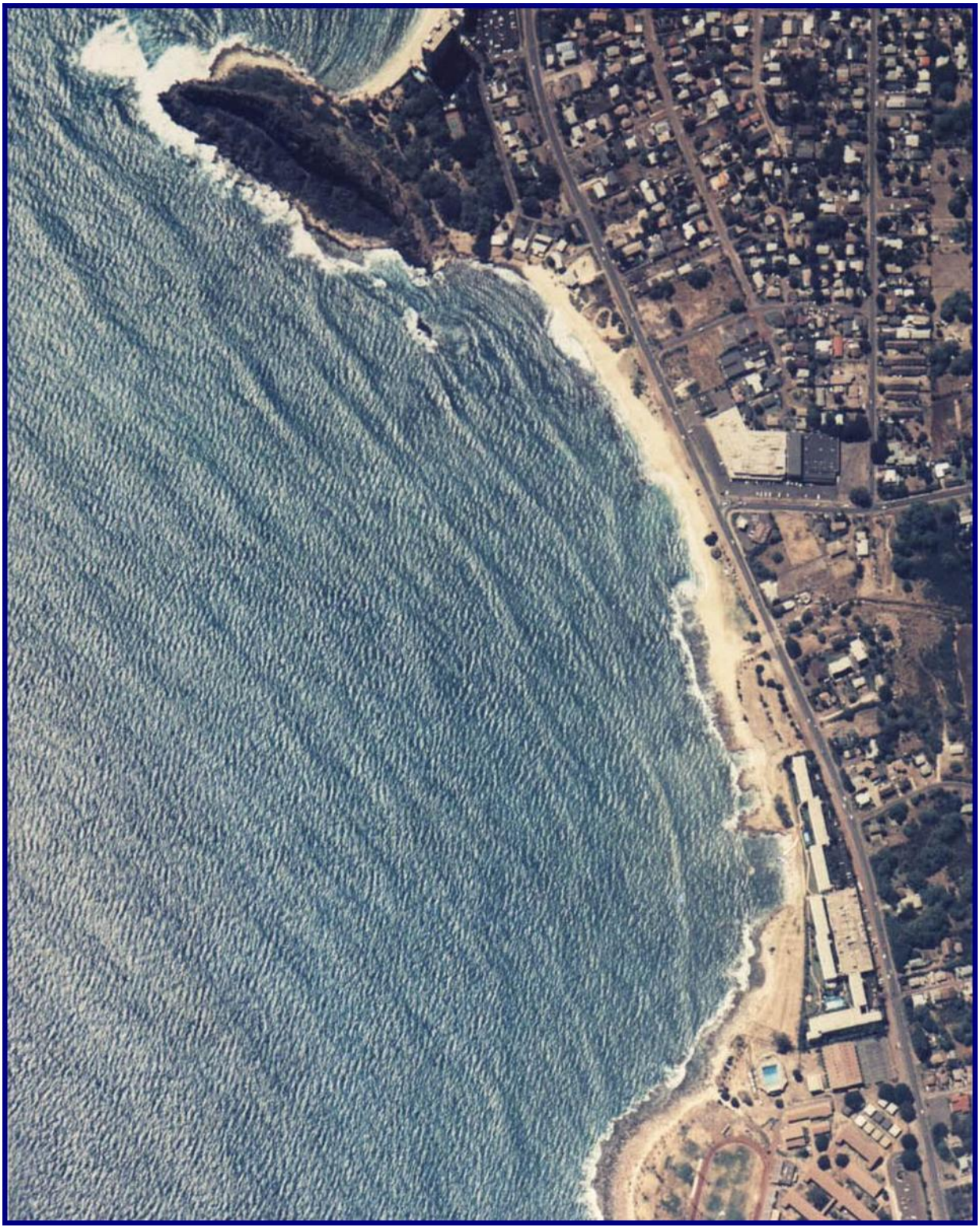


Figure 3-7. Aerial Photo of Mauna Lahilahi Beach Area from 1994

Figure 3-8. Mauna Lahilahi Beach Area in 2006 after Outer Breakwater Construction (University of Hawai'i, 2006)

Figure 3-9. 2006 Aerial Photo Showing Beach Transformation in the Lee of the Breakwater

Figure 3-10a. View from North End in 2006; Sandbag Revetment

Figure 3-10b. View from North End in 2006; Sandbag Revetment

Figure 3-10c. View from North End in 2006; Migrated Beach Nourishment

Figure 3-10d. View from North End in 2006; Breakwater Connection

Figure 3-10e. View from North End in 2006; Existing Rock Breakwater

Figure 3-10f. View from North End in 2006; Breakwater Gap

Figure 3-10g. Placement of Beach Nourishment in 2003

Figure 3-10h. Beach Nourishment Shortly after Placement

Figure 3-10i. Beach Erosion & Sandbag Revetment at North End in November 2005 (Courtesy of Jeanne Marx)

Figure 3-10j. Beach Erosion & Sandbag Revetment at North End in January 2006

Figure 3-10. Various Views of Protected Shoreline

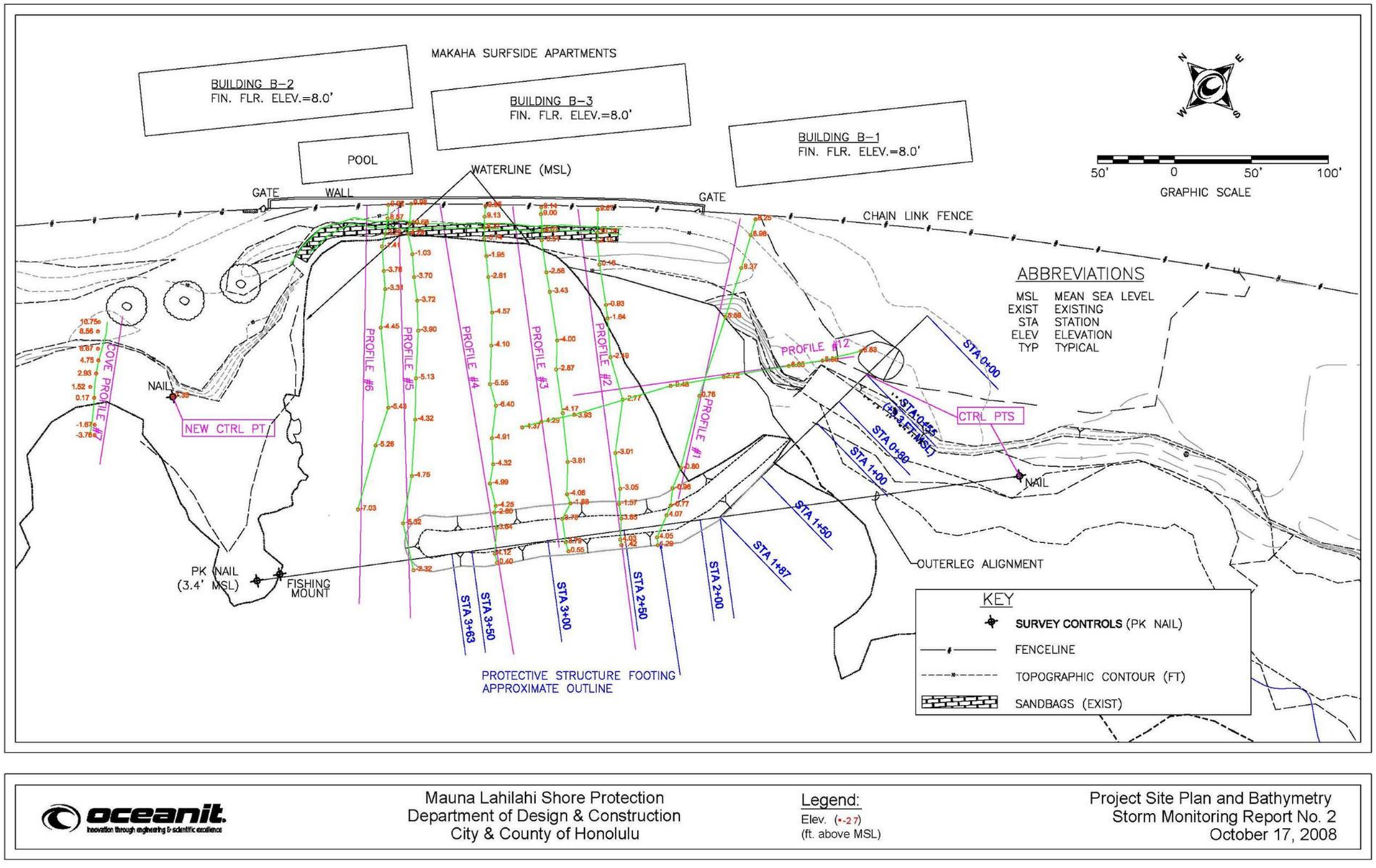


Figure 3-11. Project Site Plan and Bathymetry

3.4 Design and Construction of Proposed Project

3.4.1 Site Technical Description

Mauna Lahilahi Beach Park is located on the leeward coast of O'ahu where the beach is subject to waves from Kona storms, hurricanes, southern swells, and North Pacific swells. The site is exposed to waves from the west-northwest to the south-southeast. Deep-water wave buoy data from within the exposure window were analyzed. Most frequent wave directions are from the south-southwest (southern swell) and from the northwest (north swell). The most frequent wave period is 12 to 14 seconds and the most frequent wave height is 3 feet.

As waves approach the shore and enter shallow water, they encounter bottom friction and refract (bend). Wave analysis indicates that waves from all directions within the site's exposure window align approximately with the shoreline (southwest) as they approach the project site. Wave refraction patterns can be seen in an aerial photograph (Figure 3-7).

3.4.2 Rock Revetment Design

The rock revetment was designed using methods determined by the US Army Corps of Engineers (USACE) and by calculation methods described by experts in coastal engineering. Design Software originally produced by the USACE, called the Coastal Engineering Design and Analysis System (CEDAS), was used. Wave data from buoys near Oahu and from the USACE Wave Information System (WIS) were used as input to the model. The CEDAS software calculated wave transformation from deep water to the project site. A design wave was selected and used to calculate the size of armor stones for the revetment and to calculate wave runup and overtopping of the revetment. A category 4 hurricane was assumed to be the worst case condition. A tsunami could cause more damage, but a shoreline structure designed for tsunami would likely be prohibitively expensive and far too large to be practical.

Water depth at the opening of the cove is approximately 6 feet below mean sea level (MSL). Design water elevation for the revetment was determined to be 6.2 feet MSL. This water level was calculated by adding the highest anticipated tide (1.9 feet MSL), potential wave setup (4.8 feet), and estimated sea level rise over the 50 year design life of the structure (0.3 feet) to find the water depth (5 feet). These conditions were used to calculate a design wave height from a hurricane of 5.5 feet (assuming the breakwater was gone). This wave height was used to calculate breakwater rock size with USACE formulas.

The revetment will be constructed of two layers of armor stone, two layers of bedding stone, and a fabric filter layer to minimize soil from piping through the revetment into the water. The armor stones will weigh approximately 1.5 tons each and have a nominal diameter of 2.6 feet. The bedding layer stones will weigh approximately 300 pounds each and have a nominal diameter of 1.2 feet.

The revetment will be wider at the north end where waves entering through the breakwater gap have overtopped and damaged the sandbags and eroded the backshore area (Figures 3-12 and 3-13). By moving the revetment seaward and building a rock and gravel drainage or splash area behind the revetment, overtopping waves can drain back into the ocean with minimal damage to the backshore property.

3.4.3 Rock Revetment Construction

Construction is expected to take 2-3 months. Primary site access for construction equipment will be from Waiʻanae High School to the south. Alternate site access, if needed, will be from the north side of the Makaha Surfside. Access will be shown on construction plans (see Figure 3-14). Plans and specifications will indicate that no grading or grubbing is allowed and that all ground surfaces beneath stockpiles shall be protected. The contractor shall halt work in the vicinity of any burial or archaeological sites discovered during construction until cleared by the officer-in-charge or the State Historic Preservation Division.

The contactor will also be required to prepare and follow a Site Specific Best Management Practices Plan (BMP) that describes planned construction methods and the techniques that will be used to prevent pollution of coastal waters. Water quality monitoring before, during and after construction is required for compliance with the State of Hawaiʻi Department of Health 401 Water Quality Certification.

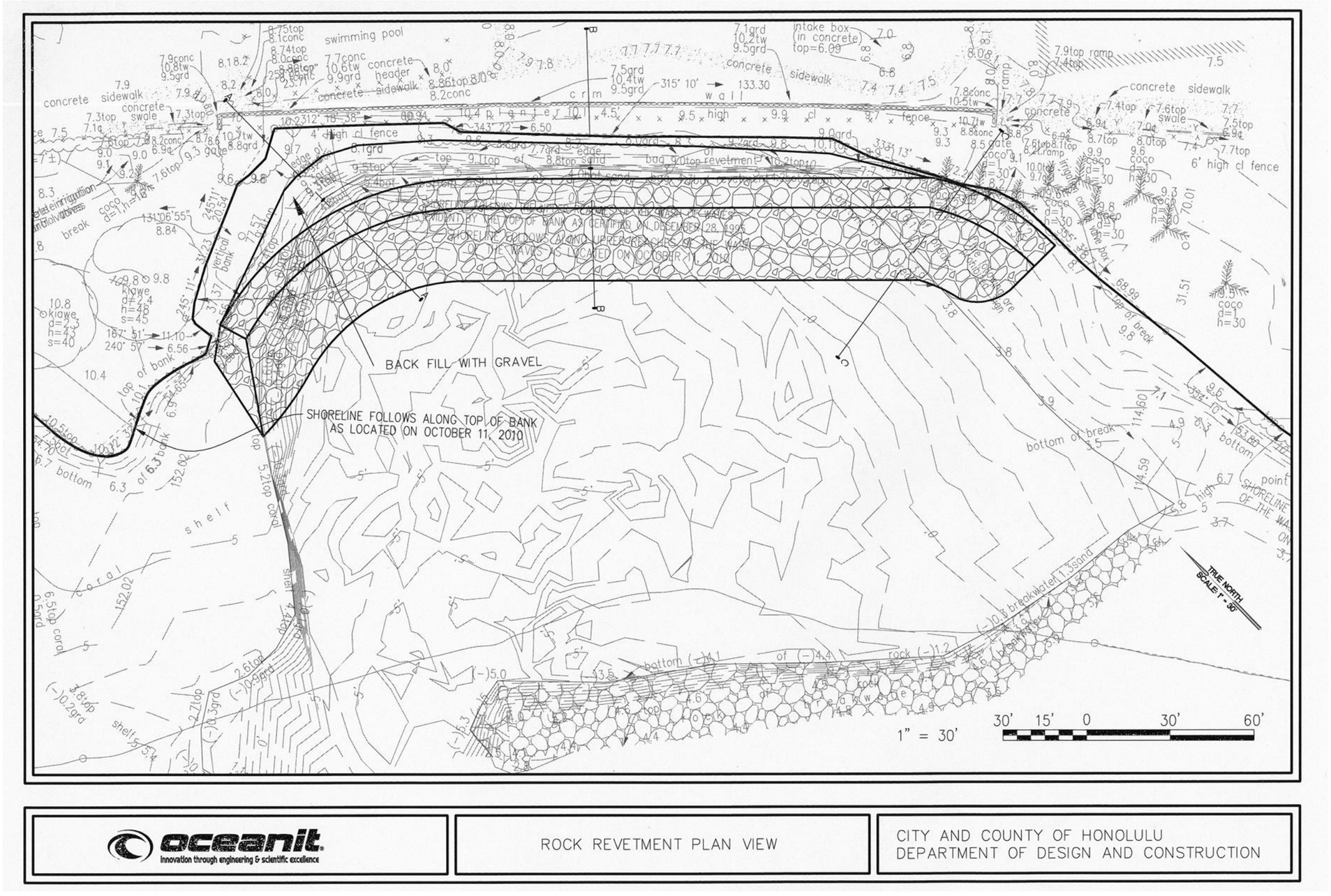


Figure 3-12. Proposed Revetment Plan

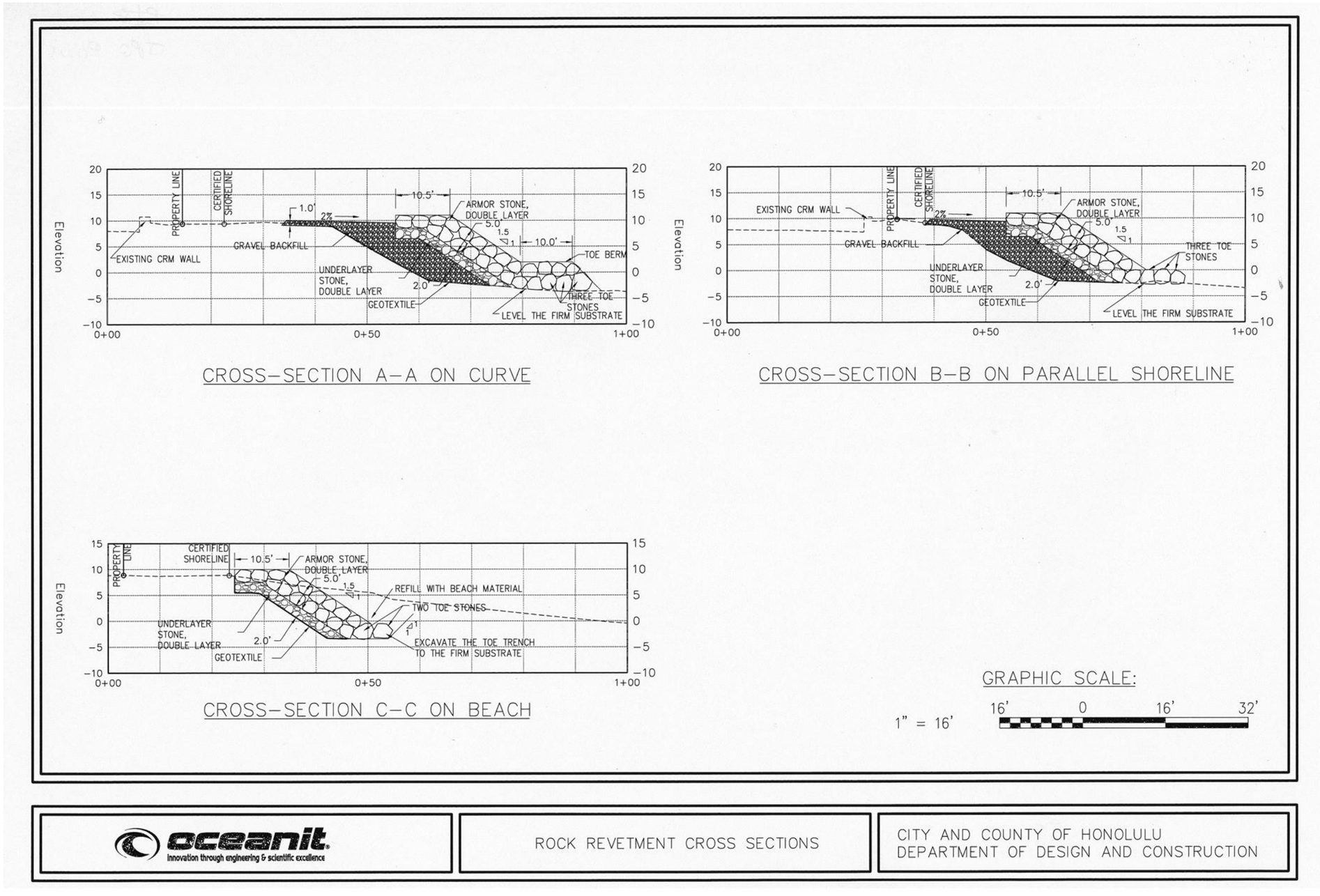


Figure 3-13. Proposed Revetment Cross Section

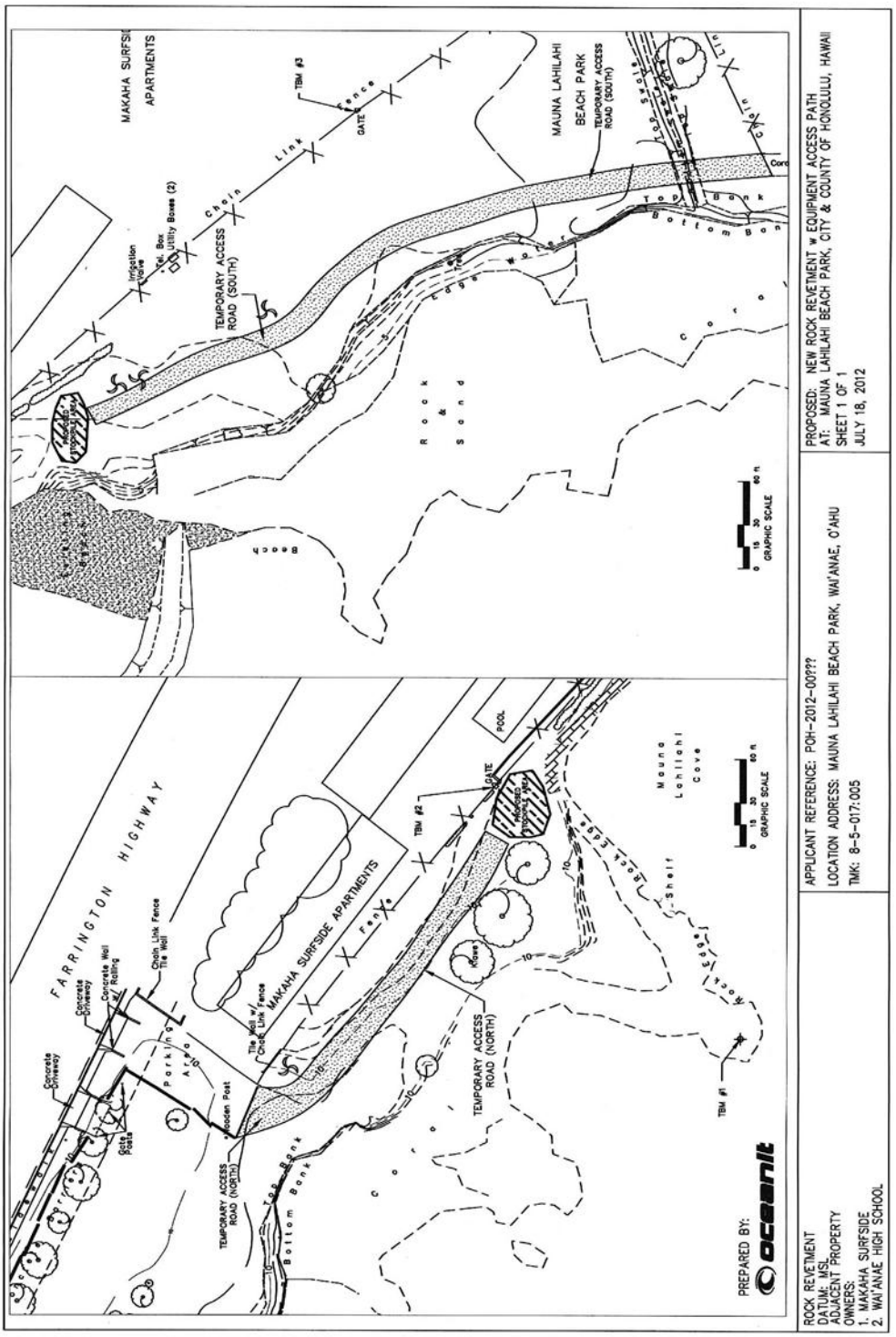


Figure 3-14. Construction Equipment Access

4. CHARACTERISTICS OF ACTION

4.1 Socio-Economic Characteristics

The project affects primarily the value and use of the beach park and the property of the Mākaha Surfside Apartments. The threatened beach park area is about 1.5 acres with a value of approximately $32,200. The Mākaha Surfside land of approximately 5.5 acres has an assessed value of over $10 million. Since the beach park and the Mākaha Surfside Apartments are not the within the same zone, the values are assessed differently. The Mākaha Surfside land is a commercial property, which is assessed higher value per square foot than the beach park and conservation land.

A portion of the beach park and a sand beach would not be usable without the existing breakwater and nourished sand beach. The Mākaha Surfside Apartments have 454 units and over 1,000 permanent residents. This figure represents a significant percentage of the housing inventory in the vicinity of the project site. The proposed new structure will better preserve the park area and better protect the Mākaha Surfside from erosion and wave damage.

