RICHARD T. BISSEN, JR.
Mayor

KATE L. K. BLYSTONE
Director

ANA LILLIS
Deputy Director

DEPARTMENT OF PLANNING
COUNTY OF MAUI
ONE MAIN PLAZA
2200 MAIN STREET, SUITE 315
WAILUKU, MAUI, HAWAIʻI 96793

September 16, 2025

Office of Planning and Sustainable Development
Environmental Review Program
235 South Beretania Street, Suite 702
Honolulu, Hawaiʻi 96813

Dear Environmental Review Program:

SUBJECT: PUBLICATION OF THE ENVIRONMENTAL ASSESSMENT TITLED ADAPTATION PATHWAY: COASTAL STABILIZATION AT 4855, 4869, & 4871 LOWER HONOAPIʻILANI ROAD, LAHAINA, MAUI, HAWAIʻI; TMKS: (2) 4-3:015:002, (2) 4-3:015:002, AND (2) 4-3:015:052

As the Approving Agency, the County of Maui Department of Planning (the Department) is in receipt of the Draft Environmental Assessment and Anticipated Finding of No significant Impact (DEA-AFONSI) titled *Adaptation Pathway: Coastal Stabilization at 4855, 4869 & 4871 Lower Honoapiʻilani Road, Lahaina, Maui Hawaiʻi*. The Department requests the publication of this DEA-AFONSI in the September 23 edition of The Environmental Notice, or the following edition.

Should you have questions or need further information please contact Jeff Overton, AICP, LEED AP at (808) 523-5866 or keonenuibay@g70.design, as the primary contact, or James Buika, Coastal Resources Planner, at (808) 270-6271 or james.buika@co.maui.hi.us, as the secondary contact.

Sincerely,

JAMES A. BUIKA
Coastal Resources Planner
Planning Department
County of Maui

K:\WP_DOCS\Planning\EA\2025\00001_CoastalStabilizationLHpiilaniRd\Environmental Notice Cover Letter 9.16.25.docx

From: dbedt.opsd.erp@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Tuesday, September 16, 2025 2:27:33 PM

Action Name

Adaptation Pathway: Coastal Stabilization at 4855, 4869 & 4871 Lower Honoapiʻilani Rd.

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (3) Propose any use within a shoreline area

Judicial district

Lahaina, Maui

Tax Map Key(s) (TMK(s))

(2) 4-3-015:002; (2) 4-3-015:003, and (2) 4-3-015:052

Action type

Applicant

Other required permits and approvals

Grading and Grubbing Permit approval from the Department of Public Works (DPW).

Discretionary consent required

1. Special Management Area Use Permit by the Maui Planning Commission, via the Department of Planning; 2. Shoreline Setback Variance approval by the Maui Planning Commission, via the Department of Planning.

Agency jurisdiction

County of Maui

Approving agency

County of Maui Planning Department

Agency contact name

James Buika

Agency contact email (for info about the action)

james.buika@co.maui.hi.us

Email address for receiving comments

keonenuibay@g70.design

Agency contact phone

(808) 270-6271

Agency address

One Main Plaza
2200 Main St, Suite 315
Wailuku, HI 96793
United States
Map It

Applicant

Walter F Hester, III; Janice Barto; Warner Lusardi

Applicant contact name

Eric Barto

Applicant contact email

ekbarto@gmail.com

Applicant contact phone

(808) 283-3452

Applicant address

4869 Lower Honoapiʻilani Road
Lahaina, HI 96761
United States
Map It

Is there a consultant for this action?

Yes

Consultant

G70

Consultant contact name

Jeffrey Overton

Consultant contact email

keonenuibay@g70.design

Consultant contact phone

(808) 523-5866

Consultant address

111 S. King St., Suite 170
HONOLULU, HI 96813
United States
Map It

Action summary

The objectives of the project are protection of the public in the nearshore waters below the bluff from catastrophic failure, protection of the nearshore water quality, and protection of the subject properties and furthermore protection of the County's Lower Honoapiʻilani Road from eventual erosion failure. The project consists of excavation of the bluff in the mauka direction, followed by the stabilization of the bluff through the application of the shotcrete reinforcing materials and the anchoring of this material to the new face of the bluff. Existing properties have faced increased coastal erosion and episodic avulsion and mass wasting of the coastal bluff, which has adversely affected these properties and threatened each of these homes over the past several years. Geotextile sandbags have previously been installed along the Hester and Barto shoreline as a temporary measure to slow erosion. However, coastal erosion has persisted, posing increased threats to public shoreline access, properties, and homes.

Reasons supporting determination

See Section 6.0.

Attached documents (signed agency letter & EA/EIS)

- Barto-Hester-SMA-2025-09-041.pdf
- EA-TRANSMITTAL-ERP-EA2025-00001_09.16.251.pdf

ADA Compliance certification (HRS §368-1.5):

The authorized individual listed below acknowledges that they retain the responsibility for ADA compliance and are knowingly submitting documents that are unlocked, searchable, and may not be in an ADA compliant format for publication. Audio files do not include transcripts, captions, or alternative descriptions. The project files will be published without further ADA compliance changes from ERP, with the following statement included below the project summary in The Environmental Notice: "If you are experiencing any ADA compliance issues with the above project, please contact (authorized individual submitting the project at email)."

Action location map

- BartoHesterTMKs1.zip

Authorized individual

Jeffrey Seastrom

Authorized individual email

keonenuibay@g70.design

Authorized individual phone

(808) 523-5866

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

Adaptation Pathway: Coastal Stabilization at 4855, 4869 & 4871 Lower Honoapiʻilani Road

DRAFT ENVIRONMENTAL ASSESSMENT,
APPLICATION FOR SPECIAL MANAGEMENT AREA USE PERMIT,
AND APPLICATION FOR SHORELINE SETBACK VARIANCE

KAHANA, ISLAND OF MAUI, HAWAIʻI

PETITIONER/APPLICANT:

Mr. Walter F Hester, III
PO Box 7900
Incline Village,
NV 89452

Ms. Janice Barto
4869 Lower
Honoapiʻilani Road
Lahaina, HI 96761

Mr. Warner Lusardi
4871 Lower
Honoapiʻilani Road
Lahaina, HI 96761

PREPARED BY:

G70
111 S. King Street, Suite 170
Honolulu, Hawaiʻi 96813

SEPTEMBER 2025

ADAPTATION PATHWAY: COASTAL STABILIZATION AT 4855, 4869 & 4871 LOWER HONOAPI‘ILANI ROAD

Kahana, Island of Maui, Hawai‘i

Tax Map Keys: (2) 4-3-015: 002, 003, and 052

Draft Environmental Assessment, Application for Special Management Area Use Permit, and Application for Shoreline Setback Variance

Applicant:

Mr. Walter F Hester, III
PO Box 7900
Incline Village,
NV 89452

Ms. Janice Barto
4869 Lower
Honoapi‘ilani Road
Lahaina, HI 96761

Mr. Warner Lusardi
4871 Lower
Honoapi‘ilani Road
Lahaina, HI 96761

Approving Agency:

County of Maui
Department of Planning
2200 Main Street
One Main Plaza, Suite 315
Wailuku, HI 96793

Prepared By:

G70
111 S. King Street, Suite 170
Honolulu, Hawai‘i 96813

This environmental document is prepared pursuant to 343, Hawai‘i Revised Statutes and Chapter 200.1 of Title 11, Administrative Rules, Department of Health, Environmental Impact Statement Rules.

SEPTEMBER 2025

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Appendices

Abbreviations

44CFR	Title 44 of the Code of Federal Regulations
AMSL	above mean sea level
BMP	Best Management Practice
CAB	Clean Air Branch
CGG	Coastal Geology Group
CIA	Cultural Impact Assessment
CMU	cement masonry unit
CRM	concrete rubble masonry
CZM	Coastal Zone Management
dBA	A-weighted decibels
DBEDT	Department of Business, Economic Development, and Tourism
DLNR	Department of Land and Natural Resources
DOE	Department of Education
DOH	Department of Health
DOT	Department of Transportation
DPW	Department of Public Works
DWS	Department of Water Supply
EA	Environmental Assessment
EPA	Environmental Protection Agency
ERP	Environmental Review Program
FEMA	Federal Emergency Management Agency
FHAT	Flood Hazard Assessment Tool
FIRM	Flood Insurance Rate Maps
FONSI	Finding of No Significant Impact
HAR	Hawaiʻi Administrative Rules
HECO	Hawaiian Electric Company
HRS	Hawaiʻi Revised Statutes
HTCO	Hawaiian Telcom
IPaC	Information for Planning and Consultation
IRHB	Indoor and Radiological Health Branch
IWS	Individual wastewater systems
KbC	Kahana Silty Clay, 7 to 15 percent slopes

LRG-LOT	LOT 11-D-1-A-1-D-1 MAUI LANI
LUC	Land Use Commission
MCPD	Maui County Planning Department
MPC	Maui Planning Commission
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NFIP	National Flood Insurance Program
OCCL	Office of Conservation and Coastal Lands
OPSD	Office of Planning and Sustainable Development
PM	particulate matter
PW	Public Works
rRS	Rough Broken and Stony Land
SAAQS	State Ambient Air Quality Standards
SHPD	State Historic Preservation Division
SMA	Special Management Area
SSV	Shoreline Setback Variance
TMK	Tax Map Key
USFWS	US Fish and Wildlife Service

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Chapter 1

Project Information

Chapter 1

Project Information

1.1 Purpose of the Request

The purpose of this Environmental Assessment (EA) is to analyze the potential impacts related to the proposed stabilization of a bluff fronting the shoreline at the makai boundary of the subject properties. This EA is submitted in support of the following application requests: 1) Special Management Area (SMA) Use Permit; and 2) Shoreline Setback Variance (SSV). Preparation of an EA is required in compliance with HRS Chapter 343, as the proposed project involves an action within the Shoreline Setback Area. In addition, the site is located within the SMA, the area of jurisdiction of the Hawaii Coastal Zone Management (CZM) program.

1.2 Project Information Summary

Type of Document:	Draft EA, Application for SMA Permit, Application for Shoreline Setback Variance.
Project Name:	Adaptation Pathway: Coastal Stabilization at 4855, 4869 & 4871 Lower Honoapiʻilani Rd.
Applicants/Landowners:	Mr. Walter F Hester, III Address: PO Box 7900 Incline Village, NV 89452 Ms. Janice Barto 4869 Lower Honoapiʻilani Road Lahaina, HI 96761 Mr. Warner Lusardi 4871 Lower Honoapiʻilani Road Lahaina, HI 96761
Agent:	G70 111 S. King St., Suite 170 Honolulu, HI 96813 Jeffrey Overton, AICP, Principal
Approving Agency:	Maui Planning Commission c/o Department of Planning, County of Maui 250 South High Street Wailuku, Maui, Hawaii 96793 Ms. Kate Blystone, Director (808) 270 7735

EA Trigger:	Development in the Shoreline Setback Area
Project Location:	4855, 4869, and 4871 Lower Honoapi‘ilani Rd. Lahaina, Maui, Hawaii
Tax Map Keys (TMK):	(2) 4-3-015:002, 003, and 052 (*Figure 1-1)*
Project Area:	1.16 acres (50,495 square feet)
State Land Use District:	Urban (*Figure 1-2)*
Special Management Area:	Within SMA (*Figure 1-3*)
County of Maui Zoning:	R-3 Residential (*Figure 1-4)*
West Maui Community Plan:	Residential (*Figure 1-5)*
Flood Zone:	X (*Figure 1-6)*
Anticipated Determination:	Finding of No Significant Impact (FONSI)
Consultants:	G70 111 S. King St, Ste 170 Honolulu, Hawaii 96813 Phone: (808) 242-1955 Contact: Jeffrey Overton, AICP, Principal **Coastal Engineer** Sea Engineering, Inc. 863 N Nimitz Hwy Honolulu, HI 96817 Phone: (808) 536-3603 Contact: Chris Conger **Structural Engineer** Kai Hawaii 50 S. Beretania St. C-119C Honolulu, HI 96813 Phone: (808) 533-2210 Contact: Ken Hayashida, P.E.

1.3 Project Area

The project area is located along Keonenui Bay in the Kahana area of the island of Maui. The project consists of three parcels at 4855, 4869 & 4871 Lower Honoapi‘ilani Road (*Figure 1-1*).

Figure 1-1 **Project Location Map with TMKs**

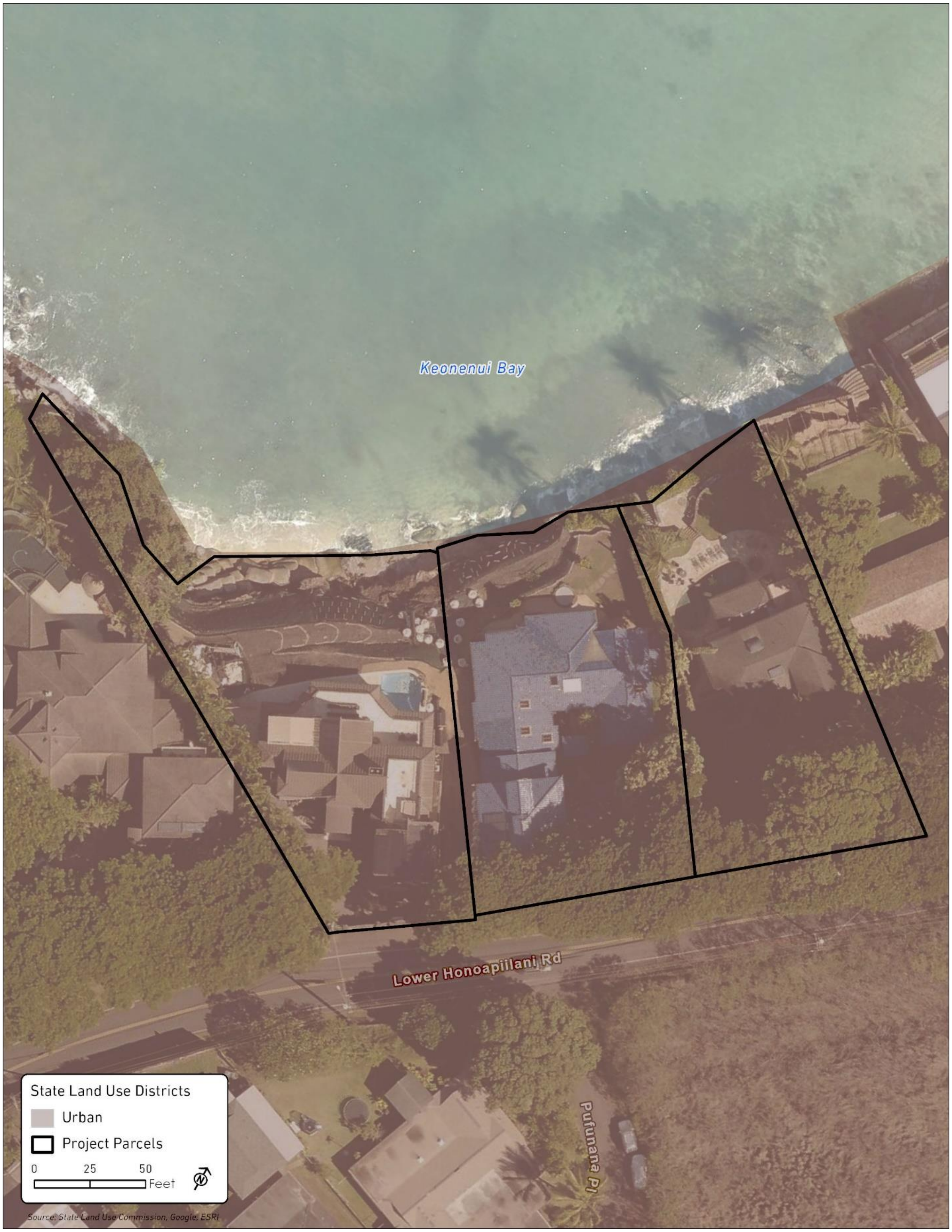


Figure 1-2 **State Land Use District**

Figure 1-3 **SMA Map**

Figure 1-4 **County Zoning Map**

Figure 1-5 **West Maui Community Plan Map**

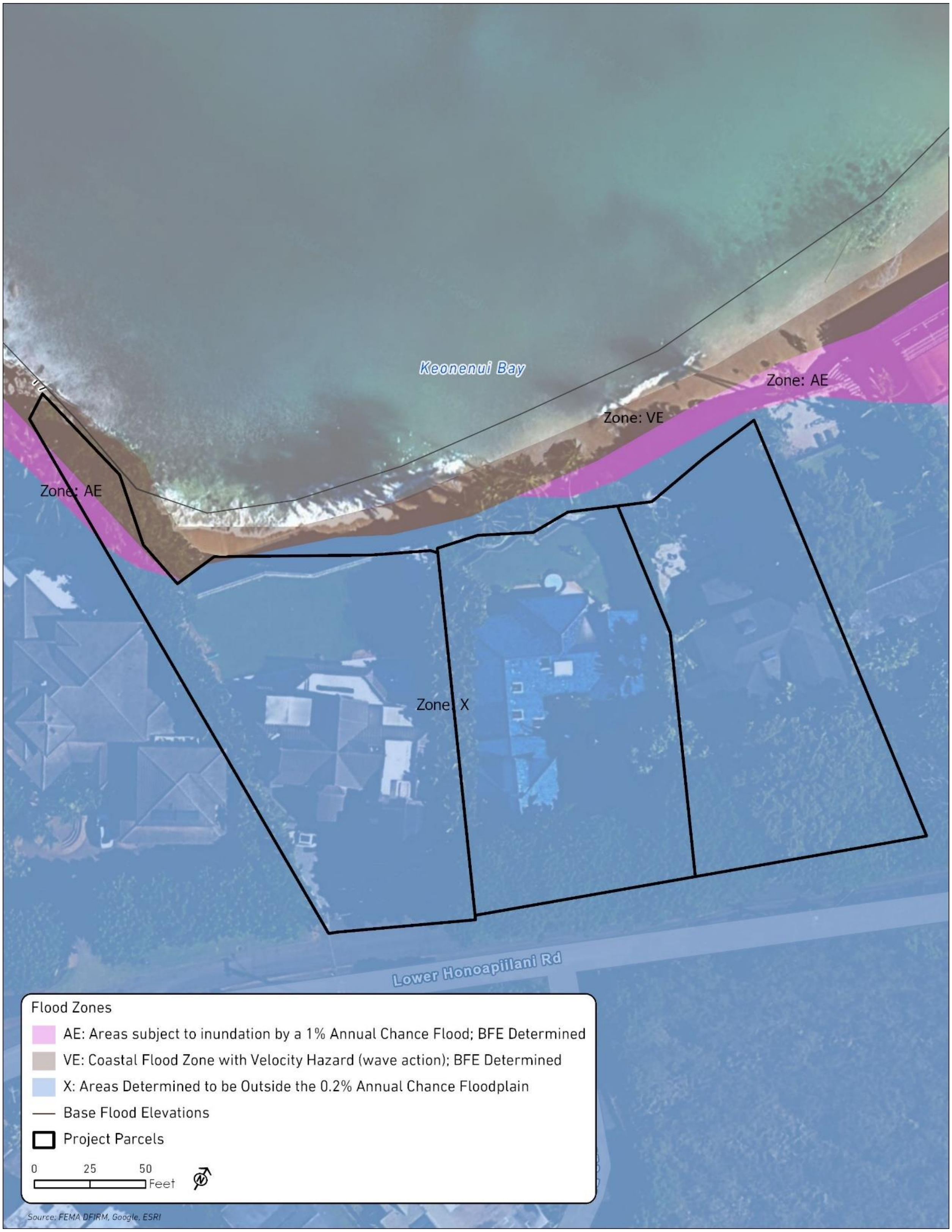


Figure 1-6 **Flood Zones**

1.4 Overview of the Proposed Project

The Coastal Stabilization at 4855, 4869 & 4871 Lower Honoapi‘ilani Road consists of a planned shoreline stabilization project in West Maui. These properties are located on Keonenui Bay with a history of chronic shoreline erosion and episodic avulsion. Currently, there is a steep and unstable slope along the makai edge of the subject properties. Mass wasting events on the face of the erosional slope present an ongoing public safety risk for individuals transiting the shoreline area, and ongoing risk to the stability of the homes and inhabitants on the upper slope. The owners are planning the stabilization of this shoreline bluff with no work planned makai of the shoreline.

The proposed project adopts a phased adaptation pathway in response to sea level rise and evolving coastal conditions. Adaptation pathways encompass a spectrum of strategies, including resistance, accommodation, avoidance, managed retreat, and proactive advancement (see *Figure 1-7*). Effective adaptation to sea level rise necessitates a comprehensive framework that safeguards critical infrastructure, maintains recreational access, and supports the resilience of shoreline communities.

Adaptation strategies are typically categorized into near-term (10–20 years) and long-term (100+ years) time horizons, each governed by distinct triggers and decision-making processes. Critical public facilities often require a long-range, practical evaluation framework, while coastal parks and residential areas benefit from flexible, short- to mid-term strategies that allow for iterative adjustments based on evolving conditions (*Figure 1-8*).

The proposed design integrates a vegetated, terraced profile set landward of the existing shoreline, coupled with targeted stabilization of the existing coastal bluff. This combined approach enables a resilient, incremental adaptation strategy that protects existing residential structures and preserves the County’s Lower Honoapi‘ilani Road from future erosion, avulsion, and storm damage.

1.5 Purpose of the Environmental Assessment

In accordance with the requirements of Chapter 343, Hawai‘i Revised Statutes (HRS), an EA is being prepared. This Draft EA will be published in the Office of Environmental Quality Control Environmental Notice, which will commence a 30-day public review period.

This EA is presented in eight sections and includes the following: a detailed summary and project description; a list of necessary approvals; a description of the environmental setting; a discussion on potential impacts and proposed mitigating measures on identified natural, cultural, and socioeconomic resources as well as existing infrastructure; a description of alternatives; a discussion of the project’s relationship to State and County land use plans and policies; findings supporting the anticipated determination; a list of references used in developing the EA; and a list of agencies, organizations, and individuals that participated in the pre-consultation phase of the EA.

After the 30-day review period of the Draft EA has concluded, public comments received will be considered and addressed to the extent feasible within the project scope and evaluation. A Final EA is prepared, highlighting key areas of the document that were revised, updated, or modified based upon information received during the public comment period. Upon acceptance of the Final EA, a Finding of No Significant Impact (FONSI) is anticipated.

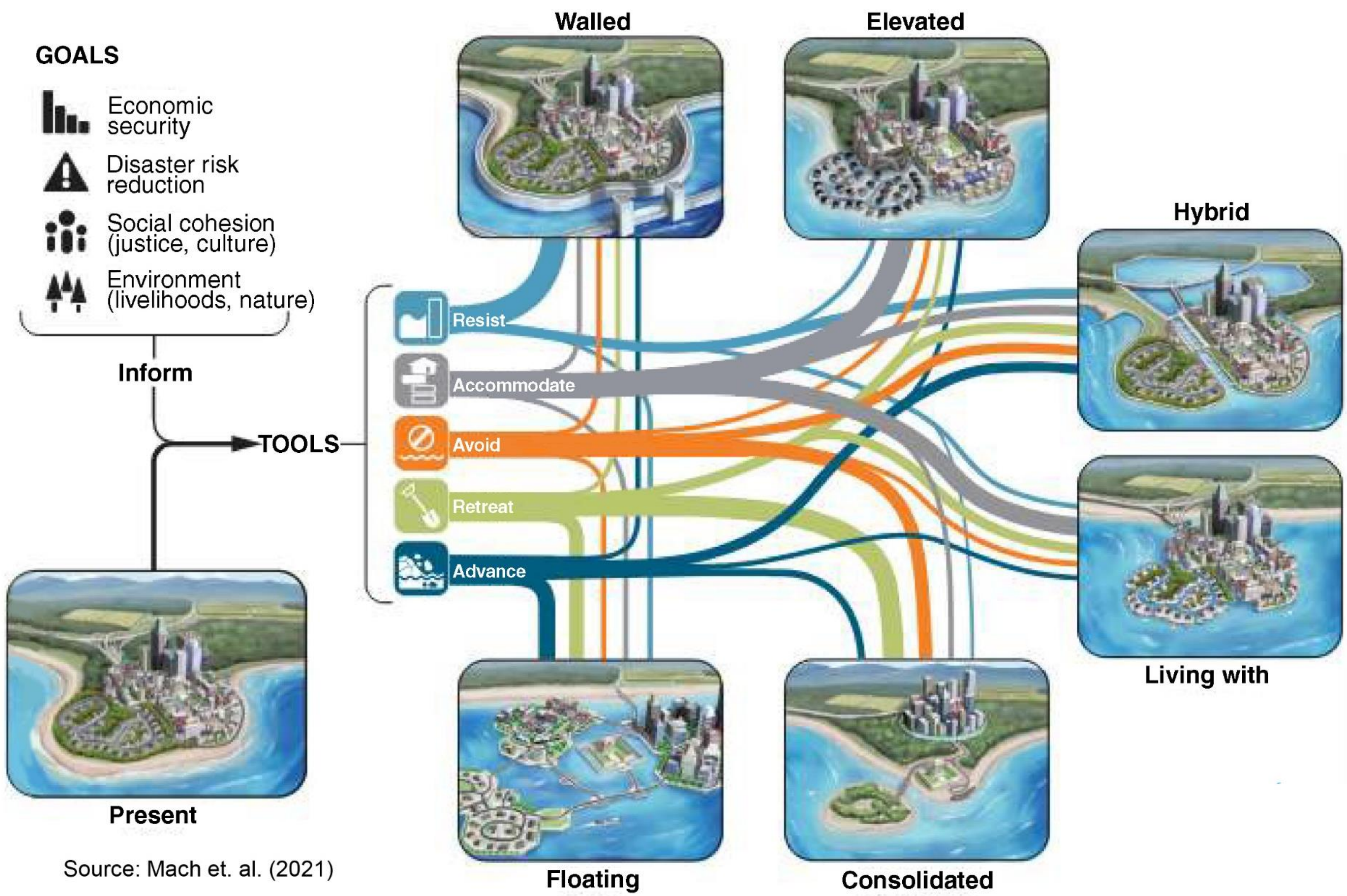
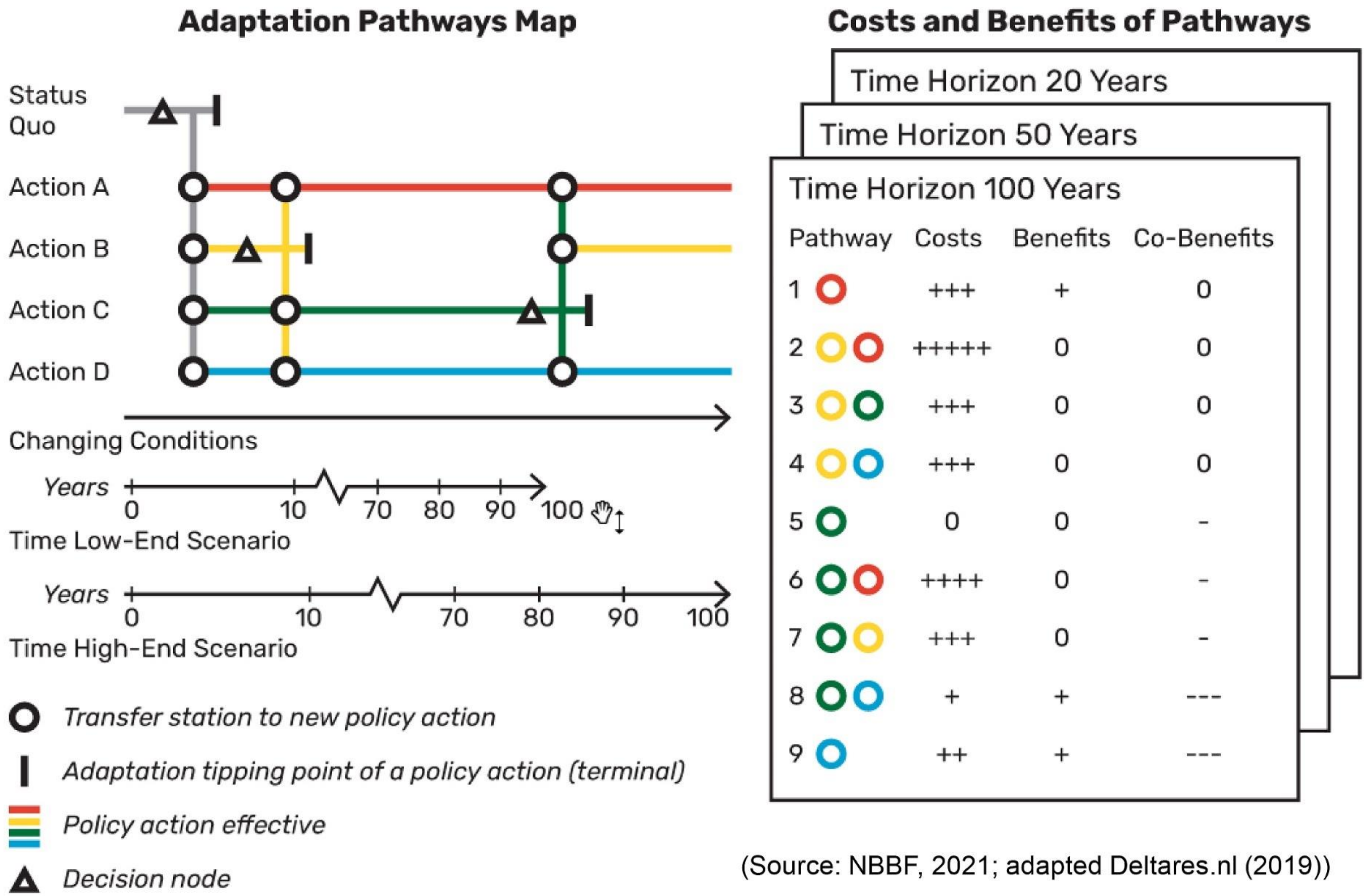


Figure 1-7 **Adaptation Strategies**



(Source: NBBF, 2021; adapted Deltares.nl (2019))

Figure 1-8 **Adaptation Pathways, Timing, Costs vs Benefits**

1.6 Permits and Approvals Required

Several other approvals will be required from the State of Hawaiʻi and County of Maui to implement the proposed action, some of which will include:

1. Grading and Grubbing Permit approval from the Department of Public Works (DPW).
2. Special Management Area Use Permit by the Maui Planning Commission, via the Department of Planning.
3. Shoreline Setback Variance approval by the Maui Planning Commission, via the Department of Planning.

Table 1-1 List of Required Government Permits and Approvals

Permit or Approval	Approving Authority
Special Management Area Use Permit	Maui County Planning Department (MCPD) Maui Planning Commission (MPC)
Shoreline Setback Variance	MCPD, MPC
Building Permits	MCPD – Public Works (PW), MPC
Grading, Grubbing, Trenching and Stockpiling Permits	MCPDPW, MPC

1.7 Agencies, Organizations and Individuals Contacted During the Pre-Consultation Process

An early consultation letter was sent June 21, 2024, to initiate the environmental review process. A list of agencies and other parties that were presented notice of the proposed project or were contacted during the pre-consultation period of the EA is provided in *Chapter 8* of this EA. Input from the pre-consultation phase is addressed in this EA. Additionally, a list of agencies that were provided an opportunity to review the Draft EA is provided in *Chapter 8*. Copies of the Pre-consultation Memo, Participant Letter, agency comment letters on the Draft EA, and response letters sent to agencies, are included in *Appendix D*.

Chapter 2

Description of the Project

Chapter 2

Description of the Project

2.1 Project Location and Characteristics

The subject properties are located at 4855, 4869, and 4871 Lower Honoapi‘ilani Road, Kahana, Lahaina District, Island of Maui, Hawaii, Tax Map Keys (2) 4-3-015:002, 003, and 052 (See *Figure 1-1*). Kahana is located in West Maui, on the northwest coast, approximately 7 miles north of former Lahaina Town and approximately 1.5 miles south of Kapalua. The project site is positioned along Keonenui Bay, between Haukoe and Alaeloa Points, in an area collectively referred to as Alaeloa. Access to the residences is via Lower Honoapi‘ilani Road.

The 0.44 acre, 0.37 acre, and 0.34 acre (1.08 acre total, approximately 47,045 square feet) parcels are located at the extreme southwest end of Keonenui Bay and vary in trapezoidal shape form. The properties are situated on a bluff overlooking Keonenui Bay, ranging in elevation from approximately 20 to 25 feet above mean sea level (AMSL) at the top of the bluff to approximately 38 feet at the mauka boundary with Lower Honoapi‘ilani Road. The bluff is composed of an upper and a lower soil unit. The lower unit is a semi-lithified conglomerate that is hard but still erodible. The upper unit is a clay-rich alluvial deposit. The erosion of the lower conglomerate unit is caused by wave action at the base of the bluff, and also by sloughing of the overlying clay substrate. The bluff has been progressively eroding due to coastal forces.

2.1.1 Existing On-Site Land Uses

The project is located within existing single-family home properties. Each parcel contains an existing single-family home, which are currently being threatened by active shoreline erosion. Previous shoreline collapses have occurred on site, including an incident in 2003 documented in *Figure 2-1*, and avulsion and undermining as shown in *Figures 2-2 and 2-3*. Site photographs of existing conditions are shown in *Figures 2-4 and 2-5.*

2.1.2 Adjacent Land Uses

Land uses adjacent to the project site include residential areas immediately to the north and south, with the Kahana Sunset residences located north of the project site, and Lower Honoapi‘ilani Road located to the east of the properties.

2.2 Description of Project

The project will reinforce the existing bluff fronting the three subject properties along the shoreline. The total length of the reinforcement work is approximately 270 linear feet. The work will be located mauka of the certified shoreline boundary. The three landowners joined to plan, design, and construct this reinforcement that would work as a single continuous feature.

Fortification of the lower conglomerate unit with Shotcrete would be coupled with a bench(es) in between the fortified unit and upper retain wall(s). Shotcrete (gunite) is concrete or mortar conveyed through a hose and pneumatically projected at high velocity onto a surface. It is typically reinforced by conventional steel rods, steel mesh, or fibers. Installation would include excavation down to hard-bottom and then applying shotcrete to the face of the existing semi-lithified conglomerate, up to about 14 feet MSL. The shotcrete would be anchored back into the semi-lithified conglomerate, with materials such as anchoring pins. Key design elements are excavation and application of reinforcing materials starting at hard substrate. Extending the slope fortification to this depth mitigates water intrusion, which is tied to the progressive erosion of the conglomerate. A structural engineer will oversee the installation.

By breaking the vertical face of the bluff into two or more sections, the risks associated with a large vertical structure along the shoreline are reduced. Terraces or benches would separate the sections of the fortification. One concept is a bench extending from the base of the upper landside retaining wall to the crest of the fortified conglomerate unit. The bench could be vegetated to soften the visual impact and mitigate storm runoff. See the concept presented in Figure 2-3.

2.3 Utilities and Infrastructure

Overall existing conditions, impacts, and mitigation measures for utilities are discussed in *Chapter 3.0* of this document. Existing vehicular access to the project site is from the two-lane Lower Honoapiʻilani Road. The subject property has water supply (DWS), electricity (HECO), communications (telcom, cable), and solid waste collection services. The project is served by the County's wastewater system. There will be no additions or changes to utilities and infrastructure.

2.4 Construction Characteristics

The reinforcement work will be installed inland of the certified shoreline for each property. Fortification of the lower conglomerate unit with Shotcrete would be coupled with a bench(es) in between the fortified unit and upper retain wall(s) (see Figures 2-4, 2-5, and 2-6). Shotcrete (gunite) is concrete or mortar conveyed through a hose and pneumatically projected at high velocity onto a fixed surface. It is typically reinforced by conventional steel rods, steel mesh, or fibers. Installation involves excavation down to hard substrate and then application of Shotcrete to the face of the existing semi-lithified conglomerate to a height of approximately 14 feet MSL. The Shotcrete will be anchored into the semi-lithified conglomerate with materials such as anchoring pins. A key design element is excavation and application of reinforcing materials starting at hard substrate. Extending the slope fortification to this depth mitigates water intrusion from the progressive erosion of the conglomerate. A structural engineer will oversee the installation.

The reinforcement project will divide the vertical face of the bluff into two or more sections, to reduce the risks associated with a large (approximately 20-25 foot) vertical structure positioned near the shoreline. Terraces or benches are planned to separate the sections of the fortification. One concept is a bench extending from the base of the upper landside retaining wall to the crest of the fortified conglomerate unit. The bench may be vegetated to soften the visual impact. The bench will also mitigate storm runoff.

Construction materials and equipment will be stored where access and lay down area is best available on the adjoining parcels. Construction will require very limited vegetation clearing and grubbing. There will be minor grading and excavation (cut and fill), and general construction.

Construction activity hours will be from 7:00 am to 6:00 pm. Construction will adhere to applicable noise regulations as per Title 11, Chapter 46, of the Hawaiʻi Administrative Rules. Typical construction vehicles will be used on the jobsite for the development of the project. These may include front-end loader, dump truck, and flatbed delivery trucks. As necessary, a permit will be obtained from DOT Highways for transport of light trucks, backhoe, oversize equipment and overweight loads.

Nearshore ocean water quality in the project vicinity will be protected by the implementation of Best Management Practices (BMPs) during the construction of the revetment. To minimize temporary effects of suspended sediments in nearshore waters, a floating silt curtain will be deployed along the seaward edge of the construction segment.

2.5 Summary of Projected Costs

The construction cost for the bluff stabilization project is estimated at approximately $2.0 to 4.0 M.

2.6 Reasons Justifying the Request

The project is intended to protect the public, the nearshore waters, and existing properties from increased coastal avulsion and mass wasting of the coastal bluff, which has adversely affected these properties and threatened each of these homes over the past several years. Geotextile sandbags have previously been installed along the Hester and Barto shoreline as a temporary measure to slow erosion. However, coastal avulsion has persisted, posing increased threats. The objectives of the project are protection of the public in the nearshore waters below the bluff from catastrophic failure, protection of the nearshore water quality, and protection of the subject properties and furthermore protection of the County's Lower Honoapiʻilani Road from eventual erosion failure.

Figure 2-1 **Shoreline Bluff Collapse Photos from February 2003 (Photo courtesy of Rory Frampton, 2003)**

Figure 2-2 **Shoreline Undermining**
(Photo courtesy of Carter Barto, 2024)

Figure 2-3 **Shoreline Undermining**
(Photo courtesy of Carter Barto, 2024)

Figure 2-4 **Current Condition of Shoreline Fronting Project Parcels (Photo courtesy of Eric Barto, 2024)**

Figure 2-5 **Current Condition of Shoreline Fronting Project Parcels (Photo courtesy of Eric Barto, 2024)**

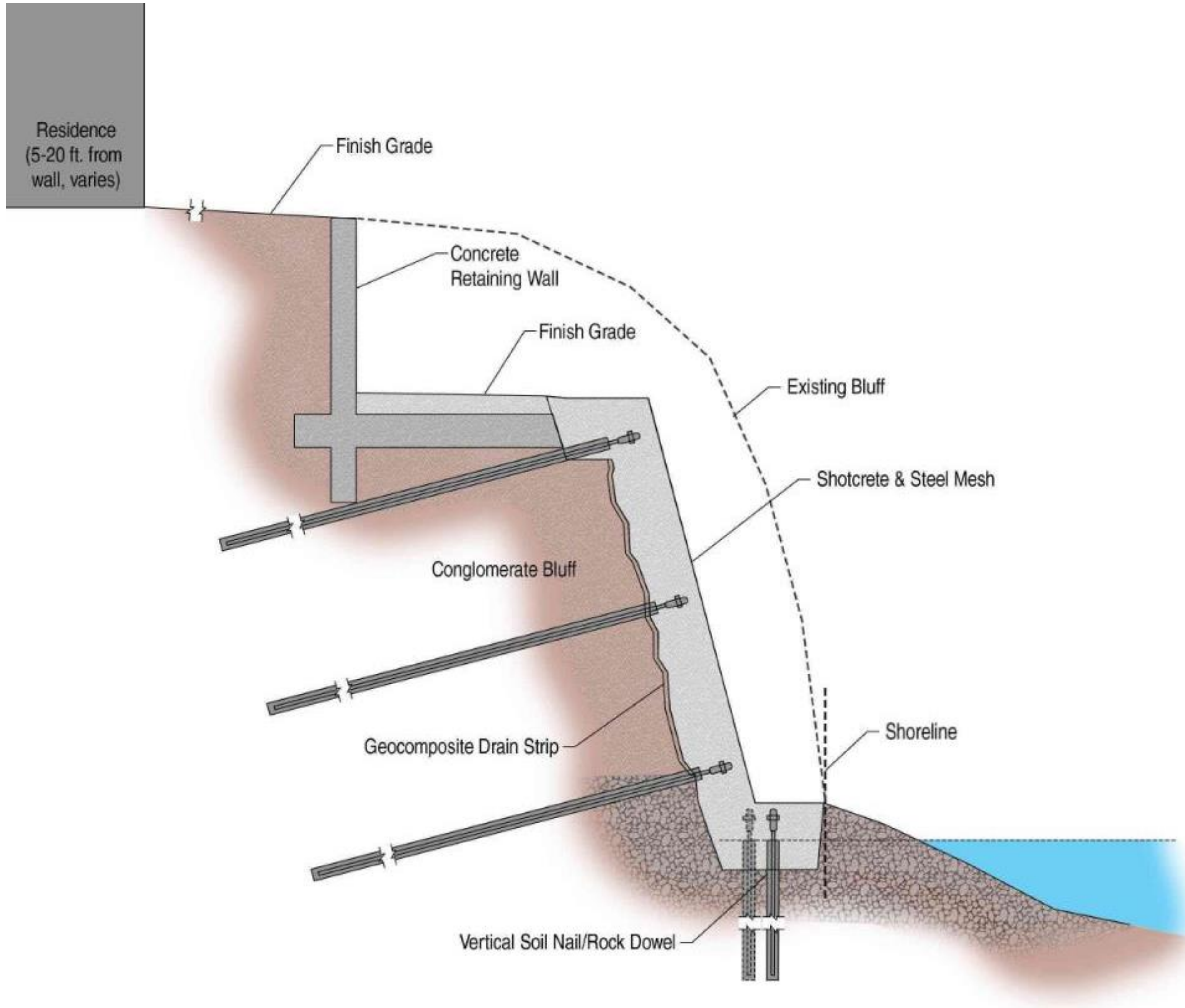


Figure 2-6 **Concept Detail for Fortified Conglomerate with Terraced Walls**

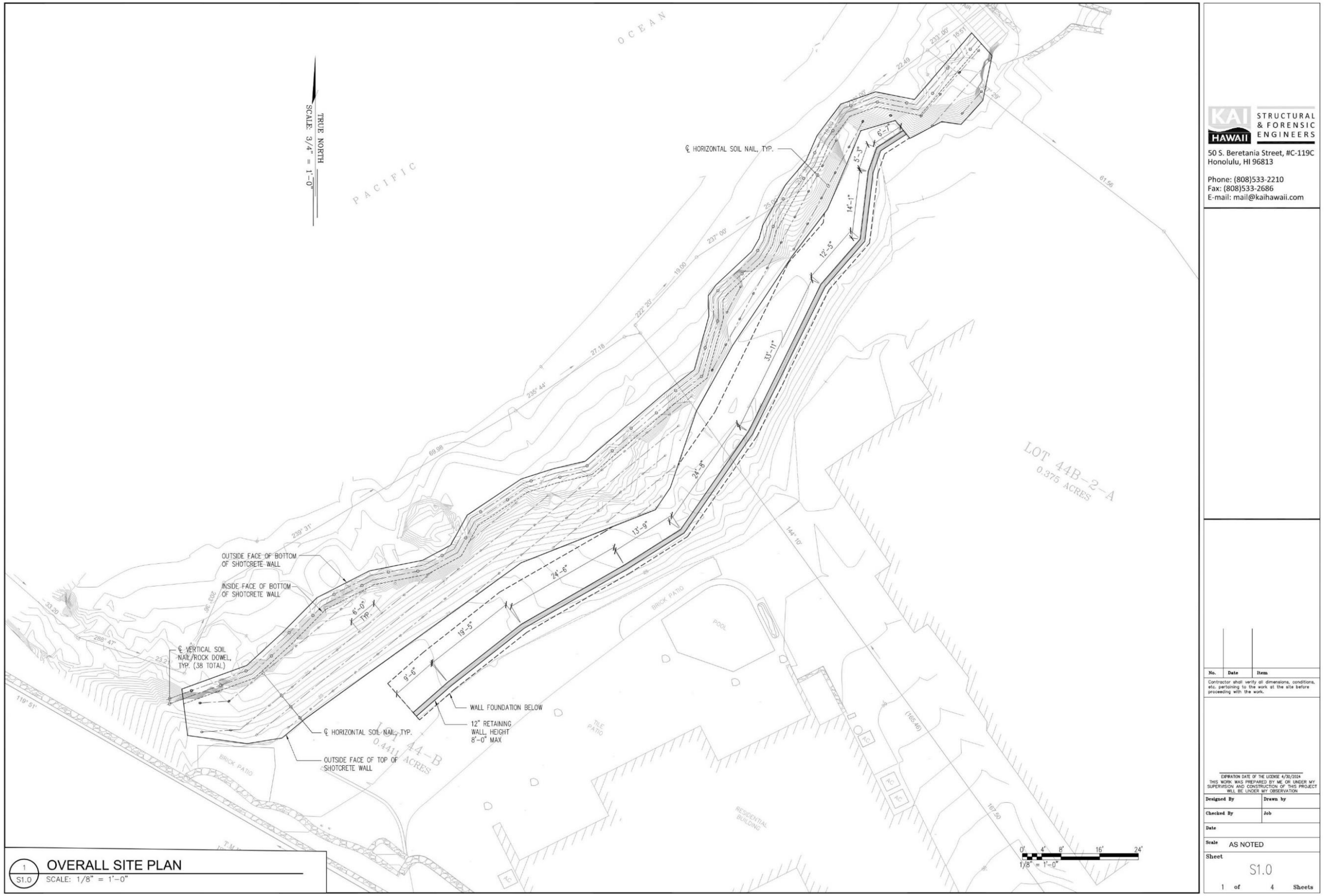


Figure 2-7 **Reinforcement Concept Site Plan (Source: Kai Hawaii, 2024)**

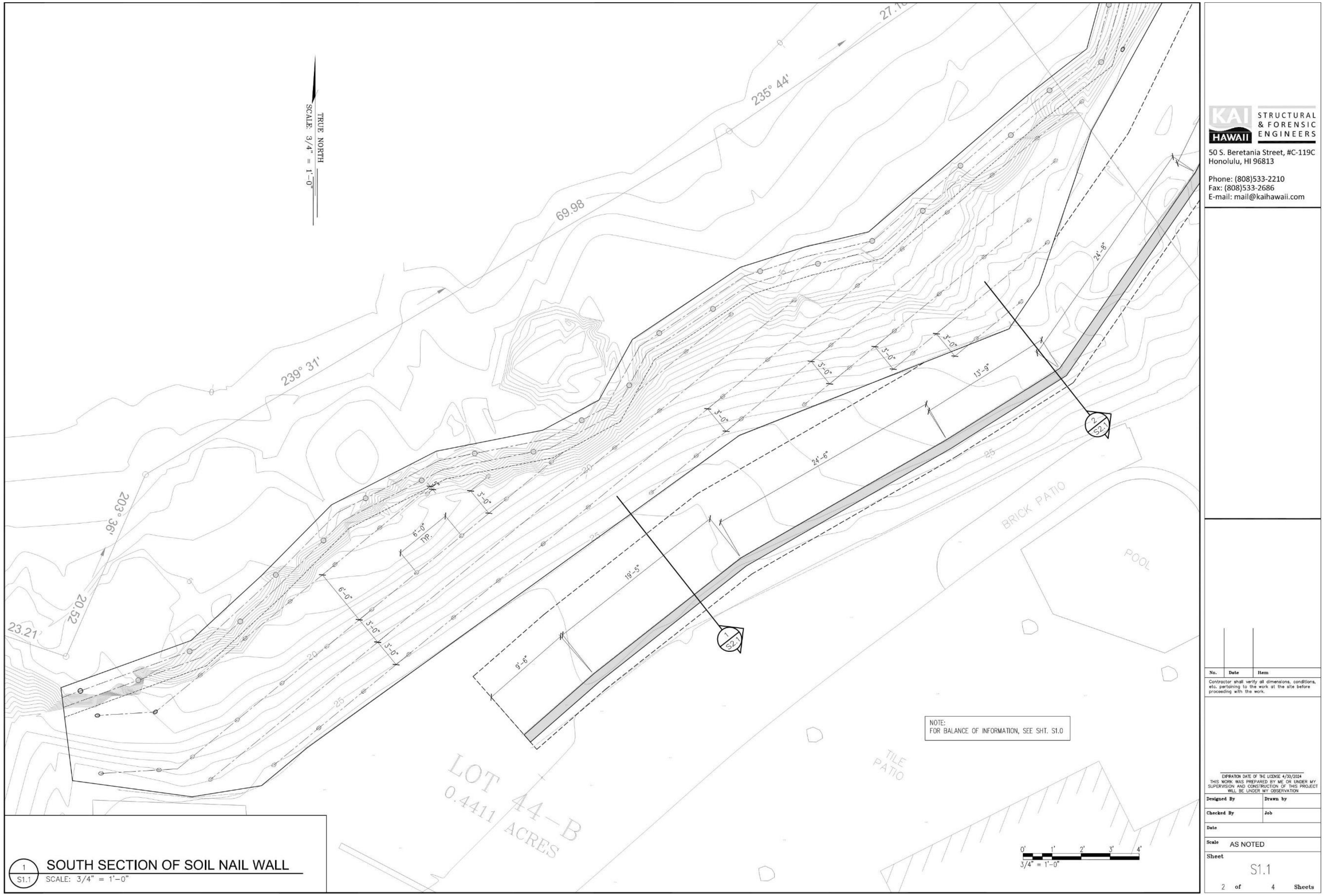


Figure 2-8 **Reinforcement South Portion Plan (Source: Kai Hawaii, 2024)**

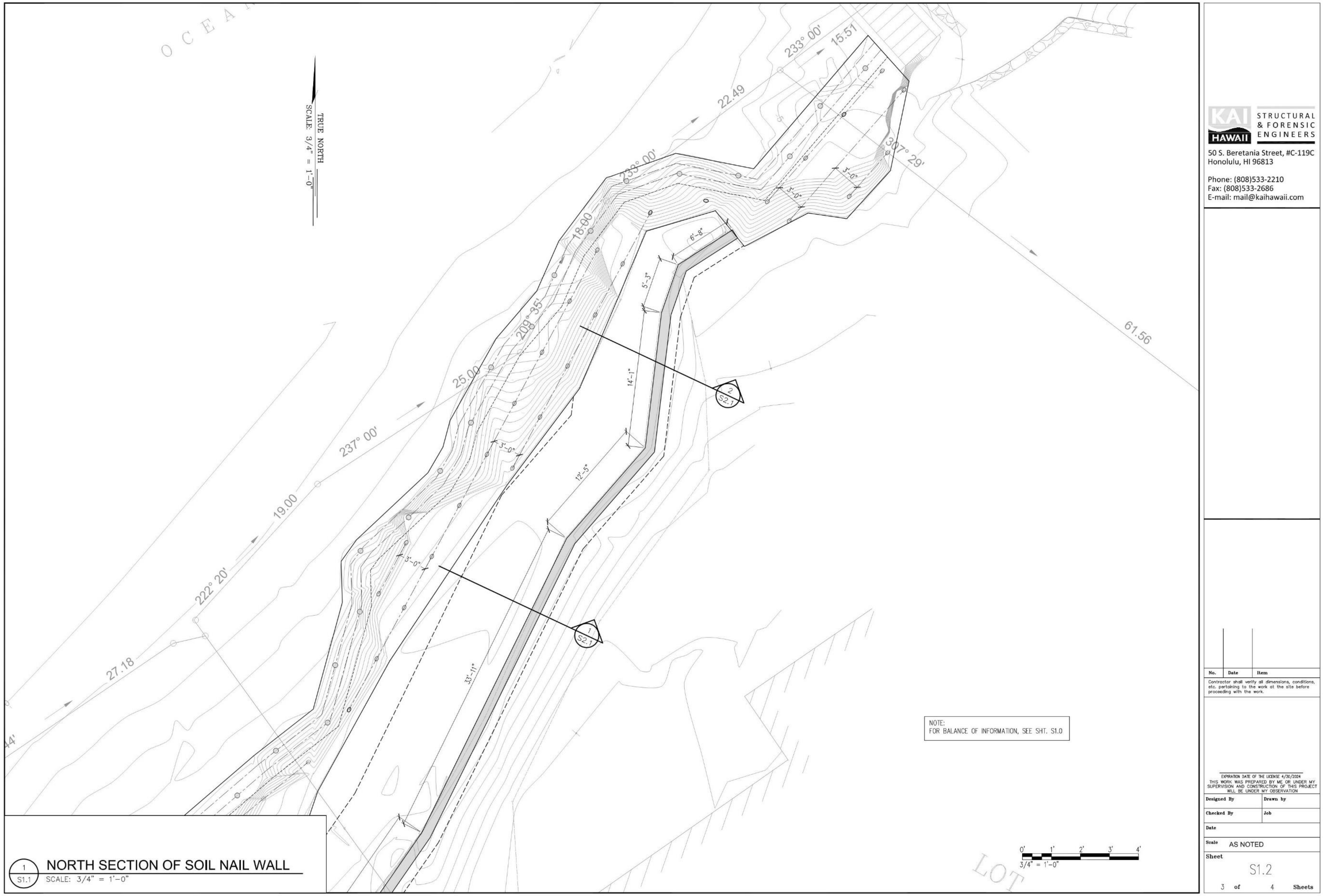


Figure 2-9 **Reinforcement North Portion Plan (Source: Kai Hawaii, 2024)**

Chapter 3

Alternatives to the Proposed Project

Chapter 3

Alternatives to the Proposed Project

The following chapter presents an analysis of the project alternatives considered during the design process. The coastal engineering consultant, Sea Engineering, prepared a Coastal Engineering Assessment that presents data and information necessary to understand the coastal landscape and existing and potential hazards of the site (Sea Engineering, Inc. January 2025) (Appendix A). The baseline information collected was used develop conceptual engineering solutions to fulfill the project's objectives as listed below:

- Mitigate future erosion of the properties and protect the existing dwellings
- Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both;
- Mitigate human-induced impacts to the natural coastal processes and littoral cell;
- Prevent potential undermining of neighboring shoreline protection structures;
- Minimize the volume of artificial material introduced to the shoreline; and
- Prevent earthen soils from eroding and causing siltation of the coastal waters.

3.1 Alternative A – No-Action Alternative

The "No-Action" alternative is the baseline against which all other alternatives are measured. "No-action" refers to the future site conditions that would result should the project not proceed.

The No-Action Alternative would involve not proceeding with the bluff reinforcement project and leaving the existing homes unprotected. This alternative would result in the continued worsening of shoreline erosion threats to the existing homes, and eventual undermining of each of these residences. This option would also result in a considerable risk to public safety as anyone accessing the public shoreline would be put at risk for potential harm in the event of an unexpected catastrophic collapse due to the unpredictable nature of the unstable conditions found at the shoreline. Given the locations of the existing residential structures, the relatively small lot areas, along with their proximity to Lower Honoapiʻilani Road, relocating the structures further inland is not physically possible. Allowing the shoreline to further encroach on these properties would continue to adversely affect these properties and potentially render their residences unusable.

This alternative would increase nearshore turbidity and siltation. This alternative would not properly address the current needs for protection from further shoreline erosion and wave action damage. This alternative would continue to place the private homes and public accessing the shoreline in jeopardy by enabling ongoing increased beach loss and catastrophic erosion events. The shoreline would inevitably retreat further inland threatening these homes and eventually threatening the Lower Honoapiʻilani Road. This alternative would likely not result in the reestablishment of a sandy shoreline. For these reasons, the "No-Action" alternative was not considered a viable alternative.

3.2 Alternative B – Vertical Seawall

A seawall is a vertical or sloping concrete, concrete rubble masonry (CRM), cement masonry unit (CMU), or sheet pile wall used to protect the land from wave damage and erosion. Wave energy is deflected both upward and downward, and also a large amount of wave energy is reflected seaward. The downward component can cause scour at the base of the wall, particularly in shallow waters, and the reflected waves can inhibit beach formation in front of the wall.

Seawalls are not flexible structures and their structural stability is dependent on the design and strength of their foundations. If the foundation of a seawall is breached, hydraulic action can erode fill material behind the wall. With the loss of enough fill, the ground surface behind the seawall will collapse and sinkholes will form. Sinkholes can compromise the structural integrity of a seawall and may lead to failure of the structure. To avoid foundation problems, the seawall foundation should be below the potential scour depth, which can require extensive excavation.

Vertical walls exist at the Lusardi and Kahana Sunset properties within Keonenui Bay. A seawall across the project area would be located behind rock outcrops on the beach face. This alternative would involve the excavation of a bench in the hard-bottom at the base of the bluff, construction of a wall approximately 20-25 feet in height, toe protection, and backfill behind the wall.

The conventional reinforced concrete cantilever would require excavation at the base of the structure involving the removal of a large volume of rock and dirt from the shoreline area and also the addition of a large volume of artificial material to the shoreline. An appropriate seawall design for the project site would require a geotechnical engineer to examine the soils and determine the wall design that could perform best under the soil forces at this site.

In addition, the seawall would avoid potential future encroachments onto State regulated beach areas makai of the certified shoreline. Costs for design, permitting, and construction would be high, and a seawall of this scale would require a major construction effort and coordination with affected landowners. A vertical seawall is not the preferred alternative, due to the large footprint and significant amount of rock and soil removal and importation of materials in the shoreline area.

3.3 Alternative C – Beach Nourishment

Beach nourishment is another alternative that was considered for the project area. Beach maintenance typically consists of sand back-passing or sand pushing. Sand back-passing involves moving existing sand from an area of seasonal beach accretion to an area of seasonal beach erosion. Sand pushing, or beach scraping, typically involves reshaping beaches and/or dunes using seasonally-accreted sand from lower on the beach profile. Regulatory permitting for sand pushing is typically simpler than permitting for permanent shore protection structures.

Sand pushing is not feasible at the project site due to limited beach width and volume. Sand back-passing would require coordination with property owners at the north end of the beach, where it is widest. Sand back-passing within the littoral cell would only be feasible when the beach is inflated. While sand back-passing may result in a temporary increase in beach width and appearance, the sand would continue to mobilize and move alongshore and offshore. It is unlikely that sand placed at the subject properties would remain in front of the site, unless placement was accompanied by construction of several groin structures to minimize sand movement.

If the beach were replenished with sand, the volume of sand would likely still slowly diminish with time as the area suffers from chronic erosion. In addition, individual storm events or other weather conditions can cause rapid beach changes, and areas such as the Keonenui Beach shoreline can experience beach deflation in a short time even if it is widened with beach nourishment. With the present severe erosion conditions between the homes and the shoreline, beach nourishment would not provide effective long-term protection for the residential properties along Keonenui Bay.

3.4 Alternative D – Beach Nourishment with Stabilizing Structures

Beach nourishment typically involves the placement of beach fill to specified profiles that are designed to augment the natural morphology of the beach to offset the effects of chronic, seasonal, or episodic erosion. Beaches are an effective way of minimizing wave impacts on the shoreline. Wave energy is absorbed by bed shear and resulting turbulence, the transport of sediment by wave swash, and percolation into the beach. Unlike hard structures, beaches will adjust to different incident wave conditions by shifting orientation, changing slope, and by hydraulic sorting of beach sediment.

