Ofu Coastal Storm Damage Reduction Feasibility Study

CONTINUING AUTHORITIES PROGRAM - SECTION 14

Draft Integrated Feasibility Report and Environmental Assessment

US Army Corps of Engineers ®
Honolulu District

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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE), Honolulu District, has prepared a Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) for the Ofu Coastal Storm Damage Reduction Feasibility Study. This project is located on the southern coast of Ofu island in the United States (U.S.) Territory of American Samoa. The American Samoa Government (ASG), represented by the Department of Port Administration (DPA), is the non-federal sponsor. This IFR/EA evaluates and discloses impacts that would result from the implementation of potential emergency shoreline protection measures for the study area. In accordance with federal law, regulation, and procedures the IFR/EA identifies coastal erosion hazards and analyzes a series of potential alternatives, including the "No Action" alternative, to address coastal erosion risks in the study area.

This study is authorized under Section 14 of the Flood Control Act of 1946 (Section 14) (Public Law [P.L.] 79-525), as amended (33 U.S.C. 701r) for emergency shoreline protection under the Continuing Authorities Program (CAP). This report documents the plan formulation process to select a Tentatively Selected Plan (TSP), along with environmental, engineering, and cost analyses of the TSP, which will be used as the basis for subsequent design and construction of the Recommended Plan following approval of this report.

The Territory of American Samoa is in the mid-South Pacific Ocean, a part of the Samoan Islands archipelago in Polynesia, approximately 2,300 miles southwest of the State of Hawaiʻi. The island of Ofu is in the Manuʻa Island group of American Samoa, located about 66 miles east of Tutuila Island. Ofu Airport (study area) is located on the southern coast of Ofu Island. The 18-acre public airport is operated by DPA on property leased from local families. The airport is intended to serve the aviation needs for residents of both Ofu and Olosega islands.

The shoreline along the western edge of Ofu Airport Runway 8/26 is experiencing erosion due to storm surge and wave attack. Without protection from erosion, the runway will continue to sustain damage, leading to the eventual closure of Ofu Airport. Ofu Airport serves as the primary means of transportation for people and critical goods from the Olosega islands to the main island of Tutuila. Closure of the airport due to damage following a storm will result in detrimental impacts to health and safety as well as a significant delay in travel and transport of vital resources to the island.

The study authority focuses plan formulation and evaluation for CAP Section 14 studies on the least-cost alternative. The least-cost alternative plan is justified if the cost of the proposed alternative is less than the costs to relocate the threatened facilities (Engineering Pamphlet [E.P.] 1105-2-58). This report identifies and evaluates the alternatives that were considered to address the identified problem statement and recommends a TSP that would best meet the study objectives and protect the public facilities at risk. The plan formulation process identified several structural and non-structural emergency shoreline protection management measures to potentially address coastal erosion risk in the study area. An initial array of six alternatives underwent early rounds of qualitative and semi-quantitative screening. Additional evaluation, comparison, and optimization of alternatives assisted in identifying and evaluating the final array of four action alternatives.

The study also describes the existing and future without project conditions for 14 environmental resources and evaluates the potential impacts that the proposed array of alternatives could have on each of these resources. For all categories, the resource falls under one the following: (1) unaffected by the action, (2) effects are considered insignificant, or (3) effects can be considered insignificant with the appropriate level of mitigation. Ten (10) resource categories are unaffected by the proposed action, five (5) resource categories would have insignificant effects with no substantial adverse change in the environment as measured by the applicable significance criteria; and four (4) resource categories have insignificant effects with application of standard avoidance/minimization measures and best management practices (BMPs). Less than significant impacts on threatened and endangered species are expected for all alternatives proposed, with implementation of mitigation measures and other best management practices to bring effects to this resource down to insignificant levels. The project may affect, but is not likely to adversely affect, hawksbill and green sea turtles.

The TSP is Alternative 2: Tribar Revetment. Alternative 2 proposes construction of a 500 foot (ft) long, 33 ft wide, revetment comprised of engineered, interlocking concrete armor units (i.e. Tribar), to reduce the threat of coastal erosion to the landside infrastructure and facilities at Ofu Airport. The revetment crest elevation of 10 ft above mean sea level (MSL) meets the USACE 50-year design requirement for sea level change (SLC) and is adaptable to 100-year SLC under the intermediate scenario at 9 ft above MSL. The TSP is the least cost, environmentally acceptable alternative that is less than the cost of facility relocation ($91 million). At the federal fiscal year (FY) 2023 discount rate of 2.25 %, the total project first cost of the TSP is approximately $8.2 million.

The ASG supports Alternative 2 as the TSP. Alignment for the support was coordinated through DPA. The public will have the opportunity to review and comment on this draft report during the 30-day public review period, which will begin in May 2023. A virtual public meeting will be held during the open comment period to present the TSP and allow the public to ask questions and submit oral comment. Public comments on the draft IFR/EA will be considered and incorporated, as appropriate, into the final IFR/EA. The final report is estimated to be complete around February 2024.

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*Sections marked with an asterisk are required for compliance with the National Environmental Policy Act.

APPENDICES

****to be inserted when received from NMFS**

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

AD	anno domini
AQCR	air quality control region
ASG	American Samoa Government
ASHPO	American Samoa Historic Preservation Office
ASPA	American Samoa Power Authority
BMPs	best management practices
CAA	Clean Air Act
CAP	Continuing Authorities Program
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	code of Federal regulations
CRM	concrete rubble masonry
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
D&I	design and implementation phase
dB	decibels
dBA	decibel A scale
DMWR	Department of Marine and Wildlife Resources
DNL	day-night average sound level
DOC	American Samoa Department of Commerce
DPA	American Samoa Government Department of Port Administration
DPS	distinct population segment
DPW	American Samoa Government Department of Public Works
EA	environmental assessment
EFH	essential fish habitat
EIS	environmental impact statement
ENSO	El Nino—Southern Oscillation
EO	Executive Order
EOP	environmental operating principles
EP	Engineering Pamphlet
EPP	environmental protection plan
ER	Engineering Regulation
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCSA	feasibility cost sharing agreement
FONSI	finding of no significant impact
ft	feet
ft	foot
FWCA	Fish and Wildlife Coordination Act
FWOP	future without project
FY	(federal) fiscal year
GPM	Gallons per minute
HRS	Hawaii Revised Statutes
HTRW	hazardous, toxic, and radioactive wastes
IFR/EA	integrated feasibility report and environmental assessment
lbs	Pounds
Lf	linear feet
LERRD	lands, easements, rights-of-way, relocations, and disposal
MPA	marine protected area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSL	mean sea level

NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act
NFS	non-federal sponsor
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NNBF	natural and nature-based features
NOAA	National Oceanic and Atmospheric Administration
NOAA PIRO	National Oceanic and Atmospheric Administration Pacific Islands Regional Office
O&M	operation and maintenance
OMRR&R	operations, maintenance, repair, replacement, and rehabilitation
PED	preconstruction, engineering, and design
P&G	Principles and Guidelines
PDT	project delivery team
PL	Public Law
PPA	project partnership agreement
RSA	runway safety area
S&A	Supervision and Administration costs
SLC	sea level change
SLR	sea level rise
SWPPP	stormwater pollution prevention plan
T&ES	threatened and endangered species
TAAQS	Territory Ambient Air Quality Standards
TS	tropical storm
TSP	tentatively selected plan
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VdB	vibration decibels
WQC	water quality certification
WOTUS	waters of the U.S.
WRDA	Water Resources Development Act

Section 1 Introduction

This chapter provides information on the U.S. Army Corps of Engineers (USACE) planning process, study purpose, need and scope, study authority, study area, study participants, and previous studies that contributed to this product.

1.1 USACE Planning Process

The USACE uses a six-step planning process, as outlined in Engineering Regulation (ER) 1105-2-100, *“Planning Guidance Notebook”,* which includes the following steps:

1. Identification of water and related land resources problems and opportunities (relevant to the planning setting) associated with the federal objective and specific state and local concerns,
2. Inventory, forecast, and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities,
3. Formulation of alternative plans,
4. Evaluation of the effects of the alternative plans,
5. Comparison of alternative plans, and
6. Selection of a Tentatively Selected Plan (TSP) based upon the comparison of alternative plans

This Integrated Feasibility Report and Environmental Assessment (IFR/EA) will mirror the process noted above, beginning with defining the problems and opportunities and culminating in the selection and description of a TSP. This IFR/EA discusses and discloses environmental effects, beneficial or adverse, and evaluates the significance of impacts that may result from the proposed project in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code Section 4321 et seq.); the Council on Environmental Quality (CEQ) (regulations published in 40 Code of Federal Regulations [CFR] Part 1500 et seq.); and USACE procedures for implementing NEPA published in 33 CFR Part 230. This IFR/EA also documents project compliance with other applicable Federal environmental laws, regulations, and requirements.

1.2 Study Purpose, Need, and Scope*

This report considers implementation of emergency shoreline protection measures along approximately 500 feet (ft) of shoreline along the western edge of the Ofu Airport runway. The shoreline in this area is threatened by wave action eroding the beach fronting and protecting landside infrastructure of Ofu Airport. Without this project, continued airport operations and use of Runway 8/26 are at high risk of shutdown due to closure of the runway**.**

The study scope includes the development and evaluation of a series of potential alternative plans focused on emergency shoreline protection in the project area. Alternatives were developed in consideration of study area problems and opportunities as well as objectives and constraints and evaluated utilizing the four evaluation criteria described in the "*Planning Guidance Notebook"*: completeness, effectiveness, efficiency, and acceptability. Analysis of alternative plans focused on the least-cost, environmentally acceptable plan, which was identified as the TSP. The results of this analysis are documented in this decision document, which will serve as the basis for project construction authorization.

ER 1105-2-100, "*Planning Guidance Notebook*" defines the contents of feasibility reports authorized under the Continuing Authorities Program (CAP). This document and its appendices present the information required by regulation as an integrated feasibility report and environmental assessment (EA).

1.3 Study Authority

This IFR/EA is being conducted under the authority of Section 14 of the Flood Control Act of 1946 (Section 14) (Public Law [P.L.] 79-525), as amended (33 U.S.C. 701r). Section 14 authorizes USACE to partner with a non-Federal sponsor to study, design, and construct emergency streambank and shoreline protection for public facilities in imminent danger of failing due to bank failure caused by natural erosion and not by inadequate drainage, by the facility itself, or by operation of the facility. The full text of Section 14 is as follows:

> "*The Secretary of the Army is authorized to allot from any appropriations heretofore or hereafter made for flood control, not to exceed $25,000,000 per year, for the construction, repair, restoration, and modification of emergency streambank and shoreline protection works to prevent damage to highways, bridge approaches, lighthouses (including those lighthouses with historical value), and public works, churches, hospitals, schools, and other nonprofit public services, when in the opinion of the Chief of Engineers such work is advisable: Provided, that not more than $10,000,000 shall be allotted for this purpose at any single locality from the appropriations for any one fiscal year, and if such amount is not sufficient to cover the costs included in the Federal cost share for a project, as determined by the Secretary, the non-Federal interest shall be responsible for any such costs that exceed such amount.*"

Engineering Pamphlet (EP) 1105-2-58 limits emergency shoreline protection projects authorized under Section 14 to essential public facilities and facilities owned by non-profit organizations that have been properly maintained and are in imminent threat of damage or failure by natural erosion processes of streambanks and shorelines. Eligible facilities include highways, highway bridge approaches, lighthouses, public works, churches, public and private non-profit hospitals, schools, and other public or non-profit facilities offering public services open to all on equal terms. The Ofu Airport is an essential public facility eligible for consideration of protection under Section 14.

Section 14 studies have a federal participation limit of $10,000,000. In the Feasibility phase, the first $100,000 is 100% federally funded and the balance is cost shared 50%

Federal to 50% non-Federal. In the Design & Implementation (D&I) phase, the cost share is 65% Federal to 35% non-Federal. Additionally, Section 1156 of the Water Resources Development Act (WRDA) of 1986 (33 U.S.C. 2310), as amended, provides a non-Federal cost share waiver applied to both the Feasibility and D&I phases for studies located within any United States (U.S.) Territory, such as American Samoa.

In March 2022 a Feasibility Cost Sharing Agreement (FCSA) was executed between USACE and the American Samoa Government (ASG); at the time, the Section 1156 waiver was $530,000. In November 2022, the Section 1156 waiver increased to $665,000 and will continue increasing annually based on current inflation rates. The cost share waiver deducts from the non-Federal share and adds to the Federal share. The non-Federal sponsor for this project is the ASG, represented by the Department of Port Administration (DPA). Additional information on projected cost share requirements can be found in Section 6.7 Cost Sharing.

1.4 Study Area (Planning Area)*

American Samoa is a U.S. territory located in the mid-South Pacific Ocean, a part of the Samoan Islands archipelago in Polynesia, approximately 2,300 miles southwest of the State of Hawaiʻi (Figure 1). The island of Ofu is in the Manuʻa Island group of American Samoa, located about 66 miles east of Tutuila Island.

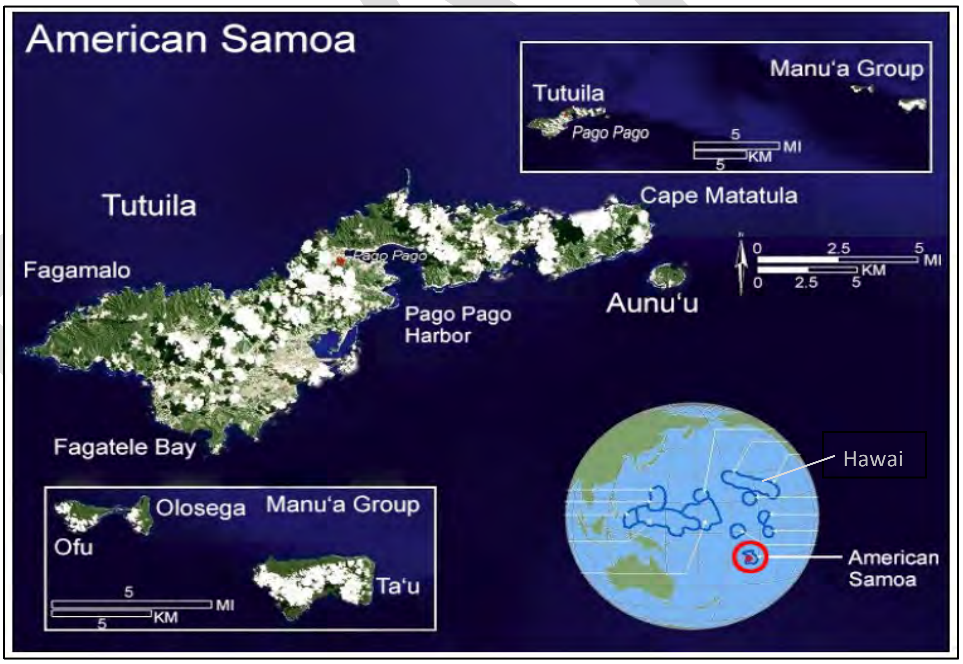

Figure 1: Territory of American Samoa and location maps. Source: Pacific Regional Integrated Sciences and Assessments

Ofu Airport (study area) is located on the southern coast of Ofu Island (Figure 2). The 18-acre public airport is operated by the DPA on property leased from local families.

The airport is intended to serve the aviation needs for residents of both Ofu and Olosega islands.

Figure 2: Ofu Airport Location

1.5 Background and History

A history of USACE studies in and around the study area is included below.

- **Section 14 Reconnaissance Report on Shore Protection for Ofu Airstrip, Ofu Island, American Samoa, USACE Honolulu District, May 1985**. The report established a federal interest in protecting the Ofu airstrip from coastal erosion occurring on the runway's east shoreline. Based on the study findings, a shoreline protection feature was constructed on the east end of the runway in October 1986, at a cost of $182,500 (Federal funds). The project was authorized under Section 14, and the local sponsor was the ASG.
- **Ofu Airstrip Shore Protection Project Operations and Maintenance Manual, Ofu Island, Territory of American Samoa, USACE Honolulu District, August 2003**. The report purpose was to furnish the local sponsor with information on project history, operation and maintenance (O&M) requirements, reporting requirements, emergency operation, and to document as-constructed conditions of the Ofu Airstrip Shore Protection Project described in the bullet above.
- **Hurricane Induced Stage-Frequency Relationships for the Territory of American Samoa TR CHL-98-33, USACE, Engineering Research and Development Center, Coastal and Hydraulics Laboratory**. The purpose of the study was to determine the frequency of flood levels along the shoreline of American Samoa that are caused by the combined effects of astronomical tides and typhoon-induced high-water levels. The results of this study have been incorporated into the analyses contained in this report.
- **American Samoa Climate Related Vulnerability Assessment for Transportation Infrastructure, USACE Honolulu District, April 2020**. The study objective was to

assess the vulnerability of American Samoa's transportation assets to climate related hazards. The study approach involved broad research on climate-related impacts, vulnerability indices and adaptation strategies for public transportation systems, interviews with American Samoa stakeholders and regional subject matter experts, and two on-site stakeholder workshops held in June and October 2019. The assessment included an inventory of American Samoa public harbors, airports, and roadways. For the assessment of Ofu Airport, the study noted that "Ofu and Fitiuta airport facilities are 7 ft elevation and are not exposed to the sea level rise (SLR) inundation areas analyzed in this study." Therefore, Ofu Airport was not considered as one of the more vulnerable airport assets in American Samoa and was not further evaluated. However, this was a preliminary study that did not evaluate the effect of storm surge and wave inundation in combination with future SLR, due to a lack of available data.

1.6 Problems and Opportunities

This section summarizes the first step of the six-step planning process: Identification of water and related land resources problems and opportunities (relevant to the planning setting) associated with the federal objective and specific state and local concerns.

1.6.1 Overview of Coastal Erosion Problems

The shoreline along the western end of the Ofu Airport is progressively eroding with the coastline receding further into the Runway Safety Area (RSA) of Runway 8/26 located at the distal ends of the runway. The RSA is mandated by Federal Aviation Administration (FAA) regulations to accommodate aircraft that may veer off the runway, as well as store firefighting equipment. At Ofu Airport, the RSA is already non-standard due to the limited available real estate. The RSA in theory should be 150 ft wide, centered on the runway, and extend 300 ft beyond each end of the runway. The RSA currently extends only 100 ft beyond the end of Runway 8/26. An exemption to the FAA design standards currently allows the airport to remain operational in its current state; however, continual erosion will result in the imminent closure of the runway.

Coastline erosion in the project area was accelerated during Tropical Storm (TS) Evans in 2012 and again more recently by TS Gita that devastated the islands in 2018. After TS Gita, sand and rocks were deposited onto the grassed area and runway from the high storm wave runup. Airport staff quickly cleared debris from the airport runway in order to restore runway operations. In 2022, a passing extratropical storm that coincided with a king tide resulted in similar impacts to the runway with wave runup, erosion, and damage to the runway itself. Photos taken before and after the 2022 event are shown in Figure 3 and Figure ***4***.

Figure 3: West end of the runway prior to king tide damage (photo taken on July 13, 2022). Source: American Samoa DPA

Figure 4: Photos of erosion and damage to runway following king tides (photo taken July 14, 2022). Source: American Samoa DPA

1.6.2 Problems

The problem statements are based on information gathered during scoping and supported by information documented in past reports:

- The shoreline along the western edge of the Ofu Airport runway is experiencing erosion due to wave attack and storm surge.
- Without emergency shoreline protection, the runway will continue to sustain damage during high wave and storm events, leading to the imminent closure of the airport.

- Disruption of airport operations will affect the primary means of transporting people and essential goods and supplies to and from both Ofu and Olosega islands.
- Due to the isolation of the Manuʻa islands, air travel is especially important in the event of an emergency when transport of food, supplies, and medical evacuation are needed urgently. Closure of the airport due to damage following a storm will result in detrimental impacts to health and safety as well as a significant delay in travel and transport of vital resources to the island.

1.6.3 Opportunities

Opportunities to address the problems include the following:

- To proactively plan for future changes to sea level along shorelines of American Samoa while developing structural and non-structural solutions

1.7 Objectives and Constraints

This section further builds upon the first step of the planning process by identifying planning objectives and constraints. These will be the basis for formulation of alternative plans outlined in Section 3.

1.7.1 Federal Objective

The Federal objective, as stated in the CEQ Principles and Guidelines (P&G), is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders (EOs), and other Federal planning requirements.

1.7.2 Planning Objective

The planning objective for the study is to identify the least cost, environmentally acceptable alternative that provides shoreline protection to Ofu Airport over a 50-year period of analysis. The least cost alternative is justified if the total cost of the proposed alternative is less than the cost to relocate Ofu Airport.

1.7.3 Planning Constraints

The following factors were identified as planning constraints:

- FAA regulations limit the vertical height of any structure implemented within the study area since it is immediately adjacent to an active runway. The top elevation of any coastal erosion structure may not exceed more than 3 inches above the elevation of the existing Ofu airport runway, currently estimated at +10 ft. mean sea level (MSL). Continued coordination with the FAA will be necessary during both Feasibility and D&I phases to ensure the proposed action is within FAA guidelines.
- Shortening the runway is not an option – the minimum length required for the

airport designation type is 2,000 ft. The existing runway is already at 2,000 ft.

1.7.4 Planning Considerations

The high cost of implementation in remote territories such as American Samoa is a planning consideration. There are two main contributing factors to this consideration:

1) Given the recent period of high inflation and the high costs associated with mobilizing equipment and personnel to remote territories such as American Samoa, let alone a remote island within a remote territory, there may be a limited number of economically justified, constructable alternatives that qualify within the range of coastal erosion management measures and alternatives that may be considered and selected under the CAP Section 14 authority, and;

2) Section 1156 of the WRDA 1986 (33U.S.C. 2310) provides a territorial cost-sharing waiver under both the Feasibility and D&I phases of CAP studies, reducing the total project costs allowable to remain within the Federal per-project limits for CAP studies. While the intent of the territorial waiver is to reduce costs for tribal and territorial non-Federal sponsors, under a Section 14 authority with a limited federal per project limit of $10 million, the territorial waivers alone consume a large portion of the federal share. This results in fewer federal funds remaining for the planning, design, and construction of a shoreline protection measure. The study team would need to find an implementable solution at a much lower cost than that of a non-territory, which will be difficult in a remote location such as American Samoa.

Section 2 Existing and Future Without Project Conditions*

This section provides the existing conditions (i.e., the affected environment) for each of the physical, chemical, biological, and sociological characteristics and resources that could be affected by implementing any of the final array of alternatives proposed. The spatial scope of analysis focuses on the immediate and surrounding environment of the study area. The temporal scope of the study is a period of 50 years, beginning in 2026 and ending in 2076.

For each resource, the existing conditions within the study area are described with a summary of historic conditions where applicable. A forecast of the “Future Without Project (FWOP)” conditions of the “No Action” Alternative is also provided in Section 4 for each respective resource category. No resource categories were screened from analysis. However, the level of *detail* in the description of each resource corresponds to the magnitude of the potential direct, indirect, or cumulative impacts on each resource and focuses only on significant resources that would be potentially affected by the alternatives and have the most material bearing on the decision-making process.

Future Without Project Conditions and Climate Change

Climate change and climate variability must be included as part of any discussion of the forecasted FWOP. An understanding of these future conditions under a climate change scenario can inform the decision process related to the FWOP, plan formulation, evaluation of the performance of alternative plans, and other decisions related to project planning, engineering, operation, and maintenance.

ER 1100-2-8162 (USACE 2019) provides guidance for incorporating climate change information in the feasibility analysis process in accordance with the USACE overarching climate change adaptation policy. This policy requires consideration of climate change in all current and future studies to reduce vulnerabilities and enhance the resilience of water resources infrastructure.

A qualitative climate change assessment was conducted for this study to assess the potential vulnerability of the study area to climate change in the context of shoreline protection and coastal flood risk management alternatives. This assessment included a literature review to determine broad trends and projected trends in climate that could affect the pertinent hydrologic parameters (i.e., temperature and precipitation) in the project area.

As in all regions of the world, the climate of the Pacific islands, including American Samoa, is changing. These impacts are already being felt and expected to intensify in the future. In American Samoa, the impact of climate change on some aspects of water resources have been documented for over 50 years. Climate change impacts, such as the outlook for more frequent and extreme rainfall events, a wetter rainy season, rising air and ocean temperatures, rising sea level, and the uncertainty about El Niño–Southern Oscillation (ENSO) driven seasonal drought can amplify the water management challenges posed by climate variability (Wallsgrove and Grecni 2016).

The key impacts and challenges from climate change and its effects on coastal erosion and flooding in American Samoa, include:

(1) less frequent, but stronger, more intense tropical storms and storm surges are expected;
(2) increases in the frequency of gale-force winds that produce moderate to high waves is expected in the central-south Pacific, and;
(3) increases in SLR are anticipated to lead to more frequent and intense coastal flooding and erosion events.

Tropical storms can bring intense winds, torrential rainfall, high waves, and storm surge to the islands of American Samoa. Generally occurring between November and April, the risk of tropical storms tends to increase during medium-to-strong El Niño events. The increased maximum intensity would be expected to exacerbate the effects of coastal flooding and lead to more severe coastal damage. In the area surrounding American Samoa and the southeast Pacific Basin, the overall outlook is for fewer, but much stronger intensity, storms in the future. However, it is also expected that the frequency of gale-force winds in the central-south Pacific that produce moderate to high waves will increase and further contribute to coastal erosion and flooding (Keener et al. 2022).

SLR threatens infrastructure and critical resources, including drinking water, agriculture, housing, and transportation, as well as ecosystems and cultural sites. Overall, SLR will result in more frequent and extreme coastal erosion and coastal flooding in American Samoa, which could be exacerbated by future increasing sea level variability associated with more extreme El Nino and La Niña events (Widlansky et al. 2015). Because much of American Samoa's infrastructure is located along a narrow band of flat land along the coast, these areas are highly vulnerable to the effects of SLR. Relatively small changes in average sea level can have large effects on tidal flood frequency. In addition, land subsidence due to earthquakes can exacerbate the effects of high tide (nuisance) coastal flooding.

Coral reefs provide a natural, physical barrier to storm surge, protecting shorelines, and landside infrastructure. Climate change, in particular rising sea level temperatures and ocean acidification, compromise reef health and the functions and services reefs provide. Healthy coral reefs provide coastal storm damage reduction and are both resilient and resistant to the negative effects of global climate change. Reducing anthropogenic harm to coral reefs is necessary to ensure healthy coral reefs continue to provide natural coastal storm damage reduction for coastal communities.

Figure 5: Landscape features of Ofu Island. Red boxes are the general action areas containing the proposed COSAs in dark blue and proposed shoreline protection measure in red. The Ofu-Va'oto Territorial Marine Park is outlined in yellow and the Ofu Unit of the National Park of American Samoa is outlined in pink. Streams of the Saute Watershed are in blue.

The study area is located on Ofu Island in the Manu'a Island group of American Samoa, about 66 miles east of the main island of Tutuila Island (Figure 1). Ofu Island is the western part of the volcanic outcrop of Ofu-Olosega Island and the westernmost of the Manu'a Islands. The study area is located at the 18-acre Ofu Airport, a public airport operated by the DPA of the ASG on property leased from local families (Figure 2) on the

Va’oto Plain. The airport serves the aviation needs of Ofu and Olosega islands.

The project area includes two proposed Construction Staging Areas (COSAs) at Ofu Harbor (blue polygons in box a. on Figure 5) and 2 COSAs (blue polygons in box b. on Figure 5) and the construction site (orange polygon in box b. on Figure 5) at Ofu Airport. The COSAs are already cleared and will not require any vegetation clearing or ground disturbance for their use in storing construction materials and equipment.

2.1 Physical Environment

The physical environment includes the abiotic (non-living) elements of the environment such as the landforms rocks, soils, sediments, water, and climate. The physical environment provides the geographic foundation of the natural environment.

Ofu and Olosega Islands are the remains of shield volcanoes formed by volcanic activity along the crest of the easternmost portion of the submarine Samoan Ridge, characterized by steep, high cliffs formed via marine erosion. The highest elevation on Ofu is Mt. Tumu at 1,621 ft. Ofu is separated from Olosega by the Asaga strait, approximately 500 ft wide. The study area is located on the Vaʻoto Plain at Papaloloa Point on the south side of Ofu island (see Figure 5). The Vaʻoto Plain is a wide coastal flat that formed at the base of Leolu Ridge, a steep (almost vertical) cliff abutting the backside of the plain.

The prevailing winds throughout the year are southeasterly trades. Ocean currents along the south shore of Ofu tend to run parallel to the shore from east to west. Storms approach primarily from the north and the area has experienced at least 34 hurricanes from 1831 to 1923, and an additional seven from 1923 to 1991.Typically, storm season occurs during the months of November through April.

Tides on American Samoa are semi-diurnal with a mean range of 2.6 ft and a diurnal range of 2.8 ft. The study area is exposed to two distinct wave types: waves generated by the prevailing local winds; and sea and swell from local and distant storms and typhoons. Long period swells generated by distant tropical storms and typhoons can have a significant effect on the study area.

2.1.1 Geomorphology, Hydrology, and Hydraulics

Geomorphology is the study of landforms with an emphasis on their origin, evolution, form, and distribution across the physical landscape of an area. Access to the interior uplands from the Vaʻoto Plain is limited due to the steep, precipitous cliffs. This plain has an approximate 10-degree fore-slope that rises steadily to the crest of a berm ranging from 15-20 ft above sea level. The Vaʻoto Marsh has formed between the berm crest and the talus slope at the base of the cliff (Figure 5).

Soils on Vaʻoto plain consist of a thin layer of silty sand clay loams with a mixture of well-draining materials (i.e., sand, gravel, and rock fragments) underneath. Subsurface structure consists of olivine pahoehoe basalt flow volcanic rock atop reefs and sediments (ASG 2006). Two primary soil types comprise the area: 1) Ngedebus Mucky Sand along the shore at Papaloloa Point, and 2) Urban land-Ngedebus complex north of Papaloloa Point in the vicinity of Ofu Airport runway. Ngedebus mucky sand is a deep, somewhat excessively drained soil, derived from coral and seashells. Urban land-Ngedebus complex soils are generally comprised coral fragments, sand, cinders, and other material that have been graded or filled to support residential, commercial, and public facilities. The project footprint consists of sandy beach with beach rock exposed in the intertidal zone.

Geologic hazards on Ofu include landslides, volcanic eruptions, earthquakes, cyclones, and tsunamis. Landslides are primarily caused by overly steep slopes and regularly persistent heavy rainfall. Erosion due to runoff poses a threat to both the land and the adjacent surface waters. The Ofu-Olosega volcano last erupted in 1866, and other volcanoes in the region have not been active for thousands of years. Although no active volcanoes exist in American Samoa, many craters are still visible on the landscape.

In addition to being a volcanic hotspot, the islands of American Samoa experience frequent and often large earthquakes. Most recently, Taʻū experienced volcanic unrest in the form of an earthquake swarm that was felt throughout the Manuʻa Islands from late July through early September 2022 (USGS 2023). Since 1900, 242 magnitude 7 or greater earthquakes have been recorded which equals an average rate of more than 2 large earthquakes per year (Petersen et al, 2012). Tsunamis (huge water waves) that can affect all islands in American Samoa are generated by earthquakes from fault movements along the Tonga Trench, the Pacific Rim in the Aleutian Islands, South America, and other locations.

*Hydrolog*y describes the patterns of precipitation, evaporation, infiltration, groundwater flow, surface runoff, streamflow, and the transport of substances dissolved or suspended in flowing water through an area and the timing of its arrival at a specific point of interest (in this case, the proposed action or study area). The climate of Ofu is tropical and characterized by a relatively dry season (June-August) and a wet season (January-March). However, heavy showers and long rainy periods can occur in any month, while typhoons are common from December to March. The steep topography of Ofu affects localized rainfall amounts, which can range from 125 to 200 inches annually across the island. The prevailing winds throughout the year are easterly trades, interrupted more often in summer than winter and sometimes associated with tropical cyclones, convergence bands, and upper-level disturbances. Tropical cyclones impact the island chain with tropical storm-force winds on average once every three years.