The project is not expected to provide a large economic boost to the local community. Project construction may offer some economic benefits. Some construction materials may be purchased in the local area.

Oceanit met with the neighborhood board in 2000 prior to construction of the existing breakwater. There were some concerns about fishing and gathering. The new revetment will probably not provide much habitat for edible marine species, because the water is very shallow. The revetment rocks will provide only small surface areas for settlement of benthic organisms. Wave action will be continuous at the revetment's north end. Spaces between the armor stones will provide limited cover for some marine life.

4.2 Cultural and Archaeological Characteristics

The area of Mauna Lahilahi Beach Park near the project site contains human burials and locations where burials have been exposed by waves and removed. There is a cultural soil layer that can be seen where the coastal embankment is eroded. The State Historic Preservation Division identified the "cultural layer" as site 4064, a buried habitation site complex with associated burials.

Since the July 2001 environmental assessment, additional cultural/archaeological studies have been made near the erosion control site. Cultural Surveys Hawai'i Inc. has published seven reports on the culture and archaeology of the area. Studies by the State Historic Preservation Division (SHPD) indicated that the entire flat, sandy soil area of Mauna Lahilahi Beach Park, south of a canal across from the old Coronet Store, is a historic site of significance (site 4064). These reports document artifacts and burials and review the history of the area. These are referenced in Section 11.

Information to assess cultural impacts was obtained through review of archaeological studies conducted in the area, community meetings, and ethnographic interviews. Planners initially contacted key individuals and groups in the community who were known to be knowledgeable about traditional cultural practices, properties or other types of historic sites.

Prior to writing the 2001 environmental assessment for the existing breakwater, Oceanit met with Mr. Lucio Badayos, a kupuna whose family formerly lived at the project site and who was

recognized as the most appropriate person to contact regarding cultural issues. Oceanit also met with members of Mr. Badayos' family and representatives of the Burial Council. Mr. Badayos did not object to the plans for the existing breakwater.

The meeting with Mr. Badayos yielded some very important information. He confirmed the existence of burials. He also noted that the area was and still is a good fishing area. When asked about his opinions about the project, the kupuna noted that he thought the project would be a good idea because he believed that the breakwater would likely act like an artificial reef and would attract fish. He also noted that erosion control would minimize the probability of future shoreline burials being exposed.

Other individuals and groups contacted in 2000 included: Hui Malama I Na Kupuna 'O Hawai'i Nei, Mr. William Aila, Mr. Glenn Kila, Mr. Alika Silva, and Mr. Clarence De Lude.

During construction of the existing breakwater in June and July of 2003, a burial re-interment site that Mr. Badayos identified was fenced off to prevent construction equipment from damaging the site. A similar plan will be used for any additional sites near new construction areas. The nourished beach now protects the re-interment site.

An archaeological study conducted by Cultural Surveys Hawai'i in 2003 documented the presence of burials in the vicinity of the project site. Earlier erosion associated with long periods of high surf has exposed remains. The proposed project would reduce some of the shoreline erosion.

Based on previous discussions with SHPD, Oceanit believes that an archaeological monitoring plan will be required for building a new revetment. Oceanit is currently (2013) working with the City and County on a project to design protection for cultural and archaeological sites found near the breakwater work site. This cultural protection project involves coordination and work with cultural experts and some of the same community members contacted earlier. As part of this new project, in 2010 a City Department of Design and Construction representative, Oceanit employees, and Mr. Aki Sinoto, a consulting archaeologist, met with members of the Badayos family to discuss their former family home site and burials in the area. The Badayos sisters were not aware of any members of their immediate family who had been buried at the site. They believe that burials in the beach park are ancient.

The City and County of Honolulu conducted the Mauna Lahilahi Beach Park Improvements Project starting in 2003. The final archaeological monitoring report for the project was published in January 2009 and is included as an appendix to this environmental assessment.

5. DESCRIPTION OF AFFECTED ENVIRONMENT

5.1 Ocean/Coastal Environment

5.1.1 General

The coastal shoreline of Waiʻanae consists of basalt outcrops and uplifted limestone benches with stretches of white coralline sand beaches. There are no major estuarine areas along the coast, and streams and drainage ditches are intermittent due to low annual rainfall. The generally calm and clear adjacent coastal waters are excellent for fishing, diving, surfing, and other water sports.

Waiʻanae's shallow-water reefs are narrow and the offshore reef surface is comprised mainly of hard consolidated coralline pavement interspersed with sand channels and pockets, and coral growth. Basalt headlands, such as Lahilahi Point, are sometimes associated with offshore basalt formations. Offshore water depths are shallow. The 10-fathom (60-feet) contour is about 900 yards offshore from the project site.

5.1.2 Erosion

The beaches of the Waiʻanae coast generally consist of light-colored coralline sand (Oceanic Institute, 1976). The subject property lost most of its beach since 1949 when the shoreline was approximately in the same location as the existing breakwater (see Figure 3-5). Prior to building the existing breakwater, waves entered along the southern shoreline of the cove and return currents exited out the center and north side of the cove. Outside the cove, currents move along the coast in both directions depending on the tide. This wave action and resulting currents likely caused the beach erosion. However, it is not known what caused the initial erosion after 1949. Hurricane Iwa in 1982 and Hurricane Iniki in 1992 both had a very obvious effect on the beach, and waves washed through the first floor of the Mākaha Surfside during both hurricanes. During initial project inspections, no shoreline debris or trash was found at the site indicating that materials including sand are moved offshore or along shore. After the existing breakwater was constructed, waves moving through the porous breakwater regularly transported sand to the bottom outside the breakwater. Waves also push sand over the root of the breakwater and along the limestone bench to the south re-establishing a new beach where one was lost years ago.

The construction of a rock revetment will reduce erosion of the cove's inner shoreline and backshore area. The revetment will also reduce wave overtopping and runup on the backshore area.

5.1.3 Waves

A wave exposure window is shown in Figure 5-1. The most frequent wave directions are from the SSW (southern swell) and from the NW (north swell). The most frequent wave period is 12 to 14 seconds and the most frequent wave height is 3 feet. The design wave is discussed in Section 3.4.2.

5.1.4 Currents and Circulation

Currents on the Waiʻanae coast are weak and dominated by the tides. Figure 5-2 shows the general offshore flow patterns during flood and ebb tides. Offshore currents show a reversal over the tidal cycle, flowing southeast during ebb tide and northeast during flood tide. The currents closer to shore in the vicinity of the project site generally flow to the northwest during both flood and ebb tides. This is caused by eddies that form down-current from Lahilahi point. Measured current speeds were typically near 0.25 knots (Waiʻanae Boat Harbor Final EIS, 1976).

5.1.5 Tides

In Hawai'i, tides are mixed semi-diurnal and have a range of approximately 2 feet. There are two high tides and two low tides every day. At Mauna Lahilahi the Mean Higher High Water (MHHW) is 1.9 feet above Mean Lower Low Water (MLLW). Mean High Water (MHW) is 1.44 feet above MLLW. The extreme low water is –1.41 foot below MLLW. Mean Sea Level (MSL) is 0.82 feet above MLLW (Ref NOAA Tides and Currents web site).

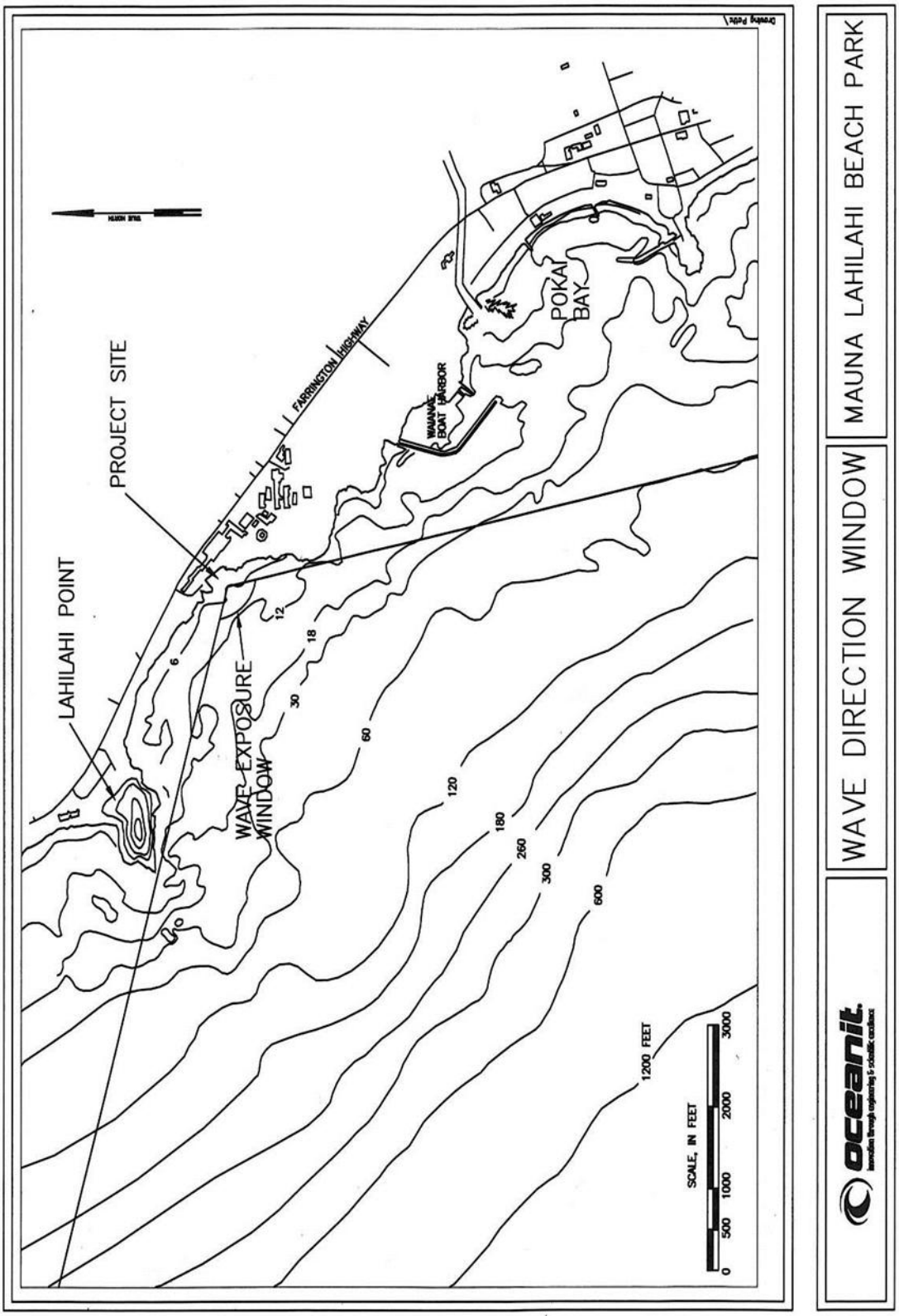
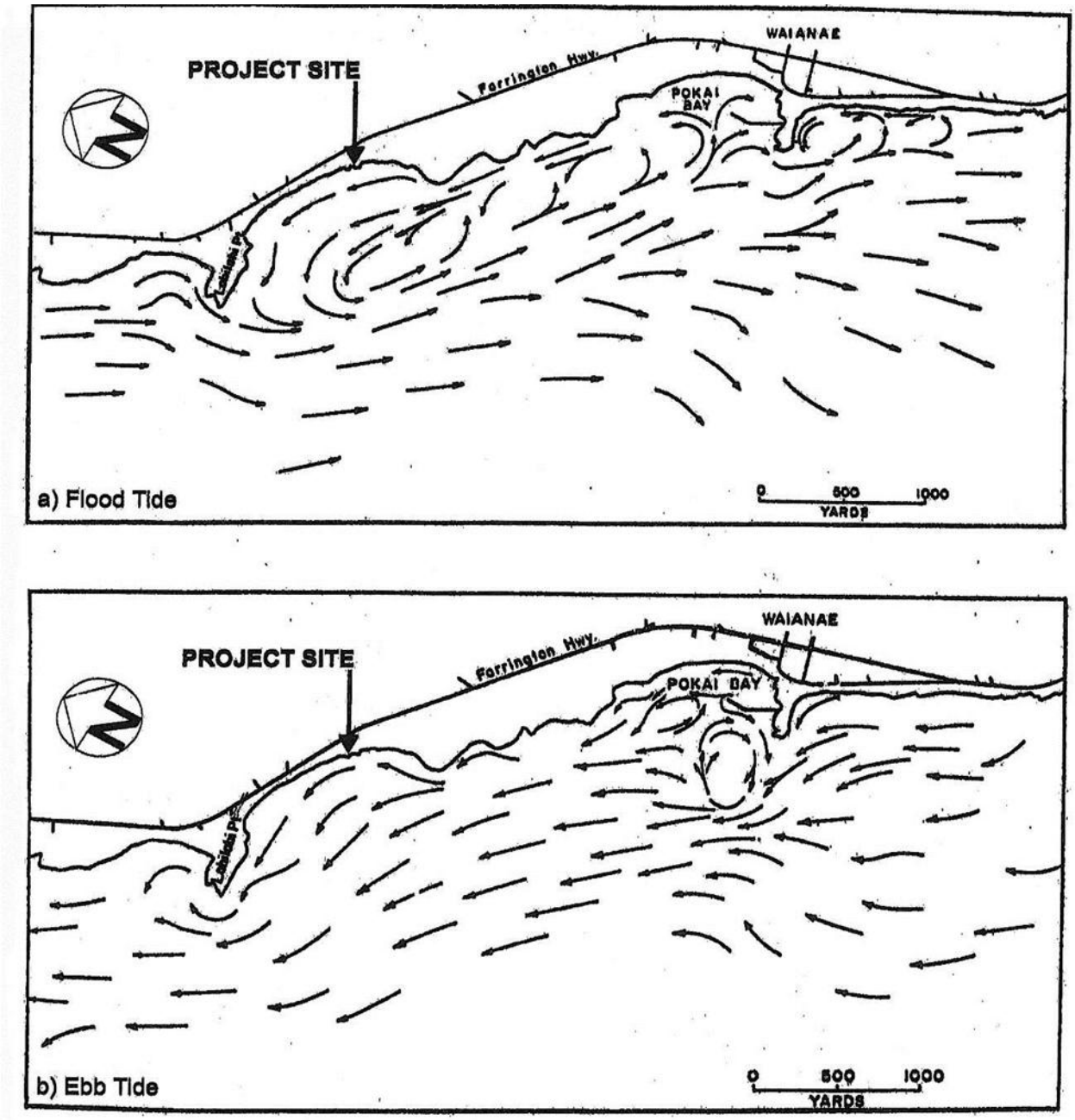


Figure 5-1. Wave Direction at Project Site



Source: Sun, Low, Tom and Hara, 1962 As Referenced in Waianae Boat Harbor EIS, 1976

Figure 5-2. Current Patterns Mauna Lahilahi Beach Park

5.1.6 Water Quality

Waiʻanae coastal waters are categorized Class A in the State Water Quality Standards. Sewer discharges and thermal discharges along the coast are the only major local deviations from Class A standards. Several intermittent streams, including ʻEku Stream to the north and drainage ditches, discharge into coastal water; however, their influence on water quality is limited to periods of heavy rainfall. Water quality samples were taken at the locations shown in Figure 5-3. Results are summarized in Table 5-1. Samples were collected during a low and rising tide.

Samples exceeded State open coastal water quality standards for several parameters, specifically Nitrates + Nitrites [samples #2, 3 & 4], Ammonia (NH4) [samples #2, 3 & 4], and turbidity [sample 1].

Table 5-1. Water Quality Results

Parameter	Units	SAMPLE #			
		1	2	3	4
PO4	(□ g/l)	4.34	5.27	7.13	4.34
Nitrates + Nitrites	(□ g/l)	1.96	4.06	6.30	6.30
NH4	(□ g/l)	2.52	3.08	5.32	3.78
Tot. Phosphorus	(□ g/l)	12.09	11.47	13.33	11.16
Tot. Nitrogen	(□ g/l)	116.2	110.5	177.9	115.9
Turbidity	(Ntu)	1.22	0.09	0.19	0.13
Tot. Susp. Solids	(mg/l)	7.20	3.07	2.33	2.07
Chl-a	(□ g/l)	0.189	0.137	0.144	0.120
Salinity	(ppt)	34.60	34.87	34.77	34.78
Temperature	(deg F)	81.6	80.1	80.7	80.4
pH	-	8.4	8.4	8.4	8.4

Figure 5-3. Water Quality Sample Locations

5.1.7 Marine Biology

A marine biology investigation was made and a report was written and included in the environmental assessment for the existing breakwater (Oceanit Laboratories, Inc., 2001). The investigation included a coral survey that extended from the shoreline to about 280 feet offshore. The closest coral found was approximately 90 feet offshore, which is outside the footprint of the proposed revetment. Additional information on the marine environment can be found in the Final Environmental Impact Statement, Waiʻanae Boat Harbor, Waiʻanae, Oʻahu, Hawaiʻi (1976).

The physical and biological environment was monitored for five years after the existing breakwater was constructed. Fourteen monitoring reports were provided to the Department of Design and Construction, The Army Corps of Engineers, Department of Health, and the Coastal Zone Management office. Two of these reports were written after high wave events. Each report included surveyed bathymetric profiles from the inner shoreline to the new breakwater, analysis of sand sampled at some of the profiles, an assessment of breakwater and beach condition, a biological assessment of marine life on the breakwater, and analysis of algae samples for ciguatera.

The last progress report "Post Storm Monitoring #2" surveyed October 17, 2008, and submitted in December 2008 details the last post-construction observation of the existing breakwater. According to the report, as no significant changes in benthic conditions were observed, the benthic sand plume outside the breakwater extends 50-60 feet seaward and all fish observed were less than 6 inches in

length. Extremely sparse coral establishment was noted on the breakwater boulders. Typical of a high wave energy environment, crustose coralline algae were found covering the rocks inside the breakwater nearest the beach, inside the breakwater 50 feet from the end, at the tip of the breakwater, outside the breakwater 50 feet from the tip, and at the outside breakwater 50 feet past the bend. Other algae observed include: turf algae on boulder faces inside the breakwater 50 feet from the end, and macro algae growth on boulders in the upper intertidal outside the breakwater, 50 feet from the tip.

Inside the breakwater 50 feet from the end, the coral heads facing away from the breakwater and on rocks above the sand level remain healthy. Off the breakwater tip, in the deeper waters of the breakwater channel, numerous coral colonies were observed, many of the smaller ones with bleaching at their leading edges. Outside the breakwater, 50 feet from the tip, a coral colony growing on one of the boulders, continues to expand laterally.

5.2 Land Environment

5.2.1 Climate

The climate at the project area and surrounding area is warm, sunny and dry, which is characteristic of the leeward shores of Oʻahu. Average temperatures (Fahrenheit) in Waiʻanae range from the high 60s to low 80s in winter months and between the high 60's and mid 80's during summer months. Average annual rainfall at the project site is between 20 and 30 inches (Helber, Hastert & Kimura Planners, 1989).

5.2.2 Existing Land Use

The project site is bounded on the southeast by Waiʻanae High School and on the west by the Pacific Ocean. Abutting the project site to the northeast (mauka) are the Mākaha Surfside Apartments. Further northwest along the coast is Lahilahi Point with its adjacent beach park and urban/resort developments. Further southeast are the Waiʻanae Boat Harbor and Pōkaʻi Bay. Mauka lands of the Waiʻanae Valley are used for dairy, diversified agriculture and low-density residential areas with more densely populated neighborhoods closer to the coastline. Residential uses (single-family dwellings) predominate near the ocean around Waiʻanae town. The project site is zoned P-2, General Preservation and designated as Park land according to the City's Development Plan, which is designed to help guide future public improvements and zoning. The shoreline area is in the City's Special Management Area, which is designed to protect natural, cultural, and recreational resources of the coastal zone of Oʻahu.

5.2.3 Visual and Open Space

The project area as viewed from the Mākaha Surfside Apartments includes the Pacific Ocean to the south and west and Kamaile ʻunu Ridge of the Waiʻanae mountain range to the east and north. The Coastal View Study (Department of Land Utilization, 1987) identifies significant stationary views from the public beach area adjacent to Mauna Lahilahi Point, which is approximately ¾ mile northwest of the project site. The project area itself has a rocky shoreline with an escarpment and cannot be seen from Farrington Highway, the main coastal roadway.

5.2.4 Surface Hydrology and Drainage

Storm runoff from the upland areas during wet weather is directed to two drainage channels. One, ʻEku Stream, exits a few hundred feet north of the site under a highway bridge and the other exits

south of the Waiʻanae Boat Harbor. Local rainfall is small and drainage from the site flows as sheet flow into low areas and into a narrow drainage channel at the high school.

5.2.5 Flood Hazard/Tsunami/Hurricane

The Mākaha Surfside is located in flood zones VE and AE, an area subject to tsunamis or other velocity hazards, with a base flood elevation of 13 feet. Figure 5-4 is the Flood Insurance Rate Map for the project area.

Although hurricanes occur infrequently in Hawaiʻi, they occasionally hit the islands. Hurricane Iwa in 1982 and Hurricane Iniki in 1992 resulted in significant damage on Kauaʻi. Both hurricanes also caused coastal flooding and damage on the leeward coast of Oʻahu, including the Mākaha area. During Hurricane Iwa, wave run-up and inundation reached as far as 500 feet inland. Hurricane Iniki also resulted in extensive flooding as 15-foot waves inundated the shore and damaged seawalls and coastal structures (Sea Engineering, 1997). The bottom floor of the Mākaha Surfside was severely damaged by both hurricanes.

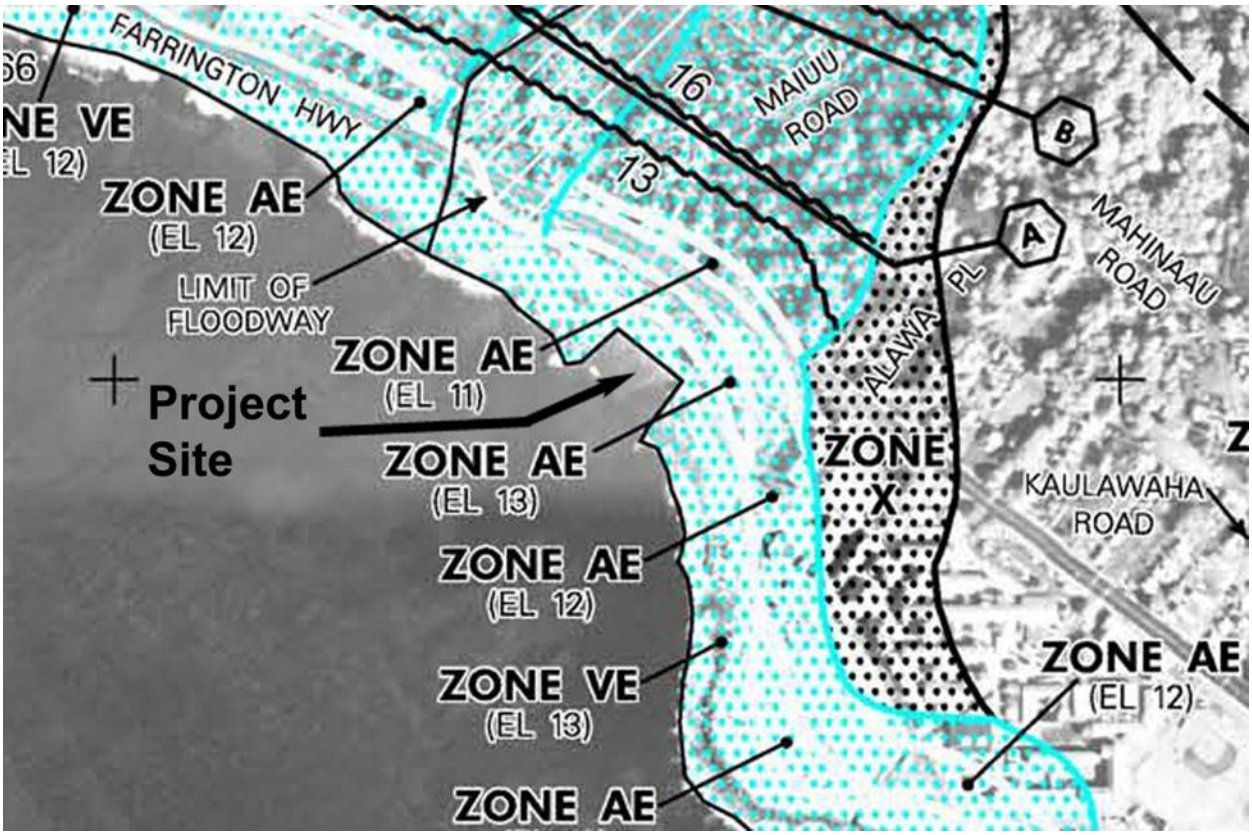


Figure 5-4. FEMA Flood Map

5.2.6 Soils

According to a soil survey by the United States Soil Conservation Service (SCS, 1972), soils mauka of the shoreline at the Mākaha Surfside are classified as HnA, Hanalei silty clay with 0 to 2 percent slopes. This type of soil was typically used for sugarcane, taro, and pastureland. Lands to the northwest of the project site are classified as beach sand (BS) and lands southeast of the project site, including Waiʻanae High School, are listed as coral outcroppings (CR).