Beach nourishment requires a supply of sand that is similar in grain size to the native beach sand. While sand may seem like a plentiful commodity, the reality is that good quality beach sand is in short supply in Hawaii. An adequate sand source to support beach nourishment within the project area has not been identified. Supplies of compatible inland sand are limited and excavation is controversial. An offshore sand source investigation may be required to identify an adequate supply of compatible beach quality sand. Offshore sand source investigations are technically challenging and can be expensive.

To be effective, beach nourishment would have to occur along the entire beach, not just in front of the Hester, Barto, and Lusardi properties. This would greatly increase costs and would require the planning and financial commitment of all property owners, plus support from both the County and State governments. Unfortunately, beach nourishment is not a guaranteed solution for erosion, and the nourished beach is still exposed to current and future erosion forces, including large wave events and storms. Beach nourishment projects on eroding coastlines typically require periodic maintenance.

Increased beach width would create a natural buffer that would offer some protection for the base of the bluff, as discussed above. If the project area shoreline were to be replenished with sand, it is unclear how stable the sand would be, once placed. The beach fill would be subject to local sediment transport dynamics within the bay and would eventually mobilize and move alongshore and offshore during seasonal shifts within the littoral cell and/or large wave events. Moreover, erosion is expected to continue and possibly accelerate over the long-term as a result of sea-level rise. The beach, located between two headlands with chronic erosion, will eventually disappear if sand is not continuously added or stabilized.

To account for the loss of sand due to natural processes, engineered containment structures, such as T-head groins, may be designed to maintain a stable beach. The type, size, and orientation of stabilizing structures require modeling of the waves and sediment transport within the bay. T-head groins decrease and reorient the amount of wave energy reaching the beach and create artificial littoral cells to stabilize the sand.

Beach nourishment with stabilizing structures would help retain beach sand fronting the subject properties. This alternative would satisfy some of the project objectives; however, it is also very difficult to permit, construct, and find suitable sand.

This method of sand nourishment can also restrict the longshore flows of sand and deplete beaches downdrift of sands. Additionally, T-groins pose the potential threats of degrading the aquatic environment as a result of downdrift erosion when littoral drift is trapped, clouding waters by decreasing wave action nearshore, and interfering with aquatic ecosystems.

Artificial sand nourishment structures such as T-groins are not a feasible solution for this project. Additional permitting would be required including State Conservation District permits from the BLNR, and Federal permits from the US Army Corps of Engineers. Moreover, it requires the conversion of the seafloor to rock structure for the construction of the groins.

Given the additional costs and potentially lengthy time required for planning between the Federal, State and County agencies, this alternative was not further considered.

3.5 Alternative E – Managed Retreat

Managed Retreat (also referred to as adaptive realignment) is a coastal management strategy that is intended to allow the shoreline to naturally move inland, rather than fixing the shoreline with engineered shore protection structures. Managed Retreat typically involves modification, relocation, or removal of existing structures to reduce hazard exposure and maintain a natural shoreline.

The Hawaii Office of Planning and Sustainable Development (OPSD) published a report entitled, Assessing the Feasibility and Implications of Managed Retreat Strategies for Vulnerable Coastal Areas in Hawaii (2019). The study evaluated options to establish policies, regulations, tools, and programs to support a managed retreat strategy in response to sea level rise. The study found that retreat is one of three primary adaptation strategies, along with accommodation (e.g., freeboard) and protection (e.g., armoring), and that, prior to deciding upon retreat, accommodation and protection must be examined to determine which strategy is the best for the area dealing with coastal hazards, climate change, and sea level rise. The study also found that retreat is only effective when done voluntarily and that economic incentive programs to fund retreat (e.g., buyouts, transferrable development rights, rolling easements) are unlikely to be effective in Hawaii due to the high cost of oceanfront real estate. Finally, the report noted that retreat from chronic coastal hazards (e.g., erosion and sea-level rise) is incremental and typically takes decades to complete.

Managed Retreat would avoid the costs associated with design, permitting, and construction of shore protection measures or beach restoration; however, costs associated with modifying, relocating, or removing the existing structures would be substantial. In the absence of shore protection, the terrestrial area would be exposed to erosion and flooding and would be more vulnerable to coastal hazards. In addition, this option does not change the condition of the littoral cell, which is deflating and causing beach narrowing within the bay. The semi-lithified conglomerate lower unit effects the beach system in a similar manner to a shoreline structure. Beach erosion in the cell will continue until the beach gets “pinched” out against the semi-lithified conglomerate and is lost.

Managed Retreat strategies can be horizontal or vertical in nature. Horizontal retreat strategies seek to reduce hazard exposure by moving structures further inland. Vertical retreat strategies seek to reduce hazard exposure by elevating structures above the hazard.

Shoreline setbacks are a “horizontal retreat strategy” that require development to be set back a minimum distance from the shoreline. The County of Maui requires shoreline setbacks for new construction along the shoreline. The purpose of the shoreline setback is to protect and preserve the natural shoreline, lateral shoreline access, and open space along the shoreline. Shoreline setbacks are also intended to reduce risks to property from coastal hazards.

Freeboard is a "vertical retreat strategy" that involves elevating structures above the Base Flood Elevation (BFE). The shoreline is located in Zone VE with a BFE of 17 feet. The residential parcels are already at an elevation of at least 25 feet so this strategy would not be applicable, feasible, or effective for the project site.

This alternative would also result in the continued worsening of shoreline erosion threats to the existing homes, and eventual undermining of each of these residences. This option would also result in a considerable risk to public safety as anyone accessing the public shoreline would be put at risk for potential harm in the event of an unexpected catastrophic collapse due to the unpredictable nature of the unstable conditions found at the shoreline. Given the locations of the existing residential structures, the relatively small lot areas, along with their proximity to Lower Honoapiʻilani Road, relocating the structures further inland is not physically possible. Allowing the shoreline to further encroach on these properties would continue to adversely affect these properties and potentially render their residences unusable.

This alternative would also increase nearshore turbidity and siltation. This alternative would not properly address the current needs for protection from further shoreline erosion and wave action damage. This alternative would also continue to place the private homes and public accessing the shoreline in jeopardy by enabling ongoing increased beach loss and catastrophic erosion events. The shoreline would inevitably retreat further inland threatening these homes and eventually threatening the Lower Honoapiʻilani Road. This alternative would also likely not result in the reestablishment of a sandy shoreline.

3.6 Alternatives Not Further Considered

The following alternatives were studied in the 2025 Sea Engineering report, but due to their not meeting the purpose and need of the project, were not studied further:

- Temporary Erosion Control
- Full Height Terraced Seawall and Retaining Wall(s)
- Rock Rubblemound Revetment
- Hybrid Revetment-Wall

For further information and analysis on these alternatives not further considered, please see the Sea Engineering Coastal Assessment Report attached to this application as Appendix A.

3.7 Preferred Alternative/Proposed Action – Stabilization of Conglomerate with a Terraced Wall

The preferred alternative is the stabilization of conglomerate with a terraced wall. As described in Section 2, stabilization of the lower conglomerate unit with Shotcrete would be coupled with a bench(es) in between the stabilized unit and upper retain wall(s). Shotcrete (gunite) is concrete or mortar conveyed through a hose and pneumatically projected at high velocity onto a fixed surface. It is typically reinforced by conventional steel rods, steel mesh, or fibers. Installation would include excavation down to hard substrate and then applying Shotcrete to the face of the existing semi-lithified conglomerate, up to about 14 feet MSL. The Shotcrete would be anchored back into the semi-lithified conglomerate, with materials such as anchoring pins. A key design element is excavation and application of reinforcing materials starting at hard substrate. Extending the slope stabilization to this depth mitigates water intrusion, which is tied to the progressive erosion of the conglomerate. A structural engineer should oversee the installation.

By breaking the vertical face of the bluff into two or more sections, the risks associated with a vertical structure along the shoreline are reduced. Terraces or benches would separate the sections of the fortification.

The preferred concept is a bench extending from the base of the upper landside retaining wall to the crest of the fortified conglomerate unit. The bench would be vegetated to soften the visual impact and mitigate storm runoff. Refer to the concept section view presented in *Figure 2-3*.

Stabilization of the conglomerate with terraced walls would satisfy project and regulatory objectives. Reinforced shotcrete would mitigate erosion and provide protection for the backshore land and infrastructure. Costs for design, permitting, and construction would be moderate. Fortification of the conglomerate lower unit with terraced wall(s) is the preferred alternative for the project site.

Examples of shotcrete reinforcement in the bay include a shotcrete stabilization project to the north that was constructed in 1974, and with continued maintenance and upkeep, is still functioning at the present day (*Figure 3-1*).

Figure 3-1 Example of Shotcrete Stabilization in Keonenui Bay with Clear Nearshore Waters

3.7.1 Adaptation Pathways

The proposed project adopts a phased adaptation pathway in response to sea level rise and evolving coastal conditions. Adaptation pathways encompass a spectrum of strategies, including resistance, accommodation, avoidance, managed retreat, and proactive advancement (see *Figure 1-7*). Effective adaptation to sea level rise necessitates a comprehensive framework that safeguards critical infrastructure, maintains recreational access, and supports the resilience of shoreline communities.

Adaptation strategies are typically categorized into near-term (10–20 years) and long-term (100+ years) time horizons, each governed by distinct triggers and decision-making processes. Critical public facilities often require a long-range, practical evaluation framework, while coastal parks and residential areas benefit from flexible, short- to mid-term strategies that allow for iterative adjustments based on evolving conditions (see *Figure 1-8)*.

The no-action alternative and managed retreat alternative fail to mitigate the risks associated with rising seas, while beach nourishment provides only temporary relief and is not considered a sustainable long-term solution.

The proposed design integrates a vegetated, terraced profile set landward of the existing shoreline, coupled with targeted stabilization of the existing coastal bluff. This combined approach enables a resilient, incremental adaptation strategy that protects existing residential structures and preserves the County's Lower Honoapiʻilani Road from future erosion, avulsion, and storm damage (*Figure 3-2*).

3.8 Shoreline Setback Assessment

The Shoreline Rules for the Maui Planning Commission, Chapter 203, was established to regulate the use and activities of land within the shoreline environment in order to protect the safety and welfare of the public by providing protection from coastal hazards; and to ensure that the public use and enjoyment of our coastal resources are preserved and protected for future generations in accordance with HRS 205A. Recent amendments to the Rules went into effect on August 25, 2024. As described in the 2024 update, Section §12-203-6 Establishment of shoreline setback lines, "For areas where there is no mapped erosion hazard line, the shoreline setback line shall be two hundred feet from the shoreline as mapped by the department".

The erosion hazard line is not mapped in the project area due to the site geology. The project is located within the 200-foot default setback per the County of Maui Shoreline Rules. See Section 5.10 for additional information and description of the project's compliance with the County's Shoreline Rules.

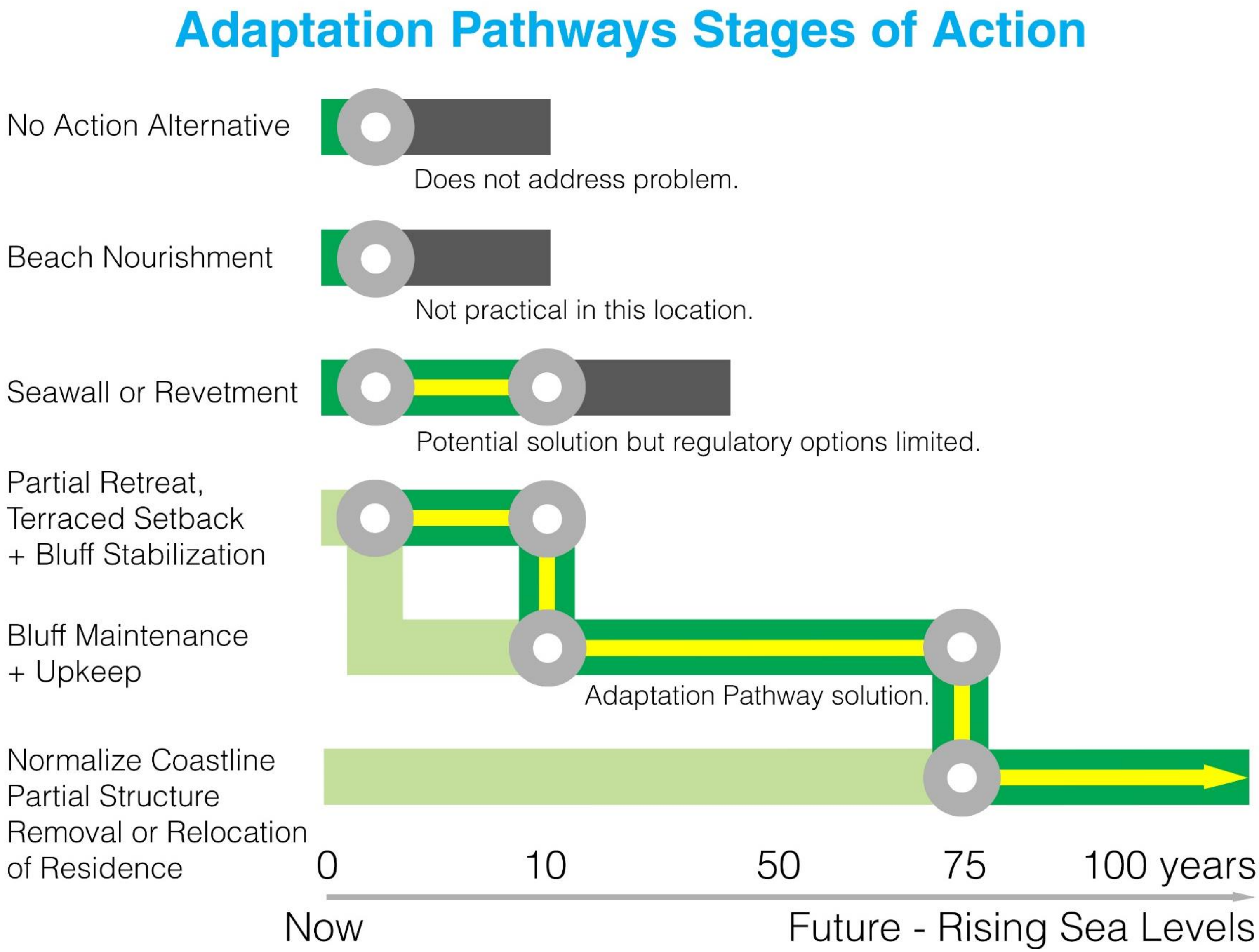


Figure 3-2 **Barto Hester Lusardi Adaptation Pathway**

Chapter 4

Description of the Environmental Setting, Potential Impacts, and Mitigation Measures

Chapter 4

Description of the Environmental Setting, Potential Impacts, and Mitigation Measures

This section describes the existing environmental setting and identifies possible impacts of the planned shoreline revetment. Strategies to mitigate potential impacts are also identified.

4.1 Physical Environment

4.1.1 Land Use

Existing Conditions

The subject property is located in Kahana, in an area known as Alaeloa, at TMKs: (2) 4-3-015:002, 003, and 052 *(See Figures 1-1 and 1-2)*. The parcels are located along Keonenui Bay, situated on the northwest coast of West Maui, seven miles north of Lahaina Town and 1.5 miles south of Kapalua. The parcels and surrounding parcels are zoned for residential use. The following is a description of zoning, community plan designations, and existing land uses adjacent and in close proximity to the subject property:

North: Zoning: R-3 Residential
Community Plan: Single Family
State Land Use: Urban
Existing uses: Single-Family Residence.

South: Zoning: R-3 Residential
Community Plan: Single Family
State Land Use: Urban
Existing uses: Single-Family Residence.

East: Zoning: R-3 Residential
Community Plan: Single Family
State Land Use: Urban
Existing uses: Lower Honoapiʻilani Rd.; Single-Family

West: Zoning: N/A
Community Plan: N/A
State Land Use: N/A
Existing uses: Pacific Ocean.

Anticipated Impacts and Mitigation Measures

The project site is zoned for single family residential use, permitting the existing residential uses on the three parcels. A Shoreline Setback Variance application for reinforcement work to protect the bluff from erosion will be submitted to the County of Maui. This action conforms with the West Maui Community Plan's environmental goals, as detailed in Section IV.

4.2 Soils and Shoreline Erosion Conditions

Existing Conditions

The subject properties are located along Keonenui Bay between Haukoe Point and Alaeloa Point, approximately 4,200 feet south of Nāpili Bay. The Bay in the project vicinity is approximately 500 - 600 feet long and is situated between two headlands that extend roughly 400 to 500 feet into the bay. The Kahana Sunset resort and condominiums are located to the north of the project site. Shoreline properties along the southern half of the bay are occupied by single-family residences. The subject properties are the last properties at the south end of the bay.

Coastal geology at the project site along the erosion scarp, which provides a nice cross-section, is characterized by the clay-rich alluvial deposit, or alluvium, in the upper unit. This is typical for the Kahana Silty Clay surficial geology unit. The lower unit, a semi-lithified conglomerate, comprises clasts (typically basaltic) in a range of sizes that are entrained in a silt/clay matrix. This lower unit is more resistant to erosion than the overlaying alluvium and responds to coastal changes at a time scale of years to decades. The formation of erosional cavities and sea-caves is an ongoing process during periods of beach deflation. The lower unit acts as a long-term, stable feature with respect to the coastal processes that affect sand movement on the shoreline. Failure of the lower unit, however, has generally been expressed as very rapid events. These failure events are a result of mass wasting that occurs when erosional cavities deteriorate the stability of the lower unit to a point where the overburden causes a gravity-induced failure of the entire slope (See *Figures 4-1 through 4-4*).

The combination of a gradual loss of carbonate sand supply, as evidenced by the significant reduction in beach width over time, and the hard substrate on the mauka edge of the beach, has resulted in the decay of the littoral cell. The long-term presence of the harder, more erosion-resistant conglomerate, will likely lead to the natural loss of the beach in this bay.

This process has played out in many areas on Maui's shoreline and continues to actively occur in locations such as Keonenui Bay. There are numerous locations along the coastline where the beach has been 'pinched' against hard-substrate, such as clay banks, alluvium, rocky bluffs, boulder and cobble banks, and conglomerate such as is present at the project site. This is a naturally occurring phenomenon, where continued erosion of the backshore has not typically resulted in reestablishment or recovery of the sand beach. In most of these situations, the sand beach is eventually lost, leaving harder substrate exposed along the coastline.

A series of historical aerial photographs are used to determine shoreline change trends. The University of Hawaii Coastal Geology Group (CGG) has undertaken a historical analysis of Maui's shoreline and produced a shoreline change map for the Alaeloa region based on aerial imagery from 1912 to 1997.

Figure 4-1 View Towards Northwest Corner of Property Showing Shoreline Prior to Collapse (Photo courtesy of Rory Frampton, August 15, 2022)

Figure 4-2 View Towards Northwest Corner of Property Showing Shoreline Collapse (Photo courtesy of Rory Frampton, August 18, 2022)

Figure 4-3 **View Towards Sand Containers, Nearshore Debris and Damage (Photo courtesy of Rory Frampton, August 15, 2022)**

Figure 4-4 **View Towards Sand Containers, Showing Nearshore Debris and Damage (Photo courtesy of Rory Frampton, August 18, 2022)**

The CGG analysis determined that the dominant shoreline change trend for Keonenui Bay (Transects 1 to 14) has been erosion at an average annual rate of 1.3 feet/year.

Physical interaction between the dynamic sandy beach and the more erosion-resistant conglomerate is similar to the interaction between sand beaches and hard substrate. The significantly slower erosion rate of the conglomerate is imperceptible when compared to the rapid and large changes the sand beach undergoes during individual wave events and in response to seasonal changes in wave direction. The long-term trend of both the beach and the mauka substrate has been erosional; however, though there has been some erosion of the backshore, the beach narrowed by 43% between 1949 and 1997. Moreover, the beach at the north end of the bay was eventually lost when it was 'pinched' out against the hard, high elevation substrate in the backshore.

Given these natural conditions, the historic shoreline and beach width trends, and the presence of semi-lithified conglomerate, a sandy beach is unlikely to survive in this location. Erosion of the beach, as evidenced by the mauka migration of the beach toe, is projected to continue, while the significantly slower erosion of the conglomerate becomes an impassible feature that the beach is eventually 'pinched' out against. The beach has already become ephemeral, disappearing in front of the subject properties during erosional extremes.

There are currently existing seawalls located at the Lusardi property and the Kahana Sunset condominiums to the north, and there are reinforced shotcrete areas at the Boyd property as well as the Kahana Sunset. The former retaining wall at the Hester property was not permitted to go deeper to the underlying substrate, became undermined, and has since failed.

The landowners' representative has been contacted by the County's Zoning and Enforcement Division staff expressing concern for public safety presented by bluff failure. The staff urges the landowners to pursue as expeditiously as possible a long-term plan to stabilize the shoreline in order to reduce risks to the public accessing along the shoreline.

Anticipated Impacts and Mitigation Measures

Vertical surfaces can increase nearshore wave energy by reflecting waves back out to sea. This reflection of wave energy at the face of the structure can cause scour in front of the wall and inhibit the accretion of sand. Conversely, the influence of the walls is minimized when a beach is established that prevents wave runup (or "swash") from encountering the wall.

Analysis of the effects of walls on the Keonenui shoreline is not conclusive. During the eight months between the 1987 and 1988 photos, with some shoreline structures already lining the shoreline and exposed conglomerate along the remaining areas, there was an accretion of 35 feet and 68 feet of sand along the beach. Yet between 1988 and 1997, the beach appeared to erode.

The bluff that fronts much of Keonenui Bay is especially pronounced in front of the subject properties where it acts as a natural wall, reflecting wave energy where there is already an absence of a sandy beach. Stabilizing the cliff face would not meaningfully change wave reflection or affect coastal processes differently than the steep, naturally occurring rock and clay material that is already present along this shoreline.

The reinforcement of the existing bluff is not anticipated to negatively affect existing shoreline conditions and processes. The fortified conglomerate unit with terraced wall is anticipated to provide positive impacts on the shoreline, including reducing vulnerability of homes to coastal hazards and sea level rise, mitigating future mass wasting events to avoid hazards to public life and safety, and is anticipated to protect the marine habitat by limiting the release of upland fine materials into the nearshore waters. The fortified conglomerate is not anticipated to increase wave energy reflection along the shoreline, as the existing naturally occurring semi-lithified conglomerate has similar effects on the beach and waves as would the reinforced bluff surface *(Appendix A)*.

4.3 Marine Resources

Existing Conditions

The nearshore seafloor in Keonenui Bay primarily consists of sand in the central part of the bay, and coral, limestone and rock along the perimeter and beyond about 400 feet offshore. There is a narrow patch of rocky, cobble bottom close to shore in front of the project parcels. Nearshore waters adjacent to the project site are classified as open coastal "A," according to the State Office of Environmental Planning and Hawaii Department of Health.

Anticipated Impacts and Mitigation Measures

The project area for the bluff reinforcement work is located inland of the shoreline. Best Management Practices (BMPs) will be implemented to mitigate construction-phase impacts on the nearshore environment. In the long term, construction of the conglomerate unit with terraced upper wall is anticipated to reduce turbidity conditions in the southern end of the bay through the reduction and prevention of further erosion of the bluff's silty clay substrate.

4.4 Soils

Existing Conditions

According to the "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii (August 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soils within the project site are classified as Kahana Silty Clay, 7 to 15 percent slopes, (KbC) and Rough Broken and Stony Land (rRS). KbC is characterized by slow runoff, slight to moderate erosion hazard, and moderately rapid permeability. The rRS series consists of very steep, stony areas where runoff is rapid *(Figure 4-5)*.

Anticipated Impacts and Mitigation Measures

The bluff reinforcement and terraced wall configuration will be designed to integrate with the natural topography of the site to minimize extensive excavation and backfill. The planned project will greatly reduce soils loss from the subject properties.

4.5 Flood and Tsunami Zone

Existing Conditions

According to Hawaii National Flood Insurance Program, administered by the Department of Land and Natural Resources (DLNR), the project site is situated in flood Zone X, areas determined to be outside the 0.2% annual chance floodplain. *(Figure 1-6)*.

Figure 4-5 **Soil Map**

Anticipated Impacts and Mitigation Measures

The bluff reinforcement design will be engineered to withstand the on-going wave action in the bay, reducing the likelihood that an extreme event would damage the conglomerate unit. The project is not anticipated to adversely affect neighboring properties with regards to flood hazard potential.

4.6 Terrestrial and Marine Biota (Flora and Fauna)

Existing Conditions

Existing vegetation on the properties are primarily grasses and native and non-native trees and shrubs. Avifauna typically found in the area includes the common mynah, several species of dove, cardinal, house finch, and house sparrow. Mammals common to this area include cats, dogs, rats, mice, and mongoose. No known rare, endangered, or threatened species of flora or fauna were discovered on the subject property. The project team requested a species list from the US Fish and Wildlife Service (USFWS) on October 4, 2024, and received the following comments:

- There are no critical habitats within the project area under the USFWS office's jurisdiction.
- There are no refuge lands or fish hatcheries within the project area.
- There are no bald and golden eagles within the vicinity of the project area.
- The following migratory birds have a small probability of presence to be present or breeding in the project vicinity:
  - 'apapane (*Himatione sanguinea)*
  - Black Noddy (*Anous minutus melanogenys)*
  - Black-footed Albatross (*Phoebastria nigripes)*
  - Bulwer's Petrel (*Bulweria bulwerii)*
  - Hawai'i 'amakihi (*Chlorodrepanis virens)*
  - Maui 'alauahio (*Paroreomyza montana)*
  - Red-tailed Tropicbird (*Phaethon rubricauda melanorhynchos)*
  - Wandering Tattler (*Tringa incana)*
- There are no wetlands within the project area.

Anticipated Impacts and Mitigation Measures

There are no known habitats of rare, endangered or threatened species of flora and fauna located on the subject properties. Rare, endangered, or threatened species of flora and fauna are not anticipated to be significantly affected by the bluff reinforcement work. Fortification of the conglomerate unit is anticipated to mitigate ongoing losses of the upper alluvium unit, which will reduce siltation of the coastal waters and improve the nearshore environment for marine species, including the federally threatened sea turtle that may nest in shoreline areas of West Maui. Reinforcement of the bluff is not anticipated to affect any migratory bird nesting areas or habitats, however contractors on site will be informed of potential species and will alert property owners in the event any species of fauna are present during construction. Construction activities will be limited to daylight hours and will not use construction work lights to avoid attracting seabirds and/or disorienting sea turtles. The project is not anticipated to adversely affect environmental and marine resources.

4.7 Air Quality

Existing Conditions

The Clean Air Act (42 U.S.C. 7401 et seq.) requires the United States Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for seven criteria pollutants that are harmful to public health and the environment: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter (PM) less than 10 and 2.5 microns respectively (PM_{10} and $PM_{2.5}$).

The DOH, Clean Air Branch (CAB) has established State Ambient Air Quality Standards (SAAQS) for criteria pollutants in HAR §11-59, *Ambient Air Quality Standards* and HAR §11-60, *Air Pollution Control*. The DOH, CAB, Air Surveillance and Analysis Section, collects measurements of ambient level pollutants in the air through a statewide monitoring network.

The DOH, CAB has an air monitoring station in Kahului at LOT 11-D-1-A-1-D-1 MAUI LANI (LRG-LOT) SUBD NO 7 Kuihelani Highway. Based on DOH, CAB's air monitoring data, Maui is currently in attainment for all applicable NAAQS and SAAQS (DOH-CAB, 2022).

There are no point sources of airborne pollutants in the vicinity of the Site. Minimal, indirect non-point sources of airborne pollutants in the vicinity are attributable to vehicular traffic and dust from surrounding undeveloped lands; however, prevailing winds quickly disperse these particulates.

Anticipated Impacts and Mitigation Measures

During construction, fugitive dust, criteria pollutants and GHG emissions will result from grubbing, grading, demolition, excavation, and structure construction. However, construction-related emissions will be short-term, intermittent, and spread over several acres. The following mitigation measures will be implemented:

- Phasing/limiting disturbed areas;
- Stabilizing disturbed areas as soon as practicable;
- Periodic watering of exposed surfaces;
- Regular maintenance of construction equipment;
- Covering open-bodied trucks when transporting soil materials;
- Application of water on disturbed areas and haul roads; and
- Reduction of speeds on unpaved roads to <15 mph.

Additionally, the Contractor will comply with HAR §11-60.1-33, *Air Pollution Control* and may develop a dust control management plan.

Once the Project is developed, direct and indirect criteria pollutant and GHG emissions may result from residential uses (e.g., energy usage, water usage, solid waste generation, landscaping equipment, and consumer products) and mobile sources (e.g., vehicle trips); however, the quantity of emissions will not result in significant adverse effects on existing air quality.

With the implementation of the proposed mitigation measures, the Project is not anticipated to adversely affect air quality, as the proposed improvements do not involve permanent point source activities that will impair the State's ability to meet Federal or State air quality standards. No additional mitigation is recommended.

4.8 Noise Characteristics

Existing Conditions

Noise is defined as any unwanted or unpleasant sound that causes a disturbance or interferes with normal activities. It may be intermittent or continuous, steady, or impulsive, and stationary or temporary. Existing ambient noise in the Project vicinity is attributable to both the natural environment and human activity, from sources that are typical of residential environments.

In Hawaiʻi, noise is regulated by the Department of Health (DOH), Indoor and Radiological Health Branch (IRHB), in accordance with HAR §11-46, *Community Noise Control*. HAR §11-46-3 defines maximum permissible sound levels (at property lines) for three land use classifications (i.e., zoning districts) and provides for the abatement and control of excessive noise sources, including stationary and temporary construction and industrial generated noise sources. “Class A” zoning districts include residential, conservation, preservation, public space, open space, or similar types of zoning districts; “Class B” zoning districts include multi-family dwelling, apartment, business, commercial, hotel, resort, or similar types of zoning districts; and “Class C” zoning districts include agriculture, country, industrial or similar types of zoning districts. The Site is in the Class A zoning district. The maximum permissible sound levels in the Class A zoning district are 55 A-weighted decibels (dBA) from 7:00 AM to 10:00 PM and 45 dBA from 10:00 PM to 7:00 AM. If impulsive sounds exceed 120 impulses in any 20-minute period, the noise limit is 10 dB above the maximum permissible sound level. Per HAR §11-46, noise levels are not permitted to exceed the maximum permissible sound levels for more than 10% of the time within any 20-minute period, except by permit or variance from DOH, IRHB.

Noise generated in the vicinity is primarily attributed to vehicular traffic along the surrounding roadway Honoapiʻilani Highway.

Anticipated Impacts and Mitigation Measures

During construction, short-term, intermittent noise impacts will occur. The Contractor will obtain a noise permit from DOH, IRHB. A noise permit is required for construction activities (during 7:00 AM to 6:00 PM Monday through Friday and 9:00 to 6:00 PM on Saturday) that exceed 56 dBA or have a total cost of more than $250,000 (based on the value of the building permit). Additionally, the Contractor will employ the following mitigation measures to minimize noise impacts:

- Construction equipment and vehicles will be appropriately muffled and maintained to reduce backfires. Generators will be placed in locations distanced from neighbors, be equipped with an attached muffler, or use other noise-abatement methods in accordance with industry standards;
- Construction equipment use, including pile drivers, hydraulic hammers, and jackhammers, will be limited to Monday through Friday (7:00 AM to 6:00 PM); and
- Equipment staging and storage areas will be distanced from neighbors.

With the implementation of the proposed mitigation measures, the Project is not anticipated to adversely affect existing noise conditions. No additional mitigation is recommended.

4.9 Archaeological/Historical/Cultural Resources

<u>Existing Conditions</u>

An Archaeological Field Assessment was conducted on the site in April 2009 by Scientific Consultant Services, Inc. *(Appendix B)*. No surface or subsurface cultural remains were identified during the archaeological assessment, and the project Archaeologist recommended no future work is necessary for the subject parcel.

A Cultural Impact Assessment Report for the proposed project was prepared by Jill Engledow *(Appendix C)*, based upon archival research as well as consultation with individuals knowledgeable about historical and cultural practices associated with the area surrounding the project site.

The specific project area (the bluff face or lower conglomerate) is not a site that provides habitat for species such as opihi or limu.

<u>Anticipated Impacts and Mitigation Measures</u>

The Archaeological Field Assessment concluded no future archaeological work is necessary for the subject parcel. The CIA concluded that work on the shoreline bluff does not interfere with any known Hawaiian or non-Hawaiian gathering, practices, protocols or access. The project is not anticipated to adversely affect significant cultural and historic properties.

4.10 Visual Resources

<u>Existing Conditions</u>

The subject properties are situated along the makai side of Lower Honoapiʻilani Road within a residential area of Nāpili. The parcels maintain a total of approximately 274 feet of frontage along Lower Honoapiʻilani Road and has an average lot depth of approximately 172 feet, excluding the narrow strip of land protruding seaward along Haukoe Point. The approximately 388 foot makai boundary of the properties abuts the shoreline.

Nāpili features views of the Pacific Ocean, Lanai, and Molokaʻi. Public views of these resources exist in various locations from Lower Honoapiʻilani Road and Honoapiʻilani Highway. Other scenic resources have been identified in the Nāpili area, including views of the Pacific Ocean which are listed as a scenic resource in the project area. The ocean is currently partially visible from Lower Honoapiʻilani Road fronting the subject properties.

<u>Anticipated Impacts and Mitigation Measures</u>

The project is not anticipated to significantly affect public view corridors, or the visual character of the site and its immediate environs (See *Figures 4-7 through 4-10*). The proposed bluff reinforcement will utilize a similar rock/masonry façade to be consistent with the existing shoreline forms. Shotcrete will be colored and textured to look like natural rock. The terracing of the reinforcement work and growth of the overhanging vegetation at the top of the bluff and on the midway terrace may provide visual mitigation, de-emphasizing the height of the bluff. The vertical bluff face will not protrude above the existing mauka grade of the property, thus by topographic nature it will not block scenic views of the ocean or mountains.

Figure 4-7 **Site Photo Key**

Figure 4-8 **1. View from 4855 Lower Honoapiʻilani Road**

Figure 4-9 **2. View from 4869 Lower Honoapiʻilani Road**

Figure 4-10 **3. View from 4871 Lower Honoapiʻilani Road**

4.11 Socio-Economic Characteristics

Existing Conditions

The project site is located in Kahana, near Lahaina on the island of Maui. The areas near the project site consist primarily of single-family homes and a condo development along the coastal highway.

Anticipated Impacts and Mitigation Measures

The project is not expected to adversely affect socio-economic characteristics of the Island of Maui and the project region. The project will not increase population of Kahana. The project will generate short-term economic benefits through construction materials expenditures and construction employment. Upon completion, the reinforced bluff is expected to have beneficial long-term impacts by providing these three properties with protection from wave action erosion, protecting the public ocean users in the bay, and protecting nearshore water quality.

4.12 Public Facilities and Services

This section discusses the potential for the project to adversely affect public facilities and services.

4.12.1 Educational Facilities

Existing Conditions

The Maui School District is operated under the State Department of Education (DOE). There are two elementary schools, one intermediate school, and one high school located near the project site:

- King Kamehameha III Elementary School is located approximately 1.8 miles away from the project site and is the closest DOE educational facility.
- Princess Nāhiʻenaʻena Elementary School is located approximately 9.4 miles away from the project site.
- Lahaina Intermediate School is located approximately 9.5 miles away from the project site.
- Lahainaluna High School is located approximately 9.5 miles away from the project site.

While not part of the DOE, Maui Preparatory Academy is located 0.25 miles to the east of the project site.

Anticipated Impacts and Mitigation Measures

The project is not anticipated to adversely affect educational facilities. The project will not increase the population in the West Maui region. No mitigation is proposed.

4.12.2 Public Services

Existing Conditions

There are a variety of County parks and beach parks located in the West Maui region, including those in the vicinity of the project site, such as Kaopala Beach, Nāpili Park, the Kapalua Coastal Trail, and Pōhaku Beach Park. The project area is serviced by the Maui Police Department, with the closest substation located 6.5 miles to the south in Lahaina off Honoapiʻilani Road. The project is also serviced by the Maui Fire Department, with the closest substation located 6.4 miles to the south also in Lahaina off Honoapiʻilani Road. The closest medical facility is the Lahaina Satellite Clinic, located 10.8 miles to the south off Honoapiʻilani Road. Westside Waste is the nearest waste management service to the site, and is located 11 miles to the south in Lahaina.

Anticipated Impacts and Mitigation Measures

The project site is in an established neighborhood with existing infrastructure. Based on the scope and scale of the project, it is not anticipated to require the expansion of current public services like parks, law enforcement, fire departments, educational institutions, healthcare facilities, or waste management. The project is not anticipated to adversely affect these services, and no mitigation is proposed.

4.12.3 Infrastructure

4.12.3.1 Water

Existing Conditions

The Maui Department of Water Supply (DWS) provides public water service for the West Maui region. In addition to the County, private water utilities such as the Kapalua Water Company and the Hawaii Water Service Company provide domestic water service for resorts in the area. Domestic water and fire flow for the project are currently provided by the County water system.

The project area is served by 8-inch and 12-inch County waterlines on Lower Honoapiʻilani Road. The subject properties are presently serviced by a 5/8" water meter with a capacity of 20 gpm. Fire protection is provided by two (2) existing fire hydrants on Lower Honoapiʻilani Road.

Anticipated Impacts and Mitigation Measures

The bluff reinforcement work is not anticipated to adversely affect the County's public water system.

4.12.3.2 Sewer

Existing Conditions

The existing wastewater infrastructure consists of a 21-inch gravity sewerline on Lower Honoapiʻilani Road, which is part of the County's Nāpili-Honokowai wastewater transmission system. The parcels have existing sewer laterals which connect to the existing sewer line. Wastewater collected from the area is transported to the Lahaina Wastewater Reclamation facility located approximately 2.75 miles south of the project site.

Anticipated Impacts and Mitigation Measures

The bluff reinforcement work is not anticipated to adversely affect the County's public wastewater system.

4.12.3.3 Drainage

Existing Conditions

The majority of the project site is located within Flood Zone "X" as delineated by Panel No. 150003 0264F of the Flood Insurance Rate Map, September 19, 2012, prepared by the United States Federal Emergency Management Agency (FEMA). Surface runoff from the site currently sheet flows in a northeasterly direction to discharge into the shoreline. There are currently no man-made drainage facilities at the site.

Anticipated Impacts and Mitigation Measures

The bluff reinforcement work is not anticipated to adversely affect site drainage. The new system is designed to reduce run-off and erosion, improving drainage at the site and reducing the amount of sediment and run-off flowing into the shoreline.

4.12.3.4 Roadway

Existing Conditions

Lower Honoapiʻilani Road is a two-lane, paved County roadway that provides access to the project site along with other properties in Nāpili and Kahana. The road begins at the intersection with Honoapiʻilani Highway near Honokowai Stream in Kāʻanapali and continues until it ends at the Resort Community of Kapalua.

Anticipated Impacts and Mitigation Measures

The scope and scale of the project is not anticipated to adversely affect traffic on Lower Honoapiʻilani Road.

4.12.3.5 Electrical, Telephone, Cable and Data Systems

Existing Conditions

Existing electrical power to the project parcels is provided by Hawaiian Electric Co. Ltd. (HECO). Existing internet and phone service is provided by Hawaiian Telcom (HTCO).

Anticipated Impacts and Mitigation Measures

The bluff reinforcement work is not anticipated to adversely affect electrical, telephone, cable or data systems.

4.13 Potential Cumulative and Secondary Impacts

Cumulative effects are impacts which result from the incremental effects of an activity when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertake such other actions.

Erosion has occurred for decades along the project parcels shoreline. Because of the chronically eroding shoreline, previously constructed sea walls and revetments in the area were likely in response to erosion of the bluff area. Reinforcement of the bluff via the designed fortified conglomerate unit with terraced walls at the subject properties will help to stabilize this shoreline section and is not anticipated to adversely affect shoreline processes at other sections of the bay's shoreline. The action to stabilize the bluff at the project parcels will reduce future erosion threats to Honoapiʻilani Highway at this location. The reinforcement work is consistent with applicable development plans and policies. The applicants will seek a Shoreline Setback Variance, SMA Use Permit, and will adhere to the applicable terms and conditions of approval tied to these permits.

Construction activity during the proposed project will generate direct employment as well as indirect and induced employment in construction-related industries. The project is expected to cost approximately $2,000,000 to $4,000,000, which will be spent in Hawaiʻi. Short-term construction-related impacts on the environment will be generated by the project, and mitigation measures will be implemented to minimize these impacts. Construction-related impacts will be temporary and will be in the immediate vicinity of the project site. Federal, State, and County environmental regulations will be met throughout the construction and operation of the project.

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Chapter 5

Plans, Policies, and Regulations

Chapter 5

Plans, Policies, and Regulations

The project's consistency with applicable Federal, State of Hawaiʻi and County of Maui planning and land use objectives, policies, principles and guidelines are discussed below.

The subject project is located within the SMA. As such, the planned improvements require an SMA Use Permit. Pursuant to Chapter 205A, Hawaiʻi Revised Statutes, and the Rules and Regulations of the Planning Commission of the County of Maui, projects located within the SMA are evaluated with respect to SMA objectives, policies, and guidelines. This section addresses the project's relationship to applicable coastal zone management considerations, as set forth in Chapter 205A and the Rules and Regulations of the Planning Commission.

5.1 Hawaiʻi State Plan

The Hawaiʻi State Plan establishes a statewide planning system that provides goals, objectives, and policies that detail priority directions and concerns of the State of Hawaiʻi. HRS Chapter 226 codifies the Hawaiʻi State Plan to serve as a guide for the future long-range development of the State; identify the goals, objectives, policies, and priorities for the State; provide a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources; improve coordination of federal, state, and county plans, policies, programs, projects, and regulatory activities; and to establish a system for plan formulation and program coordination to provide for an integration of all major state, and county activities. This plan directs creation of Functional Plans and County general plans and sets forth the State planning structure.

State goals under the Hawaiʻi State Planning Act are set to guarantee, for present and future generations, those elements of choice and mobility that insure individuals and groups may approach their desired levels of self-reliance and self-determination:

1. A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaiʻi present and future generations.
2. A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.
3. Physical, social, and economic well-being, for individuals and families in Hawaiʻi, that nourishes a sense of community responsibility, of caring, and of participation in community life (Chapter 226-4, HRS).

Objectives and policies of the State Plan that pertain to the project follow:

Section 226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources.

(a) *Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:*

(1) Prudent use of Hawaiʻi's land-based, shoreline, and marine resources.

(2) Effective protection of Hawaiʻi's unique and fragile environmental resources.

(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:

(1) Exercise an overall conservation ethic in the use of Hawaiʻi's natural resources.

(3) Take into account the physical attributes of areas when planning and designing activities and facilities.

(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.

(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaiʻi.

(8) Pursue compatible relationships among activities, facilities, and natural resources.

Discussion: The project's use of this area is consistent with State and County land use districts and zoning designations. No endangered plant species, animal species, or habitats are present in the project area. The project is not anticipated to pose threats to Native Hawaiian endangered plant or animal species and habitats.

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

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaiʻi's scenic assets, natural beauty, and multi-cultural/historical resources:

(b) To achieve the scenic, natural beauty, and historic resources objectives, it shall be the policy of this State to:

(1) Promote the preservation and restoration of significant natural and historic resources.

(3) Promote the preservation of views and vistas to enhance the landscapes, and other natural features.

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

Discussion: The project is not anticipated to have significant impacts to existing scenic assets or cultural/historical resources at the project site. As the properties are developed with existing homes, the project will not be visible from roadway views toward the ocean.

A Cultural Impact Assessment and Archaeological Assessment were previously conducted for the project. These studies indicated no effects to cultural, archaeological, or historical resources are anticipated to result from the project.

Section 226-13 Objectives and policies for the physical environment--land, air, and water quality.

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:

(1) Maintenance and pursuit of improved quality in Hawaiʻi's land, air, and water resources.

(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:

(2) Promote the proper management of Hawaiʻi's land and water resources.

(6) Encourage design and construction practices that enhance the physical qualities of Hawaiʻi's communities.

Discussion: The project is appropriately scaled and will maintain the physical qualities of Hawaiʻi's natural and scenic resources. Best management practices will be implemented during construction to protect the physical environment (land, air, and water).

5.2 Hawaiʻi 2050 Sustainability Plan

The long-term strategy of the Hawaiʻi 2050 Sustainability Plan is supported by its main goals and objectives of respect for culture, character, beauty, and history of the State's island communities; balance among economic, community, and environmental priorities; and an effort to meet the needs of the present without compromising the ability of future generations to meet their own needs.

The 2050 Plan delineates five goals toward a sustainable Hawaiʻi accompanied by strategic actions for implementation and indicators to measure success or failure. The goals and strategic actions that are pertinent to the Coastal Stabilization project are as follows:

Goal Three: *Our natural resources are responsibly and respectfully used, replenished, and preserved for future generations*. Strategic Actions: *Provide greater protection for air, and land-, fresh water- and ocean-based habitats; conserve agricultural, open space and conservation lands and resources.*

Discussion: The project will protect land, air, fresh water, and ocean-based habitats; conserve resources through preserving the existing coastal bluff area and preventing housing and debris from contaminating shoreline waters.

5.3 Hawaiʻi State Land Use District Boundaries

Under the Chapter 205, HRS, all lands of the State are to be classified in one of four categories: urban, rural, agricultural, and conservation lands. The State Land Use Commission (LUC), an agency of the State Department of Business, Economic Development, and Tourism (DBEDT), is responsible for each district's standards and for determining the boundaries of each district (Chapter 205-2(a), HRS). The LUC is also responsible for administering all requests for district reclassifications and/or amendments to district boundaries, pursuant to Chapter 205-4, HRS, and the HAR, Title 15, Chapter 15 as amended. Under this Chapter, all lands in Hawaiʻi are classified into four land use districts: (1) Conservation, (2) Agricultural; (3) Urban, and (4) Rural.

The Urban District generally includes lands characterized by "city-like" concentrations of people, structures and services. This District also includes vacant areas for future development. Jurisdiction of this district lies primarily with the respective counties. Generally, lot sizes and uses permitted in the district area are established by the respective County through ordinances or rules.

Discussion: As classified by the State of Hawaiʻi LUC, the project site is situated within the State Urban District. The existing residential uses of the project parcels are consistent with permitted uses for the Urban District with a Special Management Area use permit, and will not require district reclassification or boundary amendments. No work will be done seaward, no state permits will be required.

5.4 Ka Paʻakai v. Land Use Commission

In this section, an analysis of the project's potential effect on or impairment of valued cultural, historical, or natural resources in the petition area, including traditional and customary native Hawaiian rights, is performed to address the case Ka Paʻakai v. Land Use Commission, 94 Hawaiʻi 31, 74, 7 P.3d 1068, 1084 (2000). The Court in Ka Paʻakai held that the following analysis is to be conducted:

1. The identity and scope of valued cultural, historical, or natural resources in the petition area, including the extent to which traditional and customary native Hawaiian rights are exercised in the petition area;
2. The extent to which those resources - including traditional and customary native Hawaiian rights - will be affected or impaired by the planned action; and
3. The feasible action, if any, to be taken by the Land Use Commission to reasonably protect native Hawaiian rights if they are found to exist.

Discussion: This Ka Paʻakai cultural analysis draws from the existing biota conditions *(Section 3.6),* Archaeological Assessment *(Appendix B),* and Cultural Impact Assessment (*Appendix C*) to determine the project's potential effect on or impairment of valued cultural, historical, or natural resources in the petition area, including traditional and customary native Hawaiian rights.

First Test: Identification of Valued Cultural, Historical, or Natural Resources

This test comprises two elements:

Identification of Tangible Resources: Recognizing existing cultural, historical, or natural resources, such as sacred sites and culturally significant flora and fauna. There are no critical habitats within the project area under the USFWS office's jurisdiction. There are no refuge lands or fish hatcheries within the project area, and there are no wetlands within the project area. No historical resources have been identified in the petition area.

The Cultural Impact Assessment found that no evidence of the exercise of traditional and customary native Hawaiian rights within the project area. Cultural practices related to gathering of coastal and marine resources occur in the nearby vicinity, but not at the specific project site. Work and accessory uses in the project area would not affect or impair traditional and customary native Hawaiian rights in any event.

Assessment of Utilization: Understanding how these resources are accessed and utilized in connection with traditional practices. The Cultural Impact Assessment conducted for this parcel provided sufficient details as to how cultural and natural resources have continued to be accessed and utilized for continued traditional and customary practices with the Project area. Additional testimony and interviews referenced from the Kahana Sunset Building F and Building A Repairs testimony before the County of Maui Planning Commission dated July 20, 2023, noted Ka Malu o Kahālāwai and other families from the area have used Keoenui Bay for traditional and customary practices such as fishing, diving, surfing, voyaging, hukilau, and gathering for many generations.

Second Test: Assessment of Impact on Resources

This test involves evaluating whether the proposed action may adversely affect identified resources, including potential harm to biological, cultural, and historical sites. The project is not anticipated to adversely affect ocean resources as the reinforcement work will be done outside of the shoreline and will prevent erosion and bluff failure events that would contaminate nearshore waters. The proposed Project action at the Barto, Hester, and Lusardi properties holds the potential to benefit and the identified practices through the reinforcement work proposed as a part of the coastal stabilization project, which will serve to protect the bay from degradation.

Other benefits and actions include collaborating with local community groups to ensure cultural resources remain unharmed.

By adopting such measures, the applicants can ensure the preservation of cultural rights and practices at Keoenui Bay in alignment with the principles of the Ka Paʻakai Analysis.

Considering the analysis required under the Ka Paʻakai case, there is a determination that the project will not affect or impair valued cultural, historical, or natural resources in the petition area, including traditional and customary native Hawaiian rights.

Third Test: Identification of Feasible Protective Measures

The third test includes feasible actions to protect Native Hawaiian rights.

In the event that any previously unidentified historic sites or native Hawaiian burials are encountered during site work and construction phases, all work in the immediate area will cease and SHPD will be notified. Work in the area will be suspended until further recommendations are made for the appropriate treatment of cultural materials.

5.5 Hawaiʻi Coastal Zone Management Program

The Coastal Zone Protection Act of 1996 (16 U.S.C. Section 1451), as amended through Public Law 104-150, created the coastal management program and the National Estuarine Research Reserve system. The coastal states are authorized to develop and implement a state coastal zone management program. The Hawaiʻi CZM Program received federal approval in the late 1970s. The objectives of the CZM Program, Section 205A-2, HRS, are to protect valuable and vulnerable coastal resources such as coastal ecosystems, special scenic and cultural values and recreational opportunities. The objectives of the program are also to reduce coastal hazards and to improve the review process for activities planned within the coastal zone.

Each county is responsible for designating a SMA that extends inland from the shoreline. Development within this SMA is subject to County approval to ensure the proposal is consistent with the policies and objectives of the Hawaiʻi CZM Program. The entire Project site is within the SMA as delineated by the County of Maui and as such, requires an additional review under State CZM and County SMA rules. The following subsections examine the objectives of the Hawaiʻi CZM Program and the Project's impacts relative to the State CZM objectives and policies as noted in HRS 205A-2. Specific County of Maui SMA policies are also discussed in *Section 5.14*.

RECREATIONAL RESOURCES

Objective: Provide Coastal Recreational Opportunities Accessible to the Public.

(A) *Improve coordination and funding of coastal recreation planning and management.*

(B) *Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*

- *Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
- *Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites and sandy beaches, when such resources will be unavoidable damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;*
- *Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
- *Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
- *Encouraging expanded public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value;*
- *Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters;*
- *Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, artificial reefs for surfing and fishing; and*
- *Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use Commissions, board of land and natural resources, county planning commissions, and crediting such dedication against the requirements of Section 46-6.*

Discussion: The project will not affect coordination and funding of coastal recreation planning and management.

The project includes the reinforcement of an existing coastal bluff outside of the State jurisdiction. The project will comply with State CZM guidelines and improve coastal recreational opportunities by reducing a significant safety risk and protecting water quality.

Construction will be in accordance with State and federal water quality regulations.

HISTORIC RESOURCES

Objective: Protect, preserve and, where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiʻi and American history and culture.

(A) *Identify and analyze significant archaeological resources;*

(B) *Maximize information retention through preservation of remains and artifacts or salvage operations; and*

(C) Support state goals for protection, restoration, interpretation and display of historic resources.

Discussion: An Archaeological Assessment Report was conducted for the project area to assess the potential for locating archaeological resources. The study did not identify evidence of archaeological remains at the site. Consistent with the archaeological investigation, the Cultural Assessment determined the site does not possess culturally significant resources. Cultural practices related to gathering of coastal and marine resources occur in the nearby vicinity, but not at the specific project site. Work and accessory uses in the project area would not affect or impair traditional and customary native Hawaiian rights in any event. See Section 5.4 Ka Paʻakai Analysis above.

SCENIC AND OPEN SPACE RESOURCES

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

(A) Identify valued scenic resources in the coastal zone management area;

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

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments which are not coastal dependent to locate in inland areas.

Discussion: As described in *Section 3.10,* the action will not adversely affect vistas or scenic resources.

COASTAL ECOSYSTEMS

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

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

(B) Improve the technical basis for natural resource management;

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

(E) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

Discussion: The project will bring many private and public benefits from protecting the shoreline properties from high wave action events and rapid erosion. This innovative engineering strategy sacrifices land to the State outside of the shoreline in order to improve the overall high sea-level situation across the bay. As discussed in *Section 3.5* of this EA, the project is not anticipated to pose adverse effects to coastal ecosystems and will have positive impacts on coastal water quality.

ECONOMIC USES

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

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

<u>Discussion:</u> The project is consistent with State and County plans and land regulations, and is seeking a Special Management Area permit and Shoreline Setback Variance for the bluff reinforcement work. The project is not anticipated to result in adverse social, visual, and environmental impacts in the coastal zone management area.

COASTAL HAZARDS

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

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

<u>Discussion:</u> The purpose of the project is to prevent high wave action from further exacerbating coastal avulsion issues fronting the subject properties. The project supports the objectives and policies with regards to coastal hazards.

MANAGING DEVELOPMENT

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

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

(B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

(C) Communicate the potential short and long-term impacts of planned significant coastal developments early in their life-cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

<u>Discussion:</u> The project supports the objectives and policies with regards to managing development in coastal areas. This EA complies with the requirements for assessing and communicating the potential short and long-term impacts of the coastal reinforcement work.

PUBLIC PARTICIPATION

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

(A) Promote public involvement in coastal zone management processes;

(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

<u>Discussion:</u> Public participation is requirement of the HRS Chapter 343 environmental review process. The Environmental Review Program (ERP) is the governing agency of EA publications, and makes available all EAs for public review and comment. The public is provided 30 days to submit comments on the EA. Information regarding the coastal issues and processes is publicly provided in the EA, along with planned mitigation measures for coastal concerns. Consulted parties in the process are also encouraged to provide inputs regarding the project during the Draft EA. The SMA permit and shoreline setback variance application process for the project will also require a public hearing which allows individuals to provide comments on the project.

BEACH PROTECTION

Objective: Protect beaches for public use and recreation.

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

(B) Prohibit construction of private shoreline hardening structures, including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities;

(C) Minimize the construction of public shoreline hardening structures, including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities;

(D) Minimize grading of and damage to coastal dunes;

(E) Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and

(F) *Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.*

<u>**Discussion:**</u> The coastal stabilization work is to be located in land of the existing shoreline. The project will reduce the potential loss of structures due to erosion. The subject properties face ongoing threats from avulsion that would eventually undermine the structural integrity of existing homes. The coastal reinforcement will not interfere with and will preserve existing recreational and waterline activities and coastal access while reducing health risks to beach users. The steep sea cliffs that front much of the bay, and that are especially pronounced in front of the Hester and Barto properties, act as natural walls to reflect wave impact in the absence of a sand beach. It is not likely that the reinforcement of the cliff face would measurably change wave reflection or affect coastal processes differently than the steep naturally occurring rock and clay material that is already present on the shoreline. See *Appendix B* for additional analysis.

MARINE RESOURCES

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

(A) *Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*

(B) *Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;*

(C) *Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;*

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

(E) *Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

<u>**Discussion:**</u> The project will not directly affect marine resources. A Coastal Assessment by Sea Engineering, Inc. (2024) examined the alternatives to stabilize the shoreline and taking into consideration the marine resources of the area (*Appendix B*). The report identified the bluff reinforcement work as the preferred engineering alternative.

PART III. SHORELINE SETBACKS

A shoreline setback variance is required when structures are planned within the shoreline area. Shoreline area is defined by HRS Chapter 205A-41 as,

"'Shoreline area' shall include all of the land area between the shoreline and the shoreline setback line and may include the area between mean sea level and the shoreline; provided that if the highest annual wash of the waves is fixed or significantly affected by a structure that has not received all permits and approvals required by law or if any part of any structure in violation of this part extends seaward of the shoreline, then the term 'shoreline area' shall include the entire structure."

Discussion: The project qualifies for a variance as being clearly in the public interest and for the purposes of public safety. The current shoreline fronting the subject properties is highly susceptible to exacerbated erosion conditions that may likely cause hardship to the applicants, whose homes' structural integrity would eventually be undermined at the current rates of erosion.

Criteria for Granting a Shoreline Setback Variance

Criteria for granting a shoreline setback variance are provided in Part III of HRS Chapter 205A- 46 and Title MC-12 Chapter 203, §12-203-14. The coastal stabilization work is anticipated to meet the criteria required for a Shoreline Setback Variance under both regulations.

HRS Chapter 205A-46 (a) (7) and (8) read:

(a) A variance may be granted for a structure or activity otherwise prohibited in this part if the authority finds in writing, based on the record presented, that the proposed structure or activity is necessary for or ancillary to:

7. Private facilities or improvements that are clearly in the public interest

8. Private facilities or improvements that will not adversely affect beach processes, result in flanking shoreline erosion, or artificially fix the shoreline; provided that the authority may consider any hardship that will result to the applicant if the facilities or improvements are not allowed within the shoreline area

Erosion of the subject properties without planned reinforcement would result in release of sediment into the nearshore waters as the bank erodes. Removal of the shoreline would result in negative environmental impacts to the marine environment and further encroachment of the shoreline into the properties. The project work consists of fortification of the backshore at the existing bluff, takes place outside of the shoreline, and without the improvements may likely cause hardship to the applicants, whose homes' structural integrity would eventually be undermined at the current rates of erosion.

The planned action will also meet the required conditions listed in 205A-46(c).

No variance shall be granted unless appropriate conditions are imposed:

(1) To maintain safe lateral access to and along the shoreline or adequately compensate for its loss;

(2) To minimize risk of adverse impacts on beach processes;

(3) To minimize risk of structures failing and becoming loose rocks, sharp or otherwise dangerous debris, or rubble on public property; and

(4) To minimize adverse impacts on public views to, from, and along the shoreline.

A reinforced bluff will help to: (1) enlarge and maintain safe lateral shoreline access by stabilizing the bluff to avoid erosion and failure that could endanger the safety of shoreline users, (2) minimize adverse impacts on shoreline sediment movement processes and (3) minimize risk of structures failing by reinforcing the bluff to mitigate loose rocks and dangerous debris while also reducing contamination of nearshore waters and beach processes, and (4) minimize adverse public views along the shoreline as the work will be done outside of and without impacting public shoreline views.

5.6 Hawai‘i Water Quality Standards

The State of Hawai‘i DOH CWB Hawai‘i Water Quality Standards 11-54, HAR were last revised in 2014.

The project is consistent with the applicable objectives and policies for state water quality standards as described below.

General Policy of water quality antidegradation

(a) *Existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.*

(b) *Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the director finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the director shall assure water quality adequate to protect existing uses fully. Further, the director shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.*

(c) *Where existing high quality waters constitute an outstanding resource, such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.*

(d) *In those areas where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with section 316 of the Clean Water Act.*

Discussion: Construction BMPs will be implemented to control water quality fronting the project area, including water quality monitoring. After the reinforcement work is complete, long term water quality impacts are not anticipated, and nearshore water quality is anticipated to improve due to the reduction in on-going major erosion events.