While the Ofu Airport study area is within the 1.78 mile^2 Ofu Saute watershed along the west slopes of Tumu Mountain and Mako Ridge (Figure 5), none of the seven (7) streams comprising the Ofu Saute watershed drain to the Vaʻoto Plain where the study area is located.

Hydraulics describes the *mechanical behavior (movement/flow)* of water in physical systems and is essentially a measure of how surface and/or subsurface flows move from one point to the next. Large swells from the open Pacific Ocean break on the reef crests along Ofu, delivering large quantities of water to the relatively shallow reef flats. Strong currents are created as these large masses of ocean water are pushed along the shore and out to sea via small openings (called avas) in the reef. Ocean waters continually flush the reef flats even during low tide, when lower volumes of water break over the reef-crest, generating less forceful currents.

Although a detailed budget of sediment movement and current velocities for the southern coast of Ofu at Papaloloa Point is not available, the currents along this shoreline tend to run parallel to the shore from east to west. The westerly current is evident at the shoreline at the east end of the runaway that has considerably narrowed over time, exposing natural bedrock, likely a result of the rock revetment constructed to armor the shoreline in the 1980s.

2.1.2 Water Resources and Quality

Surface waters include rivers, streams, and ponds. As mentioned above, there are no streams or other jurisdictional waters in the study area except the Pacific Ocean.

Groundwater is the principal source of domestic and industrial water supply throughout the Territory of American Samoa due to its relative abundance in comparison to surface water, as well as its overall high quality. Because Ofu is composed largely of thin-bedded lava flows that have high and generally uniform permeability, large reservoirs of high-level ground water do not exist here. If such water bodies exist on Ofu, they are deep within the masses of the islands and do not discharge at the surface. Locally, dense lava beds perch small bodies of water, some of which produce small springs having flows of 1 or 2 gallons per minute (gpm). Reportedly, groundwater beneath coastal lands on Ofu, including groundwater beneath the Ofu airport, is typically too brackish to be a viable potable water source.

Though Ofu Airport has no drainage or storm water pollution control or prevention facilities to control runoff at the terminal or the runway (ASG 2006), water quality monitoring data indicate coastal water quality is consistently good on Ofu and the other Manuʻa Islands. Coastal waters fully support all aquatic life uses and indicate no water quality impairments. Ofu beaches rarely exceed the American Samoa Water Quality Standard for *Enterococcus* bacteria (Makiasi et al. 2022). The good water quality can be attributed to the remote location, low human population density, and generally well-circulated coastal areas. Periodic algal blooms can occur in front of villages, but studies indicate that the major sources of nutrients to lagoons here are most likely oceanic, atmospheric and/or sedimentary in origin and not derived from animal or terrestrial sources. High volumes of oceanic waters and strong currents flush the lagoons daily and would be expected to rapidly dilute any nutrient input from land.

2.1.3 Air Quality

The Territory of American Samoa is not a non-attainment area under the Clean Air Act (USEPA 2023). Air quality in American Samoa meets all National Ambient Air Quality Standards (NAAQS), which are also the Territorial standards.

2.1.4 Hazardous, Toxic, and Radioactive Wastes (HTRW)

There are no known HTRW in the Study Area.

2.1.5 Noise and Vibration

Within the vicinity of the study area, aircraft using the airport are the main source of noise. The FAA investigated the noise level at Ofu Airport using the FAA's Integrated Noise Model version 6.1. The analysis found that the homes located near the airport would be exposed to noise levels well below the 65 day-night average sounds level (DNL) threshold for compatibility with residential areas. The screening indicated that the home closest to the runway would likely experience aircraft noise levels of approximately 55 DNL which is well within the levels considered to be compatible with residential use.

The location of the proposed Project at the Ofu Airport limits the available operational levels making more intense noise impacts unlikely. While there are several residences near the airport, the main village is located one (1) mile away

2.2 Natural Environment

The natural environment includes the biotic (living) elements of the environment such as the microorganisms, plants, and animals. The natural environment is intrinsically linked with the physical aspects of the environment.

The study area includes a stretch of sandy beach at the west end of the Ofu Airport runway (red box b. in Figure 5). Ofu Island is skirted by coastal flats of largely calcareous beach sediments (coralline algae and coral) and a narrow fringing coral reef that encircles the islands, forming almost a single, continuous reef, the widest of which is on the leeward western and southern coastlines.

The Ofu-Vaʻoto Territorial Marine Park, a Territorial marine protected area (MPA), is located on Ofu's southern shoreline (Figure 5) directly adjacent the study area and could be influenced by project activities. It comprises approximately 100 acres that extends approximately one-half mile from Fatuana point to the west end of the Ofu Airport runway and from the mean high-water line seaward to the ten-fathom (60 ft) depth curve and includes sandy shore and reef flat habitat. The offshore waters of the Territorial Marine Park include a high diversity of corals and fish (NOAA 2009). Hawksbill and green sea turtles also nest on the sandy beaches (Tagarino 2015; DMWR 2019). Regulations for the park prohibit fishing or shellfish harvesting. However, there is an exception that allows Ofu Island residents to continue subsistence fishing and shellfish harvesting in the park in accordance with territorial fishing regulations.

Fishing by villagers consisted primarily of shore-based activities by individuals or groups.

The eastern boundary of Ofu-Vaʻoto Territorial Marine Park is located near the western boundary of the Ofu unit of the National Park of American Samoa (Figure 5). The diverse marine communities of the National Park would not be influenced by project activities.

2.2.1 Terrestrial Habitats and Species

2.2.1.1 Vegetation

The vegetation of Ofu consists of littoral (shore-associated) vegetation, tropical evergreen rainforest, and montane summit vegetation (Table 1). The only freshwater marsh on the island, Vaʻoto Marsh, is between the island roadway and Leolo Ridge on the opposite side of Ofu Airport from the study area. No prime or unique agricultural lands exist within the vicinity of the study area.

Table 1: Land Use/Land Cover on Ofu Island, American Samoa (NOAA 2010)

Land Use/Land Cover	Acres	Percent
Evergreen Forest	2,813	90%
Scrub/Shrub	111	4%
Bare Land	93	3%
Impervious Surface	44	1%
Developed Open Space	29	1%
Cultivated	7	<1%

The study area along the western edge of the Ofu Airport runway is bounded to the east and west by beach areas and the Toʻaga Lagoon on the approaches to Runway 8/26. Leolo Ridge rises behind and north of the airport terminal. Within the boundary of the study area, terrestrial vegetation consists mainly of herbaceous littoral (shore) vegetation on sandy, rocky, talus, or coral rubble shores, restricted seaward by the hightide mark. This plant community has low species diversity because so few plants can tolerate the harsh conditions of high winds, battering salt spray, high sun exposure, and extreme high temperatures characteristic of this vegetation zone. Plants must also be adapted to sandy saline soils, with extremely low nutrient loads, and low water holding capacity.

The study area is currently devoid of any vegetation except for *Ipomea spp.* (beach morning glory) and sparse terrestrial grasses adjacent to the runway (USFWS 2023) due to a series of storms and various airport maintenance projects (Figure 3 and Figure ***4***).

Seaside of the runway at Papaloloa Point and adjacent to one of the proposed staging areas is a patch of highly disturbed littoral forest locally named “Coconut Grove” (Figure 6) which consists of a mixture of planted and naturalized coconut trees, *Hernandia nymphaeifolia* (pu’a), and *Terminalia samoensis* (talie).

Figure 6: "Coconut Grove" at Papaloloa Point along the Ofu Airport Runway

Seagrasses do not occur in American Samoa and were not observed by USFWS (2023).

2.2.1.2 Terrestrial Wildlife

Due to American Samoa's small size and remote location in the Pacific Ocean, the diversity of terrestrial flora and fauna is relatively low and includes 25 resident or migratory land and water birds, 20 resident seabirds, three native mammals (all bats, including two species of fruit bats), three skinks, and one gecko. The native terrestrial invertebrate fauna of American Samoa, including insects, is far less known than other taxa. All other terrestrial species present have been either historically introduced by early Polynesians (e.g., Polynesian rat, chickens, and pigs) or are considered modern introductions (i.e., after western colonization).

2.2.2 Aquatic Habitats and Species

Aquatic habitats within the study area include intertidal and marine environments (open ocean and intertidal shoreline).

2.2.2.1 Wetlands

Wetlands are defined as, "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (40CFR§120.2(c)(1)). The study area is absent of wetlands i.e. jurisdictional waters, regulated by the Clean Water Act (CWA) at 33 CFR 328.3(a)(4). Vaʻoto Marsh is outside the study area (Figure 5).

2.2.2.2 Riparian Areas

Riparian areas are defined as "lands adjacent to streams, rivers, lakes, and estuarine-marine shorelines. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality" (33CFR§332.2). There are no streams, rivers, or other tributaries to a navigable water i.e. jurisdictional waters, regulated by the Clean Water Act (CWA) at 33 CFR 328.3(a)(2), within the study area. Accordingly, there are no riparian areas within the study area.

2.2.2.3 Marine Environment

Marine waters encompass diverse subtidal saline environments such as sandy bottom and coral reefs. Marine waters in the vicinity of the study area are generally clear and warm, with low primary productivity, small seasonal fluctuations in ocean conditions, and larger multiyear fluctuations in response to greater climatic cycles such as the ENSO (Craig et al. 2019). Coral reefs are a special aquatic site as defined and regulated at 40 CFR 230.44.

Most of the study area (67%) is sandy beach including rubble, scattered boulders, and a small area of pavement. The beach is periodically covered by normal high tides; however, the biological community is largely terrestrial. The entire beach within the study area appears to be suitable habitat for turtle nesting though no turtles or turtle nests were observed by biologists during the USFWS (2023) survey.

The reef flat is located directly seaward of the study area and beach, adjacent to, but not in, the study area. The reef flat is 0.1 - 2 m of water over hard bottom pavement with smaller areas of scattered coral rock in unconsolidated sediment. USFWS (2023) report that the reef flat is a productive and healthy habitat with coral cover, diversity, and colony size increasing from shore to the surf zone, though the larger microatolls of *Porites sp.* tended to be closer to shore. The nearest live coral colony to the study area was observed 27 m away from the runway cement and approximately 10 m outside the study area. Coral cover is limited to scattered individuals near the low tide mark but quickly progress to 10-50 percent cover slightly further from shore and near 80 percent coral cover just inside the surf zone where large encrusting and lobate corals and numerous small branching corals dominate (USFWS 2023).

Crustose coralline algae, frondose algae, and turf algae were common but not dominant throughout the reef flat. *Halimeda* occurs in dense isolated clusters. Filamentous algae and cyanobacteria are uncommon. Seagrass was not observed. Sea cucumbers were moderately common and observed in approximately 8-10 locations on the reef flat. One crown of thorns starfish and one giant clam were observed in the Project Area. Additional invertebrates were not observed in populations considered significant to define the overall ecosystem characteristics (USFWS 2023).

2.2.3 Threatened and Endangered Species (T&ES)

Plant and animal species are designated as rare, threatened, or endangered because of their overall rarity, endangerment, unique habitat requirements, and/or restricted distribution as defined by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS).

Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1536), USACE requested technical assistance from the USFWS and NMFS and on February 2, 2022 received the following list of species listed or proposed for listing under both NMFS and USFWS jurisdiction (Table 2) that may be present on or in the vicinity of the proposed project location, as well as confirmation that there is no designated critical habitat occurring within or in the immediate vicinity of the study area (Reference Number: 2022-0006860-S7-00).

Table 2: ESA Listed Species potentially present on or in the vicinity of the proposed project location. Key to within table notations: *endemic to American Samoa

Common Name	Scientific Name	Status	Critical Habitat	Jurisdiction	Observed in Action Area
Sea Turtles					
Green sea turtle, Central South Pacific Distinct Population Segment (DPS) (*laumei ena`ena*)	*Chelonia mydas*	Endangered	No	NMFS in ocean; USFWS on land	No
Hawksbill sea turtle (*laumei uga*)	*Eretmochelys imbricata*	Endangered	No	NMFS in ocean; USFWS on land	No
Terrestrial Species					
striped Eua tree snail (sisi totolo)	*Eua zebrina**	Endangered	No	USFWS	No
friendly ground dove (tuʻaimeo)	*Gallicolumba stiri*	Endangered	No	USFWS	No
Coral Species					
small-polyp stony coral	*Acropora globiceps***	Threatened	Pending	NMFS	Yes
small-polyp stony coral	*Acropora jacquelineae*	Threatened	Pending	NMFS	No
small-polyp stony coral	*Acropora retusa***	Threatened	Pending	NMFS	Yes
small-polyp stony coral	*Acropora speciosa*	Threatened	Pending	NMFS	No
colonial stony coral	*Seriatopora aculeata*	Threatened	Pending	NMFS	No
branching frogspawn coral	*Euphyllia paradivisa*	Threatened	Pending	NMFS	No
small-polyp stony coral	*Isopora crateriformis***	Threatened	Pending	NMFS	Yes

While there is no designated critical habitat in the study area, in November 2020, NMFS proposed to designate critical habitat in American Samoa for seven (7) species of threatened Indo-Pacific corals found in U.S. Pacific Island waters (*Acropora globiceps, A. jacquelineae, A. retusa, A. speciosa, Euphyllia paradivisa, Isopora crateriformis, and Seriatopora aculeata*) pursuant to Section 4 of the ESA. Under this designation, the entire fringing reef of Ofu and Olosega would be considered critical habitat at depths from 0-67 ft. Currently, the proposed critical habitat designation is still pending and not final.

Three species of ESA listed corals were observed and photographed during the USFWS (2023) surveys: *Acropora globiceps*, *Acropora retusa*, and *Isopora crateriformis*.

2.2.3.1 Endemic Tree Snail

One species of endemic tree snail (*Eua zebrina)* is federally listed as endangered on Ofu. This species is known to inhabit forests of Tutuila and Ofu Island, occurring primarily on leaves but also on tree trunks and branches (Cowie 1992). The species was once considered abundant in the territory but is now known to occur only in a few locations and it was last documented at one locality on Ofu in 1998 (USFWS 2020). This species was not observed in the study area.

2.2.3.2 Friendly Ground Dove

The friendly (or shy) ground-dove (*Gallicolumba stairi*) is a medium-sized dove native to the Samoan, Fijian and Tongan archipelagos and Wallis and Futuna Islands. The American Samoa population of the friendly ground-dove was listed as endangered and a Distinct Population Segment (DPS) under the ESA in 2016. Historically and currently, the American Samoa DPS of the friendly ground-dove is only known to occur on the islands of Ofu and Olosega. Population trend information is unavailable, but the population has remained consistently small (< 100 individuals) since at least the late 1970s. In American Samoa, the friendly ground-dove is reported to occur primarily in shaded forests or thickets, including areas disturbed by human activity (Pyle et al. 2018), on or near steep, forested slopes, sometimes with an open understory and fine screen or exposed soil (Kayano et al. 2019). They forage on the ground and in the understory for seeds, fruit, and invertebrates (Clunie 1999). This species was not observed in the study area.

2.2.3.3 Sea Turtles

In American Samoa, sea turtles (or *laumei* in Samoan) include the endangered hawksbill sea turtle (*Eretmochelys imbricata*) (US DOC NOAA ONMS 2012) and the endangered green sea turtle (*Chelonia mydas)*, Central South Pacific DPS (81 FR 20058). Both species are globally distributed throughout tropical and sub-tropical zones. Both species are known to nest on Ofu Island and juveniles of both species are commonly found in near-shore coral reef habitats. It had been assumed that only hawksbills nested on the beaches of the Manuʻa Islands (Craig 2009); however, recent tagging work by American Samoa Department of Marine and Wildlife Resources

(DMWR) and the National Park of American Samoa have confirmed that a substantial proportion of turtles nesting on Ofu Island are green sea turtles.

In the Territory of American Samoa, both species are protected by American Samoa Administrative Code (Chapter 09 Fishing Title 24 Ecosystem Protection and Development 24.0959 Sea Turtles), EO 005-2003 and the U.S. ESA of 1973. There is no designated critical habitat for either species in American Samoa.

2.2.3.3.1 Green Sea Turtle

Green sea turtles, the larger of the two species, occasionally forage in the open ocean and coastal waters off American Samoa. Low-level nesting occurs on sandy beaches of Tutuila and the Manuʻa Group, including Ofu Island (NMFS and USFWS 1998), in even lower numbers.

The major nesting site for green sea turtles in American Samoa and a significant source for the central South Pacific DPS is Rose Atoll, located approximately 100 miles east of Ofu Island (Tuato'o- Bartley et al. 1993). The green turtles that nest at Rose Atoll likely forage elsewhere in the central South Pacific where sea grasses and algae are abundant. Green sea turtles tend to be most associated with deep-water coral and seagrass beds. As seagrasses are absent in American Samoa, this may be one reason the species is less common there.

Based on observation, the breeding season for green sea turtles is from November and January. Nesting occurs at night on sandy beaches, mainly from December to June, peaking in February. Females dig a hole in the sand above the high tide mark and deposit several dozen eggs, a process that takes about three hours. She then covers them with sand to protect them from the sun, heat, and predators and returns to the ocean. The newly laid eggs incubate in the sand for 50 to 60 days.

Surveys from 2009 to 2013 documented two (2) green sea turtle nests (NE03 and NE05 in Figure 7) above the high tide line and beach slope at Ofu Airport (Tagarino, 2015). One nest was in grass and vines and the other was under beach forest. More recent surveys from 2017-2019 conducted by the DMWR and National Park at Vaʻoto Beach recorded four (4) green sea turtle nests in 2017-2018 (red dots in Figure 8), and three (3) green sea turtle nests at one location in 2018-2019 (pink dots in Figure 8). The data indicate that while green sea turtles prefer to nest within the same beach over time, they are not devoted to a specific spot on that beach and while turtle nests have been observed in the study area, there is suitable adjacent nesting habitat for the turtles to use throughout the study area. No turtles or nests were observed by USFWS during the 2023 surveys.

2.2.3.3.2 Hawksbill Sea Turtle

The sandy beaches on American Samoa provide nesting habitat for a small number of hawksbill sea turtles which live year-round in the territory. Tutuila supported an estimated 50 nesting female per year through the 1990s (NMFS and USFWS 1998). However, recent monitoring studies conducted by the American Samoa DMWR between 2005 and 2010 indicate that fewer than 30 females nest on the beaches of American Samoa (NMFS and USFWS 2013). Beaches in the Manuʻa Island Group, specifically Ofu and Olosega Islands, represent a significant area for nesting hawksbill sea turtles in American Samoa (Tagarino 2015).

On Ofu and Olosega Islands, hawksbill turtles nest every 3-5 years. Nesting season occurs from late August to March. While some data suggest turtle nesting can occur year-round, there is a definite peak in activity between the month of January and February on the islands.

Surveys from 2009 to 2013 documented three (3) hawksbill nests (NE01, NE02, and NE04 in Figure 7) at Ofu Airport (Tagarino 2015). One (1) hawksbill turtle nest was located above the high tide line, one at the top section of the beach slope, and one behind the beach slope. Both nests above the beach slope were in vegetation, one in grass and creeping vegetation, and the other in the beach forest vegetation of mostly Scaevola sp. and grass. The nest on the beach slope was in grass and creeping vegetation. More recent surveys from 2017-2019 conducted by the DMWR and National Park at Vaʻoto Beach recorded three (3) hawksbill turtle nests in 2018-2019 (blue dots in Figure 8). The data indicate that while hawksbill sea turtles prefer to nest within the same beach over time, they are not devoted to a specific spot on that beach and while turtle nests have been observed in the study area, there is suitable adjacent nesting habitat for the turtles to use. No turtles or nests were observed by USFWS during the 2023 surveys.

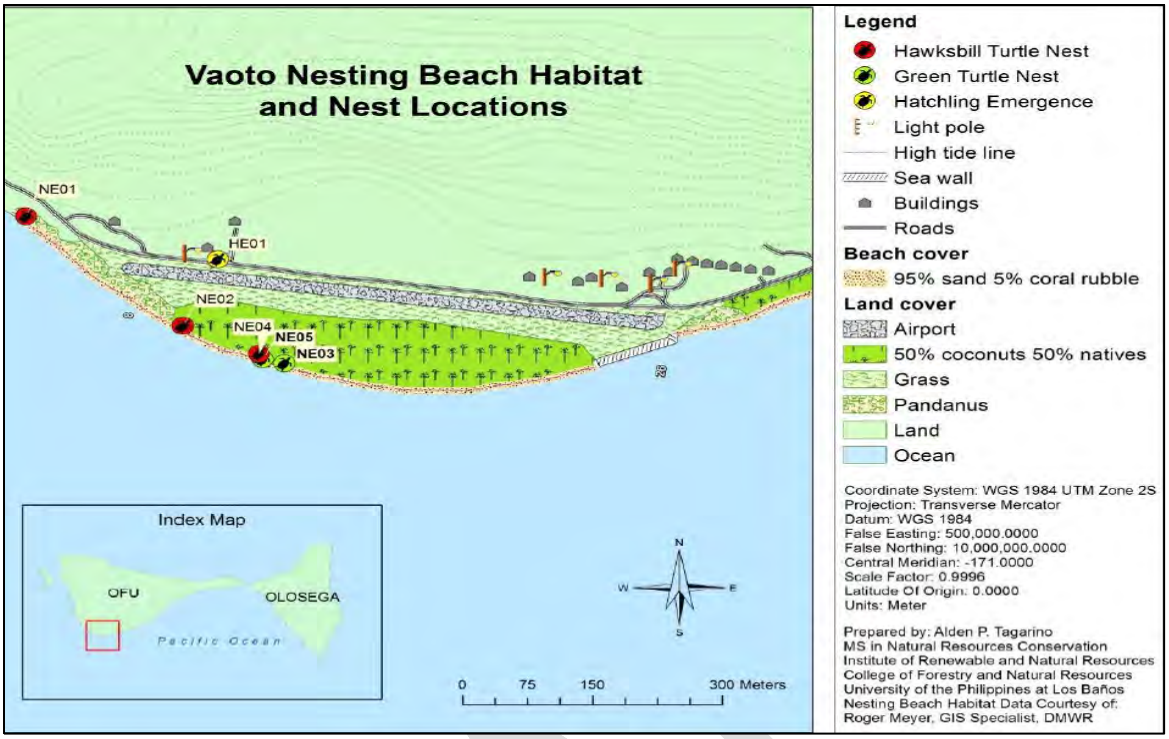

Figure 7: Locations of sea turtle nests observed at Va'oto Beach 2009-2013 (from Tagarino 2015)

Figure 8: Location of hawksbill (EI; blue dots) and green sea turtle (CM; pink and red dots) nests observed at Va'oto Beach at the Ofu Airport 2017-2019 by the DMWR

Predation and inundation by water significantly affected the hatching and emergence success of hawksbill nests on Ofu and Olosega Islands while beach vegetation and locations of nests did not (Tagarino 2015). Management leading to a reduction of predation on sea turtle nests has resulted in increased hatching and emergence success (Engeman & Smith 2007, Dutton & Squires 2008). SLR and climate change implications may have profound effects on the nests in Ofu and Olosega islands given the observed adverse effect of water inundation on the nests caused by high water surges (Tagarino 2015).

2.2.3.4 Corals

Coral reefs are among the most diverse and productive ecosystems on the planet, providing habitat for over 25% of all marine species, including many commercially valuable fishes and invertebrates as well as ESA-listed species such as hawksbill and green sea turtles. They also protect coastlines and vital infrastructure and contribute directly to coastal economies through fisheries, tourism, and recreation. Coral reefs are particularly important to Pacific Island communities that heavily rely on them for food, protection, and income.

Overall, coral reefs in American Samoa are in good condition but the Territory is struggling against threats such as coastal pollution, overfishing, and the impacts of global climate change (NOAA 2018). Known human-induced stressors to the listed species in the waters around American Samoa include the effects of over-fishing (especially for sharks and other predators), land-based sources of pollution, and direct damage and habitat degradation through coastal development activities. Anthropogenic stressors reduce the resistance and resiliency of coral reefs to the compounding effects of global climate change such as ocean warming and ocean acidification.

There are seven species of threatened Indo-Pacific corals found in American Samoa waters: *Acropora globiceps, A. jacquelineae, A. retusa, A. speciosa, Euphyllia paradivisa, Isopora crateriformis,* and *Seriatopora aculeata*. Three (3) of these were observed within the vicinity of the study area: *Acropora globiceps, A. retusa*, and *Isopora crateriformis*. Coral cover close to shore was relatively low. The closest observed ESA listed coral colony was approximately 25 meters (82 ft) seaward of the proposed study area (USFWS 2023).

In November 2020, NMFS proposed to designate critical habitat in American Samoa for these coral species pursuant to Section 4 of the ESA. Under this designation, the entire fringing reef of Ofu and Olosega would be considered critical habitat at depths from 0-67 ft. This designation is still pending and not final.

2.3 Built Environment

The built environment includes buildings, roads, bridges, and other infrastructure that have been designed and constructed by humans for human occupancy, use, or other purposes that benefit humans, within the study area this includes:

- Ofu-Olosega Highway, a single-lane coastal road, was constructed in 1970, connecting the islands of Ofu and Olosega and passing parallel to the landward perimeter of the Ofu Airport and seaward of the Vaʻoto Marsh.

- Ofu Airport was constructed in 1974 and the runway was realigned to its current location in 1986.
- In October 1986, the Corps constructed a shoreline protection feature intended to protect the Ofu airstrip from coastal erosion occurring on the runway's east shoreline.

More recently, DPA was awarded an FAA Airport Improvements project grant to rehabilitate and reconstruct the entire existing airport runway, completed in July 2022. In July 2022, a "king tide" event caused damage to the west end of the runway and required emergency repairs and maintenance to restore airport operations (Figure 3 **and** Figure *4Figure 4: Photos of erosion and damage to runway following king tides (photo taken July 14, 2022). Source: American Samoa DPA*

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2.3.1 Land Use, Utilities and Public Services

Residential and commercial development comprises only 2% of the total land use on Ofu Island. Ofu and Alaufau Villages (approximately 200 people) are located on the western shore, approximately one (1) mile northwest from the airport and study area. Ofu Village is the main population center on the island. Cultivated land covers less than one percent (7 acres) of the island.

Utilities for Ofu Island include electricity, water, sanitary and solid waste disposal, and communication services. Between the airport runway and Leolo Ridge are several structures including the airport terminal, Vaʻoto Lodge and associated cottages, a ranger station/medical dispensary, a power generator/sub-station building, a radio transmitter, and several private residences (ASG 2006).

Utility services at the airport consist of underground electrical service supplied from the Ofu Power Plant, located in Ofu Village. Underground telephone service, water mains, and associated fire hydrants lie along the main island road. There are no provisions at Ofu Airport for aircraft fueling, navigational equipment, or air traffic control facilities.

Ofu Airport contains aircraft rescue and firefighting facilities and teams that are available to support the Fire Division when additional fire services are necessary. The American Samoa Department of Public Safety Fire Division provides fire services for the entire Territory.

Public services on Ofu are extremely limited. There are several buildings located near the airport, just north (landward) of the coastal road, including the airport terminal, Vaʻoto Lodge and cottages, a medical center/ranger station with a standby generator, a radio transmitter and associated buildings, a government building, and several private residences.

Travel to Ofu from the main island of Tutuila can be accomplished by plane or boat. Ofu Airport is a single-runway, uncontrolled airspace airport used primarily for chartered flights between Ofu and Pago Pago International Airports. Inter-Island Airways is the sole service provider with commercial passenger and cargo air direct service to/from Pago Pago International Airport using 8 passenger BN2 Islander and 19 passenger Twin Otter aircraft. The airport is also utilized by government and privately chartered aircraft.

Travel to Ofu direct from Tutuila can also be accomplished by boat through commercial cargo and private charter boat services. A small wharf/dock complex is located near Ofu Village to serve the population of both Ofu and Olosega Islands. This facility can accommodate vessels of various sizes, mainly for periodic commercial shipping activities. The wharf is located west of the village of Ofu, approximately 1.5 miles from the airport. There is no formal boat service between the Manuʻa islands. Passengers typically charter a local fishing vessel through informal arrangements with local fishermen. Once on the island, there are no rental cars, taxis, or bus service available.

2.3.2 Traffic and Circulation

American Samoa has a limited, but defined road system. Transportation occurs mainly by personal vehicles. Due to the condition of many roads and topography, larger heavy-duty trucks and Sports Utility Vehicles are most common on roadways. The highway system in American Samoa is managed by the DPW. In American Samoa, local bus service is available on the Island of Tutuila only.

On Ofu, few cars exist and vehicular traffic is extremely light. There are no rental cars, taxis, and bus service available on Ofu-Olosega. There is a single main, six (6) mile coastal road on the island that begins at the Wharf at the west end of the island, connecting through the village of Alaufau and Ofu Village to the Ofu Airport. At the Ofu Airport, the main coastal road runs parallel to the runway. Barriers exist to prevent vehicles from using the road 10 minutes prior to take-off and landing of an aircraft. The road continues through the National Park of American Samoa and the Asaga Strait. At the Asaga Strait, the road connects with neighboring Olosega Island via a bridge (see Figure 2 and Figure ***5***). The road is a narrow two-lane road except when it crosses the bridge to Olosega Island, where it becomes a one-lane road. This road is recognized as a national highway by the Federal Highway Administration.

2.4 Economic Environment

The economic environment refers to all the external factors in the immediate marketplace and the broader economy that affect commercial and consumer behavior.

Residential and commercial development comprises only 2% of the total land use on Ofu Island. Cultivated land covers less than one percent (7 acres) of the island (Table 1). In 1960, Ofu Island had 605 residents, but since 2010 has experienced a dramatic population decline, losing over 2/3 of its population. As of the 2020 U.S. Census, Ofu has 132 residents. Most of the population lives in the village of Ofu and Alaufau, located about one (1) mile northwest of the study area.

Industry on Ofu is very limited. Of the working labor force, about half of the residents are employed in the education, health, and social services sector. Transportation, Warehousing, and Utilities account for approximately 13% of the population and construction and public administration account for almost 12% and 11% respectively, of Ofu and Olosega residents.

2.4.1 Cultural, Historic, and Archaeological Resources

The Manuʻa Islands hold special status in tradition and in Samoan society. An oral tradition that relays the origins of the Samoan political organization based upon the birth of the first Tui Manuʻa. The Manuʻa islands remained independent from both political dominancy by the western islands of Upolu and Savaiʻi as well as during the period of the Tongan wars. The Tui Manuʻa, often translated as the king of Manuʻa was considered equal in rank to the highest- ranking titles of the western Samoan islands as well as the king of Tonga. Today, Samoans regard Manuʻa as the cradle of Samoa civilization. According to a Manuʻa legend, Manuʻa was the beginning of everything.

The affected environment for cultural, historic, and archaeological resources includes all resources in those categories which are present within: 1) the immediate area of implementation of structural or nonstructural improvements and 2) the broader area which would be affected by the implementation (or non-implementation) of the improvements. The first set of effects are direct and short-term, while the second set are indirect and long-term. The area of potential effect for the project have only been partially surveyed for cultural, historic, and archaeological resources. This work has been done over the course of both academic research and National Historic Preservation Act (NHPA) compliance for the federally funded or permitted undertakings associated with federally assisted projects on Ofu. No cultural resources surveys have been conducted of the study area itself. Based on what is known from regional academic and NHPA compliance findings, cultural, historic, and archaeological resources are present throughout Ofu, including two archaeological sites on the Vaʻoto Plain dated to the period of initial settlement of the Samoan archipelago slightly more than 2700 calibrated years before the present. The Vaʻoto Site (AS-13-13) at the base of the mountain on the eastern side of the Vaʻoto Plain and the Coconut Grove site (AS-13-37) in the Coconut grove south of the runway are both prehistoric habitation sites dating to the early habitation of Ofu Island. The upper deposits at both sites are disturbed by modern activities, including agriculture. An undated raised area with loosely piled rocks on the surface between the road and the airport runway (AS-13-12) is a possible agricultural site. A rough semi-circle of volcanic rocks with coral pieces in the interior (AS-13-11) between the road and the runway is also undated, untested, and of uncertain function. Three other sites are further away from the project location, including a terrace on the inland side of the road just as it approaches Vaʻoto Plain (AS-13-10), and three sites on the mountain, including Tufu habitation site (AS-13-42) and a star or pigeon catching mound overlooking the Vaʻoto Plain. Radiocarbon dates from Tufu date to between anno domini (AD) 1024 and 1795. A relatively flat area identified through geographic information system analysis east of the star mound may also contain archaeological materials but has not been investigated. Two sites are near proposed staging areas at Ofu Harbor. Nu‘utele Islet (AS-13-03) is west of Ofu Harbor and Ofu Village. Two (2) legendary features and 36 archaeological features have been identified on Nu‘utele, although no radiocarbon dates have been obtained for the site. Radiocarbon dates from a series of test units and trenches in Ofu Village returned radiocarbon dates beginning as early as 781-511 BC to as late as AD 1695-1919, with a range of radiocarbon dates between.