5.2.7 Flora/Fauna

A field reconnaissance was conducted to identify flora and fauna at the project site. The rocks on the beach are home to several species of marine algae (Grateloupia phuquoensis & Symploca hydnoides), snails (Nerita picea [pipipi] & Littorina pintado [pipipi kōlea]), and shore crabs (Graspus tenuicrustatuts). The open shoreline area does not offer much habitat or dwelling space for any land mammals.

No sand dwelling birds were observed on the field reconnaissance. Surrounding the project site on the remainder of the City and County Park are several large mature kiawe trees (Prosopis sp.) and miscellaneous weeds and grasses.

5.2.8 Archaeology

There are many known burial locations in the park on either side of the project site (discussed in Section 4.2). There is also a buried cultural layer that can be seen in the eroded embankment. The Cultural References Section of this Environmental Assessment lists reports and plans that have been written based on studies of the area. The City and County of Honolulu is determining if shore protection can be used to protect the cultural sites. The City and the Hawaiian community are evaluating preliminary burial treatment plans for exposed remains. Construction of a revetment will likely require a monitoring plan and monitoring during any excavation or movement of beach sand.

5.2.9 Noise

The major source of noise in the area is Farrington Highway, located approximately 300 feet mauka (inland) from the project site. The Mākaha Surfside Apartments are located between the project site and the highway. Due to the distance from the highway to the project site, the highway is not a major factor in ambient noise levels for this project. Natural sources of noise from wind and waves are typical of similar shoreline locations in the Waiʻanae area.

5.2.10 Air Quality

Ambient air quality is generally good due to offshore trade winds, typical of similar rural shoreline areas in the vicinity of the project site.

5.2.11 Traffic

Access to the project site is via Farrington Highway. In the vicinity of the project area, Farrington Highway is a four-lane paved road running parallel to the shoreline along the leeward coast of Oʻahu. Farrington Highway serves local traffic within the Waiʻanae area and acts as a commuter highway for trips outside of Waiʻanae. The highway can become congested during peak traffic hours. Peak traffic periods are between 5-7 a.m. for morning commuters to Honolulu.

5.2.12 Utilities

There are no electric, telephone, cable, sewer or water utilities serving the revetment site. The beach park does have irrigation systems, and the Mākaha Surfside Apartments have utilities.

6. CONFORMANCE WITH PLANS AND POLICIES

6.1 Hawai'i State Plan and Functional Plans

6.1.1 Background

The Hawai'i State Plan was developed to serve as a guide for future development of the State of Hawai'i in areas of population growth, economic benefits, enhancement and preservation of the physical environment, facility systems maintenance and development, and socio-cultural advancement. The Plan identifies, in general, the goals, objectives, policies and priorities for the development and growth of the State. The Plan has not been revised since 1990-91.

Twelve Functional Plans were also developed to further define the goals and objectives of the Hawai'i State Plan. The twelve functional plans include: 1) Agriculture; 2) Conservation Lands; 3) Employment; 4) Energy; 5) Health; 6) Higher Education; 7) Historic Preservation; 8) Housing; 9) Recreation; 10) Tourism; 11) Transportation; and 12) Water Resources Development.

Functional plans that have a positive or adverse impact from the proposed revetment are Historic Preservation, Recreation, and Housing.

6.1.2 Historic Preservation

The Historic Preservation Functional Plan includes the following activities:

1. The preservation of historic properties;
2. The collection and preservation of historic records, artifacts and oral histories;
3. The provision of public information and education on the ethnic and cultural heritages and history of Hawai'i.

The area around the Mauna Lahilahi project contains burials and a sub-surface cultural layer. The area is well documented as listed in the Cultural References of Section 11. Most of the project is in the water and will not affect burials or the cultural layer. However, construction equipment will have to transit some of the potentially sensitive areas. Project plans include access maps for equipment (see Figure 3-14). An archaeological monitor will be employed during construction to advise the contractor and the County on any inadvertent finds.

6.1.3 Recreation

The objectives of the Recreation Functional Plan are to:

1. Assess present and potential supply of and demand for outdoor recreation resources,
2. Guide State and County agencies in acquiring or protecting land of recreational value,
3. Provide adequate recreation facilities and programs, and
4. Assure public access to recreation areas.

This is a City and County of Honolulu project. The purpose of the project is to preserve eroding shoreline areas in Wai'anae's Mauna Lahilahi Beach Park by constructing a rock revetment. By

building the revetment, lateral access along the shoreline will also be preserved. Without the planned revetment, there most likely will not be any good lateral access between adjoining park areas.

6.1.4 Housing

The Housing Functional Plan focuses on six areas. Two of these areas are affected by the project.

1. Expanding rental housing opportunities;
2. Expanding rental opportunities for the elderly and other special need groups.

The eroding beach is immediately in front of the Mākaha Surfside Apartments. Some of these apartments are for low income families. Also, historically these apartments have been less expensive than others in the area. On several occasions waves and erosion have extended from park land into the private property causing damage and flooding. The new revetment will help reduce the risk of future damage.

6.2 General Plan of the City and County of Honolulu, 2006 Edition

6.2.1 Background

The General Plan of the City and County of Honolulu is a requirement of the City Charter. The General Plan is a guide for all levels of government, private enterprise, neighborhood and citizen groups, organizations, and individual citizens in eleven areas of concern:

1. Population;
2. Economic activity;
3. The natural environment;
4. Housing,
5. Transportation and utilities;
6. Energy;
7. Physical development and urban design;
8. Public safety;
9. Health and education;
10. Culture and recreation; and
11. Government operations and fiscal management.

Of these, two are most affected by the project: the natural environment, and culture and recreation.

6.2.2 The Natural Environment

Objective A, Policy 2 is to: Seek the restoration of environmentally damaged areas and natural resources. The purpose of the project is to protect the back shore area from erosion and potential damage to property.

Objective B, Policy 1 is to: Protect the Island's well-known resources: its mountains and craters; forests and watershed areas; marshes, rivers, and streams; shoreline, fishponds, and bays; and reefs and offshore islands. The project will protect a section of the shoreline from wave erosion.

6.2.3 Culture and Recreation

Objective D, Policy 1: Develop and maintain community-based parks to meet the needs of the different communities on O'ahu. Mauna Lahilahi Beach Park is a major beach park in Wai'anae. The wave erosion at the project site has already caused major damage to the park.

Objective D, Policy 6: Provide convenient access to all beaches and inland recreation areas. If erosion of the beach park continues there will be no easy access to the south end of the park near Wai'anae High School. The Department of Parks and Recreation has planted numerous coconut trees in this area, and there are also burial sites in the area.

Objective D, Policy 12: Provide for safe and secure use of public parks, beaches, and recreation facilities. When the shoreline was unprotected, it was rocky and dangerous for swimmers and beachgoers. Furthermore, the ongoing erosion is threatening to cut off access between the northern and southern portions of the beach park. The proposed revetment project will provide necessary protection against erosion. This will allow safer and more convenient access to the beach and public park land in this area.

6.3 Hawaii Coastal Zone Management (CZM) Act, HRS Chapter 205A

6.3.1 Objectives

The objectives of Chapter 205A include among others:

(1) Recreational resources;

(A) Provide coastal recreational opportunities accessible to the public.

(2) Historic resources;

(A) 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.

(3) Coastal hazards;

(A) Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

(4) Beach protection;

(A) Protect beaches for public use and recreation.

The objectives are met as follows:

Objective (1) - Lateral access along the shoreline is currently provided by a sandbag revetment along the inner shoreline of the cove. The rock revetment will replace the damaged sandbag revetment.

Objective (2) - The protected area contains known ancient Hawaiian burial sites and a cultural layer below the surface.

Objective (3) - The proposed shore protection also protects an apartment complex that has been damaged by hurricanes and by high winter waves. The existing breakwater currently protects the buildings from wave flooding at the project's south end. Before the existing breakwater was constructed in 2003, waves washed over the top of the bank and ran down to threaten the bottom floor of the building. That no longer happens. The new revetment will provide similar protection at the north end of the cove.

7. IMPACTS AND MITIGATION

7.1 Direct Impacts

7.1.1 Marine Flora/Fauna

The proposed rock revetment will cover an area approximately 300 feet long and 40-45 feet wide. The area is mostly hard substrate with sand and rubble and has been partially covered by the existing sandbag revetment for over 10 years. As discussed in Section 5.1.7., the closest live coral to the shoreline was about 90 feet offshore, which is outside the footprint of the proposed revetment. No other benthic flora or fauna are likely to survive under the revetment footprint. The loss of any benthic habitat and associated organisms is partially mitigated by the new habitat represented by the rock structure itself. There may be some habitat for crevice dwelling species such as crabs and habitat for algae.

A green sea turtle was sighted only once during 5 years of monitoring (2003-2008), so no negative impact to the sea turtle population is expected after construction is complete.

Mitigation for the existing breakwater included a marine education program for students of Waiʻanae High School. This program and donations of equipment and books were completed. No further mitigation is recommended for revetment construction.

7.1.2 Terrestrial Flora/Fauna

Naupaka grows along the fence bordering the Mākaha Surfside. The naupaka will probably be damaged during construction and may have to be replanted after construction. Grass and shrubs growing in the park will likely be damaged by construction vehicles. The vehicles will be routed around major trees such as coconut trees or kiawe trees. Some landscaping will probably be necessary when construction is finished. The open shoreline and park area does not offer much habitat or dwelling space for land mammals, and no terrestrial animals were observed during multiple park visits. No sand dwelling birds were observed on field reconnaissance visits. Birds that use the park may be disturbed by construction. The proposed project should have no significant long-term impacts on flora or fauna within the park.

7.1.3 Water Quality

During revetment construction, suspended sediment levels may be temporarily elevated in water immediately adjacent to the operations. Construction specifications call for the contractor to clean all stone before placement in the water to minimize the impacts of suspended sediment. No dredging is planned for this project. A detailed Best Management Practices (BMP) plan including a water quality monitoring plan will be submitted to the Corps of Engineers and State of Hawaiʻi Department of Health (DOH) Clean Water Branch. The contractor will be required to enclose the immediate work site with sandbags for water quality control and to monitor turbidity during construction.

7.1.4 Currents and Circulation

Currents and overall circulation outside the cove are not expected to be affected since the proposed structure is located inside the existing breakwater. Offshore current patterns are shown in Figure 5-2. Circulation at the site is good. Water now flows both in and out through the breakwater voids

and through the gap between the breakwater and the hard shoreline. The new revetment will reduce wave reflection, but circulation through the breakwater rocks and breakwater gap will continue.

7.1.5 Traffic

There will be a temporary increase of heavy vehicle traffic on Farrington Highway as stone and construction materials are brought to the project site. The contractor will be required to provide traffic control for site access and to comply with City and County and State traffic regulations.

7.1.6 Air Quality

Fugitive dust from hauling and placing rock, exhaust emissions from vehicles, and possible traffic disruptions may temporarily degrade air quality at the project site. Dust concentration is anticipated to be low based on previous experience with the existing breakwater. The contractor will control construction dust by applying water to stock piles and work areas. The contractor will be required to comply with City and County of Honolulu and State Department of Health regulations for dust concentration during the construction period.

7.1.7 Noise

During revetment construction, trucks and rock handling equipment will generate higher than normal noise levels during the work day. Residents of the Makaha Surfside will be able to see and hear the equipment. The Surfside buildings will block noise from residents across Farrington Highway. Mitigation of vehicle noise to inaudible levels is not possible. Construction equipment will use mufflers. Construction will be restricted to daytime hours.

7.1.8 Runoff

The proposed revetment will be porous and will allow rainwater or wave overtopping to drain easily through gravel, rock, and fabric filter. The revetment will not hold water or divert runoff that might cause erosion. No impact on existing drainage is expected from the proposed action. Rainfall during construction may wash sediment into the ocean. The contractor will be required to provide a site specific best management plan for review by county, state, and federal agencies.

7.1.9 Archaeology

The beach park contains a significant number of burial sites and an exposed cultural layer. These are shown in an archaeological monitoring plan prepared for construction of the existing breakwater (Hammatt et al, March 2003). A new archaeological monitoring plan will be prepared for revetment construction and an archaeologist will be hired by the contractor to monitor construction. The most recent report - Final Archaeological Monitoring Report for Mauna Lahilahi Beach Park Improvement Project (2009), is attached as Appendix B. Site visits and consultation with community members have been held. Burial sites have been identified and positions marked with GPS coordinates. Access routes and staging/stockpile locations are planned to avoid burial or other cultural sites during construction. If required by the State Historic Preservation Division, areas of heavy equipment use will be protected by steel plates. Section 11 has a list of related reports. If burials or cultural artifacts are discovered during construction, work will be stopped and appropriate county and state agencies will be notified.

7.1.10 Surf

No surfing has been seen near the project during numerous visits over many years. The nearest surfing site is down the coast at Mauna Lahilahi Point. The proposed revetment and existing breakwater are in water much too shallow for surfing waves. Impacts to surfing are not expected.

7.1.11 Beach Use

Beach use and lateral access at the revetment site will be curtailed during the construction period. This disruption will be temporary. The main Mauna Lahilahi Beach will not be affected by construction and will be open for public use.

7.1.12 Erosion

The shoreline at the project site, formerly a sand beach, has been eroding for more than 50 years. The previous beach is gone, and the backshore area has been overtopped and damaged. The revetment will significantly reduce backshore erosion within the project area. The nourished beach placed in 2003 will continue to slowly lose sand, and sand will be transported through or around the breakwater. If desired, additional sand could be placed on the beach in the future to mitigate loss.

Post construction monitoring of the structure and surrounding beaches may be required by the permitting agencies. Periodic visual inspection should be sufficient to determine revetment performance.

7.2 Indirect and Cumulative Impacts

7.2.1 Nearshore Marine Life

No significant change in nearshore marine life is anticipated after the site settles. The new revetment will replace the existing sandbag revetment that occupies approximately the same location. Some marine life such as crabs or algae may inhabit the new revetment.

7.2.2 Water Quality

The revetment will prevent erosion of backshore soil and clay, which over the long term, should help reduce turbidity related to erosion. Some turbidity is expected during construction, and the contractor will be required to use best management practices and to monitor water quality. No long-term water quality degradation occurred after the existing breakwater construction and none is anticipated for revetment construction.

7.2.3 Visual and Open Space

As stated in Section 5.2.3, the public beach area adjacent to Mauna Lahilahi Point contains significant stationary visual resources. The new revetment will occupy the same position as the existing sandbag revetment and will be below the view plane for people walking along the top of the bank. The project will have no visual impact on any view of Mauna Lahilahi.

As noted in the Coastal View Study (Department of Land Utilization, 1987), coastal views are already "severely" impacted by mid-rise apartments adjacent to Mauna Lahilahi. The Mākaha Surfside Apartment buildings block coastal roadway views of the ocean. The proposed revetment is at or below the elevation of the surrounding coastal area and seaward of the buildings. It cannot be seen from the road and will not block views for apartment owners.

7.2.4 Beach Use and Water Safety

The new revetment should cause very little change to the recreational use and safety of the beach. Wet revetment rocks may be slippery, but access to the water is easy over the nourished beach. Water depth is shallow and will remain shallow. The beach is protected from waves by the existing breakwater. There will be a lateral access path along the top of the revetment. There are no lifeguards at this location.

7.2.5 Noise and Air Quality

Long-term noise and air quality will not be changed by the proposed action. There will be temporary equipment noise during construction. No air quality degradation was observed when the existing breakwater was constructed, and no cumulative or indirect negative impacts are anticipated.

7.2.6 Traffic

The project will not impact traffic except temporarily during construction. The contractor will provide traffic control as needed.

7.2.7 Archaeology

The revetment will reduce erosion of backshore soil, which should help protect burials and other archaeological sites in the vicinity of the project. Access for construction equipment will be controlled to avoid sensitive areas. The project is not expected to cause any cumulative impact on the cultural resources.

7.2.8 Erosion

The cumulative impact on shoreline erosion will be positive. Erosion and wave overtopping will be reduced by the new revetment, which is the purpose for the project. The new revetment will not cause coastal erosion at other locations in Mauna Lahilahi Beach Park, because it is contained in a cove pocket beach with rock headlands extending seaward on each side. The headlands minimize long shore currents and sand transport. Before the beach was nourished in 2003, nearly all of the sand had eroded out of the cove and moved laterally in both directions along the shoreline. Sand eroding from the main Mauna Lahilahi Beach to the north does not appear to be accumulating in the cove. The nourished sand in the cove is protected by the existing breakwater, and the nourished beach remains. There are no nearby beaches between the south side of the cove and the Wai`anae Boat Harbor.

8. PERMITS

8.1 Permits and Approvals Required

1. Department of the Army Section 10/404 permit
2. State of Hawai'i Department of Health, Section 401, Water Quality Certification
3. Department of Business, Economic Development and Tourism, Office of Planning, Coastal Zone Management (CZM) Federal Consistency
4. Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands, Conservation District Use Permit
5. DLNR Chapter 6E-8 Historic Preservation Review

Backfill for the planned revetment will extend close to the certified shoreline. A determination whether a Special Management Area (SMA) Use Permit or a Shoreline Setback Variance (SV) are required has not yet been made.

At the request of the State Historic Preservation Division, an archaeological monitoring plan will be prepared and submitted for approval.

9. SIGNIFICANCE AND DETERMINATION

9.1 Significance

Based on the information contained in this document, the recommended determination for the proposed action is a Finding of No Significant Impact (FONSI). When a FONSI is issued, a project may proceed without further study. In making a FONSI determination certain "significance criteria" have been established. An action shall be determined to have a significant effect to the environment if it meets any of the following significance criteria:

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;

The proposed revetment will cover a small portion of the underwater bottom near the water line. This area is hit by breaking waves and is continually scoured by turbulent water and sand. While the covered habitat will be changed, the rocks used for revetment construction may add habitat for crabs or other shoreline life. The revetment will partially protect cultural or historic resources, including burials.

2. Curtails the range of beneficial uses of the environment;

The new revetment will replace an existing sandbag revetment. No change in beneficial uses of the environment is anticipated.

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

The proposed project is consistent with Hawai'i's State Environmental Policy which, as established in Chapter 344, Hawai'i Revised Statutes (HRS), is to encourage conservation of natural resources and the quality of life. The proposed project is consistent with the goals of HRS 344-4(4) to preserve and maintain park areas for public recreational uses.

4. Substantially affects the economic or social welfare of the community or state;

The proposed project will reduce the threat to property damage by waves and flooding. Two hurricanes have badly damaged the relatively inexpensive housing at the Mākaha Surfside Apartments.

5. Substantially affects public health;

As noted in Section 7 of this report, the project will have some short term impacts on air, noise, and water quality. However, these impacts will be limited to the construction period of the project and are not anticipated to substantially affect public health.

6. Involves substantial secondary impacts, such as population changes or effects on public facilities;

These changes are not anticipated to have a significant impact on population or existing public facilities.

7. Involves a substantial degradation of environmental quality;

The proposed project is not expected to have any significant negative direct, indirect, or cumulative impact to environmental quality. Water quality should improve from reduced shoreline erosion. The anticipated environmental impacts of the proposed project are described in more detail in Section 7 of this report.

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

The project is not anticipated to have cumulative negative impacts or involve a commitment for significant larger actions. Periodic inspection and maintenance are recommended for all coastal structures, particularly after hurricanes or large storms.

9. Substantially affects a rare, threatened, or endangered species, or its habitat;

No rare, threatened, or endangered species or habitats exist in the project area. It is possible that green sea turtles (Chelonia mydas) may feed in the area. There are various types of sea weed growing on the rocks. If protected species enter the site, construction will be stopped until the animals voluntarily leave the area.

10. Detrimentally affects air or water quality or ambient noise levels;

As noted in Section 7, impacts on air, water quality, and noise are not anticipated to be significant and will be limited to the construction period.

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

The proposed revetment is designed to protect inland buildings from erosion and flood damage. However, it is not designed to prevent damage during a tsunami or hurricane. The revetment itself could possibly sustain damage during an extreme event, but a larger rock structure is not recommended because of high cost, size, and aesthetics.

12. Substantially affects scenic vistas and view planes identified in county or state plans or studies; or

The project will have no significant negative impacts on scenic vistas and view planes identified in county or state plans or studies. Visual impacts are addressed in more detail in Section 7 of this report.

13. Requires substantial energy consumption.

Construction of the proposed project will require only the energy necessary to run construction equipment. After construction, no energy will be needed.

9.2 Determination

The City and County of Honolulu Department of Design and Construction anticipates a Finding of No Significant Impact (FONSI) based on the information and assessment provided in this DEA.

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APPENDIX A

Marine Biological Survey

From Final Environmental Assessment for Proposed Shore Protection at Mauna Lahilahi Beach Park, July 2001

Marine Biology Survey 2001

This shoreline is generally categorized as an uplifted calcareous or carbonate solution bench separated at the shore by a raised, sharply pitted limestone face undercut at the base [Devaney and Eldredge, 1987]. Along this coast the limestone shoreline appears to be the remnant of a prehistoric deposition of beach rock when the sea was at a higher level. At the present sea level erosion has broken through the fascia of beach rock forming this small cove. Remnants of the old shoreline escarpment are visible underwater just seaward of the boulders and exposed limestone in the center of the cove. The cove itself then represents relatively new marine benthic habitat that is being colonized by a number of species.

The biological habitat present within the project area is determined to a large degree by physical characteristics including depth, wave energy, substrate type, and water quality. The cove is quite small, measuring approximately 350 feet across the mouth and 250 feet from the beach to the mouth; for a total area of roughly 100,000 square feet. The cove is also relatively shallow, sloping gradually from the beach toe out to a maximum depth of 6 feet at the mouth. Even small southern swells or wind-generated chop lead to waves large enough (1-2 feet) to break across the mouth of the cove creating a turbulent shallow water habitat. Therefore wave energy is a significant factor in determining species that can inhabit a given area.

The site was examined on three occasions by a marine biologist from Oceanit [Bourke]. On the first occasion general qualitative observations were made using mask and snorkel. On the second occasion a transect was laid out along the path of the proposed structure to quantify benthic habitat. On both of these first two occasions the water was too turbulent to obtain photographs of adequate quality for publication or documentation of species cover. The survey quantified coral cover in the footprint at the end of the breakwater within 16 square meter quadrants. Coral cover would be expected to be the highest at the extreme end of the breakwater, providing a "worst case" highest estimate for coral coverage along the length of the breakwater. Data from this survey was quantified using two standard methods. By the "point method" eight of the sixteen quadrants had 0 percent coral, two were less than 10 percent cover, two at 10 to 20 percent cover, two at 20 to 30 percent cover, and two at 30 to 40 percent cover, for an average of 10.8 percent cover. By the visual quadrant estimate method, the percent coverage was 5.8%. Coral cover by either method can be qualified as patchy.