5.7 General Plan County of Maui

The Countywide Policy Plan provides broad goals, objectives, policies, and implementing actions that portray the desired direction of the County's future. The Countywide Policy Plan was adopted in 2010 by Ordinance 3732, and was last updated in 2021 by Ordinance 5264.

This Plan includes:

1. vision statement and core values for the County to the year 2030;
2. explanation of the plan making process;
3. description and background information regarding Maui County today;
4. identification of guiding principles; and
5. countywide goals, objectives, policies, and implementing actions related to 11 core themes.

The Project supports the following goals, objectives, and policies:

Part A: Protect the natural environment.

Goal: Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity.

Objective 2: Improve the quality of environmentally sensitive, locally valued natural resources and native ecology of each island.

- Policy a: Protect and restore nearshore reef environments and water quality.
- Policy b: Protect marine resources and valued wildlife.
- Policy g: Preserve and provide ongoing care for important scenic vistas, view planes, landscapes, and open-space resources.

Objective 3: Improve the stewardship of the natural environment.

- *Policy a: Preserve and protect natural resources with significant scenic, economic, cultural, environmental, or recreational value.*
- *Policy h: Provide public access to beaches and shorelines for recreational and cultural purposes where appropriate.*

Part G: Improve Parks and Public Facilities.

Goal: A full range of island-appropriate public facilities and recreational opportunities will be provided to improve the quality of life for residents and visitors.

Objective 1: Expand access to recreational opportunities and community facilities to meet the present and future needs of all ages and physical abilities.

- *Policy a: Protect, enhance, and expand access to public shoreline and mountain resources.*

<u>Discussion:</u> The project supports the objectives of the General Plan. Development of the project will not pose significant adverse impacts to the natural environment, and seeks to preserve the existing shoreline from accelerated erosion rates. The project is in the urban growth boundary but will not increase square footage or density of the existing structures. The project will maintain the existing scenic vistas as seen from Lower Honoapiʻilani Road, and will not alter existing views. As discussed in *Section 3.9,* an Archaeological Assessment and Cultural Impact Assessment were conducted for the project site, both of which indicated no significant findings. Lastly, the recreational resources and public access at the shoreline will be protected and preserved by the project.

Maui Island Plan

The Maui Island Plan is a blueprint that provides direction for future growth, the economy, and social and environmental decisions on Maui through 2030. The Plan was adopted in 2012 by Ordinance 4004, and assesses existing conditions, trends, and issues specific to the island of Maui; provides policy direction for the use and development of land, extension and improvement of transportation services and infrastructure, development of community facilities, expansion of the island's economic base, provision of housing, and protection of natural and cultural resources; establishes policies to manage change and to direct decisions about future land use and development; and provides the foundation to set capital improvement priorities, revise zoning ordinances, and develop other implementation tools. The Plan also sets the Urban Growth Boundaries and Small-Town Boundaries and Rural Growth Boundaries.

The Project supports the following Plan goals, objectives, and policies:

Goal 2.5 Maui will continue to be a beautiful island steeped in coastal, mountain, open space, and historically significant views that are preserved to enrich the residents' quality of life, attract visitors, provide a connection to the past, and promote a sense of place.

> **Objective 2.5.2:** Reduce impacts of development projects and public-utility improvements on scenic resources.
>
> **Policies 2.5.2.a:** Enforce the policies and guidelines of the SMA regarding the protection of views.

Goal 8.1 Maui will have well-serviced, complete, and vibrant urban communities and traditional small towns through sound planning and clearly defined development expectations.

> **Policies 8.1.i:** The County will promote (through incentives, financial participation, expedited project review, infrastructure/public facilities support, etc.) appropriate urban infill, redevelopment and the efficient use of buildable land within UGBs to avoid the need to expand the UGBs.

<u>Discussion:</u> The project supports the objectives of the Maui Island Plan. The Project will not substantially or detrimentally alter any natural land forms. The Project will stabilize existing land forms. The Project improvements are not anticipated to impact existing public views from Honoapiʻilani Highway or alter any views along the shoreline. The Site is located within the Urban Growth Boundaries and is consistent with the Plan's Directed Growth Plan.

5.8 West Maui Community Plan

The West Maui Community Plan Area focuses on how and where West Maui will grow and what this growth should look like to meet the needs of residents while protecting and preserving that which makes the area special. The Plan covers the majority of the traditional moku of Lāhainā and Kāʻanapali, an area which includes the Project. The Plan was adopted in 2021 by Ordinance No.5334. The Project supports the following goals and policies from the Plan:

<u>Goal: Responsible stewardship of resources, culture, and character.</u>

Policies 2.3.3 | Protect ocean and stream water quality by requiring that wetlands, as defined by traditional historic knowledge or by Section 404 of the Clean Water Act, be preserved with vegetated buffer areas that are adequate to protect them from pollutants.

2.3.13 | The marine and nearshore environment and open space areas are important assets of the region and should be protected and preserved. Habitat connectivity for threatened and endangered species, watersheds, undeveloped shoreline areas and other environmentally sensitive lands must be preserved.

2.3.15 | Prohibit the construction of seawalls and revetments except as may be permitted by rules adopted by the Maui Planning Commission governing the Special Management Area and Shoreline Area and encourage beach nourishment through dune restoration and native planting efforts.

<u>Goal | Safe, healthy, livable communities for all.</u>

Policies: 2.5.21 | Support public and private efforts to inventory, evaluate, and expand public shoreline access. Require shoreline access to currently privatized shoreline areas by gates and walls.

2.5.23 | Require public shoreline access to be provided through establishment of both vertical and lateral access through public rights-of-way and public transit corridors as a condition of any SMA Major permit for properties that lie within the Special Management Area and abut the shoreline to the extent permitted by law.

<u>Discussion:</u> The Project is located in a Residential land use designation per the West Maui Community Plan, and provides multiple benefits from resilience actions, including reducing pollution and soil/sediment contamination for nearshore waters by reducing on-going erosion, preserving public shoreline access, protecting the public from further erosion and life safety hazards, and will ultimately help protect the County's Lower Honoapiʻilani Road from additional erosion. The Project will protect ocean quality and will protect and expand existing shoreline access at the lower beach level. The project is permitted by rules adopted by the MPC governing SMA and Shoreline Areas as it is clearly in the public interest for life safety and protection of nearshore waters.

5.9 Special Management Area

The project area is located within the SMA, which was established to preserve, protect, and where possible, to restore the natural resources of the coastal zone of Hawaiʻi. Special controls on development within the SMA are necessary to avoid permanent loss of valuable resources and foreclosure of management options. The SMA Rules for the Maui Planning Commission, Chapter 202, were established to implement HRS 205A. Amendments to the Rules went into effect on August 25, 2024.

(e) In considering the significance of potential environmental and ecological effects, the director shall evaluate:

(1) The sum of those effects that adversely affect the quality of the environment and the ecology, and the overall and cumulative adverse effects of the planned action, including the extent of sea level rise impacts predicted during the planned action's lifespan;

(2) Every phase of a planned action, its expected primary and secondary consequences, and its cumulative and short-term or long-term effects, including previous, ongoing and other planned or completed actions on the same parcel or on related adjacent parcels that together with the subject parcel comprise a development, within the preceding two years. A planned action may have a significant adverse effect on the environment when the planned action potentially:

(A) Causes an irrevocable or substantial and detrimental effect on any natural or cultural resources;

<u>Discussion:</u> Based upon the previous archaeology assessment (Appendix B) and CIA (Appendix C), the Project is not anticipated to significantly impact any known archaeological resources or cultural practices.

(B) Significantly curtails the range of beneficial uses of the environment;

Discussion: The Project will not significantly curtail the range of beneficial uses of the environment. A specific program of BMPs will be implemented during construction to minimize construction-related impacts to the shoreline and nearshore waters.

(C) Conflicts with the County's or the State's long-term environmental policies or goals;

Discussion: The Project does not conflict with the State's or County's long-term environmental policies or goals as set forth in Chapter 344, HRS. The Project will preserve and protect existing shoreline areas, and will comply with the principles set forth by Chapter 344, HRS.

(D) Substantially and detrimentally affects the economic or social welfare and activities of the community, County, or State;

Discussion: The Project will support construction and construction related employment opportunities and will have a beneficial short-term impact on the local economy during construction. From a long-term economic perspective, area residents, employees and visitors will continue to benefit from the preservation of the public shoreline and associated recreational areas.

The Project improvements are anticipated to generate both short- and long-term benefits to State and County economies.

(E) Causes substantial and detrimental effects on public facilities, such as increased demand on drainage, sewage, and water systems, beach access, recreational opportunities, and pedestrian walkways;

Discussion: The Project does not involve substantial or detrimental effects on public facilities, as no increase in population or demand on public facilities is anticipated as a part of the Project.

(F) In itself has no substantial and detrimental effects but cumulatively has substantial and detrimental effects upon the environment;

Discussion: The Project scope is limited to bluff reinforcement in an existing residential area. The Project is not anticipated to have a cumulative adverse impact on the environment and does not involve a commitment to larger actions. Existing infrastructure systems and services are anticipated to adequately serve the Project.

(G) Substantially and detrimentally affects a rare, threatened, or endangered species of animal or plant, or its habitat;

Discussion: There are no known threatened, endangered, or candidate species of animals or plants or habitats within the Project site. The Project is not anticipated to have significant adverse impacts on biological resources in the area.

(H) Is inconsistent with the State plan, County general plan including the Maui Island Plan and appropriate community plans, zoning, and subdivision ordinances;

Discussion: The Project is consistent with the State plan, County general plan including the Maui Island Plan, and appropriate community plans, zoning, and subdivision ordinances.

(I) Substantially and detrimentally affects air or water quality;

Discussion: Any short-term air quality and noise impacts caused by construction will be mitigated through the implementation of BMP's and dust control measures. A noise permit will be obtained if required to mitigate noise impacts during construction from equipment and building activities.

Potential water quality impacts associated with the Project will be mitigated through the BMP program established for sediment control.

(J) Substantially and detrimentally affects or is likely to suffer damage by being located in an environmentally sensitive area, such as flood plain, shoreline, coastal dune, tsunami zone, erosion-prone area, sea level rise exposure area, wetland, geologically hazardous land, estuary, fresh waters, or coastal waters;

Discussion: The Project aims to reinforce the existing bluff in order to preserve and protect properties along the shoreline, along with keeping nearshore waters clear of debris. The Project is not likely to impact coastal waters or resources. The implementation of BMPs will minimize impacts to the adjacent shoreline areas.

(K) Substantially and detrimentally alters natural land forms and existing public views, or curtails or forecloses potential improvements to public views, to and along the shoreline; or

Discussion: The Project will not substantially or detrimentally alter any natural land forms. The Project will stabilize existing land forms. The Project improvements are not anticipated to impact existing public views from Honoapiʻilani Highway, or alter any views along the shoreline. The Project is not anticipated to present significant adverse impacts on view corridors in the area, as the design of the reinforcement work will utilize colored and textured shotcrete to soften visual impacts of the work.

(L) Is inconsistent with the objectives and policies of chapter 205A, Hawaii Revised Statutes.

Discussion: The Project is consistent with the objectives and policies of Chapter 205A, HRS. The Project improvements are not anticipated to result in any significant adverse environmental and ecological effects on the surrounding environment. As analyzed in Section 5.5, the project is consistent with the objectives and policies of Chapter 205A, HRS.

5.10 Shoreline Setback Rules

The Shoreline Rules for the Maui Planning Commission, Chapter 203, was established to regulate the use and activities of land within the shoreline environment in order to protect the safety and welfare of the public by providing protection from coastal hazards; and to ensure that the public use and enjoyment of our coastal resources are preserved and protected for future generations in accordance with HRS 205A. Recent amendments to the Rules went into effect on August 25, 2024. As described in the 2024 update, Section §12-203-6 Establishment of shoreline setback lines, "For areas where there is no mapped erosion hazard line, the shoreline setback line shall be two hundred feet from the shoreline as mapped by the department".

Discussion: The erosion hazard line is not mapped in the project area due to the site geology. The project is located within the 200 foot default setback (see *Figure 5-1*).

Figure 5-1 **County of Maui Mapped Erosion Hazard Line and Shoreline Setback Line**

5.10.1 Shoreline Setback Variance

The project will be requesting a shoreline setback variance under the following as shown in §12-203-15 (7) and (8):

7. *Private facilities or improvements that are clearly in the public interest*
8. *Private facilities or improvements that will not adversely affect beach processes, result in flanking shoreline erosion, or artificially fix the shoreline; provided that the authority may consider any hardship that will result to the applicant if the facilities or improvements are not allowed within the shoreline area*

Shoreline Setback Variance Criteria Includes:

1. *That the natural shoreline environment be preserved.*

Discussion: The Project will reinforce the existing bluff and preserve the natural shoreline environment, reducing the risk for nearshore contamination from erosion and runoff.

2. *That man-made features in the shoreline are be limited to features compatible with the shoreline area.*

Discussion: The Project will utilize colored and textured shotcrete that are physically and visibly compatible with the existing shoreline area to soften visual impacts of the reinforcement work.

3. *That the natural movement of the shoreline be protected from development.*

Discussion: The Project's reinforcement of the existing coastal bluff geology will preserve shoreline movement through the mitigation of erosion and nearshore water contamination conditions.

4. *That the quality of scenic and open space resources be protected, preserved, and where desirable, restored.*

Discussion: The Project will protect and preserve scenic and open space resources by stabilizing the existing bluff.

5. *That adequate public access to and along the shoreline be provided.*

Discussion: The Project will preserve public access in and along the shoreline adjacent to the properties through the mitigation of life safety threatening erosion failure and hazard events.

6. *That public use and enjoyment of the shoreline area and resources are ensured to be preserved and protected for the public to the fullest extent possible for future generations in accordance with the Hawaiʻi Coastal Zone Management Law, HRS Chapter 205A.*

Discussion: The Project will preserve the shoreline area and resources along the shoreline adjacent to the properties through the mitigation of life safety threatening erosion failure and hazard events, for current and future generations of ocean users.

7. *That the health, safety, and welfare of the public is protected by providing minimum protection from known coastal natural hazards.*

Discussion: The Project will protect the health, safety, and welfare of the public in and along the shoreline adjacent to the properties through the mitigation of life safety threatening erosion failure and hazard events.

As stated in §12-203-15 (10)(b): A structure or activity may be granted a variance upon grounds of hardship if:

(1) *The applicant would be deprived of reasonable use of the land if required to fully comply with the shoreline rules;*

(2) *The applicant's proposal is due to unique circumstances and does not draw into question the reasonableness of the shoreline rules; and*

(3) *The proposal is the practicable alternative that best conforms to the purpose of these rules.*

Discussion of Hardship

1. *Describe how and why you would be deprived of reasonable use of the land if required to fully comply with the Shoreline Rules.*

Discussion: Continued erosion at the bluff would threaten the habitable buildings of all three applicant properties. The coastal stabilization action will help the applicants protect their residences while also protecting the safety of the public from potential life safety hazards due to erosion and failure. The loss of the homes would deprive the applicants of reasonable use of their residences and rear yard areas.

2. *Describe how and why your proposal is due to unique circumstances and does not draw into question the reasonableness of the Shoreline Rules.*

Discussion: The Project does not question the reasonableness of the shoreline setback rules. The rules provide the reasoning for this variance, as the applicants have spent years addressing the erosional forces found at Keonenui Bay. The coastal stabilization solution proposed addresses the unique circumstances at this shoreline and is the result of lengthy discussions with the County of Maui and Sea Engineering on how to address the adaptation and resilience needs of these property owners.

3. *Describe how and why your proposal is a reasonable use of land and that it is appropriate development that will not easily pose a risk to individuals or to the public health and safety considering factors such as shoreline conditions, erosion, surf and flood conditions, and the geography of the lot.*

Discussion: All three of the properties have lost portions of their properties due to mass wasting events. The Project will involve removing additional portions of the bluff in order to be located mauka of the certified shoreline, representing a form of shoreline retreat.

The Project is a reasonable use of land as it maintains the existing residential use of the applicant parcels that has been on-going for decades, and does not pose a risk to individuals or to public health and safety. In fact, the purpose of the Project is to reinforce the existing bluff to prevent life safety hazards due to coastal erosion and soil failure.

4. *Describe how and why any hardship which leads to your proposal is or is not related to each of the following: a) economic hardship to you; b) a result of your actions; and c) county zoning changes, planned development permits, cluster permits, subdivision approvals after June 16,*

1989, or any other permit or approval which may have been issued by the Planning Commission.

Discussion: a) Loss of the residential units for each of the applicants would result in hardship as the parcels could no longer be utilized as residences, resulting in a loss of land value and property value.

b) Hardship is not a result of the actions of the applicants, as coastal erosion is an ocean and weather driven circumstance.

c) Hardship is related to Maui Planning Commission rules as the shoreline setback area has been revised to be 200 feet from the shoreline, which is up above the residences and past Honoapiʻilani Road, past the legally buildable lot area of the parcel property lines.

DESCRIBE HOW AND WHY YOUR PROPOSAL WILL BE ABLE TO MEET EACH OF THE FOLLOWING CONDITIONS OF APPROVAL THE PLANNING COMMISSION MUST REQUIRE.

1. *To maintain and require safe lateral access to and along the shoreline for public use or adequately compensate for its loss.*

Discussion: The Project will maintain lateral access along the shoreline for public use as the bluff reinforcement will protect the public and ocean users from sudden erosion failure and life safety hazards as a result of coastal erosion.

2. *To minimize risk of adverse impacts on beach processes.*

Discussion: The Project will minimize risk of adverse impacts on beach processes along the shoreline through the bluff reinforcement, as the coastal stabilization will protect the public and ocean users from sudden erosion failure and life safety hazards as a result of coastal erosion.

3. *To minimize risk of structures failing and becoming loose rocks or rubble on public property.*

Discussion: The Project will minimize risk of structures failing and existing bluff erosion along the shoreline through the coastal stabilization work, as the reinforcement will protect the public and ocean users from sudden erosion failure and life safety hazards as a result of coastal erosion.

4. *To minimize adverse impacts on public views to, from, and along the shoreline. For purposes of this section only, "adversely impacts public views" means the adverse impact on public views and open space resources caused by new building structures exceeding a one-story or thirty-foot height limitation.*

Discussion: The Project consists of reinforcement work to the existing bluff, and no new building structures exceeding one-story or thirty feet in height are proposed.

5. *To comply with chapters 19.62 and 20.08, Maui County Code, relating to flood hazard districts and erosion and sedimentation control respectively.*

Discussion: The Project will comply with Maui County Code (MCC) chapters 19.62 and 20.08 regarding flood hazard districts and erosion and sedimentation control.

FOR VARIANCE REQUESTS WHICH RELATE TO A PRIOR S.M.A. EMERGENCY PERMIT THAT IS THE RESULT OF OR THAT OTHERWISE INVOLVES COASTAL EROSION, DESCRIBE HOW AND WHY YOUR PROPOSAL IS THE BEST ALTERNATIVE COMPARED TO EACH OF THE FOLLOWING OTHER ALTERNATIVES:

**1. Relocation of threatened structures*

__Discussion:__ All three applicant structures cannot be relocated outside of the shoreline setback area, which is located past the ends of their properties and into Lower Honoapiʻilani Road.

**2. Elevation of structures*

__Discussion:__ Elevating the structures will not prevent the on-going coastal erosion and would ultimately still result in the failure of any structures on the parcels, and eventually Lower Honoapiʻilani Road.

**3. Dune or beach restoration*

__Discussion:__ Due to coastal processes, beach or dune restoration is not feasible in this area without protective structures.

4. *Protective or erosion control measures, such as groins, and offshore structures such as breakwaters*

__Discussion:__ The Project is significantly less costly and less impactful than groins and other offshore structures.

COASTAL EROSION ANALYSIS

1. *Provide an analysis of historical and anticipated coastal erosion and coastal processes related to the subject property.*

__Discussion:__ The combination of a gradual loss of carbonate sand supply, as evidenced by the significant reduction in beach width over time, and the hard substrate on the mauka edge of the beach, has resulted in the decay of the littoral cell. The long-term presence of the harder, more erosion-resistant conglomerate, will likely lead to the natural loss of the beach in this bay.

This process has played out in many areas on Maui's shoreline and continues to actively occur in locations such as Keonenui Bay. There are numerous locations along the coastline where the beach has been 'pinched' against hard-substrate, such as clay banks, alluvium, rocky bluffs, boulder and cobble banks, and conglomerate such as is present at the project site. This is a naturally occurring phenomenon, where continued erosion of the backshore has not typically resulted in reestablishment or recovery of the sand beach. In most of these situations, the sand beach is eventually lost, leaving harder substrate exposed along the coastline.

A series of historical aerial photographs are used to determine shoreline change trends. The University of Hawaii Coastal Geology Group (CGG) has undertaken a historical analysis of Maui's shoreline and produced a shoreline change map for the Alaeloa region based on aerial imagery from 1912 to 1997. The CGG analysis determined that the dominant shoreline change trend for Keonenui Bay (Transects 1 to 14) has been erosion at an average annual rate of 1.3 feet/year.

Physical interaction between the dynamic sandy beach and the more erosion-resistant conglomerate is similar to the interaction between sand beaches and hard substrate. The significantly slower erosion rate of the conglomerate is imperceptible when compared to the rapid and large changes the sand beach undergoes during individual wave events and in response to seasonal changes in wave direction. The long-term trend of both the beach and the mauka substrate has been erosional; however, though there has been some erosion of the backshore, the beach narrowed by 43% between 1949 and 1997. Moreover, the beach at the north end of the bay was eventually lost when it was 'pinched' out against the hard, high elevation substrate in the backshore.

Given these natural conditions, the historic shoreline and beach width trends, and the presence of semi-lithified conglomerate, a sandy beach is unlikely to survive in this location. Erosion of the beach, as evidenced by the mauka migration of the beach toe, is projected to continue, while the significantly slower erosion of the conglomerate becomes an impassible feature that the beach is eventually 'pinched' out against. The beach has already become ephemeral, disappearing in front of the subject properties during erosional extremes.

There are currently existing seawalls located at the Lusardi property and the Kahana Sunset condominiums to the north, and there are reinforced shotcrete areas at the Boyd property as well as the Kahana Sunset. The former retaining wall at the Hester property was not permitted to go deeper to the underlying substrate, became undermined, and has since failed.

The landowners' representative has been contacted by the County's Zoning and Enforcement Division staff expressing concern for public safety presented by bluff failure. The staff urges the landowners to pursue as expeditiously as possible a long-term plan to stabilize the shoreline in order to reduce risks to the public accessing along the shoreline.

The project will comply with Chapter 203 shoreline rules. Without the proposed bluff stabilization work, existing and on-going shoreline erosion is likely to cause hardship to the applicants as the bluff would continue to erode and eventually result in the failure and loss of all three residences. The project is clearly in the public interest as the likely erosion and failure in the shoreline that would result in the absence of the project would put the safety of the public and shoreline users at risk.

The project is requesting the granting of a variance upon the grounds of hardship, as the applicants would be deprived of the reasonable use of their land without reinforcement and stabilization of the bluff, is due to unique circumstances of the soil and geological conditions at the shoreline for these specific properties without drawing into question the reasonableness of the shoreline rules, and is the practicable alternative that best conforms to the purpose of these rules.

The reinforcement of the existing bluff is not anticipated to negatively affect existing shoreline conditions and processes. The fortified conglomerate unit with terraced wall is anticipated to provide positive impacts on the shoreline, including reducing vulnerability of homes to coastal hazards and sea level rise, mitigating future mass wasting events to avoid hazards to public life and safety, and is anticipated to protect the marine habitat by limiting the release of upland fine materials into the nearshore waters. The fortified conglomerate is not anticipated to increase wave energy reflection along the shoreline, as the existing naturally occurring semi-lithified conglomerate has similar effects on the beach and waves as would the reinforced bluff surface *(Appendix A)*.

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Chapter 6

Findings Supporting the Anticipated Determination

Chapter 6

Findings Supporting the Anticipated Determination

6.1 Anticipated Determination

Based on a review of the significance criteria outlined in Chapter 343, HRS, and Section 11-200-12, State Administrative Rules, Contents of EA, the project has been determined to not result in significant adverse effects on the natural or human environment. A Finding of No Significant Impact (FONSI) is anticipated.

6.2 Reasons Supporting the Anticipated Determination

The potential impacts of the project have been fully examined and discussed in this EA. As stated earlier, there are no significant environmental impacts expected to result from the project. This determination is based on the assessments as presented below for criterion (1) to (13).

(1) Involve an irrevocable loss or destruction of any natural or cultural resources.

Archaeological and cultural landscapes have been documented in this assessment and in previously conducted studies for the project area. As described in *Section 3.9, Appendix B, and Appendix C* of this report, the project does not involve any known loss or destruction of existing natural, cultural, archaeological or historical resources. There is the potential for the inadvertent discovery of subsurface historical or cultural resources, including the unknown possibility of iwi kūpuna (ancestral remains). If any cultural or archaeological resources or ancestral remains are inadvertently discovered, the DLNR, SHPD, the Maui Island Burial Council representative and participating interests from lineal descendants and individuals will be notified. The treatment of these resources will be conducted in strict compliance with the applicable historic preservation and burial laws. While the beaches in the area are being lost due to natural erosion and sea wave impacts, the project will not create any separate loss or destruction as a result of protecting and reinforcing the existing bluff.

(2) Curtail the range of beneficial uses of the environment.

The project will not curtail the range of beneficial uses of the environment. Existing uses conform to existing land use designations. The project will provide a beneficial effect, by protecting the public and shoreline users adjacent to these properties, protecting the existing properties, and protecting the associated shoreline from further erosion.

(3) Conflict 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 project does not conflict 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.

(4) Substantially affects the economic or social welfare of the community or State.

The project will result in short-term economic benefits during construction that include direct, indirect, and induced employment opportunities and multiplier effects, but not at a level that would generate significant economic activity. The project will provide shoreline reinforcement along the coast, protecting the row of properties from extensive erosion and property loss.

(5) Substantially affects public health.

The project is consistent with existing land uses and is not expected to affect public health. However, there will be temporary short-term impacts to air quality from possible dust emissions and temporary degradation of the acoustic environment in the immediate vicinity resulting from construction equipment operations. The project will comply with State and County regulations during the construction period and will implement best management practices to minimize temporary impacts. The project will also provide essential safety and protection of the general public in the nearshore waters through prevention of future catastrophic bluff failure at the project sites.

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

The project will provide a reinforced bluff fronting three homes in Keonenui Bay. The approval of the project will not incur secondary impacts, such as population changes or effects on public facilities. The existing public shoreline access will not be altered or obstructed by the reinforcement work. The project is anticipated to improve lateral shoreline access and safety conditions. The project will not preclude the County or the State's ability to implement regional beach restoration and nourishment efforts.

(7) Involves a substantial degradation of environmental quality.

The project will not involve a substantial degradation of environmental quality. Long-term impacts on air and water quality, noise, and natural resources are not anticipated. The use of standard construction and erosion control BMPs will minimize the anticipated construction-related short-term impacts.

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

This entire region is experiencing long-term chronic erosion as evidenced by retreating erosion scarps along the shoreline. Developing the reinforcement will not have substantial negative effects upon the environment, and will not involve a precursor for other future actions, as the trend of beach loss fronting the project area will likely continue regardless of the project.

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

The project site does not contain known identified rare, threatened, or endangered species or habitat. Measures to avoid potential impacts to sea turtles and Hawaiian seabirds are identified in *Section 3.6*, in the unlikely event that they may nest within the project area. No impacts are anticipated.

(10) Detrimentally affects air or water quality or ambient noise levels.

General temporary impacts associated with construction are identified in *Section 3.0* of this EA. Mitigation measures which are outlined in this EA will be applied during the on-going construction activity. No detrimental long-term impacts to air, water, or acoustic quality are anticipated with the project improvements. The improvements are not anticipated to detrimentally affect air or water quality or ambient noise levels.

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

The majority of the project area lies within Zone X (Areas Determined to be Outside the 0.2% Annual Chance Floodplain) and the designated tsunami zone. The project site is located within an erosion-prone area, with the intent of reducing wave action threats to the structural integrity of the existing ocean front homes and minimizing risks from future catastrophic bluff collapses. The bluff reinforcement work will comply with necessary requirements and codes. No significant impacts are anticipated.

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

The project will be located on privately-owned properties extending from 4855 to 4869 to 4871 Lower Honoapi'ilani Road along the west coast of Maui. The bluff reinforcement work will not affect any scenic vistas and view-planes identified in State or County plans within the project vicinity. No significant adverse impacts are anticipated.

(13) Require substantial energy consumption.

Construction of the project will not require substantial energy consumption relative to other similar projects.

6.3 Justification for Shoreline Setback Variance

The Maui Planning Commission states per §12-203-2, "Purpose", of their updated Shoreline Rules:

Due to competing demands for utilization and preservation of the beach and ocean resources, it is imperative:

(1) That use and enjoyment of the shoreline area be ensured for the public to the fullest extent possible;

Discussion: The project will protect the use and enjoyment of the shoreline area by reinforcing the existing coastal bluff. The coastal stabilization will ensure the safety and access of the nearshore waters for the public.

(2) That the natural shoreline environment be preserved;

Discussion: The reinforcement of the existing coastal bluff will protect the natural shoreline environment by reducing nearshore pollution from erosion and runoff, and the shotcrete reinforcement will be designed to match the natural characteristics and features of the surrounding bluff environment.

(3) That man-made features in the shoreline area be limited to features compatible with the shoreline area;

Discussion: The coastal stabilization work proposed for the setback will be compatible with the existing shoreline area. Installation and the subsequent existence of the reinforced bluff will preserve the shoreline area and allow for the public to utilize the nearshore waters for recreational enjoyment while reducing life safety risks due to erosion.

(4) That the natural movement of the shoreline be protected from development;

Discussion: Installation of the coastal stabilization project will not have a significant impact on the natural movement of the shoreline, and will not exceed the existing single family development already in place at the applicant properties.

(5) That the quality of scenic and open space resources be protected, preserved, and where desirable, restored; and

Discussion: The coastal stabilization work will protect and preserve the current prevailing grade of the existing bluff. The reinforcement work will not interfere with the quality of scenic and open space resources in the area.

(6) That adequate public access to and along the shoreline be provided.

Discussion: The beach in this location is receding and nonexistent at times due to seasonal storm surge. Public access along the shore will be protected and enhanced by this project, as the reinforcement work will reduce the potential for erosion and life safety hazards for ocean users.

§12-203-15 Criteria for approval of a variance.

(a) A shoreline area variance may be granted for a structure or activity otherwise prohibited by this chapter, if the commission finds in writing, based on the record presented, that the proposed structure or activity is necessary for or ancillary to:

(7) Private facilities or improvements that are clearly in the public interest

(8) Private facilities or improvements which will neither adversely affect beach processes nor artificially fix the shoreline; provided that, the commission also finds that hardship will result to the applicant if the facilities or improvements are not allowed within the shoreline area;

Discussion: A single large scale erosional event, including heavy storm surge or a hurricane, would threaten the stability of the existing applicant buildings. Landowners at the subject properties as well as adjacent neighboring landowners have pursued a range of mitigation actions including small scale beach nourishment, geotextile bags, and other temporary measures. None of these solutions have proven to be effective This private coastal stabilization improvement is the best and preferred option *(b) A structure or activity may be granted a variance upon grounds of hardship if:*

(1) The applicant would be deprived of reasonable use of the land if required to fully comply with the shoreline setback rules;

Discussion: Loss of the coastal bluff to erosion would threaten the existing habitable buildings on all properties. This action will help landowners plan for future sea level rise and storm surge conditions. The loss or condemnation of the buildings would deprive the residents of the reasonable use of their residences as well as resulting in potential life safety hazards for ocean users in the near shore waters. Without the proposed bluff stabilization work, existing and on-going shoreline erosion is likely to cause hardship to the applicants as the bluff would continue to erode and eventually result in the failure and loss of all three residences. The project is clearly in the public interest as the likely erosion and failure in the shoreline that would result in the absence of the project would put the safety of the public and shoreline users at risk.

(2) The applicant's proposal is due to unique circumstances and does not draw into question the reasonableness of the shoreline setback rules; and

Discussion: The proposed project does not draw into question the reasonableness of the shoreline setback rules. In fact, the rules provide the avenue for this variance. The applicants have spent decades working to address erosional forces. The solution proposed in this application addresses the unique circumstances found at the subject properties and are the result of lengthy discussions with the County of Maui and coastal engineers on how to address the adaptation and resilience necessary for this shoreline area.

The project is requesting the granting of a variance upon the grounds of hardship, as the applicants would be deprived of the reasonable use of their land without reinforcement and stabilization of the bluff, is due to unique circumstances of the soil and geological conditions at the shoreline for these specific properties without drawing into question the reasonableness of the shoreline rules, and is the practicable alternative that best conforms to the purpose of these rules.

(3) The proposal is the practicable alternative which best conforms to the purpose of the shoreline setback rules.

Discussion: As discussed in the above written justification for the requested variance, the preferred alternative is the practicable option which best conforms to the purpose of the Shoreline Setback Rules.

(f) Notwithstanding any provision of this section to the contrary, the commission may consider granting a variance for the protection of a legal habitable structure or public infrastructure; provided that, the structure is at risk of damage from coastal erosion, poses a danger to the health, safety and welfare of the public, and is the best shoreline management option in accordance with relevant state policy on shoreline hardening.

Discussion: The three properties at Lower Honoapiʻilani Road are threatened by coastal erosion. A erosional event, like heavy storms or a hurricane, would threaten the stability of the habitable buildings over time. The landowners have pursued a wide range of mitigation actions including geotextile bags, however no solution has proven to be effective. This private improvement is the best and preferred option for current adaptation to sea level rise and restoration of the natural shoreline.

6.4 Summary

Based on the above findings, further evaluation of the project's impacts through the preparation of an Environmental Impact Statement is not warranted. The EA recommends mitigation measures to alleviate impacts when such impacts are identified. A FONSI is anticipated for this project.

The project is consistent with the Hawaiʻi State Land Use District Boundaries; the Hawaiʻi State Plan, the Hawaiʻi Coastal Zone Management Plan, the Hawaiʻi Water Quality Standards, the Maui Island General Plan; West Maui Community Plan, Shoreline Setback Rules, and the Special Management Area.

The project will have beneficial effects of providing for public safety and shoreline access, enhancing marine water quality, and protecting beachfront residences from ongoing erosion. Overall, the project will provide a public benefit while resulting in minimal impacts to the surrounding environment.

Chapter 7

List of References

Chapter 7

List of References

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7.1 Geographical Information Systems Data

Aerial Imagery

Google Earth Aerial Imagery, 2024.

Tax Map Key

County of Maui, February 2024.

Chapter 8

List of Agencies, Organizations and Individuals Receiving Copies of the EA

Chapter 8

List of Agencies, Organizations and Individuals Receiving Copies of the EA

8.1 Agencies, Organizations and Individuals Receiving Copies of the EA

Table 8-1 Agencies, Organizations and Individuals Receiving Copies of the EA				
Respondents and Distribution	**Pre-consulted Agencies**	**Receiving Draft EA**	**Comments Received**	**Receiving Final EA/ FONSI**
Federal Agencies				
U.S. Fish & Wildlife Service	X	X		
State of Hawai'i Agencies				
Department of Accounting and General Services	X	X		
Department of Agriculture	X	X		
Department of Education	X	X		
Department of Hawaiian Home Lands	X	X		
Department of Land & Natural Resources, Historic Preservation Division	X	X		
Department of Health	X	X		
Department of Land & Natural Resources, Division of Forestry and Wildlife	X	X		
Department of Land & Natural Resources, Engineering Division	X	X		
Department of Land & Natural Resources, Land Division	X	X		
Department of Land & Natural Resources, Land Division, Maui District	X	X		
Department of Land & Natural Resources, Office of Conservation & Coastal Lands	X	X		
Department of Land & Natural Resources, State Historic Preservation Division (SHPD)	X	X		
SHPD Archaeological Branch- Dr. Susan Lebo	X	X		

Table 8-1 Agencies, Organizations and Individuals Receiving Copies of the EA

Respondents and Distribution	Pre-consulted Agencies	Receiving Draft EA	Comments Received	Receiving Final EA/ FONSI
Department of Transportation (DOT), Highways Division	X	X		
DOT, Highways Division, Maui District	X	X		
Hawaiʻi State Public Library System	X	X		
Office of Hawaiian Affairs	X	X		
Office of Planning and Sustainable Development	X	X		
County of Maui Agencies				
Department of Environmental Management	X	X		
Department of Fire Control & Public Safety	X	X		
Department of Housing and Human Concerns	X	X		
Department of Management	X	X		
Department of Planning	X	X		
Department of Parks and Recreation	X	X		
Department of Public Works	X	X		
Department of Water Supply	X	X		
Emergency Management Agency	X	X		
Planning Department	X	X		
Police Dept	X	X		
Elected Officials				
Richard T. Bissen, Jr., Mayor	X	X		
Senator Angus McKelvey, Senate District 6, West Maui, Māʻalaea, Waikapū, South Maui	X	X		
Representative Elle Cochran, House District 14, West Maui	X	X		
Maui County Councilmember Tamara Paltin	X	X		
Utility Companies				
Hawaiian Electric (Maui Electric Company, Ltd.)	X	X		
Hawaiian Telcom	X	X		
Spectrum	X	X		

Table 8-1 Agencies, Organizations and Individuals Receiving Copies of the EA				
Respondents and Distribution	**Pre-consulted Agencies**	**Receiving Draft EA**	**Comments Received**	**Receiving Final EA/ FONSI**
Neighbors				
Boyd, Todd William	X	X		
Kahana Sunset - Condo Master	X	X		
Island Girl Holdings LLC	X	X		
Roddenberry, Rod Trust	X	X		

8.2 Responses to Comments Received During Early Consultation

Table 8-2 Responses to Comments Received During Early Consultation

Stakeholder	Comment	Response
Air Quality		
Education		
State of Hawaii, Department of Education (DOE)	Based on the information provided, the proposed project will not impact the Hawaiʻi State Department of Education Facilities	Thank you for your comment. We have noted the DOE does not anticipate the project impacting State DOE facilities.
Natural Hazards		
State of Hawaii Department of Land and Natural Resources - Engineering Division	The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). Be advised that 44CFR, Chapter 1, Subchapter B, Part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards. The owner of the project property and/or their representative is responsible for researching the Flood Hazard Zone designation for the project. Flood zones subject to NFIP requirements are identified on FEMA's Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMAs Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (fhat.hawaii.gov) could also be used to research flood hazard information. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency.	Thank you for your response to our early consultation letter. We have noted the rules and regulations of the NFIP and 44CFR. The project has also identified the Flood Hazard Zone designation for the site as Flood Zone X, and has listed it in Figure 3.3, Section 3.
State of Hawaii Department of Land and Natural Resources - Office of Conservation and Coastal Lands (OCCL)	According to the information provided in the proposal letter, the location of the proposed construction would be mauka of the shoreline, and therefore outside of the Conservation District boundaries. However, according to our records review there is not a current certified shoreline for the three properties included in this proposal. The most recent certified shorelines available for parcels 002 (1998) and 003 (2009) indicate that the certified shoreline was at the face of the cliff and/or previously installed retaining walls or seawalls. There is no certified shoreline on record for parcel 52. Recent photographs further indicate that the upper wash of the waves has	Thank you for your response to our early consultation letter. The erosion hazard line is not mapped in the project area due to the site geology. The project is located within the 200 foot default setback. The project will be requesting a shoreline setback variance under the following as shown in §12-203-15 (7) and (8): 7. Private facilities or improvements that are clearly in the public interest

Table 8-2 Responses to Comments Received During Early Consultation

Stakeholder	Comment	Response
	advanced to remain at the face of the cliff. The cross section conceptual drawing in the proposal illustrates a buried toe of the fortification structure. It is unclear in the documentation provided how a buried toe would be placed mauka of the shoreline, and outside of the Conservation District boundary. A current certified shoreline for the subject parcels will determine the boundary of the conservation district.	8. Private facilities or improvements that will not adversely affect beach processes, result in flanking shoreline erosion, or artificially fix the shoreline; provided that the authority may consider any hardship that will result to the applicant if the facilities or improvements are not allowed within the shoreline area The parcel owners are committed to ensuring the reinforcement work will be located mauka of the shoreline and Conservation District boundary.
Utilities		
Hawaiian Electric Company	Thank you for the opportunity to comment on the subject project. Hawaiian Electric Company has no objection to Coastal Stabilization at 4855, 4869, & 4871 Lower Honoapi'ilani Road - Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance Notification. Should Hawaiian Electric have existing easements and facilities in the project area, we will need continued access for maintenance of our facilities. Hawaiian Electric requests that the EA evaluate any potential impact of the diverted wave energy from the proposed project, including any potential impact on existing structures, including electric utility infrastructure. We appreciate your efforts to keep us apprised of the subject project in the planning process. As the proposed project comes to fruition, please continue to keep us informed.	Thank you for your comment. The project is not anticipated to generate diverted wave energy from the proposed site (see Appendix A), and is not anticipated to affect any existing electric utility infrastructure.
Wildlife		
US Fish and Wildlife Service (USFWS)	USFWS noted the first step in their updated technical assistance process is to obtain an Official Species List in their Information for Planning and Consultation (IPaC) online tool at: https://ecos.fws.gov/ecp/.	Thank you for your response letter. The project team obtained an Official Species List via the IPaC tool and found the following: There are no critical habitats within the project area under the USFWS office's jurisdiction. There are no refuge lands or fish hatcheries within the project area. There are no bald and golden eagles within the vicinity of the project area. The following migratory birds have a small probability of presence to be present or breeding in the project vicinity: • 'Apapane Himatione sanguinea

Table 8-2 Responses to Comments Received During Early Consultation

Stakeholder	Comment	Response
		• Black Noddy Anous minutus melanogenys • Black-footed Albatross Phoebastria nigripes • Bulwer's Petrel Bulweria bulwerii • Hawai'i 'amakihi Chlorodrepanis virens • Maui 'alauahio Paroreomyza montana • Red-tailed Tropicbird Phaethon rubricauda melanorhynchos • Wandering Tattler Tringa incana There are no wetlands within the project area.
Compliance with Codes and Regulations		
County of Maui, Department of Housing & Human Concerns	Based on our review, we have determined that the project is not subject to Chapter 2.96 Maui County Code, and does not require residential workforce housing agreement. At the present time, the Department has no additional comments to offer.	Thank you for your comment. We have noted that the Project does not require residential workforce housing agreement with the County.
Design and Construction		
Kahana Sunset AOAO	Kahana Sunset welcomes projects that protect land and homes of our neighbors and keeps soil contaminants away from Keonenui Bay. We helped the Boyds with their project and did not make a protest in the 5 years Hester's collapsed seawall was on the beach. 1. Shotcrete is shoreline hardening and is forbidden under Act 16 in 2020, an amendment to HRS Section 205A. Shotcrete is just a curved seawall. In our experience, the state and county interpret laws as suits them and are immune to arguments. The house between this project and Kahana Sunset is owned by Todd Boyd and Sarah Schmidt. After their seawall collapsed, they obtained permits to have the land shaped into benches up to the lawn with no shotcrete. They use salt water tolerant plants such as vetiver to hopefully stabilize the land. We know that benches reduce scour as all the wave momentum is not reflected at once, as it would for a vertical wall. 2. Burying the bottom of the shotcrete wall will not protect it. Beach sand will continue to be scoured eventually undermining the bottom. The picture for the example on page 4 is of Kahana Sunset's A Building. The	Thank you for your comment and support of projects that protect the land and homes of neighbors and keep soil contaminants away from Keonenui Bay. 1. The proposed coastal stabilization is allowed under HRS 205A-46(a)(9), as amended, shoreline hardening structures may be granted with a variance by consideration of hardship, following the standards set forth in the shoreline rules approved by the County of Maui Planning Commission and adopted by the Mayor of Maui County. Granting of the variance needs to be clearly demonstrated to be in the interest of the public, which includes a) public safety and/or public health, b) protection of public infrastructure in response to risk of coastal hazards, and c) beach protection and sand retention for public use and recreation or coastal ecosystems. 2. The design of the coastal stabilization solution includes reinforcement by conventional steel rods, steel mesh, or fibers. Installation would include excavation down to hard substrate

Table 8-2 Responses to Comments Received During Early Consultation

Stakeholder	Comment	Response
	house on the left of the picture is owned by Marcia Lucas (George Lucas' ex-wife). Its shotcrete wall had a massive failure in 2002. The best long-lasting solution is to build down to bedrock, which at Kahana Sunset, is 15 ft below sea level. 3. There is no easy heavy equipment access. Removal of Hester's collapsed wall required removal of landscaping. Kahana Sunset investigated beach nourishment and this was a problem as dewatering and spreading the sand requires heavy equipment. There is an adequate supply of offshore beach quality sand. 4. Will the EA studies investigate flow and sediment movement in Keonenui Bay's littoral cell? The Board desires information on how this project affects Kahana Sunset's beach and forces on our seawall.	and then applying shotcrete to the face of the existing semi-lithified conglomerate, up to about 14 feet MSL. The shotcrete would be anchored back into the semi-lithified conglomerate, with materials such as anchoring pins. A key design element to address your concern is excavation and application of reinforcing materials starting at hard substrate depth. 3. Heavy equipment access is projected to be done via a switchback path excavated into the lawns of the Hester and Barto properties, allowing equipment to traverse the elevation gradient. 4. The EA's coastal assessment (Appendix A) has determined the coastal stabilization work is not anticipated to create additional wave energy action across the bay. By breaking the vertical face of the bluff into two or more sections, the risks associated with a large vertical structure along the shoreline are reduced. Terraces or benches would separate the sections of the fortification. The proposed action is a bench extending from the base of the upper landside retaining wall to the crest of the fortified conglomerate unit. The bench could be vegetated to soften the visual impact, mitigate storm runoff.
No Comment		
State of Hawaii, Department of Accounting & General Services	No comment.	Thank you for your comment.
State of Hawaii, Department of Education	Based on the information provided, the proposed project will not impact the Hawaiʻi State Department of Education Facilities	Thank you for your comment.
County of Maui, Department of Parks and Recreation	The Department of Parks and Recreation has no comment at this time.	Thank you for your comment.

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Appendices

Appendix A

Coastal Assessment (Sea Engineering, 2025)

Coastal Assessment for the Hester and Barto Properties

Keonenui Bay, Maui, Hawaii

February 2025

Prepared for:
Rory Frampton
PO Box 7900
Incline Village, NV 89450

Prepared by:
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Job No. 25737

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EXECUTIVE SUMMARY

This Coastal Assessment is a key step for investigation and selection of a long-term solution that fits the environmental conditions at the *Hester and Barto Properties*. The project area has a history of chronic erosion that left a steep and unstable failure slope along the makai edge of the two adjoining properties. The erosional slope and failed sections of retaining wall are safety hazards to shoreline users, the homes on the landward side, and people using the lawns fronting the homes for recreation. The coastal assessment process is used to identify a long-term solution that will stabilize the bank to protect the homes and improve public safety along the shoreline.

Backshore: The Hester and Barto properties are located on Keonenui Bay in the Napili area of Maui. The properties are located on a high bluff overlooking the bay at elevations of 20 to 25 feet. The bluff is composed of an upper and a lower soil unit. The lower unit is a semi-lithified conglomerate that is hard but still erodible. The upper unit is a clay-rich alluvial deposit. The erosion of the lower conglomerate unit is caused by wave action at the base of the bluff, and also by sloughing of the overlying clay substrate.

Wave attack on the conglomerate has resulted in a slow, but progressive loss of material in the form of cavities, caves, and piping within the substrate. The upper unit, unconsolidated alluvium, has little internal cohesiveness and breaks down quickly under wave attack, rain, and sheet flow from higher elevations. When the lower conglomerate fails, the unsupported alluvium cannot support itself.

Currently, the lower unit continues to slowly erode and create cavities, caves, and piping within the conglomerate. Continued mass wasting events, which are naturally occurring, are a public safety risk for the individuals on the shoreline and the homes and their inhabitants on the upper slope. Moreover, the failed materials create water quality issues in the nearshore when they are broken down by wave action.

Keonenui Bay: The shoreline fronting the bluff in Keonenui Bay inflates and deflates seasonally with a variation in elevation of about ±6 feet. Along the base of the bluff, there are sea caves that are fully exposed when the beach is deflated and partially filled when the beach inflates. The north and south headlands for the embayment are basalt structures, which provide stability to the geomorphic character of the area.

Backshore and Beach Relationship: The steep bluffs that front much of the bay, and that are especially pronounced in front of the Hester and Barto properties, act as natural walls to reflect wave impact in the absence of a sand beach. It is not likely that the hardening of the cliff face would measurably change wave reflection or affect coastal processes differently than the steep naturally occurring rock and clay material that is already present on the shoreline.

Beach dynamics in Keonenui Bay operate several orders of magnitude faster than erosion along the bluff's face. Though the bluff, in particular the semi-lithified conglomerate, does erode and is the reason for this project, it is happening so slowly compared to beach changes that its effects are similar to a hardened backshore. Progressive narrowing and deflation of Keonenui Beach in the previous several decades, even with the slow erosion of the backshore, attests to this relationship.

The relationship between the semi-lithified backshore and the mobile sand beach, combined with the fact that there is no sand in storage in the backshore substrate, eliminates the potential advantages associated with allowing the backshore to erode. Based on existing conditions, continuation of the status-quo will likely result in complete loss of the sand beach, due to the presence of hard backshore substrate and the lack of available hinterland sand resources.

Structures: The presence of seawalls on a sandy shoreline is often blamed for the disappearance of sand from the beach. Vertical surfaces can increase nearshore wave energy by reflecting waves back out to sea. This reflection of wave energy at the face of the structure can cause scour in front of the wall and inhibit the accretion of sand. Conversely, the influence of the walls is minimized when a beach is established that prevents wave runup (or "swash") from encountering the wall.

Analysis of the effects of walls on the Keonenui shoreline is not conclusive. During the eight months between aerial images in 1987 and 1988, with some shoreline structures already lining the shoreline and exposed conglomerate along the remaining areas, there was an accretion of 35 feet and 68 feet of sand along the beach at the two beach-change transects at the project site. Between 1988 and present, the beach exhibited longer-term erosional behavior, but still witnessed seasonal accretion events. Based on this evidence, stating the presence of shoreline structures caused beach loss in an embayment cradled by hard backshore substrate is likely a specious claim.

Erosion Mitigation: Previous erosion of the backshore substrate had resulted in an unstable bluff at the makai edge of the properties and along the mauka edge of the sandy shoreline. In 2014, a retaining wall was permitted and built on top of the lower soil unit fronting the Hester property landward of the certified shoreline. A seawall extending down to hard substrate or beneath scour depth was not supported by regulatory agencies at the time.

The retaining wall at parcel 003 (Hester) first failed in 2017 in conjunction with one or more slope failures in the semi-lithified conglomerate substrate. A second failure, resulting from the destabilization of the structure and the substrate after the first failure, pulled down a large portion of the CRM wall fronting parcel 002 (Barto).

Continued failure of the lower unit, semi-lithified conglomerate, is causing progressive mass wasting events and affecting both the mauka properties and public safety along the beach. Long-term mitigation efforts to stabilize the slope can be beneficial to the region. Various mitigation alternatives were evaluated using the following objectives:

- Mitigate future erosion of the properties and protect the homes;
- Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both;
- Mitigate human-induced impacts on the natural coastal processes and littoral cell;
- Prevent potential undermining of neighboring shoreline protection structures;
- Minimize the volume of artificial material introduced to the shoreline; and
- Prevent earthen soils from eroding and causing siltation of the coastal waters.

Analysis of the alternatives indicates that ***fortified conglomerate with terraced wall(s)*** best meets the current project objectives and review criteria. This mixture of erosion mitigation techniques that compliments the existing backshore substrate provides a uniquely suited and elegant solution for protecting the habitable dwellings, integrating with the natural environment, protecting public safety, and mitigating impacts to the marine and coastal environments.

1. INTRODUCTION

1.1 Background

The Hester and Barto properties are located on Keonenui Bay in the Napili area of Maui (Figure 1-1). The properties are located on a high bluff overlooking the bay at an elevation of approximately 25 feet (Figure 1-2 through Figure 1-5). The bluff is composed of an upper and a lower soil unit. The lower unit is a semi-lithified conglomerate that is hard but still erodible. The upper unit is a clay-rich alluvial deposit. The erosion of the lower conglomerate unit is caused by wave action at the base of the bluff, and also by sloughing of the overlying clay substrate.

The beach fronting the bluff in Keonenui Bay inflates and deflates seasonally with a variation in elevation of about ±6 feet. Along the base of the bluff, there are sea caves that are fully exposed when the beach is deflated and partially filled with the beach inflates. South of the project area is a basalt headland. North of the project area, in Keonenui Bay, are several properties that all have hardened shorelines. A public access path is in the center of Keonenui Bay that leads down a concrete stairway to the beach. At the northern end of the bay is another basalt headland with a basalt outcrop that extends into the nearshore.

In 2014, a retaining wall was permitted and built on top of the lower soil unit fronting the Hester property landward of the certified shoreline. A seawall extending down to hard substrate or beneath scour depth was not supported by regulatory agencies at the time, so permits were obtained for the retaining wall. Due to the variable elevation of the semi-lithified conglomerate and unconsolidated alluvium contact, the foundation elevation and overall height of the retaining wall varied along its full length. Generally, it was 10 feet tall. The retaining wall was micropiled landward into the upper unit (alluvium). Landscaping was planted along the upper surface of the lower unit (semi-lithified conglomerate), seaward of the retaining wall's foundation, to soften the visual impact. The retaining wall failed in 2017 in conjunction with one or more slope failures in the semi-lithified conglomerate substrate.

To access the rubble and clean up the shoreline, a switchback path was excavated into the lawns of the Hester and Barto properties allowing equipment to traverse the elevation gradient. The failed material on the shoreline was temporarily stacked into a ramp at the base of the access path to support heavy equipment. Sandbags are being installed across the face of the northern property working towards the southern end. The equipment will back out landward from the shoreline cleaning up debris. Gravel trenches will also be installed to support drainage and erosion control along the way. This effort is intended to provide short to mid-term stabilization along the alluvium slope until a long-term engineering alternative can be implemented.

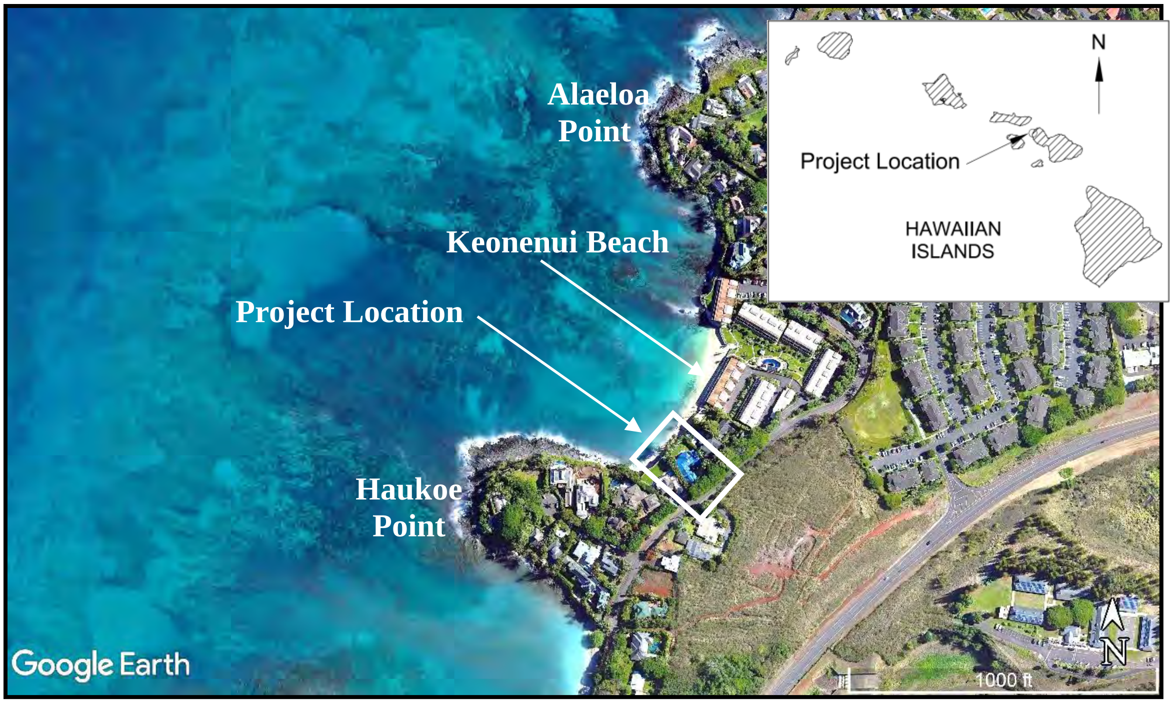

Figure 1-1. Project site location in Napili on the Island of Maui

Figure 1-2. Oblique aerial photo of the project area

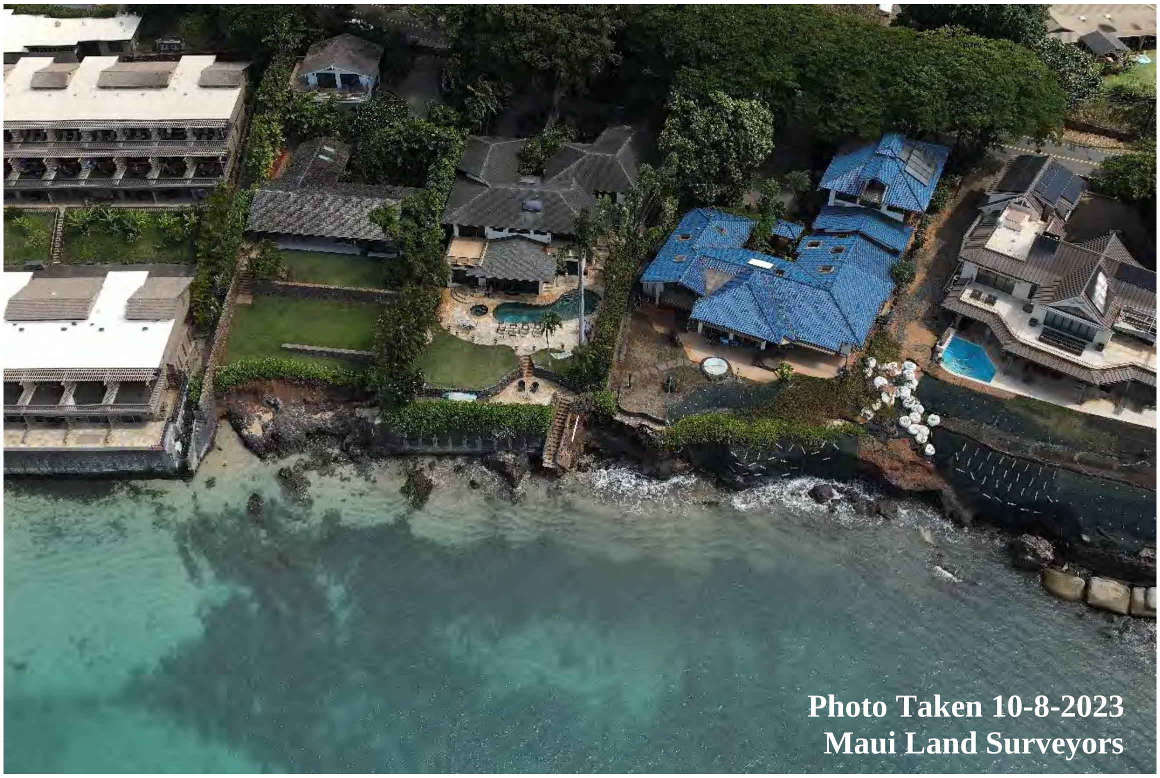

Figure 1-3 Condition of neighboring shorelines to the noth

Figure 1-4 Oblique aerial photo of Barto shoreline

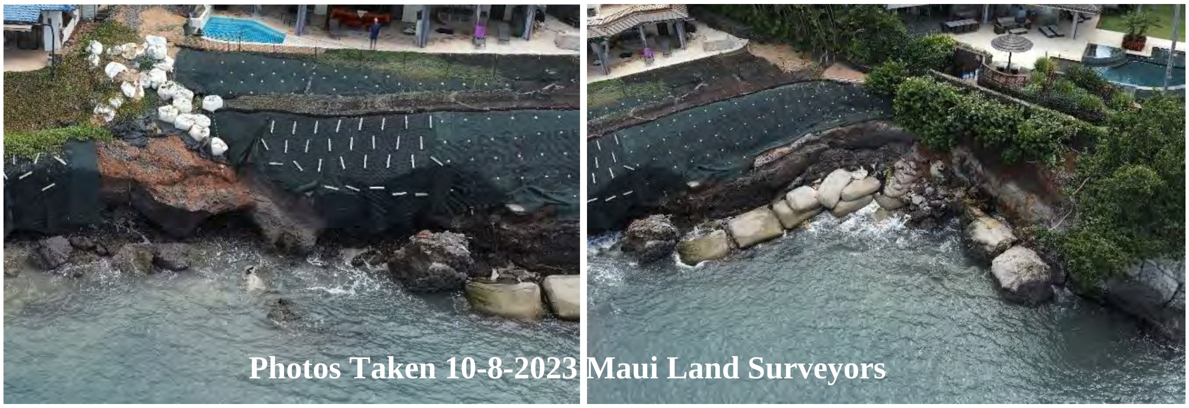

Figure 1-5 Oblique aerial photos of Hester shoreline

1.2 Purpose

This Coastal Assessment is a key step for investigation and selection of a long-term solution that fits the environmental conditions at the *Hester and Barto Properties*. The project area has a history of chronic erosion that left a steep and unstable failure slope along the makai edge of the two adjoining properties. The erosional slope and failed sections of retaining wall are safety hazards to beach users, the homes on the landward side, and people using the lawns fronting the homes for recreation. Sea Engineering, Inc. (SEI) has been selected to assist the landowners in evaluating long-term solutions to mitigate erosion, replace the failing retaining wall, and stabilize the upper alluvium substrate beneath and adjacent to the homes.