The proposed staging areas for the project have been used by previous projects and are disturbed areas that do not contain any cultural resources. The shoreline protection area is along the shoreline bank and on the beach (Figure 9). No archaeological sites were identified near the study area by a 1992 survey for improvements to the Ofu-Olosega Road, and archaeological monitoring of the 2021 airfield rehabilitation and reconstruction project concluded that the area had been heavily disturbed during the 1974 airfield construction. The study area has been subjected to erosion during storm and king tide events and repair activities took place within the study area. The shoreline protection area does not show evidence of cultural resources at this location.

Figure 9: Study area adjacent to airfield, view to the northwest (Photo courtesy of DPA)

2.4.2 Socioeconomics

Demographic and economic variables can be used to define the socioeconomic conditions within a study area and provide a baseline that can be used to evaluate whether a proposed project would have an impact.

In 1960, Ofu Island had 605 residents, but since 2010 has experienced a dramatic population decline, losing over two-thirds of its population. As of the 2020 US Census, Ofu has 132 residents (Table 3). Most of the population lives in the village of Ofu, located about one (1) mile west of the airport and study area. Industry on Ofu is very limited. Of the working labor force, about half of the residents are employed in the Education, Health, and Social Services sector. Transportation, Warehousing, and Utilities account for approximately 13% of the population and Construction and Public Administration account for almost 12% and 11%, respectively, of Ofu and Olosega residents.

Table 3: Historic and current population estimates

Area	Population		Total Change	Annualized Change over Decade
	2010	2020	2020-2010	2010-2020
Ofu	176	132	44	-2.8%
American Samoa	55,519	49,710	-5,809	-1.1%

Source: U.S. Census Bureau, 2020 Census, American Samoa

There continues to be relatively little tourism in American Samoa. Only two flights a week operate between Honolulu, Hawaiʻi and Pago Pago International Airport for most of the year. There are several flights daily between American Samoa and neighboring independent Samoa and limited service to a few other destinations. It is estimated that American Samoa received 4,556 tourists in 2019 and 4,971 tourists in 2018 (ASDOC, 2020). Approximately 80% of tourists to American Samoa are citizens of the U.S. (33.7%) or New Zealand (46.5%).

In terms of visitors (non-residents) to Ofu, the majority are scientists conducting research at the National Park. Only about 25 tourists visited Ofu over a recent 6-month period. Snorkeling in the coral reefs and hiking in the National Park are the main tourism opportunities for Ofu. The American Samoa Tourism Master Plan noted that due to current difficulties in accessing Ofu, most of the tourism development will occur on Tutuila, and not on Ofu. Tourist lodging facilities are currently limited to the Vaʻoto Lodge and home stays with locals. Lodging options would need to be expanded and improved in order to sustain long-term tourism growth on Ofu.

2.4.3 Environmental Justice

EO 12898 addresses the effect of Federal actions on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. Environmental justice issues arise when minority or low-income groups experience disproportionately adverse health or environmental effects, including ecological, cultural, human health, economic, and social impacts (CEQ 1997). There are no known American Samoa-specific local or Territorial laws or regulations specific to environmental justice.

Low-income populations in the study area were identified by several socioeconomic characteristics (Table 4), including median household income, per capita income, and poverty status. displays these economic characteristics for the study area based on 2020 U.S. Census Bureau data. Overall, in the Territory, median household income did not show much change from $28,539 (in 2019 inflation-adjusted dollars) in 2009 to $28,352 in 2019. The percentage of families in poverty in American Samoa declined from 54.4% in 2009 to 50.7% in 2019.

Table 4: Income and poverty in American Samoa. Source: U.S. Census Bureau, 2020 Census, American Samoa

Area	Individuals in Poverty	Families in Poverty	% Living in Poverty		2019 Median Household Income	Per capita income for population in households
			Individual	Family		
Ofu County	72	13	54.5%	43.3%	$25,417	$10,700
American Samoa	26,480	4,400	54.6%	50.7%	$28, 352	$8,425

Emergency facilities are essential for functioning of a community and can directly affect public health and safety; these include fire and police stations, hospitals and medical clinics, and evacuation shelters. Access to these facilities can be limited during and after flood events; in some cases, critical infrastructure may need to be evacuated (e.g., temporary closure of medical facilities would) interrupt normal public health operations, as well as trauma care).

Due to the isolation of the Manuʻa islands, air travel is especially important in the event of an emergency when transport of food, supplies, and medical evacuation are needed urgently. The Ofu Airport is the primary, fastest and most reliable access to Ofu and Olosega islands. In addition to transport of passengers, regular flights in/out of this airport are used to transport food, supplies, and medicine from Tutuila and other locations. Although boats can also transport cargo, this is heavily dependent on dynamic ocean conditions, so important supplies are typically transported by air. There is one medical clinic on Ofu that also serves Olosega residents which has minimal resources, so most patients are transported by chartered flight to Pago Pago for treatment, especially in critical or urgent conditions. If no action is taken and the patient is transported by boat, the critical time to begin treatment is delayed an additional 10-15 hours, resulting in increased negative health outcomes, including death.

2.4.4 Recreation

Recreation in American Samoa includes various forms of active and passive, mainly outdoor, activities. Active recreation includes group sporting competitions (e.g., rugby, American football, wrestling), jogging, and hunting (mainly for feral pigs), while passive family-oriented activities, like picnicking at public parks, are common. Recreation tends to be pursued mostly at specific facilities and sites and to be focused on group sporting events. Structured recreational programs (mainly sports) in American Samoa are geared and managed mainly for school students and youth through the involvement of the public school system under the Department of Education. No recreational facilities occur in the study area.

Marine and beach-based based water activities that involve boating and fishing, whether traditional subsistence fishing in the historical past of today's more modern boat-based fishing, have always been an important component of Pacific Island economies (Doulman and Kearney 1991), with American Samoa no exception. Recreational fishing, including recreational fishing tournaments for pelagic fishes, is very popular in the Territory (Craig et al 1993).

2.4.5 Aesthetics

Aesthetics refer to the natural and constructed features that provide the visual appeal of a particular location. In undeveloped areas, landforms, water bodies, and vegetation are the primary aesthetic elements that characterize the landscape. The combination of these characteristics defines the overall landscape, thus determining the visual quality of an area.

The natural landscape of Ofu is extremely scenic and aesthetically beautiful. The island is the quintessential tropical island paradise of lush green volcanic peaks, clear, turquoise waters, and colorful coral reefs. At the airport, the landward viewshed includes tall volcanic cliffs and peaks, while the ocean view looks out towards the coral reefs of the Ofu-Vaʿoto Marine Park (Figure 10).

Figure 10: Ofu Airport (dashed yellow box) from the air looking toward Asaga Strait

Section 3 Plan Formulation*

This section presents results of the third step of the six-step planning process: Formulation of alternative plans. This section will outline the evolution of the screening process from identification of management measures to development of an initial array of alternatives to the screening of alternatives to arrive at a final array.

3.1 Planning Framework

Plan formulation is the process of building alternative plans that meet planning objectives and avoid planning constraints to the extent practicable. Alternative plans are a set of one or more management measures functioning together to address one or more planning objectives. Alternatives were developed in consideration of study area problems and opportunities as well as study objectives and constraints.

3.2 Assumptions

Assumptions that were used in the planning process include the following:

- Adequate stone for the revetment alternatives is available on Ofu island. A contingency has been included in the cost estimate for these alternatives to account for the possible need to source stone from another location.
- Alternative designs are based on the intermediate SLC scenario and existing site survey data.

3.3 Management Measures and Screening

3.3.1 Management Measures

As part of the planning process, the project delivery team (PDT), in coordination with the non-federal sponsor and interested stakeholders, developed a series of measures to consider as potential elements of the study solution. A management measure is a feature or activity that can be implemented at a specific geographic site to address one or more planning objectives. Measures may be structural or non-structural.

The PDT identified structural measures that would either decrease the level of shoreline erosion or reduce coastal risks associated with wave damage and flooding. Traditional shoreline protection and coastal storm risk reduction structural measures include levees, storm surge barrier gates, seawalls, revetments, groins, and nearshore breakwaters. The PDT also identified nonstructural measures that would reduce the consequences of flooding to the threatened facility (Ofu Airport) and that do not require construction of a structure for success. Traditional non-structural measures that address shoreline erosion and coastal storm risk at coastal beach fronts include elevation, relocation, and acquisition.

Natural and nature-based features (NNBF) are measures that mimic the characteristics of natural features but are created by human design, engineering, and construction. Examples of NNBF that provide coastal risk reduction include dunes and beaches, vegetated offshore islands, oyster and coral reefs, barrier islands, and maritime forests.

The PDT reviewed the above traditionally applied measures and identified the following structural, non-structural, and NNBF measures that were most likely to meet the study objectives. Measures consisting of new in-water construction such as breakwaters and groins were not included in the initial list of measures due to the high costs (permitting, design and construction) and substantially greater environmental impacts typically associated with new in-water construction.

Structural Measures:

- Rock revetment – consists of a graded slope protected by an underlayer of medium-sized stones and a top layer of heavier armor stones
- Tribar Revetment – constructed similarly to the rock revetment, but comprised of engineered, interlocking concrete armor units
- Concrete Rubble Masonry (CRM) Wall - involves constructing a CRM wall that is keyed into hard substrate using a precast concrete base
- Sheet Pile Seawall - involves drilling/driving steel sheet piles in an overlapping pattern to form a barrier
- Precast Concrete Seawall – consists of individual cantilever concrete panels placed atop hard substrate

Non-Structural Measures:

- Relocation of Ofu Airport – involves the relocation of Ofu Airport inland to avoid continued damage from coastal erosion

Natural and Nature-Based Measures:

- Beach Fill - consists of introducing locally sourced or imported beach sand material to engineer and build up the existing beach to dissipate wave energy. This measure would require periodic beach renourishment to mitigate ongoing erosion and other natural processes.
- Vegetation – consists of select vegetative plantings to add stability to the shoreline

3.3.2 Screening of Management Measures*

Screening is the process of eliminating those measures that will not be carried forward for consideration. To meet study objectives, each of the structural and non-structural measures were individually evaluated based on a qualitative assessment of the following criteria:

- Is the measure likely to be effective at providing shoreline protection over the 50-year period of analysis?
- Is the measure likely to be the least cost in comparison to other measures with

similar effectiveness?

- Is the measure likely to be environmentally acceptable based on available information?

Parametric cost estimates and feedback from resource agency consultation were used to assist with the screening process. Table 5, presented below, summarizes the initial screening of management measures:

Table 5: Screening of Management Measures

Management Measure	Carried Forward (Y/N)	Reason Not Carried Forward
Structural Measures		
Rock Revetment	Y	N/A
Tribar Revetment	Y	N/A
Sheet Pile Seawall	Y	N/A
CRM Wall	Y	N/A
Precast Concrete Seawall	Y	N/A
Natural and Nature-Based Measures		
Beach Fill	N	Not consistent with project authority
Vegetation	Y	N/A
Nonstructural Measures		
Airport Relocation	N*	Costs too high; *Retained as a reference for plan formulation and selection.

- Rock Revetment – This measure was expected to provide shoreline protection over the 50-year period of analysis. A preliminary assessment of environmental impacts using information available at the time of management measure screening expected environmental effects to be less than significant. However, the possibility of in-water work and impacts on ESA species in the study area needed to be explored. Preliminary cost estimates indicated that this measure is cost-effective. However, refinement to the cost estimate was needed to account for the availability of adequately sized rock in American Samoa. This measure was carried forward for consideration.
- Tribar Revetment – This measure was expected to provide shoreline protection over the 50-year period of analysis. A preliminary assessment of environmental impacts using information at the time of management measure screening expected that environmental impacts would be identical to that of the rock revetment alternative. Preliminary cost estimates indicated that this measure is cost-effective and could serve as a substitute for rock revetment should rock availability be scarce. This measure was carried forward for consideration.
- CRM Wall – This measure was expected to provide shoreline protection over the 50-year period of analysis. A preliminary assessment of environmental impacts using information available at the time of management measure screening expected environmental effects to be less than significant. Preliminary cost

estimates indicated that this measure is implementable under the CAP Section 14 authority. This measure was carried forward for consideration.

- Sheet Pile Seawall – This measure was expected to provide shoreline protection over the 50-year period of analysis. A preliminary assessment of environmental impacts using information at the time of management measure screening expected that environmental impacts would be identical to that of the rock revetment alternative Preliminary cost estimates indicated that this measure is implementable under the CAP Section 14 authority. This measure was carried forward for consideration.
- Precast Concrete Seawall - This measure is likely to provide shoreline protection over the 50-year period of analysis. A preliminary assessment of environmental impacts using information at the time of management measure screening expected that environmental impacts would be identical to that of the rock revetment alternative. Preliminary cost estimates indicated that this measure is implementable under the CAP Section 14 authority. This measure was carried forward for consideration.
- Beach fill – Due to the level of storm surge and wave heights in the study area, beach fill as a standalone was considered inadequate and would be considered a temporary fix. Beach fill has the potential to be effective in combination with other structural measures. However, local availability of suitable beach fill material is limited, so this measure would be extremely costly to import and maintain. More importantly, renourishment is not covered under the Section 14 authority, therefore, regular renourishment to maintain the effectiveness of the structure would be a non-Federal responsibility. For these reasons, beach fill was screened out from further consideration.
- Vegetation - Due to the high wave energy environment and observed damages to existing shoreline and vegetation in the study area, vegetation itself would not provide adequate protection to Ofu Airport over the 50-year period of analysis. This measure was not carried forward as a standalone alternative but was considered in combination with other hardened shoreline protection measures, particularly the vertical seawall options.
- Airport Relocation – This alternative was expected to provide protection from coastal erosion over the 50-year period of analysis. However, this measure is not within the CAP authority and is not considered to be a viable measure due to recent multimillion dollar investments in Ofu Airport infrastructure. Airport relocation was screened out for incorporation in alternative plans. However, the cost of relocation is used as a benchmark for plan selection under CAP Section 14. An explanation of estimated relocation costs for the purpose of plan selection is available in Section 5.3.

3.4 Initial Array of Alternatives

Alternative plans are a set of one or more management measures functioning together to address one or more planning objectives. All management measures carried forward for consideration, i.e., rock revetment, tribar revetment, CRM wall, sheet pile sea wall and precast concrete seawall, addition of vegetative plantings to any of these measures and the no-action alternative, constitute the initial array of alternatives.

Based on parametric cost estimates and initial alternative designs, the initial array of alternatives was screened using the following criteria:

- Is the alternative likely to be cost-effective in providing shoreline protection?
- Does the alternative require special equipment, material, or expertise that is not available in American Samoa?
- Does the alternative meet USACE design life requirements, including the consideration of 100 years of SLC?
- Is the alternative likely to be environmentally acceptable?

Table 6 lists the initial array of alternatives and summarizes the screening of the initial array.

Table 6: Initial array of alternatives

Alternative	Likely to be Cost Effective?	Special Equipment Required?	Meets USACE Design Requirements?	Likely to be Environmentally Acceptable?
Alternative 0: No Action	N/A	N/A	N/A	N/A
Alternative 1: Rock Revetment	Yes	No	Yes	Yes
Alternative 2: Tribar Revetment	Yes	No	Yes	Yes
Alternative 3: CRM Wall	Yes	No	Yes	Yes
Alternative 4: Sheet Pile Wall	No	Yes	No	Yes
Alternative 5: Precast Concrete Seawall	Yes	No	Yes	Yes

Alternatives 1 and 2 consist of revetment designs that use either armor stone or precast concrete armor units. Both revetment alternatives were brought forward to the final array. Material sourcing and availability will play a major factor in refinement of cost estimates. The tribar revetment allows for the use of concrete armor units if locally sourced armor stone is unavailable or too expensive to meet project limits. While a contingency to account for the need to bring in armor stone from Tutuila is included in the cost estimate, the Tribar revetment was brought forward to address residual risk associated with stone availability and pricing.

The CRM Seawall was carried forward to the final array of alternatives for further analysis.

The Sheet Pile Seawall was screened out as it had the highest costs of all the alternatives and was not popular with resource agencies. High costs were attributed to the need to deploy specialized equipment and labor to American Samoa. In consultation with resource agencies, it was identified that other similar sheet pile seawalls deployed within the Pacific Islands have a known history for failure and short life span due to corrosion of the metal piles. Frequent maintenance and replacement of these structures are necessary to maintain effectiveness. For these reasons, this alternative was screened from further consideration.

The Precast Concrete Seawall was carried forward into the final array of alternatives as this design has been successfully implemented in other coastal erosion protection studies in the Pacific.

Further analysis of the coastal wave environment in the study area determined that the vegetation measure was not suitable for implementation as part of the federal project. Soft solutions such as vegetation would not be able to withstand the wave action in the study area, especially when combined with future projections of SLR and increased storm intensities. Additionally, from an environmental perspective, vegetative plantings along the remaining sand beach would not be conducive for turtle nesting habitat. For these reasons, vegetation was removed from alternatives containing the measure.

3.5 Final Array of Alternatives

Based on the rationale and findings documented in Section 3.4, a final array of alternative plans was developed as follows:

- Alternative 0: No Action
- Alternative 1: Rock Revetment
- Alternative 2: Tribar Revetment
- Alternative 3: CRM Wall
- Alternative 5: Precast Concrete Seawall

3.5.1 Alternative 0: No Action

Under the No Action Alternative, no federal actions for emergency shoreline protection would be implemented. Conditions in the study area are anticipated to develop as described in the FWOP condition (Section 2).

3.5.2 Alternative 1: Rock Revetment

Alternative 1 consists of construction of rock revetment with a length of 500 linear feet (lf). The revetment would consist of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a double layer of armor stone, and anchoring by an oversized toe stone. The stone sizing of the underlayer and armor layer was determined to be 675-1,125 pounds (lbs) stone for the underlayer, 3.4-5.6-ton stone for the armor layer, and 6.75-ton stone for the toe. At the specified 1.5 horizontal to 1 vertical slope (1.5H:1V), the revetment is expected to be 36.6 ft wide, extending towards the ocean, with a crest elevation of +10 ft MSL. After construction, the area behind the revetment would be backfilled to the crest of the structure and the excavated area in front of the revetment would be regraded to match the existing beach profile. Figure 11 shows the design for Alternative 1: Rock Revetment.

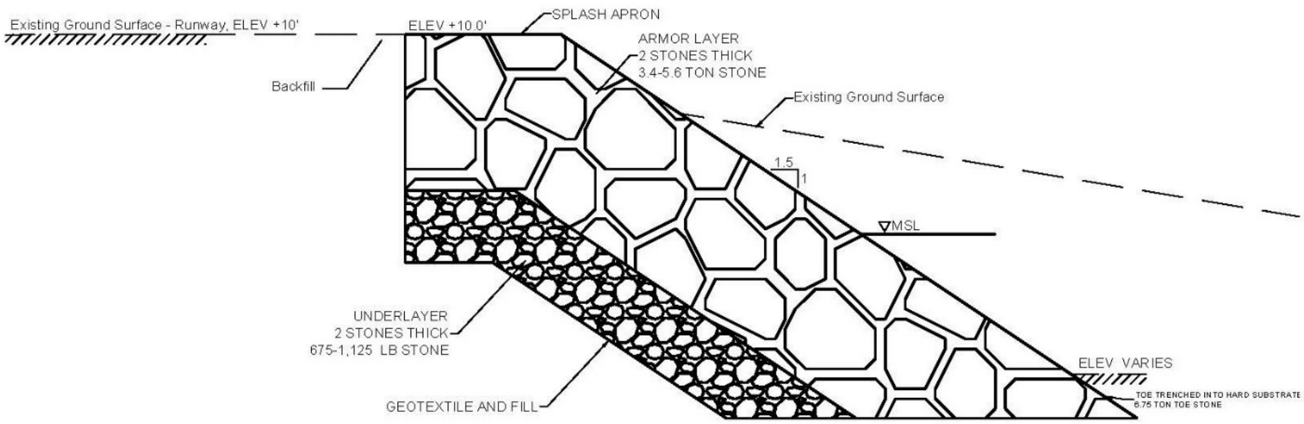

Figure 11: Alternative 1- Rock Revetment

3.5.3 Alternative 2: Tribar Revetment

Alternative 2 includes construction of a 500 lf tribar revetment. The revetment would consist of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a single layer of 1-ton concrete tribar. The stone sizing of the underlayer was determined to be 100-300 lbs. stone. At the specified 1.5H:1V slope, the revetment is expected to be 33 ft wide, extending towards the ocean, with a crest elevation of +10 ft MSL. After construction, the area behind the revetment would be backfilled to the crest of the structure and the excavated area in front of the revetment would be regraded to match the existing beach profile. Figure 12 shows the design for Alternative 2: Tribar Revetment.

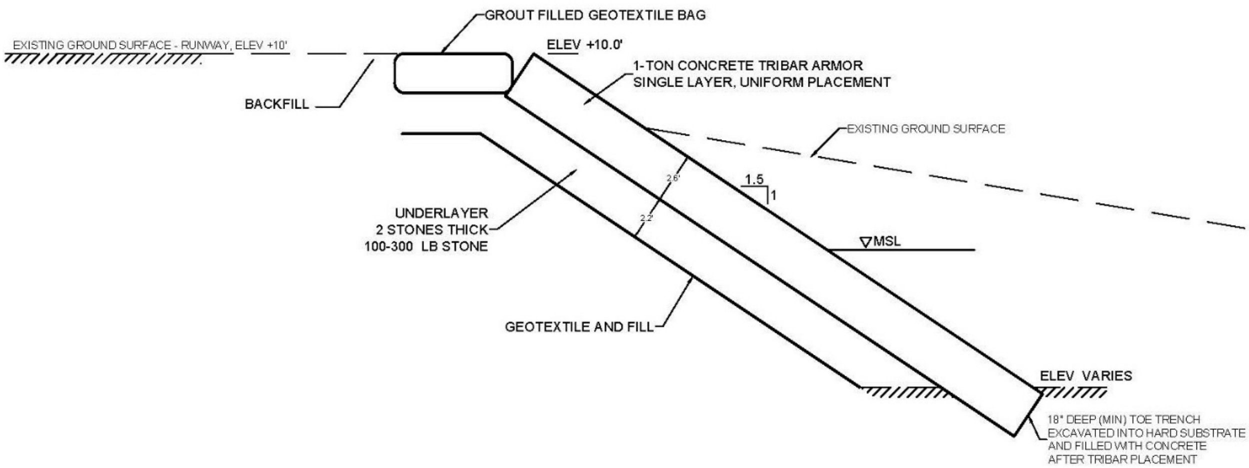

Figure 12: Alternative 2 - Tribar Revetment

3.5.4 Alternative 3: CRM Wall

Alternative 3 consists of a 500 lf gravity wall composed of CRM, constructed on a reinforced cast-in-place concrete foundation. Construction of the CRM wall would consist of excavating to the limestone shelf, placing the reinforced concrete foundation, and then installing the CRM wall on top of the concrete base. After construction, the area behind the seawall would be backfilled to the crest of the structure and the excavated area in front of the wall would be regraded to match the existing beach profile. This design has a total elevation of 10 ft above MSL and a base that is 12 ft wide, with the total disturbed area being approximately 38 ft due to excavation and backfill of the existing soils. Figure 13 shows the design for Alternative 3: CRM Wall.

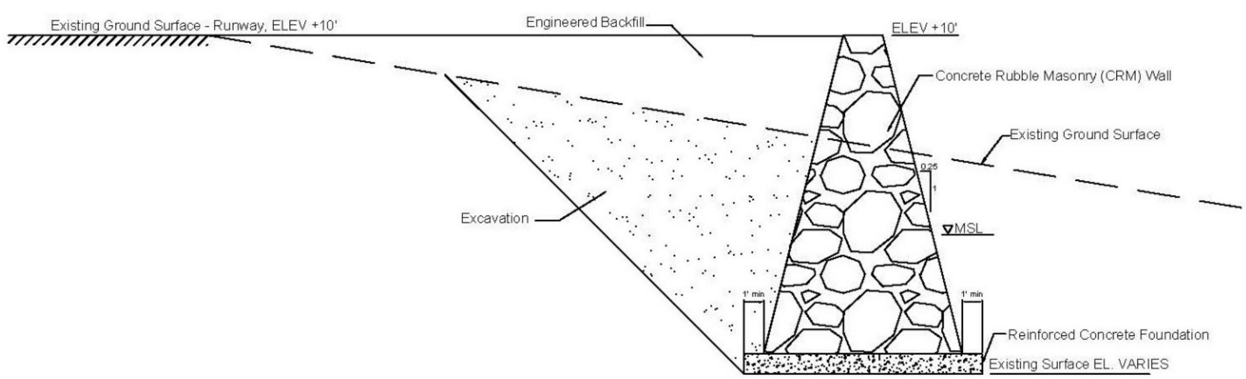

Figure 13: Alternative 3 - CRM Wall

3.5.5 Alternative 5: Precast Concrete Seawall

Alternative 5 involves the use of individual cantilever concrete panels to construct 500 lf of seawall. Concrete wall panels would be constructed offsite. Installation of the precast concrete panel wall would consist of excavating to the limestone shelf and placing the panels. After construction, the area behind the seawall would be backfilled to the crest of the structure and the excavated area in front of the wall would be regraded to match the existing beach profile. This design has a top elevation of 10 ft above MSL and a base that is 14 ft wide, with the total disturbed area being approximately 37 ft due to excavation and backfill of the existing soils. Figure 14 provides the design for Alternative 5: Precast Concrete Seawall.

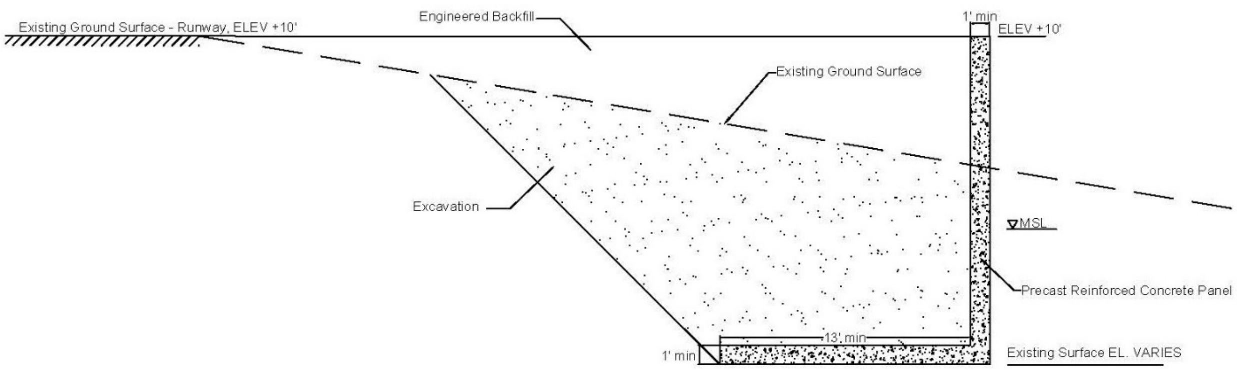

Figure 14: Alternative 5 - Precast Concrete Seawall

Table 7 provides a summary of the design quantities and dimensions for each of the structures in the final array of alternatives.

Table 7: Summary of Design Quantities and Dimensions

Alternative	**Alternative 1: Rock Revetment**	**Alternative 2: Tribar Revetment**	**Alternative 3: CRM Wall**	**Alternative 5: Pre-cast Concrete Seawall**
Structure Length (ft.)	500	500	500	500
Crest Width (ft)	7.8	6	2	1
Crest Elevation (ft.)	10	10	10	10
Bottom Elevation (ft.)	-7	-7	-7	-7
Depth into Hard Substrate (ft).	2.2	1.5	NA	NA
Structure Slope (H:V)	1:1.5	1:1.5	1:0.25	1:0 (vertical)
Structure Footprint Width (ft.)	36.6	33	12 (foundation) 10 (bottom) 2 (crest)	14 (base) 1 (top)
Armor Stone Weight (tons)	3.4-5.6	1	NA	NA
Armor Layer Thickness (ft.)	7.8 (2 layers)	2.6 (1 layer)	NA	NA
Underlayer Stone Weight (lbs.)	675-1,125	100-300	NA	NA
Underlayer Thickness (ft.)	3.6 (2 stones)	2.2	NA	NA
Toe Stone Weight (tons)	6.75	NA	NA	NA
Toe Stone Size (ft.)	4.4	NA	NA	NA
Excavation width footprint (ft.)	46.6	43	38	37

Section 4 Environmental Effects and Consequences*

This section provides an analysis of environmental effects and consequences (40 CFR 1502.16) for the resources described in Section 2 that are present in the study area based on a comparison of the effects (or impacts) of each alternative plan as formulated through the alternative analysis process (Section 3) relative to the No Action (FWOP) conditions. The general setting, natural, physical, and built environments as described in Section 2 are expected to change under the FWOP condition due to the climate change impacts described in Section 2.

Project impacts may be permanent or temporary (Table 8), adverse or beneficial, and include both direct and indirect effects. Impacts from the proposed construction will be permanent and temporary in nature. Permanent impacts are those that cause a permanent alteration of the physical, chemical, or biological properties of an area. Temporary impacts occur when fill and/or cut impacts occur that are restored to pre-construction contours or condition when construction activities are complete. (e.g., staging or stockpile area, temporary access construction easements, temporary access routes). Table 8 provides a summary of permanent and temporary impacts by action alternative for the Proposed Project. Note the four proposed staging areas (Figure 5), are the same for all four of the Action Alternatives.

Direct effects are caused by the action and occur at the same time and place; indirect effects are caused by the action and are later in time or farther removed in a spatial context (distance from the source of the effect) but are still reasonably foreseeable. Best management practices (BMPs) are used to avoid or minimize direct and indirect impacts. BMPs are policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects resulting from construction activities. BMPs for this project are detailed in Section 6.9 Environmental Commitments and will be included in construction requirements.

Table 8: Permanent and temporary impacts of construction by action alternative

Alternative Plan	**Alternative 0: No Action**	**Alternative 1: Rock Revetment**	**Alternative 2: Tribar Revetment**	**Alternative 3: CRM Wall**	**Alternative 5: Pre-cast Concrete Seawall**
Permanent Impacts	NA	0.41 acres (structure) *largest*	0.38 acres (structure) *2nd largest*	0.14 acres (structure) *smallest*	0.16 acres (structure) *2nd smallest*
Temporary Impacts	NA	1.35 acres (staging area) 0.14 (excavation and backfill*) *2nd smallest*	1.35 acres (staging area) 0.12 excavation and backfill *smallest*	1.35 acres (staging area) 0.30 acres (excavation and backfill) *largest*	1.35 acres (staging area) 0.26 acres (excavation and backfill) *2nd largest*
Total Impacts	NA	1.9 acres *largest*	1.85 acres *2nd largest*	1.79 acres *2nd smallest*	1.77 acres *smallest*

Table 8 note: **Backfill includes any material used to refill an excavated hole or trench, typically the excavated soil, a mixture of sand and gravel, or other fill material. The process of backfilling usually takes place in layers.*

Criteria based on the definitions of significance and 40 CFR 1508.1 were identified for each resource to assist with evaluation of the potential for significant adverse effects:

- Beneficial. This effect would provide benefit to the environment as defined for that resource.
- No Effect. This effect would cause no discernible change in the environment as measured by the applicable significance criteria; therefore, no mitigation would be required.
- Less than Significant. This effect would cause no substantial adverse change in the environment as measured by the applicable significance criteria; no mitigation would be required, though BMPs may be used to meet other regulatory requirements.
- Significant. This effect would cause a substantial adverse change in the physical conditions of the environment or as otherwise defined based on the significance criteria. Significant effects can be categorized as: (1) those for which there is feasible mitigation available that would avoid or reduce the environmental effects to less-than-significant levels, and (2) those for which there is either no feasible mitigation available or for which, even with implementation of feasible mitigation measures, would remain a significant adverse effect on the environment (significant and unavoidable effects).