During a third visit to the site water conditions were much better, with no swell and much improved water clarity. On this occasion five transects, each roughly 300 feet long, were surveyed. The five transects were set perpendicular to the beach at 50 foot intervals across the beach. Each transect began at the edge of the lowest sand bag and ended in approximately 8-feet of water well beyond the area of the proposed breakwater. Photographs were taken at 10 foot intervals of a 1/4 square yard quadrant frame held against the substrate. In addition, the distance was recorded along each transect from shore to the first coral within one yard to the left or right of the transect tape. This provided an estimate of the absolute inner limit of coral growth in the cove. Photographs were taken to document the general condition of the reef beyond the breakwater at 300' to 700' off shore. Graphical results of the survey are shown in Figure 1.

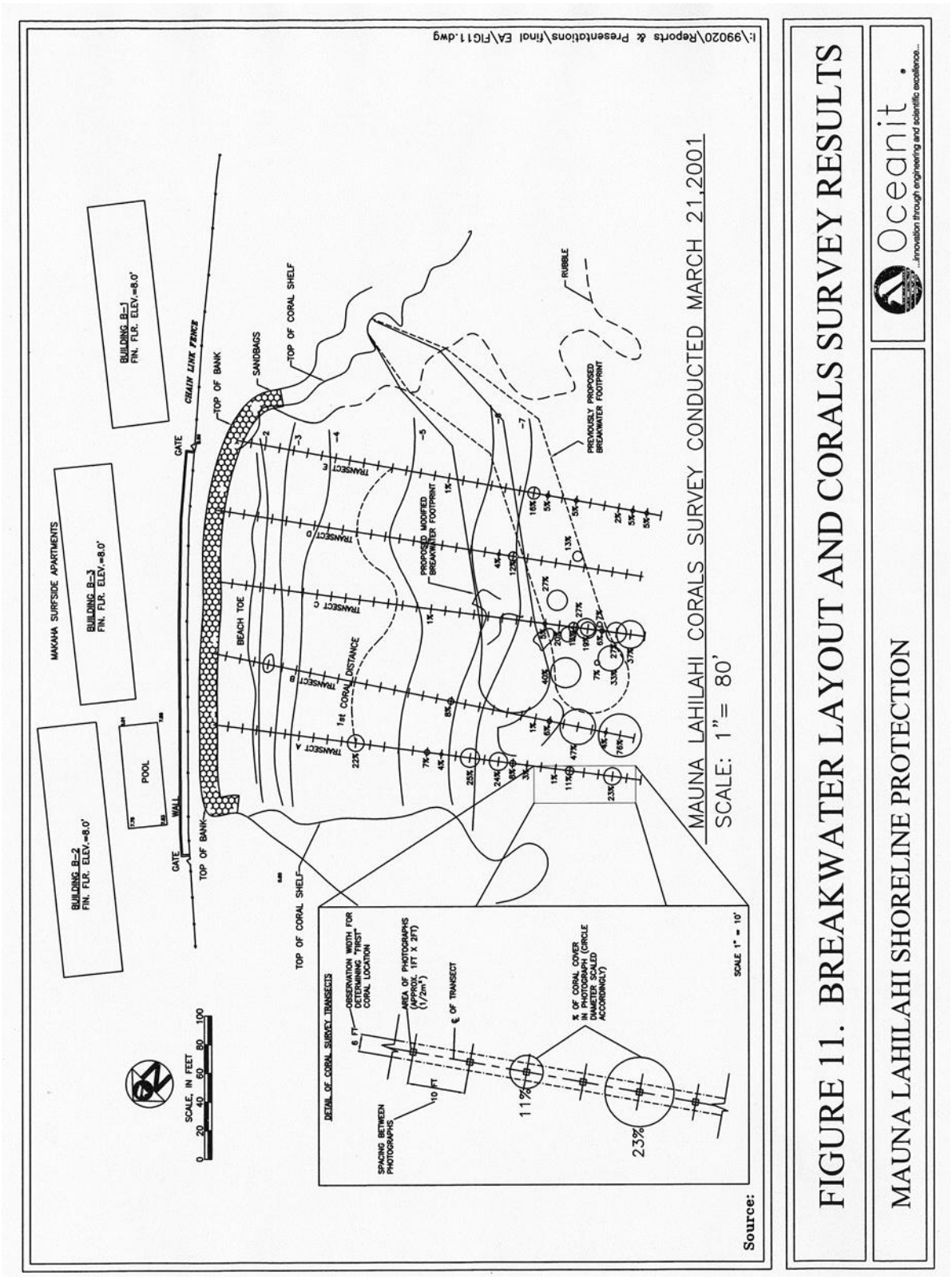

Figure 1. Breakwater Layout and Corals Survey Results

As can be seen in Figure 1 there is isolated coral growth from about 100 feet off shore to about 200 feet off shore, but significant coral growth only begins to occur about 220 to 250 feet off shore. While none of these coral heads are very large and do not contribute significantly to the structure of the benthic habitat, they do account for up to 1/3 of the bottom coverage in certain areas. To avoid these areas of high coral coverage, the tip of the initial breakwater design has been moved shoreward approximately 50 feet from the original design.

Although no turtles were seen at the site during biological surveys, it is highly probable that this cove area provides foraging habitat for turtles. However, the cove and adjacent areas are too shallow and turbulent to provide any nesting habitat for turtles, and the beach does not provide adequate sand depth for nesting. Research has never suggested foraging habitat area was a limiting factor in the recovery of sea turtle populations in Hawaii. Similarly no impact is foreseen to the occasional monk seal along this shoreline from the proposed project.

The cove may be divided into four descriptive ecotypes for the purposes of this discussion:

1. Intertidal zone with exposed rock faces and tide pools;
2. Sandy beach and wave swept rubble;
3. Shallow water zone with wave-swept rocks; and
4. Deep-water zone (to 8 ft).

Intertidal Zone

This coastline, in general, consists of a series of limestone headlands enclosing small sand beaches. The relatively flat limestone bench (consolidated coral from a previous higher sea level) is eroded and often undercut at the shoreline presenting a vertical drop of several feet to the water. This creates a wave impacted intertidal and subtidal hard substrate. The headlands and boulders flanking both sides of the bay are representative of this biotype.

Although the tidal range in Hawaii is only about three feet, the true intermittently wetted zone in this vertical habitat is extended both upward and downward by waves. In this zone most of the surface is colonized by a myriad of algae and invertebrate species adapted to the high-energy wave impact. Typical algae species include Giffordia, sp., Turbinaria ornata, Grateloupia sp., and Sargassum echinocarpum. Invertebrates typically seen in this habitat include the `a`ama rock crab (Grapsus tenuicrustatus) above water, rock boring sea urchin (Echinometra mathaei), Opihi (Cellana sp.), pipipi (Nerita sp.) at the water interface, and various encrusting sponges, particularly in the underwater caves.

The erosive powers of the waves are coupled with biological erosion in this zone as sea urchins and mollusks wear away at the rock surface creating jagged sculptured surfaces in the relatively soft limestone. On the north shoreline of the cove the higher limestone bench provided a few splash zone tide pools that are inhabited by typical tide pool fish including gobies, and juvenile surgeon fish (manini, A. sandvicencis). The southern shoreline has more boulders forming interconnected tide pools regularly washed by waves.

Sandy Beach and Wave Swept Rubble

The narrow beach on the landward side is presently layered with large sand bags to reduce erosion, exposing a strip of sand only about 10 feet wide at low tide. This entire zone is subject to rapid movement during periods of heavy surf, and species are typically either short-lived with rapid re-colonization, or have the capacity to burrow deeply into the substrate. No ghost crab (Ocypode sp.) burrows were seen on the beach. The sand beach habitat ends abruptly at the water line and is replaced by rock and coral rubble substrate. The rubble substrate is visibly barren on the surface, but active communities of small crustaceans, brittle stars and annelid worms can be found underneath the rocks. Very small patches of the green algae, Ulva, could be seen on some of the larger rocks in this zone. No coral was present in this zone.

Shallow Water Zone

The center of the bay is shallower than either side with large (2-5 foot diameter) rocks emerging above the water line even at a moderately high tide. Some of these rocks appear to be limestone remnants of a previous coastline eroded to below waterline. These rocks are still physically part of the substrate although many are severely undercut forming shallow caves and ledges underneath. Other large rocks are broken reef fragments that are probably the result of storm surf. This habitat is characterized by greater algae cover with an unbroken algae mat, fewer mobile invertebrates on exposed surfaces, and some small patches of encrusting coral beginning at about 100 feet from shore. These corals were primarily small (<10 sq in.) squamous colonies of lobe coral (P. lobata) with a few scattered very small colonies of cauliflower coral Pocillopua meandrina and lace coral (P. damicornis) noted occasionally in this zone. The most plentiful large invertebrates were sea urchins wedged tightly between or under rocks.

The surge and impact wave energy in this zone, (coupled with grazing by herbivorous fish during high tide quiescent periods) limits the algae growth to a short dense mat of fleshy algae (Sargassum, Dictyota, Dictyosphaeria, Enteromorpha, Chnoospora, Amansia) with patches of encrusting calcareous algae. Fish in this zone tend to be small mobile species adapted for life in this wave swept habitat and include damselfish (Stegastes fasciolatus, Abudefduf abdominalis), small wrasses (Hinalea, Thalassoma duperrey, T. purpureum), and a few juvenile surgeonfish. Although small caves and under-cuts were plentiful, no typical cave fish (squirrel fish, soldier fish, Aweoweo) or lobster were seen. However, these species are likely to inhabit this zone.

Deep Water Zone

The "Deep Water" zone begins at a depth of about 4 feet and extends out to a depth of about 8 feet, 300 feet from shore. This zone is subject to a great deal of wave surge, but is spared the constant impact energy from breaking waves. The surge picks up sand from small pockets at the base of the ledge. This sand serves to scour the lower portions of any hard substrate within about a foot off the bottom, and limits growth in these areas to fast colonizing and fast growing brown or red algae.

Above this depth, however, the hard substrate provides habitat for at least four species of coral including (from most to least common) lobe coral (Porites lobata) cauliflower coral (Pocillopora meandrina), blue rice coral (Montipora flabellata), and lace coral (Pocillopora damicornis). These corals are isolated and do not cover a large portion of the substrate area. Squamous (flat) colonies of lobe coral account for the most cover.

Nowhere within the cove, delimited by the 300' survey transects, did coral growth provide any significant structure to the substrate. All corals within the cove are growing over pre-existing substrate, primarily beach rock or lithified sandstone, which provides the benthic structure of the site. It is probable that coral growth in this nearshore area is limited by a number of factors including siltation, wave energy, sand scouring, and rare but devastating impacts from large storms. The benthic surface is highly irregular, or rugose, in the "deep" portion of the cove offering numerous surfaces, shallow cracks, holes, and ledges for fish and invertebrate habitat. However, it is important to note that this 3-dimensional structure is the result of erosive actions on the limestone or beach rock substrate and not due to coral reef growth. There are individual corals on the submerged and eroded beach rock substrate, but these colonies do not form a reef structure in or near this area. Further, these individual coral colonies are all, in general, small and subject to regular erosive mortality due to seasonal storms and large waves.

Whereas in the shallower boulder zone the coralline algae tended to be of a flat encrusting morphology; in this deeper zone more ramose species such as Amphiroa fragilissima, Corallina sp, and Porolithon become more common. A greater diversity of fish were seen in this zone, as would be expected, and ranged from numerous juvenile surgeonfish (Acanthurids) of several species, adult butterfly fish (primarily lemon peal, Chaetodon miliaris), small blue-line snappers (Ta`ape, Lutjanus kasmira) and adult parrot fish (Scarus sp.). Kole (goldring surgeonfish, Ctenochaetus strigosus) were not seen during visits to the site. The only Manini (Acanthurus sandvicensis) seen were small juveniles in the tide pools and shallow water boulder habitats.

A well developed coral reef exists offshore of the project site, beginning in about 15 feet of water approximately 400 feet from shore. The reef is a mixed community made up primarily of lobe coral (P.lobata) with vertical relief up to about 6 feet in height separated by open sand patches or open expanses of hard bottom. This reef continues out to a depth of at least 40 feet.

Additional information on the marine environment can be found in the Final Environmental Impact Statement, Wai‘anae Boat Harbor, Waianae, Oahu, Hawaii (1976).

APPENDIX B:

Final Archaeological Monitoring Report for Mauna Lahilahi Beach Park Improvement Project

Final
Archaeological Monitoring Report
For the Mauna Lahilahi Beach Park Improvements Project,
Waiʻanae Ahupuaʻa, Waiʻanae District
TMK: [1] 8-4-001: 001; 8-5-017:001-007 & 022, and 8-5-018:001-003

Prepared for
Department of Design and Construction
City and County of Honolulu

Prepared by
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Management Summary

Report Reference	Archaeological Monitoring Report For the Mauna Lahilahi Beach Park Improvement Project, Wai‘anae Ahupua‘a, Wai‘anae, O‘ahu, TMK: [1] 8-04-001:001; 8-05-017: 001-007 & 022, and 8-05-018: 001-003 (Jones and Hammatt 2008)
Project Number	Cultural Surveys Hawai‘i Inc. (CSH) Project Number: Maun22
Location	The project area comprises of TMK: [1] 8-04-001:001; 8-05-017: 001-007 & 022, and 8-05-018: 001-003, which are bounded by Farrington Highway and the Surf Side Apartments on the north, the wave cut banks along the ocean on the south and west, and Wai‘anae High School on the east. The project area is located in Wai‘anae Ahupua‘a, Wai‘anae District, O‘ahu Island. This area is depicted on the 1998 Wai‘anae 7.5-minute USGS topographic quadrangle.
Date Submitted	January 2009
Permit Number	Fieldwork was performed under CSH’s annual archaeological research permit, No. 04-04, issued by DLNR/SHPD
Agencies	DLNR/SHPD, City and County of Honolulu (City)
Land Jurisdiction	Owned by City and County of Honolulu
Survey Acreage	11 acres
Development Project Description	The purpose of this project was to beautify the Mauna Lahilahi Beach Park. Park improvements included the planting of 100 coconut trees and pruning of existing trees as well as the installation of waterlines for irrigation. Construction tasks within the on-site monitoring areas included excavation and installation of coconut trees, water lines, construction fencing, water line, fence posts, sidewalks, picnic tables, and grading.
Historic Preservation Regulatory Context	CSHs study is being done to fulfill and in accordance with the Hawai‘i Administrative Rules Title 13 (Department of Land and Natural Resources), Subtitle 13 (SHPD), Chapter 279 (Rules Governing Standards for Archaeological Monitoring Studies and Reports). The monitoring program was a historic preservation mitigation measure that focused on the identification and documentation of any historic properties within the project area that would otherwise be destroyed without documentation by project activities.

Field Effort	Fieldwork was completed intermittently over the course of 8 months starting on November 8th, 2003. A total of 37 days were required for on-site monitoring. Archaeologists C. Kulani Jones B.S., Jesse York B.A., Dominique L. Cordy, B.A. and Todd Tulchin B.S. conducted archaeological monitoring during the course of the project under the general supervision of Hallett H. Hammatt, Ph.D. (principal investigator).
Cultural Resources Potentially Affected by Project	There was a possibility that human burials (pre-contact or historic) and cultural deposits (pre-contact or historic) could be encountered within the project area.
Number of Historic Properties Identified	Two sites were identified during the course of the project. Both sites were human burials with no associated surface features. The sites were designated State Inventory of Historic Places (SIHP) Sites # 50-80-07-6704 and 50-80-07-6705
Site Significance Evaluations	SIHP # 50-80-07-6704 and SIHP # 50-80-07-6705 are human burials found significant under criteria D and E for their importance to yield information important for research on pre-history.
Recommendations	Preservation in place and a burial treatment plan are recommended for SIHP 50-80-07-6704 and SIHP 50-80-07-6705.
Summary of Monitoring Results	Monitoring revealed the presence of two burials designated SIHP # 50-80-07- 6704 & 50-80-07-6705.

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Section 1 Introduction

1.1 Project Background

Cultural Surveys Hawai‘i, Inc. was contracted by the City and County of Honolulu to carry out an archaeological monitoring program for Mauna Lahilahi Beach Park improvements parcel at Wai‘anae Ahupua‘a, Wai‘anae District, Island of O‘ahu, (TMK: [1] 8-04-001:001; 8-05-017: 001-007 & 022, and 8-05-018: 001-003) (Figure 1 & Figure 2).

The purpose of the project was to beautify the beach park; improvements included the planting of 100 coconut trees and the installation of waterlines for irrigation as well as pruning of existing trees. Construction tasks within the on-site monitoring areas included excavations for the installation of coconut trees, water lines, fence posts for construction fencing, sidewalks, picnic tables, and grading.

1.2 Project Area Description

The project area is located *makai* (seaward) of Farrington Highway in coastal West O‘ahu (see Figure 1 & Figure 2). Generally, the coastal areas of this region are characterized by white sand beaches with areas of old, uplifted coral reefs and limestone flats. Much of the coastal area has been disturbed by both historic and modern development as well as high surf, which have eroded large sections of the coastline. Historically, *muliwai*, or backwater marshy areas, would often develop behind dunes when streams were blocked.

Vegetation along this arid coast is sparse. With 20 inches (500 mm) or less of annual rainfall, only the hardiest plants adapted to coastal environments can thrive in this zone (Giambelluca et al. 1986). The vegetation in the project area is typical of dry seashore environments in Hawai`i and is dominated by alien species. Indigenous species include *hau* (*Hibiscus tiliaceus*), *kamani* (*Calophyllum inophyllum*), *naupaka* or *naupaka kahakai* (*Scaevola sericea*), and the coconut or *niu* (*Cocos nucifera*). Introduced species within the project area include *kiawe* (*Prosopis pallida*). The soils underlying the project area consist mainly of ancient reefs or compacted sandstone and sands overlain by alluvial clays. Beginning in the northwest (*mauka*) portion of the project area is Waialua silty clay, 0 to 3 percent slopes (WkA). Waialua series soils are characterized as moderately well drained soils developed from basic igneous rock and found on alluvial fans (Foote *et al.* 1972). The *makai* portion of the project area is dominated by beach sand (BS) which is also present below the imported fill material that has been deposited in the majority of the project area.

1.3 Scope of Work

Previous archaeological studies have documented the presence of significant cultural deposits including human burials at Mauna Lahilahi Beach Park. The archaeological inventory survey (Perzinski and Hammatt 2004) conducted in support of this project was reviewed and approved by SHPD/DLNR on April 13, 2004 (Log No 2004.1151, Doc No 0404SC10). The inventory survey documented an intact cultural layer that the lies in two narrow discrete strips just back

from the coast. The extent of this cultural layer, (SIHP # 50-80-07-6634) was taken into consideration by the City and County in the layout of proposed park infrastructure. The proposed park improvements (consisting of tree planting and excavations for associated irrigation) were designed to remain far away from the cultural layer. Based on the findings and the overall cultural sensitivity of the project area, it was recommended that on-site archaeological monitoring take place during any subsurface construction activities associated with the proposed improvements at Mauna Lahilahi Beach Park.

Based upon background research and the results of previous archaeological studies in the area, the following archaeological monitoring provisions were recommended in an archaeological monitoring plan (Hammatt and Shideler 2004) that was reviewed and approved by SHPD/DLNRA (Log No 2004.2008/ Doc No 0406SC16):

1. Anticipated finds: It is anticipated that isolated finds including human associated with pre-contact and post-contact Hawaiian habitation and/or burial may be encountered during excavation activities.
2. Treatment of remains encountered: If intact cultural deposits or human skeletal remains are encountered during ground disturbing activities, work will be stopped immediately in that area and the archaeologist will notify the SHPD/DLNR of the nature of the discovery. Burial finds will be treated according to HRS 6E-43.6 Burial Law and Administrative Rules Chapter 13-300. SHPD/DLNR will determine the appropriate treatment of the remains and any associated cultural material in consultation with the O‘ahu Island Burial Council and the City and County. No remains will be removed without an SHPD determination. If any associated materials are encountered with an inadvertent human burial, all material will be treated according to SHPDs determination. If other cultural materials are encountered, not in association with human remains including an intact cultural layer, charcoal, artifacts or midden deposits, or any disturbed objects or deposits then select sorted samples of charcoal, and bulk samples of midden material will be collected and standard documentation conducted (i.e. scale maps, photographs, detailed descriptions, and interpretation). Reburial plans will be made in consultation with SHPD/DLNR, the O‘ahu Island Burial Council, any recognized descendants, and the City and County.
3. The monitoring archaeologist has the authority to halt construction in the immediate area of the find in order to carry out the plan. The field archaeologist will make it clear to construction personnel with whom he/she is working that the archaeologist has the authority to halt work when it is appropriate.
4. Pre-construction conference between the archaeologist and the construction crew. As noted above, the archaeological monitor will hold an on-site meeting at the beginning of work to explain the monitoring plan and archaeological concerns. The entire construction crew will be informed of possible archaeological materials and the procedures to follow if such materials are encountered. The role of the archaeologist of will be explained. At this time it will be made clear that the archaeologist must be on site for all ground disturbance activities.

At the time of the on-site pre-construction conference the archaeological monitor will demarcate the known inland edge of the intact cultural layer in the vicinity of any anticipated subsurface work. Because of the concern to avoid subsurface impacts and a concern to avoid demarcation that would be easily moved or removed it is anticipated that the marking would be with spray paint, renewed as necessary.

5. Extent of monitoring. The archaeologist(s) will monitor subsurface impacts into soft substrate. The monitoring archaeologist shall ensure that construction work, equipment, and personnel do not encroach onto adjacent areas not included in the proposed beach park improvements. Once the work area is set up, on-site monitoring may be changed to on-call monitoring, with the approval of the State Historic Preservation Division. The archaeological monitor shall ensure that sufficient personnel are present on the job site to conduct all needed monitoring of ground-disturbing activity.
6. Laboratory work to be done on remains collected. If remains are encountered, the SHPD/DLNR will decide if it is appropriate to remove the human skeletal remains and if osteological analysis of human remains may occur. If removal is appropriate the remains may be stored temporarily at the archaeological consultant's facilities for the purpose of completing bone inventory and will then be transferred to the SHPD Honolulu office until reburial plans are made. Artifactual material will be catalogued and analyzed along with samples of midden material, if collected. Charcoal and other datable materials will be submitted for dating, if recovered from an in situ context which has not mixed with historic materials.
7. Schedule for Reports. A draft Archaeological Monitoring Report will be submitted within 90 days of completion of monitoring fieldwork to the State Historic Preservation Division (SHPD) for review and approval. Cultural Surveys Hawai‘i will submit the final archaeological monitoring report within 30 days after any review comments have been received.
8. Archiving of Collections. All burial materials will be given to DLNR/SHPD for storage. Materials not associated with burials will be temporarily stored at the archaeological consultant's offices until an appropriate curation facility is available on O‘ahu. Disposition of any cultural materials, including artifacts, not associated with a human burial shall occur only after written concurrence of the City and County and in consultation with the State Historic Preservation Division.