The purpose of this project is to identify a long-term solution that will stabilize the bank to protect the homes and improve public safety along the shoreline. The purpose of the Coastal Assessment is to collect the data and information necessary to understand site conditions, the erosion problem, and inform the development of conceptual engineering solutions that are appropriate for the project site conditions.

The Coastal Assessment is an important component of the environmental review and regulatory permitting process. This Coastal Assessment complies with the Office of Environmental Quality Control (OEQC) guidelines for assessing shoreline alteration projects, including a detailed description of the existing shoreline and coastal processes; historical shoreline erosion rates; site maps; oceanographic setting; coastal hazards; description of improvements; and review of alternatives. The Coastal Assessment is suitable for inclusion in an Environmental Assessment (EA) or Environmental Impact Statement (EIS).

1.3 Objectives

In a joint effort, the neighboring property owners would like to stabilize the shared shoreline and prevent any further property loss. This report is a coastal engineering assessment to evaluate erosion management design options that may be considered at the site, including a description of oceanographic and shoreline conditions, a coastal hazard analysis, and an evaluation of possible environmental impacts.

The objectives of the erosion management design are:

- Mitigate future erosion of the properties and protect the homes;
- Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both;
- Mitigate human-induced impacts on the natural coastal processes and littoral cell;
- Prevent potential undermining of neighboring shoreline protection structures;
- Minimize the volume of artificial material introduced to the shoreline; and
- Prevent earthen soils from eroding and causing siltation of the coastal waters.

2. PHYSICAL SETTING

2.1 Regional Setting

The project area is located along west Maui at the base of Puu Kukui in the Napili area and community of Alaeloa. The coastline is dominated by beaches that are situated between headlands of variable length and broad shallow fringing reefs. The region is extensively developed, and many beaches suffer from chronic and episodic erosion. The abutting subject properties are located at 4855 and 4869 Lower Honoapiilani Road, Napili, Lahaina District, Island of Maui, Hawaii, Tax Map Keys (2) 4-3-015:002 (Barto) and 003 (Hester).

The project site spans approximately 210 linear feet of shoreline along the southern end of the beach between Haukoe and Alaeloa Points in Keonenui Bay. The backshore area consists of two (2) privately-owned parcels. The surface elevations of the backshore rise quickly from a beach elevation of +2 feet to +18 feet relative to MLLW (Mean Lower Low Water). There is one (1) shore-perpendicular public beach access in the center of the bay.

2.2 Geology & Soils

The regional surficial geology of the Napili coastal plain is primarily Honolua volcanic series - domes (Sherrod et al., 2007). The elevation on the properties ranges from 38 feet above mean sea level (MSL) along Lower Honoapiilani Road to elevations of 18 to more than 20 feet MSL along the edge of the bluff. The ground, prior to the wall failure, generally sloped downward in a westerly direction toward the ocean at a grade of approximately 8%.

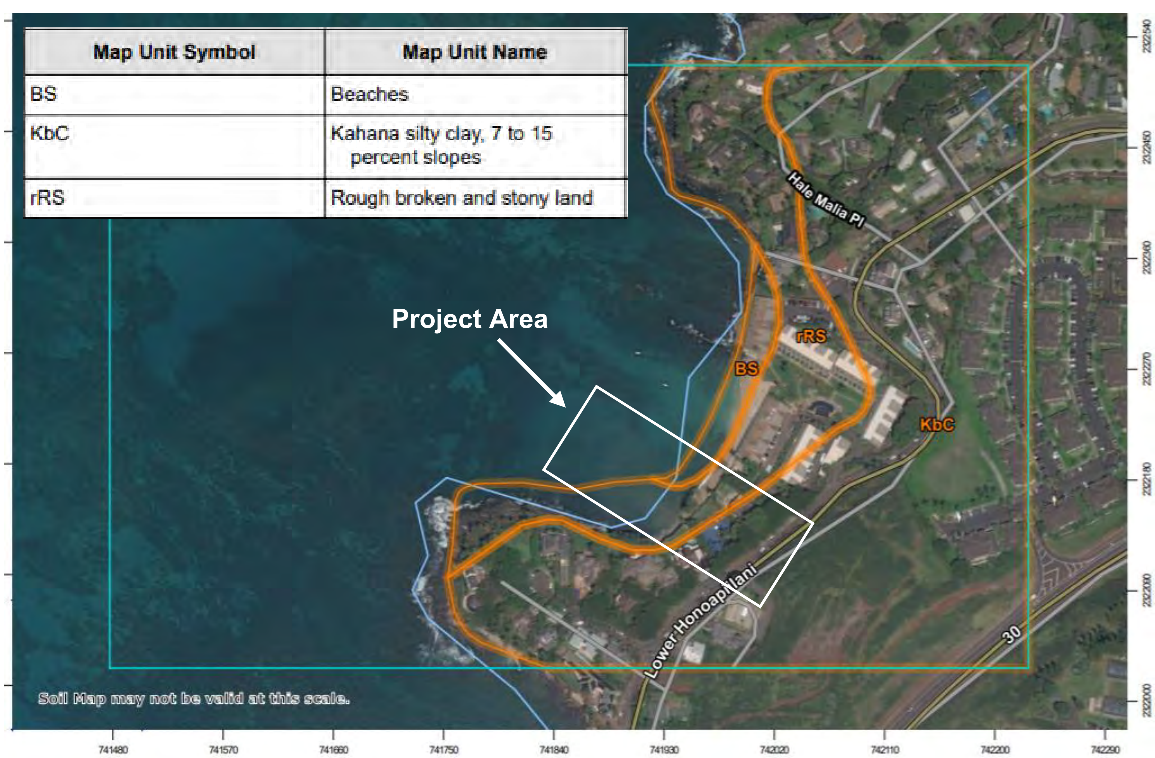

Figure 2-1. Soil types within the project area

The Keonenui Bay regional shoreline consists of a carbonate sand beach with varying widths. The foreshore (beach) with sand is classified as "beaches", and the regional backshore (land) soils are classified first as "Rough broken and stony land (rRS)" and "Kahana Silty Clay (KbC)" further landward (Figure 2-1, USDA, 2020). The rRS series consists of very steep, stony areas where runoff is rapid. KbC is characterized by slow runoff, slight to moderate erosion hazard, and moderately rapid permeability.

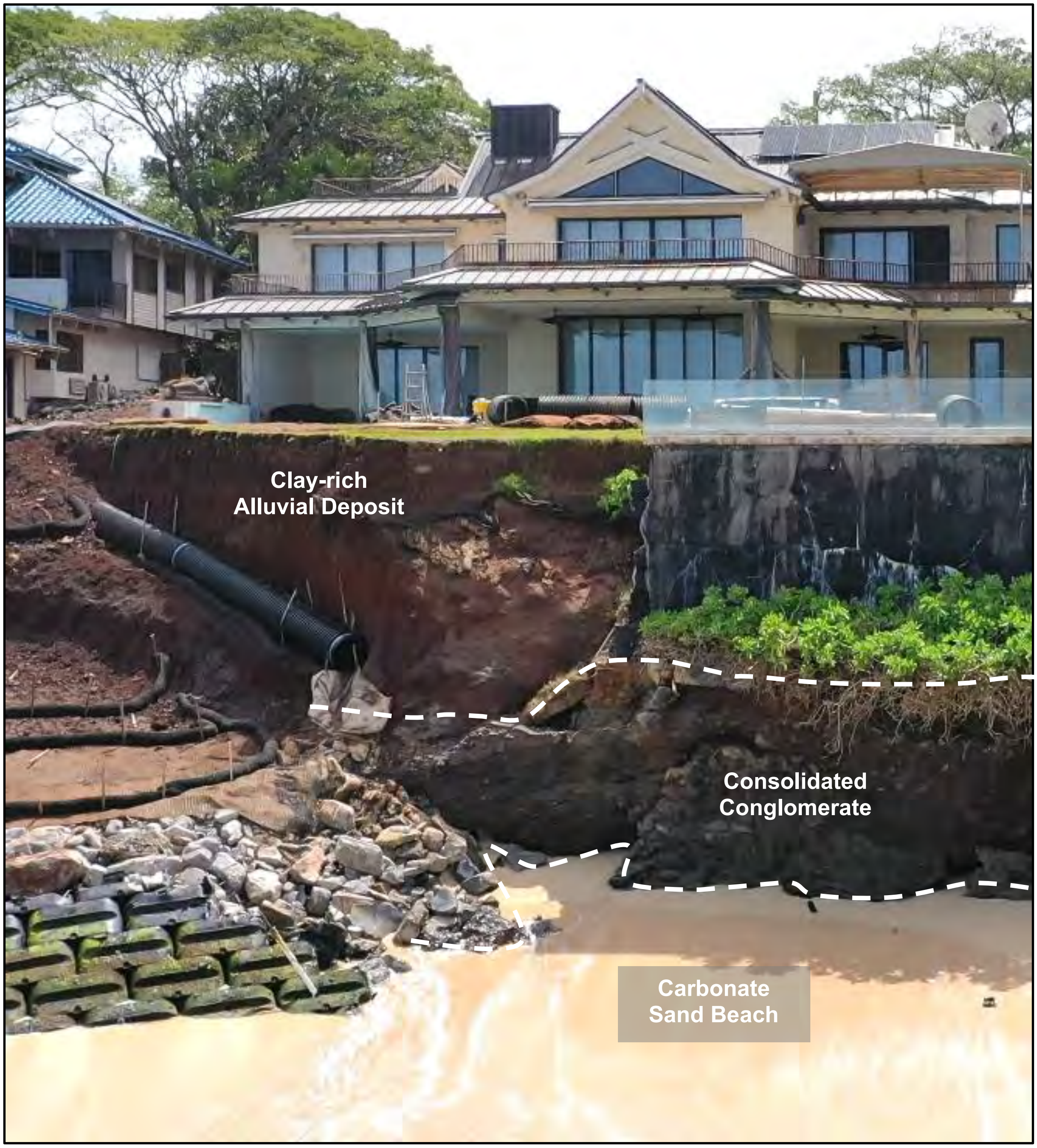

Figure 2-2. Cross-section of shoreline geology at the project site

Coastal geology at the project site along the erosion scarp (Figure 2-2), which provides a nice cross-section, is characterized by the clay-rich alluvial deposit, or alluvium, in the upper unit. This is typical for the Kahana Silty Clay surficial geology unit. The lower unit, a semi-lithified conglomerate, comprises clasts (typically basaltic) in a range of sizes that are entrained in a silt/clay matrix. This lower unit is more resistant to erosion than the overlaying alluvium and responds to coastal changes at a time scale of years to decades. The formation of erosional cavities and sea-caves is an ongoing process during periods of beach deflation. The lower unit acts as a long-term, stable feature with respect to the coastal processes that effect sand movement on the shoreline. Failure of the lower unit, however, has generally been expressed as very rapid events. These failure events are a result of mass wasting that occurs when erosional cavities deteriorate the stability of the lower unit to a point where the overburden causes a gravity-induced failure of the entire slope.

Beach stability is generally related to three key parameters: available sand volume, wave climate, and water level. As each of these parameters change, so too does the location, elevation, and shape of the beach and inshore sand field. When available sand volume increases, the beach typically increases also (Figure 2-3). As wave energy increases, beaches typically become steeper and eventually move sand offshore to form wave energy dissipative sand bars. Water level changes, even small ones that are long-lasting, can have profound effects on sand beaches, also. The warm-water bulge, an increase in regional sea level, that remained around the islands from the 2015/2016 El Nino well into 2017 contributed to noticeable changes to many of the beaches in Maui. An increase in water depth with the bulge moves the location that waves break closer to shore and increases the amplitude of wave runup on the beach changing sediment transport dynamics.

As each of these parameters modulates the condition of the beach on any given day, wave event, or wave season, the beach is limited in the space available for it to adapt to current conditions. The combination of a gradual loss of carbonate sand supply, as evidenced by the significant reduction in beach width over time, and the hard substrate on the mauka edge of the beach, has resulted in the decay of the littoral cell (Figure 2-4). The long-term presence of the harder, more erosion-resistant conglomerate, will likely lead to the natural loss of the beach in this bay.

This process has played out in many areas on Maui's shoreline and continues to actively occur in locations such as Keonenui Beach. There are numerous locations along the coastline where the beach has been 'pinched' against hard-substrate, such as clay banks, alluvium, rocky bluffs, boulder and cobble banks, and conglomerate such as is present at the project site. This is a naturally occurring phenomenon, where continued erosion of the backshore has not typically resulted in reestablishment or recovery of the sand beach. In most of these situations, the sand beach is eventually lost, leaving harder substrate exposed along the coastline.

The seasonal dynamics of Keonenui Beach, with alternating erosion and accretion cycles, combined with the long-term trend of sand loss and beach deflation has resulted in an ephemeral beach within the bay. During erosional extremes, when sand moves offshore and to the north, the shoreline fronting the subject parcels is depauperate of sand resulting in a cobble and boulder dominated waterline.

Figure 2-3. Slope stabilization in Keonenui Bay at the end of winter, facing north

Figure 2-4. Keonenui Bay after summer erosion, facing south

2.3 Historical Shoreline Change

Keonenui Beach is a west-facing pocket beach that is bound by prominent headlands on the north and south ends. The carbonate sand beach is seasonally dynamic, with regular seasons of erosion (winter) and accretion (summer). Each year, this beach goes through inflation and deflation cycles as the wave climate shifts from North Pacific swell to South Pacific swell, respectively. The carbonate sand within this littoral cell, creating the beach and inshore sand field, is contained between these headlands. Extreme conditions and southerly waves tend to move sand offshore.

A series of historical aerial photographs are used to determine shoreline change trends. The University of Hawaii Coastal Geology Group (CGG) has undertaken a historical analysis of Maui's shoreline and produced a shoreline change map for the Alaeloa region based on aerial imagery from 1912 to 1997. The CGG analyses use the beach toe as the reference feature for measuring shoreline change. The beach toe is defined as the change in slope at the transition between the nearshore and foreshore regions of the beach. It appears as a change in color or tone in vertical aerial photographs. The beach toe is a good indicator of shoreline position at the moment of the image; however, beach toe position changes quickly as it varies with seasonal or short-term erosion or accretion, or changes in beach slope and width. In the case of Keonenui Beach, which is seasonally dynamic, the beach toe recorded through a series of images from 1949 to 1997 indicates a blended signal from the dynamic nature of a beach and the long-term erosion trend.

The CGG analysis employed a weighted linear regression methodology to provide the best fit for a long-term shoreline change trend. The analyses for the project area shoreline is presented as Transects 0 through 4 on the CGG erosion map (Figure 2-5). The CGG analysis determined that the dominant shoreline change trend for Keonenui Beach (Transects 1 to 14) has been erosion at an average annual rate of 1.3 feet/year.

The shoreline location for the beach changed significantly during the time series, with periods of erosion and accretion. Near the center of the bay, the beach toe eroded 78 feet between 1949 and 1987, then accreted 68 feet in the following year, and eroded 42 feet between 1988 and 1997. The beach toe was in an accreted position during photos taken in November and March, which reflects the typical response to winter conditions. Conversely, the beach toe was in an eroded (landward) position in the photos taken in May and July, which reflects the typical response to summer surf conditions.

Accounts from long-time residents in the area are consistent with net erosion occurring on Keonenui Beach. Locals remember palm trees further seaward on the beach (visible in the November 1949 photograph, Figure 2-6), that were eventually undercut by progressive erosion shown in the August 1987 image (Figure 2-7). The scarp in the alluvium and conglomerate units fronting the project area can be seen in the 1949 aerial photo of the project area. This scarp has eroded, but at a significantly slower rate than the sandy beach.

Physical interaction between the dynamic sandy beach and the more erosion-resistant conglomerate is similar to the interaction between sand beaches and hard substrate. The significantly slower erosion rate of the conglomerate is imperceptible when compared to the rapid and large changes the sand beach undergoes during individual wave events and in response to seasonal changes in wave direction. The long-term trend of both the beach and the mauka substrate has been erosional; however, though there has been some erosion of the backshore, the beach narrowed by 43% between 1949 and 1997. Moreover, the beach at the north end of the bay was eventually lost when it was ‘pinched’ out against the hard, high elevation substrate in the backshore.

Given these natural conditions, the historic shoreline and beach width trends, and the presence of semi-lithified conglomerate, a sandy beach is unlikely to survive in this location. Erosion of the beach, as evidenced by the mauka migration of the beach toe, is projected to continue, while the significantly slower erosion of the conglomerate becomes an impassible feature that the beach is eventually ‘pinched’ out against. The beach has already become ephemeral, disappearing in front of the subject properties during erosional extremes.

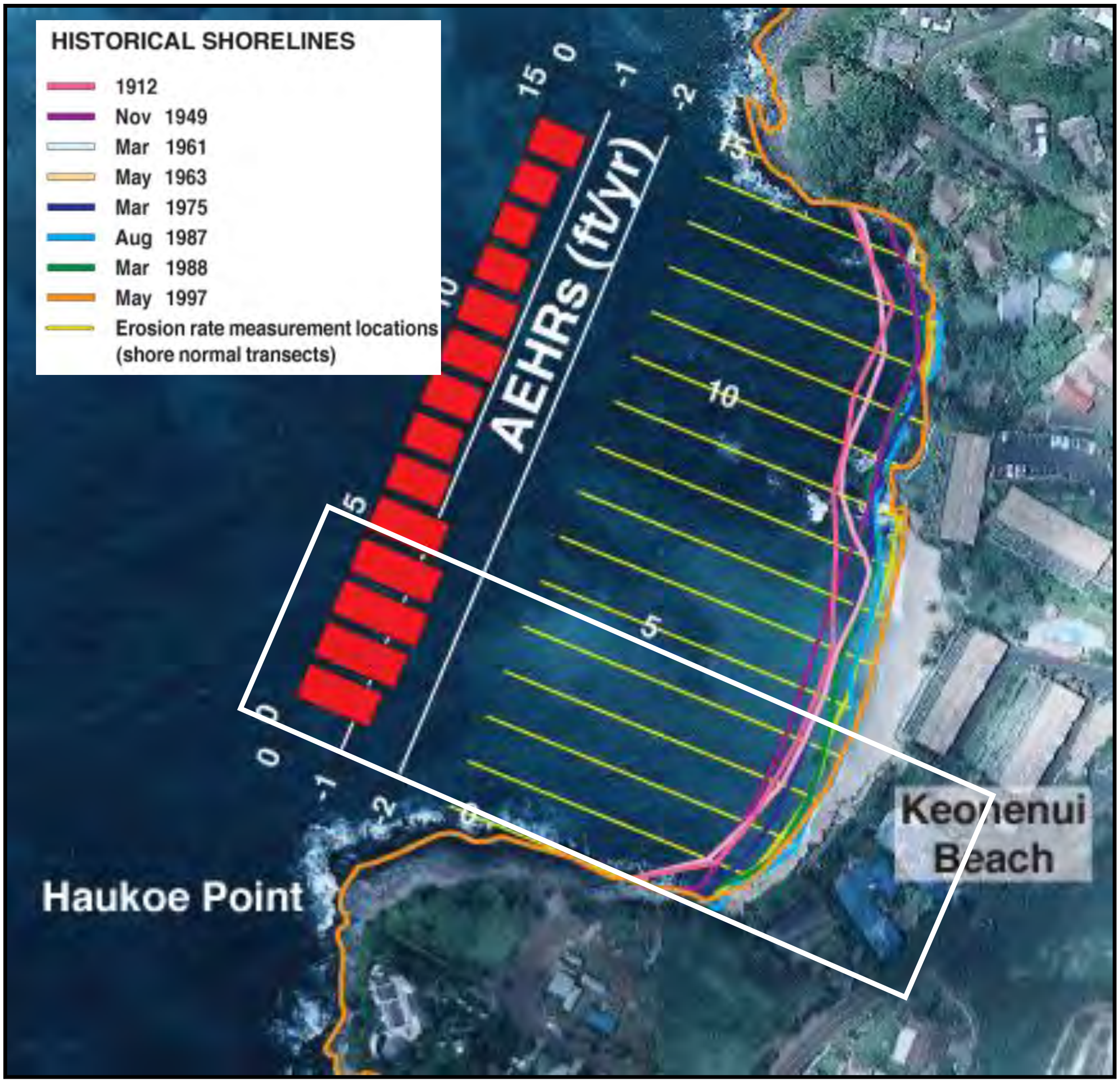

Figure 2-5. Historical shoreline change rates for the project area

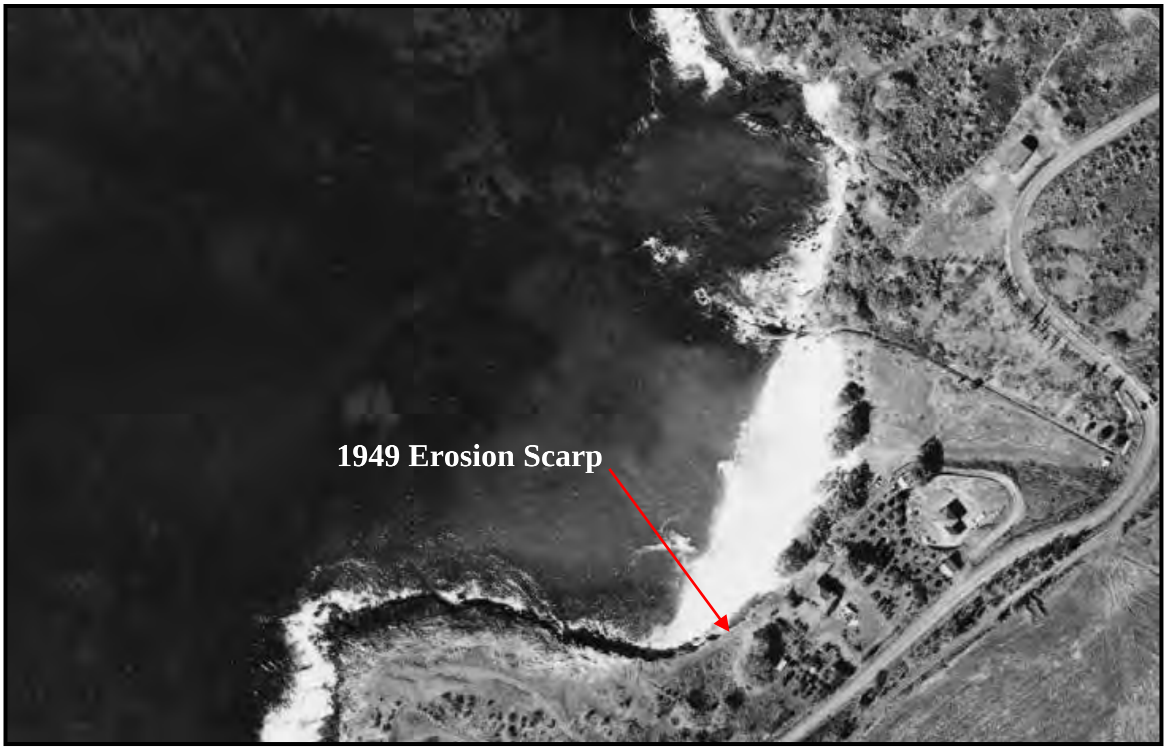

Figure 2-6. 1949 aerial photograph of Keonenui Beach showing a bluff

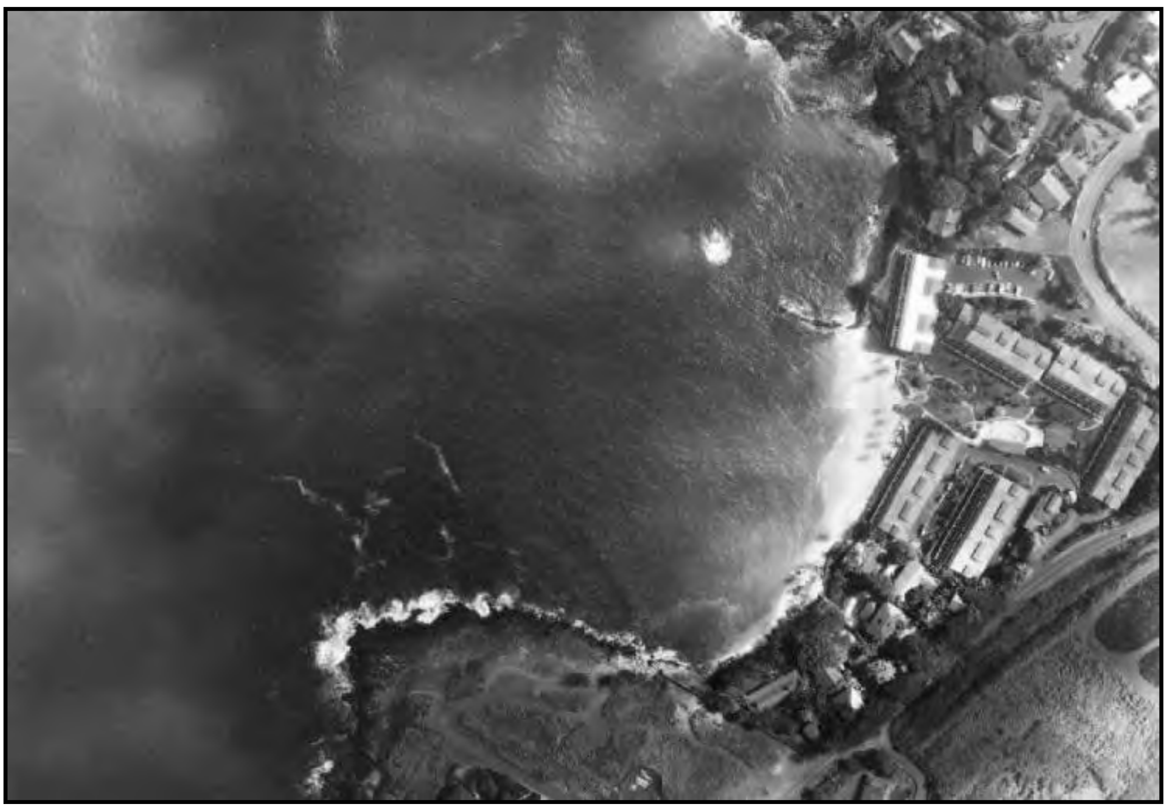

Figure 2-7. 1987 aerial photograph of Keonenui Beach

2.4 Bathymetry

Bathymetric data (Figure 2-8) shows water depths (in fathoms) relative to mean sea level (msl) offshore of the project area. Nearshore water depths are less than 3 fathoms (18 feet) on the inner reef flat, reef crest, and fore reef which extends approximately 1,950 feet offshore. Water depths on the offshore shelf increase from 3 to 61 fathoms (18 to 366 feet) before dropping off into deeper waters (142 fathoms, 852 feet) offshore in the Pailolo Channel.

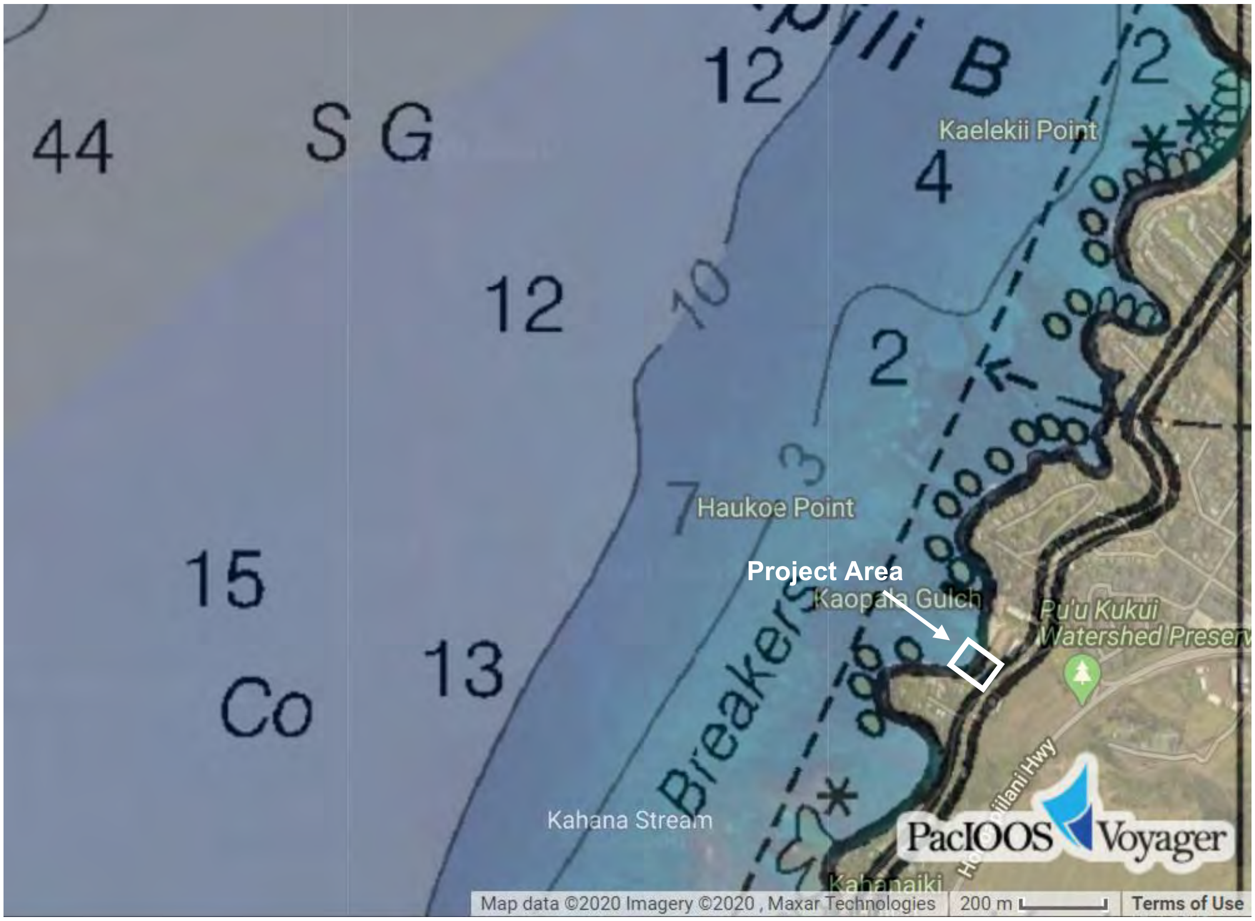

Figure 2-8. Bathymetry for the project area, in fathoms

2.5 Benthic Habitat

The Pacific Island Ocean Observing System's (PacIOOS) Voyager web-based mapping program displays the National Oceanographic and Atmospheric Administration's (NOAA) benthic habitat data for the project area. These maps show the geomorphology (Figure 2-9) and biology (Figure 2-10) of benthic habitat for the project area. The area offshore of the project area is characterized by sand and pavement that is uncolonized or has macroalgae. The U.S. Fish and Wildlife Service classifies the nearshore waters as marine, intertidal, rocky shore, and bedrock, that is regularly flooded. Offshore, the coastal waters are classified as marine, subtidal, unconsolidated bottom, and subtidal. The Hawaii Department of Health (DOH) classifies the nearshore waters as Class A Marine Waters (DOH, 2014).

Figure 2-9. Project area benthic habitat geomorphology

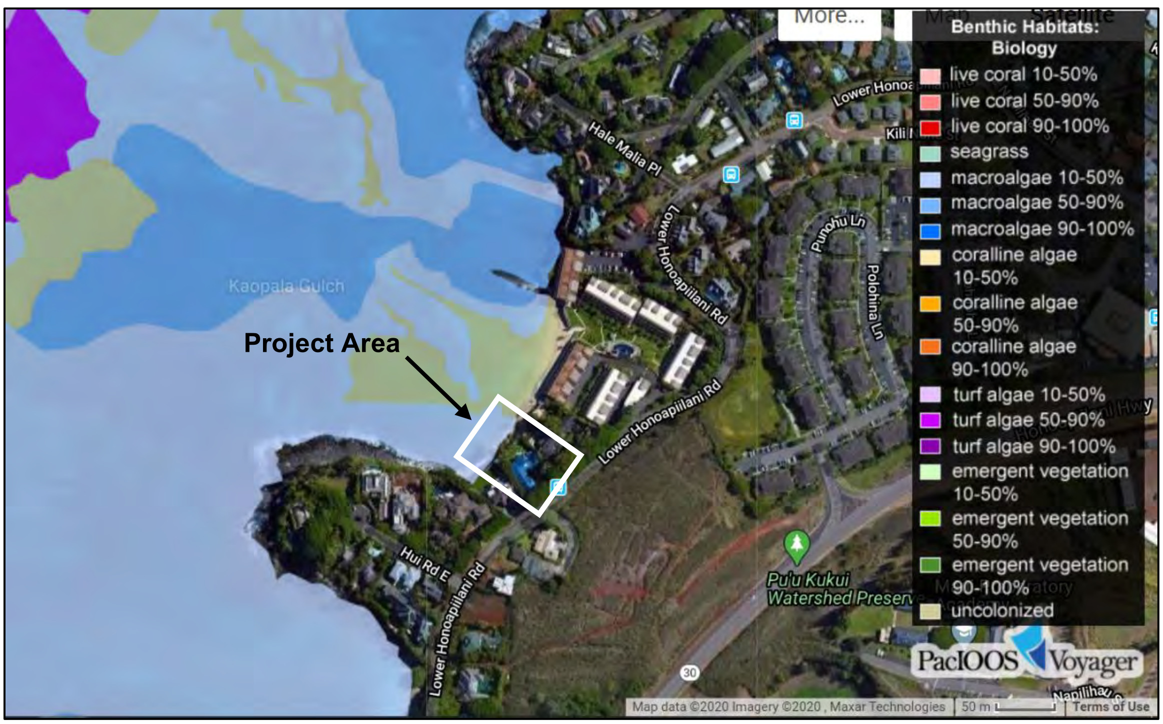

Figure 2-10. Project area benthic habitat biology

2.6 Coastal Uses

The project area shoreline is primarily used for recreational purposes. The beach is used by snorkelers, swimmers, spearfishers, and tourists. Whales can often be seen swimming offshore of Keonenui Bay. There is a public beach access path in the center of the bay.

2.7 Zoning & Land Uses

Figure 1-2 shows the property location on a TMK map. The area between Honoapiʻilani Highway and the shoreline, which is located approximately along the erosion scarp, is located in the Special Management Area (SMA) and Urban Land Use District. The lands seaward of the shoreline are located in the Resource Subzone of the Conservation District. The region offshore is within the Humpback Whale Marine Sanctuary protected area. The project area spans approximately 210 linear feet of shoreline and is zoned as Residential.

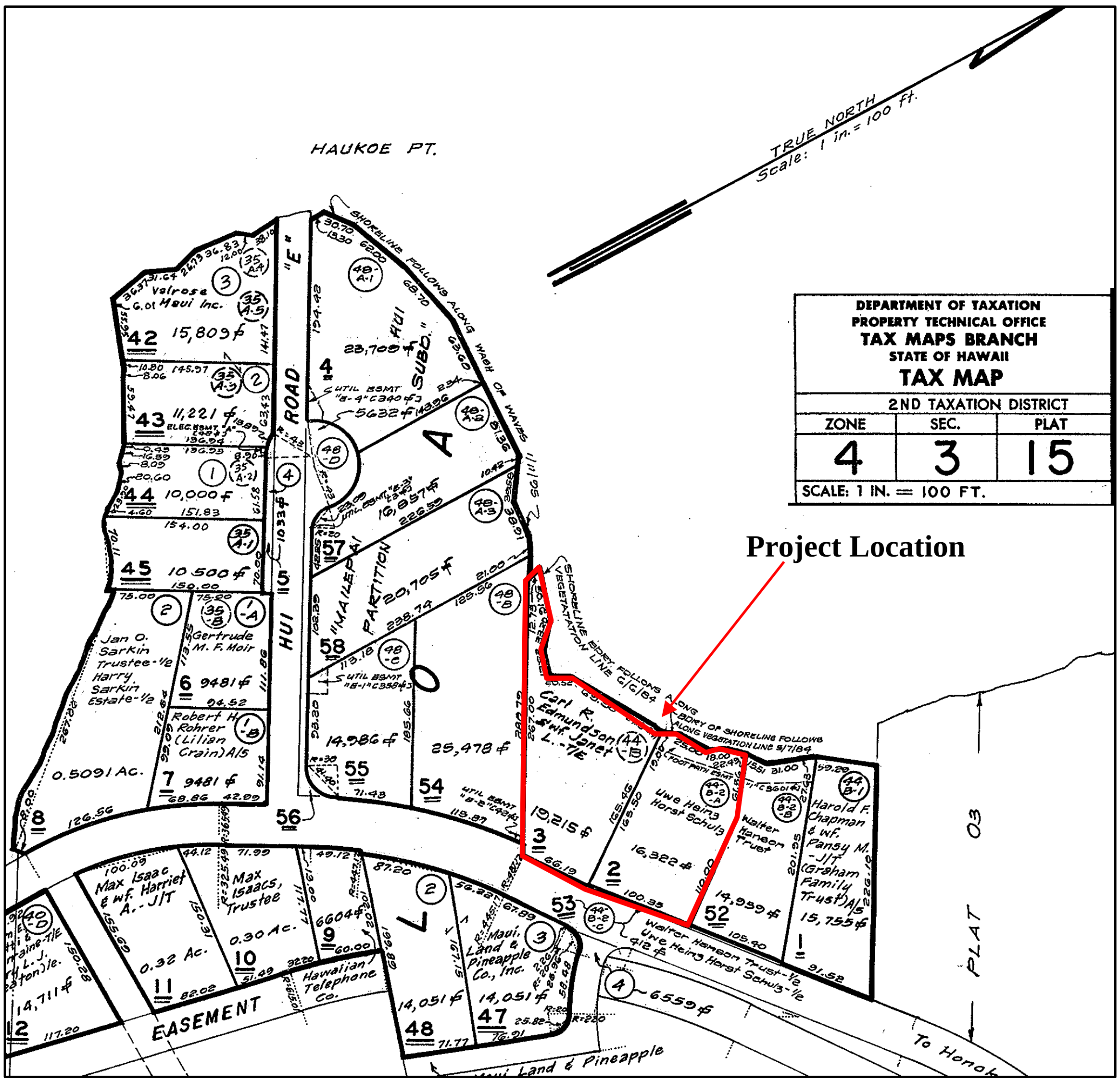

Figure 2-11. TMK map of the project site

3. OCEANOGRAPHIC SETTING

The project site is on the northwest coast of the island at the foot of the West Maui Mountains. The site is protected from prevailing tradewinds by the mountains and is somewhat sheltered from waves by the surrounding islands of Molokai, Lanai, and Kahoolawe.

The coastline is dominated by low-lying, narrow beaches with broad shallow fringing reefs extending offshore. The region has been intensely developed and its narrow beaches suffer from chronic and episodic erosion. The properties to the north and south of the subject shoreline are armored, which affects local sediment transport. The dominant wave energy is produced by the seasonal south (summer) swells, seasonal north (winter) swells, and less frequent westerly Kona storm events. The shallow reef dissipates a high percentage of the offshore wave energy through wave breaking. The waves over the reef are depth limited, meaning that the maximum wave height is a function of water depth, and more wave energy can impact the shoreline at higher water levels.

The nearshore seafloor in Keonenui Bay consists primarily of sand in the central part of the bay, and coral, limestone and rock along the perimeter and beyond about 400 feet offshore. There is a narrow patch of rocky, cobble bottom close to shore in front of the Hester property. Turbidity is higher in the southern end of the bay, with waters clearing in the central and northern portions.

3.1 Winds

The prevailing winds throughout the year are the northeasterly tradewinds. Average tradewind frequency varies from more than 90% during the summer season to only 50% in January, with an overall annual frequency of 70%. Westerly or Kona winds occur primarily during the winter months and are generated by low-pressure systems that typically move north of the islands from west to east. Figure 3-1 shows a wind rose diagram that is applicable to the project site.

Tradewinds are produced by the outflow of air from the Pacific Anticyclone high-pressure system, also known as the Pacific High. The center of this system is located well north and east of the Hawaiian Islands and moves to the north and south seasonally. In the summer months (May through September), the center moves to the north, causing the tradewinds to be at their strongest. In the winter months (October through April), the center moves to the south, resulting in decreasing tradewind frequency. During these months, the tradewinds continue to blow; however, their average monthly frequency decreases to 50%.

During the winter months, wind patterns of a more transient nature increase in prevalence. Winds from extra-tropical storms can be very strong from almost any direction, depending on the strength and position of the storm. The low-pressure systems associated with these storms typically track west to east across the North Pacific north of the Hawaiian Islands. At Honolulu International Airport, wind speeds resulting from these storms have exceeded 60 mph on several occasions. Kona winds are generally from a southerly to a southwesterly direction and are usually associated with slow-moving low-pressure systems known as Kona lows situated to the west of the Hawaiian Islands. These storms are often accompanied by heavy rains.

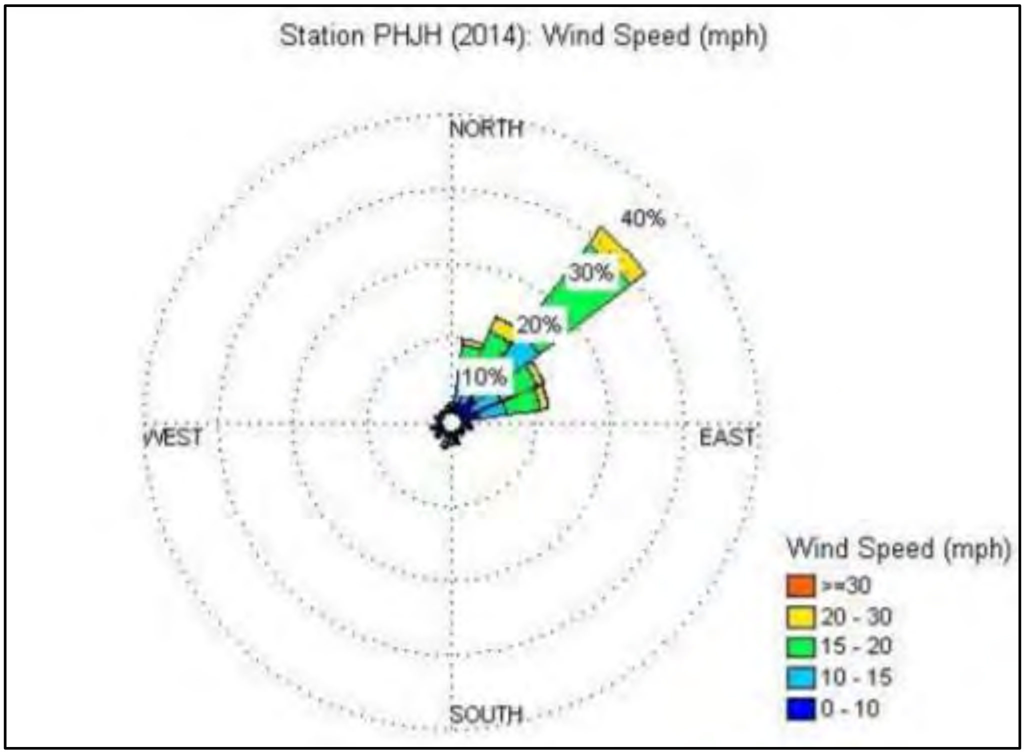

Figure 3-1. Winds rose for Kapalua Airport

3.2 Tides and Eddies

Hawaii tides are semi-diurnal with pronounced diurnal inequalities (i.e., two high and low tides each 24-hour period with different elevations). Modulation of the tidal range results from the relative position of the moon and the sun: when the moon is new or full, the moon and the sun act together to produce larger "spring" tides; when the moon is in its first or last quarter, smaller "neap" tides occur (Rapaport, 2013). The cycle of spring to neap tides and back is half the 27-day period of the moon's revolution around the earth and is known as the fortnightly cycle. The combination of diurnal, semi-diurnal and fortnightly cycles dominate variations in sea level throughout the islands.

The offshore diurnal tide reaches Hawaii Island (Big Island) first, then sweeps across Maui, Oahu, and finally Kauai. Tidal currents result from tidal variations of sea level, and near the shore are often stronger than the large-scale circulation (Rapaport, 2013). Tidal predictions and historical extreme water levels are provided by the Center for Operational Oceanographic Products and Services (COOPS), National Ocean Service (NOS), and the National Oceanic and Atmospheric Administration (NOAA). The nearest tide station to the project area is at Kahului Harbor on the north coast of Maui. The water level data from this station is shown in Table 3-1.

Hawaii is also subject to periodic extreme water levels due to large scale oceanic eddies that propagate through the islands. Eddies are circulations of about 50 to 200 km across that are often variable over a period of weeks to months depending on the latitude. These eddies produce water levels up to 0.5 to 1.0 feet higher than predicted tide elevations for periods of up to several weeks in the Hawaiian Islands (Firing and Merrifield, 2004).

Table 3-1 Tidal datums at Kahului Harbor, Station 1615680 (1983-2001 Epoch)

Datum	Elevation (feet, MLLW)
Highest Observed Water Level (12/20/1968)	3.49
Mean Higher High Water (MHHW)	2.26
Mean High Water (MHW)	1.90
Mean Sea Level (MSL)	1.12
Mean Tide Level (MTL)	1.11
Mean Low Water (MLL)	0.33
Mean Lower Low Water (MLLW)	0.00
Lowest Observed Water Level (12/20/1968)	-1.61

3.3 Currents

Local currents in the Hawaiian Islands are generally driven by the semi-diurnal tides, wind, and breaking waves. The predominant current can differ between the nearshore (inside the wave breaker zone) and the offshore.

Wave-induced currents predominate inside the breaker zone, generating both longshore (shore parallel) and onshore/offshore (rip) currents. These nearshore, wave-induced currents drive the seasonal sediment transport in the project area. Summer swells that reach the shoreline break at an oblique angle to the west-facing beach, creating a longshore current to the north. Winter swells from the north reverse the current.

Local offshore currents are predominantly tidally driven. The current primarily runs parallel to the shore. The strongest peak currents are observed during spring tides and the weakest peak currents are observed during neap tides.

Offshore surface currents are a combination of geostrophic and wind-driven Ekman flow. The large-scale current north of the project area is the North Hawaiian Ridge Current that flows from southeast to northwest. South of Maui Nui, the Hawaii Lee current also flows to the northwest (Figure 3-2, Wren and Koybayshi, 2016).

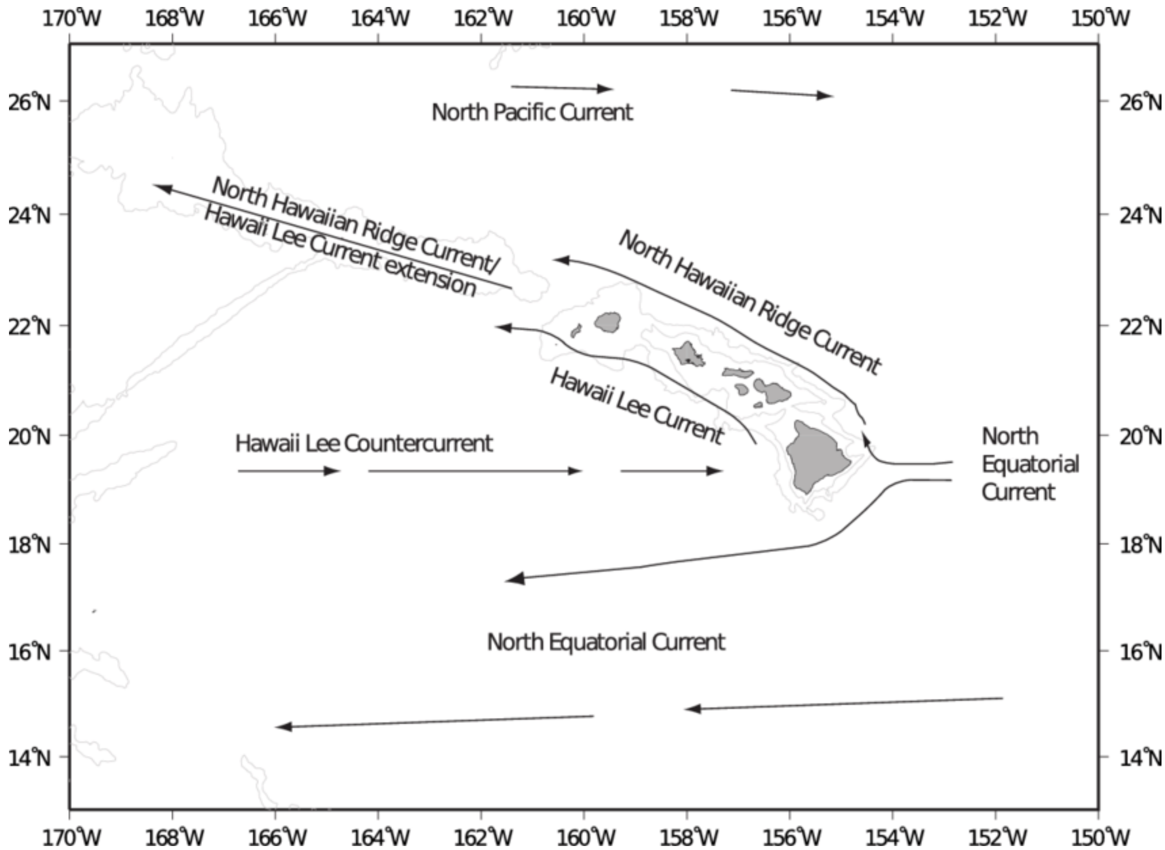

Figure 3-2. Main surface currents around the Main Hawaiian Islands

3.4 Waves

The wave climate in Hawaii is dominated by long-period swell generated by distant storm systems, by relatively low amplitude, short period waves generated by local winds, and the occasional bursts of energy associated with intense local storms. Typically, Hawaii receives four general wave types: 1) northeast tradewind waves, 2) southern swell, 3) North Pacific swell, and 4) Kona wind waves. The dominant swell regimes for Hawaii are shown in Figure 3-3 (Vitousek and Fletcher, 2008).

As waves reach shallow nearshore waters, they shoal, increase in amplitude, and eventually break (Rapaport, 2013). Short period trade wind swell generates waves with short wavelengths and in turn relatively small wave heights. Large surf is produced by the long period swell from distant storms because of the correspondingly longer wavelengths. The north shores of the Hawaiian Islands receive this long period swell in the northern hemisphere winter and the south shores in the southern hemisphere winter. Wave heights of 15 to 20 feet in the surf zone are not uncommon. Tropical storms and hurricanes also generate waves that can approach the islands from virtually any direction. Unlike winds, all these wave conditions may occur at the same time.

The project area is very well protected from the northeast tradewind waves by the island of Maui itself. The local north to northwest tradewinds have a limited fetch and result in small wind chop. The project area is exposed to waves from the north and south to west directions. Kona waves from the southwest are generated by strong winds associated with local fronts or low-pressure systems and typically have periods ranging from 7 to 12 seconds and wave heights that can exceed 18 feet. South swell is generated by southern hemisphere storms and is most prevalent during April through October. These waves have a period of 10 to 16 seconds and deepwater heights of 1 to 3 feet.

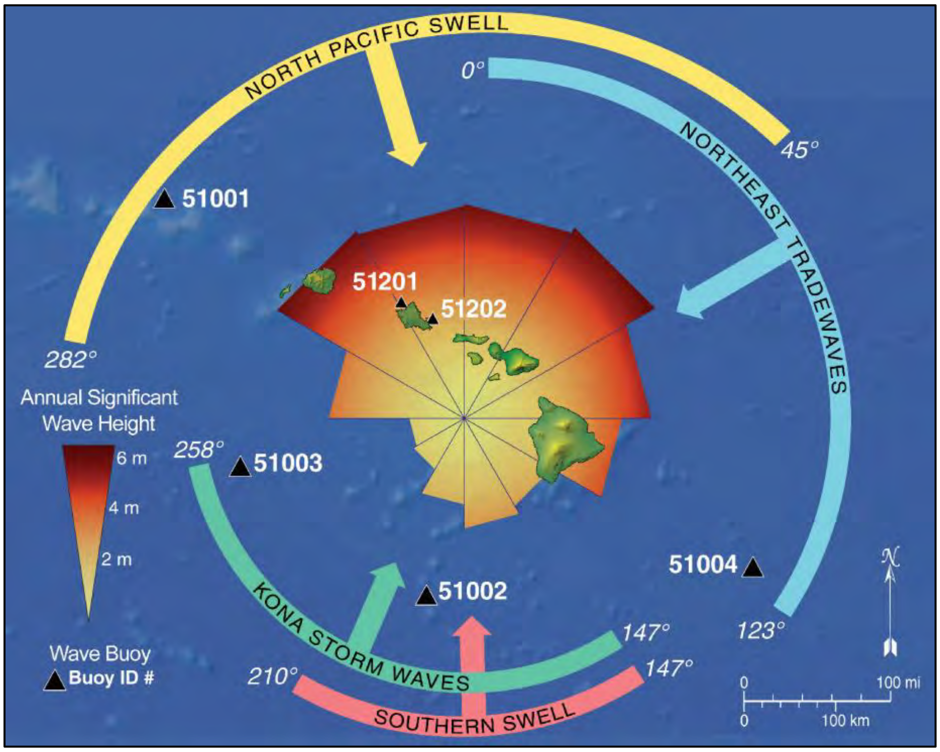

Figure 3-3. Hawaii dominant swell regimes

3.5 Still Water Levels and Nearshore Wave Heights

During high wave conditions, the nearshore water level may be elevated above the tide level by the action of breaking waves. This water level rise, termed wave setup, could be as much as 1 to 2 feet during severe storm wave conditions. During hurricane conditions, an additional water level rise due to wind stress and reduced atmospheric pressure can occur. Collectively termed "storm surge," this can potentially add another 1 to 2 feet to the still water level.

During storm or large wave conditions, there may be multiple zones of wave breaking. Wave heights are said to be *depth-limited* because once the water depth becomes shallow enough the wave breaks, losing size and energy. The wave, however, may reform before it reaches the shoreline and break again when the depth-limited ratio is again attained. The still water level rise during storm events is an important design consideration because it allows larger wave heights to reach the shoreline than during lower water levels. Estimation of still water level rise for a specific design wave event may be accomplished by a traditional analytical methodology that uses bathymetry and wave heights as inputs. The still water level rise at the shoreline is a combination of astronomical tide, storm surge, and wave setup.

4. COASTAL HAZARDS

4.1 Kona Storms

The Hawaiian Islands are annually exposed to severe storms and storm waves generated by passing low-pressure systems (Kona storms) and tropical cyclonic storms (hurricanes). Kona storms occur when the winter low pressure systems that travel across the North Pacific Ocean dip south and approach the islands. Strong southerly and southwesterly winds generated by these storms result in large waves on exposed shorelines, and often heavy rains.

Hurricanes, the worst-case tropical cyclones, are caused by intense low-pressure vortices that are usually spawned in the eastern tropical Pacific Ocean and travel westward. While they typically pass south of the Hawaiian Islands, their paths are unpredictable, and they will occasionally pass near or over the islands. In recent decades, Hurricane Iwa (1982) and Hurricane Iniki (1992) directly hit the island of Kauai and resulted in large, damaging waves along the southern and western shores of Oahu and Maui. Damage from these hurricanes was extensive, not only on Kauai, which was subject to both high winds and waves, but also along coastal areas of other islands exposed to the large waves.

Although somewhat protected by the islands of Lanai and Kahoolawe, the project area is susceptible to damage from Kona storms, which occur during winter months, generally between October and April. Kona storms typically generate waves with significant heights of 10 to 18 feet and periods of 7 to 12 seconds. Occasional strong Kona storms have caused extensive damage to south- and west-facing shorelines on Maui. Deepwater wave heights during a severe Kona storm in January 1980 were about 18.5 feet with a period of 12 seconds.

The greatest impact on West Maui from any hurricane on record was from Hurricane Iniki, which, in September 1992, passed about 400 km south of the island of Hawaii before turning north to pass directly over Kauai. This unusual track subjected the West Maui coast to a particularly long and direct period of exposure to hurricane-induced wave energy. Chu and Clark (1999) show that almost all hurricane tracks in the central Pacific between 1966 and 1997 that reached Maui pass to the southwest of the island. Wave energy they generated would induce northward causing increased sediment transport to the north.

4.2 Tsunami

Tsunami are waves that result from large-scale displacements of the seafloor. They are most commonly caused by large magnitude earthquakes (typically magnitude 7.0 or greater). If the earthquake involves a large segment of land that displaces a large volume of water, the water will travel outwards in a series of waves, each of which extends from the ocean surface to the seafloor where the earthquake originated. Tsunami waves typically have small wave heights in deep water but can have wavelengths of hundreds of miles and travel at speeds up to 500 miles per hour. A tsunami can travel from one side of the Pacific to the other in less than a day. The speed decreases rapidly as the water shoals. The waves increase greatly in height as they shoal and can push further inland. The water then recedes, also at considerable speed, and the recession often causes as much damage as the original wave front itself.

Most tsunamis in Hawaii originate from the tectonically active areas located around the Pacific Rim (e.g., Alaska, Japan, and Chile). Waves created by earthquakes in these areas take hours to reach Hawaii, and the network of sensors that is part of the Pacific Tsunami Warning System can provide Hawaii with several hours of warning before the arrival of tsunami waves generated from these locations. Less commonly, tsunamis originate from seismic activity in the Hawaiian Islands, and there is almost no warning for these locally-generated events.

Four significant tsunamis have impacted Hawaii in recent history - 1946, 1957, 1960, and 1964. The 1946 tsunami was generated in the Aleutian Islands and was one of the most destructive tsunamis to strike Hawaii. The water level rise in Napili during the 1946 tsunami was 15 feet. The U.S. Geological Survey (Fletcher et al., 2002) has given the project area a *high* tsunami hazard rating where the coastal slopes are low (Figure 4-1).