Table 9: Summary of Potential Effects

Key: S = Significant L = Less than Significant N = No Affect B = Benefit	Alternative 0: No Action / FWOP	Alternative 1: Rock Revetment	Alternative 2: Tribar Revetment	Alternative 3: CRM Wall	Alternative 5: Precast Concrete Seawall
Geomorphology, Hydrology, Hydraulics*	S	N	N	N	N
Water Resources and Quality*	S	L	L	L	L
Air Quality*	N	N	N	N	N
Noise and Vibration*	N	L	L	L	L
Terrestrial Habitats and Species*	S	L	L	L	L
Aquatic Habitat and Species*	S	L	L	L	L
Threatened and Endangered Species*	S	L	L	L	L
Land Use, Utilities, and Public Services*	S	B	B	B	B
Traffic and Circulation*	S	L	L	L	L
Cultural, Historic, and Archaeological Resources*	S	N	N	N	N
Socioeconomics	S	B	B	B	B
Environmental Justice	S	B	B	B	B
Recreation	S	L	L	L	L
Aesthetics*	N	L	L	L	L
*Effect would cause no substantial adverse change in the environment; however, use of standard BMPs would avoid or reduce the environmental effects to less-than-significant or beneficial levels.					

For all resources the impacts of Alternatives 1, 2, 3, and 5 are similar and are discussed together.

4.1 Physical Environment

4.1.1 Geomorphology, Hydrology, Hydraulics

Effects on hydrology, hydraulics, and geomorphology (including geology, seismicity, and soil conditions) are significant if implementation of an alternative would result in any of the following:

- Significantly change drainage patterns within the watershed
- Substantially increase the extent, frequency or duration of flooding
- Create or contribute to runoff that would exceed the capacity of existing or planned stormwater drainage system
- Substantially alter an important natural geologic feature;
- Cause substantial soil erosion;
- Increase exposure of people or structures to seismic-related hazards;
- Substantially contribute to an increased potential for (or otherwise be affected by) an onsite or offsite landslide/debris flow, subsidence, liquefaction, or collapse;

4.1.1.1 Alternative 0: No Action

Under Alternative 0, no federal action for emergency shoreline protection would be implemented. Conditions in the study area would be expected to equate with the current onsite conditions. No significant changes to land use in the upper watershed or surrounding area (e.g., from development, logging, large-scale agriculture) are expected through the period of analysis that would appreciably alter coastal hydrology or hydraulics to significantly influence geomorphological conditions within the study area. Natural erosional processes along the coast at the western end of the airport runway are expected to continue and be exacerbated because of climate change, leading to loss of the beach.

4.1.1.2 Alternatives 1, 2, 3, and 5

Construction of the Alternatives would not be expected to alter local coastal hydrologic or hydraulic conditions (e.g., wave patterns, currents) or affect local drainage patterns or hydrologic conditions within the Va’oto Plain (e.g., affect peak water velocities, flow discharges during flood events, obstruct or change the course of any waterway, modify an existing floodplain). There would be no placement of fill material (e.g., compacted fill) within any stream channel, waterway, or floodplain. As such, there would be no effect to hydrology, hydraulics, or geomorphology expected under these alternatives.

4.1.2 Water Resources and Quality

Effects on water quality were considered to be significant if implementation of an alternative plan would result in any of the following:

- Substantially degrade surface water quality such that it would violate water quality standards, contribute to exceedance of aquatic life guidelines, or otherwise impair beneficial uses;
- Substantially increase contaminant levels in the groundwater.

4.1.2.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. It is expected that the FWOP conditions would be relatively commensurate with existing conditions. Natural erosional processes along the coast at the western end of the airport runway are expected to continue. Because of the effects of climate change (e.g., more frequent storms, SLR), the effects of erosion under FWOP conditions are expected to exacerbate. Under the No Action Alternative, unabated shoreline erosion, exacerbated by climate change effects, may result in adverse effects to coastal water quality from chronic nearshore turbidity.

4.1.2.2 Alternatives 1, 2, 3 and 5

No steams, ponds, wetlands or groundwater would be affected by project-related activities as these resources are not located within the study area.

Construction of Alternatives 1, 2, 3, or 5 may require work within the intertidal zone of the nearshore marine environment however implementation of BMPs described in Section 6.9 would minimize impacts to be less than significant and do not result in reduced water quality conditions. Under Alternatives 1 and 2, construction of a revetment would decrease localized coastal erosion and potentially reduce chronic nearshore turbidity at this section of shoreline, which could have a beneficial effect on coastal water quality in the long-term. As part of the long-term project O&M activities required to keep the rock revetment in proper working order, the non-federal sponsor would operate and maintain the project and all recommended BMPs. Alternatives 1, 2, 3, and 5 would result in less than significant effects, and potentially beneficial effects on water quality.

4.1.3 Air Quality

Effects on air quality were considered significant if implementation of an alternative plan would result in any of the following:

- Exceedance of federal or Territorial air quality standards established for criteria pollutants
- Generation of greenhouse gas emissions that would significantly contribute to climate change

4.1.3.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. It is expected that the FWOP conditions would be relatively commensurate with existing conditions in terms of air quality. The existing range of air pollution sources within the study area would not be expected to change substantially over the period of analysis. With continuing trade wind patterns, air quality levels are expected to remain relatively constant and would continue to comply with federal and Territory standards. Alternative 0 would result in no effects to air quality resources.

4.1.3.2 Alternatives 1, 2, 3 and 5

The same equipment would be used for Alternatives 1, 2, 3, and 5 resulting in the same effects. Because the study area is an attainment area, and no air quality criteria are currently violated for American Samoa, General Conformity (GC) requirements as defined at 40CFR § 93.150-165 do not apply. In comparison to overall emissions in the region, the contribution by the proposed action is relatively small and would not cause exceedance of Territorial or national air quality standards. Over the long-term, the project would also result in limited air emissions from use of vehicles for O&M activities. However, these emission levels would be very low, and similar to those associated with construction, would be expected to have a negligible impact on air quality.

Specific to greenhouse gases, a limited amount of emissions would be associated with construction of the project resulting from the use of heavy equipment. Published USEPA data indicate that 10,180 grams of carbon dioxide are produced for every gallon of diesel fuel burned, and 8,887 grams are produced for every gallon of gasoline used (USEPA 2008). Given the scale of the project, the total amount of emissions resulting from construction would be insignificant at a regional scale, and beneath Federal reporting thresholds. With implementation of the BMPs detailed in Section 6.9, all of the Alternatives would have no effect on air quality.

4.1.4 Noise and Vibration

Effects related to noise were significant if implementation of an alternative plan would result in any of the following:

- Exceedance of maximum permissible levels established by local noise ordinances
- Long-term exposure of noise-sensitive receptor(s) to a substantial increase in noise levels over the ambient condition

4.1.4.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented and no increase in ambient noise levels would occur. Land uses under the future without-project condition are expected to be reasonably consistent with the existing land uses and be relatively commensurate with existing conditions in terms of noise generated by aircraft using the runways and typical O&M activities conducted at airport facilities. Given that the types of noise and maximum permissible noise levels are linked to the various land use types, the general range of ambient noise levels across the study area is not expected to measurably change over the period of analysis. Alternative 0 would have no effect on noise.

4.1.4.2 Alternatives 1, 2, 3, and 5

Construction of all Alternatives would require operation of the same heavy equipment for various activities, including clearing, site preparation, excavation, grading, and installation of the structure. Construction activity would generally occur between the hours of 7:00 a.m. and 5:00 p.m. Monday through Friday, though some work outside those times may be necessary. Typical sound levels produced by construction equipment are listed in Table 10**Error! Reference source not found.**.

Table 10: Example of typical sound levels emitted from construction equipment, based on an inventory of equipment noise emissions that were compiled by the Federal Highways Administration as part of their Construction Noise Handbook (USDOT 2006)

Type of Equipment [a]	Lmax at 50 feet (dBA, slow) [b]	Type of Equipment [a]	Lmax at 50 feet (dBA, slow) [b]
Backhoe	80	Excavator	85
Compactor (ground)	80	Flatbed truck	84
Concrete saw	90	Front end loader	80
Drill rig truck	84	Grader	85
Dozer	85	Pick-up truck	55
Dump Truck	84	Tractor	84

SOURCE: USDOT, 2006 (http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm)
Notes:
[a] This is an abbreviated list for example purposes; a more complete list of construction-related equipment is available at the above-referenced source.
[b] The sound levels shown are specification limits for each piece of equipment expressed as a maximum sound level (L_{max}) in dBA "slow" at a reference distance of 50 foot from the loudest side of the equipment.
dBA = A-weighted decibels

During active construction, it is not expected that construction noise levels would be significantly higher than ambient noise levels for sensitive noise receptors. Regardless, due to the short duration and temporary nature of the construction activities, advance notice and coordination with residents, and implementation of noise-reduction measures, construction-related noise impacts would be reduced to a less-than-significant level.

Over the long-term, O&M of the constructed feature is not expected to substantially affect ambient noise levels. There would be some noise generated during O&M activities (e.g., maintenance vehicles and debris removal equipment), but these would be very short-term increases that occur on a periodic basis (e.g., once per year), such that the impact on noise levels is expected to be insignificant. With the incorporation of appropriate noise reduction BMPs, these Alternatives have less than significant effects to sensitive noise receptors.

4.2 Natural Environment

4.2.1 Terrestrial Habitats and Species

Effects on terrestrial habitats or species were considered significant if implementation of an alternative plan would result in any of the following:

- Substantial loss of native species
- Reduced habitat availability or degradation of habitat suitability of a magnitude and/or duration that could substantially affect a native species population
- Substantial interference with the movement of migratory species
- Introduction or contribution to the substantial spread of an invasive species

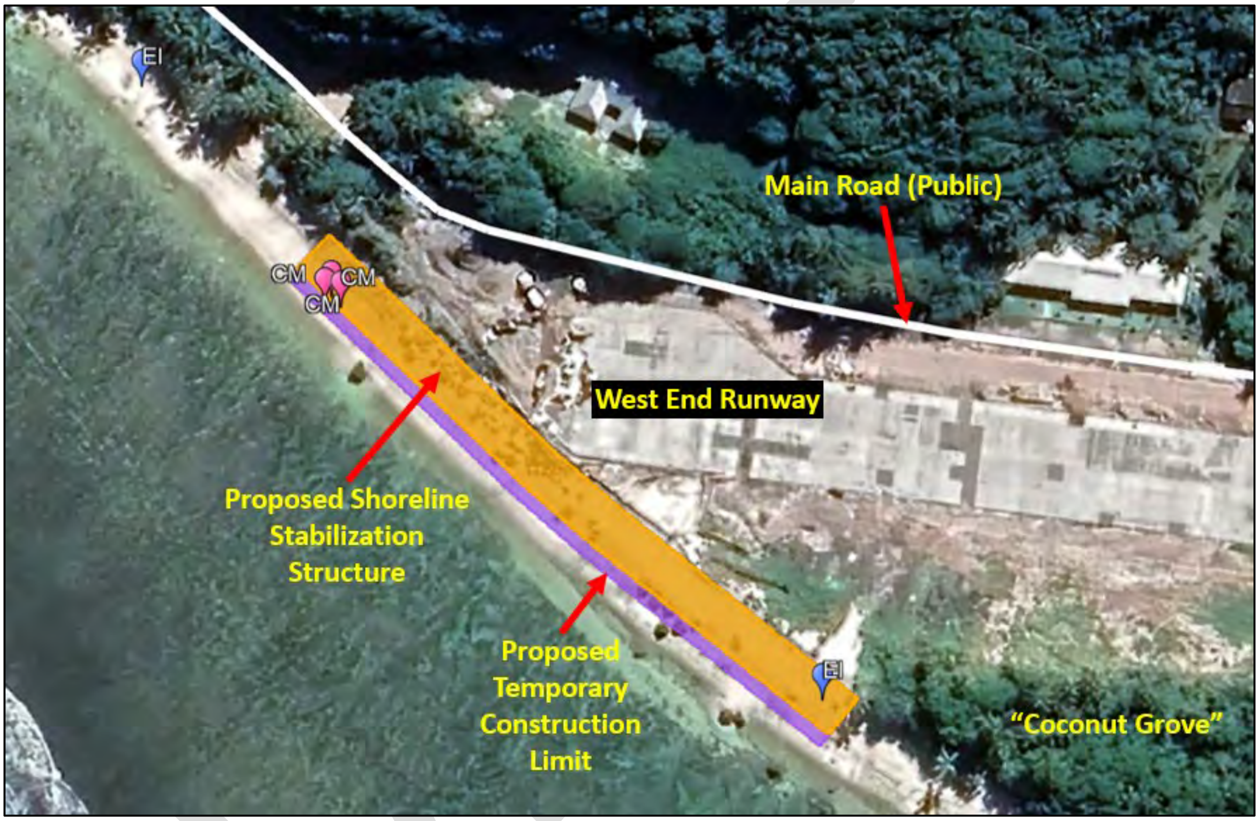

Figure 15: General location and placement of proposed shoreline stabilization structure at study area in relation to landscape features. Location of observed sea turtle nesting locations are also noted by blue and pink teardrops.

4.2.1.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. In the absence of coastal erosion reduction measures, it is anticipated that areas adjacent to the coastline within the study area would continue to be subject to periodic erosion and loss of coastal littoral strand vegetation would continue to occur. Under future climate change scenarios, increased loss and degradation of terrestrial habitat (mainly littoral strand vegetation) would be expected.

4.2.1.2 Alternatives 1, 2, 3, and 5

While the exact area of temporary and permanent impacts varies amongst the Alternatives (Table 8), effects would generally be the same for Alternatives 1, 2, 3, and 5. Construction will result in permanent impacts to 0.14 to 0.41 acres and temporary impacts to 0.12 to 0.30 acres of sand and *Ipomea spp.* at the Airport (Figure 3, Figure ***4***, and Figure ***15***). The area in which the construction would occur is already highly disturbed by storms, erosion, and airport maintenance activities. Construction noise and vibration would scatter what limited terrestrial wildlife is present within the construction footprint to adjacent areas whether construction occurs in the littoral zone or in the uplands. Less mobile invertebrates could be buried or crushed by construction equipment. However, loss of individuals would be limited to those located within the construction footprint. Individuals outside the construction footprint would be unaffected. After construction, the area behind the revetment or seawall would be backfilled to the crest of the structure and the excavated area in front of the structure would be regraded to match the existing beach profile (Figure 11-Figure ***14***) with the original excavated material and would be available for wildlife.

Staging would require 1.35 acres distributed at four separate COSA locations. No impacts to terrestrial habitat or species are expected at any staging locations as these sites are already cleared of vegetation or heavily disturbed otherwise so as no habitat exists that would support terrestrial wildlife. BMPs would include revegetation with suitable native species where practicable. Effects from Alternatives 1, 2, 3, and 5 would be less than significant.

4.2.2 Aquatic Habitats and Species

Effects on aquatic habitats and species were considered significant if implementation of an alternative plan would result in any of the following:

- Substantial loss of native species;
- Reduction of habitat availability or degradation of habitat suitability of a magnitude; and/or duration that could substantially affect a native species population;
- Substantially interference with the movement of migratory species;
- Introduction of or contribution to the substantial spread of an invasive species.

4.2.2.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. In the absence of coastal erosion reduction measures, it is anticipated that shoreline within the study area would continue to be subject to periodic erosion and continued loss of sandy beach and impacts to nearshore marine habitats could potentially occur.

4.2.2.2 Alternatives 1: Rock Revetment and 2: Tribar Revetment

Alternatives 1 and 2 would result in no impacts to wetlands or riparian habitats as these resources do not exist in the proposed Project footprint or associated staging areas. The structure would slope toward the ocean and could extend into tidally influenced marine habitats (e.g., sandy beach/rocky beach, intertidal zone). The structure is not expected to have any direct impacts on coral as the structure as currently designed would not extend into areas that are permanently inundated and support coral.

Effects to aquatic habitat and species, especially in terms of loss of native species, are not expected. However, BMPs to avoid and/or minimize any unintended project effects would be implemented as described in Section 6.9 Environmental Commitments. Preparation and implementation of these BMPs would reduce the potential construction-related impacts to aquatic habitat and species to a less-than-significant level, and no mitigation would be required.

Pre-construction activities (clearing/grubbing/grading of the site followed by excavation of the area could result in temporary discharges of soil and construction materials in the form of bulldozer side-cast to tidally influenced marine habitats. During construction, substrate on the upper coastal terrace and slopes would need to be excavated to place the seawall. Soils naturally compacted from periodic inundation and stabilized via root masses would be disturbed. Activities for establishing a work area within any of the staging areas would not be expected to affect any aquatic habitat. After construction, initial inundation from incoming tides would cause unconsolidated sediment to enter the water column causing some coastal erosion. Water infiltration would also cause loose soils to settle and reconsolidate. Regrowth of vegetation over time would further trap and consolidate soils. Thus, impacts would be temporary and decrease over time.

No permanent loss in the function or services of any aquatic habitat or species are expected under the current design. Construction would retain the existing land contours. Thus, there would be no substantial or permanent increases in water erosion of soils or loss of topsoil in the long term. There would be no changes to the in-situ substrate that would affect functions and services of nay aquatic habitat or species.

During the preconstruction, engineering, and design (PED) and construction phases for the proposed project best management practices to avoid and minimize potential impacts to aquatic habitats and species will be incorporated. Design-related efforts could include reduction of the project footprint (including temporary impact areas) to the greatest extent practicable and incorporation of design features that minimize any unintended affects to the aquatic habitats.

4.2.2.3 Alternatives 3: CRM Wall and 5: Precast Concrete Seawall

As described for Alternatives 1 and 2, but because these structures does not slope towards the ocean, impacts to sandy beach and intertidal habitat are further decreased.

4.2.3 Threatened and Endangered Species

Effects on T&ES were considered significant if implementation of an alternative plan would result in any of the following:

- Substantial loss of a T&ES
- Reduction of habitat availability or degradation of habitat suitability of a magnitude and/or duration that could substantially affect a T&ES population
- Substantially interference with the movement of any migratory T&ES
- Introduction of or contribution to the substantial spread of an invasive species that would threaten a T&ES.

In terms of potential effects that could result from implementation of Alternatives 1-5, none would result in significant effects based on the applicable significance criteria listed above. While there would be no effect to the Eua land snail or friendly ground dove from the proposed Project activities, effects to sea turtles and their habitat due to the proposed Project activities could result as the two species are known to have previously nested in the area. In terms of mitigating potential direct effects, there is feasible mitigation, in the form of avoidance measures, that would avoid and minimize direct impacts to nesting sea turtle individuals. These would be primarily achieved by placing seasonal restrictions on construction activities and avoiding all construction during periods when turtles are actively nesting in the area. By doing this, direct impacts would not occur or be extremely unlikely. BMPs to avoid and minimize direct impacts to nesting sea turtle individuals that would be implemented are detailed in Section 6.9 Environmental Commitments.

Although direct effects to sea turtle individuals can essentially be avoided, effects to sea turtle nesting habitat (sandy shore) due to the Project may also occur. It is recognized that shoreline protection management strategies involving hard engineering techniques can be disruptive to coastal processes and could result in adverse effects to marine habitats. The environmental impacts may be short-term during construction operations or long-term because of the presence of the structure.

Currents along Va’oto Beach tend to run parallel to the shore from east to west. Any type of shore armoring or stabilization structure would potentially reduce the amount of sand/sediment that is deposited, and, consequently, reduce the area of beach that is available to sea turtles for nesting. Quantitative shoreline sediment movement and nearshore current modeling were not conducted for the study. Although these processes are not expected to significantly increase spatially or temporarily with implementation of any of the proposed alternatives, sediment modeling would inform local beach formation processes and a better understanding of how a shoreline protection structures would affect sandy beach areas within the area of influence in the long-term.

However, coastal habitat loss and degradation, exacerbated by the effects of climate change, will continue on Ofu and cannot be readily decoupled from Project effects. Loss of sandy beach to erosive forces would also occur (and possibly be greater) under the FWOP condition in the absence of any shoreline protection structure being constructed. In the absence of protective measures, it is anticipated that west end of the runway will continue to be subjected to coastal erosion and sandy beach loss which, in the long-term, would reduce or completely remove nesting habitat for endangered sea turtles.

Due to the inevitability and scale of habitat loss due to climate change in the absence of any coastal erosion protection, the effects of the Proposed Project on sandy beach habitat, although un-quantifiable, are not considered significant given the natural processes already occurring Ofu.

4.2.3.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented and as such, project-related impacts to T&ES would not occur. However, in the absence of any action, coastal habitat loss and degradation is expected to continue due to (and potentially exacerbated by) the effects of climate change, including the effects of climate change-induced sea level rise. These conditions are already present and occurring on Ofu Island and throughout the American Samoa archipelago. In the absence of coastal erosion protection measures, it is anticipated that west end of the runway would continue to be subjected to coastal erosion and sandy beach loss which, in the long-term, would reduce nesting habitat for endangered sea turtles.

4.2.3.2 Alternatives 1: Rock Revetment and 2: Tribar Revetment

Implementation of these alternatives would involve clearing, grubbing, and removal of littoral strand vegetation within the construction limits. Within this area, any vegetation present would be permanently displaced within the footprint of the revetment. In addition, as a structure that slopes toward the ocean, impacts to sandy shore and intertidal marine habitat are increased. However, given the existing conditions as previously described in Section 2 and in the absence of any shoreline protection measure, the amount of sandy shore habitat that would permanently be lost under the footprint of Alternatives 1 and 2 is still expected to be less than would be lost to natural forces under the No Action Alternative / FWOP.

The Eua tree snail reported from Ofu is not expected to occur in the sandy, low lying littoral strand vegetation that characterize the study area. This species prefers forest habitat and lives primarily on leaves, trunks and branches of trees which are not found in the study area. The friendly ground dove is also not expected to be found in this type of habitat, preferring littoral forest, lowland rainforest, and agroforest habitats. Green and hawksbill sea turtles are documented to nest in the proposed action area and could be directly and indirectly impacted by project construction activities. At least two known nesting sites for these turtles fall within or are adjacent to the proposed Project footprint (Figure 7 and Figure 8).

Direct impacts to nesting individuals could be essentially avoided, but temporary impacts and loss of sandy beach habitat from construction activities may also occur. Impacts to beach habitat would be minimized by implementing the BMPs as described in Section 6.9. In addition, during the pre-engineering design phases, opportunities to reduce the overall dimensions of the structure (especially length along the shoreline) will be evaluated to minimize impacts to sandy beach.

4.2.3.3 Alternatives 3: CRM Wall and 5: Precast Concrete Seawall

Implementation and effects on T&ES species would be generally as described for Alternatives 1 and 2, however, Alternatives 3 and 5 have smaller permanent impact footprints (Table 8) and would result in a smaller area of permanent habitat loss. In addition, because these are vertical, rather than sloping structures, impacts to sandy shore and intertidal habitats would be minimized.

4.3 Built Environment

4.3.1 Land Use, Utilities and Public Services

Effects on land use, utilities and public services were considered to be significant if implementation of an alternative plan would result in any of the following:

- Substantial interference with, or increase in the response time of police, fire, or emergency medical services
- Permanently disrupt or decrease in the level of service for any public utility
- Significant burden to any public service or utility, including the water, wastewater, or storm water drainage system

4.3.1.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. Given the low population and current extent of limited development on Ofu, it is expected that the FWOP conditions would be relatively commensurate with existing conditions in terms of the distribution and scope of land use, public services, and utilities over the duration of the period of analysis. However, the airport runway and associated infrastructure would remain vulnerable to increased levels of coastal erosion from storms. These impacts include increased emergency response requirements by police, fire, and medical teams during these events. Under the FWOP condition, the airport runway and associated infrastructure would remain vulnerable to coastal erosion, exacerbated by climate change effects, which could lead to a decrease in public services in terms of more frequent air service disruptions and airport closures.

4.3.1.2 Alternatives 1, 2, 3 and 5

Construction of Alternatives 1, 2, 3, or 5 are not expected to significantly affect land use, utilities, or local public services (e.g., police, fire protection, or emergency medical services). Coordination with the airport would be conducted with any service provider relative to construction-related road closures, detours, and other potential traffic delays, as needed to maintain adequate response times and levels of service.

Construction is not expected to require removal or relocation of any airport utilities nor is the proposed project expected to significantly impact any public utilities or generate a significant amount of solid waste. During construction, all waste would be stored and periodically carried out and properly disposed of in a permitted landfill or recycled. No hazardous solid waste is expected to be generated as a result of construction of the proposed project. Because only a small amount of solid waste is expected to be generated during construction, and appropriate BMPs would be implemented, impacts to solid waste disposal or processing are expected to be minor.

Some water would be needed to support construction activities (e.g., mixing concrete for panels, providing dust control, etc.). This water would be obtained from the municipal water supply; the required quantities are expected to be well within the current water supply. The proposed project is not expected to affect the quantity of storm water runoff, nor would it otherwise burden the stormwater drainage system or involve discharge to a wastewater treatment facility. Given this, no impacts to water or wastewater are anticipated.

The proposed structure would require ongoing maintenance and specific O&M activities will need to be identified. O&M would presumably involve periodic removal of sediment and debris; other maintenance activities would generate minimal amounts of solid waste. As during construction, any materials generated during O&M would be properly disposed of in an approved landfill or recycled. No hazardous solid waste is expected to be generated as a result of O&M of the proposed project. Because only a small amount of solid waste is expected to be generated during O&M, and appropriate BMPs would be implemented, impacts to solid waste disposal or processing are expected to be minor.

The non-federal sponsor is responsible for fulfilling all O&M requirements for the project. A detailed O&M manual would be developed as part of the final design phase, and O&M costs would be specified as part of the Project Partnership Agreement, which must be executed before construction. Although the O&M requirements would require expenditure of non-federal sponsor resources, the development and implementation of detailed O&M practices is considered to be beneficial to the overall maintenance of the infrastructure.

Over the long-term, reduction of coastal flooding and erosion risk at the west end of the runway resulting from project implementation would be expected to provide some degree of benefit by decreasing the flood response burden on service providers and airport maintenance staff. In addition, some of the infrastructure related to airport services would benefit from the increased flood/erosion protection afforded by the proposed project, thus improving any flood response capabilities.

No adverse effects to land use and utilities from implementation of any of the proposed alternatives is expected. The project would benefit public services and would decrease response times for medical services by having a functional airport; no mitigation is required.

4.3.2 Traffic and Circulation

Effects on traffic and circulation were considered to be significant if implementation of an alternative plan would result in any of the following:

- Substantial increase in vehicle travel times due to increased congestion, delays in traffic movement and circulation, and/or reduced roadway capacity
- Substantial reduction in availability, quality and/or safety of roadways or other transportation resources (e.g., sidewalks, bicycle lanes, etc.)
- Substantial decrease in access to businesses, residences, or public facilities; or
- Substantial displacement of parking and/or other significant changes in parking supply

Because there were no significant potential effects to traffic or circulation identified that could result from implementation of any of the alternatives, no mitigation is required.

4.3.2.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. It is expected that the FWOP conditions would be relatively commensurate with existing conditions in terms of traffic and circulation. Under the FWOP condition, the airport runway and associated infrastructure would remain vulnerable to coastal erosion, exacerbated by climate change, which could cause more frequent closures of the main road that parallels the runway as maintenance is performed on runway on other infrastructure impacted by the effects of more frequent flooding and storms.

4.3.2.2 Alternatives 1, 2, 3, and 5

Construction of Alternatives 1, 2, 3, and 5 are not expected to significantly increase travel times or affect other transportation resources given the small population and limited traffic circulation on Ofu Island. Construction would require the delivery of construction equipment and materials from Ofu Harbor to Ofu Airport, as well as the transportation of construction workers to the project location; however, these impacts would be limited to construction, such that they would be temporary in nature. In addition, the contractor would be required to coordinate with the relevant agencies, including local airport staff and FAA, to limits any impacts to airport operations or through traffic along the main road that parallels the airport runway. With this coordination, it is anticipated that impacts to traffic and transportation resources would be reduced to a less-than-significant level. Once constructed, the structure would not permanently displace any transportation facilities, including roadways, bicycle lanes, pedestrian pathways and/or parking. The project would function to substantially reduce the extent of coastal erosion at the west end of the airport runway and would effectively protect the main vehicular thoroughfare for Ofu Island. By decreasing the potential for loss of this roadway, the project would provide important benefits, including more reliable access during storm conditions.

During non-storm conditions, O&M of the proposed structure would require the use of trucks and other vehicles (e.g., to remove and dispose of debris, etc.). It is expected to be similar to traffic levels associated with similar types of maintenance operations for other projects at the airport. Access to the site is along an existing roadway, so long-term effects would be minimal. In addition, only a minimal number of vehicles would be required, and activities would occur on a periodic basis, such that traffic and transportation resources are not expected to be significantly affected on a long-term basis. With appropriate coordination, effects to traffic and circulation expected under these Alternatives would be less than significant.

4.4 Economic Environment

4.4.1 Cultural, Historic, and Archaeological Resources

No cultural resources were identified within the study area. However due to uncertainty regarding subsurface deposits, archaeological monitoring will be conducted for any new ground disturbing activities greater than six (6) inches below the surface as described in Section 6.9 Environmental Commitments.

4.4.1.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. Conditions in the study area are anticipated to develop as described in the FWOP condition (Section 2). While no cultural resources have been identified in the study area, erosion would damage any if they were present. Extreme erosion along the western coast of the Vaʻoto Plain might reach the western portions of the Coconut Grove site (AS-13-37).

4.4.1.2 Alternatives 1, 2, 3, and 5

Alternatives 1, 2, 3, and 5 would require excavation into the shoreline bank and beach, construction of the structure, backfill behind the structure, and regrading in front of the structure. While the area affected by these individuals activities varies across the Alternatives (Table 8) the total impacted area is similar across all alternatives (Table 9). If cultural resources were present at the location the excavations would destroy any archaeological deposits. Indirect effects to cultural, historic, and archaeological resources would be beneficial in terms of shoreline protection from future erosion. However, no cultural resources have been identified in the shoreline protection area, therefore no effect to cultural, historic, or archaeological resources is expected. Common construction BMPs for cultural resources described in Section 6.9 would be implemented.

4.4.2 Socioeconomics

Effects related to socioeconomics were significant if implementation of an alternative plan would result in any of the following:

- Inducement of substantial population growth (either directly or indirectly)
- Displacement of substantial numbers of existing people or housing
- Substantial reduction of employment opportunities or income levels in the area
- Significantly affect the social connectedness of the community

4.4.2.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. It is expected that under FWOP conditions Ofu Airport would continue to be threatened by coastal erosion during storm events. Alternative 0 would result in significant effects due to increased airport closures as the airport runway is damaged by erosion and eventually lost. Loss of the airport would increase travel time and decrease ability to move goods and people between islands, increasing economic hardship in Ofu and Olosega.

4.4.2.2 Alternatives 1, 2, 3, and 5

In general, it is expected that the area directly affected by the project would be the airport and related infrastructure, with benefits extending to the entire population of Ofu and Olosega. The effects of local storms on the mobility on the entire population of the island due to impacts to the airport and road that parallels the airport runway, the benefits of the project are expected to extend to the entire island. Given the small population and limited extent of development within the study area, the proposed project is not expected to induce population growth or otherwise affect the overall population on the island, nor is the project expected to displace any portion of the population, reduce employment opportunities or income levels, or otherwise adversely affect socioeconomic conditions on the island. Rather, the project is expected to increase the level of shoreline protection, reducing the potential for displacement of people and impacts to income as a result of coastal storm damage. As part of the increased level of protection, Alternatives 1, 2, 3, or 5 would reduce the risk of lack of access to community facilities, including schools, churches, religious establishments, recreational facilities, and other areas that serve as community gathering areas. As such, the project is expected to have a positive influence on social connectedness.