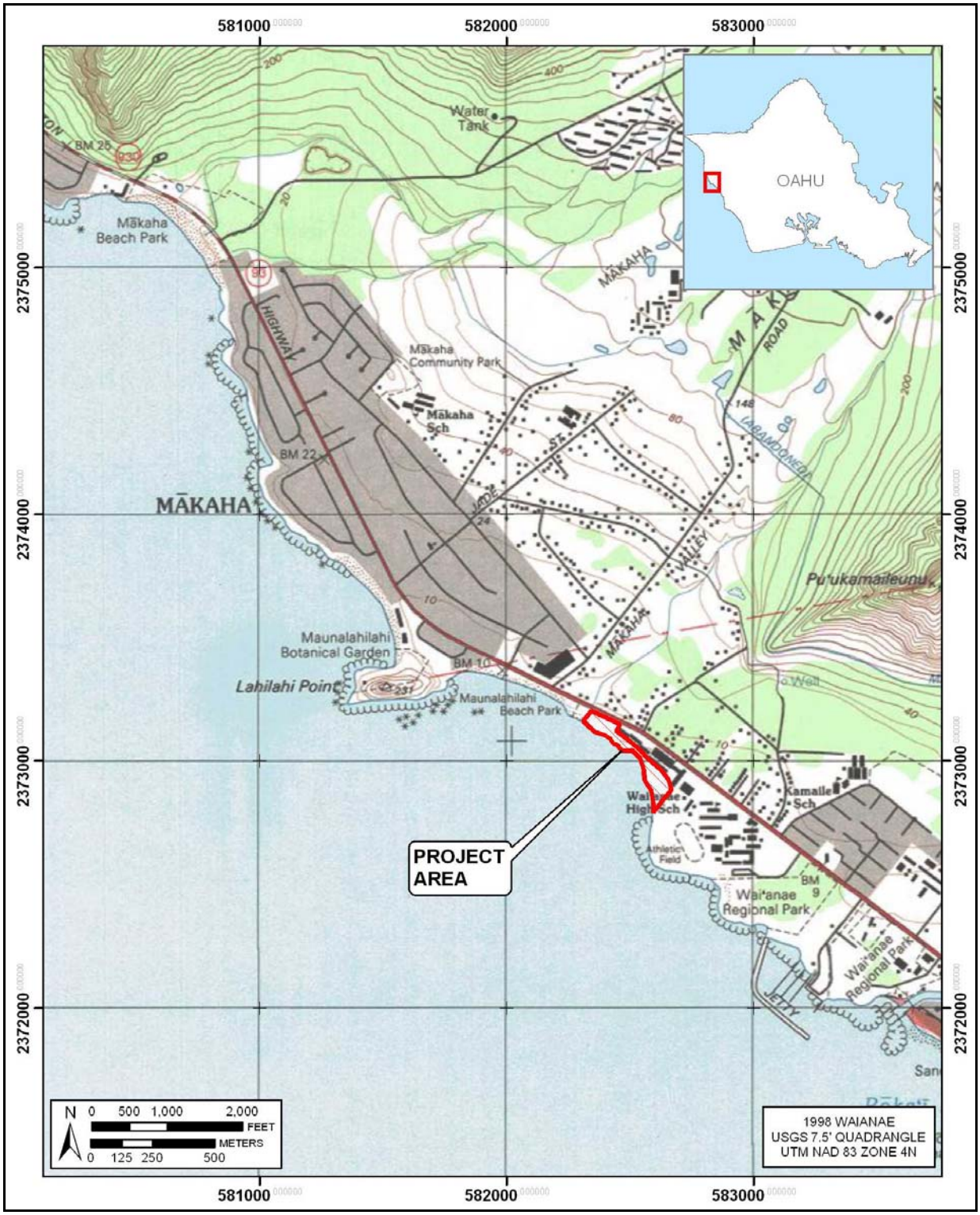

Figure 1. A portion of the USGS 7.5 minute series Wai‘anae quadrangle (1998) showing the project area.

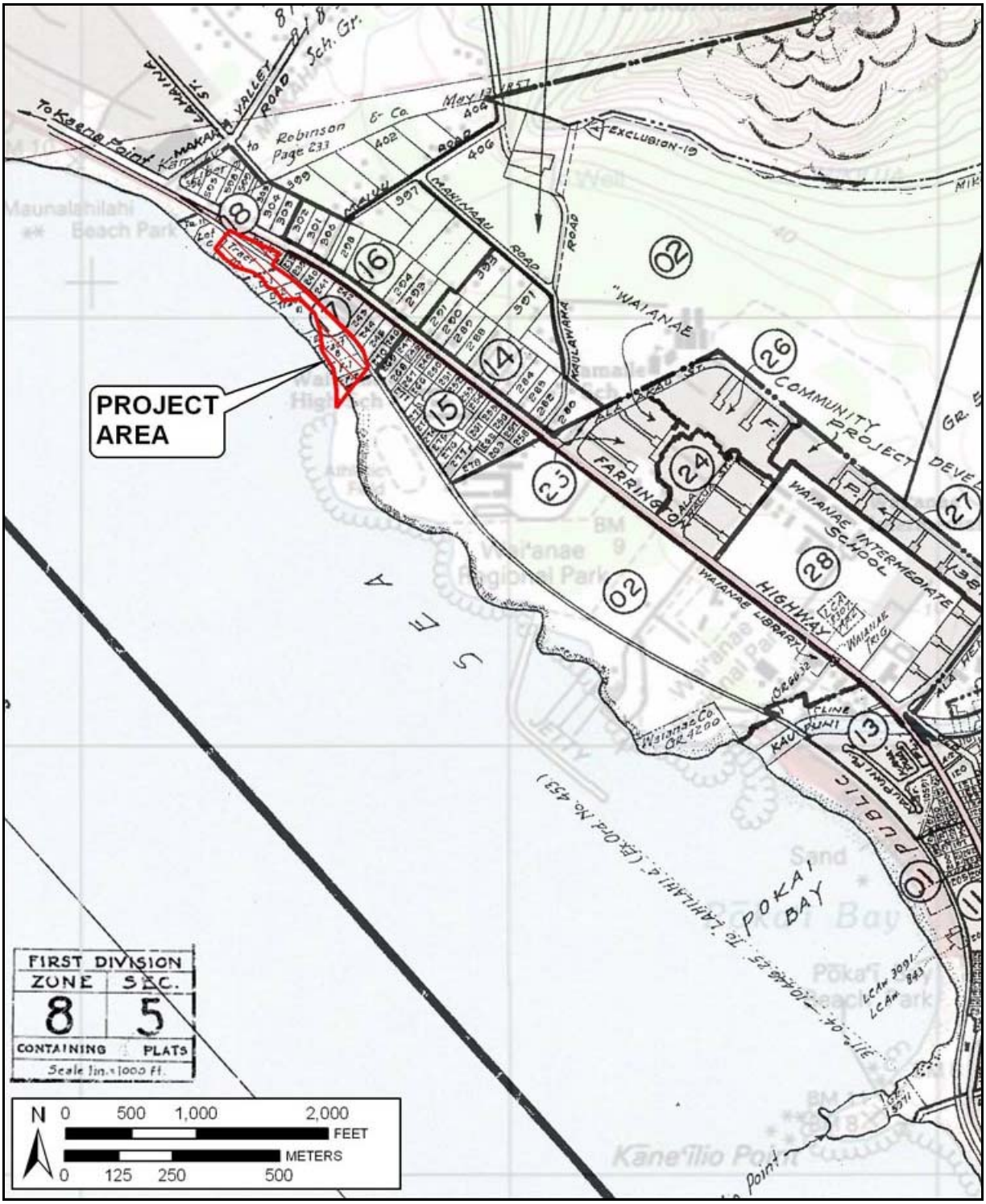

Figure 2. A portion of Tax Map Key (TMK) [1] 8-05 map showing the location of the project area. (The TMK is overlaid onto the USGS 7.5 minute series Wai‘anae quadrangle (1998) map to ensure the project area matches in both maps).

Section 2 Methods

Historic and archival research included obtaining information from the University of Hawai‘i at Mānoa Hamilton Library and the SHPD (State Historic Preservation Division) Library. Previous archaeological reports for the area were reviewed, as were historic maps and primary and secondary historical sources.

An archaeological monitor was present to observe all activities that impacted the soft sediment, including the loading and unloading of trucks, pruning of trees and all excavations in order to minimize potential impacts to subsurface deposits known or unknown.

2.1 Excavation Methodology

As part of the monitoring plan provisions, preventive construction fencing was erected prior to the beginning of construction in order to delineate the approximate extent of the cultural layer previously identified in the inventory survey (Figure 3 and Figure 4). The purpose of the fence was also to minimize any potential impact from excavation or heavy machinery to the SIHP # 50-80-07-6634 cultural layer and possible associated deposits. Due to the concern of disturbing cultural deposits (including human remains), the construction fence was erected some 10 to 40 feet (3.3 to 13 meters) *mauka* (landward) from the cultural area, as indicated in Figure 4.

Figure 3. Photograph of preventive construction fencing, view to northwest

All project excavation was done by a backhoe, using a bucket 24 inches (61cm) across. Prior to the encounter of human remains water main excavation depth was held to approximately 3ft (1m) below surface. Subsequent excavations for water lines took place at a later date after much consultation and were limited to less then 12 inches below the surface. Excavations for the new coconut trees varied in size and depth depending on the size of the tree. The larger excavations were approximately 6 feet wide by 6 feet long by 4.5 feet deep (2m by 2m by 1.5m deep).

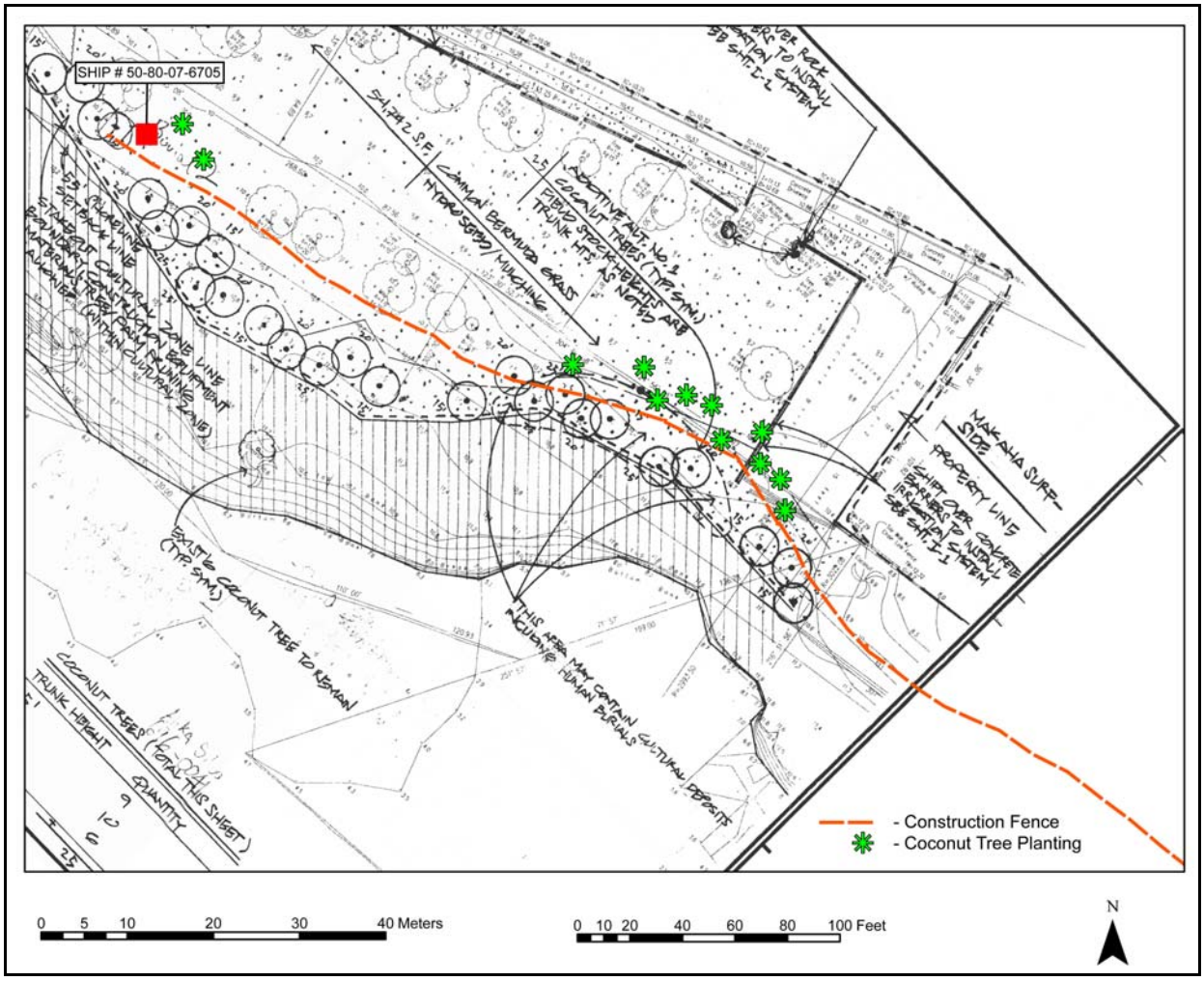

Figure 4. Portion of the site plan map showing where the construction fence and trees were scheduled to be placed as well as the location of some of the trees to be planted and the location where SIHP# 50-80-07-6705 was encountered. Note that the construction fence was erected 10-40 feet (3.3 to 13 meters) *mauka* (landward of the cultural area (the cultural area is marked with crosshatching).

2.2 Burial Encounter Methodology

Two burial sites were identified during the course of the project (these sites were designated State Inventory of Historic Places (SIHP) # 50-80-07-6704 and # 50-80-07-6705). In both

instances, when human remains were encountered during project excavations all work in the immediate vicinity was stopped so that CSH personal could notify the SHPD burials program and the contractor, and to receive directives of how to proceed from the SHPD Burials Program staff.

2.2.1 Site # 50-80-07-6704

On November 13, 2004, the day of the first burial encounter (SIHP Site # 50-80-07-6704), SHPD burials program gave verbal notification that work could proceed outside a 50 foot buffer zone of the disturbed remains. Directives for burial treatment from SHPD were to recover all the remains impacted during the excavation and to re-inter them as close to the *in-situ* remains as possible.

In order to recover as much as possible, larger blocks of the clay soil containing the remains were placed next to the *in-situ* remains. The excavated material was thoroughly inspected to collect the larger fragmentary remains from the dense clay matrix. Finally the remaining excavated material was sifted through a 1/8th- inch screen in order to ensure complete recovery.

The screened material was placed in unmarked paper bags and reinterred next to the *in-situ* remains. Small boulders were placed around and over the remains to delineate the burial and disturbed material from other backfilled material and to provide protection from future excavations (Figure 5). The excavation was backfilled to the surrounding elevation and no further work was conducted within the immediate area until further consultation with SHPD had occurred.

Figure 5. Photograph of reinterment methodology, view to west. A water worn rock was placed on top of the coral rock as a cultural marker.

2.2.2 Site # 50-80-07-6705

On November 14, 2004 a second burial (SIHP Site # 50-80-07-6705) was encountered approximately 1 meter below the surface, while excavating for a coconut palm tree. The remains had been impacted by the project, but the concentration of *in-situ* remains appeared to be disarticulated. Based on the disarticulation of the remains it appeared to the monitor as though the remains were previously disturbed but it would have required further exposure of the remains in order to determine this aspect of the burial with greater accuracy. Due to the sensitivity of the site and in consultation with SHPD, no further burial documentation was undertaken.

In order to recover as much of the remains as possible, larger blocks of the clay soil containing the remains were placed next to the *in-situ* remains. The excavated material was thoroughly inspected to collect the larger fragmentary remains from the dense clay matrix. Finally the remaining excavated material was sifted through a 1/8th-inch screen in order to ensure complete recovery.

The screened material was placed in unmarked paper bags and re-intered next to the *in-situ* remains. Small boulders were placed around and over the remains to delineate the burial and disturbed material from other backfilled material and to provide protection from future excavations. The excavation was backfilled to the surrounding elevation and no further work was conducted within the immediate area until further consultation with SHPD had occurred.

SHPD Burials program staff Nathan Napoka and Mary Carney made a site visit associated with Burial SIHP # 50-80-07-6704 and -6705 on November 15, 2004, the first work day since the burials were encountered. Mr. Alika Silva, who identified himself as a lineal descendant, also arrived for a meeting with the SHPD staff and to comment on the park improvement project. Following the meeting, SHPD staff requested that all excavations stop for the day and asked for information on the location of future excavations for the water lines. This was done so Mr. Silva could confer with his family about the location of other burials known to them that might be impacted, based on the areas of proposed excavations.

Construction activities did not resume until May 31, 2005. During the six months of work stoppage, coordination and consultation occurred between the City and County of Honolulu, SHPD, CSH and descendent representatives. Meetings and consultations continued to occur over the course of several months with one, two or all of the aforementioned parties by phone, email, letters, or in person. At some time during the duration of the stoppage an agreement was made between the City and County of Honolulu Parks Department, Mr. Silva, and Mr. Kila to limit excavations for the irrigation lines to 12 inches below surface, in order to mitigate the potential impact to other significant sites.

When work resumed in May, 2005, a CSH archaeologist was on-site for all ground-disturbance activities.

Section 3 Historical Background

The current project area is located within Wai‘anae Ahupua‘a in the district of Wai‘anae. Clues to the history of land use and activity within the ahupua‘a - and specifically within the project area - are found in preserved records - including journals, government records, scholarly studies, memoirs, archaeological studies, maps, historic photographs, and oral histories. The earliest records present glimpses of landmarks and events within the general Wai‘anae area, especially around the coastal settlement above Poka‘ī Bay; however, by the middle decades of the 19th century, it is possible to focus more precisely on the project area as documentation becomes more abundant and specific.

3.1 Pre-Contact To 1800’s

Archaeological study within the Wai‘anae district suggests that the earliest permanent habitation of the district was focused in Wai‘anae Ahupua‘a along Kaupuni Stream. In an archaeological study of Mākaha (the ahupua‘a immediately adjacent to Wai‘anae) Green (1980) proposed:

> The first settlement of the district was probably, as tradition tends to suggest, on the coast around the stream at the mouth of the Wai‘anae-kai Valley where the foreign chief from Kahiki planted the first coconut of the famous grove. That area, with its well-watered valley behind, would have been the most favored locality in the district...(Green 1980:72)

Archaeological investigations at Pōka‘ī Bay have obtained dates for occupation of the area well within the prehistoric period. During monitoring of 943 meters of sewer and waterline trenching at the Wai‘anae Army Recreation Center, five articulated human burials were recovered and a charcoal sample from the prehistoric cultural layer (Layer V) yielded a calibrated radiocarbon age of 1376 +/-50 AD (Riford 1984:14).

Hammat et al. (1985) encountered additional burials at the Wai‘anae Army Recreation Center; testing of a sample from a pit feature yielded a radiocarbon date of 1340 +/-70 AD. Hammatt notes:

> The archaeological assemblage points to the heavy use of the site as a communal area for fishing preparation, canoe launching and return. The site was the focus of beach access for the inhabitants of Wai‘anae-Kai as well as occasional informal sand burial from at least 1300 A.D. onwards. (Hammatt *et al.* 1985:i)

Shapiro and Rosendahl (1988) obtained radiocarbon dates (AD 1170-1430, 1270-1480 and 1299-1510) from three trenches in a complex of possible taro *lo‘i* at a site inland of Pōka‘ī Bay (Shapiro and Rosendahl 1988:32). The aggregate of dates suggests that permanent habitation in lower Wai‘anae Ahupua‘a, where the only perennial water sources within the *makai* portion of the district were located, was established by the latter 1100's.

The elaboration and expansion of settlement throughout the ahupua‘a during the prehistoric period is suggested by the number and variety of sites recorded during the first investigation of

Wai‘anae during the 1930s. McAllister (1933) noted sixteen sites within the ahupua‘a including ten heiau (seven of which had been destroyed), the Puehu fishpond, the Kawiwi place of refuge, and several house sites. The sites extended well mauka into lands adjacent to streams at the head of Wai‘anae Valley. McAllister recorded one burial site, Site 162, at Mauna Kuwale, which he described as:

> A small cave near the top of the peak facing Kawiwi. Contains fragments of skeletal material, but none of the objects said to have been buried with the dead. (McAllister 1933:116)

The number of heiau recorded within Wai‘anae Ahupua‘a point to its political centrality within the district and to its association with the ali‘i (royalty) during the prehistoric period. The pioneering 19th-century Hawaiian historian Samuel Kamakau recorded the oral traditions that associated some of the Wai‘anae heiau to prominent ali‘i:

> At Wai‘anae [Ka-hahana, late 18th-century O‘ahu ruling chief] restored the *heiau* of Ka-moho-ali‘i...(Kamakau 1992:134)

> Take the story of Ka-welo when he sailed for Kaua‘i to make war. He set a tabu over the *heiau* at Puehu at Wai‘anae, and at the end of the sacrifice ordered that the wood of the paehumu, both the fence and the images themselves, be used for firewood for the expedition to Kaua‘i. (Kamakau 1992:203)

The Hawaiian traditions centered on Wai‘anae further reflect the area's significance and association with the ali‘i in prehistoric times. The district is a focus in the mythological cycles of Maui, Kamapua‘a, and Kamohoali‘i. The demigod Maui and his brothers were said to have been born in Wai‘anae, and it was here that Maui learned the secret of making fire for mankind. Kamakau (1870) enumerates, among the famous locales in Wai‘anae, the cave in which Hina (moon goddess and mother of Maui) made her tapa, the fishhook, Manaia Kalani (with which Maui attempted to unite the Hawaiian islands), the snare for catching the sun (which Maui used to advantage on Haleakalā), and the place where Maui's adzes were made. The pig demi-god, Kamapua‘a, battled with the giant man-dog Kū-‘īlio-loa (after whom the heiau in Wai‘anae is named) and raised the taro patches of Wai‘anae Valley. The people caught him, tied him up, and were preparing to sacrifice him when his many supernatural bodies swept over the plains, devouring the men of Wai‘anae and sending them fleeing in terror. Pele's older and favorite brother, Kamohoali‘i, the shark god, became enamored with a maiden of the Wai‘anae coast and begot a half-man/half-shark child who devoured many people before being captured and killed.

By the time of the first contact with European expeditions during the latter 18th century, Wai‘anae Valley appeared to remain the primary locus of settlement within the Wai‘anae district. Captain George Vancouver, sailing off the southwest coast of O‘ahu in 1792, noted:

> From the commencement of the high land to the westward of Opooroah (Pu‘uloa) was...one barren rocky waste, nearly destitute of verdure, cultivation or inhabitants, with little variation all the way to the west point of the island. Not far from the south-west point is a small grove of shabby coconut trees, and along those shores are a few straggling fishermen's huts. Nearly in the middle of this

> side of the island is the only village [i.e. at Wai‘anae above Pōka‘ī Bay] we had seen westward from Opooroah. In its neighbourhood the bases of the mountains retire further from the sea-shore, and a narrow valley, presenting a fertile cultivated aspect, seems to separate and wind some distance through the hills. The shore here forms a small sandy bay. On its southern side, between the two high rocky precipices, in a grove of coconut and other trees, is situated the village, and in the center of the bay, about a mile north of the village, is a high rock (Mauna Lahilahi), remarkable for its projecting from a sandy beach...(Vancouver in Sterling and Summers 1978:67-68)

The coconut grove above Pōka‘ī Bay observed by Vancouver was not insignificant in the Hawaiian consciousness; it was recognized as the "largest and best-known coconut grove on Oahu, famed in chants and songs" (Pukui 1983:160).

The latter 18th century also saw the involvement of Wai‘anae Ahupua‘a and its population in the political changes impelled by the struggle of ali‘i from other islands for political control and conquest of O‘ahu. The Maui king Kahekili invaded O‘ahu ca. 1783, vanquishing the O‘ahu chiefs in a series of battles that culminated in Wai‘anae:

> Pupuka [an O‘ahu chief] rallied the retainers of the chiefs of Kona, ‘Ewa, Wai‘anae, Waialua, and Ko‘olau at Kawiwi, a stronghold between Wai‘anae and Mākaha, where many died of starvation or were flung over the precipice because of famine, and many perished. (Kamakau 1992:139-140)

In 1794, Ka-‘eo-kū-lani recruited the "warriors of Waialua and Wai‘anae" to make war on his nephew Ka-lani-kū-pule, then ruler of O‘ahu (Kamakau 1992:168); by December 1794 Ka‘eokūlani had been killed and his forces were defeated. Kalanikūpule would himself be deposed the following year when the invading Hawai‘i Island forces of Kamehameha prevailed at the Battle of Nu‘uanu in April 1795. Although apparently Wai‘anae was not itself the site of major conflicts associated with Kamehameha's conquest of O‘ahu, traditions record it as the refuge where large numbers of Oahuans resettled after fleeing from the Hawai‘i Island invaders.

In 1796, Kamehameha would himself come to Wai‘anae where his fleet of eighty double canoes stopped on their way to invade Kaua‘i. "The fleet went on to Wai‘anae and the war god [Kū-ka‘ili-moku] was carried ashore that evening" (Kamakau 1992:173). Kamakau records that the fleet departed Wai‘anae before midnight but Wai‘anae tradition maintains that Kamehameha remained on the coast long enough to re-dedicate two *heiau* to his war god, and that his presumption so angered the Wai‘anae gods that they sent the storm which caused the disastrous end of his Kaua‘i expedition. That setback notwithstanding, Kamehameha's ascendancy on O‘ahu in the 1790's would have immediate consequences for Wai‘anae during the decades of the next century. Additionally, the isolation of the *ahupua‘a* would not protect it from the economic and social pressures impelled by the growing presence of western missionaries, settlers and entrepreneurs on O‘ahu.