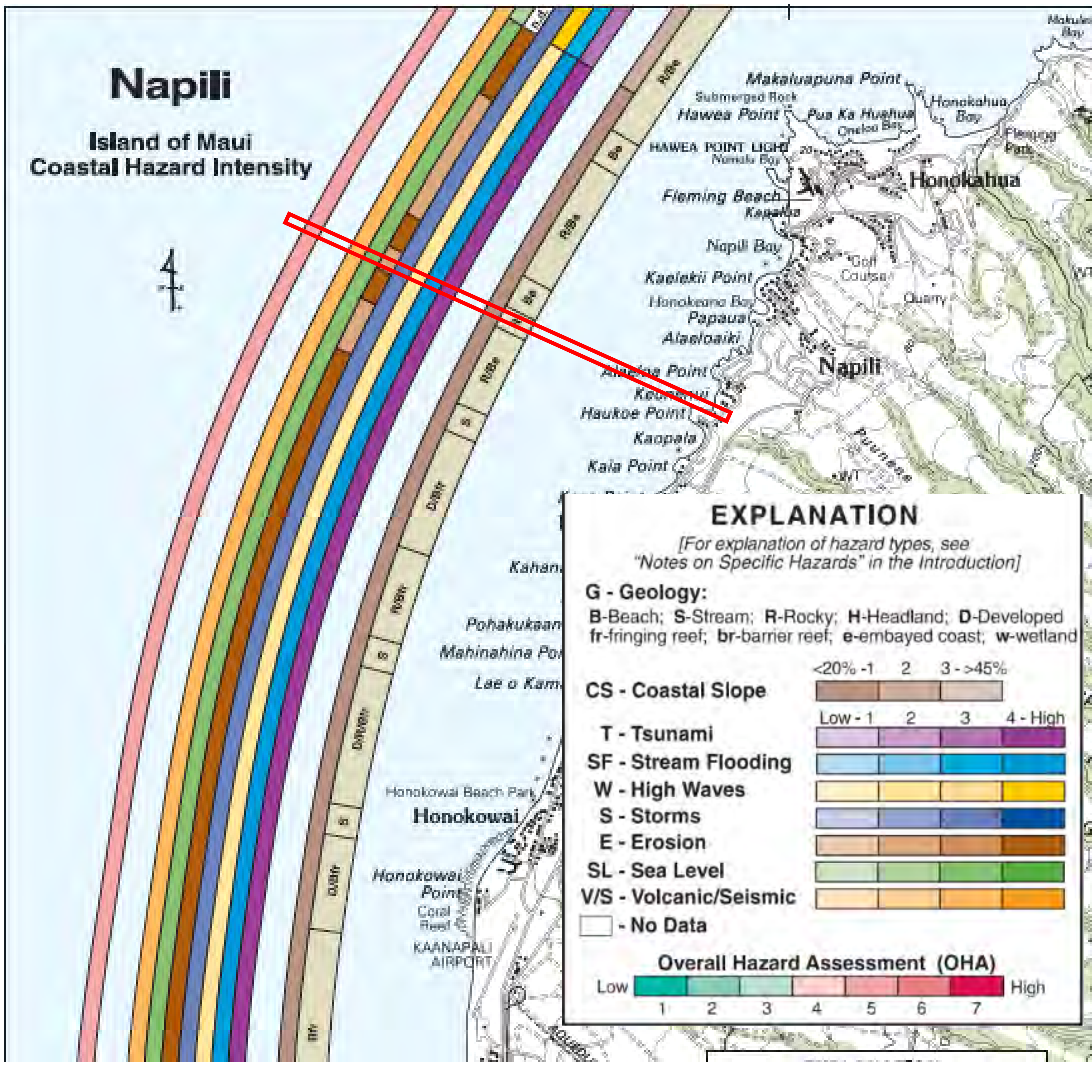

Figure 4-1. Composite hazard map with project area shown in red

4.3 Coastal Flooding

The National Flood Insurance Program, administered by the Federal Emergency Management Agency (FEMA), produces maps identifying flood hazards and risks. Figure 4-2 shows the flood hazard map for the project area. The map indicates that the shoreline area is rated as Flood Zone VE in red. Zone VE designates areas subject to inundation by the 1% annual chance flood event with additional hazards due to storm-induced velocity wave action. The Base Flood Elevation (BFE) is 17 feet. In the vicinity is also Flood Zone AE. Zone AE designates an area inundated by 1% annual chance flooding, for which BFEs have been determined. The BFE in Flood Zone AE landward of the project area is 17 feet. The subject properties are in Zone X, areas determined to be outside the 0.2% annual chance floodplain.

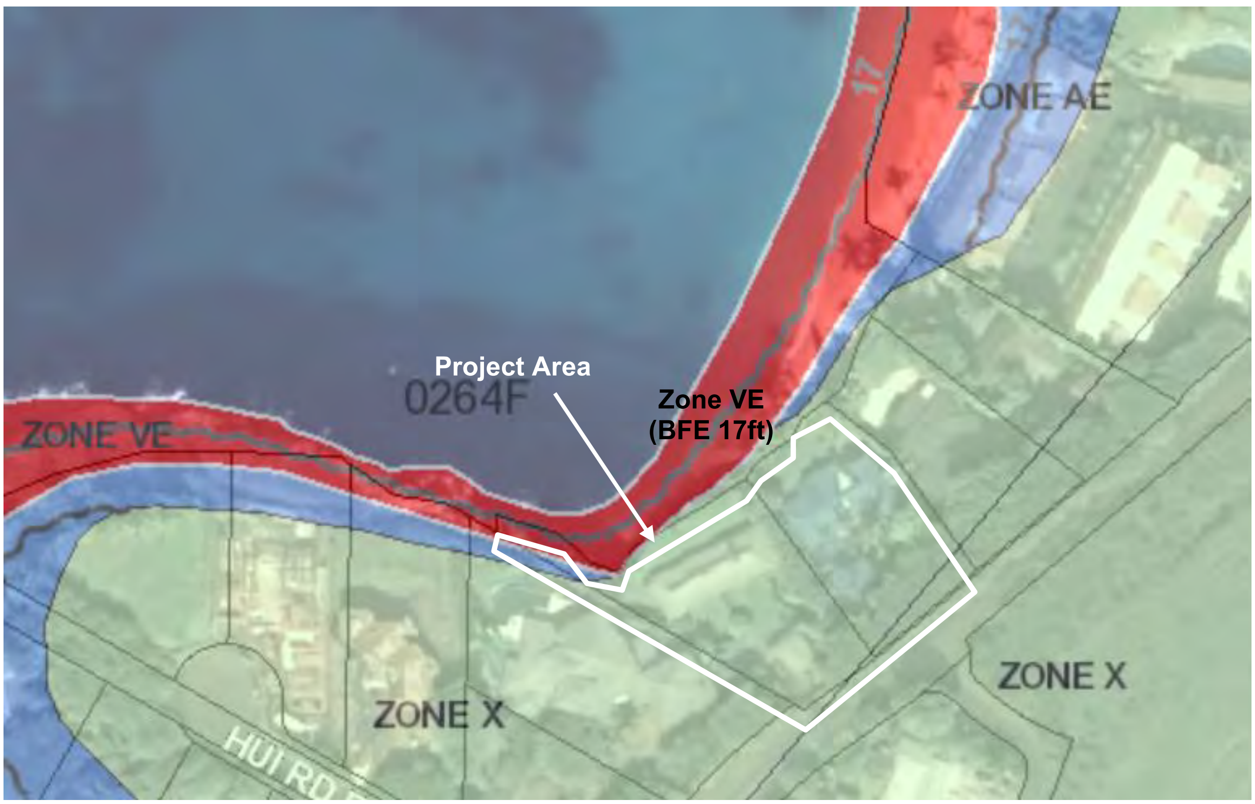

Figure 4-2. Flood hazard zones with the project area

4.4 Slope Failure

The backshore geology at the project site consists of a semi-lithified conglomerate in the lower unit, which is typically exposed to some degree of wave attack, and an unconsolidated alluvial deposit in the upper unit (Figure 4-5). Wave attack on the conglomerate has resulted in a slow, but progressive loss of material in the form of cavities, caves, and piping within the substrate. The upper unit, unconsolidated alluvium, has little internal cohesiveness and breaks down quickly under wave attack, rain, and sheet flow from higher elevations. When the lower conglomerate fails, the unsupported alluvium cannot support itself.

The lower unit has a history of catastrophic failures, which have led to larger mass wasting events on the face of the slope. Prior to the construction of the existing structures, the northern neighbor's shoreline had a deep sea cave, extending more than 10 feet inshore. When the walls and roof of the cave in the conglomerate failed, the upper unit failed also. This resulted in a large volume of backshore conglomerate and alluvium falling onto the active beach face.

The current situation manifested when the sea caves beneath the foundation of the retaining wall collapsed (Figure 4-3). Failure in the lower unit, which the foundation of the retaining wall was built atop, led to the consequent failure of the wall and the upper alluvium substrate. This failure also resulted in a significant volume of rock, wall, and alluvium falling onto the active beach face (Figure 4-4).

Currently, the lower unit continues to slowly erode and create cavities, caves, and piping within the conglomerate (Figure 4-5, Figure 4-6). Continued mass wasting events, which are naturally occurring, are a public safety risk for the individuals on the shoreline and the homes and their inhabitants on the upper slope.

Figure 4-3. Hester shoreline after a portion of the retaining wall collapsed

Figure 4-4. Hester shoreline facing south behind the portion of the retaining wall that collapsed

Figure 4-5. Typical backshore geology along the coastline of Keonenui Beach

Figure 4-6. Erosion cavities in the lower unit

4.5 Sea Level Rise

4.5.1 Sea Level Rise Projections

Global mean sea level is the average height of the entire ocean surface. The present rate of global mean sea level change is +3.1 mm/yr (Sweet et al., 2022), where a positive number represents a rising sea level. Factors contributing to the observed rise in sea level include melting of land-based glaciers and ice sheets and thermal expansion of the ocean water column. Maui thus far has seen a rate of sea level rise (+2.22 mm/yr, Figure 4-7), less than the global average (+3.1 mm/yr). Hawaii is in the “far-field” regarding the effects of melting land ice. This means that the effects of melting land ice have been significantly less in Hawaii compared to areas nearer to the ice melt.

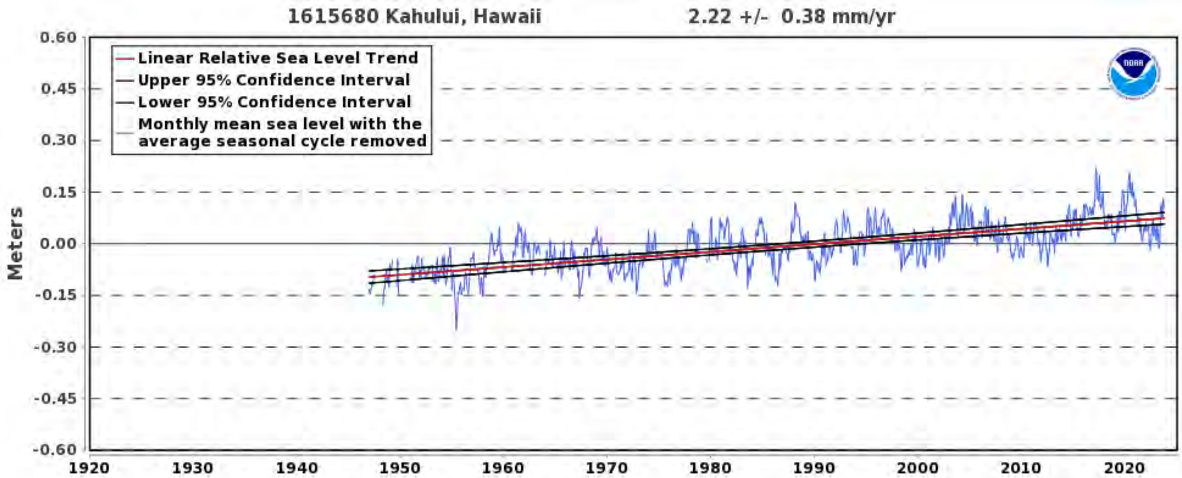

Figure 4-7. Mean sea level trend, Kahului Harbor, 1947 to 2022 (NOAA, 2023)

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations (U.N.) body for assessing the science related to climate change. The IPCC was created to provide policymakers with periodic scientific assessments on climate change, its implications, and potential future risks. As part of this effort, the IPCC surveys and distills the existing body of scientific research and provides consensus projections on future sea levels across the globe under a range of possible future scenarios. The most recent iteration of the IPCC's work, the 6th Assessment Report (AR6), was published on August 9, 2021. Five Shared Socioeconomic Pathways (SSPs) representing future scenarios with sea level rise projections for each are in AR6:

SSP1-1.9 Holds warming in 2100 to approximately 1.5°C relative to the years 1850 to 1900 after a slight overshoot (median) and implies net zero CO_2 emissions around the middle of the century.

SSP1-2.6 Stays below 2.0°C warming relative to the years 1850 to 1900 (median) with implied net zero emissions in the second half of the century.

SSP2-4.5 Approximately in line with the upper end of aggregate Nationally Determined Contribution (NDC) emission levels by 2030. SR1.5 assessed temperature projections for NDCs to be between 2.7 and 3.4°C by 2100, corresponding to the upper half of projected warming under SSP2-4.5. New or updated NDCs by the end of 2020 did not significantly change the emissions projections up to 2030, although more countries adopted 2050 net zero targets in line with SSP1-1.9 or SSP1-2.6. The SSP2-4.5 scenario deviates mildly from a "no-additional-climate-policy" reference scenario, resulting in best-estimate warming of around 2.7°C by the end of the 21st century relative to the years 1850 to 1900.

SSP3-7.0 A medium to high reference scenario resulting from no additional climate policy under the SSP3 socio-economic development narrative. SSP3-7.0 has particularly high non-CO_2 emissions, including high aerosol emissions.

SSP5-8.5 A high reference scenario with no additional climate policy. Emission levels as high as SSP5-8.5 are not obtained by Integrated Assessment Models under any of the SSPs other than the fossil-fueled SSP5 socio-economic development pathway.

The IPCC AR6 sea level rise curves for Kahului from 2020 to 2150 are shown in Figure 4-8 and Table 4-1. The State of Hawaii published the *Sea Level Rise Vulnerability and Adaptation Report for Hawaii (2017)*, which discusses the anticipated impacts of projected future sea level rise on coastal hazards, and the potential physical, economic, social, environmental, and cultural impacts of sea level rise in Hawaii (State of Hawaii, 2017). A key recommendation of the report was that 3.2 feet of sea level rise should be adopted as a statewide vulnerability zone for planning purposes. The planning horizon for the project site is 50 years, which corresponds with the *SSP2-4.5* scenario projection of 1.4 feet of sea level rise by 2070.

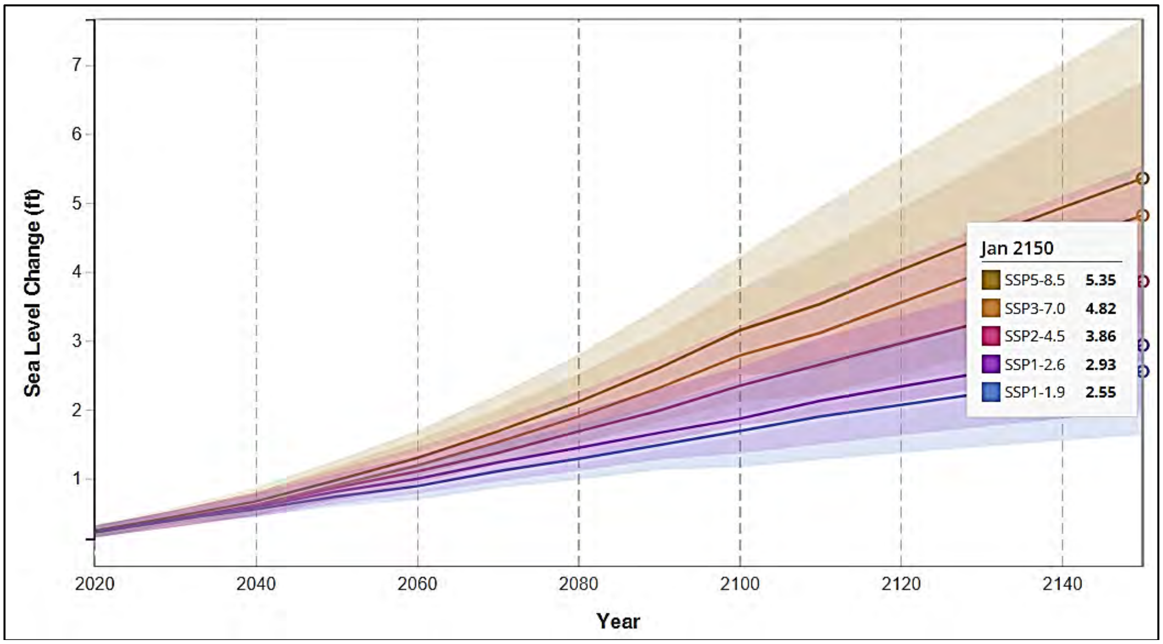

Figure 4-8. IPCC AR6 sea level rise projections for Kahului, 2020 to 2150 (NASA Sea Level Change Tool)

Table 4-1. IPCC AR6 sea level rise projections for Kahului Maui, 2020 to 2150 (NASA Sea Level Change Tool)

Scenario/Year (ft)	2020	2030	2040	2050	2060	2070	2080	2090	2100	2110	2120	2130	2140	2150
SSP1-1.9	0.2	0.4	0.6	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2.1	2.2	2.4	2.6
SSP1-2.6	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.7	1.9	2.1	2.3	2.5	2.7	2.9
SSP2-4.5	0.2	0.4	0.6	0.9	1.1	1.4	1.7	2.0	2.3	2.7	3.0	3.3	3.6	3.9
SSP3-7.0	0.2	0.4	0.6	0.9	1.2	1.5	1.9	2.3	2.8	3.1	3.6	4.0	4.4	4.8
SSP5-8.5	0.2	0.4	0.67	1.0	1.3	1.7	2.1	2.6	3.2	3.5	4.0	4.5	5.0	5.4

4.5.2 Inundation Scenarios

The Base Flood Elevations presented by FEMA include an additional 3 feet of freeboard to account for future sea level rise. Similarly, sea level rise can be included in the hurricane, tsunami, and wave inundation calculations for a chosen sea level rise scenario. While an in-depth study including numerical modeling would be required to produce more detailed inundation data, it is sufficient for this level of planning to treat the components as an additive to estimate future inundation. For example, model hurricane runup elevation is presented in Table 4-2 to be 9.2 feet, with no consideration of sea level rise. With +1.5 feet of sea level rise, it is reasonable to expect runup elevation to exceed 10.7 feet based on the current mean sea level (MSL). The estimated inundation by different types of events for different planning timeframes is presented in Table 4-2.

Table 4-2 Inundation scenarios including sea level rise

	Planning horizons / inundation elevations (feet msl)			
Inundation Event	**Present** (+0.0)	**2030** (+0.4)	**2050** (+0.9)	**2070** (+1.4)
Model hurricane	9.2	9.6	10.1	10.6
Extreme hurricane	10.9	11.3	11.8	12.3
10-yr tsunami	1.0	1.4	1.9	2.4
25-yr tsunami	5.4	5.8	6.3	6.8
50-yr tsunami	8.7	9.1	9.6	10.1

4.5.2.1 Projected Impacts

Sea level rise has the potential to impact beaches and shorelines in Hawaii. Impacts may include beach narrowing and beach loss, loss of land due to erosion, and infrastructure damage due to inundation and flooding. Anderson et.al. (2015) found that, due to increasing sea level rise, the average shoreline recession (erosion) in Hawaii is expected to be near twice the historical extrapolation by the year 2050, and nearly 2.5 times the historical extrapolation by the year 2100. The impacts from anomalous sea level events (e.g., king tides, mesoscale eddies, storm surge) are also likely to increase.

The State of Hawaii *Sea Level Rise Vulnerability and Adaptation Report for Hawaii (2017)* discusses the anticipated impacts of projected future sea level rise on coastal hazards, and the potential physical, economic, social, environmental, and cultural impacts of sea level rise in Hawaii (State of Hawaii, 2018). A key component of the report was a numerical modeling effort by the University of Hawaii (UH) to estimate the potential impacts of a 3.2-foot rise in sea level.

UH used the most current available information on climate change and sea level rise from the Intergovernmental Panel on Climate Change (IPCC) Assessment Report 5 (AR5). The UH numerical modeling is based on the upper end of the IPCC AR5 representative concentration pathway (RCP) 8.5 sea level rise scenario, which predicts up to 3.2 feet of global sea level rise by the year 2100. However, based on recent peer-reviewed publications, sea level rise could be significantly greater than the RCP 8.5 sea level rise scenario by the end of this century. Sweet et al. (2017) suggest that global mean sea level rise in the range of 6.4 feet to 8.8 feet is physically plausible by the end of this century, which is significantly higher than the worst-case IPCC AR5 projections.

UH modeled the potential impacts that a 3.2-foot rise in sea level would have on coastal hazards including passive flooding, annual high wave flooding, and coastal erosion. The footprint of these three hazards was combined to define the projected extent of chronic flooding due to sea level rise, referred to as the *sea level rise exposure area (SLR-XA)*. Flooding in the SLR-XA is associated with long-term, chronic hazards punctuated by annual or more frequent flooding events. The UH model results are presented in Figure 4-9 through Figure 4-12.

Figure 4-9 depicts the potential for passive flooding with 3.2 feet of sea level rise. Passive flooding includes areas that are hydrologically connected to the ocean (marine flooding) and low-lying areas that are not hydrologically connected to the ocean (groundwater). The model projects flooding up to the erosion scarp with 3.2 feet of sea level rise.

Figure 4-10 depicts the potential for annual high wave flooding with 3.2 feet of sea level rise. The annual high wave flooding model propagates the maximum annually recurring wave, calculated from historical wave buoy data, over the reef, and to the shore along 1-dimensional cross-shore profiles extracted from a 1-meter digital elevation model. The model depicts the spatial extent of inundation that is greater than 10cm in depth.

The projected erosion hazard lines for the project site are shown in Figure 4-11 are derived from historical sand beach erosion rates that are based on beach toe measurements collected at individual transects located 20 meters apart along the coastline. Each transect is characterized by a unique combination of physical and environmental factors that influence shoreline change at that specific transect. These erosion projections are based on historical erosion rates of the sand beach and are not entirely accurate predictions of the future. Because the backshore geology, the lower conglomerate, and upper alluvium, control the rate of coastal erosion which is significantly slower than the rate of beach change, this data is not recommended for planning purposes for the backshore parcels.

Figure 4-12, the overall Sea-Level Rise Exposure Area, is a reflection of the modeled erosion area under 3.2 feet of sea level rise. The results of the erosion model represent the combination of measured, historical erosion rates due to changes in the sand beach and the compounding impacts of higher water levels associated with projected sea level rise. This portion of the SLR-XA erosion model projects coastal response to rising sea levels as the erosion of fast land. The model assumes that all coastal changes in the nearshore, shoreline, and terrestrial area (to the maximum extent of erosion) are occurring in mobile sandy substrate. The model implicitly assumes that sand moves freely along the affected dry and submerged coastal profile, allowing the entire system to respond to the effects of a rise in sea level. However, the assumption that the affected system is composed entirely of sand is not true for much of Maui's coastline, including the project site, where shallow fringing reefs dominate the nearshore, and clay and rock are present along and within much of the terrestrial area.

In this location, coastal erosion is controlled by the semi-lithified conglomerate that erodes significantly slower than the sand beach changes. These erosion models can be a useful tool for considering the potential impacts of erosion at the island or community level; however, there are certain assumptions, limitations, and uncertainties that must be understood when considering the results at the parcel level. In this location, the erosion projection, based on changes in the sand beach, is not a valid prediction for changes in the backshore.

Another notable assumption occurs where projected erosion impacts are presented along engineered shorelines, such as seawalls and revetments. The model uses the "all sand" substrate for predictive modeling but does not account for the presence of engineered shore protection structures, such as seawalls. Typically, these structures are utilized to abate the impacts of shoreline erosion and act counter to the natural pressure influencing shoreline retreat.

The coastline of Maui is characterized by a broad spectrum of environments that include locations where sand is no longer present, the geology of the coastline has fundamentally changed, the coastline has areas of harder substrate, the shoreline is armored or otherwise engineered, and a myriad of others that are not an 'all sand' environment. A sea level rise influenced model that predicts coastal change in an all sand environment is not expected to accurately predict coastal change across the full spectrum of coastal environments present on Maui.

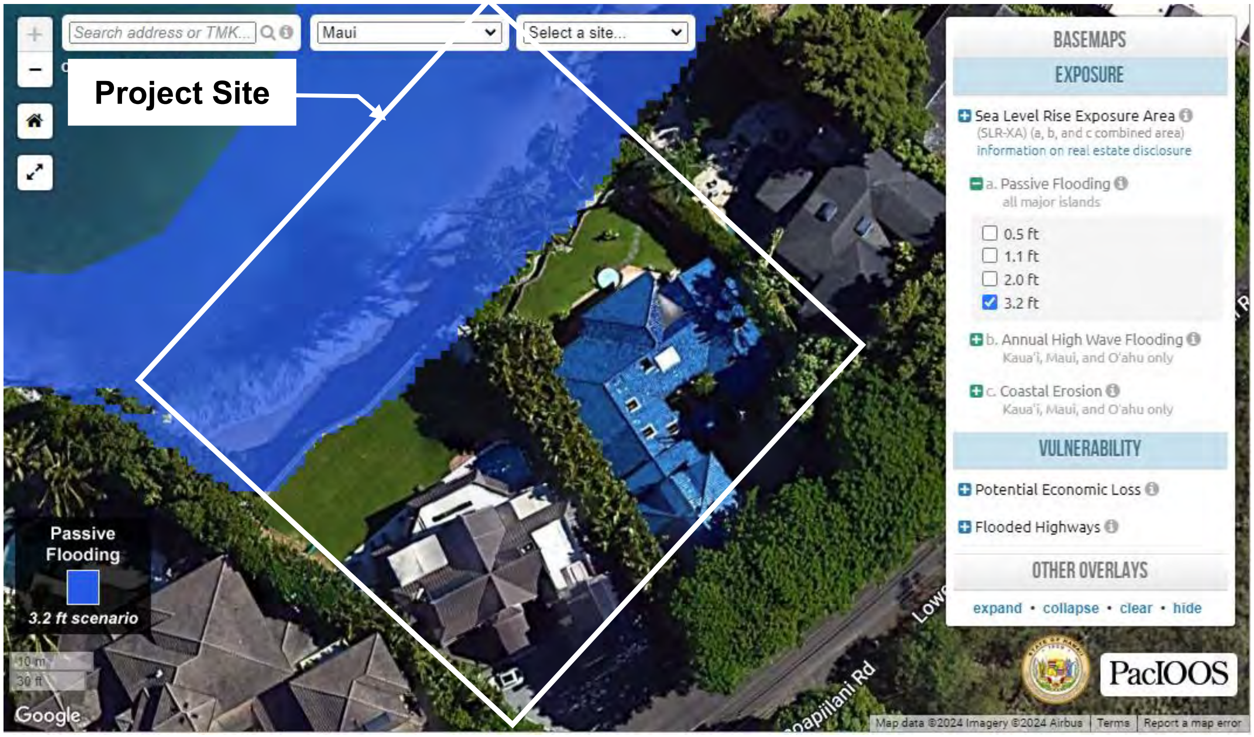

Figure 4-9. Passive flooding with 3.2 feet of sea level rise

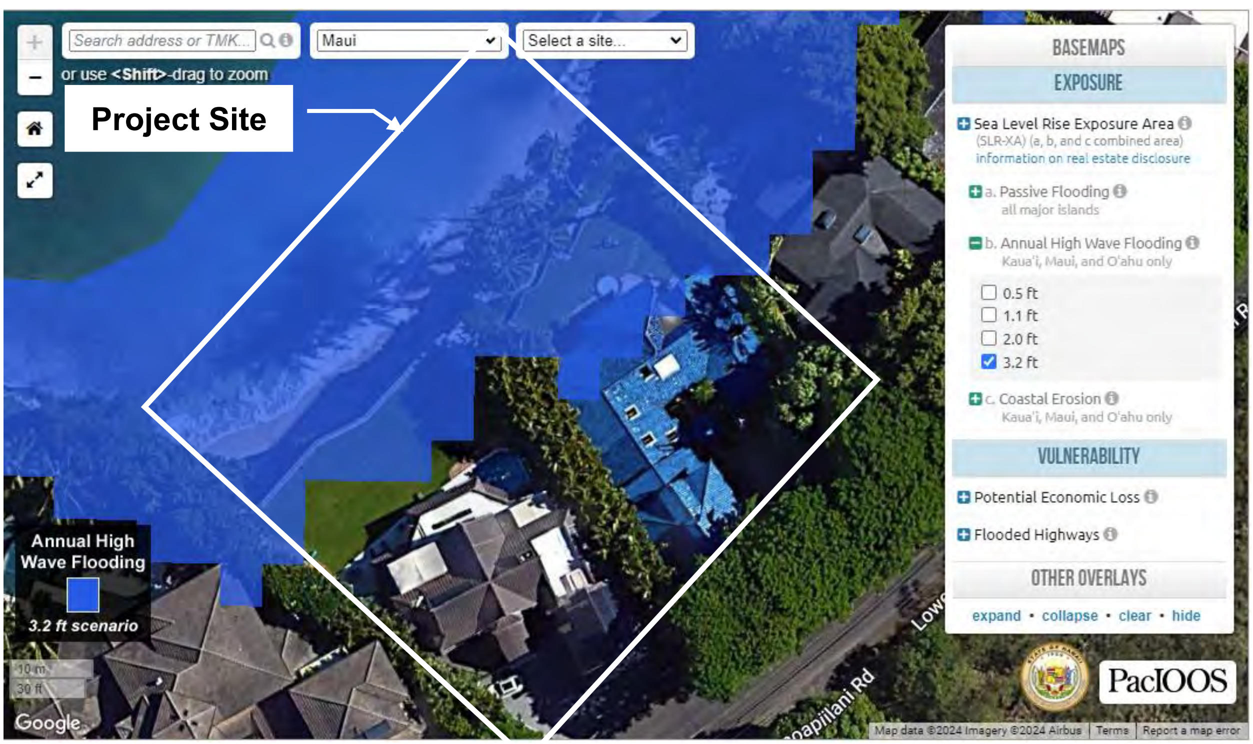

Figure 4-10. Annual high wave flooding with 3.2 feet of sea level rise

Figure 4-11. Coastal erosion with 0.5 to 3.2 feet of sea level rise

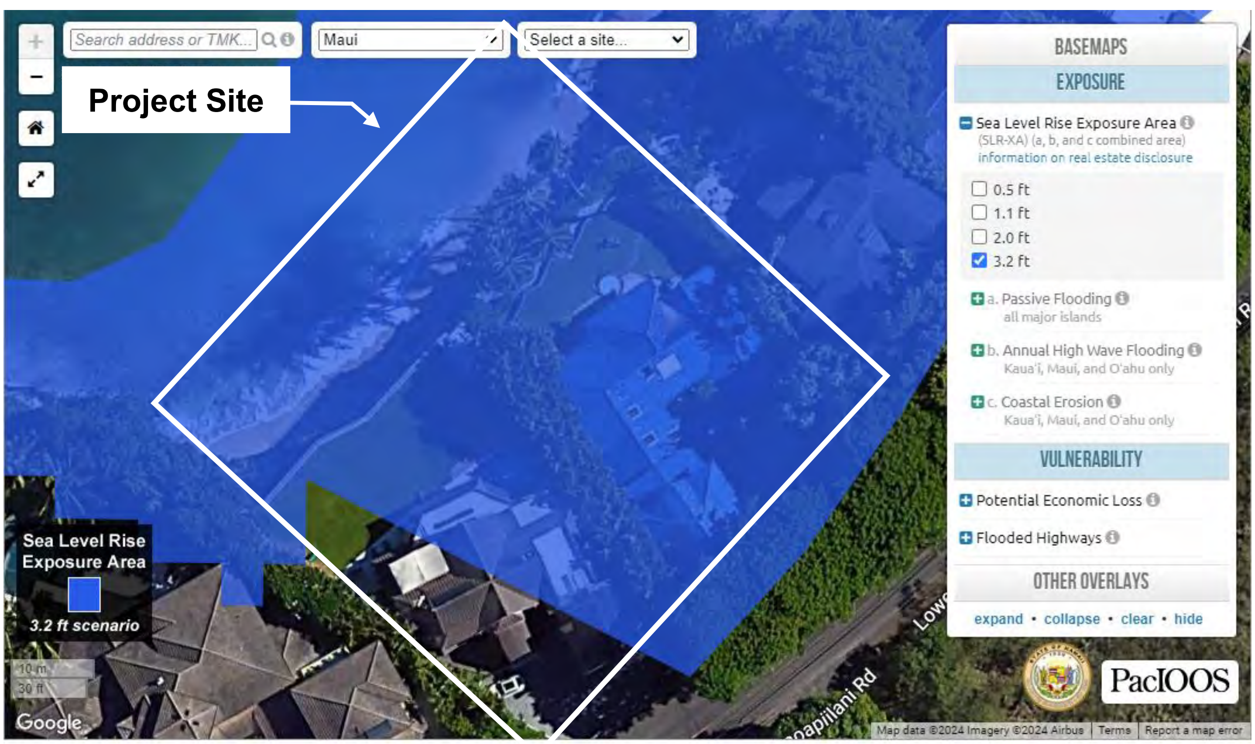

Figure 4-12. Combined hazard exposure with 3.2 feet of sea level rise

5. SHORELINE ASSESSMENT

5.1 Shoreline Description

Keonenui Bay lies between Haukoe Point and Alaeloa Point on the northwest Napili coast of Maui (Figure 1-1). The shoreline is governed by the underlying volcanic rock formations. The beach is a pocket beach typical of this stretch of coastline about 500 feet long and contained between the headlands which protrude about 400 to 500 feet seaward. Figure 5-1 is a photographic overview of the bay. The coastal processes along the shoreline within the study area are complicated by the bay and headland morphology, the presence of offshore fringing reefs, and a seasonal wave climate with two opposing wave approach directions.

The backshore along the north half of the beach is occupied by the Kahana Sunset condominium development. There, the beach is about 70 feet in width. Beach elevation is about 10 feet in front of the rock wall protecting the development, with slopes at about 1 to 10, vertical to horizontal, to the water.

The backshore along the southern half of the beach is occupied by four single-family homes, including the Hester and Barto properties. The beach narrows and transitions to an irregular, rough, rocky shore. There, the beach inflates and deflates seasonally with a variation in elevation of about 6 feet. The beach accretes during typical winter conditions and erodes in response to summer surf conditions. The upper unit of the backshore is red clay soil, or alluvium, typical of the area. The red clay can be seen actively eroding during wave uprush, resulting in the formation of small turbidity plumes (Figure 5-4). According to local residents, turbidity can become a problem during high runoff conditions. Turbid conditions improve when large winter waves arrive and flush the bay. Anecdotal accounts by long-time residents indicate slow, long-term net erosion.

A visual assessment of the project shoreline was conducted by Maui Land Surveyors on October 8, 2023. The red clay has been eroded to the point of wall undermining at the stairs at the north end of the project shoreline at the Barto property (Figure 5-6). The sand beach has been completely deflated, inducing further erosion and subsequent undermining of the beach slope. The project shoreline from Spring 2021 is shown in Figure 5-7 for comparison to the current state of the shoreline, shown in Figure 5-8.

Figure 5-1. Overview of Keonenui Bay

Figure 5-2. Shoreline fronting the Hester property

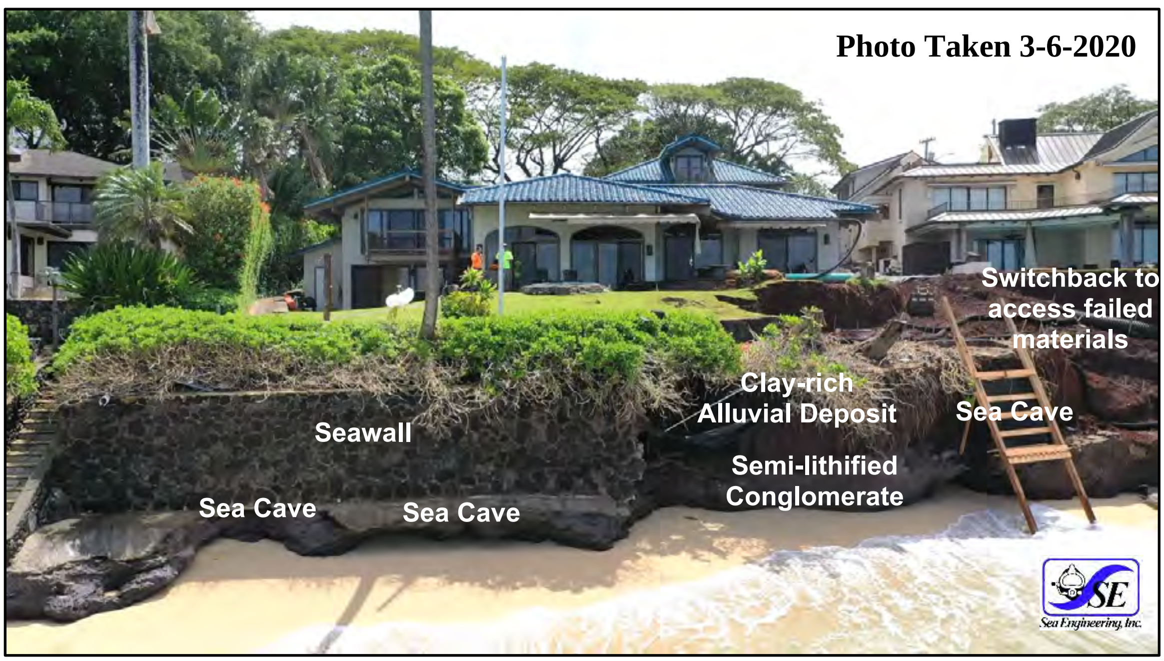

Figure 5-3. Shoreline fronting the Barto property

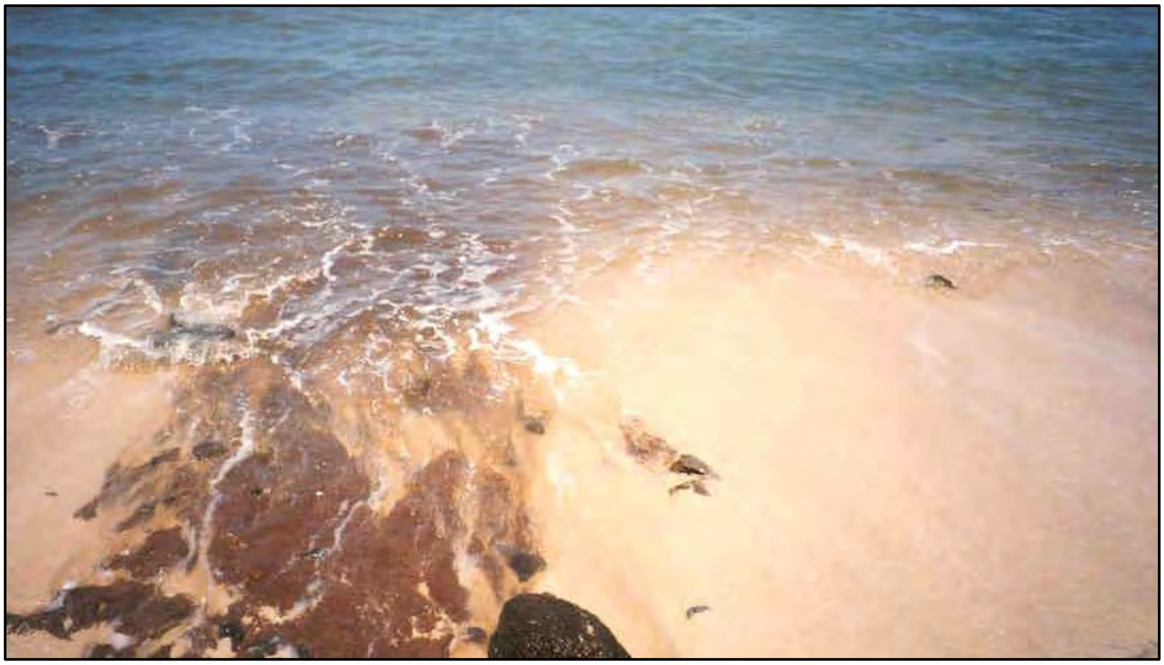

Figure 5-4. Erosion of the soft red clay substrate

Figure 5-5. Seawall north of the Barto property

Figure 5-6. Eroded of the red clay substrate at the project shoreline (10/8/2023)

Figure 5-7. Project shoreline facing north

Figure 5-8. Current state of project shoreline facing north

5.2 Effect of structures in Keonenui Bay

The presence of seawalls on a sandy shoreline is often blamed for the disappearance of sand from the beach. Vertical surfaces can increase nearshore wave energy by reflecting waves back out to sea. This reflection of wave energy at the face of the structure can cause scour in front of the wall and inhibit the accretion of sand. Conversely, the influence of the walls is minimized when a beach is established that prevents wave runup (or "swash") from encountering the wall.

Analysis of the effects of walls on the Keonenui shoreline is not conclusive. During the eight months between the 1987 and 1988 photos, with some shoreline structures already lining the shoreline and exposed conglomerate along the remaining areas, there was an accretion of 35 feet and 68 feet of sand along the beach. Yet between 1988 and 1997, the beach appeared to erode.

The steep sea cliffs that front much of the bay, and that are especially pronounced in front of the Hester and Barto properties, act as natural walls to reflect wave impact in the absence of a sand beach. It is not likely that the hardening of the cliff face would measurably change wave reflection or affect coastal processes differently than the steep naturally occurring rock and clay material that is already present on the shoreline.

5.3 Beach Profiles

A topographic survey of the project area was conducted by Sea Engineering, Inc. on March 6, 2020. On February 8 , 2021 and October 10, 2023, drone surveys were conducted from which topography is estimated. A map showing the results of the surveys and four profile locations is presented in Figure 5-9. The elevations along each of the four profiles are shown in Figure 5-10.

In 2020 the foreshore (beach) elevations ranged from +0 to +3 feet mllw. Between the beach and the backshore is a steep gradient up the face of the remaining retaining wall at profile 1, and the face of the bluff at profiles 2, 3, and 4. Backshore elevations ranged from +18 to +28 feet mllw. The beach was moderately-sloping with an average slope of 9 degrees.

Figure 5-9. Topographic data for the project area (3/6/2020)

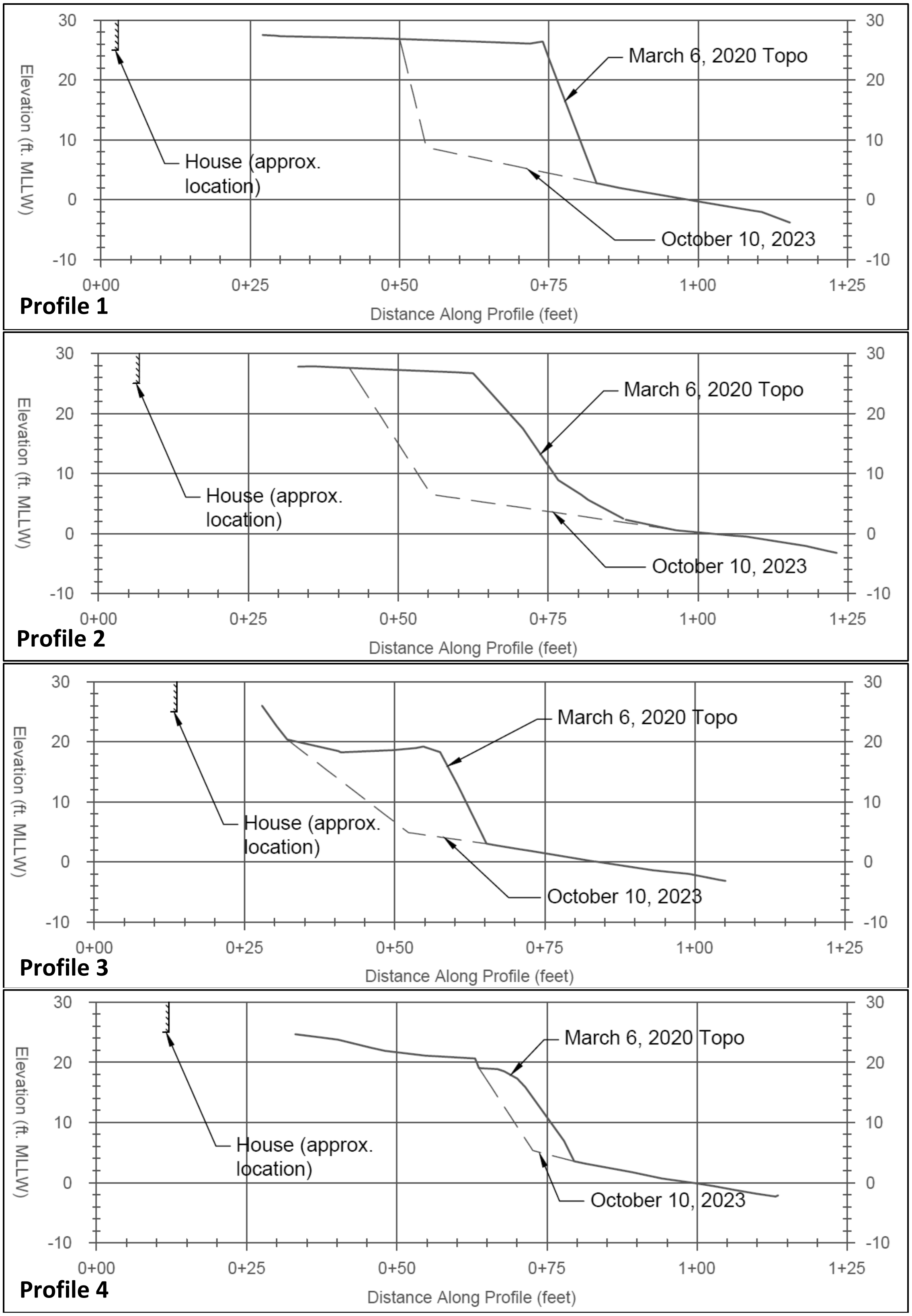

Figure 5-10. Topographic Profiles

Figure 5-11. Aerial topography of the project area (2/8/2021)

5.4 Certified Shorelines and Setbacks

Section §12-203-4 of the Shoreline Rules for the Maui Planning Commission, pertaining to the establishment of Shoreline Setback lines, states:
"(a). All lots shall have a shoreline setback line that is the greater of the distances from the shoreline as calculated under the methods listed below or the overlay of such distances:

(i). Twenty-five feet plus a distance of fifty times the annual erosion hazard rate from the shoreline;

(ii). For irregularly shaped lots, or where cliffs, bluffs, or other topographic features inhibit the safe measurement of boundaries and/or the shoreline, the shoreline setback line will be equivalent to twenty-five percent of the lot's depth as determined by the Director, to a maximum of one hundred fifty feet from the shoreline."

Section §12-203-4 of the Shoreline Rules states, "where the shoreline is fixed by (1). artificial structures that are nonconforming or that have been approved by appropriate government agencies and for which engineering drawings exist to locate the interface between the shoreline and the structure; or (2). exposed natural stabilized geographic features such as cliffs and rock formations, the Annual Erosion Hazard Rate shall cease at the interface." The Annual Erosion Hazard Rate (AEHR) method of calculating the Shoreline Setback, therefore, does not apply to the subject property.

The subject parcel is irregularly shaped. A narrow, unusable strip of land 5 to 15 feet wide protrudes approximately 108 feet seaward of the developable portion of the lot, along Haukoe Point. The proposed Shoreline Setback is therefore equivalent to twenty-five percent of the lot's depth as estimated based on the developable portion of the lot. Using the Average Lot Depth (ALD) method, the proposed shoreline setback for the parcel is 40.25 feet.

6. ALTERNATIVES ANALYSIS

The purpose of the *Hester and Barto* Coastal Assessment is to collect the data and information necessary to understand the coastal landscape and the existing and potential hazards. This baseline information is used to inform the development of conceptual engineering solutions that can achieve the objectives of the project:

- Mitigate future erosion of the properties and protect the homes;
- Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both;
- Mitigate human-induced impacts to the natural coastal processes and littoral cell;
- Prevent potential undermining of neighboring shoreline protection structures;
- Minimize the volume of artificial material introduced to the shoreline; and
- Prevent earthen soils from eroding and causing siltation of the coastal waters.

Coastal erosion mitigation and protection are generally divided into two basic types: soft solutions and hard solutions. Examples of soft solutions include retreat from the shoreline, sand pushing, temporary erosion control structures, dune restoration, and beach nourishment. Hard solutions utilize engineered rock or concrete structures, typically in the form of a revetment or seawall, to permanently armor the shoreline, stopping the erosion and shoreline recession. Beach nourishment can be combined with engineered structures, such as shore-perpendicular groins or offshore breakwaters, to stabilize the beach fill.

Erosion control measures include the following general categories:

- Temporary measures (vegetation, erosion skirts, sandbags, geotubes, gabions, mattresses)
- Beach maintenance (sand pushing, sand backpassing)
- Beach nourishment (with or without stabilizing structures)
- Sand stabilizing/retention structures (groins, breakwaters)
- Shoreline armoring (revetments, seawalls, bulkheads)

Erosion control measures should be proven, durable, and effective in protecting the backshore, while minimizing environmental impacts. The measures must also be technically feasible at the scale of the project site. SEI evaluated thirteen (13) alternatives to determine if they are suitable for the project site and capable of satisfying the project objectives:

1. No Action or Deferred Action
2. Managed Retreat
3. Temporary Erosion Control
4. Beach Maintenance
5. Beach Nourishment
6. Beach Nourishment with Stabilizing Structures
7. Slope stabilization
8. Slope stabilization with a Retaining Wall
9. Seawall
10. Full Height Terraced Seawall and Retaining Wall(s)
11. Fortification of Conglomerate with a Terraced Wall(s)
12. Rock Rubblemound Revetment
13. Hybrid Revetment-Wall

Alternatives were evaluated based on the following criteria:

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material)
3. Costs (i.e., initial costs, recurring costs, entitlement costs)
4. Feasibility (i.e., material availability, regulatory restrictions, community support)
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access)

These alternatives were previously assessed for the beach profiles based on the topographic survey conducted in 2020. On October 8, 2023, a site visit was conducted by Maui Land Surveyors. Updated profile elevations were estimated based on the visual inspection of the shoreline.

6.1 No Action or Deferred Action

These alternatives both forego any improvements associated with the proposed project and would leave the bluff face in its existing condition. These approaches do nothing to address the erosion problem and the condition of the shoreline would likely continue to deteriorate. Given the historical shoreline erosion rate and the presence of semi-lithified conglomerate backing the beach, a sand beach is unlikely to survive in this location with no action or deferred action.

The unprotected bluff face is also a source of environment degrading turbidity during high wave conditions. Continued erosion would result in the landward migration of the certified shoreline, which has implications for facilities on the parcel, land ownership, and public access. If the shoreline continues to erode, engineering options may become limited as there may be insufficient land area available to accommodate shore protection structures.

Evaluation of No Action or Deferred Action

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Disadvantage (DIS) – Does not change the coastal hazard exposure.
        ii. DIS – Continued loss of sediment makes future protection of thehomes increasingly difficult.
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. DIS – Does not mitigate the public hazard.
        ii. DIS – The public hazard may intensify as erosion continues and the slope and walls further destabilize.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
        i. Advantage (AD) – No new artificial structures would be introduced to the littoral cell that may change coastal processes.
        ii. AD – Allows the beach and shoreline to migrate naturally.
        iii. DIS – The beach will likely be lost due to the erosion-resistant nature of the lower semi-lithified conglomerate.
        iv. DIS – Would not yield any appreciable benefits in terms of beach processes.
        v. DIS – Destabilization of the adjacent wall, with potential failures onto the beach, would have a human impact on coastal processes.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. DIS – Does not mitigate the potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures.

   e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
      i. DIS – Continued erosion of the bluff may result in mass wasting events causing siltation of the coastal waters.
      ii. DIS – Loss of the adjacent seawall would release artificial material and the soils behind the seawall to coastal waters.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
   a. AD – No artificial material would be added to the shoreline.
   b. Neutral (N) – There is no design for no action or deferred action.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
   a. AD – No cost associated with design or construction of this alternative.
   b. AD – No maintenance.
   c. DIS – Costs for cleaning debris and costs for potential future alternatives increase as the situation at the property becomes worse (e.g. a steeper erosion scarp, more instability in the soils, and undermining of structures).
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
   a. DIS – If the erosion continues and there are mass wasting events or destabilization of the adjacent seawall, neighbors and the community may not support this alternative.
   b. AD – There are no regulatory restrictions requiring effort to be made beyond cleaning up the debris from the shoreline.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. N – Would not yield any appreciable benefits in terms of beach processes.
   b. DIS – The release of upland fine material into the nearshore waters may impact marine habitat.
   c. DIS – The public could traverse the existing slope creating potential privacy, security, and liability issues.
   d. DIS – When the beach has completely eroded, there will be no lateral access along the shoreline.

No Action or Deferred Action would likely leave the backshore land and infrastructure exposed to erosion. The public hazard exposure to mass wasting events and destabilization of the seawall would increase. Moreover, given the coastal geology at the site, it is unlikely that this alternative will cause the beach to stabilize or accrete. Since this alternative would not meet the project objectives, it was dropped from further consideration.

6.2 Managed Retreat

Managed Retreat (also referred to as adaptive realignment) is a coastal management strategy that is intended to allow the shoreline to naturally move inland, rather than fixing the shoreline with engineered shore protection structures. Managed Retreat typically involves modification, relocation, or removal of existing structures to reduce hazard exposure and maintain a natural shoreline.

The Hawaii Office of Planning (OP) recently published a report entitled, *Assessing the Feasibility and Implications of Managed Retreat Strategies for Vulnerable Coastal Areas in Hawaii (2019)*. The study evaluated options to establish policies, regulations, tools, and programs to support a managed retreat strategy in response to sea level rise. The study found that retreat is one of three primary adaptation strategies, along with accommodation (e.g., freeboard) and protection (e.g., armoring), and that, prior to deciding upon retreat, accommodation and protection must be examined to determine which strategy is the best for the area dealing with coastal hazards, climate change, and sea level rise. The study also found that retreat is only effective when done voluntarily and that economic incentive programs to fund retreat (e.g., buyouts, transferrable development rights, rolling easements) are unlikely to be effective in Hawaii due to the high cost of oceanfront real estate. Finally, the report noted that retreat from chronic coastal hazards (e.g., erosion and sea-level rise) is incremental and typically takes decades to complete.

Managed Retreat would avoid the costs associated with design, permitting, and construction of shore protection measures or beach restoration; however, costs associated with modifying, relocating, or removing the existing structures would be substantial. In the absence of shore protection, the terrestrial area would be exposed to erosion and flooding and would be more vulnerable to coastal hazards. In addition, this option does not change the condition of the littoral cell, which is deflating and causing beach narrowing within the bay. The semi-lithified conglomerate lower unit effects the beach system in a similar manner to a shoreline structure. Beach erosion in the cell will continue until the beach gets "pinched" out against the semi-lithified conglomerate and is lost.

Managed Retreat strategies can be horizontal or vertical in nature. Horizontal retreat strategies seek to reduce hazard exposure by moving structures further inland. Vertical retreat strategies seek to reduce hazard exposure by elevating structures above the hazard.

Shoreline setbacks are a "horizontal retreat strategy" that require development to be set back a minimum distance from the shoreline. The County of Maui requires shoreline setbacks for new construction along the shoreline. The purpose of the shoreline setback is to protect and preserve the natural shoreline, lateral shoreline access, and open space along the shoreline. Shoreline setbacks are also intended to reduce risks to property from coastal hazards.

Freeboard is a "vertical retreat strategy" that involves elevating structures above the Base Flood Elevation (BFE). The shoreline is located in Zone VE with a BFE of 17 feet. The residential parcels are already at an elevation of at least 25 feet so this strategy would not be applicable for the project site.

<u>Evaluation of the Managed Retreat</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards.
        ii. AD – Increases resilience to sea level rise.
        iii. AD – Configuration could be adapted to withstand future design wave forces (i.e. sea level rise beyond design elevation).
        iv. Disadvantage (DIS) – The terrestrial area would be exposed to erosion and flooding and would be more vulnerable to coastal hazards.
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. DIS – Does not mitigate future mass wasting events of the backshore.
        ii. DIS – Does not mitigate the adjacent wall failure hazard to the public.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:

        i. AD – Allows coastal lands to erode and the beach to deflate and eventually be lost due to natural processes.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. DIS – Does not mitigate potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures.
    e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
        i. DIS – Does not mitigate ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – The design of horizontal retreat of the homes can be done using durable materials.
    b. Neutral (N) – The volume of materials added to the shoreline would only be those needed to support the foundation of retreat structures.
    c. DIS – Destabilization of one or more supporting structures could result in a catastrophic collapse of the homes in their current location, presenting a suite of public hazards.
    d. DIS – There is little room for horizontal retreat on the existing coastal parcels.
    e. DIS – By not adding structural support to the portions of the parcels adjoining the neighboring seawall, the seawall is likely to destabilize.
    f. DIS – Involves the excavation of soil and rock. The haul-in and haul-out of such a large volume of material presents significant hazards for disruption and sedimentation of the beach and nearshore environment.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
    a. DIS – High costs to design, permit, and construct a retreat strategy for limited horizontal movement.
    b. DIS – Potentially high costs for legal issues associated with public safety hazards.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
    a. AD – Material is typically available on all islands.
    b. AD – Managed retreat is typically encouraged by the public and regulatory agencies.
    c. DIS – No existing rules, programs, or policies to manage or facilitate the retreat process.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
    a. N – Would not yield any appreciable benefits in terms of beach processes.
    b. DIS – Continued erosion would likely lead to the release of upland fine material into the nearshore waters that may impact marine habitat.
    c. DIS – As the shoreline continues to erode and there is a steep vertical scarp combined with sea level rise, lateral public access will diminish.

Managed Retreat would involve high costs to design, permit, and modify the existing structures. In the absence of shore protection, the terrestrial area would be exposed to erosion and flooding and would be more vulnerable to coastal hazards. In addition, this option does not change the condition of the littoral cell, which is deflating and causing beach narrowing within the bay and impacts public lateral access. There are no existing rules, programs, or policies to manage or facilitate the retreat process.

6.3 Temporary Erosion Control

The purpose of temporary erosion control would be to provide short-term (temporary) relief from the erosion and allow sufficient time for planning, design, environmental review, and regulatory permitting for a long-term (permanent) solution. Temporary erosion control measures in Hawaii typically consist of geotextile or biodegradable sandbags, geotextile erosion skirts, sand-filled geotubes, rock-filled gabions, or rock-filled tensar mattresses. This approach would involve maintaining and/or installing temporary erosion control structures within the project area, spanning approximately 210 linear feet of shoreline (Figure 6-1).

A disadvantage of temporary erosion control is that the materials are not durable enough to provide long-term erosion control. Temporary erosion control structures may be constructed of biodegradable material (e.g., coir), which degrades rapidly when exposed to water and sunlight. The shoreline in the project area receives high wave energy, requiring any temporary erosion control to be constructed of heavy and durable materials.

Emplacement of temporary erosion control measures on the shoreline and up the slope is currently underway and will be utilized as the short-term to mid-term solution while a long-term solution is developed, permitted, and constructed.