No effect to socioeconomics from implementation of the alternatives is expected, rather benefits to the community are anticipated.

4.4.3 Environmental Justice

Effects on public health and safety were significant if implementation of an alternative plan would result in any of the following:

- Disproportionately affect any low-income or minority group
- Disproportionately endanger children in areas within or near the project site
- Increased health and safety risks to residents and/and visitors
- Substantial interference with or increase to the response time of police, fire, or emergency medical services
- Decreased access to or functionality of critical infrastructure, or other public facilities including schools, churches, and places of worship
- Conflict with or impaired implementation of an adopted plan or policy, including applicable hazard mitigation plans

4.4.3.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. It is expected that under FWOP conditions Ofu Airport would continue to be threatened by coastal erosion during storm events. Alternative 0 would result in significant effects to environmental justice in the form of reduced mobility and timely access to medical facilities due to loss of the airport runway, and reduced response times of police and medical personnel during flood events.

4.4.3.2 Alternatives 1, 2, 3, and 5

Overall, the project would function to decrease health and safety risks associated with coastal erosion and closure of the Ofu Airport, therefore providing environmental justice benefits. Implementation of Alternatives 1, 2, 3, or 5 would significantly reduce the potential extent of coastal erosion and frequency of airport closure, directly benefiting all residents of Ofu and Olosega.

In addition to reducing health and safety risks to the affected population, critical infrastructure, and public facilities (i.e., the airport) would have increased resiliency in response to storm events. Another beneficial impact associated with implementation of the project is heightened awareness of the coastal hazard-related risks through dissemination of project-related information, including an increased understanding of the issues, thereby improving public health and safety. Alternatives 1, 2, 3, or 5 would have no adverse effect on environmental justice, and could actually improve this resource by maintaining mobility, timely access to medical facilities, and reduced response times of police and medical personnel during storm events.

4.4.4 Recreation

Effects on recreation were considered significant if implementation of an alternative plan would result in any of the following:

- Substantial disruption of activities that occur at an institutionally recognized recreational facility; or
- Substantial reduction in availability of and access to designated recreational or open space areas.

4.4.4.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. It is expected that the FWOP conditions would be relatively commensurate with existing conditions for recreation. Under the FWOP condition, the airport runway and associated infrastructure would remain vulnerable to coastal erosion, exacerbated by climate change effects, which could lead to more frequent closures of the airport and prevent tourists or others from visiting the island, thus leading to a decrease in local tourist revenues. Recreational usage along the shore within the study area could also be diminished as increased damage from wind, wave and storm surge from more frequent tropical storm events make the area unsafe for recreational pursuits.

4.4.4.2 Alternatives 1, 2, 3, or 5

Under Alternatives 1, 2, 3, or 5, the shoreline within the study area would be temporarily inaccessible to the public (including tourists) during construction activities. Recreational fishing, sunbathing, and swimming along 500 ft of shoreline at the west end of the runway will be temporarily affected by the project as the public, including local fishermen, will not be allowed to enter active work areas. However, impacts to these activities will be localized and relatively short-lived. In addition, there are ample alternative areas of beach that the public can safely access and utilize during the construction period. As such, Alternatives 1, 2, 3, or 5 would result in less than significant effects to recreation and no mitigation would be required.

4.4.5 Aesthetics

Effects on aesthetics and visual resources were considered significant if implementation of an alternative plan would result in any of the following:

- Development that substantially conflicts with the surrounding landscape (i.e., a form, line, color, or texture that contrasts with the visual setting);
- Obstruction of established viewshed, significant view corridor, or other public views of important environmental resources and/or landscapes; or
Substantial reduction of the views or aesthetic values associated with a historic property, scenic byway, or other important landmark

No mitigation would be required as the potential effects to visual resources that could result from implementation of the alternatives could be reduced to a less than significant level using the techniques described above to minimize effects to aesthetics.

4.4.5.1 Alternative 0: No Action

Under Alternative 0, no federal actions for emergency shoreline protection would be implemented. Conditions in the study area are anticipated to develop as described in the Affected Environment (Section 2). Over the period of analysis, the natural features within the viewshed (including Leolo Ridge and Mount Tumu) are not expected to significantly change in form, color, texture, or scale. As such, the visual characteristics of these features are expected to remain consistent over time.

4.4.5.2 Alternatives 1, 2, 3, and 5

Once constructed, Alternatives 1, 2, 3, or 5 would introduce a built element into the natural environment that could alter the visual landscape to some degree. The revetment or wall is not expected to substantially affect overall visual resources as the site is located along an airport runway that already contains built elements. The revetment or wall is not expected to obstruct broad landscape views (including those of Leolo Ridge and Mt. Tumu) but could diminish localized views from the coast by adding an additional built element into the environment.

Best efforts would be made to integrate the structure with the natural characteristics of the site to minimize any visual impacts to the extent possible. In particular, the use of any natural topography to minimize the overall size and obtrusiveness of the proposed structure will be investigated as would any opportunities to minimize overall structure height. Further refinements would be made during the pre-engineering and design phases to evaluate opportunities to reduce the dimensions of the wall, as well as incorporate design details that may otherwise minimize potential visual impacts, such as use of construction materials and/or landscaping to blend the structures into the surrounding environment. Implementation of these minimization measures is expected to reduce potential visual impacts to a less-than-significant level. As such, Alternatives 1, 2, 3, or 5 would result in less than significant effects to aesthetics and no mitigation would be required.

Construction of Alternatives 1, 2, 3, or 5 would involve the use of large construction equipment, exposed soils, and staged materials, which could temporarily reduce the overall aesthetic quality at the proposed project location. However, these activities would be temporary; in addition, the construction sites would be kept free of litter and excess equipment and materials, and generally maintained in a clean and organized condition, such that impacts are expected to be less than significant. As such, Alternatives 1, 2, 3, or 5 would result in less than significant effects to aesthetics and no mitigation would be required.

4.5 Cumulative Impacts

Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR Section 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The potential for cumulative impacts to the environment from the proposed action was evaluated by reviewing other projects and activities in the vicinity of the Ofu Airport that could directly or secondarily affect the same environmental resources as the proposed action. The analysis generally includes actions that were recently completed, are currently underway, or are programmed to occur in the foreseeable future, and are directly related to coastal shoreline protection, are located within or proximate to the proposed measure sites and/or would directly or secondarily affect resources in the Va'oto Plain and Va'oto Marine Park. Based on a review of the related actions, this analysis incorporates the following past projects and activities.

Although changes have occurred within the environment of Ofu over time, much of the upland remains undeveloped and still supports tropical rainforest vegetation. Residential/commercial development comprises only 2% of total land use on the island and cultivated land covers less than one percent. The current mosaic of vegetation and land cover that exists on the island today is a result of the island's natural characteristics (e.g., topography, soil type, distance from the sea), natural disturbance events (e.g., weather, tropical cyclones, volcanic eruptions), and past anthropogenic activities. Almost all the vegetation on Ofu (like that of all islands in American Samoa) has been altered to some degree after several thousand years of subsistence agriculture since the arrival of the Polynesians over 3,000 years ago (Liu et al. 2011; Mueller-Dombois and Fosberg 1998). The introduction of pigs and other non-native species (e.g., rats) also has had a deleterious impact on many endemic species and the biological composition of the native forest ecosystem (Federal Register 2016). These temporal changes provide context for the consideration of cumulative impacts.

- In 1986, a Federal Shoreline Protection Project authorized under Section 14 was constructed at the request of the ASG. The project consisted of constructing a 381-ft-long rock revetment fronting the eastern end of the airstrip. The crest elevation of the structure is 9-ft above MSL which is approximately level with the existing runway elevation. The revetment is constructed with a rock armor layer two stones-thick with stones between 1300 to 2100 lbs, a slope of 1V:1.3H (vertical to horizontal), and the structure toe placed on rock foundation at approximately 0 ft MSL. The structure is located approximately 1,6500 ft east of the current proposed project and is still functionally adequate (USACE 2020).

- A three phase airport master plan/feasibility study was implemented in 2013 and is expected to be completed in 2035. to determine the feasibility of maintaining the Ofu airport, restoring passenger service, and looking for specific opportunities for improving airport facilities. An airport master plan is being developed to determine the extent, type, and schedule of development needed to safely accommodate passenger demand at the airport.

- Beginning in April 2021 and completed in July 2022 through a FAA Airport Improvements project grant as described above, the DPA rehabilitated and reconstructed the entire existing airport runway. Construction scope included demolition of the existing concrete runway and installation of a new runway with supporting infrastructure.

- In late July 2022, a passing extra-tropical storm that coincided with a “king tide” event (exceptionally high tides) resulted in wave runup and erosion that damaged the west end of the runway. Sand and rocks were deposited onto the grassed area and runway from the high storm wave runup. Airport staff were required to quickly clear this debris from the airport runway and make emergency repairs in order to restore runway operations.

The effects of these actions were considered in combination with the degree and timing of the potential adverse and beneficial effects of the proposed alternatives to determine the types and significance of potential cumulative effects. For this analysis, implementation of the project is considered cumulatively significant if, in concert with other past, present, or reasonably foreseeable future actions, it would exacerbate the declining status of an identified resource (a resource that is already adversely affected) or create a condition in which an effect is initially minor but is part of an irreversible declining trend.

Based on an analysis of the potential impacts, these actions could cumulatively impact a variety of resources including, surface water resources, biological resources, recreation, and visual resources. Each of these are briefly described below.

• **Coastal Shoreline Protection and Public Safety:** Alternatives 1 ,2 ,3 and 5 would function to reduce coastline erosion along the west end of the airport runway, thus providing benefits associated with coastal storm damage reduction, a reduced risk of damage to the runway and associated infrastructure, and increased safety for residents and visitors within the watershed by having a functional airstrip.

The existing rock revetment constructed at the east end of the runway was implemented at a different time in the past but provides similar benefits to this portion of the runway that the proposed recommended plan would provide. This structure was observed to function as intended during the July 2022 king tide event. This project provides cumulative benefits by reducing the potential of coastal erosion and runway damage, increasing public safety within the Va‘oto Plain over the long term. This action is not expected to increase flooding or flood-related safety risks.

The rehabilitation of the existing airport runway completed in July 2022 by the DPA is not a shoreline stabilization project and is not expected to provide cumulative benefits by reducing the potential of coastal erosion and runway damage. The rehabilitation of the runway, while not expected to contribute to reduction in erosion, has cumulatively increased safety for residents and visitors within the watershed by having a functional airstrip.

The emergency actions conducted in late July 2022 to repair the runway from the effects of king tides has had a similar cumulative benefit by increasing safety for residents and visitors within the watershed by having a functional airstrip.

• **Waters of the U.S. and Loss of Aquatic Habitat:** The proposed recommended plan (and its alternatives) would potentially involve work within waters of the U.S. (WOTUS) (nearshore ocean waters) both during construction and O&M of the coastal erosion protection management structure. However, most actions would only involve temporary impacts and would not result in the long-term loss of aquatic habitat functions and values. Standard BMPs would be implemented to avoid and minimize potential direct or indirect temporary effects to WOTUS to the extent practicable and would not result in the long-term loss of aquatic habitat functions and values. Compensatory mitigation would be implemented to offset the unavoidable impacts to sandy shore used as nesting habitat for hawksbill and green seas turtles.

Based on observations, the existing rock revetment constructed at the east end of the runway may have adversely affected aquatic habitat and degraded the area of sandy shore in front of the structure over time. Exact effects are speculative, but the existing rip-rap revetment may have exacerbated loss of sandy beach habitat over time in this area.

The runway repair project and emergency repairs may also have had temporary impacts to WOTUS and aquatic habitat during construction. However, most of these actions only involve temporary impacts and would not be expected to result in the long-term loss of aquatic habitat functions and values.

As such, from a cumulative perspective, the projects are not expected to contribute incrementally to the loss of aquatic habitat functions and values. It is possible that any proposed compensatory mitigation efforts may in fact synergistically contribute to improved habitat functions and values over time.

• **Recreational Facilities:** The proposed recommended plan (and its alternatives) would temporarily impact recreational resources to include temporary loss of access and use within the construction limits. None of the related actions are expected to permanently displace recreational areas nor contribute to a significant cumulative impact on recreation on beaches at Papaloloa Point. Access and availability would be restored following construction, such that the cumulative to recreation impact is expected to be insignificant.

The other past activities described would not contribute significantly to cumulative effects to recreation.

• **Visual Resources:** The proposed recommended plan (and its alternatives) involves construction of shoreline protection feature measures which would introduce a new built elements to the existing viewshed, thus resulting in visual impacts. The shoreline protection features previously built at the east end of the runway also affects visual resources; however, this feature was constructed 37 years ago, and visual impacts did not occur simultaneously. Since being constructed, this feature has melded into the coastal landscape and its built features have become less evident and natural looking over the passage of time to not contribute to significant cumulative visual impacts.

In addition to the above-listed impacts, the proposed recommended plan (and its alternatives) would result in a range of temporary construction-related impacts, including increased potential for erosion and sedimentation, air quality emissions, increased temporary noise and traffic circulation restrictions. Most (if not all) of the past actions described have presumably resulted in similar construction-type impacts. As previously described, measures would be implemented to avoid and minimize the impacts of the proposed project; it is expected that the other projects under consideration include similar measures to minimize and mitigate potential impacts. As such, it is not expected that these temporary construction-related impacts associated with the proposed project would combine with those of other projects in the vicinity to create substantial adverse cumulative impacts. Based on this analysis, the recommended plan is not expected to result in any significant cumulative impacts to the human environment when considered with other known past, present, and foreseeable future actions.

Section 5 Plan Comparison and Selection

5.1 Plan Evaluation

5.1.1 Federal Objective

In accordance with ER 1105-2-100, plan formulation and evaluation for CAP Section 14 projects focuses on the least-cost alternative. The least-cost alternative is considered justified if the total cost of the alternative is less than the cost to relocate the threatened facility.

5.1.2 Contribution to Objectives and Avoidance of Constraints

This section evaluates the alternatives considering the study's objectives (to reduce erosion risks to critical infrastructure in the study area). The following conclusions were drawn from the hydrology and hydraulics analyses and cost analysis:

- All alternatives carried forward to the final array are effective in protecting the Ofu Airport runway from storm surge and big wave events, compared to FWOP conditions in Alternative 0: No Action.
- All alternatives conform with USACE requirements for consideration of SLC over the 50-year period of analysis and are adaptable to 100-year SLC.
- All alternatives carried forward to the final array have estimated total first costs that are less than the estimated cost of relocating Ofu Airport. The cost of relocating Ofu Airport is estimated at $91 million federal fiscal year (FY) 23.

5.1.3 Principles and Guidelines Criteria

Completeness, effectiveness, efficiency, and acceptability are the four evaluation criteria specified in the CEQ P&G in the evaluation and screening of alternative plans. Alternatives considered in any planning study should meet minimum subjective standards of these criteria to qualify for further consideration and comparison with other plans.

Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.

Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

Efficiency is the extent to which an alternative plan is a cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment.

Acceptability is the workability and viability of an alternative plan with respect to acceptance by State and local entities, tribes, and the public and compatibility with existing laws, regulations, and public policies.

Table 11: Principles and guidelines evaluation of alternatives

Alternative	Completeness	Effectiveness	Efficiency	Acceptability
Alternative 0: No Action	Low	Low	Low	Low
Alternative 1. Rock Revetment	High	High	Low	Medium
Alternative 2: Tribar Revetment	High	High	High	Medium
Alternative 3: CRM Wall	High	Medium	Low	Medium
Alternative 5: Precast Concrete Seawall	High	Medium	Medium	Medium

Alternative 0 rates low in completeness as the No Action alternative by itself will not meet study objectives; additional actions would be necessary to make it complete. It rates low in effectiveness as it does not provide any level of protection to the runway. It rates low in efficiency as the alternative does not provide any benefits and would lead to realized costs for the non-federal sponsor in the FWOP conditions. Finally, Alternative 0 rates low on acceptability as the No Action alternative will ultimately result in closure of the airport and problems identified in Section 1.6.

All structural alternatives rate high in completeness since all alternatives are complete and meet study objectives.

The revetment alternatives rate high in effectiveness in reducing the threat of coastal erosion and protecting the airport runway. Revetment structures have historically proven to be effective in the American Samoa coastal climate, with little to no maintenance required. Vertical seawalls rate medium in effectiveness, as although they are likely to provide protection over the 50-year period of analysis, these structures are likely to have a higher level of maintenance in comparison to revetments.

Alternatives 1 and 3 have the highest cost estimates and therefore rate low for efficiency. Alternative 2 has the lowest cost estimate and rates high for efficiency. Alternative 5 has the second lowest cost estimate and rates medium for efficiency.

All structural alternatives rate medium for acceptability. From an environmental standpoint, the revetment and seawall alternatives rate medium for acceptability. The revetments occupy a larger footprint, reducing available beach sand for turtle nesting. The seawall alternatives occupy a smaller footprint, however, the vertical structures deflect wave action, potentially increasing the long term rate of erosion of remaining sand. Environmental mitigation may also be considered to increase the level of acceptability in consultation with resource agencies. All structural alternatives will protect the runway and keep the airport operational and functioning. Therefore, from a social acceptability standpoint these alternatives rate high. Averaging the environmental and social aspects of acceptability, these alternatives score a medium rating.

5.1.4 Risk and Uncertainty

No high-risk items were identified for the study. However, a residual risk and several medium to low risk items were identified as follows:

- Residual risk: Due to the operational requirements of the Ofu Airport, the crest elevation of the shore protection structure is vertically constrained to be no higher than the elevation of the runway. With this design constraint, it is expected that the project will not be able to completely prevent overtopping even during present day design conditions. Additionally, the risk of overtopping (both frequency and magnitude) will increase with future SLC, as indicated by the calculated overtopping rates in the engineering appendix. This residual risk was determined to be acceptable for this project since the shore protection structure will provide increased stability to the eroding shoreline.
- Low risk: Project cost increases due to material cost increases, inflation, and costs associated with working in a remote island locale. To mitigate for potential cost increases, cost risks were identified in an abbreviated risk assessment exercise and appropriate contingency assigned to the cost estimates. At this point in the study, the total federal costs of the TSP are below the $10M federal participation limit and a policy waiver is not expected to be required.
- Low risk: Low federal participation limit and the Section 1156 waiver for the territories could necessitate a waiver. At this point in the study, the total federal costs of the TSP is below the $10M federal participation limit. While a waiver is not necessary at this time, should costs further increase, there is the risk that a waiver will be necessary, delaying the timeline for completion of the study.
- Low risk: Habitat loss due to increased erosion, is only a risk from the vertical seawall alternatives (see Appendix A-3 Attachment 5-ESA Biological Assessment & EFH Biological Evaluation for complete analysis).
- Low risk: Data on possible cultural resources in the study area is limited. There were no archaeological sites uncovered in the recent construction of the runway, nor were any uncovered during the July 2022 king tides in the study area. The American Samoa Historic Preservation Office (ASHPO) concurred with the team’s findings of no historic properties affected; however, archaeological monitoring for excavation deeper than 6” will still be required.
- Medium risk: Habitat loss due to placement of a revetment on sandy beach. Consultation with the natural resource agencies is ongoing, and environmental mitigation may be considered to mitigate for this risk. This risk only applies to revetment alternatives.
- Medium risk: Limited geotechnical, bathymetric, and topographic information

creates uncertainty in design conditions and quantities. A complete survey will be conducted during design and implementation.

- Medium Risk: A high degree of uncertainty in the future SLC projections leads to uncertainty in the evaluation of the long-term stability and performance of the structures. Even if conservative SLC curves were utilized, by restricting the crest elevation of the structure (due to runway elevation) the performance of the structure will be less than optimal. With a documented high rate of relative SLR, it is expected that under future conditions the runway will overtop during both storm and non-storm conditions. However, the timing of this outcome is uncertain, due to the inherent uncertainty in SLC projections and future subsidence. The coastal engineer is working with the Climate Preparedness and Resiliency Community of Practice to establish SLC curves with the best available information.
- Medium Risk: Historical land ownership records and uniform zoning are not available in American Samoa. As an unincorporated territory of the U.S., under the communal land system in American Samoa, rights to land use come with membership in a descent group. American Samoa's communal land system may present ownership challenges during project formulation, evaluation, and implementation. Cumulative parcel ownership data and boundary surveys do not exist, making real estate considerations of alternatives and acquisition requirements based on ownership difficult to pinpoint.

5.2 Plan Comparison*

The following sections summarize the fifth step in the six-step planning process: comparison of alternative plans. The initial array of alternatives described in Section 3.4 were either screened out or carried forward to the final array of alternatives. For CAP Section 14 feasibility studies, the TSP is the least-cost alternative that is environmentally acceptable, technically feasible, and meets study objectives. In this section, the final array of alternatives will be compared against each other for environmental considerations and cost of implementation.

An evaluation of potential environmental impacts by resource category for each of the alternatives in the final array is included in Section 4. For all resource categories, the effect determination for the final array of proposed alternatives falls under one of the following: (1) Beneficial; (2) No Effect; (3) Less than Significant; or (4) Significant. Table 12 provides an assessment of environmental acceptability for each proposed alternative included in the final array.

Table 12: Assessment of environmental acceptability

Alternative	Significantly Affected Resources	Environmentally Acceptable?
Alternative 1: Rock Revetment	N/A	YES

Alternative 2: Tribar Revetment	N/A	YES
Alternative 3: CRM Wall	N/A	YES
Alternative 5: Precast Concrete Seawall	N/A	YES

All alternatives are considered to be environmentally acceptable after the implementation of standard BMPs that would avoid or minimize the environmental effects on listed resources to less-than-significant or beneficial levels. Where applicable, the BMPs proposed for each resource category to bring project effects down to insignificant levels are fully described in Section 6.9.

5.3 Identification of the Least-Cost Alternative Plan

Under the CAP Section 14 authority, the least-cost, environmentally acceptable alternative that meets study objectives is selected as the TSP. The cost to protect must be less than the cost to relocate the threatened facility. The estimated cost of airport relocation was calculated by taking the cost of airport relocation cited in the Ofu Airport Master Plan/Feasibility Study (AECOM, 2013) of $76 million at fiscal year (FY) 2013 price levels and escalating it to $91 million at FY 2023 price levels. The escalation percentage between October 2013 and October 2022 was calculated to be 20%, based on escalation guidance from the United Facilities Criteria. The plan formulation process compares the estimated project first costs for each alternative within the final array at the same FY 2023 price levels. A summary of cost estimates for each of the alternatives in the final array are listed below in Table 13. Detailed cost estimates can be found in Appendix A-2.

Table 13: Alternative cost comparison

Alternative	Project First Cost (FY23 Price Level)	Cost Ranking
Airport Relocation	$91M	N/A
Alt. 0: No Action	N/A	N/A
Alt. 1: Rock Revetment	$11.7M	4 (Highest cost)
Alt. 2: Tribar Revetment	$8.2M	1 (Least cost)
Alt. 3: CRM Wall	$10.3M	3
Alt 5: Precast Concrete Seawall	$8.7M	2

5.4 Post-TSP Analysis

A site visit to American Samoa, conducted by the team from December 5, 2022, to December 8, 2022, identified concerns about the constructability, performance, and future maintenance of seawall structures on Ofu, which resulted in the screening of vertical seawall alternatives (Alternatives 3 and 5) from the refined array of alternatives.

Site visits to various shoreline protection projects on Tutuila indicated that while rock and tribar revetments were common, seawalls were infrequently used as shoreline protection measures. Existing CRM type seawalls typically showed signs of damage by toe scour, undermining or flanking. There were no examples of existing concrete panel seawalls. This assessment was validated during in-person discussions with two of the main contractors in American Samoa (Paramount Builders and McConnell Dowell), the DPW, and a local Sea Grant representative. All confirmed that rock or tribar revetments were frequently implemented as an effective form of shoreline protection throughout American Samoa, whereas seawalls were very limited due to performance-related concerns or were used along shoreline areas where protection from waves was less of a concern.

While there are ongoing tribar revetment projects in American Samoa and a history of successful construction of rock and tribar revetments, local contractors confirmed that they had little experience with constructing concrete panel seawalls. Contractors noted that there are at least four local firms with the requisite experience and specialized labor to successfully construct rock and tribar revetments. Contractors typically bid for both rock and tribar revetments and adjust designs based on the affordability of rock and concrete at a given time. Both this design approach and the number of skilled contractors available reduces the cost risk and creates price competitiveness for the revetment alternatives considered for this project, which was factored into the current estimates.

The risk to construction quality was also considered. Due to the remoteness of the location, quality assurance oversight is likely to be inconsistent and intermittent. Therefore, using an established construction technique is a lower risk option. The lack of existing skilled labor and unfamiliarity with the installation techniques for the precast concrete seawall alternative combined with the remoteness of the location increases the risk that quality issues could arise during construction.

In addition to the constructability concerns, potential issues with the long-term performance of the seawall alternatives in this remote coastal environment were considered. Due to the wave environment and limited amount of sand at the project site, it is possible that remaining sand fronting the seawall alternatives may erode and eventually expose the foundation of the structure. The preliminary designs for both seawalls require the structure to be placed on hard substrate which should reduce the risk of toe scour, but exposure of the foundation does increase the likelihood of damage. Additionally, it was considered that the success or failure of the seawalls was contingent on the performance of the entire structure since they are designed to function as a single unit. The CRM seawall would be comprised of individual stones grouted together and the precast concrete panel seawall consists of individual concrete panels cemented or bolted together. Thus, even localized damage could result in failure of the structure. In contrast, revetments are designed to absorb wave energy and may experience some shifting and settling of individual units without the integrity of the entire structure being compromised. The site visit identified that tribar revetments are a proven technology in American Samoa, with existing structures having little to no damage and requiring minimal maintenance. At Ofu Airport specifically, the rock revetment protecting the shoreline on the east side of the runway has also proven to provide sufficient shore protection in this environment since its construction in 1985. For these reasons, it was determined that there is a high degree of uncertainty in the long-term performance of the seawall alternatives and should therefore be removed from the array of alternatives.

Considering both the constructability and performance issues discussed, there is a significant risk that of the seawall alternatives would have a high life cycle cost. Especially for the precast concrete seawall, large equipment (i.e. crane to lift/place panels) would need to be mobilized to repair the heavy panels. Additionally, if a repair were required at the existing east-end revetment at the same time, different types of equipment would be required to repair each project. Responsibility for maintenance of the project would be borne by the non-federal sponsor, posing an increased burden on them over the lifetime of the project.

The outcome of this site visit did not substantially influence the environmental acceptability of the proposed Project. All alternatives proposed in the final array are environmentally workable with the application of appropriate avoidance and minimization measures as described in Section 4. Any alternative recommended will require compensable mitigation due to effects on nesting sea turtle beach habitat regardless of the final plan selected. The tribar revetment is larger, sloping (not vertical) structure, but it still not expected to have impacts on WOTUS or essential fish habitat (EFH) that have otherwise been disclosed and described. See Appendix A-3 for a detailed discussion of the benefits and drawbacks of revetments versus seawalls.

5.5 Plan Selection

Based on the environmental and cost analyses of the final array of alternatives, Alternative 2: Tribar Revetment is selected as the TSP. Alternative 2 was assessed as environmentally acceptable (Table 12) and is the least-cost alternative (Table 13) that meets study objectives. Implementation of Alternative 2: Tribar Revetment ($8.2M) is less than the cost to relocate Ofu Airport ($91M). As it meets all the study objectives described in Section 5.1.1, Alternative 2 was selected as the TSP.

Section 6 The Tentatively Selected Plan

This section presents results of the final step of the six-step planning process: Selection of a TSP based upon the comparison of alternative plans.

6.1 Plan Components

The TSP is Alternative 2: Tribar Revetment. This alternative consists of the construction of a tribar revetment along the shoreline adjacent to the Ofu Airport runway and RSA. The tribar revetment consists of the following components:

- Excavation of an 18-inch trench into hard substrate and fill with concrete
- Excavation and grading to accommodate the revetment
- Placement of a geotextile base and two-stone thick 200-lbs underlayer stone
- Placement of a single layer of interlocking 1-ton tribar armor units
- Backfill using excavated material

6.2 Plan Accomplishments

The construction of a tribar revetment along the western shoreline adjacent to the Ofu Airport RSA will protect the runway from continued damage from coastal erosion. The continued viability of Ofu Airport for cargo and charter flight operations is vital for the transportation of goods and people to from Ofu Island. Preventing closure of Ofu Airport will reduce delays and transportation costs of critical supplies to the island and allow for residents of Ofu to access emergency medical treatment and other services on Tutuila. At the FY23 discount rate of 2.5%, the total construction first cost of the TSP is approximately $8.2 million dollars. The TSP accomplishes the project objectives while meeting USACE engineering standards.

6.3 Cost Estimate

The total project first cost (Constant Dollar Cost at FY23 price levels) of the TSP (Alternative 2: Tribar Revetment) is $8.2 million. In accordance with the cost share provisions of Section 14 of the Flood Control Act of 1946 as amended (33 U.S.C. 701r), the federal share of the project first cost is estimated to be $5.08 million, and the non-federal share is estimated to be $1.72 million. Table 14 provides the cost breakdown for the total project first cost. Note that, for the purposes of cost estimating, environmental mitigation costs include the costs of implementing BMPs to reduce insignificant environmental effects. These costs are calculated using the upland and in-water footprints for each alternative. A detailed description of how these costs were derived is included in Appendix A-2.

Table 14: TSP Project First Costs (FY23 Price Levels)

	Measure	Qty	U/M	Total Direct Cost	Contin-gency	Total Project Cost
					32%	
Alt 2: Tribar Revetment				**$6,376,000**	**$1,835,500**	**$8,211,500**
01	Lands and Damages	1	LS	$84,500	$13,600	$98,100
06	Environmental Mitigation	1	LS	$20,000	$30,000	$50,000
	Construction					
	Geotextile	1,389	SY	$16,900	$5,400	$22,300
	Tribar Revetment	500	LF	$2,714,800	$868,700	$3,583,500
	Associated Cost	1	EA	$52,700	$16,800	$69,500
	Reseeding	1,111	SY	$24,800	$7,900	$32,700
	Backfill behind Revetment	56	CY	$1,900	$600	$2,500
	Cultural Resource Monitor	1	EA	$84,600	$27,000	$111,700
	Mob/Demob	1	EA	$786,600	$251,700	$1,038,200
	Barge Materials from Tutuila	1	EA	$797,500	$255,200	$1,052,700
16	**Construction Subtotal**			**$4,479,700**	**$1,433,500**	**$5,913,200**
30	**Engineering and Design (25%)**			**$1,119,900**	**$224,000**	**$1,343,900**
31	**Supervision and Admin (15%)**			**$672,000**	**$134,400**	**$806,300**

6.4 Lands, Easements, Rights-of-Way, Relocations, and Disposal

The non-Federal sponsor (NFS), the ASG, as represented by the DPA, is responsible for all lands, easements, rights-of-way, relocations, and disposal areas (LERRDs) required to implement the plan.

The estimated real estate cost associated with the TSP is approximately $98,100, including all LERRDs, incremental risk contingency, administrative costs to be carried out by the NFS, and government costs for LERRDs monitoring and certification. Based on the findings of the Real Estate Plan (Appendix A-4), the minimum required estates are perpetual flood protection levee easements totaling 0.4 acres for the tribar revetment and temporary work area easements totaling 1.6 acres for staging, construction, and site access. At this time, no non-standard estates are anticipated.

Final real estate acquisition acreages, limitations, and cost estimates are subject to change after approval of a final IFR/EA, including plan modifications that occur during the PED phase.

6.5 Operations, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R)

Per EP 1105-2-58, operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) is a 100% non-Federal responsibility. OMRR&R costs for the TSP are estimated at 10% of project first costs, 30 years following construction. OMRR&R activities associated with the selected alternative design include the replacement of dislodged armor units, vegetation removal, and filling to address settling.