3.2 Early Historic Period

The Hawaiian Islands began exporting sandalwood to the Orient shortly after 1800 and the commerce flourished until the supply dwindled in the mid-1830's. Trade in sandalwood was the

strict monopoly of the ali‘i beginning with Kamehameha. At the height of the sandalwood boom, Kamehameha was buying foreign ships, including six vessels between 1816 and 1818, to transport his own wood to the Orient (Kuykendall 1965:87). When Kamehameha bought the schooner Columbia in 1817, it was paid for with sandalwood from Kauai and from the districts of Waimea and Wai‘anae on O‘ahu (Kuykendall 1965:88). Peter Corney, the chief officer on the Columbia, alluded to Wai‘anae's perhaps more marginal involvement in the sandalwood trade on O‘ahu. In an account of a voyage in March 1818 from Honolulu to Waimea Bay (O‘ahu) Corney reported:

> Next day we sailed for Whymea bay, on the west end of the island, to get another cargo of wood. In our passage we touched at Wyeni (Wai‘anae), and took on board some wood and hogs. We lay here for a few days, and then sailed along the shore for Whymea...where we took on board a full cargo of wood in thirty-six hours - more than 200 canoes employed in bringing it off, day and night. (Corney 1896:89-90)

After Kamehameha's death in 1819, Liholiho (Kamehameha II) allowed his chiefs to share in the sandalwood trade, resulting in an unrestrained demand on the stocks of the wood and upon the commoners who did the harvesting.

"Traders' records from Kamehameha's last years show several important ali‘i trafficking in sandalwood on their own, including...Kalaimoku, Cox, Boki, Ka‘ahumanu, and some others" (Kirch and Sahlins 1992:59). Among these ali‘i, Boki Kama‘ule‘ule was the Kamehameha chief that the monarch had made chief of Wai‘anae. Sometime before Kamehameha's death, Boki also became governor of O‘ahu. Diaries and journals of the western entrepreneurs on O‘ahu record Boki's travels to and from Wai‘anae and the unfolding of the sandalwood trade there. Don Francisco de Paula Marin, who had arrived in the islands in the 1790s, noted in his diary Boki's departure from Honolulu to Wai‘anae aboard the schooner Paula on April 18, 1820. Three days later, on April 21, Boki returned "with a cargo of taro, dogs & hogs from Guallanae [Wai‘anae]" (Gast and Conrad 1973:239). During succeeding months, until May 1822, Marin recorded four more voyages by Boki to and from Wai‘anae, presumably to procure additional goods from the Leeward coast. In December 1829 Boki sailed to the New Hebrides in search of sandalwood; Boki and his ship were lost at sea. Boki had appointed his favorite wife, Liliha, governor of O‘ahu during his absence. She continued in that position - and also retained control of Wai‘anae - after his death had been reported.

More detailed accountings of Wai‘anae's role in the sandalwood trade during the 1820s appear in the journal of Stephen Reynolds, a clerk for the Honolulu merchant William French. French had settled in Honolulu in the 1820's, becoming involved in business enterprises throughout the islands. In 1828, he was among a company of foreign residents who converted a Honolulu sugar mill into a rum distillery. Unfortunately for the investors:

> ...by this time the Queen Regent Ka‘ahumanu and most of the powerful chiefs had become Christians and had taken a strong stand in favor of temperance. A kapu was placed upon the business of making rum; the missionaries, who had the only ox-carts in the village [Honolulu], refused to allow them to be used for carrying cane to the mill; and Ka‘ahumanu caused the cane fields to be destroyed. This

> was about 1829. The foreign residents were greatly enraged and one of them, William French, afterwards accused the missionary Rev. Hiram Bingham of having made him lose $7,000 through the failure of the distillery. (Kuykendall 1965:173)

Other investments undertaken by French were more successful and by the 1830's he was a leading merchant in the islands.

Stephen Reynolds' journal suggests how haphazard was the collection of the wood. On May 10, 1824 the vessel Water-witch went to Wai‘anae; it returned to Honolulu on May 12 and, Reynolds recorded, "got no wood, nor saw any" (King 1989:29). Two months later, the Prince-Regent "sailed for Wainai after wood" and returned with "160 piculs" (King 1989:44). Reynolds' journal contain no further record of Wai‘anae sandalwood until August 5, 1827 when he noted: "Fine morn. Fine day. Black Joe came from Wainai said Teignmouth took about Four hundred pics sand'wood on board & sailed for Wainea" (King 1989:193). William French himself was in Wai‘anae in November 1827, awaiting "goods" which were shipped to him there, perhaps in payment for a stock of sandalwood (King 1989:203). On January 17, 1828 Boki "went to Wainai to weigh Sandlewood...", and later that month, on the 28th, Reynolds reported: "Hunnewell [a trader] weighing Tax wood from Wainai" (King 1989:211-212). The next month, February 1828, Reynolds recorded that Boki was in Wai‘anae and that "Capt Meek, Chinchilla went to Wainai after tax wood"; on February 26, Meek returned from Wai‘anae with "508 piculs tax wood" (King 1989:214-215). Reynolds sailed to the Leeward coast in June 1828, reporting his vessel "got 171 piculs on Board" at Makua on the 18th, but at Wai‘anae the next day:

Went ashore at daylight. Tabuiki [Kapuiki], the Head man of Wainai was in the mountains & would not come down At 10 got under weigh. (King 1989:228)

Apparently, no sandalwood was loaded at Wai‘anae. The June 19, 1828 entry is the last record in Reynolds' journal of any attempt, successful or not, to procure sandalwood at Wai‘anae. By the middle of 1828 the stands of sandalwood above the Wai‘anae coast may already have been depleted; significantly, perhaps, when Boki himself supervised "collecting Sandlewood to pay [his] Debts" in August 1828, he went to the Ko‘olaus (King 1989:234).

Already in October 1817, a Russian visitor noted on O‘ahu: "There are now many fields left uncultivated, since the natives are obliged to be cutting sandalwood" (Barratt 1988:218). By 1828, the disruptive force of the sandalwood commerce must have been extreme in Wai‘anae where the existing limited agricultural resources would have demanded strict marshalling.

During the same decades that commercial ventures were forcing changes upon the Hawaiian landscape, western missionary interests were establishing their foothold in the islands. The American Board of Commissioners for Foreign Missions, headquartered in Boston, sent its first company of missionaries to the Hawaiian Islands in 1819, leaving Boston on October 23rd aboard the brig "Thaddeus". By the 1820's, the Protestant missionaries had established close links with the ali‘i. From July to August 1826, Ka‘ahumanu and an entourage consisting of up to 300 persons conducted a proselytizing tour around O‘ahu. Rev. Hiram Bingham's account of the proceedings in Wai‘anae suggests that traditional beliefs remained strong in the district, and that its inhabitants knew how to deal with their visitors:

> ...we passed on round the promontory [Ka‘ena Point] to Waianae, the western district of Oahu, separated from the rest of the island by a range of mountains. Its valleys and plains, nearly level with the sea, are interspersed with small steep mountains. The district was called Boki's. Here we spent the third Sabbath. While there, Ka‘ahumanu spoke with concern of the stupidity of the people...
>
> A man in that region, pretending to know something about the fabled god, Kamapuaa, assuming the form of a hog, was sent for to tell us what he knew; but his efforts to enlighten us on that subject, proved the ignorance, darkness, imbecility, and confusion of the heathen mind, as did also the first efforts to lead this man into the light of Christianity. He was once asked by a native teacher, at a meeting for prayer and conference, to tell his thoughts, that it might be known how to stood in respect to the service of God. Dropping his face low towards the ground, he stretched forth his hand, holding a small stone, and said: "What is this? It is a stone, by which we cook food;" then holding up a little tinder, said: "What is this? It is tinder, by which we kindle fire." Having made some advance when we arrived and conversed with him, he said: "I have been fed with the Word of God; and Jesus Christ has given me light. I know this body of dust will soon die, but my spiritual body will continue, and it is for that I want salvation." He continued with us several days, and had opportunity to learn something infinitely above the idle stores about Kamapuaa.
>
> As we took leave of the place, the headman, Kapuiki, being personally pressed to give his heart to God without delay, said, "Such is my intention." Such personal appeals extensively and kindly made, were generally kindly received. (Bingham 1847:296-297)

Censuses taken by Protestant missionaries throughout the Hawaiian Islands beginning in 1831 provide the earliest documentation of the size of the native population after the first decades of western contact. During the first census of O‘ahu in 1831-1832, the population of the ahupua‘a within the Wai‘anae District totalled 1,868 people: 757 adult males, 695 adult females, and 416 children (Schmitt 1973:19). Four years later, in 1835-1836, the total district population had dropped to 1,654 (Schmitt 1973:9).

The Organic Acts of 1845 and 1846 initiated the process of the Mahele - the division of Hawaiian lands - which introduced private property into Hawaiian society. In 1848 the crown and the ali‘i (royalty) received their land titles. Wai‘anae Ahupua‘a was retained by the crown.

Kuleana awards for individual parcels within the ahupua‘a of the Hawaiian Islands were subsequently granted in 1850. These awards were presented to tenants - native Hawaiians, naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners - who could prove occupancy on the parcels before 1845. No parcels were claimed or awarded, according to the tax map.

3.3 Mid to Late 1800s

In October of 1819, two whale ships had anchored in the Hawaiian Islands. During the next decades, other whale ships would follow, as the islands became a victualing and layover base in the mid-Pacific. Supplies of beef, fresh and salted, were in demand; and a trade in hide and tallow developed. Following the collapse of the sandalwood trade, since the 1840's, the Hawaiian economy had been dependent primarily on supplying whale ships during their long layovers in the islands. The trade sustained the islands until the collapse of the whaling industry in the mid-1860's.

In 1851, Paul F. Manini, son of Don Francisco de Paula Marin, leased 17,000 ac. in Lualualei Valley for grazing livestock; by 1863, a missionary could report that "most of the land in the Wai‘anae District was devoted to grazing and had already been divided `into six or seven divisions; and secured to as many parties or individuals on long lease or fee simple titles'" (McGrath et al. 1973:31). The experience of the maka‘āinana in Waialua likely mirrored that of the remaining Hawaiians in Wai‘anae:

> ...the depredations of the foreigners' cattle had virtually reduced agriculture to the cultivation of wetland taro. For destruction of sweet potato fields and gardens of melons, bananas, maize, and other crops was causing the people to take these out of cultivation, and in some cases to take themselves out of Waialua. (Kirch and Sahlins 1992:149)

A missionary account in 1863 reported that only a hundred acres were in taro in Wai‘anae Valley and that the only items for sale were fish and fungus. Censuses taken during the second half of the 19th century record the diminishing population of the Wai‘anae District. In 1853 a combined total of 2,451 persons were recorded in the ‘Ewa and Wai‘anae districts; nineteen years later, in 1872, that total had dropped to 1,671. By 1890, when the districts were recorded separately, the population of Wai‘anae had been reduced to 903 (Schmitt 1977:12-13).

Part of that population of 903 in 1890 would have consisted of workers at the then twelve-year old Wai‘anae Plantation. The livestock industry in the islands had reached its peak in the 1870's. At Wai‘anae, a new venture arose to supplant ranching. In 1878, Hermann A. Widemann, a retired Hawaiian Supreme Court justice, acquired Wai‘anae Plantation, the first sugar plantation on O‘ahu. In 1879, he leased most of Wai‘anae-Kai for 25 years.

> Between 1878 and 1884 the economy and community of Wai‘anae underwent a major change, in which the former Hawaiian landscape virtually disappeared. The reason was the production of sugar. The results were the conversion beginning in 1878 of coastal and central valley garden plots and irrigation systems to large fields of sugarcane, the construction in 1880 of a plantation railway to haul the cane to the mill, and the building, in the former Hawaiian village, not only of the mill itself, but the creation of a whole town to support the processing of cane. (Green 1980:12)

Widemann hired twenty local Hawaiians, brought in 15 technicians and almost sixty Chinese laborers. He built 24 new houses in Wai‘anae Valley and a plantation manager's mansion on the site of Haua Heiau. He built a water reservoir and installed a flume system to bring water from

the reservoir to the mill. A tramway was built from the mill site to the coast where a jetty was constructed. Seven miles of track were laid to haul harvested cane to the mill. In 1880, a Chinese firm planted 122 ac. of cane in Wai‘anae and employed about 30 men. One hundred and fifty acres were planted in sugar in Mākaha Valley by A. Hastings and Company.

By 1884 Wai‘anae Sugar Company had 475 ac. under cultivation, nine miles of railroad, and 175 men employed. A map of the port of Wai‘anae (Hydrographic Office, U.S. Navy, Port Wai‘anae, 1891) based on an 1884 Hawaiian Government survey indicates that sugar cultivation had not reached the area containing the present study.

In 1890, Wai‘anae Sugar Company had 600 ac. in cultivation. On July 4, 1895 Wai‘anae's isolation was broken when a rail line from Ewa Mill reached the Wai‘anae Sugar Company track. In 1898, the railway was extended around Ka‘ena Point, linking Wai‘anae with Waialua on O‘ahu's north shore.

3.4 1900's to Present

According to Schilz (1994:23), a business directory of 1900 identified 23 taro planters in the Wai‘anae District; by the 1924 edition, only one was listed. Other Hawaiian traditions remained in practice at Wai‘anae into the first decades of the 20th century; a kama‘āina reported: "...between 1910 and 1912 there lived in the Wai‘anae area about 25 kahunas known (only) to the Hawaiians" (McGrath et al. 1973:84). However, the sugar plantation continued to dominate the landscape. A 1922 U.S. Army Corps of Engineers Fire Control Map based on a 1908-1913 survey indicates that the area containing the present study was by then planted in sugar cane; the map also indicates, within the study area, a portion of the network of stone walls and fence lines that covered Wai‘anae Valley. The stonewall shown within the study area may correspond to Site 50-80-07-5493.

In 1933 a Naval Ammunition Depot was opened on 4000 acres of land in the Lualualei Valley portion of Wai‘anae Ahupua‘a. The military bunker SIHP 50-80-07-5494 may be associated with the development of the ammunition depot facility.

During the years of World War II, the Wai‘anae area became the site of massive amphibious training operations, training more than 200,000 men. The sugar plantation never recovered after the war. On October 17, 1946, the stockholders of American Factors Ltd. (which had bought the plantation in 1931) voted to liquidate, eliminating the economic mainstay of the Wai‘anae Coast. Chinn Ho, head of Capital Investment Co., bought the nearly 10,000-acre plantation parcel for $1.25 million in 1947.

During the late 1940's, Chinn Ho was promoting the establishment of new ventures in Wai‘anae:

> By 1949, [Chinn Ho] was trying to interest dairy operators in farm lots. The manager of a large dairy company in San Francisco turned down an offer of about 450,000 acres of prime sugar land in Wai‘anae Valley because "land in Hawaii is going to be much cheaper in the future." The wife of a local dairy operator was concerned about the schools in Wai‘anae, but her husband bought the farm anyway. (McGrath *et al.* 1973:151)

Dairy operations Honolulu City and County records indicate that by the early 1950's, the Territory of Hawaii had title to the parcel comprising the major portion of the study area - TMK [1] 8-05-004:002. At the time, the parcel was leased to the Dairy Products Sales Co., Ltd. During the 1960s, title to the parcel was transferred to the Department of Hawaiian Home Lands. Beginning in the 1970's, the parcel was leased to the George Freitas Dairy Inc. which occupied the parcel into the 1990's.

Section 4 Previous Archaeological Research

4.1 Previous Archaeological Studies in the Vicinity of the Project Area

Figure 6 and Table 1 below depict previously completed archaeological investigations in the vicinity of the project area. The table includes the source of the study, location, type (nature) of study, and any important findings.

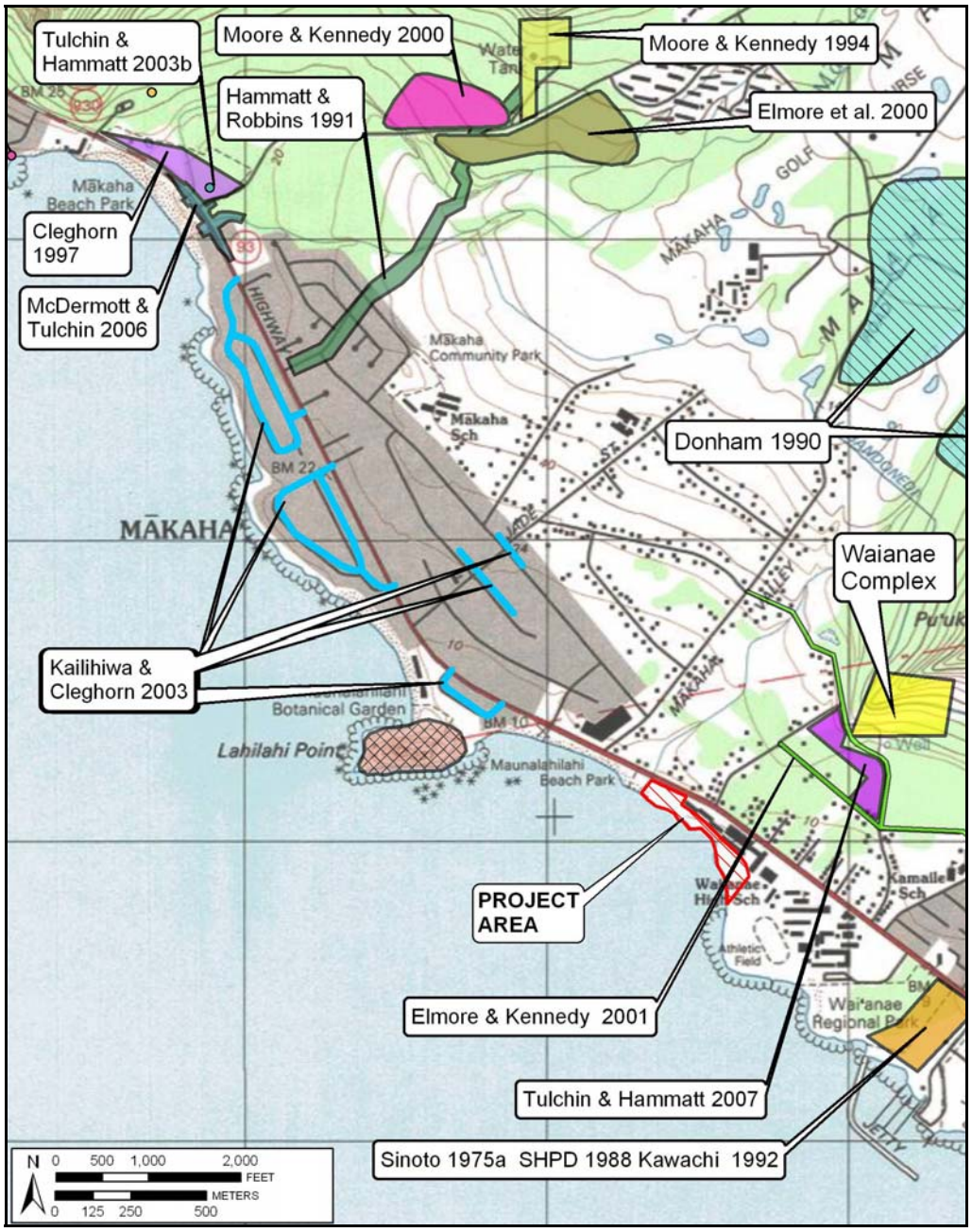

Figure 6. Previous archaeology in Wai‘anae *Ahupua‘a* near the current project area.

Table 1.Previous Archaeological Studies in the Vicinity of the Project Area

Source	Location	Nature of Study	Findings
McAllister 1933	Island-wide	Reconnaissance	Designates sites 152-168
Sinoto 1975a	Central coast	Reconnaissance Survey	Recorded 5 sites (3 enclosures, a wall & an L-shape
Kennedy 1986	Mauna Lahilahi	Archaeological Investigations	Identifies five archaeological sites.
Komori 1987	Mauna Lahilahi	Archaeological Survey & Testing	Relocates Kennedy's five sites and describes eleven more. Reports eight carbon dates.
Donham 1990	Two areas on southeast side of the valley	Archaeological Inventory Survey	Identified a terrace assoc. with dry-land ag. and/or habitation.
Kawachi 1990	Mauna Lahilahi	Burial report	Describes remains of 2+ individuals, artifacts & sites.
Hammatt & Robins 1991	Water Street/ Kili Drive Area	Archaeological Inventory Survey	Identified a linear earthen berm understood as associated with commercial sugar cane cultivation.
Kawachi 1992	84-325 Makau St., Kepuhi Point	Burial Report	1 burial? "First in this particular area".
Moore & Kennedy 1994	Northwest side of the valley, 242-foot elevation	Archaeological Investigations	No historic features were located.
Cleghorn 1997	*Mauka* of Farrington Hwy, north of Kili Drive	Archaeological Inventory Survey	A cultural layer, a pond/wetland area remains of structures associated with the O. R. & L. Railroad, and a bridge foundation .

Source	Location	Nature of Study	Findings
Elmore et al. 2000	South side of Kili Drive (Site area - 776)	Archaeological Inventory Survey	Identified three features poss. assoc. with dry-land ag. and/or habitation.
Moore & Kennedy 2000	North side of Kili Drive (Site area - 776)	Archaeological Inventory Survey	Identified two features poss. assoc. with dry-land ag.
Elmore & Kennedy 2001	Wai‘anae Coast Emergency Access Road	Archaeological Inventory Survey	Identified two historic properties: 50-80-07-5949 traditional subsurface deposit (associated with the Wai‘anae Complex) and 50-80-07-5950 historic foundations and well (associated with Wai‘anae Plantation Camp and pumping station)
Kailihiwa& Cleghorn 2003	Lower Mākaha	Archaeological Monitoring Report	Identified three sites with five features.
Tulchin and Hammatt 2003	Kili Drive and Farrington Hyw.	Archaeological Inventory Survey	No cultural resources identified.
McDermott, and Tulchin 2006	Mākaha Bridges 3 and 3A, TMK: [1] 8-4-001:012, 8-4-002:045, 47, 8-4-018:014, 122, 123, 8-4-08:018, 019, 020	Archaeological Inventory Survey	Identifies 5 historic properties: 50-80-7-6822 Mākaha Bridge 3; 50-80-7-6823 Mākaha Bridge 3A; 50-80-7-6824 Farrington Highway; 50-80-7-6825 cultural layer with human remains; 50-80-12-6714 OR&L railroad
Tulchin and Hammatt 2007	Mai‘u‘u Road and Mahinaau Road, TMK: [1] 8-5-002.	Archaeological Inventory Survey	Identifies 1 historic property: 50-80-07-6858 L-shaped structure

4.2 Burial Finds in the Vicinity of Mauna Lahilahi Beach Park

Documents relating to at least six burial finds (apparently representing 10 individuals) have been produced relating to Mauna Lahilahi Beach Park (Table 2, below).

A memorandum from Carol Kawachi of the State Historic Preservation Division, dated 2 May 1991, documented the discovery at SHPD that year of remains disinterred by the State Historic Preservation Office twelve years earlier (in October 1979). The remains were reported to be those "of a 5 ft 10 inch tall middle-aged male and a probable adult female?" (Kawachi 1991a:5). The provenance of the remains was described as the central portion of TMK 8-5-17:5, located south of the intersection of Maiu‘u Road and Farrington Highway and makai of the Makaha Surfside condominium. No other information on the circumstance of burial discovery was given but the location would be consistent with coastal erosion. While five buttons (including a porcelain button perhaps dating to 1860) and a nail were included with the remains, Kawachi noted that the historic artifacts might not have had anything to do with the burial itself. CSH was informed that these remains were re-interred with others at the Badayos family designated re-interment site within Mauna Lahilahi Beach Park.

Douglas and Pietrusewsky (1988) documented another burial discovered in the vicinity of the Makaha Surfside on December 30, 1987. A couple walking on the beach looking for shells came across what appeared to be human bones. The police report of 12/30/87 places the discovery directly behind 85-175 Farrington Highway (Makaha Surfside) and notes: "They appeared to be very old. The dirt and sand appeared to have been washed away." Douglas and Pietrusewsky (1988) concluded that the remains were those of a male of about age 48. CSH was informed that these remains were re-interred with others at the Badayos family designated re-interment site within Mauna Lahilahi Beach Park.