<u>Evaluation of Temporary Erosion Control</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of infrastructure to coastal hazards in the short to mid-term.
        ii. Neutral (N) – Provides minimal protection against wave overtopping.
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. AD – Mitigates future mass wasting events with structural protection of the backshore in the short to mid-term.
        ii. AD – The public safety hazard associated with a catastrophic collapse of the unstable vertical bluff may be diminished satisfying the project objective in the short to mid-term if the materials are monitored and maintained.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
        i. N – Hard structures restrict the landward movement of sand beaches; however, in this location, the naturally occurring semi-lithified conglomerate has the same effect on the beach as temporary erosion control materials.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. AD – Mitigates potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures in the short to mid-term.
    e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
        i. AD – Mitigates future mass wasting events with temporary slope protection.
        ii. Disadvantage (DIS) – It does not address the impacts of stormwater drainage originating on and landward of the site.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – Temporary erosion control can be designed to handle energetic environments.
    b. AD – Can be installed quickly.
    c. AD – Materials can be maintained as portions degrade or fail.
    d. AD – Geotextile material, with a color similar to sand, could be used.
    e. AD – Contractors on Maui have experience installing temporary erosion control.
    f. DIS – The volume of artificial material is high.

   g. DIS – The design life is for the short to mid-term and will not solve the long-term chronic erosion challenges at the project site.
   h. DIS – Eventually this beach will disappear under chronic erosion conditions and the temporary erosion control will not be able to sit atop of sand.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
   a. DIS – High costs for design, permitting, and construction relative to the durability of the materials or the aggregate structure.
   b. DIS – Very high costs for recurring maintenance, repair, and/or replacement, especially if materials are vandalized.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
   a. AD – Material for temporary erosion control is easily ordered and delivered to all islands.
   b. DIS – The public could traverse temporary structures creating potential liability issues.
   c. DIS – Agency and public opposition to the placement of temporary shore protection structures is common.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. AD – Better wave energy dissipation characteristics than a seawall and may facilitate sand accretion seaward of the configuration.
   b. AD – Protects marine habitat by reducing the release of upland fine material into the nearshore waters.
   c. N – Would not yield any appreciable benefits, compared to the natural shoreline, in terms of beach processes.
   d. DIS – Would interfere with public lateral access at the landward edge of the beach and may be disliked by other users of the shoreline.

Temporary erosion control may provide short to mid-term relief from erosion, with ongoing monitoring and maintenance, and would have minimal impacts on the beach, bluff, and marine resources. Temporary erosion control may be feasible and desirable as a short to mid-term solution. Eventually, the temporary erosion control would have to be removed; however, environmental conditions are unlikely to improve during that time, as waves continue to attack the shoreline and sea levels continue to rise. Temporary erosion control may temporarily satisfy the project objectives but is not considered a preferred alternative.

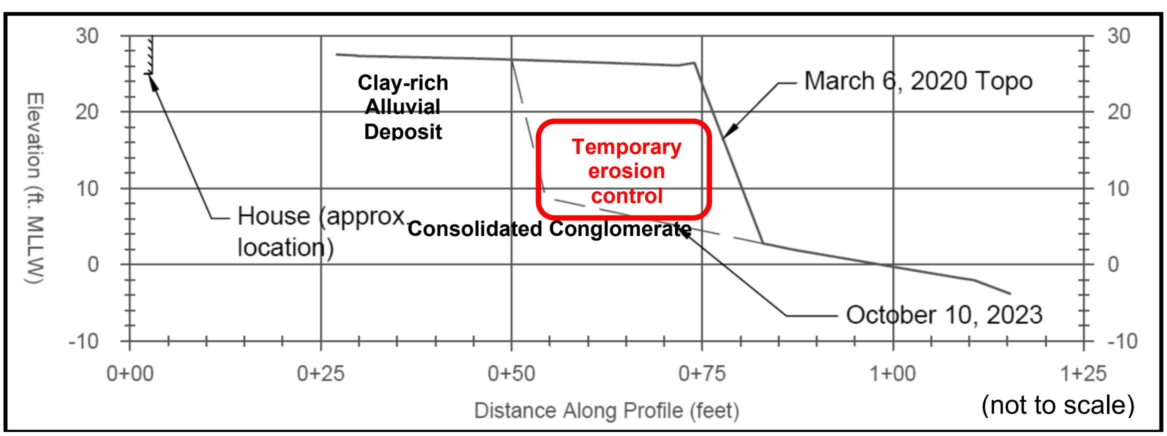

Figure 6-1. Typical location for temporary erosion control

6.4 Beach Maintenance

Regulatory agencies are generally supportive of projects that utilize minimally-invasive techniques to maintain or enhance existing beach resources. Beach maintenance typically consists of sand back-passing or sand pushing. Sand back-passing involves moving existing sand from an area of seasonal beach accretion to an area of seasonal beach erosion. Sand pushing, or beach scraping, typically involves reshaping beaches and/or dunes using seasonally-accreted sand from lower on the beach profile (HSBPA, 2014). Regulatory permitting for sand pushing is typically simpler than permitting for permanent shore protection structures. An example of a sand pushing project at Sunset Beach (North Shore, Oahu, Hawaii), is shown in Figure 6-2.

Sand pushing is not feasible at the project site due to limited beach width and volume. Sand back-passing would require coordination with property owners at the north end of the beach, where it is widest. Sand back-passing within the littoral cell would only be feasible when the beach is inflated. While sand back-passing may result in a temporary increase in beach width and appearance, the sand would continue to mobilize and move alongshore and offshore.

<u>Evaluation of Beach Maintenance</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards for the short-term.
        ii. AD – Increases resilience to sea level rise for the short-term.
        iii. Disadvantage (DIS) – Sand in this littoral cell moves quickly. Back-passed sand will likely move from the placement site quickly.
        iv. DIS – Keonenui Beach experiences pressure from chronic erosion conditions, limiting the time span that sand back-passing will be an option in the littoral cell.
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. DIS – No barriers would be placed along the face of the slope to prevent mass wasting events.
        ii. DIS – No stabilization would be added to the adjacent wall to prevent flanking and collapse.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
        i. AD – No artificial materials would be added to the littoral cell.
        ii. AD – Sand will continue to be transported by natural forces alongshore and cross-shore within the littoral cell.
        iii. AD – A sandy beach acts as an additional sediment filter to any landward stormwater runoff before it enters the bay.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. DIS – Does not mitigate the potential threat to the adjacent seawall and building, created by ongoing erosion and progressive failure of existing structures.
    e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
        i. DIS – Does not mitigate future mass wasting events with structural protection and slope remediation for the backshore.
        ii. DIS – Does not mitigate ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.

iii. DIS – Does not address stormwater that drains from the landward side of the bluff toward the shoreline causing additional siltation of coastal waters.

2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – Use of sand for beach maintenance would be a suitable match to the existing coastal conditions.
    b. AD – No structural footprint, no artificial materials added.
    c. DIS – Sand will not remain stable on this dynamic shoreline without additional engineered structures.
    d. DIS – It does not address the impacts of stormwater drainage originating on and landward of the site.
    e. DIS – The beach will likely disappear in this littoral cell limiting the design life of this alternative.
    f. DIS – This alternative is only functional under typical wave conditions. During storms, the beach may be completely washed away in a short period.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
    a. AD – There is no cost to purchase the material, sand, as it is a public resource.
    b. AD – Very low costs and efforts for each sand pushing effort.
    c. DIS – Recurring costs for repeated sand pushing efforts would be relatively high.
    d. DIS – The costs for stabilizing the slope and neighbor seawall may increase as time passes and conditions worsen.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
    a. AD – Agency and public typically support natural erosion mitigation efforts, such as sand pushing.
    b. AD – There are few regulatory agencies who need to be contacted to request permission and the process to do so is much simpler than the process to request permission for a structure.
    c. AD – Work can be completed relatively quickly.
    d. Neutral (N) – Sand would need to be back-passed from the north end of the beach to the south end. The property owner would need to coordinate permission with the landowners at the northern end of the beach. Northern neighbors may not be supportive of this alternative.
    e. DIS – Only feasible when the beach is inflated.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
    a. AD – It allows the beach and shoreline to migrate naturally.
    b. AD – A beach supports public lateral access.
    c. AD – Protects the sandy coastal habitat.
    d. DIS – Does not prevent the release of fine materials from erosion of the bluff into the marine habitat.

Beach maintenance may provide some temporary relief from erosion; however, without the addition of stabilizing structures, the sand will mobilize on this dynamic shoreline and erosion is likely to continue. Eventually, as the beach continues to disappear under chronic erosion trends, the beach will “pinch” out against the semi-lithified conglomerate and there will be insufficient sand for back-passing. Without a sandy beach, there will be no barrier between the ocean and the unstable bluff. Beach maintenance may temporarily satisfy some of the project objectives but is not considered a preferred alternative.

Figure 6-2. Sand pushing to build beach berm (Sunset Beach, Oahu)

6.5 Beach Nourishment

Beach nourishment typically involves the placement of beach fill to specified profiles that are designed to augment the natural morphology of the beach to offset the effects of chronic, seasonal, or episodic erosion. Beaches are an effective way of minimizing wave impacts on the shoreline. Wave energy is absorbed by bed shear and resulting turbulence, the transport of sediment by wave swash, and percolation into the beach. Unlike hard structures, beaches will adjust to different incident wave conditions by shifting orientation, changing slope, and by hydraulic sorting of beach sediment.

Beach nourishment requires a supply of sand that is similar in grain size to the native beach sand. While sand may seem like a plentiful commodity, the reality is that good quality beach sand is in short supply in Hawaii. An adequate sand source to support beach nourishment within the project area has not been identified. Supplies of compatible inland sand are limited and excavation is controversial. An offshore sand source investigation may be required to identify an adequate supply of compatible beach quality sand. Offshore sand source investigations are technically challenging and can be expensive.

Regulatory agencies and the public are generally supportive of beach nourishment because it has minimal environmental impacts and is consistent with State and County policies that seek to preserve and enhance beach resources.

The Hawaii Department of Land and Natural Resources, Office of Conservation and Coastal Lands (DLNR-OCCL) authorizes beach nourishment through their Conservation District permit process and the Small-scale Beach Nourishment (SSBN) program. The SSBN allows placement of compatible beach quality sand, in volumes up to 10,000 cubic yards, seaward of the shoreline in the Conservation District. An example of a small-scale beach nourishment project at Sugar Cove (Paia, Maui, Hawaii), is shown in Figure 6-3.

There are two categories of SSBN authorizations: Category I (up to 500 cubic yards of sand), and Category II (up to 10,000 cubic yards of sand). A Category II SSBN may provide sufficient volume to temporarily increase beach width fronting several properties; however, restoring beach width along the entire length of the project area shoreline would require a Conservation District Permit. In either case, the beach fill sand is unlikely to remain stable without additional engineered structures (e.g., groins).

Beach nourishment projects are regulated by Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, which regulates discharges of fill material into waters of the United States. Placement of fill material seaward of the mean higher high water line (mhhw) is generally prohibited. In general, placement of fill material is limited to areas where a stable beach is typically present and additional fill is required to maintain a stable beach profile. At the project site, there is typically no dry stable beach to put the sand on, so permissions from both the Department of the Army and the Department of Health would be needed.

To be effective, beach nourishment would have to occur along the entire beach, not just in front of the Hestor and Barto properties. This would greatly increase costs and would require the planning and financial commitment of all property owners, plus support from both the County and State governments. Unfortunately, beach nourishment is not a guaranteed solution for erosion, and the nourished beach is still exposed to current and future erosion forces, including large wave events and storms. Beach nourishment projects on eroding coastlines typically require periodic maintenance.

<u>Evaluation of Beach Nourishment</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards while placed sand is present.
        ii. AD – Increases resilience to sea level rise while placed sand is present.
        iii. AD – Provides additional protection against wave overtopping with the wave energy absorption properties of the beach while placed sand is present.
        iv. Disadvantage (DIS) – Placed sand can be moved or lost during energetic shoreline events such as storms, tsunamis, or large seasonal waves. Once the sand is removed from the project area, it no longer provides protection.
        v. DIS – Continued chronic erosion pressure on this shoreline will eventually remove the placed sand, removing protection to the project area.
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. DIS – No barriers would be placed along the face of the slope to prevent mass wasting events.
        ii. DIS – No stabilization would be added to the adjacent wall to prevent flanking and collapse.

c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
    i. AD – No artificial materials would be added to the littoral cell.
    ii. AD – Sand will continue to be transported by natural forces alongshore and cross-shore within the littoral cell.
    iii. AD – A sandy beach acts as an additional sediment filter to any landward stormwater runoff before it enters the bay.
d. Prevent potential undermining of neighboring shoreline protection structures:
    i. DIS – Does not mitigate the potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures.
    ii. DIS – The threat of undermining of neighboring structures may increase as the bluff continues to erode.
e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
    i. DIS – Does not mitigate future mass wasting events with structural protection or slope remediation for the backshore.
    ii. DIS – Does not mitigate ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.
    iii. DIS – Does not address stormwater that drains from the landward side of the bluff toward the shoreline causing additional siltation of coastal waters.

2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – Use of sand for beach maintenance would be a suitable match to the existing coastal conditions.
    b. AD – No structural footprint and no artificial materials added to the shoreline.
    c. AD – Increases beach area and sand volume.
    d. Neutral (N) – The beach width may increase putting the beach toe further seaward covering portions of the marine habitat.
    e. N – An offshore sand source investigation may or may not find a suitable sand source within the vicinity of the project site.
    f. DIS – Sand will not remain stable on this dynamic shoreline without additional engineered structures.
    g. DIS – It does not address the impacts of stormwater drainage originating on and landward of the site.
    h. DIS – The beach will eventually disappear in this littoral cell if there is no periodic renourishment limiting the design life of this alternative.
    i. DIS – This alternative is only functional under typical wave conditions. During storms, the beach may be completely washed away in a short period.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
    a. N – If a terrestrial sand source can be found on-island, the costs for sand may be lower.
    b. DIS – High costs to conduct an offshore sand source investigation.
    c. DIS – High costs to go through the permitting process for an offshore sand project and preparation of reports to support the Environmental Impact Statement.
    d. DIS – Very high costs for offshore recovery, transport, and placement of sand on the beach.
    e. DIS – Recurring costs for repeated nourishment efforts would be very high.
    f. DIS – The costs for stabilizing the slope and neighbor seawall may increase as time passes and conditions worsen.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):

   a. AD – Agencies and the public typically support natural erosion mitigation efforts, such as beach nourishment.
   b. DIS – No compatible sand has been identified in the region.
   c. DIS – A large volume of sand is required for repeated renourishment to maintain a stable beach.
   d. DIS – Requires discharge of fill material in waters of the United States and is subject to additional regulatory restrictions.
   e. DIS – Beach nourishment with repeated maintenance efforts is typically at a scale requiring State, County, and community support and participation. Several homeowners cannot effectively nourish and maintain a littoral cell.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. AD – It allows the beach and shoreline to migrate naturally.
   b. AD – A healthy beach supports public lateral access.
   c. AD – Protects the sandy coastal habitat.
   d. DIS – Does not prevent the release of fine materials from erosion of the bluff into the marine habitat.
   e. DIS – Fines washed out of the nourishment sand under wave action will cause turbidity that may impact marine habitat.
   f. DIS – Recovery of sand offshore may disrupt the offshore marine habitat.

Small-scale beach restoration could provide a short–term increase in beach volume and width for one or more properties. An adequate sand source to support beach nourishment within the project area has yet to be identified and the beach fill is unlikely to remain stable without additional engineered structures (e.g., groins). The beach would have to follow a maintenance cycle to ensure there is enough volume of sand on the beach, during typical conditions, to provide a sufficient buffer between waves and the unstable bluff. All placed sand can be removed from the site during a single energetic event, such as storm, tsunami, or high seasonal waves, leaving the properties unprotected. The bluff, neighboring structures, and homes on top of the bluff would still be at risk when waves overtop the beach or when there is flooding on the landward side. Small–scale beach nourishment would not satisfy the project objective to protect the backshore land and infrastructure and therefore is not considered a preferred alternative.

Figure 6-3. Small–scale beach nourishment at Sugar Cove (Paia, Maui)

6.6 Beach Nourishment with Stabilizing Structures

Increased beach width would create a natural buffer that would offer some protection for the base of the bluff, as discussed above. If the project area shoreline were to be replenished with sand, it is unclear how stable the sand would be, once placed. The beach fill would be subject to local sediment transport dynamics within the bay and would eventually mobilize and move alongshore and offshore during seasonal shifts within the littoral cell and/or large wave events. Moreover, erosion is expected to continue and possibly accelerate over the long-term as a result of sea-level rise. The beach, located between two headlands with chronic erosion, will eventually disappear if sand is not continuously added or stabilized.

To account for the loss of sand due to natural processes, engineered containment structures, such as T-head groins, may be designed to maintain a stable beach. The type, size, and orientation of stabilizing structures require modeling of the waves and sediment transport within the bay. T-head groins decrease and reorient the amount of wave energy reaching the beach and create artificial littoral cells to stabilize the sand. An example of regional beach nourishment with stabilizing T-head groin structures is shown in Figure 6-4.

Key parameters for T-head groin design include groin length, head length and orientation, and beach shape and width. In general, the beach shape responds more to the gap width (opening) between the groin heads than it does to the structure heads themselves. Thus, the stable beach is a function of the length and orientation of the gaps. The orientation of the gaps is primarily dictated by the shape of the shoreline and the prevailing wave approach direction.

The empirical relationships show that the mean low water (low tide) shoreline will be located between one-third and two-thirds of the gap length, G, behind the groin head, i.e., $0.35G$ to $0.65G$. Larger values in the range are appropriate for 1) energetic open coasts directly exposed to wave action, 2) larger gap openings, 3) large angles between the wave approach and the gap orientation, 4) poor beach fill sand compatibility, and 5) a greater level of conservatism. The groin head length should be long enough so that the mean low water shoreline approaches the head while maintaining a minimum ratio of gap width to head width of about 60:40 for aesthetic reasons so that the groins do not appear to dominate the viewscape. A schematic of the components of a tuned T-head groin system is presented as Figure 6-5.

The groin stems should extend landward of the design beach crest to eliminate flanking and loss of sand from the cell around the back of the groin. The groin crest elevation should be above the high tide elevation and high enough to prevent significant overtopping during typically prevailing (non-storm) water level and wave conditions.

<u>Evaluation of Beach Nourishment with Stabilizing Structures</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards.
        ii. AD – Increases resilience to sea level rise.
        iii. AD – Configuration could be adapted to withstand future design wave forces (i.e. sea level rise beyond design elevation).
        iv. AD – Provides additional protection against wave overtopping with the wave energy absorption properties of the beach.

b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
    i. AD – Reduces the risk of future mass wasting events with stabilization of the sandy beach.
    ii. Disadvantage (DIS) – No barriers would be placed along the face of the slope to prevent mass wasting events.
    iii. DIS – No stabilization would be added to the adjacent wall to prevent flanking and collapse.

c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
    i. AD – Materials to construct the stabilizing structures are natural to the island and match the headlands on either side of the bay.
    ii. AD – A stabilized wide sandy beach puts more distance between backshore human infrastructure and the marine environment.
    iii. AD – A stabilized wide sandy beach acts as an additional sediment filter to any landward stormwater runoff before it enters the bay.
    iv. AD – With proper design, currents and circulation within the littoral cell could continue to flush the bay.
    v. Neutral (N) – The current and circulation patterns in the bay would readjust to the new shoreline.

d. Prevent potential undermining of neighboring shoreline protection structures:
    i. AD – A stabilized wide sandy beach reduces the wave energy that reaches the bluff causing erosion and flanking.
    ii. DIS – Does not mitigate the potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures.
    iii. DIS – The threat of undermining of neighboring structures may increase as the bluff continues to erode.

e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
    i. AD – A stabilized wide sandy beach reduces the wave energy that reaches the bluff causing erosion.
    ii. AD – A stabilized wide sandy beach acts as an additional sediment filter to any landward stormwater runoff before it enters the bay.
    iii. DIS – Does not mitigate future mass wasting events with structural protection and slope remediation for the backshore.
    iv. DIS – Does not mitigate ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.
    v. DIS – Does not stop stormwater that drains from the landward side of the bluff toward the shoreline causing siltation of coastal waters.

2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – Well designed stabilizing structures will require only minimal maintenance when exposed to its design conditions and less energetic environments.
    b. AD – Use of sand and stone would be a suitable match to the existing coastal conditions.
    c. AD – Would mitigate sand loss in the cross-shore direction.
    d. AD – Increases beach area.
    e. N – Requires the addition of a large volume of natural rock material.
    f. N – Increasing beach width results in the beach toe further seaward, covering portions of the marine habitat.
    g. DIS – Requires a large volume of compatible beach quality sand.

   h. DIS – Large structural footprint, nearly all of which is on the seafloor.
   i. DIS – Involves the haul–in of a large volume of sand and stone material presents significant hazards for disruption and sedimentation of the beach and nearshore environment.
   j. DIS – An offshore sand source investigation has not been conducted for the project site.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
   a. AD – Very low maintenance costs.
   b. N – If a terrestrial sand source can be found on-island, the costs for sand may be lower.
   c. DIS – High costs for permitting.
   d. DIS – High costs to conduct an offshore sand source investigation.
   e. DIS – Very high costs for offshore recovery, transport, and placement of sand on the beach.
   f. DIS – Very high cost for construction of the groins.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
   a. AD – Material for stabilizing structures is typically available on all islands.
   b. AD – SSBN or Conservation District authorizations may allow for periodic renourishment between stabilizing structures.
   c. DIS – Requires extensive coordination with regulatory agencies and the community.
   d. DIS – Potential agency and public opposition to the construction of new shore protection structures.
   e. DIS – Requires discharge of fill material in waters of the United States and is subject to additional regulatory restrictions.
   f. DIS – Beach nourishment with repeated maintenance efforts is typically at a scale requiring State, County, and community support and participation. Several homeowners cannot effectively nourish and maintain a littoral cell.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. AD – Better wave energy dissipation characteristics than a seawall.
   b. AD – The abundance and diversity of fish typically increase after the installation of stabilizing structures.
   c. AD – A healthy beach supports public lateral access.
   d. AD – Protects the sandy coastal habitat.
   e. N – Stabilizes the shoreline, protecting upland homes and inhabitants, but restricts natural shoreline movement on the coastline.
   f. DIS – Involves excavation below the water level, which presents additional environmental risks.
   g. DIS – When the root of the stabilizing structures is exposed during beach deflation events, shoreline access can be limited or difficult across the structure.
   h. DIS – Does not prevent the release of fine materials from erosion of the bluff into the marine habitat.
   i. DIS – Potential exposure to personal injury liability.
   j. DIS – Fines washed out of the nourishment sand under wave action will cause turbidity that may impact marine habitat.
   k. DIS – Recovery of sand offshore may disrupt the offshore marine habitat.

Beach nourishment with stabilizing structures would help retain beach sand fronting the subject properties. This alternative would satisfy some of the project objectives; however, it is also very difficult to permit, construct, and find suitable sand. Moreover, it requires the conversion of the seafloor to rock structure for the construction of the groins. Beach nourishment with stabilizing structures is not considered a preferred alternative.

Figure 6-4. Beach nourishment with T-head groins (Iroquois Point, Oahu)

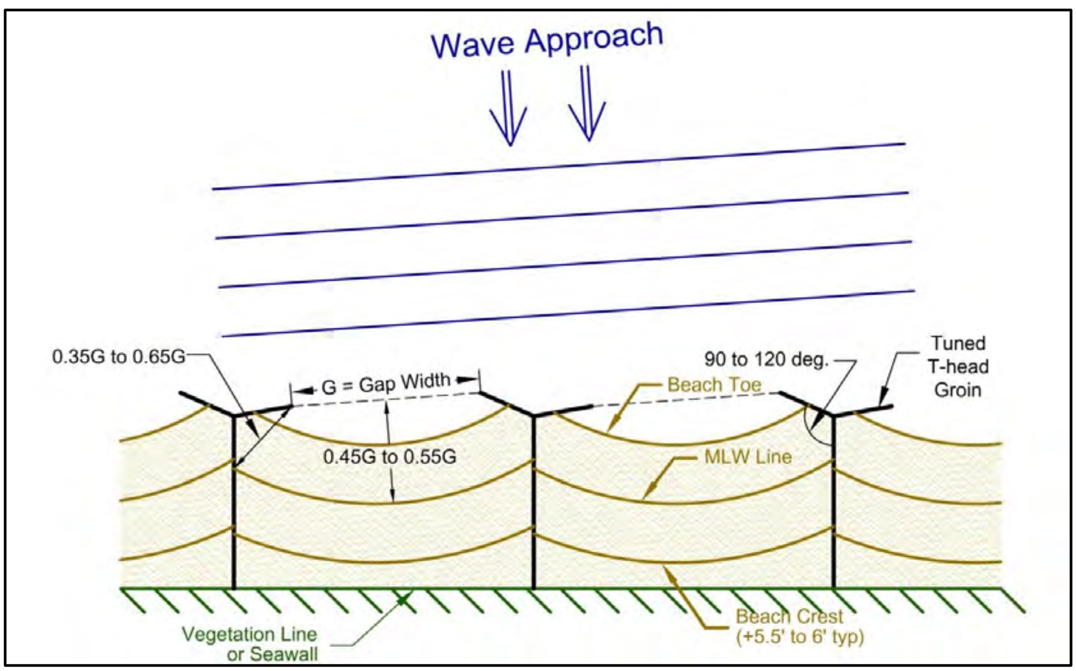

Figure 6-5. Schematic of a typical tuned T-head groin system

6.7 Slope Stabilization

Slope stabilization would involve the grading of the bluff at an angle of 30 degrees from vertical angled mauka toward the homes. A geoweb cellular mat would be secured to the slope and filled with aggregate and soil. This amended surface is suitable for planting a host of coastal species, though typically grasses, low lying vines, and shrubs work best with this type of slope stabilization. This style of slope remediation restores a natural aesthetic to the shoreline, while also remaining highly adaptable to changing conditions. The concept is illustrated in Figure 6-7.

Evaluation of Slope Stabilization

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
   a. Mitigate future erosion of the properties and protect the homes:
      i. Neutral (N) – Does not reduce vulnerability of homes to coastal erosion, as the lower slope and geoweb are still open to wave attack and erosion.
   b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
      i. Advantage (AD) – Geoweb embedded into the upper alluvium slope mitigate future failure events of the clay substrate.
      ii. Disadvantage (DIS) – Does not mitigate future mass wasting events with structural protection of the conglomerate lower unit.
      iii. DIS – Does not mitigate the public hazard associated with a wall failure at the adjacent property.
   c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
      i. AD – Allows waves to wash into the properties landward of the vegetation line.
   d. Prevent potential undermining of neighboring shoreline protection structures:
      i. DIS – Excavation of the shoreline to a 30–degree slope would remove a large volume of sediment adjacent to the neighboring shoreline protection structure. This would require additional tie-in structures to mitigate flanking.
   e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
      i. AD – Assuming the successful establishment of vegetation on the upper alluvium unit, it can mitigate the siltation of the coastal waters.
      ii. DIS – Does not mitigate future mass wasting events by protecting the lower conglomerate.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
   a. AD – Drainage features can be added to the slope.
   b. AD – If not destabilized by erosion, then the slope stabilization can be both durable and adaptable, allowing for modification of the slope grade, location, drainage characteristics, and vegetative cover.
   c. AD – Slope stabilization could soften the visual effect that a large vertical structure might otherwise create.
   d. AD – Work can be completed relatively quickly.
   e. AD – Does not require the addition of artificial material.
   f. DIS – Without structural protection of the lower conglomerate unit, the slope stabilization effort will not mitigate erosion of the unit or larger mass wasting events associated with failures.
   g. DIS – Involves the excavation of soil and rock. The haul–out of such a large volume of material presents significant hazards for disruption and sedimentation of the beach and nearshore environment.

   h. DIS – Large footprint that would extend well into the properties.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
   a. N – Moderate cost for the emplacement of slope stabilization features.
   b. DIS – Continued erosion of the lower conglomerate will require frequent regrading and repairs of the full slope.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
   a. AD – Geoweb materials are easily acquired and have low shipping costs due to the lightweight and collapsible nature of the material.
   b. AD – Agencies and the public typically support natural erosion mitigation efforts, such as slope stabilization.
   c. AD – There are minimal regulatory restrictions limiting features such as the slope stabilization, compared to shoreline structures.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. AD – The short term and peripheral impacts associated with the construction of a wall would be avoided.
   b. AD – Protects marine habitats by limiting the release of upland fine material into the nearshore waters.
   c. AD – It does not negatively impact lateral shoreline access.
   d. N – Wave energy dissipation characteristics will be similar to the existing features.
   e. N – Would not yield any appreciable benefits, compared to the natural shoreline, in terms of beach processes.
   f. DIS – Public could traverse the slope creating potential privacy, security, and liability issues and damaging the vegetative buffer.

Slope stabilization may provide a natural solution for the unstable bluff; however, waves will continue to exert force on the base of the slope causing erosion, mass wasting events, and siltation of coastal waters. Flanking may occur to the neighboring seawall causing destabilization along the neighboring shoreline. Slope stabilization is not considered a preferred alternative.

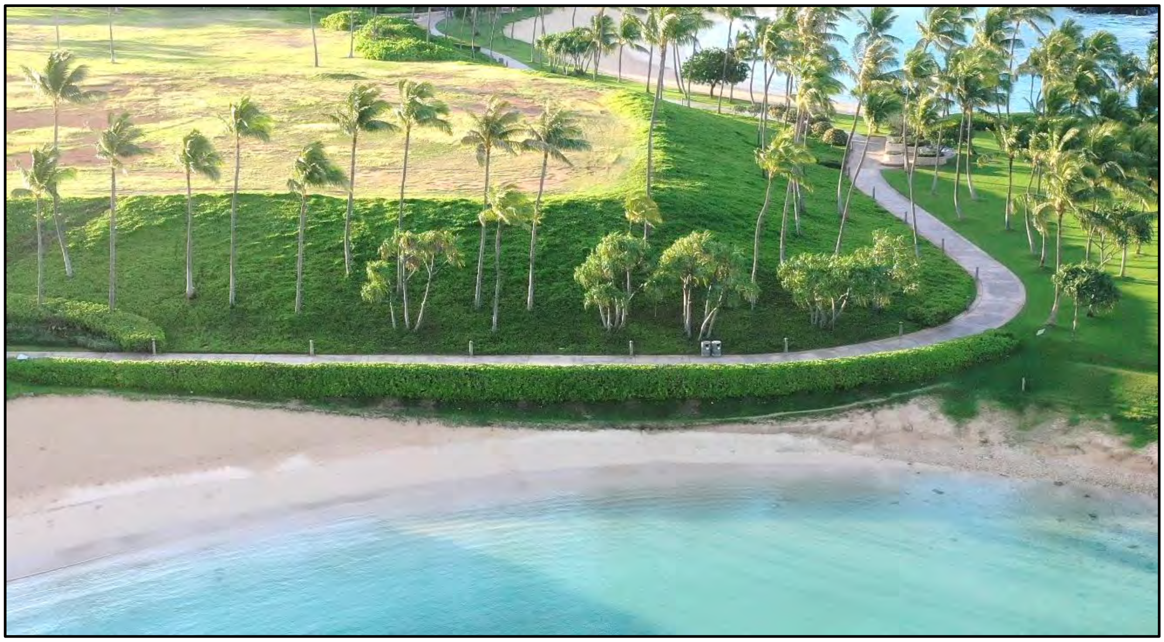

Figure 6-6. Shoreline slope stabilization and vegetative cover (Ko Olina, Oahu)

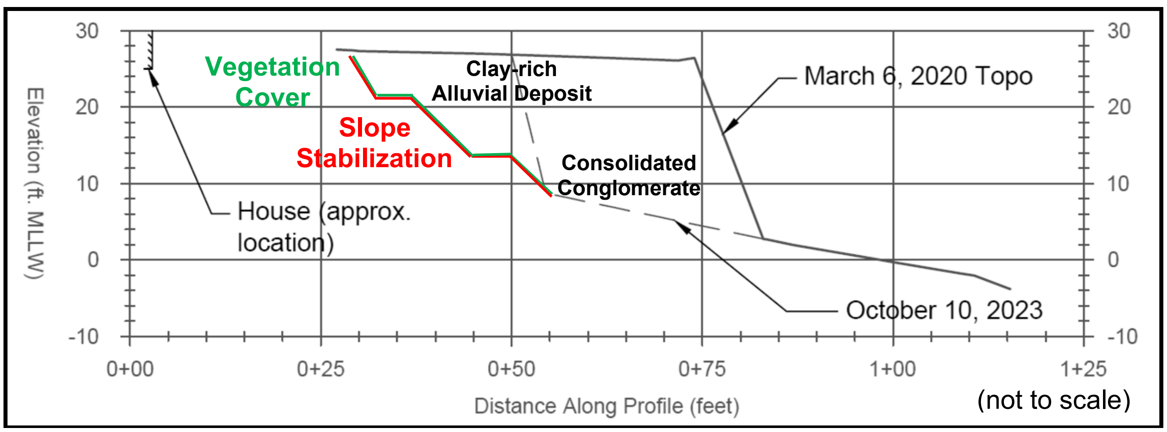

Figure 6-7. Concept for slope stabilization

6.8 Slope Stabilization with a Retaining Wall

Slope stabilization with a retaining wall would involve sloping the upper alluvium unit inland at a 30-degree angle from vertical and constructing a retaining wall to protect the semi-consolidated conglomerate in the lower unit. A geoweb cellular mat would be secured to the slope and filled with aggregate and soil. This amended surface is suitable for planting a host of coastal species, though typically grasses, low lying vines, and shrubs work best with this type of slope stabilization. The retaining wall at the base of the slope protects the surface of the conglomerate, which is good for short-term erosion mitigation. Retaining walls are not typically suitable for mid to long-term shoreline deployment along energetic coastlines. This style of slope remediation restores a natural aesthetic to the shoreline, while also remaining highly adaptable to changing conditions; however, it is not durable over the mid to long-term. The concept is illustrated in Figure 6-8.

<u>Evaluation of a Slope Stabilization with a Retaining Wall</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Neutral (N) – Does not significantly reduce the vulnerability of homes to coastal hazards due to the low durability of the lower retaining wall.
        ii. N – Does not improve resilience to sea level rise.
        iii. N – Retaining wall and geoweb can be relocated inland to provide short-term protection at a more inland location.
        iv. Disadvantage (DIS) – Not appropriate to withstand typical or future design wave forces.
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. DIS – Does not mitigate the public hazard associated with a wall failure at the adjacent property.
        ii. DIS – Does not provide mid to long-term structural protection for the lower semi-lithified conglomerate.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
        i. DIS – The lower retaining wall has the wave reflection characteristics of a seawall without any of the structural advantages.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. DIS – The retaining wall is unlikely to provide mid to long-term flanking protection for the neighboring shoreline protection structure.
        ii. DIS – Tie back walls will be needed for the upper portion of the neighbor's structure.
    e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
        i. Advantage (AD) – Slope stabilization and vegetation can mitigate erosion of the clay-rich alluvial deposit.
        ii. DIS – Failure of the lower retaining wall would result in the release of materials to the beach and nearshore waters.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – Drainage features can be added to the retaining wall.
    b. AD – Slope stabilization is adaptable, allowing for modification of the slope grade, location, drainage characteristics, and vegetative cover.
    c. AD – Slope stabilization could soften the visual effect that a large vertical structure might otherwise create.
    d. DIS – Involves the excavation of soil and rock. The haul–out of such a large volume of material presents significant hazards for disruption and sedimentation of the beach and nearshore environment.
    e. DIS – Moderate footprint that would extend into the properties.
    f. DIS – Micropiles drilled into the semi-lithified conglomerate to support the retaining wall may lose integrity if the semi-lithified conglomerate is scoured beneath the base of the wall.
    g. DIS – The upper slope stabilization would likely require tie back walls to tie into the northern neighbor's seawall.
    h. DIS – Retaining walls are not typically designed to withstand the forces a seawall is designed for. This would not be a mid to long-term solution for erosion and flooding.
    i. DIS – Requires the additional of artificial material to build the retaining wall.

3. Costs (i.e., initial costs, recurring costs, entitlement costs):
    a. N – Moderate cost for slope stabilization and retaining wall construction.
    b. N – Moderate costs for design and permitting.
    c. DIS – High mid to long-term maintenance, replacement, and relocation costs.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
    a. AD – Geoweb materials are easily acquired and have low shipping costs due to the lightweight and collapsible nature of the material.
    b. AD – Agencies and the public typically support natural erosion mitigation efforts, such as slope stabilization.
    c. AD – There are minimal regulatory restrictions limiting features such as the slope stabilization.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
    a. AD – The short-term and peripheral impacts associated with the construction of a seawall would be avoided.
    b. AD – Protects marine habitats by limiting the release of upland fine material into the nearshore waters.
    c. N – Similar wave energy dissipation characteristics when compared to a seawall.
    d. N – It does not negatively impact lateral shoreline access.
    e. N – Would not yield any appreciable benefits, compared to the natural shoreline, in terms of beach processes.
    f. DIS – Public could traverse the slope creating potential privacy, security, and liability issues.

Slope stabilization with a retaining wall would mitigate the erosion and provide effective short-term protection for the backshore land and infrastructure; however, this solution is not suitable for mid to long-term protection. Slope stabilization of the upper unit would bring the slope landward of the neighboring seawall and may result in flanking and destabilization of their shore protection structure. The lower retaining wall will likely need routine maintenance and progressive relocation mauka as wave forces and wave scour destabilize it. Slope stabilization with a retaining wall is not considered the preferred alternative.

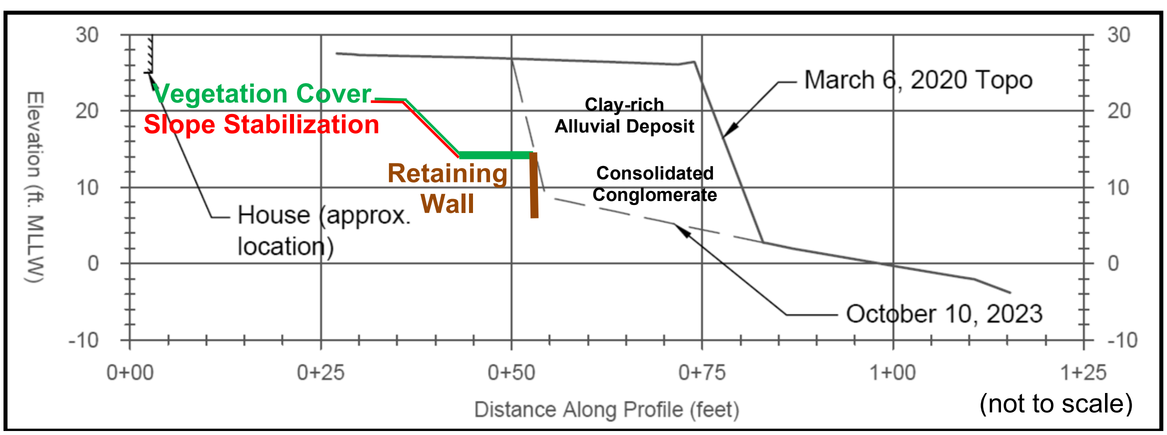

Figure 6-8. Concept for slope reconfiguration with a retaining wall

6.9 Seawall

A seawall is a vertical or sloping concrete, concrete rubble masonry (CRM), cement masonry unit (CMU), or sheet pile wall used to protect the land from wave damage and erosion. The United States Army Corps of Engineers describes seawall as "…massive structures who primary purpose is interception of waves." Seawalls are recommended in areas of intense wave action. A seawall, if properly designed and constructed, is a proven, durable, and relatively low-maintenance shore protection method. Seawalls also have the advantage of having a relatively small footprint along the shoreline, which helps to preserve lateral shoreline access. The walls are often stepped or recurved to reduce problems of wave overtopping and spray. Wave energy is deflected both upward and downward, and also a large amount of wave energy is reflected seaward. The downward component can cause scour at the base of the wall, particularly in shallow waters, and the reflected waves can inhibit beach formation in front of the wall. An example of an existing seawall that has performed well on the northern side of the Barto property is shown in Figure 6-9. There is a sandy beach along the shoreline fronting the seawall.

Seawalls are not flexible structures and their structural stability is dependent on the design and strength of their foundations. If the foundation of a seawall is breached, hydraulic action can erode fill material behind the wall. With the loss of enough fill, the ground surface behind the seawall will collapse and sinkholes will form. Sinkholes can compromise the structural integrity of a seawall and may lead to failure of the structure. To avoid foundation problems, the seawall foundation should be below the potential scour depth, which can require extensive excavation.

Regulatory agencies tasked with beach and shoreline management are generally reluctant to permit the construction of seawalls due to concerns about potential impacts to beach resources, particularly in areas with beaches and coastal dunes. There is also a history of public opposition to the construction of new shore protection structures, particularly on Maui.

Vertical walls protect properties along the entire length of Keonenui Beach, with the exception of the Hestor property. A seawall across the project area would be located behind rock outcrops on the beach face. This alternative would involve the excavation of a bench in the hard-bottom at the base of the bluff, construction of a wall approximately 34 feet in height, toe protection, and backfill behind the wall. The wall could be a conventional reinforced concrete cantilever, a gravity wall, or a sheet pile wall. The face of the cantilever or gravity wall could be CRM if the owners preferred.

The conventional reinforced concrete cantilever would require excavation at the base of the structure involving the transport of a large volume of sediment out and concrete into the project area. The wall could be cast in place or brought in as precast sections. The front of the wall could be made to be visually similar to the property adjacent to the Barto property (Figure 6-9). A gravity wall would also require excavation of sediment and the addition of a large volume of concrete. A sheet pile wall with a concrete cap would require the least amount of excavation but would be less visually appealing on the seaward side. An appropriate seawall design for the project site would require a geotechnical engineer to examine the soils and determine the wall design that could perform best under the soil forces at this site. See the concept presented in Figure 6-10.

<u>Evaluation of a Seawall</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:

      i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards.
      ii. AD – Increases resilience to sea level rise.
      iii. AD – Configuration could be adapted to withstand future design wave forces (i.e. sea level rise beyond design elevation).
   b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
      i. AD – Mitigates future mass wasting events with structural protection of the backshore.
   c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
      i. Neutral (N) – Hard structures restrict the landward movement of sand beaches; however, in this location, the naturally occurring semi-lithified conglomerate has the same effect on the beach as a hard structure.
   d. Prevent potential undermining of neighboring shoreline protection structures:
      i. AD – Mitigates potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures. The wall would tie in directly to the neighboring wall.
   e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
      i. AD – Mitigates future mass wasting events with structural protection.
      ii. AD – Mitigates ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
   a. AD – A seawall can effectively protect the homes and inhabitants on the backshore.
   b. AD – A seawall can be designed to handle large waves and some elevation of sea-level rise.
   c. AD – A well-designed seawall will require only minimal maintenance when exposed to its design conditions and less energetic environments.
   d. AD – Drainage through the wall could be maintained with the addition of pipes and weep holes.
   e. AD – The front of the walls can be designed to be aesthetically pleasing.
   f. AD – Vegetation along the top of the wall can soften the visual impact.
   g. AD – Small structural footprint.
   h. Disadvantage (DIS) – Involves the excavation of soil and rock. The haul–out of material presents significant hazards for disruption and sedimentation of the beach and nearshore environment.
   i. DIS – Any micropiles drilled into the semi-lithified conglomerate to anchor the wall may lose integrity if the substrate erodes. Alternative designs should be considered.
   j. DIS – Required the addition of a large volume of artificial material to the shoreline.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
   a. AD – Very low maintenance costs for the seawalls for their design life.
   b. DIS – High cost for the construction of a seawall at this scale.
   c. DIS – High costs for the design and permitting process.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
   a. AD – Material for seawalls is typically available on all islands.
   b. DIS – Requires extensive coordination with regulatory agencies and the community.
   c. DIS – Agency and public opposition to the construction of new shore protection structures, such as seawalls.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):

a. AD – Does not interfere with lateral shoreline access.
b. N – The beach in this bay will eventually disappear under chronic erosion conditions. When it does, a structure would already be in place to protect the semi-lithified conglomerate from the ocean.
c. N – Would not yield any appreciable benefits, compared to the natural shoreline, in terms of beach processes.
d. N – Protects marine habitat by limiting the release of upland fine material into the nearshore waters, but also limits the sandy coastal habitat by creating a hard backstop on the mauka side of the beach.
e. N – Fixes the shoreline, protecting upland homes and inhabitants, but restricts natural shoreline movement on the coastline.
f. DIS – Wave energy reflection on the front of a vertical wall will not support sand accretion.
g. DIS – Involves excavation below the water level, which presents additional environmental risks.

A seawall is an appropriate engineering solution for a project of this scale and could be designed to match the adjacent property to the north. A seawall would mitigate the erosion threat and provide effective long–term protection for the backshore land and infrastructure; however, there is also significant opposition from the public and some regulatory agencies toward the construction of seawalls. A seawall of this scale would require a major construction effort and coordination with all of the affected landowners. Costs for design, permitting, and construction would be high. A seawall is not the preferred alternative at the project site.

Figure 6-9. Example of a seawall north of the Barto property

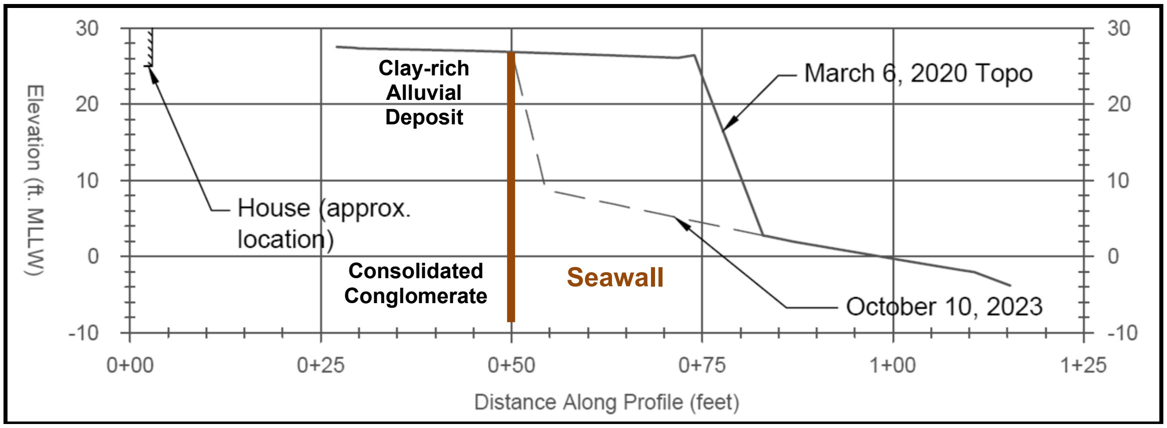

Figure 6-10. Concept for seawall alternative

Seawall Alternative A: Buried Seawall

An alternative to construction of a seawall on the face of or abutting the erosion scarp is to construct the wall inshore of the shoreline and erosion scarp (Figure 6-11). Buried or driven walls can be placed inshore of the erosion threat. The landward location allows for natural shoreline dynamics, in this case beach narrowing and loss and bank erosion, to continue unabated until bank erosion reaches a critical distance to backshore infrastructure or habitable dwellings. Once bank erosion exposes the buried seawall, it will function as an erosion mitigation structure preventing further loss of the backshore substrate to the marine environment.

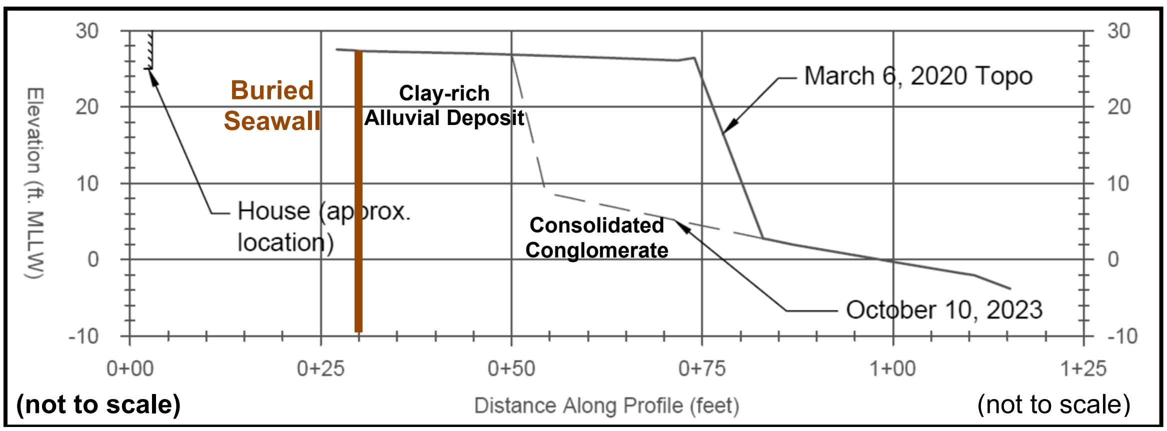

Figure 6-11. Concept for a buried seawall

6.10 Full Height Terraced Seawall and Retaining Wall(s)

A full-height terraced seawall would consist of two or more walls with a bench(es) in between. By breaking the vertical face of the bluff into two or more sections, the risks associated with a large (~34 foot) vertical structure along the shoreline are reduced. Terraces or benches would separate the sections of walls. One concept is a bench extending from the base of the upper wall to the crest of the lower seawall. The lower seawall would protect the semi-lithified conglomerate, extending from ~14 feet MSL down to hard-bottom or below scour depth. The bench could be vegetated to soften the visual impact, absorb wave energy that overtops the lower wall, and mitigate storm runoff. See the concept presented in Figure 6-12.

Evaluation of a Full-Height Terraced Seawall

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards.
        ii. AD – Increases resilience to sea level rise.
        iii. AD – Configuration could be adapted to withstand future design wave forces (i.e. sea level rise beyond design elevation).
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. AD – Mitigates future mass wasting events with structural protection of the backshore.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
        i. Neutral (N) – Hard structures restrict the landward movement of sand beaches; however, in this location, the naturally occurring semi-lithified conglomerate has the same effect on the beach as a hard structure.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. AD – Mitigates potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures. The lower unit would tie in directly to the neighboring wall.
        ii. Disadvantage (DIS) - Tie–back walls would be needed for the bench and upper wall(s).
    e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
        i. AD – Mitigates future mass wasting events with structural protection.
        ii. AD – Mitigates ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – A seawall can effectively protect the homes and inhabitants on the backshore.
    b. AD – A seawall can be designed to handle large waves and some elevation of sea-level rise.
    c. AD – A well-designed seawall will require only minimal maintenance when exposed to its design conditions and less energetic environments.
    d. AD – Drainage through the walls could be maintained with the addition of pipes and weep holes.
    e. AD – The front of the walls can be designed to be aesthetically pleasing.
    f. AD – Terracing the wall could soften the visual effect that a large vertical structure might otherwise create.
    g. N – Moderate structural footprint.
    h. Disadvantage (DIS) – Involves the excavation of soil and rock. The haul–out of such a large volume of material presents significant hazards for disruption and sedimentation of the beach and nearshore environment.
    i. DIS – The upper terrace would likely require tie-back walls to tie into the northern neighbor's seawall.
    j. DIS – Micropiles drilled into the semi-lithified conglomerate to anchor the walls may lose integrity if the substrate erodes.
    k. DIS – Required the addition of a large volume of artificial material to the shoreline.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
    a. AD – Very low maintenance costs for the seawalls for their design life.

   b. DIS – High cost for construction of the walls.
   c. DIS – High costs for the design and permitting process.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
   a. AD – Material for seawalls is typically available on all islands.
   b. DIS – Requires extensive coordination with regulatory agencies and the community.
   c. DIS – Agency and public opposition to the construction of new shore protection structures, such as seawalls.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. AD – Does not interfere with lateral shoreline access.
   b. N – The beach in this bay will eventually disappear under chronic erosion conditions. When it does, a structure would already be in place to protect the semi-lithified conglomerate from the ocean.
   c. N – Would not yield any appreciable benefits, compared to the natural shoreline, in terms of beach processes.
   d. N – Protects marine habitat by limiting the release of upland fine material into the nearshore waters, but also limits the sandy coastal habitat by creating a hard backstop on the mauka side of the beach.
   e. N – Fixes the shoreline, protecting upland homes and inhabitants, but restricts natural shoreline movement on the coastline.
   f. DIS – Wave energy reflection on the front of a vertical wall will not support sand accretion.
   g. DIS – Involves excavation below the water level, which presents additional environmental risks.

A full-height terraced seawall and retaining wall(s) would mitigate erosion and provide effective long-term protection for the backshore land and infrastructure; however, there is also significant opposition from the public and some regulatory agencies toward the construction of seawalls. This solution would require a major construction effort and coordination with the community. Costs for design, permitting, and construction would be high. A full-height terraced seawall and retaining wall(s) is not considered the preferred alternative.

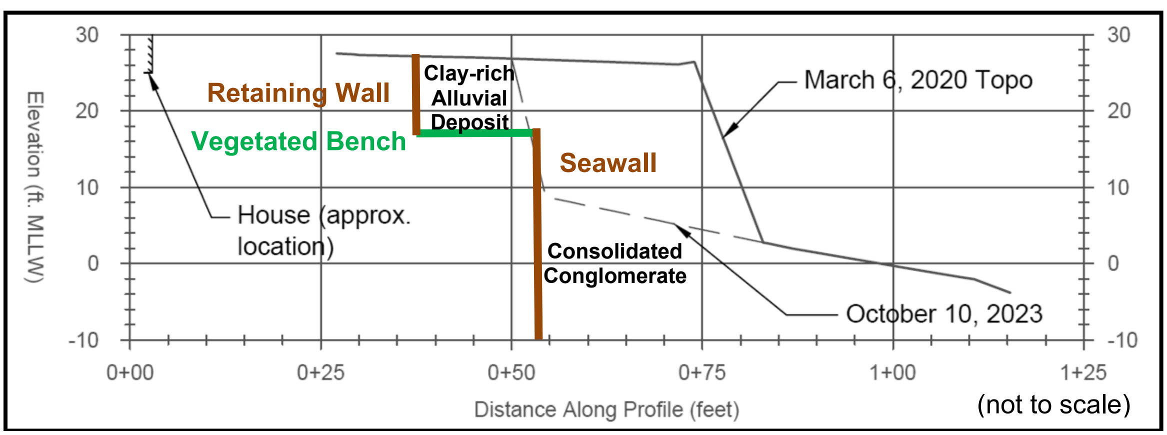

Figure 6-12. Concept for full height terraced seawall and retaining wall(s) alternative

6.11 Fortification of Conglomerate with a Terraced Wall

Fortification of the lower conglomerate unit with Shotcrete would be coupled with a bench(es) in between the fortified unit and upper retain wall(s). Shotcrete (gunite) is concrete or mortar conveyed through a hose and pneumatically projected at high velocity onto a surface. It is typically reinforced by conventional steel rods, steel mesh, or fibers. Installation would include excavation down to hard-bottom or below scour depth and then applying shotcrete to the face of the existing semi-lithified conglomerate, up to about 14 feet MSL. The shotcrete would be anchored back into the semi-lithified conglomerate, with materials such as anchoring pins. A key design element is excavation and application of reinforcing materials starting at scour depth. Extending the slope fortification to this depth mitigates water intrusion, which is tied to the progressive erosion of the conglomerate. A structural engineer should oversee the installation.

By breaking the vertical face of the bluff into two or more sections, the risks associated with a large (~34 foot) vertical structure along the shoreline are reduced. Terraces or benches would separate the sections of the fortification. One concept is a bench extending from the base of the upper landside retaining wall to the crest of the fortified conglomerate unit. The bench could be vegetated to soften the visual impact, absorb wave energy that overtops the fortified conglomerate, and mitigate storm runoff. See the concept presented in

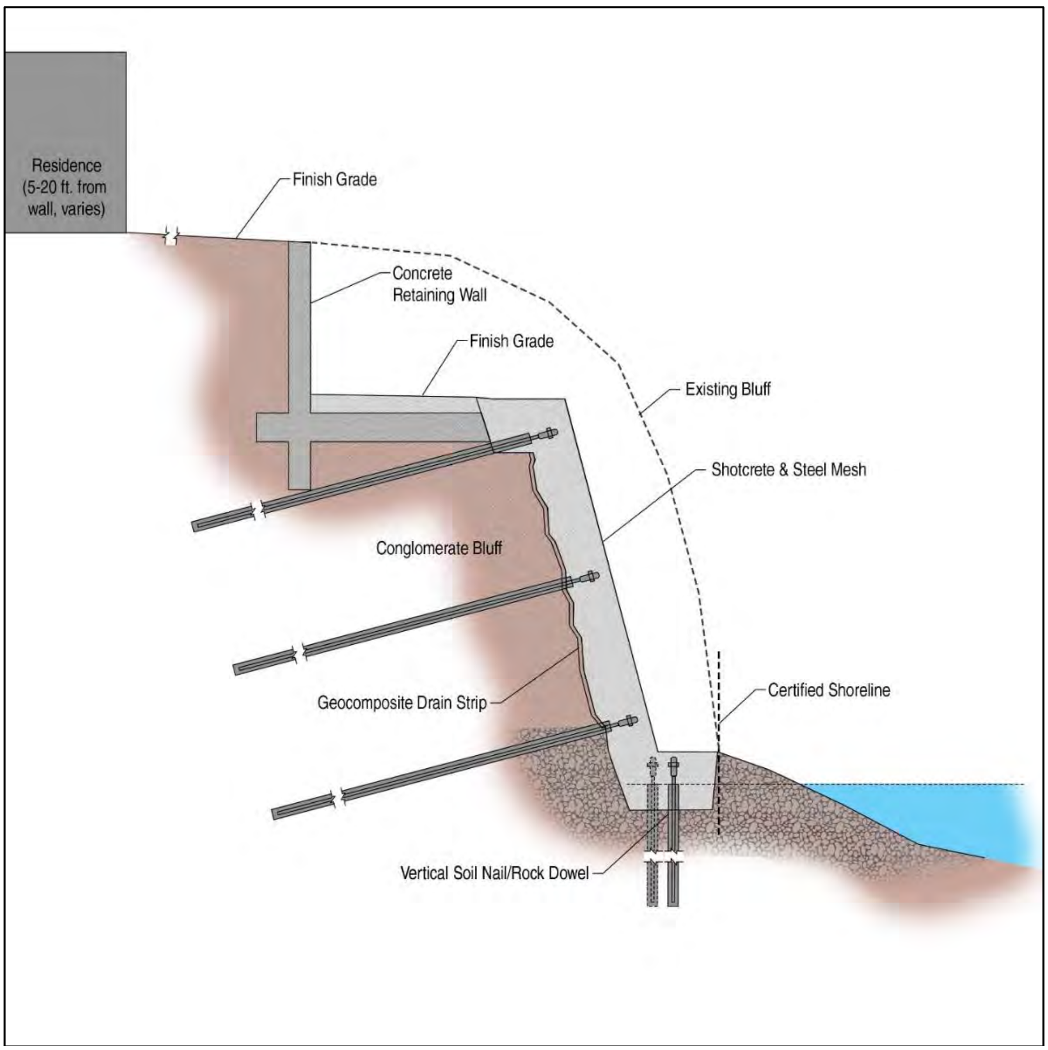

Figure 6-14.