6.6 Project Risks

The TSP, a tribar revetment, will provide protection to Ofu Airport runway 8/26 and the RSA from coastal erosion due to storm surge and wave attack. The following risks were identified by the PDT during the plan formulation process:

Loss of beach associated the placement of a tribar revetment could impact sea turtle nesting grounds. Sea turtle nesting areas have been identified in close proximity to the study area. Loss of sandy beach necessary for placement of the revetment may have an impact on ESA-listed turtle species and would require environmental mitigation. However, the dissipation of wave energy associated with revetments may result in decreased loss of remaining beach when compared to vertical seawall alternatives. This risk was noted in the project risk register and environmental mitigation costs associated with beach loss were included in the TSP cost estimate.

Historic properties and human burials may be found in the study area. There is a documented history of burials in sandy beach ridge areas in the Pacific and known historic properties and burials in the vicinity of the project area of potential effect. Encountering previously unknown archaeological or burial sites during construction could lead to project delays and increased project costs associated with cultural resources mitigation to resolve adverse effects in accordance with Section 106 of the NHPA. Archaeological monitoring and cultural resources mitigation are included in the project first-cost estimate as a construction cost. In coordination with the ASHPO archaeological monitoring will be conducted for excavations over 6 inches in depth.

Estimated costs are subject to inflation and supply chain risks. At the time of writing, the global economic environment is characterized by high rates of inflation and strained global supply chains. Supply chain issues are especially acute on the remote island of Ofu, where normal equipment failure could lead to project delays and increased costs while replacement parts or new equipment are shipped to the island. Comprehensive documentation of cost-related risks is included in the Cost and Schedule Risk Analysis in Appendix A-2.

Changes in design quantities could result in a change in the selected plan. There is a high degree of uncertainty in critical elevations (i.e. runway elevation and reef flat elevation) at the project site, due to the quality of available of data at this time and potential issues with the vertical datum used for data collection. With better geotechnical/topographic/bathymetric data, it is possible that design quantities will change, resulting in a change in cost. Since the base costs of each alternative are driven by quantities, it is possible that a significant change in quantities could change the least cost alternative. If more comprehensive and accurate data is not collected during the feasibility phase, this risk would be carried forward into the design and implementation phase a could require additional detailed engineering evaluation as more data becomes available.

6.7 Cost Sharing

The ASG qualifies for Section 1156 cost-share waivers in the amount of $530,000 during the feasibility phase and $665,000 during the design and implementation (D&I) phase. Because the FCSA was executed in fiscal year 2022, the feasibility study cost sharing waiver is authorized at the FY22 level of $530,000 (USACE, 2022). The design and implementation cost sharing waiver is based on the FY23 level. CAP Section 14 studies are cost-shared at a Federal to non-Federal ratio of 65/35, respectively. The Federal per-project expenditure limit for CAP Section 14 studies is $10 million.

Table 15: Cost sharing breakdown (FY23 price levels)

Alt 2: Tribar Revetment	Fed	Non-Fed	Total
Feasibility Phase			
FID	$100,000	$0	$100,000
Feasibility Study	$550,000	$20,000	$570,000
Total Feasibility Phase	**$650,000**	**$20,000**	**$670,000**
D&I Phase			
Construction (Incl. PED/S&A)	$8,113,400	$0	$8,113,400
LERRD		$98,100	$98,100
	$8,113,400	$98,100	$8,211,500
Adjustments			
5% Min Cash Contribution	($410,600)	$410,600	$0
Additional Cash Contribution	($2,365,400)	$2,365,400	$0
Total Before Waiver	$5,337,500	$2,874,000	$8,211,500
	65%	35%	
Sec 1156 Waiver*	$665,000	($665,000)	$0
Total D&I Phase	**$6,002,500**	**$2,209,000**	**$8,211,500**
Feasibility & D&I Phases			
Feasibility Phase	$650,000	$20,000	$670,000
D&I Phase	$6,002,500	$2,209,000	$8,211,500
Total Cost Apportionment	**$6,652,500**	**$2,229,000**	**$8,881,500**

**Section 1156 waiver value as of November 2022*

6.8 Design and Construction

Upon completion of this feasibility study, a general schedule for the design and implementation phase is as follows:

- Execute a Project Partnership Agreement with the non-federal sponsor – 6 months following approval of this IFR/EA
- Conduct necessary surveys (topographic, bathymetric, geotechnical) – approximately 6 months following project partnership agreement (PPA)
- execution
- Develop Plans and Specifications – approximately 1 year following completion of surveys
- Construction contract award – approximately 2 years following PPA execution
- Construction completion – approximately 1 year following construction contract award

6.9 Environmental Commitments* (ECs)

The environmental commitments described below include avoidance, reduction, minimization measures, and BMPs that would be implemented during the design and construction of the TSP to ensure that potential design and construction-related effects are minimized and/or reduced to a less than significant level. Impacts to certain resources (hydrology, hydraulics, and geomorphology, cultural, socioeconomics/environmental justice, land use/utilities/public services, and recreation) are not anticipated for the proposed action, but some best practices to be implemented are included for some of these resources and/or can be covered through environmental commitments for another resource category.

Hydrology, Hydraulics, and Geomorphology

- **EC-H-1** The Contractor shall design the shoreline protection structure in compliance with ER 1110-2-1806 (Earthquake Design and Evaluation for Civil Works Projects)
- **EC-H-2** The Contractor shall construct the shoreline protection structure with materials that would maintain strength and stability during seismic activities.

Water Resources and Quality

- **EC-WR-1** Construction contractors shall, to the extent possible, time construction activities to avoid work during periods of heavy rain that produce overland flow and during storm surge and high tide events and otherwise avoid in water work;
- **EC-WR-2 Construction Stormwater Pollution Prevention Plan (SWPPP)**. A SWPPP shall be developed for the project by the construction contractor and filed with ASEPA and the AS Department of Commerce prior to construction. The SWPPP would designate all BMPs that would be implemented during grading,

clearing, grubbing, and construction activities. The SWPPP would define areas where hazardous materials would be stored, where trash and debris would be placed, where rolling equipment would be parked, fueled, and serviced, and where construction materials would be stored. Erosion control during grading of the construction sites and during subsequent construction would be in place and monitored as specified by the SWPPP and according to the guidelines in the American Samoa Erosion and Sediment Control Field Guide ver. 2.0.

1. The contractor shall produce and submit the project-specific SWPPP to the Contracting Officer for approval prior to the commencement of work. The SWPPP must meet the requirements of 40 CFR 122.26 and the conditions of any permit for stormwater discharges from construction sites.
2. Maintain an approved copy of the SWPPP at the onsite construction office, and continually update as regulations require, reflecting current site conditions.
3. The contractor shall ensure that SWPPP professionals are available to conduct site inspections and maintain BMPs all time and that a crew is available to make repairs as needed to stay in compliance with SWPPP, land use, and National Pollutants Discharge Elimination System (NDPES) permit conditions.
4. The contractor shall ensure that the USACE reviews compliance reports prior to submittal
5. The contractor shall prepare a Notice of Intent (NOI) for NPDES coverage under the general or land use permit for construction activities. Submit to the Contracting Officer for review and approval.

- **EC-WR-3 Hazardous Materials Management Plan and Emergency Response Plan.** The construction contractor shall prepare a project-specific hazardous materials management and hazardous waste management plan prior to initiation of construction. The plan would identify types of hazardous materials to be used during construction and the types of wastes that would be generated. All project personnel would be provided with project-specific training to ensure that all hazardous materials and wastes are handled in a safe and environmentally sound manner.
- **EC-WR-4** The construction contractor shall prepare a Spill Prevention and Contingency Plan. The Plan shall be implemented prior to and during site disturbance and construction activities. The plan will include measures to prevent or avoid an incidental leak or spill, including identification of materials necessary for containment and clean-up and contact information for management and agency staff. The plan and necessary containment and clean-up materials shall be kept within the construction area during all construction activities. Workers shall be educated on measures included in the plan at the pre-construction meeting or prior to beginning work on the project.
- **EC-WR-5 Conditional Notifications and Reports:**
    a. **Accidental Discharges of Hazardous Materials**. Following an accidental discharge of a reportable quantity of a hazardous material, sewage, or an unknown material, the contractor shall notify ASEPA staff

- **EC-WR-6 Post-Construction.** The contractor shall visually inspect the project site for one season within the project maintenance period to ensure excessive erosion, stream instability, or other water quality pollution is not occurring in or downstream of the project site. If water quality pollution is occurring, the contractor shall notify the Contracting Officer within three (3) working days. The Contracting Office will then notify the ASEPA staff member overseeing the project. The ASEPA may require the submission of a Violation of Compliance with Water Quality Standards Report. Additional permits may be required to carry out any necessary site remediation.
- **EC-WR-7** The Corps shall grant ASEPA staff or an authorized representative to enter the site and present the land use permit and inspect the site.
- **EC-WR-8** The contractor shall request the land use permit from USACE and follow the permit conditions as applicable. The Contractor must abide by all applicable requirements, avoidance and minimization measures, and BMPs within the permits. A copy of the land use permit shall be available at the project site(s) during construction for review by the construction contractor, site personnel and agencies. All personnel performing work on the project shall be familiar with the content of the permit and its posted location at the project site.
- **EC-WR-9** Minimize extent of clearing and grubbing; maintain existing vegetation (to the extent possible); sequence activities to minimize exposure of cleared areas; provide temporary soil stabilization (e.g., mulching; hydroseeding; soil binders, geotextiles, etc.); provide dust control (but avoid excess dust control watering); install sediment barriers (e.g., silt fencing, turbidity curtains) and implement bank stabilization practices (e.g., erosion control blankets); cover loose materials in haul trucks; stabilize construction entrance/exit and provide tire wash; revegetate temporarily disturbed areas if needed;
- **EC-WR-10** Regular vehicle and equipment inspection; fueling and maintenance in designated areas; use of drip pans; proper storage and disposal techniques; implement spill controls;
- **EC-WR-11** Protect and manage stockpiles; provide watertight dumpsters, with regular waste removal and disposal; proper containment, labeling and disposal of hazardous materials, such as petroleum products, solvents, etc.); regular site inspection and litter collection; salvage and reuse of materials, as appropriate;
- **EC-WR-12** Proper storage and handling techniques for concrete-curing compounds; perform washout of concrete trucks in designated areas only; containment in wash water pits; proper disposal of material from washout facilities;
- **EC-WR-13** Implement proper sanitary/septic waste management during construction.

Air Quality

- **EC-AQ-1** The project construction contractor shall electrify equipment, where feasible.
- **EC-AQ-2** The project construction contractor shall restrict the idling of construction equipment to ten minutes.

- **EC AQ-3** The project construction contractor shall ensure that equipment will be maintained in proper tune and working order.
- **EC-AQ-4** The project construction contractor shall use catalytic converters on all gasoline equipment (except for small [2-cylinder] generator engines).
- **EC-AQ-5** The project construction contractor shall use only solar powered traffic signs (no gasoline-powered generators shall be used).
- **EC-AQ-6** The project construction contractor shall apply non-toxic soil stabilizers according to manufacturers' specification to all inactive construction areas
- **EC-AQ-7** The project construction contractor shall enclose, cover, water twice daily, or apply non-toxic soil binders according to manufacturers' specifications to exposed stockpiles (i.e., gravel, sand, dirt) with 5% or greater silt content.
- **EC-AQ-8** The project construction contractor shall water active grading/excavation sites at least twice daily.
- **EC-AQ-9** The project construction contractor shall increase dust control watering when wind speeds exceed 15 miles per hour for a sustained period of greater than ten minutes, as measured by an anemometer. The amount of additional watering would depend upon soil moisture content at the time; but no airborne dust should be visible.
- **EC-AQ-10** The project construction contractor shall suspend all excavating and grading operations when wind speeds (as instantaneous gusts) exceed 25 mph (40 kph).
- **EC-AQ-11** The project construction contractor shall ensure that trucks hauling dirt on public roads to and from the site are covered and maintain a 50 mm (2 in) differential between the maximum height of any hauled material and the top of the haul trailer. Haul truck drivers shall water the load prior to leaving the site to prevent soil loss during transport.
- **EC-AQ-12** The project construction contractor shall ensure that graded surfaces used for off-road parking, materials lay-down, or awaiting future construction are stabilized for dust control, as needed.
- **EC-AQ-13** The project construction contractor shall sweep streets in the project vicinity once a day if visible soil material is carried to adjacent streets.
- **EC-AQ-14** The project construction contractor shall install wheel washers where vehicles enter and exit unpaved roads onto paved roads or wash off trucks and any equipment leaving the site each trip.
- **EC-AQ-15** The project construction contractor shall apply water three times daily or apply non-toxic soil stabilizers according to manufacturers' specifications to all unpaved parking, staging areas, or unpaved road surfaces.
- **EC-AQ-16** The project construction contractor shall ensure that traffic speeds on all unpaved roads to be reduced to 15 mph (25 kph) or less.
- **EC-AQ-17** Prior to the approval of plans and specifications, the USACE shall ensure that plans and specifications specify that all heavy equipment shall be maintained in a proper state of tune as per the manufacturer's specifications.

Noise and Vibration

- **EC-N-1** The construction contractor shall be required to comply with any municipal noise and vibration ordinances of the Territory of American Samoa. Activities requiring use of heavy equipment shall be limited to the hours of 7:00 a.m. to 6:00 p.m., Monday through Saturday, except nationally recognized holidays. There shall be no construction permitted on Sunday or nationally recognized holidays unless approval is obtained prior.
- **EC-N-2** All noise-producing project equipment and vehicles using internal combustion engines (including haul trucks) would be fitted with mufflers; air-inlet silencers, where appropriate; and any other appropriate shrouds, shields, or other noise-reducing features. These devices would be maintained in good operating condition to meet or exceed original factory specifications.
- **EC-N-3** Mobile or fixed “package” equipment (e.g., arc welders or air compressors) would be equipped with the shrouds and noise control features that are readily available for that type of equipment.
- **EC-N-4** All mobile or fixed noise-producing equipment used on the project site that is regulated for noise output by a local, territorial, or federal agency would comply with such regulation while used in the course of project activity.
- **EC-N-5** The use of noise-producing signals, including horns, whistles, alarms, and bells, would be for safety warning purposes only.
- **EC-N-6** Written notification to property owners and residents near the project sites and staging areas, as determined in consultation with the matai of the affected village, should be provided. The notice would provide a construction schedule, the required noise reduction measures for the project, and the name and telephone number of the project manager who can address questions and problems that may arise during construction. Any deviation from the proposed construction schedule would require the contractor to contact the respective village matai and nearby residents surrounding the active work site within 24 hours of construction activities to notify them of the anticipated construction schedule.

Biological Resources (Aquatic and Terrestrial)

- **EC-BR-1** Minimize the extent of clearing and grubbing; maintain existing vegetation (to the extent possible); provide temporary soil stabilization (e.g., mulching; hydroseeding; soil binders, geotextiles, etc.). Upon completion of construction, revegetate any temporarily impacted area with vegetation replaced in-kind and any non-native vegetation replaced with suitable native species where practicable.
- **EC-BR-2** Upon development of final construction plans and prior to site disturbance, the USACE shall clearly delineate the limits of construction on project plans. All construction, site disturbance, and vegetation removal shall be located within the delineated construction boundaries. The storage of equipment and materials, and temporary stockpiling of soil shall be located within designated areas only, and outside of natural habitat areas/channel. The limits of

construction shall be delineated in the field with temporary construction fencing, staking, or flagging.

- **EC-BR-3** A USACE approved environmental monitor will monitor construction activities to ensure compliance with environmental commitments.
- **EC-BR-4** Construction activities shall be monitored by a USACE approved environmental monitor to assure that vegetation is removed only in the designated areas. Sensitive areas not to be disturbed shall be flagged *(staked, or otherwise demarcated)*.
- **EC-BR-5** Prior to construction activities and throughout the construction period, a USACE approved environmental monitor shall continue to inspect the construction site and adjacent areas to determine if any birds are nesting within 200 ft of the construction site. If active nests are found, the USACE biologist will coordinate with DMWR to determine appropriate avoidance or minimization measures.
- **EC-BR-6** Prior to any ground-disturbing activities (e.g., mechanized clearing or rough grading) for all project related construction activities, a USACE approved environmental monitor shall conduct a pre-construction survey of the project site for the presence any terrestrial or aquatic special-status or sensitive species. During these surveys the biologist will:
    - Inspect the study area for any sensitive species;
    - Ensure that potential habitats within the construction zone are not occupied by sensitive species; and
    - In the event of the discovery of a non-listed, special-status species, and in coordination with the DMWR, recover and relocate the animal to adjacent suitable habitat within the project site at least 200 ft from the limits of construction activities.
- **EC BR-7** Prior to construction activities, a USACE approved environmental monitor shall conduct pre-construction environmental training for all construction crew members. The training shall focus on required mitigation measures and conditions of any regulatory agency permits and approvals (if required). The training shall also include a summary of sensitive species and habitats potentially present within and adjacent to the project site.
- **EC-BR-8** When construction is completed in a given area, the construction contractor shall restore all temporarily disturbed areas within the temporary construction easement by planting an appropriate groundcover. The native species to be planted shall be approved in advance by the USACE.
- **EC-BR-9** If artificial lighting is required during construction, a lighting plan will be developed by the contractor to outline and determine locations of light sources. All work occurring after dark will be coordinated with local municipalities to avoid disturbance wildlife.

Threatened and Endangered Species

- **EC-TE-1** Restrict all project construction to late-April through early August. This would be the optimal period when no nesting sea turtles would be present and nestlings will have emerged and left the area. This would avoid/minimize direct impacts to nesting turtles to less than significant levels;

- **EC-TE-2** During the pre-engineering design phases, evaluate opportunities to reduce the overall dimensions any shoreline stabilization structure proposed (especially longitudinal length parallel to the shoreline) to minimize impacts to documented nesting beach locations along the west end of the airport runway that could be potentially impacted by proposed project activities;
- **EC-TE-3** During the pre-engineering design phases, look for opportunities to site/place the shoreline stabilization structure above or as close to the current line of littoral vegetation as possible and avoid placement below the high tide mark; vegetation lines typically delineate the general height reached by a rising tide to spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.
- **EC-TE-4** Maximize the amount of construction work that can be conducted from the landward (north) side of the project site (closest to the runway). Minimize construction activities on beach, splash/spray, and intertidal zones. Any structure sited below the high tide mark would potentially exacerbate loss of turtle nesting beach area;
- **EC-TE-5** Avoid construction work at night so that construction lighting on beaches is minimized to the fullest extent possible;
- **EC-TE-6** Ensure all protection measures for sea turtles be included in all contract specifications and the contractor's EPP.

Land Use, Utilities, and Public Services

See Traffic and Circulation.

Traffic and Circulation

- **EC-T-1** The contractor shall develop a Traffic Management Plan and ensure that designated roads are used during construction, particularly at the ingress/egress to the project site. The contractor shall coordinate in advance with municipal emergency services to avoid roads restricting movements of emergency vehicles. At locations where access to nearby property is blocked, provision shall be ready at all times to accommodate emergency vehicles, such as plating over excavations, short detours, and alternate routes in conjunction with local agencies. The Traffic Management Plan shall include details regarding emergency services coordination and procedures. Additionally, the Traffic Management Plan shall clearly identify all affected roadways, bike paths, and pedestrian paths within the affected area. The plan shall identify measures to notify the public and divert automobile and pedestrian traffic safely around the construction area, including but not limited to a notice posted in the local publication, posted signage, and written notification to the American Samoa DPA.

- **EC-T-2** The project construction contractor shall schedule all material deliveries to the construction spread outside of peak traffic hours, and minimize other truck trips during peak traffic hours, or as approved by local jurisdictions.

Cultural, Historic, and Archaeological Resources

- **EC-CR-1** Excavations over six (6) inches in previously undisturbed deposits will be monitored by a qualified archaeologist. If previously unknown cultural resources are found during construction of any feature of the project, construction in the area of the find shall cease until the requirements in 36 CFR 800.13, are met. This would include coordination with the American Samoa State Historic Preservation Officer, the Advisory Council on Historic Preservation, and appropriate other interested parties. It may require additional measures such as test and data recovery excavations, archival research, avoidance measures, etc.

Socioeconomic

No environmental commitments are required for this resource.

Environmental Justice

Environmental commitments applicable to this resource are addressed in other resource categories (e.g., Traffic and Circulation, Noise, etc.).

Recreation

No environmental commitments are required for this resource.

Aesthetics

- **EC-A-1 -** If artificial lighting is required during construction, a lighting plan will be developed by the contractor to outline and determine locations of light sources. All work occurring after dark will be coordinated with local municipalities to avoid disturbance to residents and wildlife.
- **EC-A-2 -**The contractor shall use construction materials and/or landscaping to blend structures into surrounding environment to the greatest extent possible.
- **EC-A-3-** The contractor shall maintain the construction area maintained a clean and organized condition, free of litter and excess equipment/materials.

6.10 Environmental Operating Principles (EOP)*

The TSP is consistent with the USACE Environmental Operating Principles (EOP) that were developed to ensure USACE's missions include totally integrated and sound environmental practices:

- Foster a culture of sustainability throughout the organization;
- Proactively consider environmental consequences of all USACE activities, and act accordingly;
- Create mutually supporting economic and environmental solutions;

- Continue to meet corporate responsibility and accountability under the law for activities undertaken by USACE, which may impact human and natural environments;
- Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs;
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner; and
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

The EOPs were considered in the following ways:

- Both environmental and economic considerations were considered in the development of the TSP. Benefits or costs were accounted for in terms of appropriate monetary and non-monetary metrics. These considerations will be carried through the project planning, design, construction, operation, and maintenance phases of the project.
- The study team has, to the maximum extent practicable, attempted to make effective use of transparency in scoping and planning actions in order to elicit new insights from individuals and diverse stakeholder groups. The study team coordinated with partners and stakeholders early in the process and has made a concerted effort engage the resource agencies early.
- The TSP incorporates lessons learned from similar actions (e.g., other shoreline stabilization studies conducted in the region) to ensure activities avoid adverse environmental consequences.
- The study team has identified potential environmental concerns at the conceptual stage and has engaged subject matter experts within the USACE, as appropriate. Outreach to the centers of expertise was conducted (e.g., Engineering with Nature).
- The best available science, practices, analyses, and tools are being investigated and utilized whenever possible. Data and information are being leveraged with partner agencies.
- Development of the TSP (Alternative 2) considered areas of relevant risk and the intent is to consider adaptive management through the project life cycle process.

6.11 Views of the Non-Federal Sponsor

The ASG supports Alternative 2 as the TSP. Alignment for the support was coordinated with the DPA. Concurrent with the draft decision document release, the study team will coordinate a public meeting to complete necessary outreach with the public, local agencies, and specific stakeholders.

Section 7 Environmental Compliance*

In accordance with NEPA, the draft IFR/EA is an EA integrated with a feasibility report that includes an evaluation of environmental effects of Alternative 0 (the No Action Alternative) and the four (4) proposed action alternatives included in the final array. This document, along with the supporting Appendix A-3 for Environmental Resources, describe how the TSP (Alternative 2: Tribar Revetment) complies with all applicable federal environmental laws, statutes, and EOs and how coordination with Federal, Territorial, local agencies, and the public has been documented. Appendix A-3 also discusses any related regulation specific to American Samoa (Territory).

7.1 Environmental Compliance Activities

The status of the project's compliance with applicable federal, state, and local environmental requirements is summarized below and includes an administrative record of environmental coordination and compliance conducted to date as part of the proposed Project. See Appendix A-3 for more detail.

ENDANGERED SPECIES ACT. Pursuant to Section 7 of the ESA of 1973 (16 U.S.C. 1536), USACE requested technical assistance from the USFWS and on February 2, 2022 and received a list of species listed or proposed for listing under both NMFS and USFWS jurisdiction that may be present on or in the vicinity of the proposed project location (Reference Number: 2022-0006860-S7-00; see Appendix A-3 Attachment 1), as well as confirmation that there is no designated or proposed federally designated critical habitat occurring within the immediate vicinity of the study area (see Appendix A-3).

Pursuant to Section 7 of the ESA of 1973, as amended, the USACE determined that there is no federally designated critical habitat within the immediate vicinity of the proposed project. The draft ESA Biological Assessment is Attachment 5 to Appendix A-3. The project will comply with this act.

FISH AND WILDLIFE COORDINATION ACT. Pursuant to the FWCA of 1934, as amended (16 U.S.C. §§ 661–667e), the Corps is coordinating with USFWS and NMFS on the effect of the recommended alternative (Alternative 2: Tribar Revetment) on fish and wildlife resources as documented in the Draft IFR/EA. The construction of a revetment will require formal coordination to satisfy FWCA compliance. Initial coordination was initiated with the USFWS in November 2021. The Corps received a formal request from the USFWS via email for assistance in assessing marine habitat and biological resources, and potential impacts to those resources, at the site of the proposed Project (see Appendix A-3). The USFWS has provided a draft Planning Aid Report, information from which is included in this report and Appendix A-3. The USFWS Report is not included at the agencies request pending finalization. The Corps will continue to coordinate with the USFWS through the remainder to the feasibility phase. The project will comply with this act.

MAGNUSON-STEVES FISHERY CONSERVATION AND MANAGEMENT ACT.

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (*16 U.S.C. § 1801 et seq.*), the Corps is coordinating with the NMFS. In an email dated November 9, 2021, NMFS was alerted to the proposed project during the early scoping process for this study and email communication with the NMFS PIRO has continued through 2022. EFH consultation with NMFS PIRO will be initiated concurrently with the public release of the draft NEPA document and during the remainder of the feasibility phase to address any comments received. The draft EFH Evaluation is Attachment 5 to Appendix A-3. The project will comply with this act.

NATIONAL HISTORIC PRESERVATION ACT. Pursuant to Section 106 of the NHPA of 1966 (54 U.S.C. § 306108), as amended, the Corps has determined no historic properties affected by any of the Alternatives. The Corps initiated consultation on November 21, 2022 with the ASHPO. The ASHPO concurred with Corps determination on December 28, 2022, with the condition that archaeological monitoring take place for excavations over 6 inches (Appendix A-3 Attachment 8). The project is in compliance with the act.

CLEAN WATER ACT, SECTION 404. Pursuant to Section 404 of the CWA, the Corps evaluated the recommended plan (Alternative 2: Tribar Revetment) and determined that the action proposes discharges regulated under Section 404. The Corps adopts and incorporates by reference the draft 404(b)(1) analysis completed by Corps (see Appendix A-3 Attachment 6). The project will comply with this act.

CLEAN WATER ACT, SECTION 401. Pursuant to Section 401 of the CWA, the Corps must obtain a water quality certification (WQC) from the ASEPA for any discharge into state waters. On April 7, 2020, the Corps reached out the ASEPA to brief the ASEPA on the study and determine 401 obligations and processes. The ASEPA has been made aware of Corps' plans to obtain a WQC in the design phase, prior to implementation of the project. The project will comply with this act.

COASTAL ZONE MANAGEMENT ACT. The Corps reached out to the American Samoa Department of Commerce (DOC) via electronic mail on November 3, 2021 and will continue to coordinate with the DOC during the remainder of the feasibility phase and work within its process in order to obtain final concurrence for the proposed action to satisfy the statutory requirements under Section 307 of the Coastal Zone Management Act (CZMA). The Draft CZM Federal Consistency Determination is included in Appendix A-3 as Attachment 7. The Corps will continue to coordinate with the DOC in the design phase and prior to construction. The project will comply with this act.

7.2 Public Involvement

The USACE continues to conduct NEPA scoping and has initiated agency coordination under the FWCA, ESA, MSA, Clean Water Act, and CZMA. The USACE invited Federal agencies with relevant expertise or jurisdiction by law to be Cooperating Agencies under NEPA. FAA is a formal cooperating agency for this project. The environmental lead has coordinated with the national and local NMFS office, as appropriate. Most of the habitat that might be affected by the study alternatives is expected to fall under ESA, CWA, or

CZMA requirements. However, the study team is coordinating with the agencies to identify appropriate ways to quantify impacts to environmental resources in the study area.

Consistent with the requirements of NEPA the draft IFR/EA will be circulated for a 30-day public review. Copies of the draft document will be distributed to a variety of individuals and organizations, requesting their comments on the project. The distribution list for the Draft Feasibility Report/EA includes all project stakeholders identified to date. This list includes federal, state, and local agencies; elected officials; community groups and organizations; adjacent landowners; libraries; and the news media. The complete distribution list is provided in Appendix A-5 Public Outreach.

The stakeholder involvement approach for this project is ongoing and incorporates a variety of different techniques, including phone interviews, small-group virtual meetings and informational presentations, agency working meetings, and e-mail updates. Through implementation of these techniques, the stakeholder involvement efforts have been designed to develop awareness of specific site conditions and project objectives, gain stakeholder input on issues and specific project measures, and generate dialogue on project alternatives to build support for project implementation. Due to unique challenges related to COVID-19 and restrictions to travel to American Samoa throughout the feasibility process, meetings with village matais (chiefs) and village councils, in-person open house meetings, and public events in the Territory were not possible. This level of in-person engagement in American Samoa is recognized as being very important for engendering community support.

Coordination on public outreach and information sharing continues with the non-federal sponsor, the DPA. Various means of disseminating information on the project and the draft IFR/EA will be used, including the local newspaper (published on Tuesdays), government newsletters, websites (USACE website and DPA/ASG website), and the DPA airport and seaport users meetings. Future opportunities for the study team to travel to the territory will be continually explored after the draft report is released to the public.

7.2.1 Scoping

Email communications with individual resource agency staff were conducted throughout the feasibility process to keep them informed as the study developed.

7.2.2 Agency Coordination

Coordination with the resource agencies will continue to be conducted to comprehensively address USACE policies, as well as specific regulatory requirements for consultation. NEPA requires agency involvement as part of the environmental review process. NHPA Section 106 requires consultation with the ASHPO as part of a federal agency’s consideration of the effects of their proposed undertaking on historic properties.

7.2.3 Tribal Consultation – Not applicable.

7.2.4 List of Statement Recipients

See Appendix A-3 Environmental Resources for a list of the agencies, organizations, and persons to whom USACE will provide copies of the draft IFR/EA for review.

7.2.5 Public Comments Received and Responses

This section will be completed to include comments received during the public comment period following release of the Draft IFR/EA.

Section 8 District Engineer Recommendation

I have considered all significant aspects of this project, including environmental, social, and economic effects and engineering feasibility. I support Alternative 2, the TSP, for the Ofu Airport Emergency Shoreline Study, as generally described in this report, be approved for implementation as a federal project after approval of the final report, with such modifications thereof as in the discretion of the Commander, USACE may be advisable. The estimated total project cost of the TSP is approximately $8,211,500. The federal portion of the estimated total project first cost is approximately $6,002,500. The non-federal sponsors' portion of the estimated total project first costs is approximately $2,209,000. All amounts are in FY23 price levels.

Federal implementation of the project for emergency shoreline protection includes, but is not limited to, the following required items of local cooperation to be undertaken by the non-federal sponsor in accordance with applicable federal laws, regulations, and policies:

- Provide a minimum of 35%, up to a maximum of 50%, of construction costs, as further specified below:
    - Provide, during design, 35% of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;
    - Pay, during construction, a contribution of funds equal to 5% of construction costs;
    - Provide all real property interests, including placement area improvements, and perform all relocations determined by the Federal government to be required for the project;
    - Provide, during construction, any additional contribution necessary to make its total contribution equal to at least 35% of construction costs;
- Operate, maintain, repair, rehabilitate, and replace the project or functional portion thereof at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal laws and regulations and any specific directions prescribed by the Federal government;
- Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-federal sponsor owns or controls for access to the project to inspect the project, and, if necessary, to undertake work necessary to the proper functioning of the project for its authorized purpose;
- Hold and save the Federal government free from all damages arising from design, construction, operation, maintenance, repair, rehabilitation, and replacement of the project, except for damages due to the fault or negligence of the Federal government or its contractors;
- Perform, or ensure performance of, any investigations for hazardous, toxic, and radioactive wastes (HTRW) that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, and

any other applicable law, that may exist in, on, or under real property interests that the Federal government determines to be necessary for construction, operation, and maintenance of the project;

- Agree, as between the Federal government and the non-federal sponsor, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal government;

- Agree, as between the Federal government and the non-federal sponsor, that the non-federal sponsor shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities in a manner that will not cause HTRW liability to arise under applicable law; and

- Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, PL 91-646, as amended, (42 U.S.C. 4630 and 4655) and the Uniform Regulations contained in 49 C.F.R Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

The recommendations contained herein reflect the information available at this time and current departmental policies governing the formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of the national civil works construction program or the perspective of higher levels within the executive branch. Consequently, the recommendations may be modified before they are transmitted to Congress for authorization and/or implementation funding. However, prior to transmittal to Congress, the ASG, interested Federal agencies, and other parties will be advised of any significant modifications in the recommendations and will be afforded an opportunity to comment further.