Kawachi (1991b) reported another burial discovery in the vicinity of the project area on February 27, 1991. The burial was reported as eroding out "24.4 m at 22 - 202 degrees south of the beach Ka‘ena corner of the [Makaha Surfside] apartment fence". A cultural layer with dark staining, charcoal and midden, 30 cm thick, was noted starting at 54 cm below surface. A shell fishhook pre-form was found in this cultural layer. The site was designated SIHP Site # 50-80-07-4064 Kawachi (1991b) noted the two previous (in 1979 and 1987) burial discoveries in the vicinity discussed above. Osteological study (Douglas 1991) concluded two individuals were present; an 8-9 year old child and a middle aged individual, probably male. These remains were re-interred with others at the Badayos family designated re-interment site within Mauna Lahilahi Beach Park.

A Memorandum (Case #505) to the SHPD files from SHPD burial sites program staff member Edward H. Ayau documents a call from Mr. Glen Kila of Koa Mana Resources/Wai‘anae High School on October 20, 1992 regarding remains found on the shoreline fronting the Makaha Surfside Apartments. Mr. Kana‘i Kapeliela picked up the remains that same day. CSH was informed that these remains were reinterred, along with other remains, at the Mākua Sinkhole Complex (“Po‘ohuna”) by the Koa Mana organization.

Table 2. Burial Finds in the Vicinity of Mauna Lahilahi Beach Park

Source	SIHP Number	Location of Find	Circumstance of Find	Sets of Remains	Reinterrment Site
Kawachi (SHPD) 1991a	50-80-07-4064	Central portion of TMK 8-5-17:5 located south of the intersection of Maiu‘u Road and Farrington Highway and seaward of the Makaha Surfside condominium.	Recovered in October 1979, the bones were stored at SHPD for 12 years before they were written up	2	Uncertain
Douglas and Pietrusewsky 1988	50-80-07-4064	Directly behind 85-175 Farrington Highway (Makaha Surfside)	December 30 1987. A couple walking on the beach came across what appeared to be human bones.	1	Badayos family re-interment area within Mauna Lahilahi Beach Park?
Kawachi, (SHPD) 1991b	50-80-07-4064	24.4 m at 22 - 202 degrees south of the beach Ka‘ena corner of the [Makaha Surfside] apartment fence	February 26, 1991, Burials eroding out of beach	2	Badayos family re-interment area within Mauna Lahilahi Beach Park.?
Ayau 1992 Memo (Case #505) to the SHPD files	50-80-07-4064	Fronting the Makaha Surfside Apartments	October 20, 1992, Reported by Glen Kila	1?	Mākua Sinkhole Complex (“Po‘ohuna”)?
Jourdane 1995	Burial #1 was designated site 50-80-07-6592-1,	Two burial sites are reported: Burial #1 was reported 40 m west of the Makaha Surfside Complex in the face of a sand bank on the western edge of a small cove and	June 1995, Found on shoreline following high surf by Alika Silva	2	Badayos family re-interment area within Mauna Lahilahi Beach Park.?

Source	SIHP Number	Location of Find	Circumstance of Find	Sets of Remains	Reinterrment Site
	Burial # 2 designated site 50-80-07-4064	Burial # 2 was at the edge of the lawn fronting the 2nd building from the Nānākuli end of the complex, 10 to 15 yards from the waters edge.			
Cordy April 7, 1997 Memo to SHPD Burial Program	50-80-07-6592-2 and 50-80-07-6592-3	SHPD Archaeologist observed burials exposed on coast	April 1997, Exposed by erosion	2	1 still in-situ, the other presumed lost to erosion
Perzinski and Hammatt 2004	50-80-07-4064	50-80-07-4064 was reported approximately 30 m west of Makaha Surfside Complex within Mauna Lahilahi Beach Park	Encountered during Inventory survey	1	Still *in-situ* within Mauna Lahilahi Beach Park

Another burial find was reported by Mr. Alika Silva in June 1995 (Jourdane 1995). Human remains were found while Mr. Silva was walking the beaches looking for burials following a period of large surf. Two burial sites are reported: Burial #1 (designated site 50-80-07-6592-1) was reported 40 m west of the Makaha Surfside Apartments in the face of a sand bank on the western edge of a small cove and Burial # 2 (designated site 50-80-07-4064) was at the edge of the lawn fronting the 2nd building from the Nānākuli end of the complex, 10 to 15 yards from the waters edge. The SHPD staff recommended relocation and the remains were disinterred in October 1995 in consultation with the Lucio Badayos family. It is understood that the remains were re-interred in the known Badayos re-interment location within the park on January 2, 1996.

Dr. Ross Cordy reported two sets of human remains (later designated site 50-80-07-6592-2 and 50-80-07-6592-3) in a memo to the Burial Program on April 7, 1997. We believe that one of these was the burial reported in the 2004 archaeological inventory survey (SIHP# 50-80-07-4064-1) and that the other was most likely lost to high surf between 1997 and 2004.

The archaeological inventory survey for the Beach Park Improvements Project included both surface survey and subsurface testing components. The archaeological inventory survey documented an intact cultural layer which contained varying concentrations of charcoal, historic and indigenous artifacts and midden. Radiocarbon dating of charcoal from the cultural layer returned dates ranging from A.D. 1430-1640, suggesting settlement of the project area by the 15th century, with occupation continuing into historic and modern times. Historic documentation of commercial agriculture and transport indicated the presence of a portion of the Oahu Railway and Land Company (OR&L) railroad passing through the project area. Along the makai side of the Makaha Surfside Condominiums a low, linear berm was observed and tested and found to contain compact, crushed coral and a railroad spike which confirmed the presence of the abandoned rail line. Four sites were identified and documented and are summarized below in Table 3.

Table 3. Historic Sites Identified During the Archaeological Inventory Survey

SIHP #	Site Type	Significance	Recommendations
50-80-07-4064	Human Burials	D, E	Preservation
50-80-07-6634	Cultural Layer	D	Preservation
50-80-07-6635	Historic Alignment	D	No further work
50-80-12-9714	O.R. & L. Railroad	D	No further work

Two sites in the project area were recommended for preservation including a previously documented burial actively eroding out of the shoreline and one adjacent probable crypt burial (50-80-07-4064: 4 and 5), as well as the intact cultural layer that runs along the southern portion of the project area (south of the drainage/existing beach park). Preservation of the human burials were recommended, though it was also suggested that the remains that are actively eroding be subjected to a burial treatment plan that would address the long term preservation and immediate concerns regarding this burial.

A Burial Treatment Plan (Hammatt & Shideler 2004) was developed and on September 17, 2004, SHPD staff CSH archaeologists and Mr. Alika Silva inspected the site to assist in identifying the location of burial 50-80-07-6592-2. No remains were visible on the surface of the location of said burial. Based on observations, the burial site area had undergone natural erosional activities (e.g. high surf) and there were no remains of this specific site to be recovered.

Section 5 Results of Fieldwork

5.1 Introduction

Cultural Surveys Hawaii Inc. was contracted to conduct archaeological monitoring on the Mauna Lahilahi Beach Park Improvements Project, which consisted of planting 100 new coconut palms as well as installing water lines for their maintenance.

According to previous archaeological studies conducted within the project area, evidence of cultural activity increased with proximity to the ocean, especially in areas with Jaucas Sand. The creation of a buffer zone kept excavations associated with the beach park's improvements closer to Farrington Hwy, limiting all construction activities to the *mauka* half of the project area (Figure 7), and away from the ocean-cut banks containing cultural evidence (see Figure 8). Despite these precautions to reduce damage to any known or unknown cultural deposits, the *mauka* construction zone revealed additional cultural deposits along with human burials.

Figure 7. Photograph of the construction fence boundary (the orange fence is visible at the left side of the image) showing the excavations contained within the *mauka* half of the project area, view to northwest.

Fieldwork was completed intermittently over the course of 8 months, from November 8, 2004 to July 14, 2005. A total of 37 days were required for on-site monitoring. All excavation was limited to the two areas marked on Figure 8. The excavations for the new coconut trees varied in size and depth depending upon the size of the tree; the larger excavations were approximately 6 feet wide by 6 feet long by 4.5 feet deep (2m by 2m by 1.5m deep). Prior to the encounter of human remains water main excavation depth was held to approximately 3ft (1m) below surface. Subsequent excavations for water lines took place at a later date after much consultation and were limited to less then 12 inches below the surface. Two human burials were encountered, noted as SIHP sites 50-80-07-6704 & -6705, on opposite ends of the park; Site -6704 on the southeast end and Site -6705 on the northwest end (see Figure 8). No other significant cultural deposits were encountered.

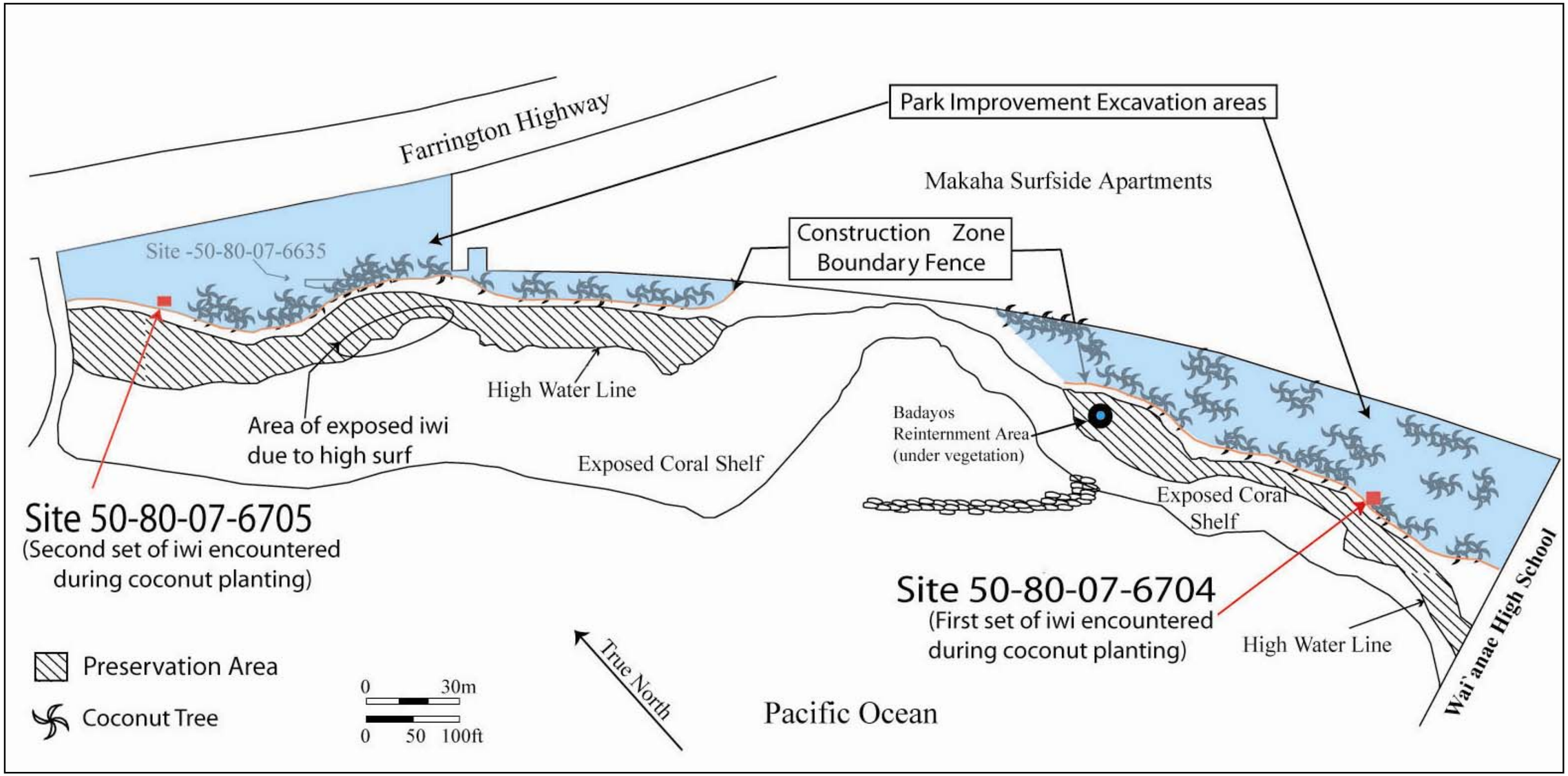

Figure 8. Map of project area showing the park improvement excavation area located *mauka* of the construction zone boundary fence, .

5.2 Stratigraphic Analysis

5.2.1 Primary Stratigraphic Sequence

This archaeological monitoring project was specific to landscaping improvements to the southern end of Mauna Lahilahi Beach Park. In accordance with the Improvement Plan the proposed park improvements (consisting of tree planting and excavations for associated irrigation) were designed to maintain a safe distance from the cultural layer along the coast, where burials and cultural deposits had previously been identified. Based on the proposed location of project excavations related to the landscaping improvements a primarily terrestrial stratigraphic sequence was anticipated.

The primary stratigraphic sequence documented throughout the project area (designated as Type A stratigraphy) (Figure 9) consisted of three layers; Stratum I, a very dark gray sandy clay characterized by the mixing of marine sediment (i.e. sand) and terrestrial sediment (dark grayish clay loam) which can be related to the wave action that routinely floods the area and to wind distribution of beach sand; Stratum II, a very dark grayish brown clay loam; and Stratum III, a very dark brown clay matrix with few inclusions as well as generally hard to very hard consistency. These observations agree with the USDA soil data for the project area and its vicinity (Foote et al. 1972).

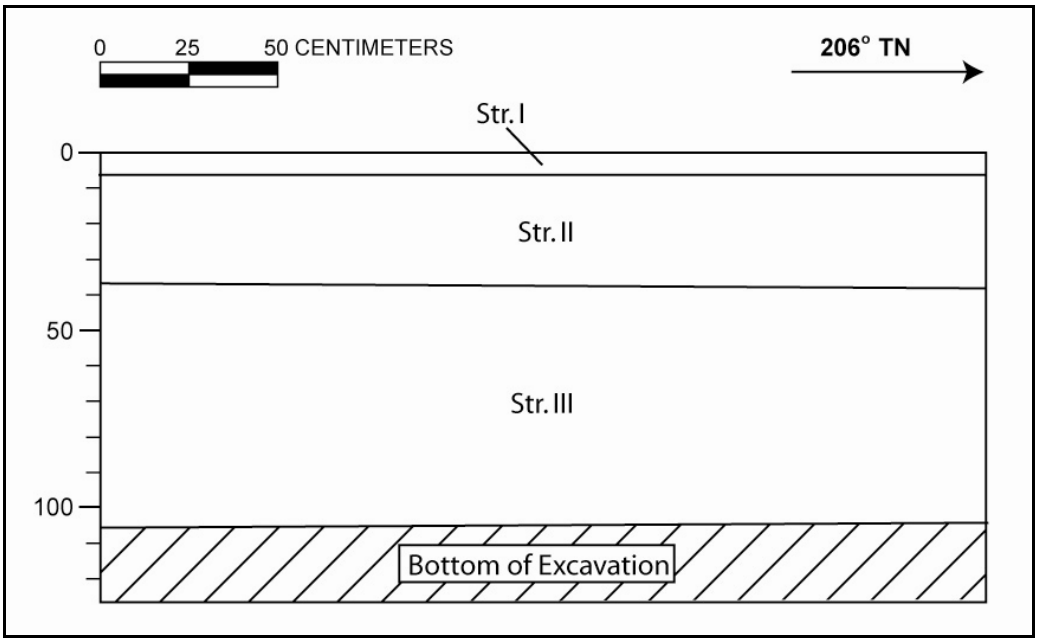

Figure 9. Representative profile of the dominant (Type A) stratigraphic sequence in the project area.

The Type A stratigraphic sequence consisted of three strata (Strata I, II and III):

Stratum I- (0-7 cmbs) 10 YR 3/1 very dark gray sandy clay; fine moderate sub-angular blocky structure; dry hard consistency; slightly plastic; a mixture of terrestrial and marine sediments; the lower boundary was smooth and abrupt.

Stratum II- (7-38 cmbs) 10 YR 3/2 Very dark grayish brown clay loam; moderate, medium blocky structure; dry hard consistency; the lower boundary was clear and smooth.

Stratum III- (38 cmbs –BOE) 10 YR 2/2 Very dark brown clay; moderate, medium block structure; dry very hard consistency; slightly plastic; no cementation.

According to the initial inventory survey, the Type A stratigraphy would probably continue to be the basic sequence throughout the proposed Park Improvements Project area (Perzinski and Hammatt, 2004) and, within isolated pockets, might contain cultural deposits.

5.2.2 Isolated Stratigraphic Sequences

Three isolated areas that differed from the Type A stratigraphic sequence were identified during the current project; these were designated as Types B, C, and D stratigraphy (see Figure 11 for the locations of these isolated areas).

The Type B stratigraphic sequence was found in the area near the newly-created swimming bay and the breakwater wall fronting the Makaha Surfside Apartments (see Figure 11) There was no evidence of naturally deposited soils in this area. The stratigraphic profile showed a single layer of imported beach sand (Stratum I) ranging from 0 – 1.2 mbs, composed entirely of imported beach sand and large sand bags from the surface to the base of excavation. These sand bags were components of a temporary revetment which was installed in 1999 to prevent beach erosion (Figure 10). Once the revetment was in place sand was imported to cover the sandbag revetment and nourish the eroded portion of the beach (Oceanit 2001). In 2003 the City and County of Honolulu Department of Design and Construction constructed a breakwater to reduce further beach erosion at this location and imported more sand to nourish the beach at this location (Jones and Hammatt 2003).

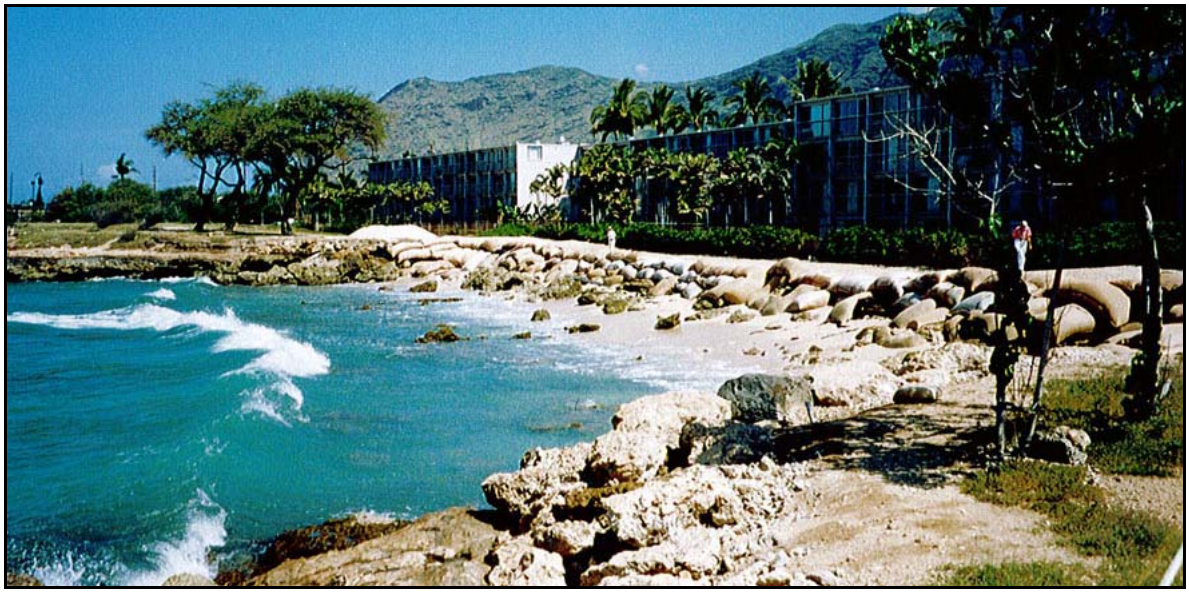

Figure 10. Photograph of the sandbag revetment installed in 1999 to stop beach erosion near the Makaha Surfside apartments, view to north.

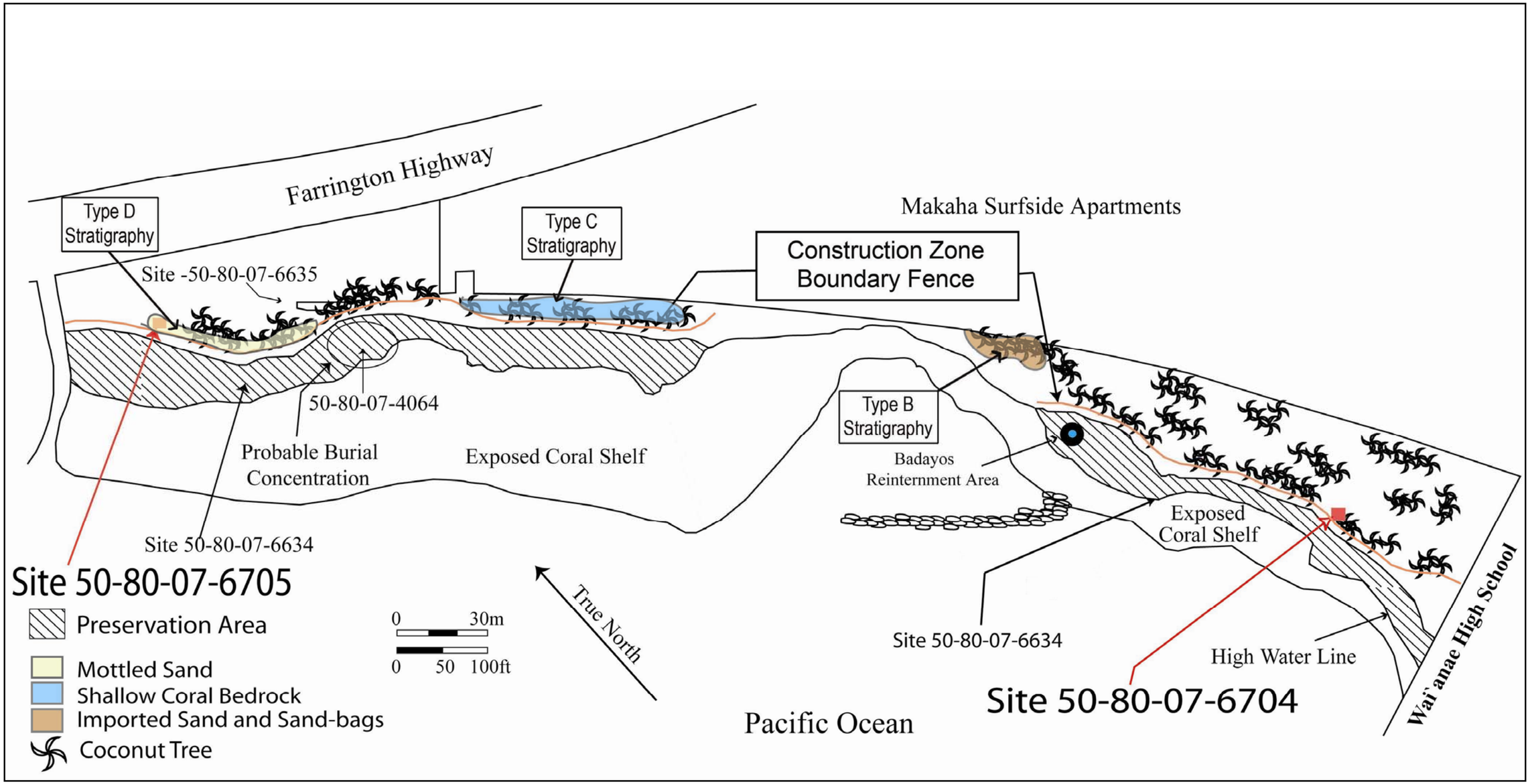

Figure 11. Map of the project area showing the three isolated areas where the stratigraphy varied from the primary (Type A) stratigraphy found throughout the excavation area.