Evaluation Fortified Conglomerate Unit with a Terraced Wall

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards.
        ii. AD – Increases resilience to sea level rise.
        iii. Disadvantage (DIS) – Configuration can not be adapted to withstand future design wave forces (i.e. sea level rise beyond design elevation).
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. AD – Mitigates future mass wasting events with fortification of the lower conglomerate unit, which has been responsible for previous mass wasting events.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
        i. Neutral (N) – Hard structures restrict the landward movement of sand beaches; however, in this location, the naturally occurring semi-lithified conglomerate has the same effect on the beach as a hard structure.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. AD – Mitigates potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures. The fortified conglomerate would tie in directly to the neighboring wall.
        ii. DIS - Tie–back walls would be needed for the bench and upper wall(s).
    e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
        i. AD – Mitigates future mass wasting events by fortifying the existing semi-lithified conglomerate unit.
        ii. AD – Mitigates ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – Shotcrete can protect the semi-lithified conglomerate that supports the homes and inhabitants on the backshore.
    b. AD – Reinforced shotcrete can handle wave energy and some elevation of sea-level rise.
    c. AD – Well-designed shotcrete will require only minimal maintenance when exposed to its design conditions and less energetic environments.
    d. AD – Drainage through the shotcrete could be maintained with the addition of pipes and weep holes.
    e. AD – The front of the upper retaining wall(s) can be designed to be aesthetically pleasing.
    f. AD – Terracing the wall could soften the visual effect that a large vertical structure might otherwise create.
    g. AD – Small structural footprint.
    h. AD – Small volume of artificial material added to the shoreline.
    i. Disadvantage (DIS) – Involves the temporary excavation of soil to scour depth.
    j. DIS – The upper terrace would likely require tie-back walls to tie into the northern neighbor's seawall.
    k. DIS – Micropiles drilled into the semi-lithified conglomerate to anchor the shotcrete may lose integrity if the substrate erodes mauka of the fortification.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):

   a. AD – Very low maintenance costs for the shotcrete for their design life.
   b. AD – Low cost for installation of the shotcrete and upper wall(s).
   c. DIS – Moderate costs for the design and permitting process.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
   a. AD – Material for shotcrete is available on all islands.
   b. DIS – Requires extensive coordination with regulatory agencies and the community.
   c. DIS – Agency and public opposition to the construction of new shore protection.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. AD – Does not interfere with lateral shoreline access.
   b. AD – Textured surface of the shotcrete may by more inviting for marine growth.
   c. N – The beach in this bay will eventually disappear under chronic erosion conditions. When it does, shotcrete would already be in place to protect the semi-lithified conglomerate from the ocean. The bluff responds orders of magnitude slower than the beach.
   d. N – Would not yield any appreciable benefits, compared to the natural shoreline, in terms of beach processes.
   e. N – Protects marine habitat by limiting the release of upland fine material into the nearshore waters, but also limits the sandy coastal habitat by hardening the existing geologic unit on the mauka side of the beach.
   f. N – Fixes the shoreline, protecting upland homes and inhabitants, but restricts natural shoreline movement on the coastline.
   g. N – Wave energy reflection from the fortified conglomerate will be similar to the existing condition, and will not support sand accretion during high wave events.
   h. DIS – Involves excavation below the water level, which presents additional environmental risks.

Fortification of the conglomerate with terraced wall(s) would satisfy the project objectives. Reinforced shotcrete would mitigate erosion and provide protection for the backshore land and infrastructure; however, there is also significant opposition from the public and some regulatory agencies toward the construction of shoreline protection. This solution would require a small construction effort but focused coordination with the community. Costs for design, permitting, and construction would be moderate. Fortification of the conglomerate lower unit with terraced wall(s) is the preferred alternative for the project site, due to satisfying the most project objects.

Figure 6-13. Example of shotcrete used over semi-lithified conglomerate on North side of project area Bay (Keonenui Bay, Maui)

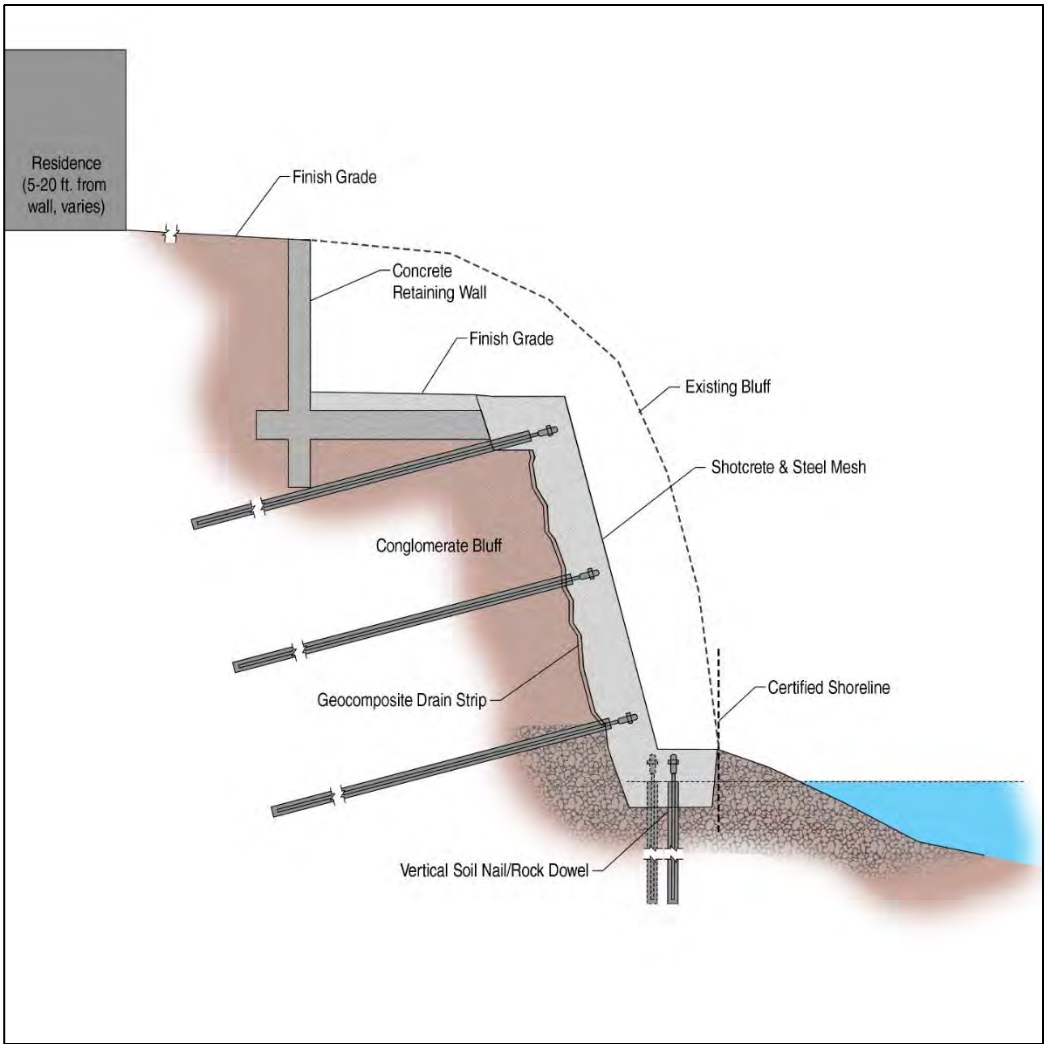

Figure 6-14. Concept for fortified conglomerate with terraced wall(s) alternative

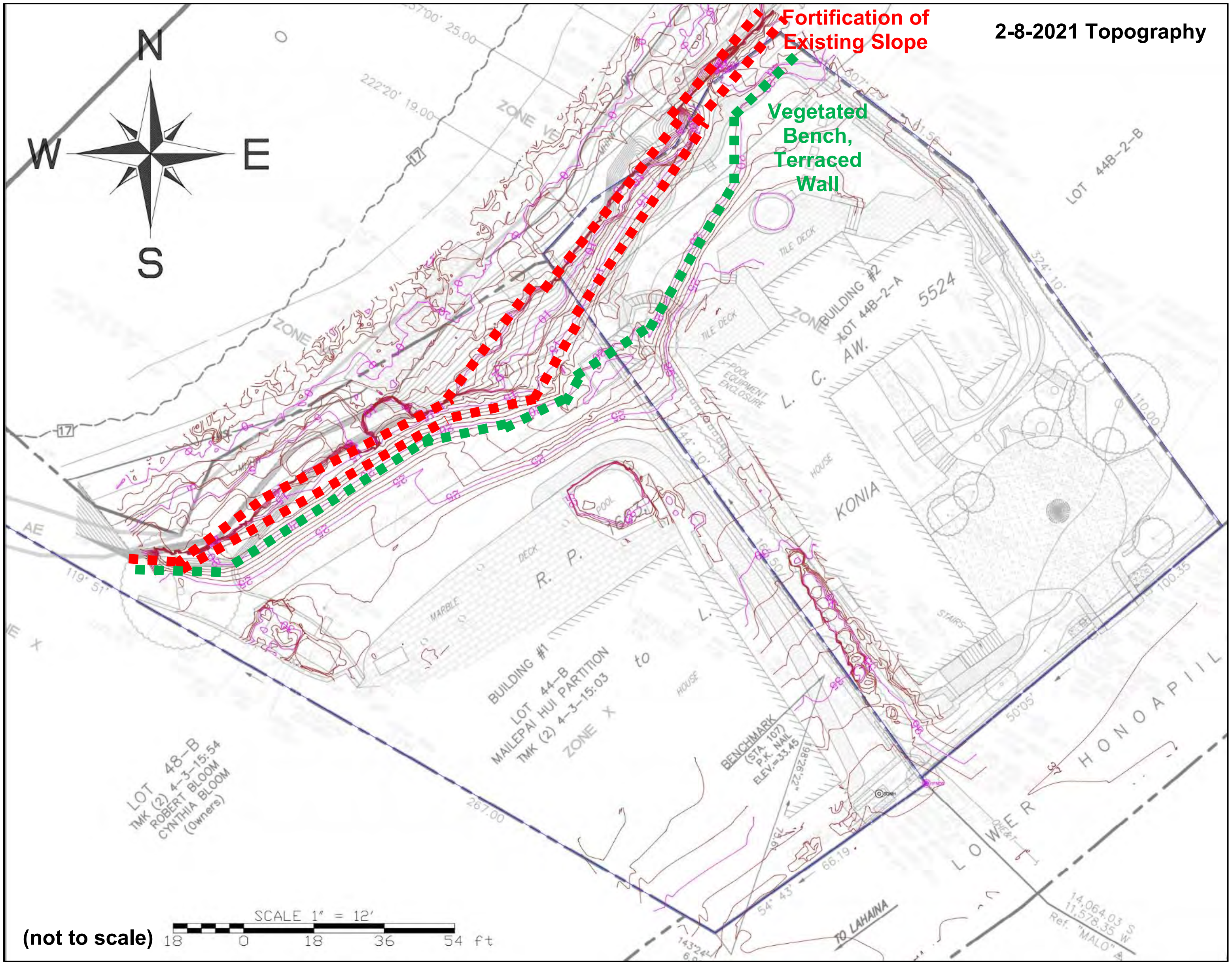

Figure 6-15. Concept plan view for fortified conglomerate with terraced wall(s) alternative

6.12 Rock Rubblemound Revetment

A revetment is a sloped structure built of wave resistant material. The most common method of revetment construction is to place an armor layer of stone, sized according to the design wave height, over an underlayer and bedding layer designed to distribute the weight of the armor layer and to prevent loss of the shoreline material through voids in the revetment. In Hawaii, almost all revetments are constructed of basalt boulders. Limestone boulders can be used, but the lesser density of limestone requires a larger boulder size for a given site. Toe protection can be provided by excavating to place the toe on solid substrate where possible, constructing the foundation as much as practicable below the maximum depth of anticipated scour, or extending the toe to provide excess stone and extra wave protection. Additional toe stones allow the structure to settle and readjust without major failure, should toe scour occur. Damage from large waves is typically not catastrophic, and the revetment can still function effectively even if damage occurs. The rough and porous surface and flatter slope absorb more wave energy than smooth vertical walls, thus reducing wave reflection, runup, and overtopping. An example of a rock revetment at Kahului Harbor (Kahului, Maui) is shown in Figure 6-16.

An advantage of a revetment is that the rough porous rock surface and sloping face of the structure absorb wave energy, reduce wave reflection, and may help to promote accretion of sand on a sandy beach when sufficient sand volume is available in the littoral environment. Wave energy measurements collected near sand beaches, revetments, and seawalls, indicate that the wave absorption capacity of a well-built revetment is close to that of a natural sand beach. Additional investigation in Lanikai, Oahu, Hawaii, documented beach volumes fronting rip-rap and revetments were nearly as high as unarmored shorelines in the region. Additional advantages of revetments are that materials are readily available and localized damage can be repaired by the placement of additional armor stone. Properly designed and constructed rock revetments are durable, flexible, highly resistant to wave damage, and reduce wave reflection energy.

A disadvantage of a revetment is the large structural footprint, which can be problematic in a coastal setting. Revetment location, relative to the waterline and certified shoreline, affects the overall cost and permitting requirements. The steepest practical revetment slope is 1V on 1.5H, therefore revetments have a larger footprint than vertical seawalls. A revetment at the project site, with a crest elevation of +25 feet MSL, would extend back 50 feet or more into the property. A crest elevation of +10 feet MSL would extend approximately 25 feet or more and a crest at +6 feet MSL would extend 20 feet or more. The design height would depend on the wave conditions, sea level rise projections, and the results of geotechnical investigations. Installation of a revetment would require significant bank excavation and would require engineering and additional structure to tie in with the vertical wall on the north side.

Revetments are typically constructed in areas where the terrestrial area is already threatened by erosion, such as along roadways. In these locations, the erosion threat is typically so severe that there is little terrestrial area to accommodate a revetment so the structure can only be constructed seaward of the shoreline. Hawaii Revised Statutes discourages the construction of shore protection structures seaward of the shoreline in the Conservation District. Construction of a revetment landward of the shoreline would require extensive excavation of the terrestrial area, see the concept presented in Figure 6-17. It is important to note that, even if the revetment were constructed landward of the shoreline, the future certified shoreline would likely be located considerably inshore of the toe of the revetment.

<u>Evaluation of the Rock Rubblemound Revetment</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards.
        ii. AD – Increases resilience to sea level rise.
        iii. AD – Structure could be adapted to withstand future design wave forces (i.e. sea level rise beyond design elevation).
        iv. AD – Provides additional protection against wave overtopping.
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:
        i. AD – Mitigates future mass wasting events with structural protection of the backshore.
        ii. AD – Proper foundation and toe protection mitigate the chance of structural failure.
        iii. AD – When revetments settle, they typically settle downward, not outward toward the beach.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
        i. AD – Revetments reduce return wave energy nearly as well as natural sand beaches.
        ii. Neutral (N) – Hard structures restrict the landward movement of sand beaches; however, in this location the naturally occurring semi–lithified conglomerate has the same effect on the beach.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. AD – Mitigates potential threat to the adjacent seawall, created by ongoing erosion and failure of existing structures.
        ii. Disadvantage (DIS) – Requires tie back walls to protect neighboring shoreline structures.
    e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
        i. AD – Mitigates future mass wasting events with structural protection of the backshore.
        ii. AD – Mitigates ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.
2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – A revetment can effectively protect the homes and inhabitants on the backshore.
    b. AD – A revetment can be designed to handle large waves and some elevation of sea-level rise.
    c. AD – A well-designed revetment will require only minimal maintenance when exposed to its design conditions and less energetic environments.
    d. AD – Drainage through the revetment could be maintained with the addition of pipes.
    e. Disadvantage (DIS) – Involves the excavation of soil and rock. The haul–in and haul–out of such a large volume of material presents significant hazards for disruption and sedimentation of the beach and nearshore environment.
    f. DIS – Very large structural footprint within the property.
    g. DIS – Very large volume of artificial material added to the shoreline.

   h. DIS – Requires careful design of structural return on the north end to tie in with neighbor's structures.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
   a. AD – Very low recurring maintenance costs and effort.
   b. N – Mid-range costs for design and construction of coastal shoreline protection structure.
   c. DIS – Very high costs for permitting.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
   a. AD – Material for revetments is typically available on all islands.
   b. DIS – Requires extensive coordination with regulatory agencies and the community.
   c. DIS – Agency and public opposition to the construction of new shore protection structures.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. AD – Better wave energy dissipation characteristics than a seawall or vertical bluff, and may facilitate sand accretion seaward of the structure.
   b. N – Would not yield any appreciable benefits, compared to the natural shoreline, in terms of beach processes.
   c. N – Fixes the shoreline, protecting upland homes and inhabitants, but restricts the natural shoreline movement on the coastline.
   d. N – Protects marine habitat by limiting the release of upland fine material into the nearshore waters, but also limits the sandy coastal habitat by creating a hard backstop on the mauka side of the beach.
   e. DIS – Involves excavation below the water level, which presents additional environmental risks.
   f. DIS – The public could traverse the revetment creating potential privacy, security, and liability issues.
   g. DIS – When the revetment is exposed during beach deflation events, shoreline access can be limited or difficult across the face of the structure.

A rock rubblemound revetment is an appropriate engineering solution for the project site and would satisfy the project objectives. However, a rock rubblemound revetment would have a large structural footprint within the properties, and high costs for permitting. A rock rubblemound revetment, therefore, is not the preferred alternative.

Figure 6-16. Typical rock revetment (Kahului, Maui)

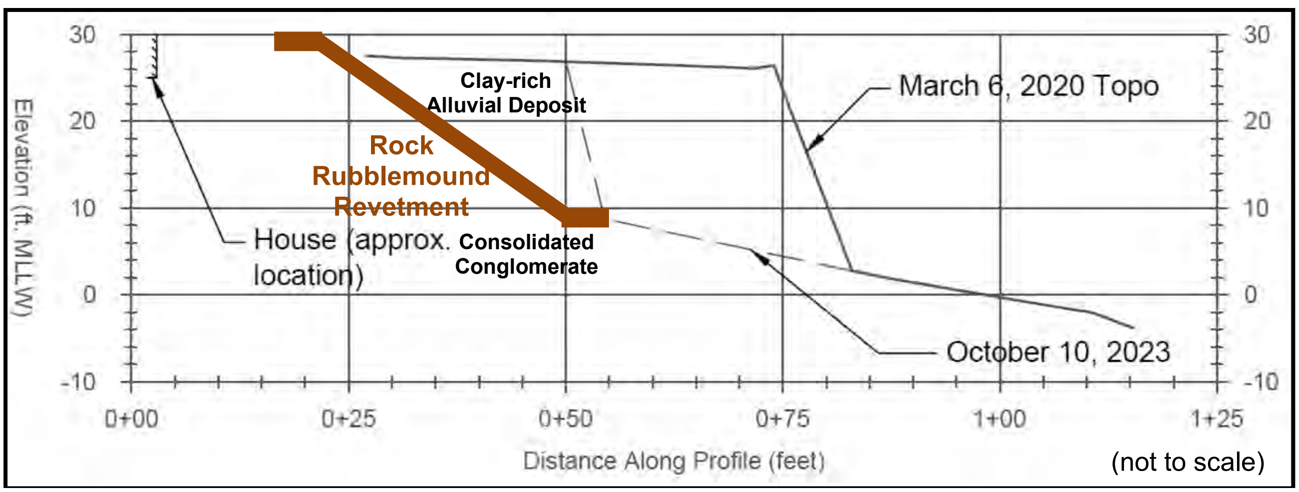

Figure 6-17. Concept profile 1 view for rock rubblemound revetment alternative

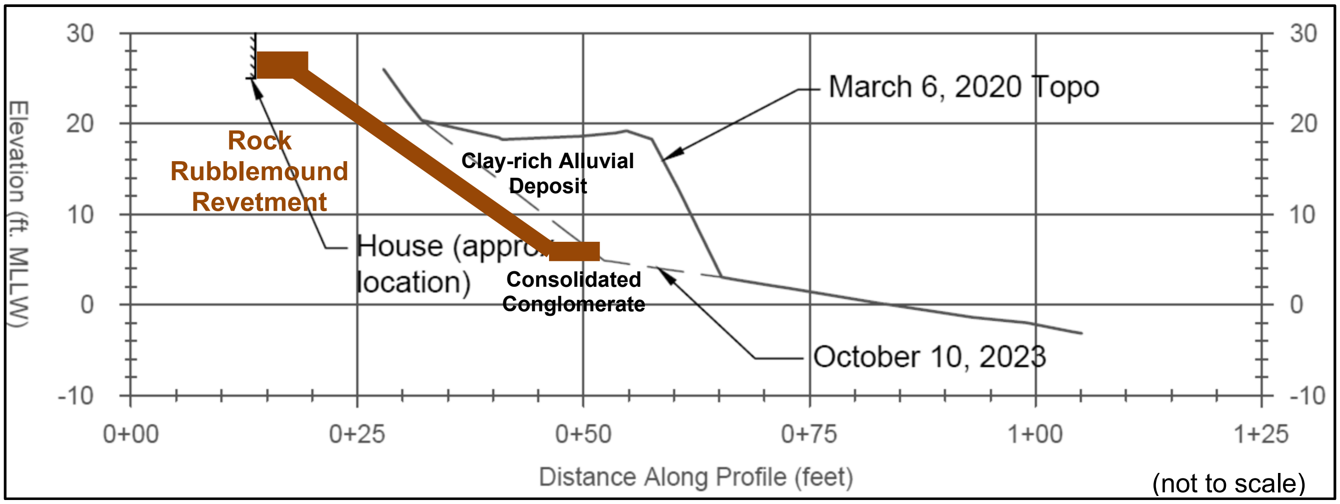

Figure 6-18. Concept profile 3 view for rock rubblemound revetment alternative

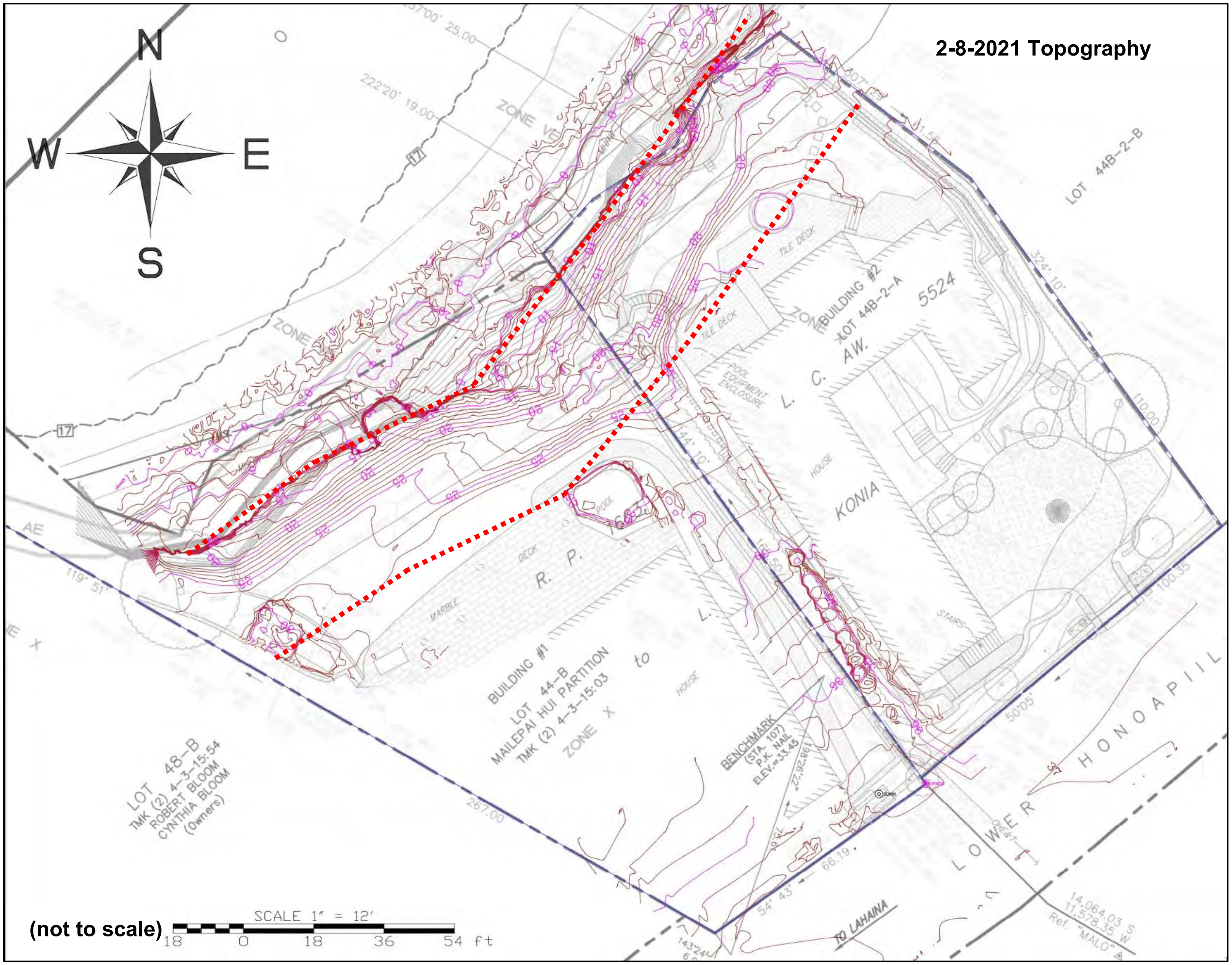

Figure 6-19. Concept plan view for rock rubblemound revetment alternative

6.13 Hybrid Revetment-Wall

Another potential long-term engineering solution for the project site is a hybrid revetment-wall, which is a shore protection structure that combines a sloping rock revetment with a vertical wall. A hybrid revetment-wall would be composed of two primary elements: a uniform armor rock rubblemound revetment and a wall (i.e. sheet pile, reinforced concrete, or cemented rock masonry). An example of a hybrid revetment-wall is shown in Figure 6-20.

An advantage of a hybrid revetment-wall is that the structure can be designed to be modified to withstand changing design wave conditions as sea level rises. Additional advantages of a hybrid revetment-wall are that materials are readily available and localized damage to the revetment can be easily repaired by the placement of additional armor stone. Properly designed and constructed hybrid revetment-walls are durable, flexible, and highly resistant to wave damage.

A disadvantage of a hybrid revetment-wall is that the revetment would still have a relatively large structural footprint. The location of the structure would affect the overall cost and permitting requirements. Hawaii Revised Statutes discourages the construction of shore protection structures seaward of the shoreline in the Conservation District. Construction of a hybrid revetment-wall landward of the shoreline would require excavation of the terrestrial area. It is important to note that, even if a hybrid revetment-wall were constructed landward of the shoreline, the future certified shoreline would likely be considerably inshore of the toe of the revetment.

Design heights for shore protection structures typically account for the effects of tides, surges, waves, and relative sea-level rise. Accounting for projected sea-level rise in the design of shore protection structures often requires increasing the design height of the structure. Sea-level driven changes in wave characteristics, and to a lesser extent, tides, amplify the resulting design heights by an average of 48-56%, relative to design changes caused by sea level rise alone. (Arns et.al., 2017).

A shoreline structure that is designed to account for sea level rise 50 years in the future would typically have a larger structural footprint, higher crest height, and larger stone size than is required for current conditions. A larger structure would have a greater impact on view planes along the shoreline and from within the property. An alternative approach is to design a structure that can be modified as sea level rises. A hybrid revetment-wall can provide the flexibility to modify the structure as conditions change over time. The concept is illustrated in Figure 6-21 and Figure 6-22.

<u>Evaluation of a Hybrid–Revetment Wall</u>

1. Effectiveness (i.e., likelihood of satisfying the project objectives)
    a. Mitigate future erosion of the properties and protect the homes:
        i. Advantage (AD) – Reduces vulnerability of homes to coastal hazards.
        ii. AD – Increases resilience to sea level rise.
        iii. AD – Structure could be adapted to withstand future design wave forces (i.e. sea level rise beyond design elevation).
        iv. AD – Provides additional protection against wave overtopping with the wave energy absorption properties of the lower revetment.
    b. Remove the public hazard associated with mass wasting events at the face of the slope, or wall failures, or both:

        i. AD – Mitigates future mass wasting events with structural protection of the backshore.
        ii. AD – Proper foundation and toe protection mitigate the chance of structural failure.
        iii. AD – When revetments settle, they typically settle downward, not outward toward the beach.
        iv. AD – The lower revetment provides structural protection for the upper wall's foundation.
    c. Mitigate human-induced impacts to the natural coastal processes and littoral cell:
        i. AD – Revetments reduce return wave energy nearly as well as natural sand beaches.
        ii. Neutral (N) – Hard structures restrict the landward movement of sand beaches; however, in this location the naturally occurring semi–lithified conglomerate has the same effect on the beach.
    d. Prevent potential undermining of neighboring shoreline protection structures:
        i. AD – Mitigates potential threat to the adjacent wall, created by ongoing erosion and failure of existing structures.
    e. Prevent earthen soils from eroding and causing siltation of the coastal waters.
        i. AD – Mitigates future mass wasting events with structural protection of the backshore.
        ii. AD – Mitigates ongoing losses of the upper alluvium unit, which results in the siltation of the coastal waters.

2. Design Considerations (i.e., suitability, design life, durability, volume of artificial material):
    a. AD – The hybrid structure has some of the footprint advantages of a wall with all the wave energy reduction advantages of a revetment.
    b. AD – A revetment can effectively protect the homes and inhabitants on the backshore.
    c. AD – A revetment can be designed to handle large waves and some elevation of sea-level rise.
    d. AD – A well-designed revetment will require only minimal maintenance when exposed to its design conditions and less energetic environments.
    e. AD – Drainage through the revetment and upper wall could be maintained with the addition of pipes.
    f. N – The upper wall allows for a more complete tie into the northern neighbor's seawall than a full-size revetment alone.
    g. Disadvantage (DIS) – Involves the excavation of soil and rock. The haul–in and haul–out of such a large volume of material presents significant hazards for disruption and sedimentation of the beach and nearshore environment.
    h. DIS – Medium to large structural footprint within the property.
    i. DIS – Large volume of material added to the shoreline.
3. Costs (i.e., initial costs, recurring costs, entitlement costs):
    a. AD – Very low recurring maintenance costs and effort.
    b. DIS – Higher costs for design and construction of coastal shoreline protection structure, because of dual design efforts.
    c. DIS – Very high costs for permitting.
4. Feasibility (i.e., material availability, regulatory restrictions, community support):
    a. AD – Material for walls and revetments are typically available on all islands.
    b. DIS – Requires extensive coordination with regulatory agencies and the community.

   c. DIS – Agency and public opposition to the construction of new shore protection structures.
5. Potential Impacts (i.e., shoreline, coastal processes, marine habitat, and shoreline access):
   a. AD – Better wave energy dissipation characteristics than a wall and may facilitate sand accretion seaward of the structure.
   b. N – Would not yield any appreciable benefits, compared to the natural shoreline, in terms of beach processes.
   c. N – Fixes the shoreline, protecting upland homes and inhabitants, but restricts natural shoreline movement on the coastline.
   d. N – Protects marine habitat by limiting the release of upland fine material into the nearshore waters, but also limits the sandy coastal habitat by creating a hard backstop on the mauka side of the beach.
   e. DIS – Involves excavation below the water level, which presents additional environmental risks.
   f. DIS – The public could traverse the revetment creating potential privacy, security, and liability issues.
   g. DIS – When the revetment is exposed during beach deflation events, shoreline access can be limited or difficult across the face of the structure.

A hybrid revetment–wall would have some of the footprint advantages of a wall and the wave energy dissipation advantage of a revetment. However, a hybrid revetment-wall would have high costs for design, permitting, and construction, as well as possible community and agency opposition. The hybrid revetment-wall is not the preferred alternative for the project site, due to the high costs and footprint on the shoreline.

Figure 6-20. Hybrid wall–revetment (Kapaa, Kauai, Hawaii)

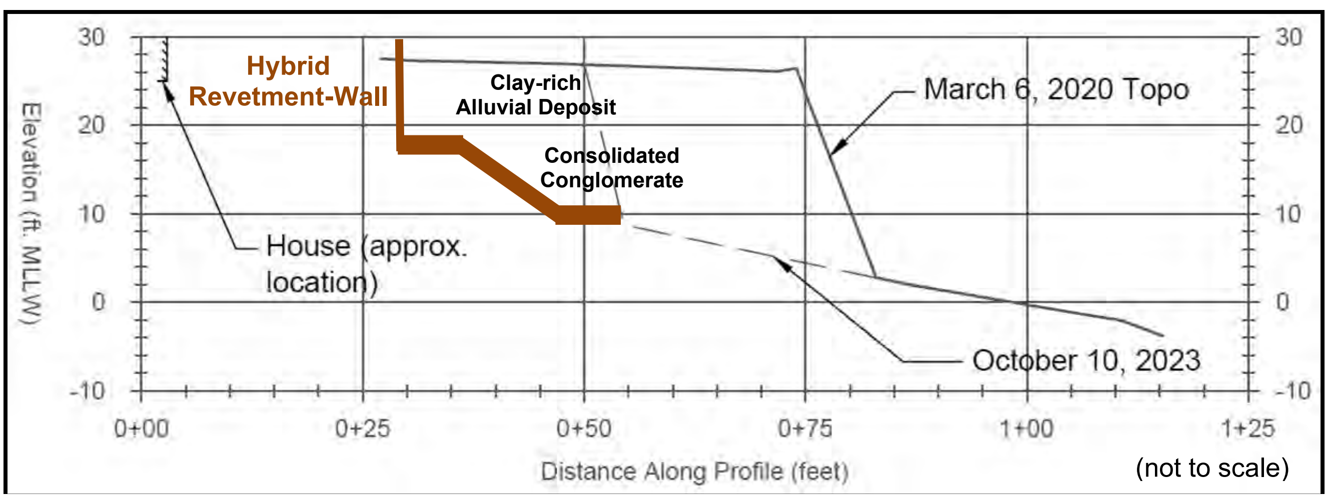

Figure 6-21. Concept for hybrid revetment-wall alternative at profile 1

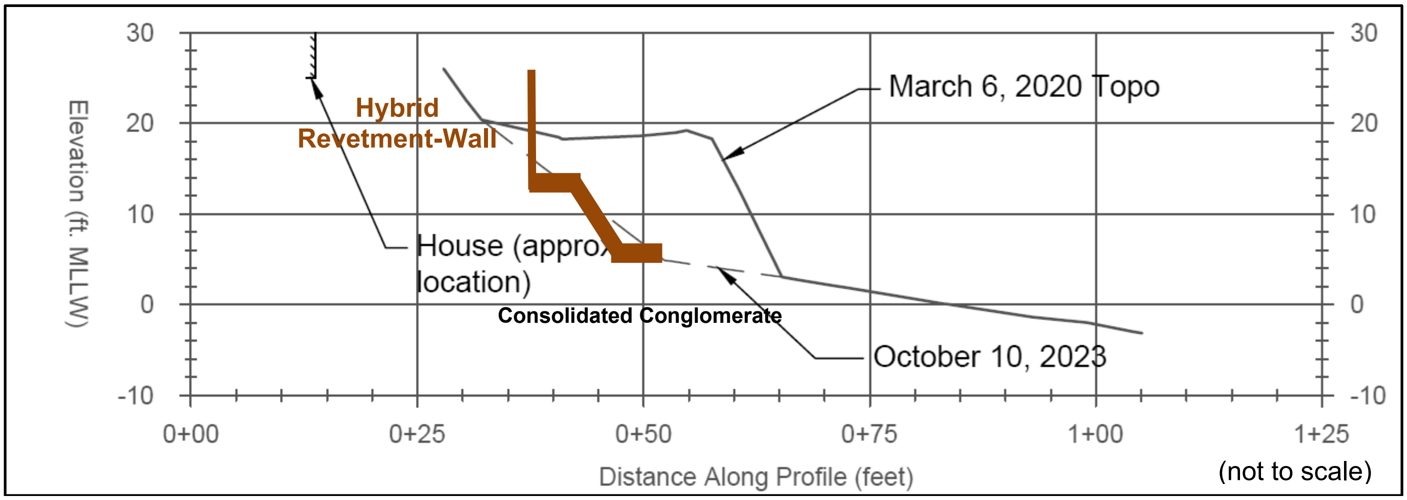

Figure 6-22. Concept for hybrid revetment-wall alternative at profile 3

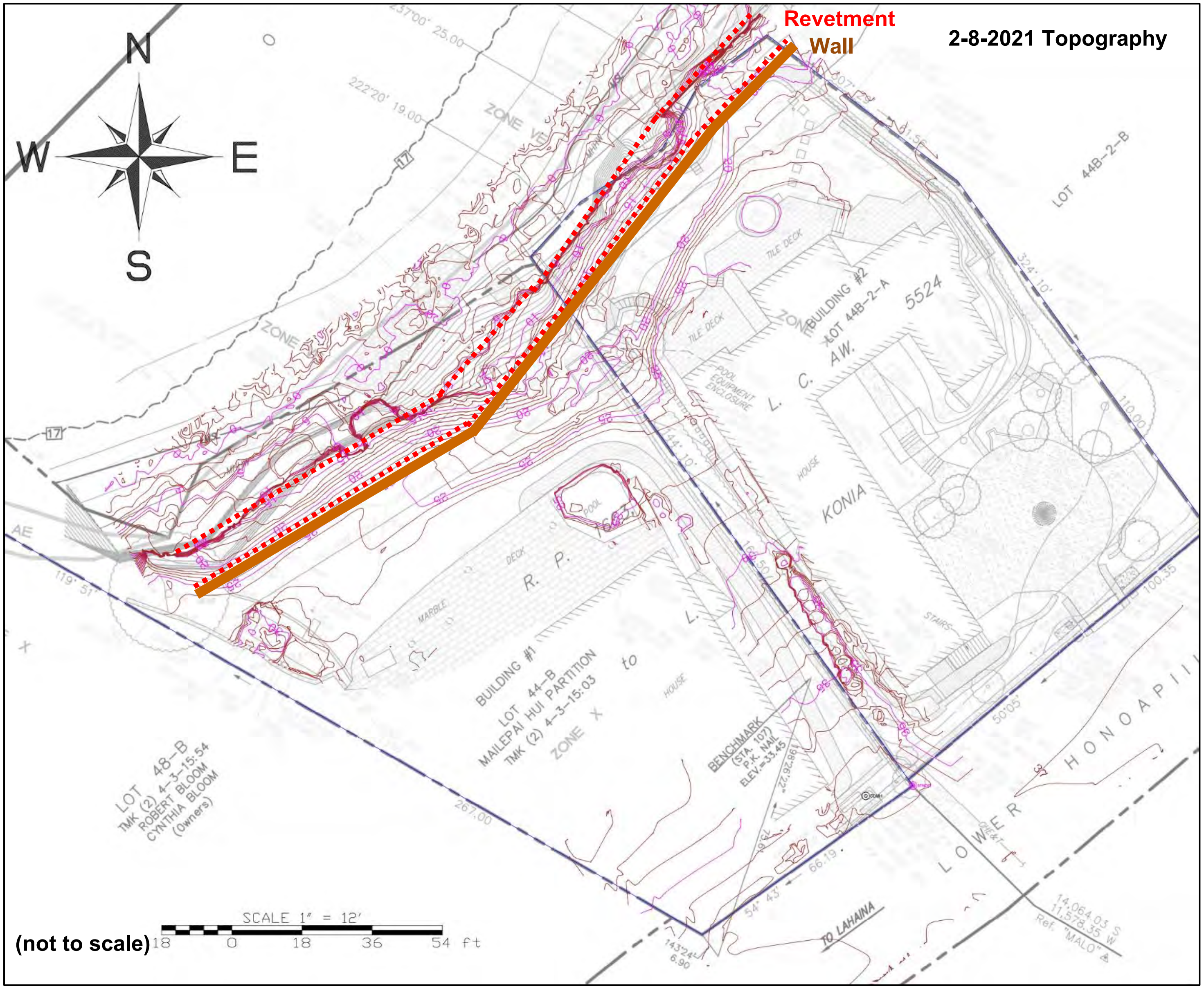

Figure 6-23. Concept plan view for a hybrid revetment-wall alternative

6.14 Preferred Alternative

Presentation, analysis, and review of thirteen alternatives were covered in the sections above. The thirteen alternatives include the following:

1. No Action or Deferred Action
2. Managed Retreat
3. Temporary Erosion Control
4. Beach Maintenance
5. Beach Nourishment
6. Beach Nourishment with Stabilizing Structures
7. Slope stabilization
8. Slope stabilization with a Retaining Wall
9. Seawall
10. Full Height Terraced Seawall and Retaining Wall(s)
11. Fortification of Conglomerate with Terraced Wall(s)
12. Rock Rubblemound Revetment
13. Hybrid Revetment-Wall

Analysis of the alternatives indicates that ***fortified conglomerate with terraced wall(s)*** is the **preferred alternative**, based on the current project objectives and review criteria. This mixture of erosion mitigation techniques that compliments the existing backshore substrate provides a uniquely suited and elegant solution for protecting the habitable dwellings, integrating with the natural environment, protecting public safety, and mitigating impacts to the marine and coastal environments.

7. ENVIRONMENTAL REVIEW AND REGULATORY PERMITTING

Hawaii's environmental impact statement law (Chapter 343, Hawaii Revised Statutes) requires the preparation of an EA or EIS for more substantial projects. When a project is anticipated to result in significant environmental impacts, a full EIS is often required. Given the complex nature and relatively large scope of the erosion problem within the project area, it is not clear which level of environmental review will be required for the Hester and Barto Properties.

Depending on the nature of the recommended engineering solution, additional studies and engineering services may be required. Additional studies and services may include the following:

- Structural Engineering
- Geotechnical Engineering
- Marine Biological Assessment
- Water Quality Assessment
- Historical, Cultural, and Archaeological Assessment
- Cultural Impact Assessment

The environmental review process will determine whether the project can be advanced to final design, permitting, and construction. Given the complex nature and relatively large scope of the erosion problem within the project area, SEI anticipates that Federal, State, and County permits may be required. The regulatory permits that may be required for a shoreline improvement project of this scope include, but are not limited to, the following:

- Department of the Army Individual Permit
- Department of Health Clean Water Branch Water Quality Certification
- Conservation District Use Permit
- Special Management Area Use Permit

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Appendix B

Archaeological Assessment (Scientific Consultant Services, 2009)

SCS Project Number 1029-1

AN ARCHAEOLOGICAL ASSESSMENT FOR PROPOSED CONSTRUCTION ACTIVITIES AT 4855 L. HONOAPI`ILANI HIGHWAY IN NAPILI, `ALAELOA AHUPUA`A, LAHAINA DISTRICT, ISLAND OF MAUI, HAWAII, [TMK; (2) 4-3-015:003]

Prepared by:
David Perzinski, B.A.
and
Michael Dega, Ph.D.
April 2009

Prepared for:
Chris Hart & Partners, Inc
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INTRODUCTION

At the request of Chris Hart and Partners, Scientific Consultant Services, Inc. (SCS) conducted an archaeological Field Inspection of the proposed development site for a single-family residence and seawall on a 0.44 acre site at 4855 L. Honoapi`ilani Highway in Napili, `Alaeloa Ahupua`a, Lahaina District, Island of Maui, Hawai'I [TMK: (2) 4-3-015:003]. (Figures 1 and 2). The Field Inspection was conducted by SCS archaeologist David Perzinski, B.A, on April 17, 2009 under the direction of Michael Dega, Ph.D.

The request for Field Inspection was made to satisfy State of Hawai`i Historic Preservation Division (SHPD) review requirements. A surface reconnaissance survey was previously conducted by SCS Archaeologist Dr. Allison Chun and no surface sites or sand deposits were observed. Extensive alteration by modern residential construction appears to have significantly altered the natural topography and any possible previously existing surface sites or Jaucus sand deposits no longer exist. The purpose of the Field Inspection was to determine the presence or absence of architecture, midden deposits, and artifact deposits on the surface of the project area, as well as assess the potential for the presence of subsurface cultural deposits.

Location and Current Status

The project area is a 0.44-acre (19,214 ft^2) lot that is bounded by existing residential lots to the northeast and southwest, the shoreline to the northwest, and L. Honoapi`ilani Highway to the southeast. The parcel has a slight slope (less than 5°) and is tiered with the *mauka* side approximately 2 meters higher than the *makai* side. A single-family house is located on the *makai* side of the lot and a single car garage occupies the *mauka* tier. The lot is almost entirely vegetated with domestic grasses and the perimeters are landscaped with plumeria, ti, croton, mulberry, naupaka and ornamental palms.

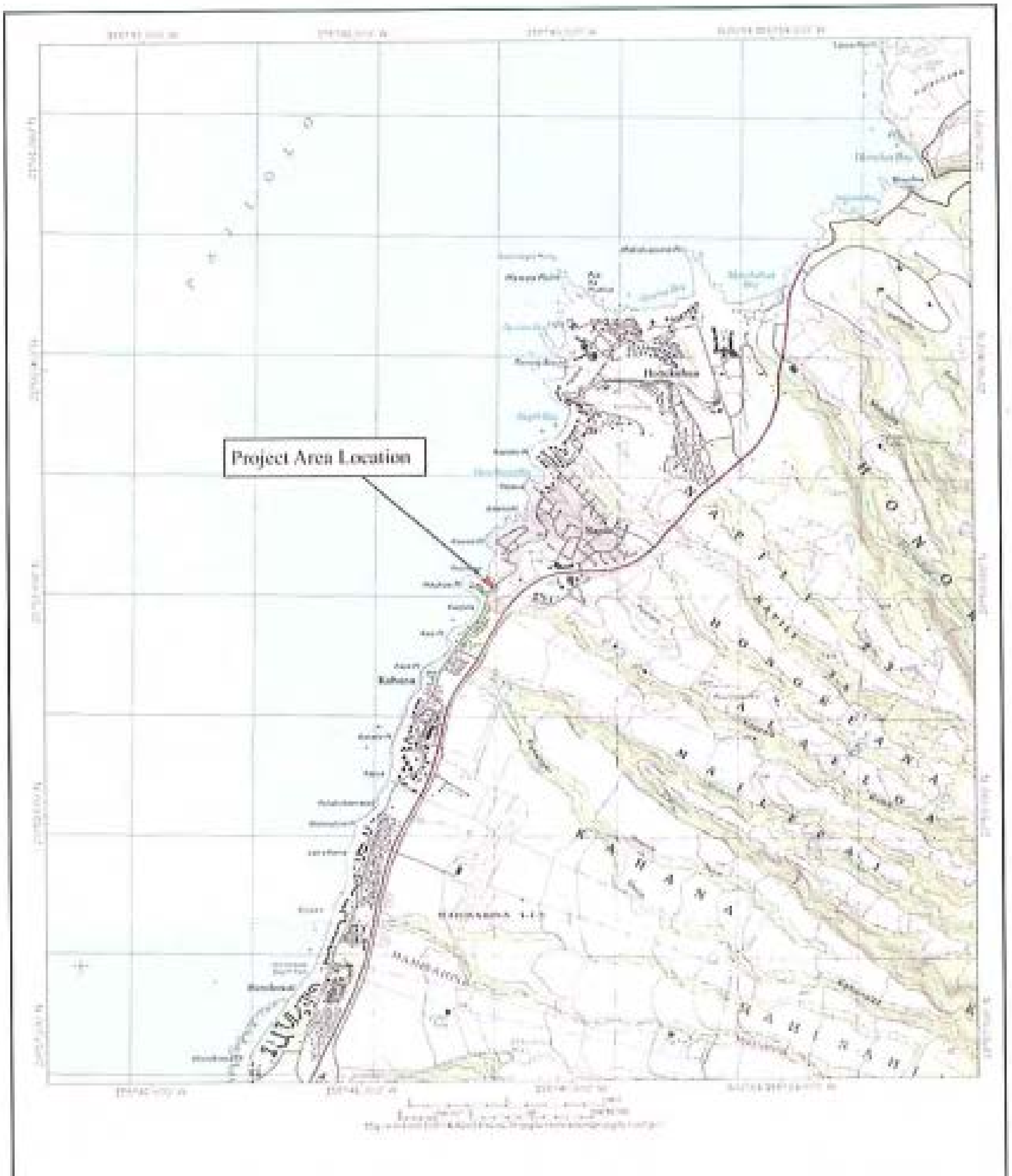

Figure 1: Portion of USGS Topographic Map Showing the Location of the Project Area

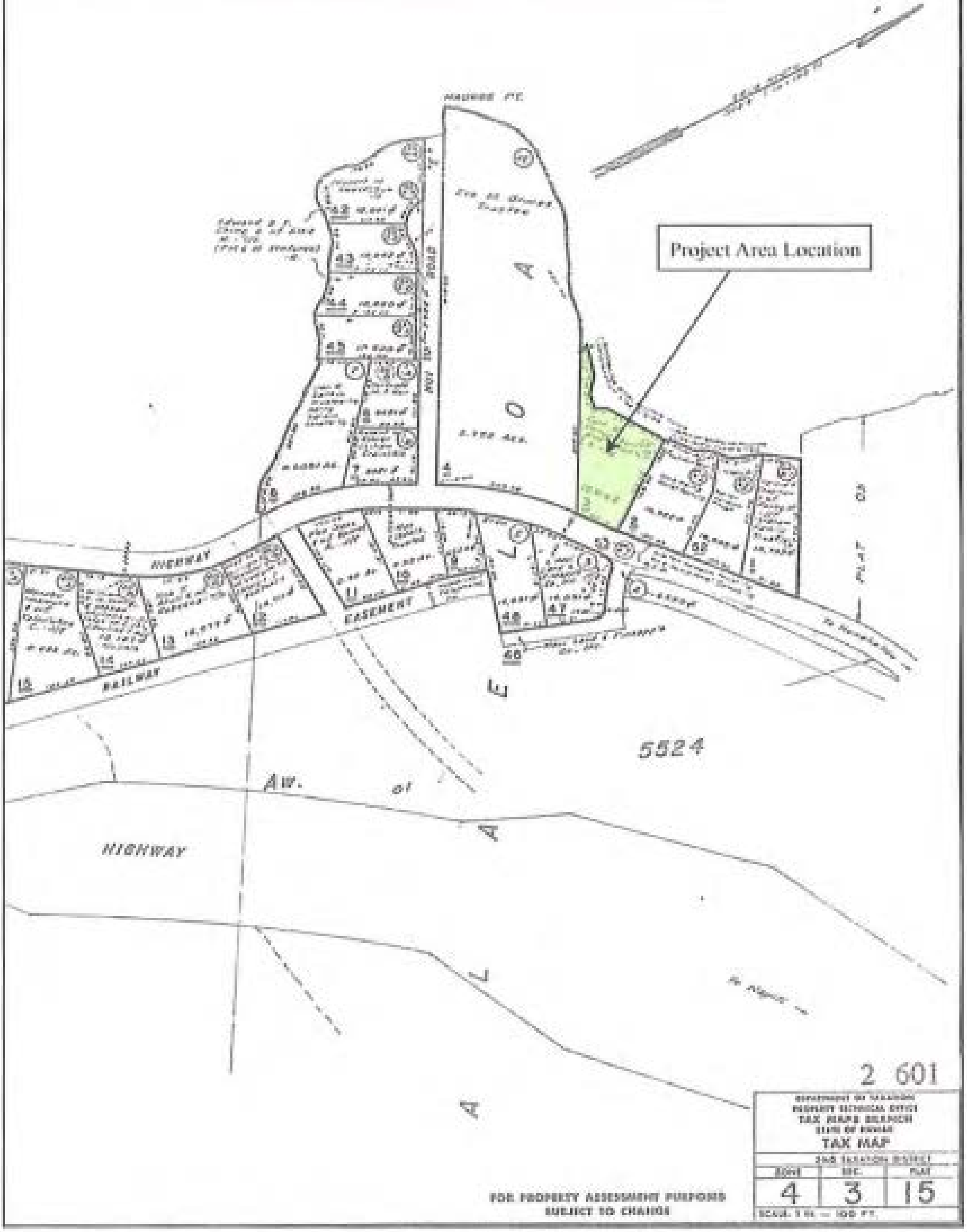

Figure 2: Tax Map Key [TMK: (2) 4-3-015] Showing Project Area.

ENVIRONMENTAL SETTING

Project Area Description

The property is a pentagon shaped parcel located on the coastline just south of `Alaeloa Point and north of Haukoe Point and covers and area of 0.29-acres (12,624 ft^2). The parcel is bounded on the north and south by residential housing, on the east by Hale Malia Road and to the west by the sea.

Natural Setting

Coastal Nāpili, in general, is classified as a '*Kiawe* and Lowland Shrubs' vegetation zone, and common, local plants include: *kiawe* (*Prosopis pallida*), *koa haole* (*Leucaena glauca*), finger grass, and *pili* grass, (the latter is a native species) (Armstrong 1983). In traditional times, *i.e.*, before the historic-era introduction of *kiawe* and *koa haole*, the project area was probably covered with indigenous grasses (Kirch 1973a). Today, vegetation in the project area includes beach *naupaka* (*Scaevola taccada*), coconut palm (*Cocus nucifera*), beach heliotrope (*Heliotropium* sp.), plumeria (*Plumeria acuminate*), *wiliwili* (*Erythrina sandwicensis*), yellow hibiscus (Family, *Malvaceae*), and bougainvillea (*Bougainvillea spectabilis*) as well as various other introduced tropical flowering plants and extensive grassy lawns.

The project area receives an average amount of precipitation, compared with other settled parts of Maui and the Hawaiian Islands, in general. According to Armstrong (1983), mean annual rainfall in the Nāpili area is approximately 76 cm (30 in.). Giambelluca *et al.* (1986) report *median* annual rainfall for the area of approximately 100 cm (40 in.). Part of the discrepancy between these rainfall data is probably due to the steeply increasing precipitation gradient east and southeast of the project area, as one moves up into the relatively wet flanks of West Maui. Regardless of which of these (30 or 40 in.) numbers is more typical of the local rainfall, a tremendous amount of through-flowing water from the West Maui uplands would have been available in traditional times in the Honokahua Stream and the (smaller, but much closer) Napili Stream.

The topography of the parcel is flat with the *makai* side bounded by a steep cliff. The topsoil of the property consisted of brown (7.5 YR 4/2) silt loam mixed with abundant debris from the current construction. The natural soils in the area are generally classified as Kahana Silty Clay (KbB) (Foote *et al*, 1972) that are derived from igneous rock and deposited as alluvium.

PREVIOUS ARCHAEOLOGICAL RESEARCH

A fair number of archaeological investigations have been conducted over the years in the Napili in Lahaina District, Maui, resulting almost unanimously in the documentation of both pre-contact and historic deposits. The majority of these cultural deposits were identified as burials, habitation plots, or refuse pits. Classes of artifacts midden found in association with these features included coral abraders, basalt flakes, volcanic glass debitage, and marine shell debris.

North of the project area, remnants of a pre-historic *ala loa* (trail) have been recorded. Traditional accounts attribute the construction of this trail to chief Kiha-a-Pi'ilani during the early 1500s (Sterling 1998). In 1973 the Bishop Museum conducted archaeological research at Hawea Point. A site complex (Site 50-50-01-1346) comprised of eight features was identified and recorded. This site was interpreted to be a temporary Hawaiian settlement for marine exploitation and was dated to *c.* A.D. 1500 (Kirch 1973a). Additional sites were located and recorded by Kirch (1973a), including a cave shelter on the cliff face of Hawae Point (Site 50-50-01-1347) and a stone terrace platform, which was located on a promontory overlooking Oneloa Bay (Site 50-50-01-1348). During this survey the Honokahua Burial Site (Site 50-50-01-1342) was first recorded. Several additional sites were located by Kirch at Fleming Beach Park along Honokahua Stream; these included a house site, terrace, enclosure, and midden deposits (Site 50-50-01-1345).

Archaeological work conducted by Griffin and Lovelace (1977) in conjunction with the realignment of Honoapi`ilani Road was concentrated in the gulches of Honokowai, Mahinahina, Kahana, Mailepai, and Alaeloa. The survey resulted in the identification of four sites, a buried midden deposit, a trail segment, a stone wall, and three retaining wall segments. It was concluded that this site represented a prehistoric, repetitively occupied, temporary habitation site (Griffin and Lovelace 1977). In Kahana, work conducted in conjunction with U.S. Department of Agriculture's Soil Conservation Service to create a desilting basin resulted in the identification of a prehistoric inland agricultural area that had been reused during historic times for commercial sugarcane and pineapple cultivation (Walker and Rosendahl 1985).

Based on previous archaeological work in the area, it was anticipated that pre-Western Contact cultural layers associated with permanent habitation and/or burials could be encountered. It was noted however that extensive ground altering activities associated with the construction of the residence and surrounding parcels likely altered the natural sediment deposits in this area.

METHODS

The Field Inspection of the parcel was conducted by SCS archaeologist David Perzinski, B.A., on April 17, 2009, under the direction of Michael Dega, Ph.D. The project area is located along the *makai* side of L. Honoapi`ilani Highway and based on the topography and landscaped condition of the lot it was clear that extensive grading activities had occurred (Figures 3 and 4).

The landscaped lot is clearly demarcated by modern stone walls and the property was subjected to a 100% pedestrian survey. The property was then documented with photographs and the topography and vegetation was noted.

Following the surface survey, a shovel test unit was manually excavated on the northeast and southwest portion of the parcel to better understand the nature of the subsurface deposits. Documentation of the subsurface sediments included screening of all excavated material through 1/8th-inch mesh screen and profiling and recording the stratigraphic sequence with scale drawings and photographs. Once the material was evaluated for any cultural content it was returned to the test pits and manually compacted.

RESULTS OF FIELDWORK

No new sites, surface features or undisturbed surface sediments were identified during the Field Inspection. The two shovel tests that were manually excavated had nearly identical stratigraphic sequences (Figures 5 and 6). Stratum I (0-5 cmbs) consisted of dark brown (7.5 YR 3/2) imported clay loam. The thin layer was likely imported after grading the lot to support the grass lawn. Stratum II (5-45 cmbs) consisted of dark reddish brown (2.5 YR ¾) silty clay. The matrix has a blocky structure and is slightly plastic. Stratum II contained few uniformly dispersed charcoal flecks (flecks < 1 mm in diameter) that are likely the result of historic agricultural runoff. No cultural layers or materials were encountered in either shovel test pit.

CONCLUSIONS

No surface or subsurface cultural remains were identified during the archaeological assessment. A full pedestrian inspection and manually excavated shovel test pits within the parcel failed to lead to the identification of historic surface features or subsurface sites or layers. Repeated instances of modern era clearing and grading in and area the parcel have extensively disturbed portions of the area, further making the likelihood of encountering any remaining surface features non-existent.

It is our estimation, based on this field inspection, that the proposed undertaking would not have an adverse impact on any significant historic properties. No further work is needed for this land parcel. However, should the inadvertent discovery of significant cultural materials and/or burials occur during construction, all work in the immediate area of the find must cease and the SHPD be notified to discuss mitigation, if necessary.