If the IFR/EA identifies no significant impacts, the District Engineer will sign a FONSI and recommend the TSP for implementation based on economic justification and environmental acceptability. There is insufficient information at this time to make a formal recommendation.

CHRISTOPHER RYAN PEVEY
LTC, EN
Commanding

Section 9 List of Preparers*

The team members listed below provided substantial text to the Ofu Coastal Storm Damage Reduction, Section 14 Emergency Shoreline Protection IFR/EA.

Table 16: List of preparers

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Carl Iwasaki	Geotechnical Engineering	CEPOH-ECE-G
Tiffany Murray	Real Estate Specialist	CEPOH-RE

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OFU COASTAL STORM DAMAGE REDUCTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
OFU, AMERICAN SAMOA

DRAFT INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

APPENDIX A-1
ENGINEERING

A-1.1 Coastal Engineering

A-1.2 Geotechnical Engineering

US Army Corps of Engineers ®
Honolulu District

Appendix A-1.1: Engineering Analysis

SECTION 14

EMERGENCY SHORELINE PROTECTION

OFU AIRPORT, AMERICAN SAMOA

DRAFT

January 2023

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Contents

1 Introduction

This appendix summarizes the engineering design elements of the Section 14 Ofu Emergency Shoreline Protection Study in Ofu, American Samoa. It describes the process and analysis used for feasibility-level evaluation of shoreline protection options, including the assessment of existing coastal processes that affect the study area, and an assessment of the proposed alternatives to determine the recommended plan.

1.1 Study Authority

This current Feasibility Study is being conducted under the authority of Section 14 of the 1946 Flood Control Act, as amended (33 USC 701r). Section 14 authorizes USACE to partner with a non-federal sponsor to study, design, and construct emergency stream bank and shoreline protection for public facilities in imminent danger of failing due to bank failure caused by natural erosion and not by inadequate drainage, by the facility itself, or by operation of the facility.

EP 1105-2-58 limits emergency shoreline protection projects authorized under Section 14 of the Flood Control Act of 1946 to essential public facilities and facilities owned by non-profit organizations that have been properly maintained and are in imminent threat or damage or failure by natural erosion processes of streambanks and shorelines. Eligible facilities include highways, public works, churches, public and private non-profit hospitals, schools, and other public or non-profit facilities offering public services open to all on equal terms. The Ofu Airport qualifies under these parameters. The non-Federal sponsor for this project is the Government of American Samoa, represented by the Department of Port Administration (DPA).

1.2 Project Background

1.2.1 Study Area

American Samoa is a U.S. territory located in the mid-South Pacific Ocean, a part of the Samoan Islands archipelago in Polynesia approximately 2,300 miles southwest of Hawaii (Figure 1). The island of Ofu is in the Manu’a Island group of American Samoa, located about 60 miles east of Tutuila Island.

Ofu Airport is located on the southern coast of Ofu Island (Figure 2). The 18-acre public airport is operated by the Department of Port Administration (DPA) of the American Samoa Government on property leased from local families. The airport is intended to serve the aviation needs of Ofu and Olosega islands.

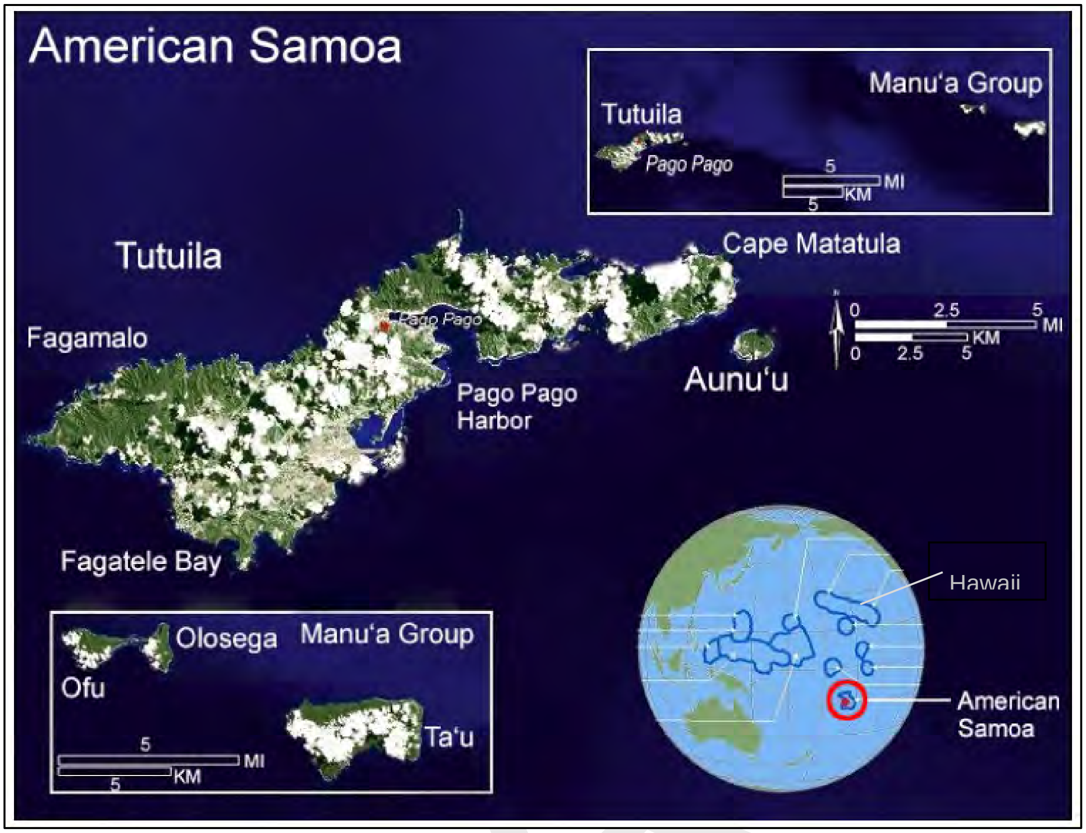

Figure 1. Territory of American Samoa and location maps (Source: Pacific Regional Integrated Sciences and Assessments)

Figure 2: Ofu Airport Location

1.2.2 Problem Description

The shoreline along the western end of the Ofu Airport is progressively eroding with the coastline receding further into the Runway Safety Area (RSA) of Runway 8. The RSA is mandated by FAA regulations to accommodate aircraft that may veer off the runway, as well as firefighting equipment. At Ofu Airport, the RSA is already non-standard due to the limited amount of real estate available. The RSA in theory should be 150 feet wide, centered on the runway, and extend 300 feet beyond each end of the runway. The RSA currently extends only 100 feet beyond the end of Runway 8. An exemption to the FAA design standards currently allows the airport to remain operational in its current state, however, continued erosion will result in the imminent closure of the runway.

Shoreline erosion at the project site was accelerated during Tropical Storm (TS) Evans in 2012, again by TS Gita in 2018, and most recently in July 2022 during a combination of king tides and a passing storm system. After TS Gita, sand and rocks were deposited onto the end of the runway and surrounding grassed area from the high storm wave runup. Airport staff were required to quickly clear this debris from the airport runway in order to restore runway operations. In July 2022, an extratropical storm passing south of American Samoa generated a long period swell that coincided with a king tide (i.e. the highest high tides of the year), which may have exacerbated the overtopping and runup associated with this event. The July 2022 event resulted in similar impacts to the runway as TS Gita, with wave runup, erosion, and damage to the runway. Photos taken before and after the July 2022 event are shown in Figures 3 and 4.

Figure 3: West end of the runway prior to the July swell event (photo taken on July 13, 2022)

Figure 4: Photos of erosion and damage to runway following extratropical storm event during king tides (photo taken July 14, 2022)

1.3 Existing Projects

An existing Federal Shore Protection Project was constructed at the request of the American Samoa Government in 1986, also authorized under Section 14 of the Flood Control Act of 1946. The project consists of a 381-foot long rock revetment fronting the eastern end of the airstrip. The crest elevation of the structure is 9 feet above Mean Sea Level (MSL, established by the National Tidal Datum Epoch (NTDE) of 1983-2001), which is approximately level with the existing runway elevation. The revetment is constructed with a rock armor layer two stones-thick with stones between 1,300 to 2,100 pounds, a slope of 1V:1.5H (vertical to horizontal), and the structure toe wedged into the coral ledge approximately -3 feet MSL (NTDE). The structure was last inspected in July 2019 and was rated “marginal” with moderate deterioration, but still functionally adequate (USACE, 2019).

DPA was awarded a Federal Aviation Agency (FAA) Airport Improvements project grant to rehabilitate and reconstruct the existing airport runway. The $8.7 million project began in April 2021 and was completed in July 2022. The project included demolition of the existing concrete runway and installation of a new runway with supporting infrastructure.

2 Previous Reports

Previous Federal reports, listed below, have assessed conditions within the region and were referenced within this study as needed.

i. Section 14 Reconnaissance Report on Shore Protection for Ofu Airstrip, Ofu Island, American Samoa, U.S. Army Corps of Engineers (USACE) Honolulu District, May 1985. The report established a federal interest in protecting the Ofu airstrip from coastal erosion occurring on the runway’s east shoreline. Based on the study findings, a shoreline protection feature described above was constructed on the east end of the runway in October 1986, at a cost of $182,500 (Federal funds). The project was authorized under Section 14 of the Flood Control Act of 1946, and the local sponsor was the American Samoa Government.

ii. Ofu Airstrip Shore Protection Project Operations and Maintenance Manual, Ofu Island, Territory of American Samoa, USACE Honolulu District, August 2003. The report purpose is to furnish the local sponsor with information on project history, operation and maintenance (O&M) requirements, reporting requirements, emergency operation, and to document as-constructed conditions.

iii. Hurricane Induced Stage-Frequency Relationships for the Territory of American Samoa TR CHL-98-33, USACE, Engineering Research and Development Center, Coastal and Hydraulics Laboratory. The purpose of the study was to determine the frequency of flood levels along the shoreline of American Samoa that are caused by the combined effects of astronomical tides and typhoon-induced high water levels. The results of this study have been incorporated into the analyses contained in this report.

iv. American Samoa Shoreline Inventory Update III, USACE Honolulu District, April 2006. The purpose of this study was to identify the physical characteristics of the American Samoa shoreline with emphases on erosion and shore protection needs. The Ofu Airport runway was described as being located on a flat backshore approximately 8 ft above MSL landward of a vegetated berm. The shoreline on the west end of the Ofu runway was identified as non-critical, stable, and with a large accreting beach at the time of the report.

v. American Samoa Climate Related Vulnerability Assessment for Transportation Infrastructure, USACE Honolulu District, April 2020. The study objective was to assess the vulnerability of American Samoa's transportation assets to climate related hazards. The study approach involved broad research on climate-related impacts, vulnerability indices and adaption strategies for public transportation systems, interviews with American Samoa stakeholders and regional subject matter experts, and two on-site stakeholder workshops held in June and October 2019. The assessment included an inventory of American Samoa public harbors, airports, and roadways. For the assessment of Ofu Airport, the study noted that "Ofu and Fitiuta airport facilities are 7 feet elevation and are not exposed to the SLR inundation areas analyzed in this study." Therefore, Ofu Airport was not considered as one of the more vulnerable airport assets in American Samoa and was not further evaluated. However, this was a preliminary study that did not evaluate the effect of storm surge and wave inundation in combination with future sea level rise, due to a lack of available data.

3 Existing Conditions

Ofu Island is characterized by steep, high cliffs as a result of marine erosion and a forested interior of volcanic soils. The highest elevation is Mt. Tumu at nearly 1,621 feet elevation. The island is skirted by narrow coastal flats of largely calcareous beach sediments. The Ofu Airport is located on the Va'oto Plain at Papaloloa Point, the southernmost tip of the island. Ofu is surrounded by a narrow fringing coral reef, the widest of which is on the leeward western and southern coastlines.

At the project site, the reef is approximately 500 feet wide, and effectively blocks most wave energy from reaching the shoreline during periods of normal water levels and wave heights. The existing beach is narrow, approximately 50 ft wide.

3.1 Climate

American Samoa is south of the equator, located east of the Pacific date line in the Central South Pacific. Given its tropical location, relatively small seasonal variations in annual air temperature occur in American Samoa. Only a 2 to 6 degrees Fahrenheit difference exists between the warmest and coolest months. The wet season in American Samoa is generally December through March; however, trace precipitation is recorded about 300 days of the year. Rainfall averages between 125 and 250 inches per year and are seasonally and locality dependent.

3.1.1 Winds

The prevailing winds throughout the year are southeasterly trades. Winds tend to approach Samoa more directly from the east during December through March, but during the remainder of the year, they originate predominantly from the east-southeast and the southeast (Figure 5). The average wind velocity varies from 7 to 15 miles per hour (mph). Strong winds from the north can create unsafe operating conditions at Ofu airport as the winds come around and over Tumu Mountain.

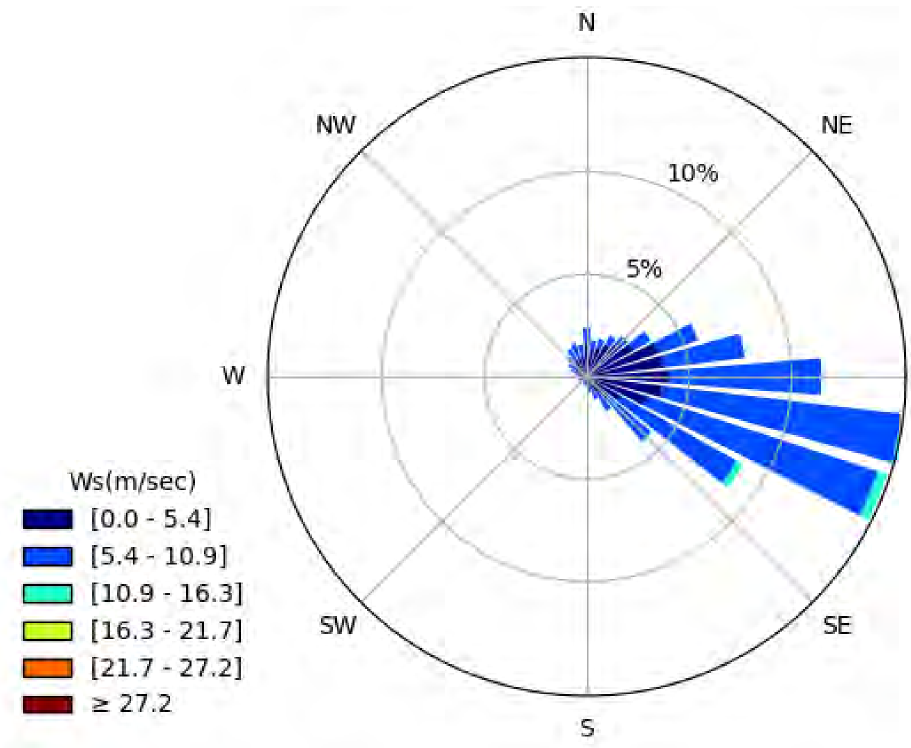

Figure 5. WIS Wind Rose for American Samoa (typical)

3.1.2 Tropical and Extratropical Cyclones

Tropical storms that affect American Samoa approach primarily from the north. The area has experienced at least 41 cyclones from 1831 to 1991, and an additional 14 from 1991 to 2020.Typically, tropical storm season occurs during the months of November through April.

The worst tropical cyclone to strike American Samoa in modern times was Tropical Cyclone Val which occurred in 1991. The effects of the storm were seen throughout the entire territory, but most damaging near Pago Pago, where sustained winds of 105 mph, gusts up to 145 mph, ocean waves up to 50 feet in height, and rainfall up to 14 inches were recorded. There were 17 fatalities associated with the storm and damage was estimated at $368 million (in 1991 dollars). More recent events include Tropical Cyclone Heta in 2004 and Tropical Cyclone Olaf in 2005, both of which resulted in disaster declarations with flooding, high surf, and high winds. Tropical Cyclone Gita passed near American Samoa in February 2018, with sustained winds of 74 mph that left 90 percent of Tutuila without power. A cargo ship sank near Ta'u island and territory wide damages were estimated at close to $200 million. These tropical storms have accelerated the coastline erosion in the project area as described in section 1.2.2 above.

Extratropical cyclones are low-pressure weather systems that occur in the middle latitudes, between 30° and 60° latitude. In contrast with tropical cyclones, extratropical cyclones have cold weather fronts at the center of the cyclone and bring abrupt changes in temperature and weather. An extratropical cyclone can transition to a tropical cyclone if it moves over warmer water, and the core of the storm becomes warm. At approximately 14°S latitude, Ofu may still be affected by extratropical storms generated far from the project site as long period wave energy generated by the storm can propagate far across the ocean and ultimately impact the project site. An example of this occurred in July 2022, when a powerful extratropical storm formed to the east of New Zealand generating waves with a significant wave height greater that 49 ft (15 m) at its source and with very long periods of 20-30 seconds. These waves traveled across the entire Pacific Ocean, impacting coastal communities across the basin. By the time the swell reached American Samoa, the CDIP buoy near Aunuu measured the event to have a peak significant wave height of 15.4 ft (4.7 m) and peak period of 20 seconds.

3.1.3 El Niño Southern Oscillation Cycles

Climate impacts sea levels, coastal storm surge, and tropical cyclone intensity, and is significantly tied to El Niño Southern Oscillation (ENSO) fluctuations. ENSO consists of three phases, Neutral, El Niño and La Niña, with average durations between 9 and18 months.

The relationship between El Niño and La Niña cycles and the Southern Oscillation is a relationship between oceanic sea surface temperature (SST) and the atmospheric pressure gradient, respectively. In neutral conditions, the Pacific trade winds are driven westward owing to changes in the atmospheric pressure gradient across the Pacific, where lower atmospheric pressures in the western Pacific and higher pressure to the east drive trade winds and warmer SST westward. Consequently, cooler SSTs are observed in the eastern Pacific. Higher SSTs transfer heat to the atmosphere, which, in turn, change the pressure gradient. In other words, the pressure gradient affects the SST and the SST affects the pressure gradient. This circulation is referred to as the Walker Circulation.

Under El Niño conditions, trade winds weaken, allowing warmer western Pacific waters to migrate eastward. This results in lower sea levels and SST in the western Pacific and higher sea levels and SST in the eastern Pacific. Sea surface elevations can fluctuate from El Niño and La Niña events by as much as 0.7 to 1.0 feet (IPRC, 2014). During El Niño the western Pacific experiences reduced rainfall and drought conditions, while the eastern Pacific experiences wetter conditions. Under La Niña conditions, trade winds increase, resulting in significant pooling of warm water and higher SST in the western Pacific, increased sea levels, and increased convection. Correspondingly, lower SST, lower sea levels, and reduced convection occurs in the eastern Pacific (NOAA, 2021). See Figure 6 below for an illustration of ENSO cycles.

Tropical cyclones thrive off warm ocean waters. El Niño effectively discharges heat into the ocean, leading to intensified tropical cyclones (Rupic et al., 2018). ENSO affects climate and weather patterns which impact precipitation, cyclones, and sea levels. ENSO adds variability to recorded water levels, which affects the total water levels at the project site.

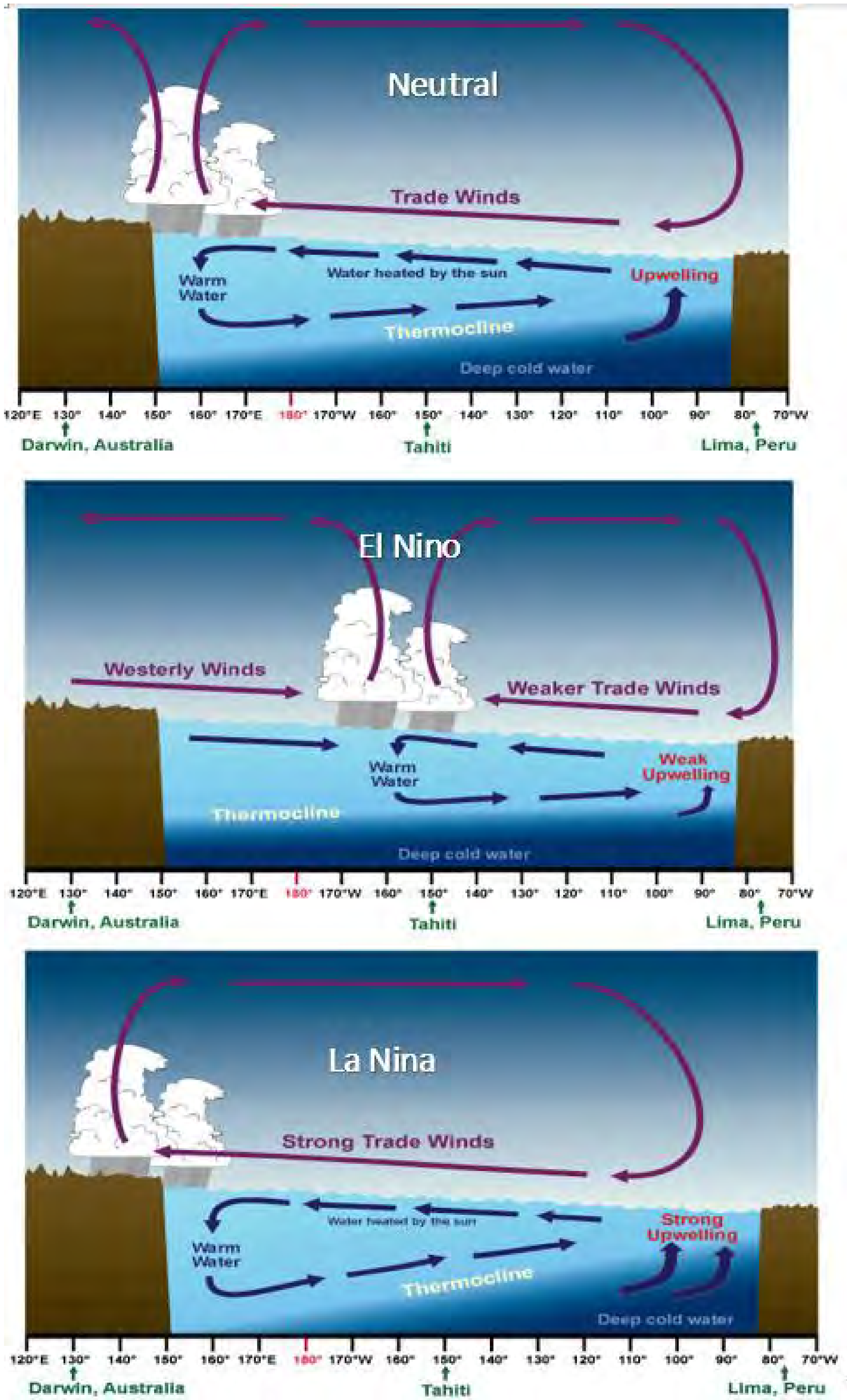

Figure 6. ENSO Fluctuations in the Pacific: Neutral, El Niño, and La Niña (Source: NOAA)

3.2 Earthquakes

Ofu and Olosega Islands are the remains of a volcanic doublet. The two islands were formed from shield volcanoes that are separated by Asaga strait, which is relatively narrow at approximately 500 feet wide. A powerful combination of near-simultaneous fault and thrust earthquakes occurred in the Tonga Trench in September 2009. Based on Pago Harbor tide gauge data, this event caused Tutuila to initially rise about 2 to 3 inches at the time of the earthquake event, and then sink down about 7 to 9 inches over the next 2 to 3 years due to the more immediate relaxation from the earthquake deformation. Since then, the ongoing subsidence is estimated to be occurring at a rate of about 0.3 to 0.6 inches per year and is expected to continue. Subsidence is included in the relative sea level change rate presented, so even though seismic activity (i.e. earthquakes) and tsunamis are not considered in design of shore protection (since it cannot be accounted for statistically within the design life), sea level rise (including subsidence) is considered.

3.3 Vertical Datum

ASVD02, which was the official vertical datum for American Samoa, was destroyed due to the geophysical activity of the 2009 earthquake. The National Geodetic Survey (NGS) determined that local tidal datums would supercede ASVD02 as the vertical datum for American Samoa. ASVD02 was approximately equal to local Mean Sea Level (MSL) established by the National Tidal Datum Epoch (NTDE) of 1983-2001. Tidal datums established by NOAA at Pago Pago Harbor over a more recent period of analysis (2011-2019) are provided in section 3.5.1 below. The difference between MSL NTDE and the current MSL is -0.232 m (-0.761 ft). This datum shift was used to adjust all elevation data to the current MSL datum, and is noted to capture relative sea level change (i.e. land movement and sea level rise) up to the end of the analysis period in 2019. Thus, the vertical datum used for this project is the 2011-2019 MSL datum, unless otherwise noted (e.g. MSL NTDE).

3.4 Bathymetry and Topography

Elevation data available for the project area included topographic lidar data collected by NOAA in 2012 and made available for download from the NOAA digital coast data access viewer (https://coast.noaa.gov/digitalcoast/tools/dav.html). This data was provided in NAD83(2011) UTM Zone 2S (meters) horizontal projection and referenced to the ASVD02 vertical datum in units of meters. The vertical accuracy of the lidar data is 15 centimeters. Bathymetry data for this area was provided by the Pacific Islands Benthic Habitat Mapping Center (PIBHMC) as a combination of multibeam bathymetry in the offshore areas (with a vertical accuracy of ~1% of the water depth) and bathymetry derived from multispectral IKONOS satellite imagery for the nearshore areas (with a vertical accuracy in the 5m range). The dataset was made available for download from http://soest.hawaii.edu/pibhmc/pibhmc_amsamoa_ofu_bathy.htm. The dataset was in UTM Zone -2 (meters) and referenced to mean lower low water (MLLW) tidal datum, which would have been established by the National Tidal Datum Epoch of 1983-2001 at the time of data collection in 2009.

These two datasets were combined by first adjusting them into the same MSL NTDE datum, then shifting the datum to the current MSL datum as described in section 3.3 above. This combined dataset was used as input into the numerical model, as well as for the engineering assessment of the site conditions to develop concept designs. However, it is noted that due to the low level of accuracy of the bathymetry data and the importance of water depth in determining design criteria in a depth limited wave climate, use of this dataset introduces a large uncertainty in the analysis. Figure 7 illustrates the bathymetry and topography of the project site and surrounding areas used in this analysis.

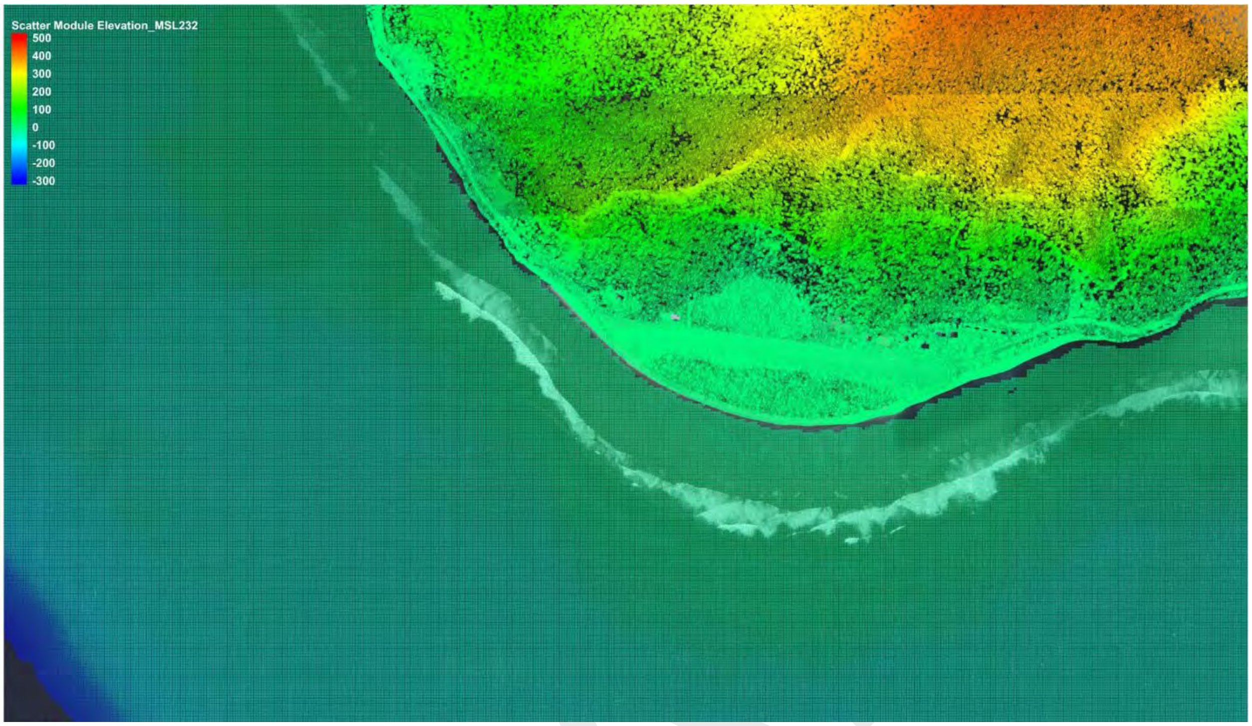

Figure 7. Ofu Topography and Bathymetry

From this data, the depth of the coral reef rock was determined to be at approximately -7 ft below MSL, however, the as-built information for the existing revetment on the east end indicates the reef flat at approximately -4 ft MSL. From the lidar data, the elevation of the existing runway was determined to be +10 ft above MSL. However, the runway elevation published by the airport indicates that the west end of the runway is +8.5 ft, and the topographic survey conducted as part of the recent runway reconstruction project established the end of the runway at +12 ft. Given the range of top/bottom elevations, it was determined that for initial concept designs, -7 ft. MSL would be used as the depth of hard substrate for the structure foundation, and +10 ft. MSL would be assumed as the maximum crest elevation allowable (i.e. equal to the elevation of the existing runway). This errs on the conservative side for quantity calculations. While every effort was made to reconcile different datasets, it is possible that the uncertainty in the elevation data is in part due to differences in data source, collection method, and the use of different benchmarks or datums. To obtain accurate elevation data, a comprehensive topographic and bathymetric survey should be conducted during the design and implementation phase.

3.5 Water Levels

Water levels are typically measured through tide stations or other gages. Information is sparse in the southern Pacific due to low inhabitance. The closest tide station to the study area, maintained by the National Oceanographic and Atmospheric Administration (NOAA), is in Pago Pago Harbor, Tutuila Island, American Samoa (Station 1770000). The tidal station is located 67 miles west of the project area. At this distance the correlation between the water levels observed at Pago Pago and those at Ofu Island are not precise, however, it is the best information available and is sufficient for feasibility level analysis.

3.5.1 Tides

Current tidal datums for Pago Pago Harbor have been established by the Center for Operational Oceanographic Products and Services (CO-OPS), NOAA over an 8-year period of analysis (10/01/2011 - 09/30/2019), superseding the tidal datums from the National Tidal Datum Epoch (NTDE) period of analysis from 1983-2001. The Pago Pago tide gauge record was also disturbed by the 2009 earthquake, therefore post-earthquake data was used to establish current tidal datums.

Table 1 summarizes tidal data for the 8-year period of analysis between 2011 and 2019 recorded in Pago Pago Harbor. Project elevations are referenced to a MSL datum. The most recent tidal datums (based on latest tidal epoch) for Pago Pago Harbor are used in the analysis, as there is currently no tide station in the Manu'a Islands.