The Type C stratigraphic sequence was found during excavations near the Makaha (North) end of the Makaha Surfside Apartments (see Figure 11) Type C stratigraphy consisted of a shallow (25-45 cmbs) soil deposit atop the hardened coral shelf. The soil deposit (Stratum I) contained sparse deposits of historic trash and gravel probably associated with the construction of the nearby Makaha Surfside Apartments. Type C consisted of a single stratum (Stratum 1):

Stratum I- (0-25 cmbs) 10 YR 5/2 Grayish brown silty sand; structureless; dry hard consistency; a mixture of terrestrial and marine sediments; the lower boundary was abrupt and smooth.

The Type D stratigraphic sequence was observed in excavations within 3 meters of the construction zone fence on the Makaha side (northwest) of the project area (see Figure 11). Type D stratigraphy consisted of mottled sand and clay layers and appeared to be a transition area between the sandy beach deposits and the clay soil found throughout the mauka portion of the project area. The Type D sequence comprised four strata designated I, II, III and IV:

Stratum I (0-10 cmbs) 2.5 YR 7/4 Pale yellow medium-grain sand; structureless with dry loose consistency; marine sediment; the lower boundary was smooth and abrupt.

Stratum II (10-50 cmbs) 10 YR 5/2 Grayish brown silty loam; structureless with dry loose consistency; a mixture of terrestrial and marine sediments, the lower boundary was abrupt and smooth. Lenses of clean beach sand and lenses of dark stained sand were identified in this layer.

Stratum III (50-90 cmbs) 10 YR 3/1 very dark gray silty clay loam, structureless with moist friable consistency; slightly plastic; terrestrial sediment; the lower boundary was smooth and abrupt. Lenses of pale brown beach sand and silty sand were identified in this layer.

Stratum IV (90 cmbs-BOE) 10 YR 3/2 Very dark grayish brown clay; weak, fine crumb structure with moist very firm consistency; plastic; terrestrial sediment. Lenses of pale brown beach sand and silty clay/sand were identified in this layer. (Burial site SIHP # 50-80-07-6705 was discovered in this stratum).

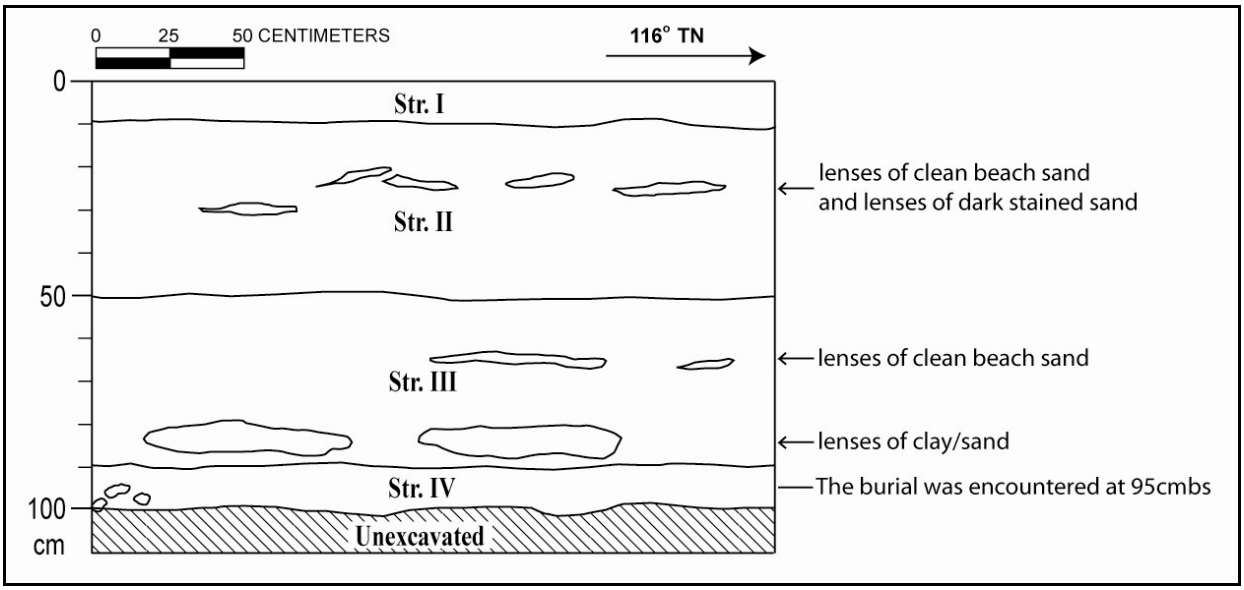

Figure 12. Profile of Type D stratigraphic sequence, from an excavation on the northwest side of the project area, near the construction zone fence.

5.3 SIHP # 50-80-07-6704

Site Type: Human Burial

Site Function: Religious/ Ceremonial

# of Features: 1

Age:Post Contact

Description:

On November 13, 2004, a human burial was encountered while excavating for a coconut palm (Figure 13) in the southern portion of the project area. Work was halted and SHPD/DLNR was notified.

Figure 13. Photograph of excavation for coconut palm where site # 50-80-07–6704 was encountered, the stones mark the location of the inadvertent burial discovery, view to west

The encountered remains were a primary burial found lying on its back in a fully extended position within a coffin. The burial was oriented roughly north/south with the head at the southern or *makai* end of the coffin (Figure 14). The burial was found with historic era artifacts including buttons, nails, and the coffin itself. Based on verbal accounts of descendants in the area the burial is definitely historic but believed to be of Hawaiian ancestry. Though the human remains were encountered at 80 cmbs, the *in-situ* coffin remains illustrated that the top of the coffin was probably closer to 70 cmbs originally but had slumped in some areas to the depth of the human remains due to decay.

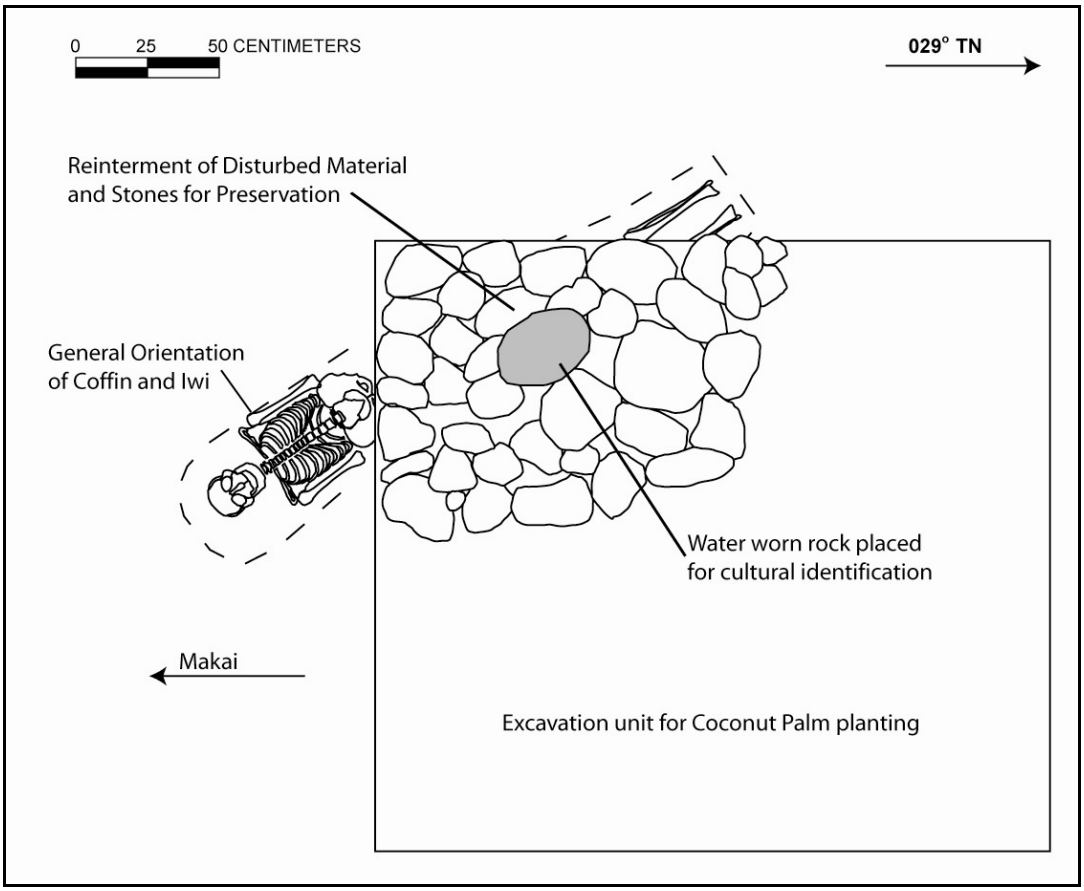

Figure 14. Plan view of SIHP 50-80-07-6704 burial encountered during project. Darkened rock illustrates water worn rock placed for cultural identification.

Site 50-80-07–6704 did not exhibit any discernible pit outline. The stratigraphy within this excavation (Figure 15) resembled the dominant (Type A) stratigraphic sequence for the project area, and consisted of three layers:

Stratum I (0-7 cmbs) 10 YR 3/1 very dark gray sandy clay, fine moderate sub-angular blocky structure; dry hard consistency; slightly plastic; a mixture of of terrestrial and marine sediments; the lower boundary was smooth and abrupt.

Stratum II (7-28 cmbs) 10 YR 3/2 Very dark grayish brown clay loam; moderate, medium blocky structure; dry hard consistency; the lower boundary was clear and smooth.

Stratum III (28 cmbs-BOE) 10 YR 2/2 Very dark brown clay; moderate, medium block structure; dry very hard consistency; slightly plastic; no cementation.

After SIHP # 50-80-07-6704 was encountered, procedures followed the methodology discussed in the section 2.2 (Burial Encounter Methodology) of this report. The site was mapped and GPS points were taken for long-term preservation. The disturbed remains were reinterred with the *in situ* portion of the burial, small boulders were placed around and over the remains to delineate the burial (see Figure 14 and Figure 5), and the excavation was backfilled to the surrounding elevation.

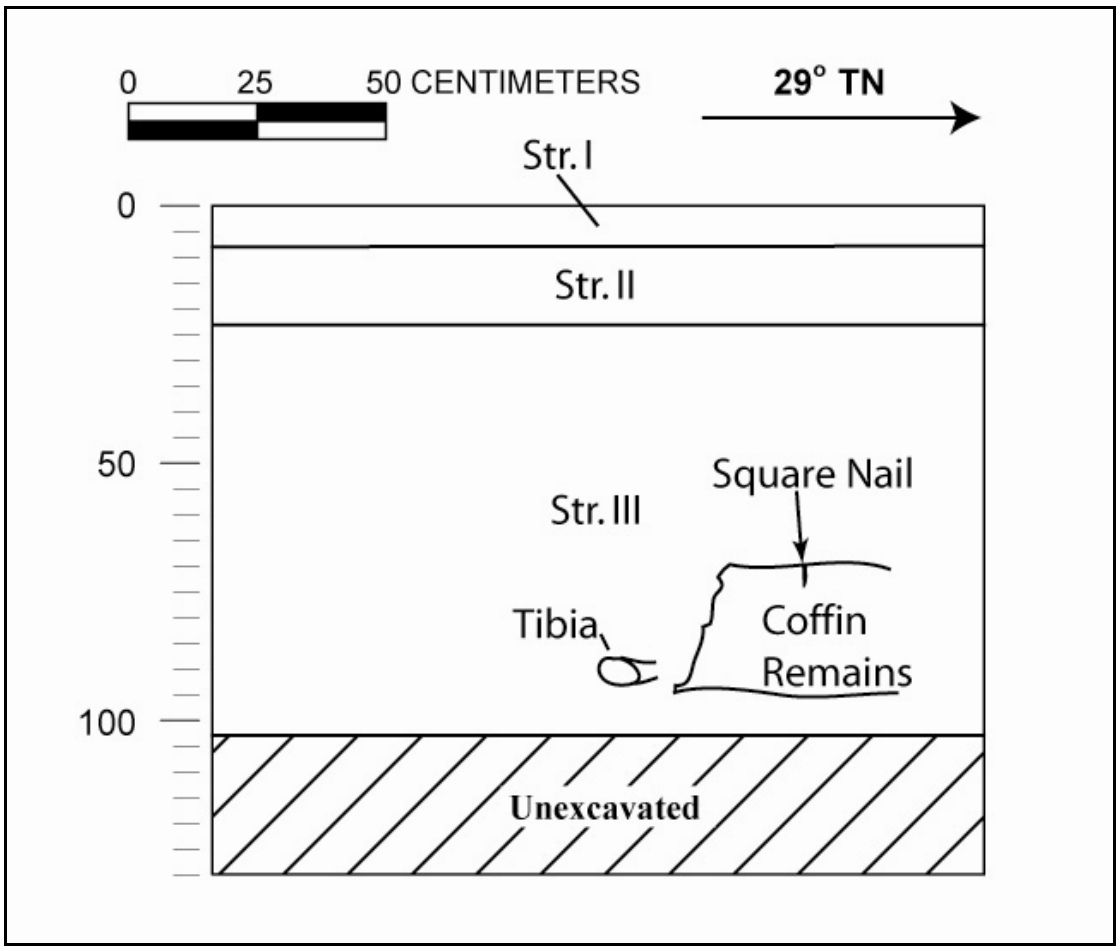

Figure 15. Stratigraphic profile of SIHP # 50-80-07-6704.

5.4 SIHP # 50-80-07-6705

Site Type: Human Burial

Site Function: Religious/ Ceremonial

# of Features: 1

Age: Pre-Contact

Description: On November 14, 2004 a second burial (designated SIHP # 50-80-07–6705) was encountered while excavating for a coconut palm tree in the northern portion of the project area(see Figure 8 and Figure 11). The remains had been impacted by the excavation but they appeared to have become disarticulated prior to their discovery (it appeared as though the remains were previously disturbed, but would have required further exposure of the remains to determine this aspect of the burial with greater accuracy). Due to the sensitivity of the site and in consultation with SHPD, no further burial documentation was undertaken. The remains were recovered following the methodology previously described in Section 2 and preserved in place (Figure 16).

The (Type D) stratigraphic sequence in the vicinity of SIHP # -6705 was unique to a relatively small portion of the project area (see Figure 11), which appeared to be an isolated area of transition between the beach sand sediments in the preservation area and the primary (Type A) stratigraphic sequence observed throughout most of the project area. A profile of the sidewall adjacent to the burial was taken in order to describe and illustrate the stratigraphic sequence in the vicinity of the burial (Figure 17). This profile does not illustrate the exact position of the burial in the profile only because the burial was located in the center of the excavation, some 25cm away from the sidewall that was recorded in Figure 17. The depth of the remains is marked on the profile for reference.

Stratigraphy in the excavation consisted of four strata (designated I, II, III and IV):

Stratum I (0-10 cmbs) 2.5 YR 7/4 Pale yellow medium grain sand; structureless; dry loose consistency; marine sediment; the lower boundary was smooth and abrupt.

Stratum II (10-50 cmbs) 10 YR 5/2 Grayish brown silty loam; structureless; dry loose consistency; a mixture of terrestrial and marine sediments, the lower boundary was abrupt and smooth. Lenses of clean beach sand and lenses of dark stained sand were identified in this layer.

Stratum III (50-90 cmbs) 10 YR 3/1 very dark gray silty clay loam, structureless; moist friable consistency; slightly plastic; terrestrial sediment; the lower boundary was smooth and abrupt. Lenses of pale brown beach sand and silty sand were identified in this layer.

Stratum IV (90cmbs-BOE) 10 YR 3/2 Very dark grayish brown clay; weak, fine crumb structure; moist very firm consistency; plastic; terrestrial sediment. Lenses of pale brown beach sand and silty clay/sand were identified in this layer. SIHP # 50-80-07-6705 was discovered in this stratum.

Based on the lack of historic artifacts, the spatial relationship to the SIHP # 50-80-07-6634 cultural layer, and accounts of lineal relationship, it is probable that the remains of SIHP # 50-80-07-6705 were pre-Contact and of native Hawaiian ancestry.

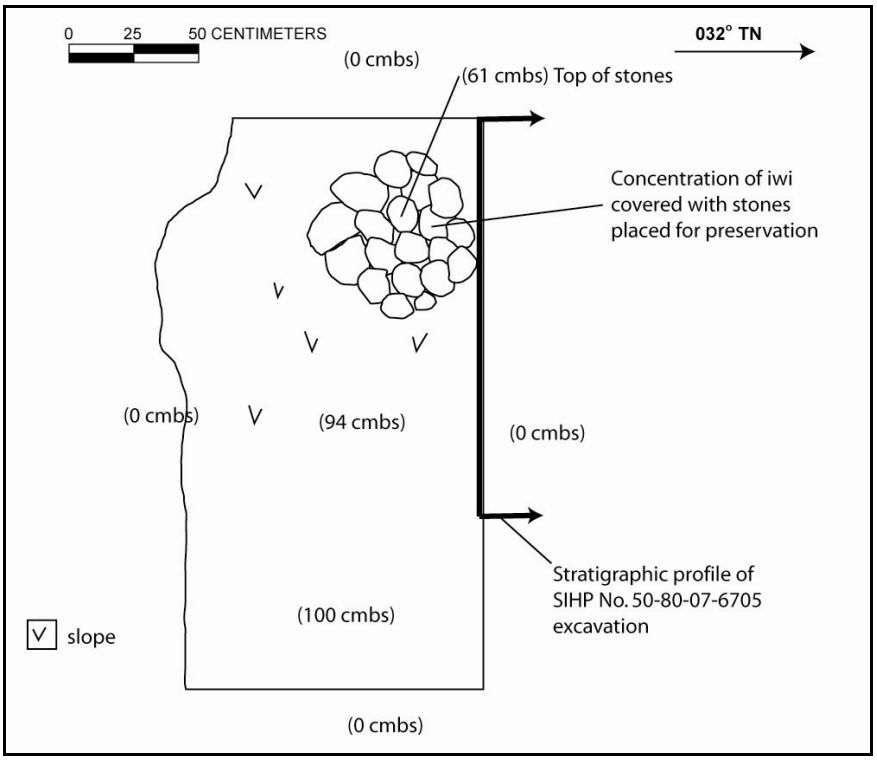

Figure 16. Plan view of Site 50-80-07-6705 showing the location of the remains and the stones placed over them for preservation purposes. The depths (measured in centimeters below the surface) at various places in the excavation and vicinity are marked in parentheses. The location and view direction of the stratigraphic profile (Figure 17) are indicated as well.

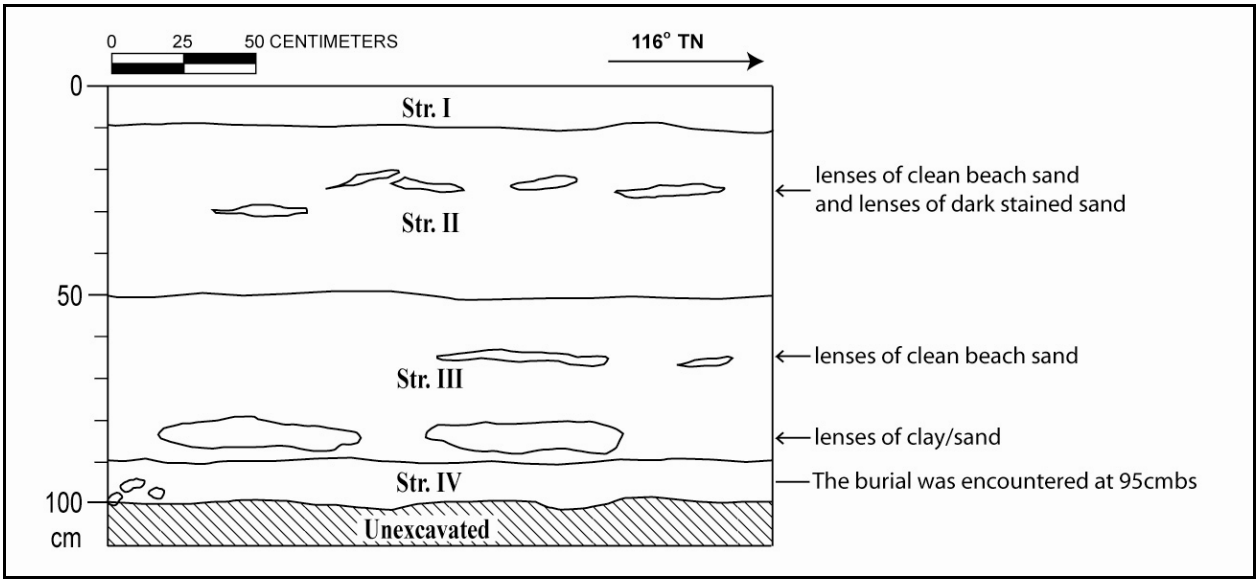

Figure 17. Stratigraphic profile of Site 50-80-07-6705 showing the stratigraphic sequence in the vicinity of Site 50-80-07-6705.

Section 6 Summary

Prior to the beginning of construction work within the project area, an archaeological inventory survey (Perzinski and Hammatt, 2004) documented a cultural layer, site 50-80-07-6634, within the sand deposits of the beach park. Human burials and isolated human bones have previously been documented within the beach park, some of which were reinterred at the Badayos site (Douglas and Pietrusewsky 1988, Kawachi 1991a and b). Therefore, preventative measures were put in place during this project to minimize the impact to significant cultural deposits, including erecting a construction zone fence line 10 to 40 feet (3.3 to 13 m) *mauka* (landward) of the edge of the cultural layer (SIHP # 50-80-07-6634).

With three isolated exceptions (described in this report as stratigraphic Types B, C, and D), the primary (Type A) stratigraphic sequence, found throughout the project area, matched the soil descriptions from the 2004 archaeological inventory survey of the project area (Perzinski & Hammatt 2004).

Two burials were discovered during excavations for the planting of coconut trees. The first burial (SIHP # 50-80-07-6704) was encountered on November 13, 2004, in the southeast portion of the project area. The burial was discovered in a layer of clay sediment with no cultural layer present. The burial was clearly historic as the remains had been interred in a coffin; accounts by descendants stated that the individual was of native Hawaiian ancestry. The second burial (SIHP # 50-80-07-6705) was encountered November 14, 2004, in the Northwest portion of the project area. Site -6705 was discovered in a layer of sandy clay sediment with no historic or pre-Contact artifacts. The stratigraphy of the area where Site -6705 was discovered appears to be a transition area between the sandy beach deposits and the clay soil found throughout the project area. Based on the spatial difference between the burials and the presence of historic artifacts associated with one of the burials (while no historic artifacts were discovered in association with the other burial), it does not appear that the remains are directly related.

Both burials encountered were left in-situ, secured and covered to surrounding elevation. No other significant cultural deposits were identified during the project excavations. Though previous archaeology has determined a greater concentration of cultural deposits within the sand deposits, the presence of burials within the project area clay deposits suggests that cultural deposits might be found anywhere within the project area.

Section 7 Significance Assessments

7.1 Introduction

According to the Hawaii Administrative Rules:

> To be considered significant a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criterion:
>
> Criterion "A"- Be associated with events that have made an important contribution to the broad patterns of our history;
>
> Criterion "B"- Be associated with the lives of persons important in our past;
>
> Criterion "C"- Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value;
>
> Criterion "D"- Have yielded, or is likely to yield, information important for research on prehistory or history; or
>
> Criterion "E"- Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts-- these associations being important to the group's history and cultural identity [Hawaii Administrative Rules 13-275-6b]

7.2 Significance

SIHP # 50-80-07-6704 is assessed as significant under criteria D and E. This site represents a human burial within a coffin. The human remains are believed to be of Native Hawaiian ancestry and have cultural value per criterion E.

SIHP # 50-80-07-6705 is assessed as significant under criteria D and E. This site represents the remains of an individual encountered during the current project. The human remains are believed to be of Native Hawaiian ancestry and have cultural value per criterion E.

7.3 Recommendation

Preservation in place and a Burial Treatment Plan are recommended for SIHP # 50-80-07-6704 and SIHP # 50-80-07-6705. Based on the stratigraphy of the current study and the presence of significant cultural properties, archaeological monitoring is recommended for any future subsurface work in the vicinity of the current project area. Numerous burials and pre-contact cultural deposits have been recorded within the current project area as well as nearby areas, it is therefore recommended that the Burial Treatment Plan accompany any monitoring plan created for future work within the area.

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