Figure 3: View North Showing *Makai* Portion of Project Area

Figure 4: View North Showing *Mauka* Portion of Project Area

Figure 5: View North of Shovel Test 1 Showing Stratigraphy

Figure 6: View North of Shovel Test 2 Showing Stratigraphy

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Appendix C

Cultural Impact Assessment (Jill Engledow, 2009)

Walter Hester Residence

Cultural Impact Assessment

for

4855 Lower Honoapi'ilani Highway
'Alaeloa, Maui, Hawai'i
TMK (2) 4-3-015:003

by

Jill Engledow
Historical Consultant
Wailuku, Maui

May 2009

Prepared for
Mr. Walter Hester

Walter Hester Residence
Cultural Impact Assessment
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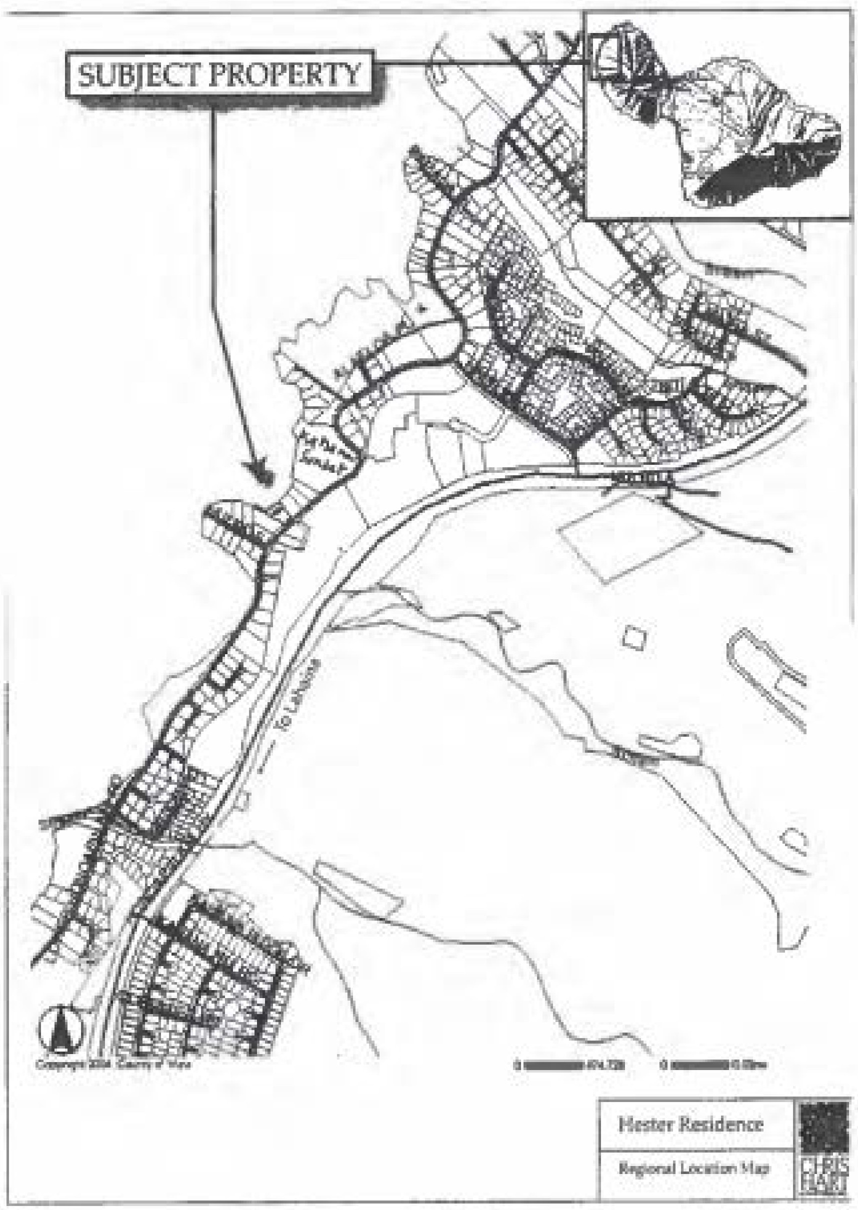

Fig. 1. Regional Location Map

Fig. 2. Hester residence is at center of photo, past palm trees, with overhanging *naupaka* hedge. Engledow photo 4/09

Fig. 3. Fishers on Haukoe Point, south of the subject property. Engledow photo 4/09

Fig. 4. Hester residence, seen from Haukoe Point. Note armored cliff on both sides of property. Engledow photo 4/09

Fig. 5. West Maui *ahupua'a* map, on display at Kapalua Resort's Kukui Room.

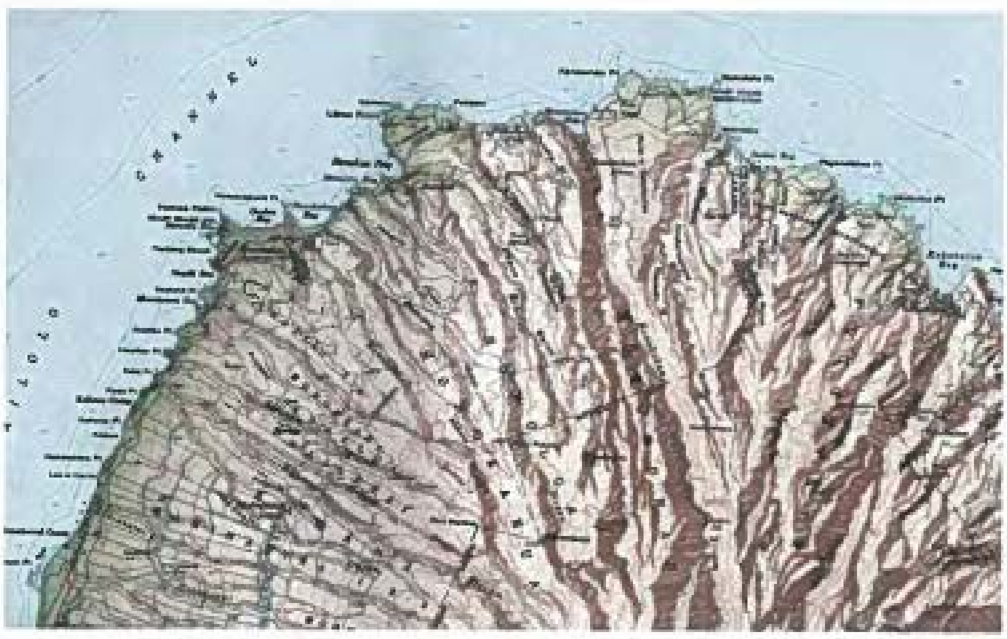
Fig. 6. Portion of U.S. Geological Survey map showing Ka'anapali District.

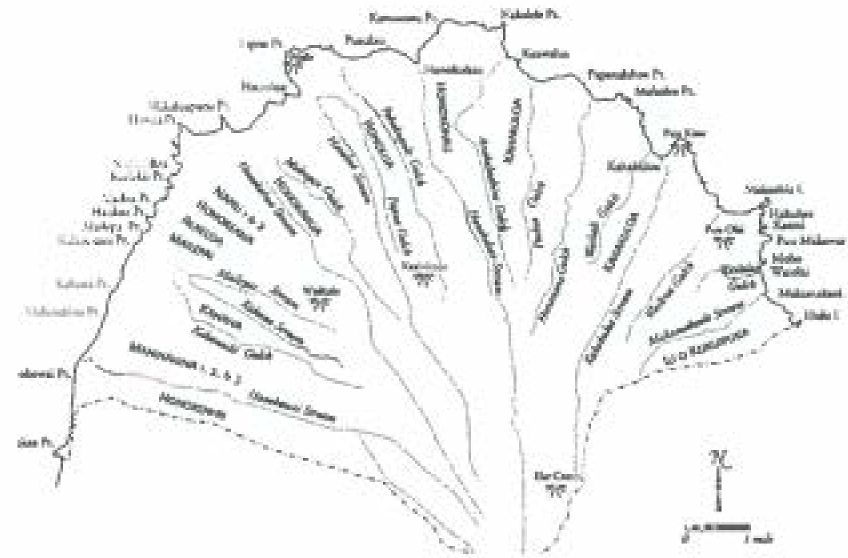

Fig. 7. West Maui *ahupua'a* and water courses. From *Sites of Maui* by Elspeth Sterling.

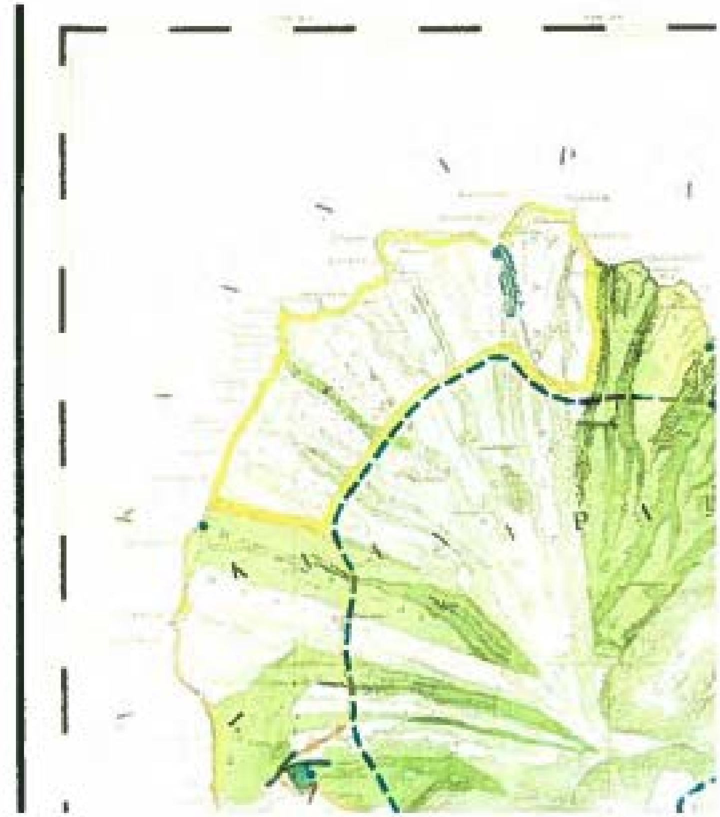

Fig. 8. Hawaiian Government Survey Map, 1885/1903. Yellow outline indicates grazing land.

Walter Hester Residence

Cultural Impact Assessment

I. Introduction

At the request of Chris Hart & Partners, Inc., researcher and writer Jill Engledow prepared this Cultural Impact Assessment of the property owned by Walter Hester at 4855 Lower Honoapi'ilani Highway, TMK (2) 4-3-015:003. This 19,214-square-foot property faces northwest on a cliff that drops to a small beach. It is backed on the southeast by Lower Honoapi'ilani Highway and flanked on either side by developed residential properties. An existing single-family house on the site was built in 1976. The proposed project will include demolition of this house, along with construction of a new single-family residence and a seawall. The proposed action that requires this Cultural Impact Assessment is an HRS Chapter 343 Environmental Assessment in support of an application for a Special Management Area Permit and a Shoreline Setback Variance. See project location in Figure 1.

The seawall is planned to stabilize the exposed bank of the cliff upon which this property stands. The bank has been eroding for some time. The Field Books containing information about this property in the Maui County Property Tax office show that in 1972, the lot totaled 21,620 square feet. In 1973, it was 21,340 square feet. In 1987, the book noted a "change in area and boundary due to erosion," and the current 19,214-square-foot size clearly demonstrates that the erosion is continuing. Landowners have attempted to slow this erosion by planting a thick naupaka hedge along the cliff's edge, but the lot is set high above the shore, and waves continue to pound the cliff at its base, potentially threatening public safety and silting up the water with earth and clay. The cliff already has been stabilized by vertical stone reinforcement along the rest of the bay, leaving the area under this parcel to bear the brunt of wave action. (Figures 2 and 4)

II. Report Methodology/Resource Materials Reviewed

Sources sited in archival research are listed in the attached bibliography. Additional searches included the Internet and the indexes of a variety of books on Hawaiian culture and history which were searched for the words 'Alaeloa, Mailepai and Nāpili. A number of commonly used texts about Hawaiian history included no specific references to 'Alaeloa and very few to the surrounding area. Among the works consulted without success were:

- *Ruling Chiefs of Hawaii, The People of Old, The Works of The People of Old, Tales and Traditions of the People of Old* (all by Samuel M. Kamakau)
- *Nānā I Ke Kumu, Volumes I* and *II* (Mary Kawena Pukui, E.W. Haertig, and Catherine A. Lee)
- *Hawaiian Antiquities* (David Malo)
- *Ke Alaloa O Maui* (Inez Ashdown)
- *Faith in Paradise* (Maggie Bunson)
- *Sugar Trains Pictorial* (Jesse C. Conde)
- *Sugar Water* (Carol Wilcox)
- *The Index to The Maui News* (Gail Bartholomew)
- *Hawaiian Almanac and Annual, 1875-1878* (Thomas G. Thrum)
- www.ulukau.org, which includes digital copies of old Hawaiian-language newspapers
- The Windley Files of the Lahaina Restoration Foundation
- The archives of Maui Historical Society

Engledow also conducted interviews with residents who remember uses in the area over the past 50 years.

III. Study Area Description

This site is a small residential parcel overlooking a small bay between 'Alaeloa and Haukoe Points. The property sits on a coastline that is highly developed, with much of Lower Honoapi'ilani Highway lined with walls and gates. The Hester residence is one of several private homes on the south side of the bay, while the Kahana Sunset condominium is on the northern end. The bay's small beach is accessible to the public only through the Kahana Sunset property, but a beach access path on Hui Road E leads out onto Haukoe Point at the south end of the bay, where a rocky point provides a platform for fishing. (Figure 3) A white sand beach fronts the Kahana Sunset, formerly called Keonenui, "the big sand," and later Yabui Beach (Young 1980:63)

While informant Alan Yabui recalls an intermittent stream that ran during Kona storms, a 1913 USGS drainage map reprinted in *Sugar Water* (Figure 7) shows no permanent waterway in this *ahupua'a*. Honokōhau Ditch (also known as Honolua Ditch) was completed in 1904 and rebuilt in 1913, but apparently did not tap any sources in the 'Alaeloa area. The ditch, constructed by Honolua Ranch, supplied water to Pioneer Mill. (Rice 1996:126-130)

IV. Study Area History

The subject property is located within the *ahupua'a* of 'Alaeloa in the district once known as Kā'anapali, but now known as Lahaina. In the Civil Code of 1859, "the twelve ancient districts of the island of Maui were reduced to four by combining Kaanapali with Lahaina. . ." (King, quoted in Sterling 1998:3). Prior to this time, the district of Lahaina extended to Keka'a, in the area that now is the Kā'anapali Resort. The district of Kā'anapali extended from Keka'a around the north coast of West Maui, past Kahakuloa, to near Hulu Island. (Figure 6)

Two Hawaiian proverbs seem to apply to this area of the Kā'anapali district. *Kā'anapali wāwae 'ula'ula* (red-footed Kā'anapali) is "a term of derision for the people of Kā'anapali. The soil there is red, and so the people are said to be recognizable by the red soles of their feet." A second seems to indicate that this was a productive area: *Ka ua leina hua o Kā'anapali* (the rain of Kā'anapali that leaps and produces fruit). (Pukui, *'Ōlelo No'eau* 1983:1280, 1581)

This area includes the famous Honoapi'ilani--the bays of Pi'ilani, including the major bays of Honokōwai, Honokeana, Honokahua, Honolua and Honokōhau. 'Alaeloa is just south of Honokeana. This name for the bays refers to the chief Pi'ilani, who controlled all of Maui Nui in the 15th century. While Pi'ilani is remembered for the peace and prosperity he brought to his kingdom, his sons, Lono-a-Pi'ilani and Kiha-a-Pi'ilani, fought each other, and succeeding generations fought battles in this West Maui neighborhood, some of which are described below.

Rich with fish, fed by streams that watered *lo'i kalo* in their valleys, the bays drew admiring attention in the song *Moloka'i Nui A Hina*. This song about Moloka'i, whose people view West Maui from across the channel, begins with the line *Ua nani nā hono a Pi'ilani:* How beautiful are the bays of Pi'ilani. These lovely bays are a symbol of Maui in other songs as well, such as *Maui Nani* by Johanna Koana Wilcox and *Lei Lokelani* by Charles E. King. Although the small coves of 'Alaeloa are not listed among the famous bays, they are certainly junior members of the family, tucked between Honokōwai and Honokeana.

The name 'Alaeloa translates as "distant mudhen," according to Pukui, but some contemporary informants related the word "*'alae*" to the area's red dirt. According to the *Hawaiian Dictionary, 'alaea* is "the water-soluble collodial ocherous earth used for coloring salt, for medicine, for dye and formerly in the purification ceremony called *hi'uwai.*" (Pukui and Elbert 1974:16) Silla Kaina, cultural resources coordinator for Kapalua Land Company, grew up in Honolua, and remembers her grandmother (from Hāna) collecting red dirt from 'Alaeloa cliffs which she boiled to make an iron-rich tea. Ms. Kaina says the dirt from this *ahupua'a* is redder than that in other *ahupua'a*.

W.M. Walker, in his notes on *Archaeology of Maui*, describes a *heiau* "on bluff at south side of rocky cove between 'Alaeloa and Papaua Points." He says this simple structure is a "small rectangular enclosure measuring 50 x 66 ft. . . . Use unknown. Several people thought it was a cattle pen." (Walker, Maui Historical Society)

Handy, in *Hawaiian Planter*, says that:

> On the south side of western Maui the flat coastal plain all the way from Kihei and Maalaea to Honokahua, in old Hawaiian times, must have supported many fishing settlements and isolated fishermen's houses, where sweet potatoes were grown in a sandy soil or red *lepo* near the shore. For fishing, this coast is the most favorable on Maui, and although a considerable amount of taro was grown, I think it reasonable to suppose that the large fishing population which presumably inhabited this leeward coast ate more sweet potatoes than taro with their fish. (Handy, quoted in Sterling 1998:17)

A 1985 archaeological study agrees with this opinion, finding few signs of irrigated *lo'i kalo* in the area near the subject parcel. The study, titled "Testing of Cultural Remains Associated with the Kahana Desilting Basin," says:

> An examination of the L.C.A. documents for the various *ahupua'a* of the general area, and field inspection of the gulch area immediately *mauka* of the project area strongly suggest that irrigation systems were not in use at Kahana. . . indeed for the three *ahupua'a* north of here, only two L.C.A. parcels with *lo'i* were recorded, and both were very small, presumably springfed, systems several miles inland . . . thus the Kahana settlement pattern in A.D. 1848 consisted of houselots, and at least one small fishpond, extending several miles inland along the banks of Kahana Stream. No houselots were claimed beyond a few hundred feet inland. This pattern also appears to hold for at least the next three *ahupua'a* to the north of Kahana --Mailepai, 'Alaeloa and Honokeana. (Walker and Rosendahl 1985:A-3)

However sparsely populated, the area around the subject parcel played its part in the great battles of the 1700s. Here is Sterling's summary of battles at Lahaina and Ka'anapali, taken from Fornander's *Account of the Polynesian Race:*

> [*Alapainui, on his return from Oahu, hears of the uprising of Kauhiaimokuakama against his brother Kamehamehanui. Kamehamehanui is defeated in Lahaina and flees with Alapainui to Hawaii.*]
>
> In the following year, say 1738, Alapainui returned to Maui with a large fleet, well-equipped, accompanied by Kamehamehanui. With headquarters at Lahaina, his forces extended from Ukumehame to Honokowai. . .

> [Kauhi sends to Peleioholani, moi of Oahu, for help] . . . which that restless and warlike prince accepted, and landing his fleet at Kekaha, encamped his soldiers about Honolua and Honokahua.
>
> It is said that Alapai proceeded with great severity against the adherents of Kauhi in Lahaina, destroying their taro patches and breaking down the watercourses out of the Kauaula, Kanaha, and Mahoma *[Kahoma]* valleys.
>
> *[Alapai reaches Lahaina before Peleioholani can get there from Oahu, and Kauhi retreats to the uplands and ravines behind Lahaina. Peleioholani lands and attacks Alapainui's forces in the hopes that he can form a junction with Kauhi's forces.]*
>
> To this effect Peleioholani advanced to Honokowai where he found a detachment of Alapai's army, which he overthrew and drove back with great loss to Keawawa. Here they rallied upon the main body of the Hawaii troops. The next morning Alapai had moved up his whole force, and a grand battle was fought between the Oahu and Hawaii armies. The fortune of the battle swayed back-and-forth from Honokowai to near into Lahaina . . . (Fornander, quoted in Sterling 1998:19)

Kamakau also describes this battle in *Ruling Chiefs*. He says that Alapa'i, in addition to drying up the streams in the Lahaina area, also "kept close watch over the brooks of Olowalu, Ukumehame, Wailuku and Honokowai." The hardest fighting, he says, "even compared with that at Napili and at Honokaua in Kaanapali," took place at Pu'unēnē. (Kamakau 1961:74) It may be that, rather than the better-known Pu'unēnē on the Central Maui isthmus, this refers to Pu'unēnē *mauka* of 'Alaeloa, which can be seen on a U.S. Geological Survey map (Figure 6).

More than a century later, when Western contact had greatly changed Hawaiian society, 'Alaeloa as well as other *'āina* across the islands began a transition that eventually led to the resort/residential neighborhood it is today. Before the *Māhele* of the 1840s and 1850s, 'Alaeloa was part of a large piece of land controlled by Laura Kanaholo Konia (c. 1807-1857). Laura Konia was an *ali'i nui* and was either a granddaughter or a grandniece of Kamehameha I; the identity of her father's father is uncertain. She married Abner Pākī and became the mother of Bernice Pauahi. Laura Konia held 22 *'āina* prior to the Māhele, almost all on Maui in the Kā'anapali district. She relinquished half to the king and was left with ll, of which eight were on Maui. 'Alaeloa was among them. With neighboring lands of Mahinahina, Napili, Mailepai and a portion of Honokeana, it became part of Land Commission Award 5524 and later Royal Patent 1663. (Kame'eleihiwa 1992:228, 246)

When Laura Konia died in 1857, her daughter Bernice Pauahi inherited this land. Documents on file in the state Bureau of Conveyances show that, in June 1860, Bernice Pauahi and Charles Bishop deeded this land to a number of individuals. This was the *Hui 'Āina o Mailepai*, an early example of a system Native Hawaiians established in order to maintain their traditional lifestyle, with residents of an *ahupua'a* having access to the resources of a much larger area than the small homestead of a *kuleana* lot. "A *hui* was a native cooperative, established to buy and manage *ahupua'a* (land divisions), using a modicum of Western legal structure to establish a very Hawaiian cooperative land-tenure social system." (Stauffer 2004:2) In 1932, the *Honolulu Star-Bulletin* published a series of essays by Leslie Watson, a civil engineer who worked for Alexander & Baldwin, Inc., in which he described this system. Because he worked for a Maui corporation, many of his examples are Maui-based, including details about the Mailepai Hui. Regarding the impetus for establishing *hui 'aina*, he wrote in the December 13 edition:

> The communal ideas, which had been developed through the course of centuries, were so deeply a part of the life of the Hawaiians as to make it but natural that the urge to continue such ideas should manifest itself; so shortly after 1850 the Hawaiian land hui was born. Thus it is evident that the fundamental reason for the huis was that ownership of an undivided interest in a large tract of land was far more adaptable to the Hawaiians' needs and background than ownership in entirety of small parcels.

In his December 14 article, Watson went into detail about the Mailepai Hui:

> Mailepai hui land consisted of a 2,825 acre tract in the district of Kaanapali, Maui, running from the sea up into the forest. The land was originally owned by L. Konia and was inherited by Bernice Pauahi Bishop. A certain Naiapaakai formed "Mailepai hui" for the purpose of acquiring the land. In 1860, the land was conveyed to Naiapaakai and 105 others.
>
> An unusual feature was that Naiapaakai gave "deeds" in the form of printed slips which bear his signature to members as they paid in their $25 contributions to the purchase price. The Hawaiians received title, however, under the deed from Bernice Pauahi Bishop. These slips, which came to be known as Naiapaakai certificates, read substantially as follows: "Know all men by these presents that -------- of ---------- is possessed of a share in fee simple in the land of Bernice Pauahi Bishop at Kaanapali as described in the deed now in my possession. On account of his paying $25 towards the purchase price of the land he is entitled to a 1-113th undivided interest in the land. (Signed) D. K. Naiapaakai, agent for the people of the hui."
>
> Naiapaakai's own certificate shows a contribution of $200 and gives 8-

113th as his share. [His eight shares brought the total of shares from 105 to 113.]

> These interesting certificates were, in many cases, transferred by one individual to another . . . Thus title to a considerable number of the shares was passed from one individual to another without having deeds prepared and recorded. In the partition of the hui in 1930-1931 these certificates, if properly endorsed, were given the status of recorded deeds.
>
> In many cases Baldwin Packers Ltd., the largest shareholder, had what appeared to be perfect record title to shares but the company recognized title transfers as evidenced by the endorsed certificates as having priority over record titles originating in deeds of a later date. . .
>
> Mailepai hui was a well-organized hui and had regular meetings until about 20 years ago when interest in the hui waned. The allotment system was well established, however, and had a prominent part in the partition proceedings.

Baldwin Packers was the petitioner in this 1931 partition. Henry Perrine Baldwin acquired most of the company's land (when it was known as Honolua Ranch) by the end of the 19th century through a series of land grants and purchases. (Cameron et. al 1987:7) According to Laurel Murphy, who is writing a history of the Baldwin family, Baldwin bought many small pieces of land from members of the Mailepai Hui before his death in 1911. Originally used for grazing, the ranch gradually switched over to planting various crops in the early 20th century. (Figure 8) A map in the book *Plantation Days* shows plantings of aloe vera, mangoes, avocados and lychees *mauka* of the subject property, across the road that would become Lower Honoapi'ilani Highway and railroad tracks that transported pineapple to the company's Lahaina cannery in the early 1900s. (Figure 9) (Cameron et al. 1987:5)

Pineapple was planted by manager David T. Fleming, hired by Baldwin in 1911 to oversee Honolua Ranch. Fleming, who experimented with many crops in addition to pineapple, also owned assorted parcels of land along this coast, including some in the neighborhood of the subject parcel. His granddaughter, Ginger Gannon, said he had a beach house at 'Alaeloa. In 1932, Fleming planted 10 acres of aloe (apparently the field depicted in Figure 9), which he attempted to develop as a marketable product. Though he was before his time, and the project was never commercially successful, Ginger Gannon recalls that "We always had creams and salves" made by her grandfather, and "they worked!" Possibly this field was the source for the aloe vera plants which are ubiquitous in home gardens all over Maui. Over the years, the ranch (renamed Baldwin Packers in 1924) gradually replaced its grazing land with pineapple plantings, which totaled 3,500 acres when *Plantation Days* was written in 1987. Baldwin Packers merged with Maui

Pineapple Company in 1962, and the Honolua area which was its headquarters became the Kapalua Resort, while the land south of Honolua, including the Mailepai Hui land, was developed as a residential and resort neighborhood.

V. Oral Interviews

Methodology, Procedures, and Interviewee Biographical/Organizational Information

In addition to personal contact with individuals listed below, letters briefly outlining the development plans along with a map of the project site were sent to organizations whose jurisdiction includes knowledge of the area, asking for input on this report. Letters were sent to the headquarters of the Office of Hawaiian Affairs, to Thelma Shimaoka, coordinator of the Maui branch of the Office of Hawaiian Affairs, and to the Lahaina Hawaiian Civic Club. A legal ad in The Maui News requested information from anyone with knowledge of cultural practices around this parcel; no replies were received.

OHA Administrator Clyde W. Nāmu'o responded for that agency, saying in a May 6, 2009 letter: "While OHA understands the specific intent of this proposed seawall is to prevent further erosion of the shoreline cliffs fronting the subject parcel, we generally do not support the construction of seawalls because they often lead to increased shoreline erosion such as the effects mentioned in your letter. Increased erosion contributes to environmental damage and inhibits beach access for traditional and customary practices."

The Napili Canoe Club, which is headquartered in Kā'anapali at Hanaka'ō'ō Beach, does paddle along the shore as far north as this cove. Contacted by phone on May 11, 2009, club president Jeanne Gonzalez declined to comment on the subject property, saying that the club does not take an official stand on anything political because it is a 501(c)3 organization, and they view anything having to do with development issues as political.

Several individuals were interviewed, only one of whom actually lived in 'Alaeloa. Others lived in the general area and were able to talk about the lifestyle of this part of West Maui a generation ago.

Two women who formerly lived in the Nāpili area shared memories of the lifestyle they enjoyed during their youth. Gwen Lutey and Frances Kalua were interviewed in an informal meeting at the Hale Mahaolu Eono senior housing in Lahaina March 31. Also present was historical author Katherine Smith.

Frances Kalua lived in Nāpili. Her family had lived in the area for generations. Her grandfather, August Reimann, had a little ranch, with a windmill to draw water from a well for the animals. [August Reimann and other family members are listed in the Mailepai partition document and in census documents of the area from 1900.] Ms. Kalua does not recalls hearing that there used to be a fishing village in the area, and no one talked much about it. In her childhood, her aunt was the *kilo i'a*, watching from above Honolua Bay to find schools of fish. This aunt was adept at making throw nets. People would lay net and share the fish they caught. There was also plenty of the *limu* known as *lipe'e*. The shellfish known as *pipipi* were big and plentiful. They were boiled and then picked out of their shells with a pin, a process Ms. Kalua said was tedious but worth it because the *pipipi* were tasty. Another shellfish, the *kupe'e*, lived in the sand and could be found only on starry nights, and people went down to the beach to catch sand crabs as well. Her aunt delivered mail in the area, and picked up goods from Lahaina for anyone in the neighborhood who asked, dropping them off when they delivered the mail.

Gwen Amaral Lutey grew up on Nāpili Bay. Like Ms. Kalua, she remembered a rural, traditional cooperative lifestyle, in which families lived off the land. They raised chickens, pigs and ducks and shared with others. Her grandmother made 300 loaves of bread at a time and the family worked together to make and sell the bread. David Fleming loved fishing, and set up a commercial operation to catch the large schools of *akule* in Honolua Bay, where the best fishing was. Some of the fish were divided among families, who would take them home to eat or dry.

Native plants were used to some extent. *Noni* was easily available, and Ms. Kalua and her brothers used to ride horses to collect *koko'olau* and pick mountain apples. Both Ms. Kalua and Mrs. Lutey recalled seeing *akualele* [defined in Pukui's *Hawaiian Dictionary* as meteors] during the day and night.

Both women praised David Fleming, saying that he sold parcels in the lower portion of Mailepai Hui to local families for $500. "He never forgot the people," Mrs. Lutey said.

Asked about potential cultural impacts of the proposed project, Ms. Kalua commented that she believes putting a stone retaining wall along the cliff desecrates the area.

Alan Yabui, interviewed April 13, 2009, by telephone, spent some of his childhood living at the site of the present Kahana Sunset. He is now a resident of Bothell, Washington, where he teaches classes in Hawaiian history, intercultural communication and history of the Japanese internment camps. He and his wife visit Maui often.

Mr. Yabui's grandfather, Yoshimatsu Yabui, was the Lahaina Cannery supervisor, and his son Yoshihara Yabui (Alan's father) also worked as a cannery supervisor. Yoshimatsu Yabui was a good friend of D.T. Fleming, who often visited the Yabui family home to relax with his friend under a hau tree. Because this home was on the site of the current Kahana Sunset, Keonenui Beach is often called Yabui Beach. Mr. Fleming also gave his friend a piece of land (less than an acre) in exchange for Mr. Yabui allowing Baldwin Packers to remove some sand from the dunes on his property in order to make a concrete floor for an expansion at the Lahaina Cannery in the space now occupied by the ABC

Store and the *mauka* space with several stores, a restaurant, and Starbucks.

Mr. Yabui said his grandfather brought this property in 1939 from a Chinese merchant in Lahaina who had decided to go back to China. The Mailepai Hui partition document includes Allotment 16 to Ah Cheen of Lahaina, with a boundary description that seems to match that of the Yabui property. Mr. Yabui said he remembers that the name began with the letter "C." Mr. Yabui thinks there must have been a Hawaiian village there at one time--rocks that his grandfather dug up, now used in the walls around the Kahana Sunset, were weathered when his grandfather found them, so they might have come from that village. Some of the rocks were dark-blue basalt, adze-quality stone. His grandfather planted ti plants and mango trees that are still growing on the Kahana Sunset property. His grandfather also had poi pounders and *'ulu maika* stones, but Mr. Yabui is not sure whether his grandfather found these artifacts or whether David Fleming gave them to him.

The tsunami of April 1, 1946, turned a neighbor's home near Yoshimatsu Yabui's family home on the Lahaina shoreline (now the parking lot near the entrance to Lahaina Luau) upside down, so Mr. Yabui's grandfather bought the house structure and moved it to Alaeloa and fixed it up over the next four years.

Alan's mother contracted TB in 1943 was sent to Kula Sanatorium (before penicillin, to recover) and he was raised by his grandparents and lived with them after the April 1, 1946, tidal wave in a house in "Cannery Camp," now the location of the Lahaina Lū'au. Later, after 1946, his grandparents moved to another house in "Cannery Camp," which is now the site of the main performance stage at Lahaina Lū'au. His grandfather retired in 1950 and at age 10 he moved to the now Kahana Sunset. He lived there until he left for college at age 18.

Mr. Yabui remembers that Dr. William Dunn lived on the lot that is the site of the Hester residence. Dr. Dunn retired from his position at the Pioneer Mill Co. hospital in 1948. (*The Maui News*, June 30, 1948) Dr. Dunn's daughter (who was a teacher at Kamehameha III School) and her daughter lived adjacent in a Quonset hut, next to the Dunn home. Other neighbors were well-known Maui hula teacher Emma Sharpe and her husband, David. [Mrs. Sharpe's mother, Annie Farden, is mentioned in the Mailepai Hui partition document.] David Sharpe used a World War II-era landing boat to spread fishing nets with Hawaiian residents in the Kahana area. Mr. Yabui and his father helped in a hukilau-type fishing event near Kahana Sunset.

Mr. Yabui said there was a stream that ran intermittently; a dip in the road crossing the stream bed (between the Dunn and Sharpe properties), that intermittently flowed when heavy Kona rain came onshore from the ocean side. He used to go up into the valley above his home, walking on the pineapple field roads, where some native plants still grew. In those days, however, "Hawaiian culture was submerged," he said, and there was little discussion or practice of native cultural matters.

VII. Confidential information withheld; Conflicts in information or data

No confidential information was withheld. There were no conflicts in information or data within the reports consulted for this Cultural Impact Assessment.

VIII. Conclusion

After making site inspections, interviewing knowledgeable people of the area and conducting documentary research on the subject property and the area around it, it appears that the proposed action does not interfere with any known Hawaiian or non-Hawaiian gathering, practices, protocols or access.

Because the subject property has long been developed for residential use and because this cliff-top lot does not provide access to the shoreline, construction of a new house is unlikely to have an impact on use of the shoreline. There appear to be few if any other cultural resources that might be impacted by the building on the site. Other than one negative opinion from Mrs. Frances Kalua and a comment from OHA, armoring of the cliff below the property does not seem to be a cultural issue with anyone interviewed for this report. It is instead an environmental issue, and decisions about the impact of that action are more properly addressed by experts on the health of the shoreline.

###

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Appendices

INFORMATION RELEASE FORM

I, the undersigned, participated in an interview in Lahaina with Jill Engledow, representing Walter Hester, on March 31, 2009.

I understand that the information I provided to Jill Engledow will be submitted as part of a Cultural Impact Assessment report on the building of the seawall and Hester residence at TMK: (2) 4-3-015:003.

I have read Engledow's summary of the interview, and the information is true and accurate to the best of my knowledge. The summary contains no confidential information. By signing this release form, I am providing my approval for the release of the information to Walter Hester for the purpose outlined above.

Print name: [illegible]

Signature: [illegible]

Release dated: [illegible]-20-2009

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WITH CORRECTIONS [illegible]

Print name: F[illegible] L. [illegible]

Signature: [signature]

Release dated: 26-01-09

COPY KEPT ON THIS!

AFFIDAVIT OF PUBLICATION

STATE OF HAWAII, } ss.
County of Maui. }

Rhonda M. Kurohara being duly sworn deposes and says, that she is in Advertising Sales of the Maui Publishing Co., Ltd., publishers of THE MAUI NEWS, a newspaper published in Wailuku, County of Maui, State of Hawaii; that the ordered publication as to

Information Wanted for Cultural Impact Assessment

of which the annexed is a true and correct printed notice, was published 2 times in THE MAUI NEWS, aforesaid, commencing on the 29th day of March, 2009, and ending on the 31st day of March, 2009, (both days inclusive), to-wit: on

March 29, 31, 2009

and that affiant is not a party to or in any way interested in the above entitled matter.

[signature]

This 1 page Information Wanted, dated March 29, 31, 2009, was subscribed and sworn to before me this 31st day of March, 2009, in the Second Circuit of the State of Hawaii, by Rhonda M. Kurohara.

[signature]

Notary Public, Second Judicial Circuit, State of Hawaii

LEILA ANN L. LEONG
My commission expires 11-23-11

Information Wanted for Cultural Impact Assessment

Maui Island Press requests information on culture resources or activities on or near this parcel in Napili, Maui: TMK (2) 4-3-015:003.

Please contact MIP within 30 days at (808)343-5459.

(MN Mar. 29, 31, 2009)

Appendix D

Early Consultation

Jeff Seastrom

From:	Javar-Salas, Chelsie <chelsie_javar-salas@fws.gov>
Sent:	Monday, July 15, 2024 7:04 AM
To:	223035-01 Barto Hester SMA - Keonenui Bay
Subject:	Technical Assistance for the Proposed Coastal Stabilization Project located at 4855, 4869, and 4871 Lower Honoapiʻilani Road, Keonenui Bay
Attachments:	IPaC Info Letter_Species List Instructions_PIFWO_20Apr2022_Final.pdf

Dear Jeffrey Overton,

Thank you for the opportunity to comment on the Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance for the Proposed Coastal Stabilization Project located at 4855, 4869, and 4871 Lower Honoapiʻilani Road, Keonenui Bay, Nāpili, Maui Island [TMKs (2) 4-3-015:002, 003 and 052]. The U.S. Fish and Wildlife Service (Service) has updated how we manage our technical assistance workload and process section 7 consultations.

The U.S. Fish and Wildlife Service (Service) has streamlined portions of the consultation process. Your first step in our updated process is to obtain an Official Species List in our new Information for Planning and Consultation (IPaC) online tool, for which a link can be found at the box in top left corner of the this home page: **https://ecos.fws.gov/ecp/**.

After entering basic project information, including a map of the project (you can use the map drawing tool or upload a GIS polygon that contains the project area(s)), please navigate to request an Official Species List. In addition to creating your species list, this process automatically generates an ECOSphere Project in our system, facilitating our work on your project. Each submitted project is assigned a unique Project Code; please provide this Project Code in any correspondence with our office relating to the project.

Your IPaC-generated Official Species List will include all federally listed species, critical habitat, migratory birds, and wetland habitat that occurs, or may transit through, the project vicinity. For projects in Hawaiʻi, each species on your Official Species List page (links directly below it) provides the Service's recommended avoidance and minimization measures for that species. Our general avoidance and minimization measures for both animals and plants are provided at our website here: https://www.fws.gov/office/pacific-islands-fish-and-wildlife/library, please refer to them in the preliminary stages of project design.

A few IPAC tips:

- If you upload a polygon for your project area, please include all sites in a single file. Otherwise, you will get a project code for every site. To facilitate your closer look at which species may occur within smaller portions of your project site, you may use IPaC's functionality, without making the Official Species List request.
- Unless you are a Federal agency with an existing programmatic consultation with us, you can ignore any prompts to further your consultation in IPaC or to use D Keys.
- Once you have an established account in Login.gov, you may access IPaC directly at **https://ipac.ecosphere.fws.gov/** or continue to access IPaC via the home page at **https://ecos.fws.gov/ecp/**, accessing IPaC in the upper left hand corner.
- Additional background information about IPaC:
  - Your offical IPaC species list is based on species' range maps shown on each species' page in https://ecos.fws.gov/ecp/.
  - Survey the project footprint and adjacent areas that may be affected by project-related increases in noise, lighting, invasive species, wildfire, and other stressors. Use the survey data to inform project design and your analysis of the effects of the action to the species.
  - Address all the species in the Official Species List in your effects analysis.

- Incorporate the Service's recommended avoidance and minimization measures to the extent you can, and coordinate with our office for project-specific technical assistance when the avoidance measures can't be implemented.

Please do not hesitate to contact me or pifwo_admin@fws.gov for additional assistance.

Mahalo, Chelsie

Chelsie Javar-Salas (she/her) | Island of Hawaiʻi and Maui Nui Island Team | U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office | 300 Ala Moana Blvd., Room 3-122 Honolulu, HI 96850 | email: chelsie_javar-salas@fws.gov | website: https://www.fws.gov/office/pacific-islands-fish-and-wildlife

JOSH GREEN M.D.
GOVERNOR
KE KIAʻĀINA

KEITH A. REGAN
COMPTROLLER
KA LUNA HOʻOMALU HANA LAULĀ

MEOH-LENG SILLIMAN
DEPUTY COMPTROLLER
KA HOPE LUNA HOʻOMALU HANA LAULĀ

STATE OF HAWAIʻI | KA MOKUʻĀINA O HAWAIʻI
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES | KA ʻOIHANA LOIHELU A LAWELAWE LAULĀ
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)24.154

JUN 2 7 2024

Jeffrey H. Overton, AICP, LEED, AP
Group 70 International, dba G70
111 South King Street, Suite 170
Honolulu, Hawaiʻi 96813

Dear Jeffery Overton:

Subject: Coastal Stabilization at 4855, 4869, and 4873 Lower Honoapiʻilani Road, Maui
Early Consultation for Environmental Assessment, Special Management Area
Use Permit, and Shoreline Setback Variance
TMK: (2) 4-3-015:002, 003, and 052, Kaʻeʻenui Bay, Nāpili, Maui, Hawaiʻi

Thank you for the opportunity to provide comments on the subject project. The project does not impact any of the Department of Accounting and General Services' projects or existing facilities in the vicinity of the subject site(s), and we have no comments to offer at this time.

If you have any questions, your staff may call Dennis Chen of the Planning Branch at (808) 586-0491 or contact him via e-mail at dennis.yk.chen@hawaii.gov.

Sincerely,

GORDON S. WOOD
Public Works Administrator

DE:mo

JOSH GREEN, M.D.
GOVERNOR

KEITH T. HAYASHI
SUPERINTENDENT

STATE OF HAWAIʻI
DEPARTMENT OF EDUCATION
KA ʻOIHANA HOʻONAʻAUAO
P.O. BOX 2360
HONOLULU, HAWAIʻI 96804

OFFICE OF FACILITIES AND OPERATIONS

July 19, 2024

Mr. Jeffrey H. Overton, AICP, LEED AP
G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Re: Coastal Stabilization at 4855, 4869 & 4871 Lower Honoapiilani Road
Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance
TMK (2)4-3-015:002, 003 & 052, Keonenui Bay, Napili, Maui, Hawaii

Dear Mr. Overton:

Thank you for your letter dated June 21, 2024. Based on the information provided, the proposed project will not impact the Hawaii State Department of Education Facilities.

Should you have any questions, please contact Cori China of the Facilities Development Branch, Planning Section, at (808) 784-5080 or via email at cori.china@k12.hi.us.

We appreciate the opportunity to comment.

Sincerely,

Roy Ikeda
Interim Public Works Manager
Planning Section

RI:ctc
c: Facilities Development Branch

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

June 26, 2024

MEMORANDUM

FROM: ~~TO:~~

DLNR Agencies:
X Div. of Aquatic Resources (kendall.l.tucker@hawaii.gov)
__ Div. of Boating & Ocean Recreation
X Engineering Division (DLNR.ENGR@hawaii.gov)
X Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
__ Div. of State Parks
X Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
X Office of Conservation & Coastal Lands (sharleen.k.kuba@hawaii.gov)
X Land Division – Maui District (dlnr.land.maui@hawaii.gov)
X Land Division – Ian C. Hirokawa (ian.c.hirokawa.@hawaii.gov)
X Land Division – Rebecca L. Anderson (rebecca.l.anderson@hawaii.gov)
__ Aha Moku Advisory Committee

TO: ~~FROM:~~ Russell Y. Tsuji, Land Administrator *Russell Tsuji*

SUBJECT: **Coastal Stabilization –** Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance

LOCATION: ; TMKs: (2) 4-3-015: 002, 003, & 052 G70 on behalf of the Barto, Hester, and

APPLICANT: Lusardi Families

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit any comments by **July 19, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: [signature]

Print Name: Carty S. Chang, Chief Engineer

Division: Engineering Division

Date: Jun 28, 2024

Attachments
cc: Central File

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Coastal Stabilization – Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance
LOCATION: Keonenui Bay, Napili, Island of Maui
TMK(s): (2) 4-3-015: 002, 003, & 052
Applicant: G70 on behalf of the Barto, Hester, and Lusardi Families

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). Be advised that 44CFR, Chapter 1, Subchapter B, Part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible for researching the Flood Hazard Zone designation for the project. Flood zones subject to NFIP requirements are identified on FEMA's Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMA's Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (fhat.hawaii.gov) could also be used to research flood hazard information.

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7139.
- Kauai: County of Kauai, Department of Public Works (808) 241-4849.

Signed: [signature]
CARTY S. CHANG, CHIEF ENGINEER

Date: Jun 28, 2024

MA-24-204

AW

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
OFFICE OF CONSERVATION AND COASTAL LANDS

2024 JUN 26 P 3:44

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

RECEIVED LAND DIVISION
2024 JUL 10 AM 10:23
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

June 26, 2024

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources (kendall.l.tucker@hawaii.gov)
__ Div. of Boating & Ocean Recreation
X Engineering Division (DLNR.ENGR@hawaii.gov)
X Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
__ Div. of State Parks
X Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
X Office of Conservation & Coastal Lands (sharleen.k.kuba@hawaii.gov)
X Land Division – Maui District (dlnr.land.maui@hawaii.gov)
X Land Division – Ian C. Hirokawa (ian.c.hirokawa.@hawaii.gov)
X Land Division – Rebecca L. Anderson (rebecca.l.anderson@hawaii.gov)
__ Aha Moku Advisory Committee

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: **Coastal Stabilization** – Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance
LOCATION: Keonenui Bay, Napili, Island of Maui; TMKs: (2) 4-3-015: 002, 003, & 052
APPLICANT: G70 on behalf of the Barto, Hester, and Lusardi Families

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit any comments by **July 19, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: [signature]
Print Name: Michael Cain
Division: OCCL
Date: 7/8/2024

Attachments
cc: Central File

JOSH GREEN, M.D.
GOVERNOR | KE KIAʻĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIAʻĀINA

STATE OF HAWAIʻI | KA MOKUʻĀINA ʻO HAWAIʻI
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA ʻOIHANA KUMUWAIWAI ʻĀINA

P.O. BOX 621
HONOLULU, HAWAII 96809

DAWN N.S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RYAN K.P. KANAKAʻOLE
FIRST DEPUTY

DEAN D. UYENO
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

REF: OCCL: AW

COR: MA-24-204
Jul 8, 2024

MEMORANDUM

TO: Russell Y. Tsuji, Administrator
Land Division Administrator

FROM: Michael Cain, Administrator *S Michael Cain*
Office of Conservation and Coastal Lands (OCCL)

SUBJECT: Coastal Stabilization – Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance, Keonenui Bay, Tax Map Keys (TMKs) (2) 4-3-015: 002., 003, 052.

According to the information provided in the proposal letter, the location of the proposed construction would be mauka of the shoreline, and therefore outside of the Conservation District boundaries. However, according to our records review there is not a current certified shoreline for the three properties included in this proposal. The most recent certified shorelines available for parcels 002 (1998) and 003 (2009) indicate that the certified shoreline was at the face of the cliff and/or previously installed retaining walls or seawalls. There is no certified shoreline on record for parcel 52. Recent photographs further indicate that the upper wash of the waves has advanced to remain at the face of the cliff. The cross section conceptual drawing in the proposal illustrates a buried toe of the fortification structure. It is unclear in the documentation provided how a buried toe would be placed mauka of the shoreline, and outside of the Conservation District boundary. A current certified shoreline for the subject parcels will determine the boundary of the Conservation District.

Should you have any questions, please feel free to contact Amy Wirts, Sea Grant Extension Agent and Coastal Lands Program Coordinator at DLNR OCCL at Amy.E.Wirts@hawaii.gov.

STATE OF HAWAIʻI
OFFICE OF PLANNING
& SUSTAINABLE DEVELOPMENT

235 South Beretania Street, 6th Floor, Honolulu, Hawaiʻi 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaiʻi 96804

JOSH GREEN, M.D.
GOVERNOR

SYLVIA LUKE
LT. GOVERNOR

MARY ALICE EVANS
DIRECTOR

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: https://planning.hawaii.gov/

Coastal Zone Management Program

Environmental Review Program

Land Use Commission

Land Use Division

Special Plans Branch

State Transit-Oriented Development

Statewide Geographic Information System

Statewide Sustainability Branch

DTS 202406250834DO

July 15, 2024

Mr. Jeffrery H. Overton
Group 70 International, Inc., dba G70
111 South King Street, Suite 170
Honolulu, Hawaiʻi 96813

Dear Mr. Overton:

Subject: Environmental Assessment Early Consultation for Coastal Stabilization at 4855, 4869 and 4871 Lower Honoapiʻilani Road, Keonenui Bay, Nāpili, Maui, Hawaiʻi; Tax Map Key: (2) 4-3-015: 002, 003 and 052.

The Office of Planning and Sustainable Development (OPSD) is in receipt of your early consultation request, received June 25, 2024, on the preparation of an Environmental Assessment (EA), for the proposed shoreline stabilization project at 4855, 4869 and 4871 Lower Honoapiʻilani Road, Keonenui Bay.

According to the request, the properties of Barto, Hester and Lusardi families located on Keonenui Bay propose a shoreline stabilization project. The proposed project calls for fortification of the lower conglomerate soil layers with shotcrete that will be coupled with a bench in between the fortified unit and upper soils with retaining wall(s).

Shotcrete is concrete or mortar conveyed through a hose and pneumatically projected at high velocity onto a surface. It is typically reinforced by conventional steel rods, steel mesh, or fibers. Installation would include excavation down to hard-bottom or below scour depth and then apply shotcrete to the face of the existing semi-lithified conglomerate, up to about 14 feet mean sea level (MSL). A key design element is excavation and application of reinforcing materials starting at scour depth.

The OPSD has reviewed the subject request, and has the following comments to offer:

1. The EA shall discuss all triggers of the subject EA set forth in Hawaiʻi Revised Statutes (HRS) Chapter 343, and list all required permits and approvals for the proposed shoreline stabilization project.

2. The Hawai'i Coastal Zone Management (CZM) Law, HRS Chapter 205A, requires all state and county agencies to enforce the CZM objectives and policies. The subject EA should include an assessment with mitigation measures as to how the proposed action conforms to each of the CZM objectives and supporting policies set forth in HRS Chapter 205A-2, as amended.

3. The subject EA would be the supporting document for the applications for a SMA Use Permit and Shoreline Setback Variance. The OPSD recommends that the EA specifically discuss the compliance with the requirements of the adopted SMA Rules and Shoreline Rules from the County of Maui Planning Commission by consulting with the County of Maui Planning Department.

   Please note that shoreline setback variance is an exception to the prohibition of structures and activities within the shoreline areas as defined in HRS § 205A-41. Pursuant to HRS § 205A-46(a)(9), as amended, shoreline hardening structures may be granted with a variance by consideration of hardship. Hardship shall follow the standards set forth in the shoreline rules approved by the County of Maui Planning Commission and adopted by the Mayor of Maui County. However, shoreline hardening structures shall not be granted in areas with sand beaches unless the granting of the variance is clearly demonstrated to be in the interest of the public. The interest of the public includes a) public safety and/or public health; b) protection of public infrastructure in response to risk of coastal hazards; and c) beach protection and sand retention for public use and recreation or coastal ecosystems.

4. According to the review material, no work is proposed makai of the shoreline. The EA shall provide a current shoreline certified by the Board of Land and Natural Resources to ensure the proposed shoreline stabilization action will not occur in makai of the shoreline.

5. To assess potential impacts of sea level rise on the property area, the OPSD suggests the EA refer to the findings of the Hawai'i Sea Level Rise Vulnerability and Adaptation Report 2017 and its 2022 update, accepted by the Hawai'i Climate Change Mitigation and Adaptation Commission. The Report, and Hawai'i Sea Level Rise Viewer at https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/ particularly identifies a 3.2-foot sea level rise exposure area across the main Hawaiian Islands which may occur in the mid to latter half of the 21st century. The EA should provide a map of the 3.2-foot sea level rise exposure area in relation to the property area, discuss impacts of 3.2-foot sea level rise and shoreline erosion on the properties. Pursuant to Hawai'i Administrative Rules (HAR) § 11-200.1-18, the

EA needs to consider alternatives to the proposed action, and assess their potential impacts respectively.

6. The EA shall provide and discuss the site-specific Best Management Practices (BMPs) in detail to prevent any runoff, sediment, soil and debris potentially resulting from associated construction activities from adversely impacting the coastal ecosystems and the State waters as specified in HAR Chapter 11-54.

7. In enacting Act 224, Session Laws of Hawaiʻi 2005, the legislature found that light pollution in Hawaiʻi's coastal areas and artificial lighting illuminating the shoreline and ocean waters can be disruptive to avian and marine life. Pursuant to HRS § 205A-30.5, exterior lighting and lamp posts associated with the proposed action shall be cut-off luminaries to provide the necessary shielding to mitigate potential light pollution in the coastal areas and lessen possible seabird strikes. No artificial light from the proposed action shall be directed to travel across the property boundary toward the shoreline and ocean waters.

If you respond to this comment letter, please include DTS 202406250834DO in the subject line. For any questions regarding this letter, please contact Shichao Li of our office at (808) 587-2841 or by email at shichao.li@hawaii.gov.

Sincerely,

Mary Alice Evans

Mary Alice Evans
Director

RICHARD T. BISSEN, JR.
Mayor

LORI TSUHAKO
Director

SAUMALU MATAAFA
Deputy Director

DEPARTMENT OF HOUSING
& HUMAN CONCERNS
COUNTY OF MAUI
2200 MAIN STREET, SUITE 546
WAILUKU, MAUI, HAWAII 96793
PHONE: (808) 270-7805

June 27, 2024

Jeffrey H. Overton, AICP, LEED AP, Principal
Group 70 International, Inc., dba G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. Overton:

SUBJECT: COASTAL STABILIZATION AT 4855, 4869, & 4871 LOWER HONOAPIILANI ROAD EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT, SPECIAL MANAGEMENT AREA USE PERMIT, AND SHORELINE SETBACK VARIANCE TMK (2) 4-3-015:002, 003 & 052, KEONENUI BAY, NAPILI, MAUI, HAWAII

The Department has reviewed the information submitted for the above subject project. Based on our review, we have determined that the project is not subject to Chapter 2.96, Maui County Code, and does not require a residential workforce housing agreement. At the present time, the Department has no additional comments to offer.

Please be advised the Department of Housing and Human Concerns will be bifurcated into two separate departments effective July 1, 2024. Should you have any questions, please contact Mr. Buddy Almeida, Housing Administrator with the Department of Housing, at (808) 270-7351.

Sincerely,

LORI TSUHAKO, LSW, ACSW
Director of Housing and Human Concerns

cc: Buddy Almeida, Housing Administrator

RICHARD T. BISSEN, JR.
Mayor

JOSIAH K. NISHITA
Managing Director

PATRICK S. MCCALL
Director

SHANE T. DUDOIT
Deputy Director

DEPARTMENT OF PARKS AND RECREATION
COUNTY OF MAUI
700 HALI'A NAKOA STREET, UNIT 2
WAILUKU, MAUI, HAWAI'I 96793
www.mauicounty.gov

July 1, 2024

Jeffrey H. Overton, AICP, LEED AP
Group 70 International, Inc., dba G70
111 S. King Street, Suite 170
Honolulu, HI 96813

Dear Mr. Overton:

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT, SPECIAL MANAGEMENT AREA USE PERMIT, AND SHORELINE SETBACK VARIANCE, COASTAL STABILIZATION AT 4855, 4869 & 4871 LOWER HONOAPI'ILANI ROAD, TMK (2) 4-3-015:002, 003 & 052, KEONENUI BAY, NAPILI, MAUI, HAWAI'I

Thank you for the opportunity to review and comment on the subject project. The Department of Parks and Recreation has no comment at this time.

Should you have any questions, please feel free to contact me or Samual Marvel, Chief of Planning and Development, at samual.marvel@co.maui.hi.us or (808) 270-6173.

Sincerely,

PATRICK S. MCCALL
Director of Parks and Recreation

c: Samual Marvel, Chief of Planning and Development

PSM:SAM:gh

Jeff Seastrom

From: Nagata, Sarah <Sarah.Nagata@hawaiianelectric.com>
Sent: Monday, July 8, 2024 9:20 PM
To: 223035-01 Barto Hester SMA - Keonenui Bay
Cc: Liu, Rouen; McNeff, Mathew; Smith, Emily; Paul, Perry; Kuwaye, Kristen; Capps, Brittani; Smith, Lee
Subject: AMENDMENT: Coastal Stabilization at 4855, 4869, & 4871 Lower Honoapi'ilani Road - Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance

Aloha Mr. Overton,

Please kindly disregard today's earlier email sent at 9:03am, we would like to amend it with the below:

Thank you for the opportunity to comment on the subject project. Hawaiian Electric Company has no objection to Coastal Stabilization at 4855, 4869, & 4871 Lower Honoapi'ilani Road - Early Consultation for Environmental Assessment, Special Management Area Use Permit, and Shoreline Setback Variance Notification. Should Hawaiian Electric have existing easements and facilities in the project area, we will need continued access for maintenance of our facilities. Hawaiian Electric requests that the EA evaluate any potential impact of the diverted wave energy from the proposed project, including any potential impact on existing structures, including electric utility infrastructure. We appreciate your efforts to keep us apprised of the subject project in the planning process. As the proposed project comes to fruition, please continue to keep us informed.

Mahalo,
Sarah

Sarah Nagata
Permits Engineer, Transmission & Distribution
Hawaiian Electric
PO Box 2750 / Honolulu, HI 96840

O: 808.543.7046
M: 808.772.3281
E: sarah.nagata@hawaiianelectric.com

Kahana Sunset AOAO
4909 Lower Honoapiilani Rd
Lahaina, HI 96761

Jeffrey Overton
G70
111 S. King St, Suite 170
Honolulu, HI 96813

Aloha Mr. Overton

This letter is in response to your letter of June 21, 2024 requesting comments on a proposed project for bluff stabilization. Kahana Sunset welcomes projects that protect land and homes of our neighbors and keeps soil contaminants away from Keonenui Bay. We helped the Boyds with their project and did not make a protest in the 5 years Hester's collapsed seawall was on the beach.

The first signee below is a retired physicist and Kahana Sunset Board Member who has spent 6 years researching why the sand disappeared and potential projects. He is also President of the Keonenui Bay Foundation, 501(c)(3) non-profit organization. For years, he tried unsuccessfully to involve neighboring properties. It is the Board's hope that this project can unify our efforts. We urge that the project owners join us and others in the Keonenui Bay Community Group. This is part of our managed retreat plan and creates an outreach group to share information and work together.

After our discussion yesterday, here are comments on your proposal:

1. Shotcrete is shoreline hardening and is forbidden under Act 16 in 2020, an amendment to HRS Section 205A. Shotcrete is just a curved seawall. In our experience, the state and county interpret laws as suits them and are immune to arguments. The house between this project and Kahana Sunset is owned by Todd Boyd and Sarah Schmidt. After their seawall collapsed, they obtained permits to have the land shaped into benches up to the lawn with no shotcrete. They use salt water tolerant plants such as vetiver to hopefully stabilize the land. We know that benches reduce scour as all the wave momentum is not reflected at once, as it would for a vertical wall.
2. Burying the bottom of the shotcrete wall will not protect it. Beach sand will continue to be scoured eventually undermining the bottom. The picture for the example on page 4 is of Kahana Sunset's A Building. The house on the left of the picture is owned by Marcia Lucas (George Lucas' ex-wife). Its shotcrete wall had a massive failure in 2002. The best long-lasting solution is to build down to bedrock, which at Kahana Sunset, is 15 ft below sea level.
3. There is no easy heavy equipment access. Removal of Hester's collapsed wall required removal of landscaping. Kahana Sunset investigated beach nourishment and this was a problem as dewatering and spreading the sand requires heavy equipment. There is an adequate supply of offshore beach quality sand.

4. Will the EA studies investigate flow and sediment movement in Keonenui Bay's littoral cell? The Board desires information on how this project affects Kahana Sunset's beach and forces on our seawall.

The source of all these problems is the constant beach sand disappearance over the past 112 years of measurements. If beach sand is restored to its previous levels (at least 8 ft vertically higher), structures will be safe and all the owners in the back of the bay will have a sandy beach. I have an elegant, effective, economic, environmental, and non-disruptive solution to beach sand restoration. This solution is proposed by the Keonenui Bay Foundation at https://knbf.org/ .

Mahalo,

Michael Lindenfeld, Member, Kahana Sunset AOAO Board
MichaelLindenfeld@gmail.com, (858) 232-8063

Cyndi Reese, Secretary, Kahana Sunset AOAO Board
cyndireese@comcast.net , (707) 695-0384