Table 1. Pago Pago Harbor Tidal Datums

Tidal Datum	Elevation [feet] above MSL
Highest Tide, observed	2.7
Mean Higher High Water (MHHW)	1.4
Mean High Water (MHW)	1.3
Mean Sea Level (MSL)	0.0
Mean Low Water (MLW)	-1.3
Mean Lower Low Water (MLLW)	-1.4
Lowest Tide, observed	-2.5

3.5.2 Sea Level Change and Variability due to Pacific Climate Patterns

Ofu, like the rest of American Samoa is experiencing sea level change (SLC) impacts at its shorelines. Climate research by the Intergovernmental Panel on Climate Change (IPCC) has documented global warming during the 20th century that is anticipated to either continue or accelerate for the 21st Century. Global mean sea level change varies in response to global climate change, and it was determined that global mean sea level rose at an average rate of 0.07 inches per year (in/yr) (1.7 ± 0.5 millimeters per year [mm/yr]) during the 20th century (IPCC 2007).

Over the past two decades, sea level trends have increased in the western tropical Pacific Ocean with rates that are approximately three times the global average. Several papers including Merrifield and Maltrud (2011) have shown that the high rates of SLC recorded are caused by a gradual intensification of Pacific trade winds since the early 1990s. Multi-decadal tradewind shifts in the Pacific (1950-1990 had weak tradewinds, while 1990-2012 have shown strong tradewinds) are likely related to the Pacific Decadal Oscillation (Merrifield et al., 2012), a recurring pattern of ocean-atmosphere climate variability centered over the mid-latitude Pacific basin. These low frequency tradewind changes can contribute on the order of 1 cm variations in sea level in western tropical Pacific. Multi-decadal variations such as these can lead to linear trend changes over 20 year time scales that are as large as the global SLC rate, and even higher at individual tide gauges (Merrifield, 2011 and Merrifield et al., 2012).

In addition, higher frequency interannual variations in Pacific water levels can be caused by the effect of the ENSO, which is described above. In fact, it is known that the largest interannual variability of sea level around the globe occurs in the tropical Pacific, due to these climate patterns (Widlansky et al., 2015). During El Niño years, sea level in the western tropical Pacific is known to drop by 20 to 30 cm, while La Niña phases cause an average sea level rise of about 10 cm.

Additionally, and throughout the tropical Pacific, prolonged interannual sea level inundations are also found to become more likely with greenhouse warming and increased frequency of extreme La Niña events, thus exacerbating the coastal impacts of the projected global mean sea level rise (Widlansky et al., 2015).

As part of the previously noted American Samoa Climate Related Vulnerability Assessment for Transportation Infrastructure, National Oceanic and Atmospheric Administration (NOAA) (Chris Zervas, email communication) provided an estimate of relative sea level change in American Samoa accounting for subsidence in combination with thermal influences on sea level rise (e.g., glacial melt, thermal expansion). A relative sea level trend of 8.9 mm/yr (0.35 in/yr) was calculated over the period of 2011-2018 with a high margin of error (+/-9.8 mm/year; 0.386 in/yr) due to the short period of analysis and uncertainty introduced by the strong influence of ENSO forcing in the region. For this project, NOAA (Chris Zervas, email communication) provided an updated relative sea-level change (RSLC) trend of 11.1 +/-6.5 mm/yr, calculated over the period of 2011-2022.75 (i.e. through September 2022). It is noted that while the rate has increased, the uncertainty has decreased. Since the rate and extent of subsidence will continue to change over the short to mid-term, monitoring over time will help to help improve RSLC estimates in the future.

Recent USACE guidance (ER 1100-2-8162) requires incorporation of the effects of RSLC predictions in all managing, planning, engineering, designing, constructing, operating, and maintaining of USACE projects or systems of projects in tidally influenced areas. The guidance recommends assessing sea-level change based upon “low”, “intermediate”, and “high” rates developed by the National Research Council (NRC). RSLC estimates were incorporated into project planning and design by utilizing the USACE sea level change curve calculator. Typically, RSLC curves start at 0 in 1992, because 1992 is the middle of the national tidal datum epoch (1983-2001). As noted above, in American Samoa a new tidal epoch has been established over the period of analysis of 10/01/2011 - 09/30/2019. The middle of this epoch is 2015. Therefore, when using the USACE sea level change curve calculator, the base year was set at 2015. Using the current sea level trend of 11.1 mm/yr (0.437 inches/yr) as a custom rate, curves for future sea level change were predicted, as shown in Figure 8.

Under future conditions, possible impacts to the project site due to climate change may include a dramatic increase in RSLC. Figure 8 indicates that at the 50 year planning horizon RSLC could be between 2.2 and 4.6 ft, and at the 100 year adaptation horizon it could be as much as 10.5 ft (however there is still a high uncertainty on the estimate this far into the future). If that projection were to be realized, the existing runway would be inundated even during typical conditions. However, even with a moderate increase in sea level, greater water depths over the reef would reduce the amount of wave energy dissipated by the reef, allowing more wave energy to propagate to the shoreline. With larger waves breaking at the shoreline, there would be an increase in shoreline erosion and more frequent overtopping at the runway. Increased water levels could also lead to “sunny day” flooding, where high tides alone could cause flooding and overtopping. With more frequent overtopping, the useability of the airport would be reduced.

Due to the variability and uncertainty in sea level trends outlined above, it will be important to fully evaluate the “high” SLC curve as design parameters are further refined, both to ensure that the project is resilient to this potential outcome and to realistically predict what adaptations could be necessary.

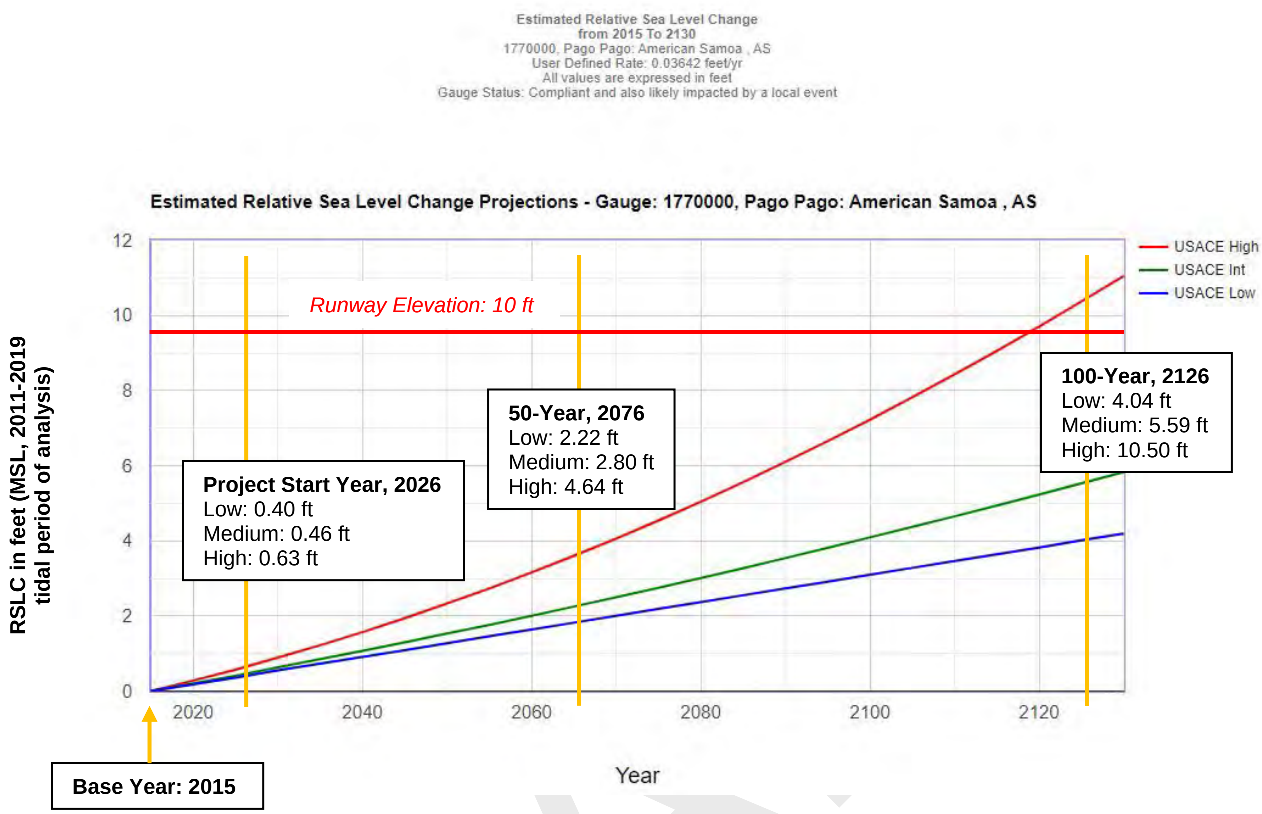

Figure 8. American Samoa Estimated Relative Sea Level Change Projections

3.5.3 Design Water Levels

Water level plays a critical role in design of shoreline protection projects, particularly in those locations where waves are depth limited. The super-elevation of water level near the coast can be a controlling factor in determining the amount of wave energy that reaches the shoreline. It can significantly affect coastal processes such as wave breaking, wave generated currents, wave runup and inundation, and sediment transport.

Water level is a combination of many factors that can occur over different temporal and spatial scales. Longer-term water level increases may be due to sea level changes, and/or annual or decadal anomalies such as El Nino/La Nina or the Pacific Decadal Oscillation. Shorter-term effects on nearshore still water level are astronomic tide, storm surge (which includes wind setup and localized increase due to low pressure), and wave setup. Wave runup can be added to the still water level in areas where inundation along the shoreline or overtopping of a structure is a concern.

The impact of storm surge and water level anomalies can be captured by evaluating the annual exceedance probability (AEP) levels relative to the MSL datum, as shown in Figure 9. As shown, the 2% AEP or 50-year return period water elevation at Pago Pago Harbor American Samoa is approximately 2.89 ft (0.88 m) relative to MSL. Based on the location of the tide gauge in a protected harbor area, the extreme water level does not include the contributions of ponding or wave setup that would be experienced in an open coast fringing reef environment such as that fronting Ofu Airport. However, it is appropriate to use as the offshore boundary condition in the numerical wave model, with the total design water level comprised of astronomical tides, storm surge, and RSLC. The EurOtop equations for runup and overtopping used in Section 6 implicitly include wave setup, therefore there is no need to add on an additional water level increase for wave setup when calculating overtopping discharges using the EurOtop equations.

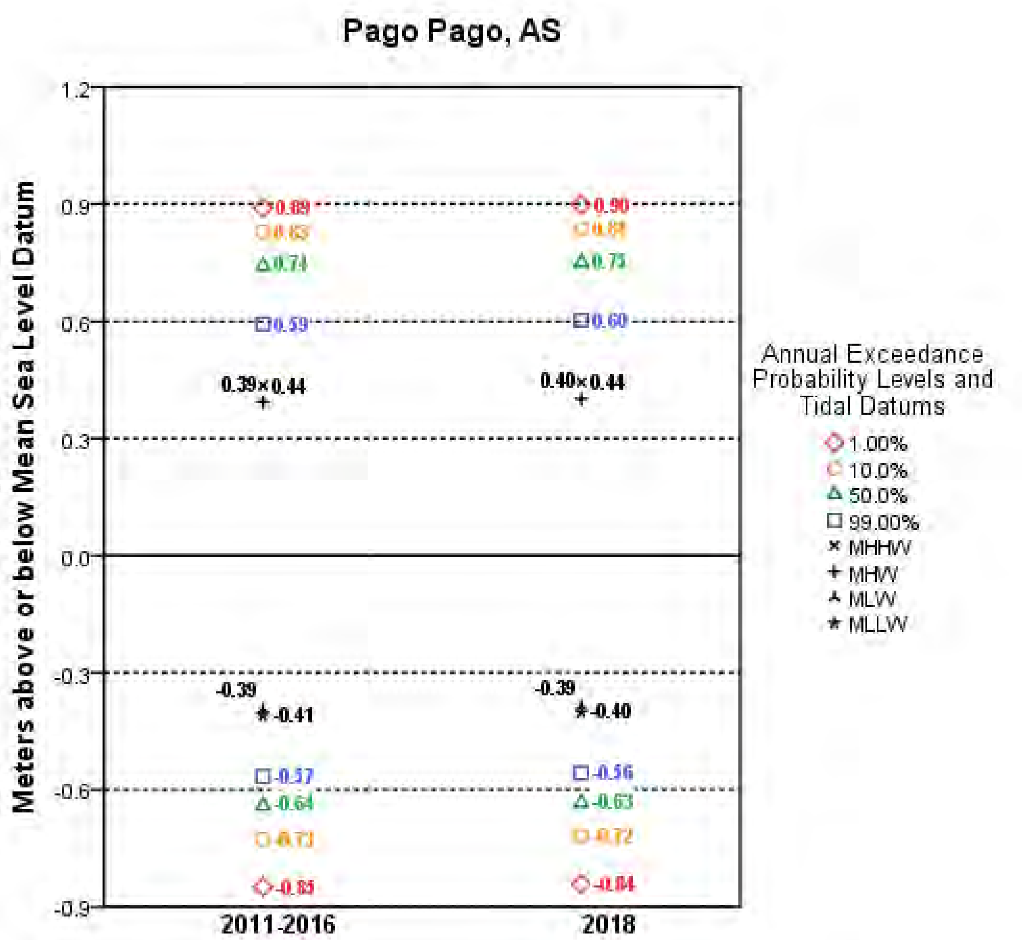

Figure 9. AEP Water Levels relative to MSL

3.6 Waves

American Samoa is exposed to two distinct wave types: waves generated by the prevailing local winds; and sea and swell from local and distant storms and typhoons. Long period swells generated by distant tropical storms and typhoons can have a significant effect on the study area. The USACE's Wave Information Study (WIS) developed 40 years (1981– 2020) of wave hindcast data for the study area. WIS generated wave roses for the area show that the typical wave climate includes sea and swell waves of up to 13 feet (4 meters [m]) predominantly from the southeast, as well as the east and south (Figure 10). In addition, a less frequent but more energetic (up to 16 feet [5 m]) source of tropical cyclone wave energy typically approaches from the north. The direct wave window for the project area includes directions from southeast (partially sheltered by Tau) through west (Figure 11), however refraction of long period waves from northerly storms could potentially be a factor as well. The WIS hindcast database was used as the source of wave data for the feasibility phase of this study. The nearest WIS station to the Ofu Airport project area is station 81538, located at 14.5° S and 170.0° W approximately 30 miles from the project site. The water depths at the station are 999m (3,280 ft).

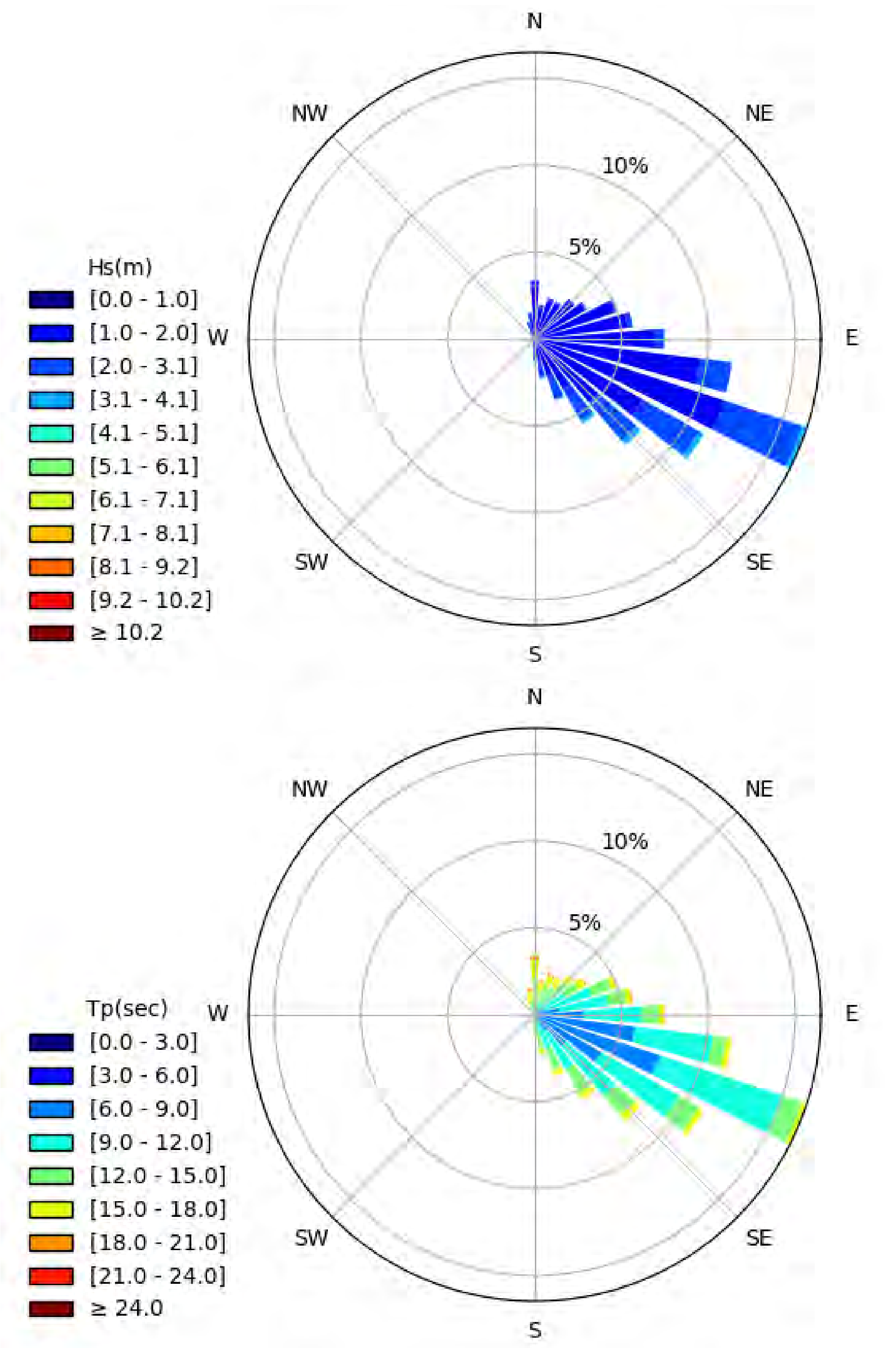

Figure 10. WIS Wave Height (top) and Period (bottom) Rose for American Samoa (typical)

Figure 11: WIS Wave Window for Project Site

3.6.1.1 Extreme Wave Return Periods

Waves generated from the southeast to north of Ofu, regardless of the generation source, may impact the project location. To perform an extremal analysis of return period wave heights, the extreme storm events table for Station 81538 was downloaded from the WIS Portal, where an extreme event is identified as a peak over the threshold that is twice the standard deviation of wave heights. From the 40 year hindcast, 781 events were identified where the significant wave height Hmo > 9.2 ft (2.89 m). Figure 12 shows the top 10 events captured at WIS Station 81538. From these top events, the dataset was filtered to include only those wave directions that would directly impact the shoreline, therefore waves arriving from mean directions between 90° to 360° were considered. A return period analysis was conducted on the largest 40 events from this filtered dataset, to identify the 2, 10, 50, and 100-yr return period wave heights for the project site, as shown in Table 2. To note, Cyclone Heta in January 2004 produced wave heights up to 11.1 m at this location, which is greater than the estimated 100-year event. Cyclone Gita in 2018 had significant wave heights up to 5.8 m, which is close to a 10-yr return period wave event.

Top 10 events based on Peak H_{mo}

Event	Date/Time(UTC)	H_{mo}	T_{pp}	θ_{wave}	Event	Date/Time(UTC)	H_{mo}	T_{pp}	θ_{wave}
1	2004/01/06 00:00	11.10	14.40	339.9	6	2018/02/10 05:00	5.80	10.80	325.7
2	1991/12/10 06:00	8.60	11.60	4.1	7	1993/01/04 14:00	5.70	10.70	321.8
3	1990/02/04 21:00	6.20	11.40	343.9	8	2005/02/17 03:00	5.50	11.80	348.4
4	2010/02/13 10:00	6.10	10.60	138.8	9	2008/01/22 12:00	4.90	9.90	321.1
5	2016/02/18 19:00	5.80	11.00	333.0	10	2011/01/24 13:00	4.80	9.60	350.2

An event is defined as any period when $H_{mo} > 2.89$m θ_{wave} is direction that waves are arriving from

Figure 12. Top 10 events

Table 2. Return Period of Filtered Wave Events

Return Period	Wave Height	
2-year	4.1 m	13.6 ft
10-year	6.3 m	20.6 ft
50-year	8.4 m	27.5 ft
100-year	9.3 m	30.6 ft

As a comparison, Sea Engineering, Inc. (via email communication) completed an extremal analysis on the Aunuu CDIP wave buoy station number 189. This wave buoy is located approximately 3.8 miles northeast of Aunuu island and 4.5 miles west of Tutuila, therefore is more sheltered from the westerly and southwesterly waves than the WIS points which are located farther offshore. Table 3 shows the results of this return period analysis. The July 2022 swell event, which had a peak Hs of 15.4 ft (4.7 m) and peak period of 20 seconds as measured by the CDIP buoy, is estimated to be a 10-year return period event based on this analysis. Overall, the return period wave heights are lower than those calculated from the WIS data. While the buoy provides actual measurements rather than a hindcast, it is noted that the CDIP buoy has only been collecting data for the past 8 years, which will lead to a higher margin of error on the longer return period events (e.g. the 50 & 100 year). Based on the WIS analysis, the July 2022 swell was approximately a 3 year event.

Table 3. Return Period of CDIP wave buoy station number 189

Return Period	Hs (ft)
1	9.7
2	10.6
5	11.9
10	12.8
25	14.0
50	14.9

4 Numerical Modeling

Accurate and representative numerical modeling requires that wave and water level conditions are generally known in deep water, far away from the shoreline and the area of interest. The numerical model, CMS-Wave, was used to transform waves from deep water to the nearshore water depths at the project site.

CMS-Wave is a phase-averaged spectral wave model for nearshore wave generation, propagation, transformation, and dissipation (Smith et al. 2001, Smith 2007, Massey et al. 2011). Phase-averaging models determine the average conditions over multiple wavelengths. CMS-Wave is formulated on a Cartesian grid, with the x-axis oriented in the cross-shore direction (I) and the y-axis oriented alongshore (J), parallel with the shoreline. Angles are measured counterclockwise from the grid's x-axis.

4.1.1 Model Domain

A single grid was created to transform the incident deep water waves from the WIS station to the nearshore environment at the project area. The model domain was developed using the available elevation datasets as described in section 4 and a grid cellular resolution of 32.8 ft (10 m). The grid was comprised of 180 cells in the cross-shore direction (I) and 325 cells in the alongshore direction (J). The projection of the grid was UTM NAD83 Zone 2S with a vertical datum relative to MSL. The model domain extends over the entire southern point of Ofu Island to capture wave energy from all approach angles. On the fringing reef area fronting the project location, a spatially varied Manning's n roughness coefficient was added to account for reef roughness, where n=0.2 in areas with reef and n=0.025 elsewhere.

The properties of the CMS-Wave domains are provided in Table 4, and the extents are shown in Figure 13.

Table 4. Model Domain Parameters

Grid	Projection	Grid Origin (x,y) [m]	Azimuth [deg]	Δx and Δy [ft]	Number of Cells	
					I	J
CMS-Wave	UTM NAD83 Zone 2S, m MSL	**(256013.93, 1491713.41)**	**40**	**10**	**180**	**325**

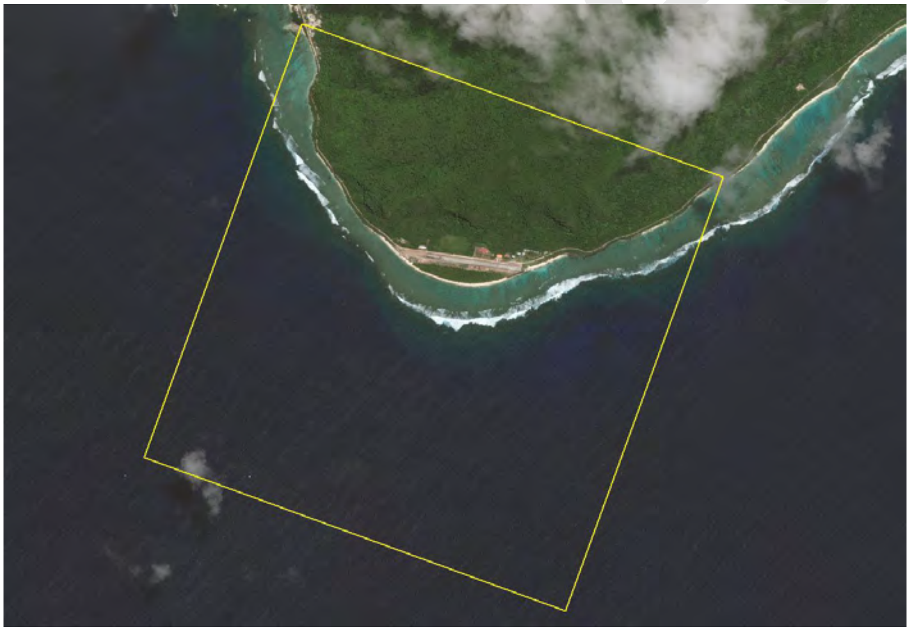

Figure 13. CMS-Wave Domain Extents

4.1.2 Wave and Water Level Inputs

Design water level and wave conditions were developed to supply boundary conditions to CMS-Wave. The incident wave conditions used were the extremal return periods, as described in section 3.6.4.1. A sensitivity analysis was conducted on a range of wave periods and directions to determine design wave conditions. Wave periods included 5 seconds (s), 10 s, 15 s, and 20 s to capture the range of the WIS data. Wave directions of 100, 140, 160, 180, 220, 280, and 340 were tested to represent the full range of wave approaches to the project site.To ensure that the wave energy from the north swells were sufficiently represented by the model, an additional run with the grid rotated 90 degrees to the north was also tested. Results of the sensitivity analysis indicated that the design wave consistently had a 15 s period approaching from 140 degrees. Table 5 summarizes the final modeled wave conditions.

Table 5. Modeled Wave Conditions

Return Period (yrs)	Significant Wave Height, m	Period, sec	Direction, deg
2	4	15	140
10	6	15	140
50	8.5	15	140
100	11	15	140

Six different water levels were identified for model inputs. MSL and MHHW represent typical current day mean and high water level conditions. The 2% AEP water level represents the increase in water levels associated with a design storm event. To evaluate future water levels over the 50-yr planning horizon, the USACE low, intermediate, and high sea level change estimates are added to the 2% AEP to evaluate 50-yr design water level conditions. The resulting water elevations relative to the updated (2011-2019) MSL were 1.44 ft. (0.44 m) for MHHW; 2.89 ft. (0.88 m) for the 2% AEP; 5.08 ft. (1.55 m) for the 2% AEP plus low SLC curve; 5.64 ft. (1.72 m) for the 2% AEP plus intermediate SLC curve; and 7.41 ft. (2.26 m) for the 2% AEP plus high SLC curve.

Using these inputs, modeled boundary conditions consisted of 6 water levels and 4 wave conditions producing 24 model runs to represent inclement conditions within the project area. Offshore boundary spectra are created in CMS-Wave with input wave conditions using a shallow water self-similar spectral form, referred to as a TMA spectrum, which substitutes an expression for the shallow water equilibrium range into the JONSWAP equation for spectral energy density. This spectral form is intended to describe single peaked wind seas, or wind seas which have reached a growth equilibrium in finite depth water. The resolved spectra were represented by 30 frequency bands, ranging from 0.04 Hz (25 sec) to 0.33 Hz (3.03 sec), and 72 directional angle bands, from 0° to 355° with respect to the x-axis (306.0°).

4.1.3 Model Outputs

CMS-Wave transformed the extreme waves from offshore to the project site at the different water levels discussed above. The modeling outputs were analyzed directly seaward of the project location, as indicated by the observation point shown in Figure 14. The breaker ratio (significant wave height/water depth) was calculated for each scenario, ranging from 0.56 to 0.72, which is appropriate for depth limited shallow water waves. The significant wave height observed at the project site for each is shown in Figure 15 and Table 6. The model shows that the water levels are a driving factor in resulting wave heights, due to controlling nature of the fringing reef. Larger waves break on the reef edge, allowing only smaller waves to reach the project site. As water levels over the reef increase, larger waves can reach the shoreline. The resulting design wave height is 7.87 ft for the 50-yr return period wave at the 2% AEP plus intermediate SLC curve condition. The intermediate SLC was selected as a moderate prediction of future SLC, considering the high level of uncertainty with the projected curves. The high curve was also evaluated for the alternatives as a comparison.

Figure 14. Location of Observation transect in front of Project Area

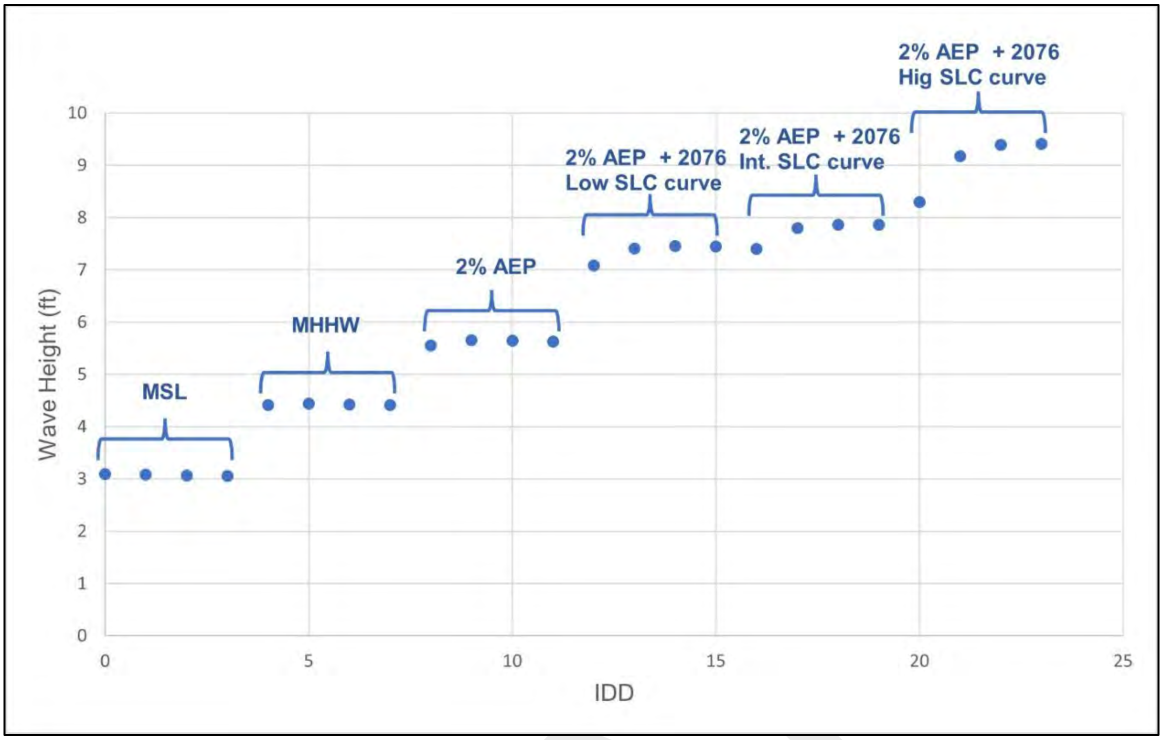

Figure 15. Observation Transect Max Significant Wave Height Results.

Table 6. Observation Point Max Significant Wave Height Results

	MSL		**MHHW**		**2% AEP**	
Return Period	**IDD**	**Ft.**	**IDD**	**Ft.**	**IDD**	**Ft.**
2-year	0	3.09	4	4.42	8	5.56
10-year	1	3.08	5	4.44	9	5.65
50-year	2	3.07	6	4.42	10	5.64
100-year	3	3.06	7	4.41	11	5.63
	2% AEP + 2076 Low SLC curve		**2% AEP + 2076 Int. SLC curve**		**2% AEP + 2076 High SLC curve**	
Return Period	**IDD**	**Ft.**	**IDD**	**Ft.**	**IDD**	**Ft.**
2-year	12	7.08	16	7.40	20	8.29
10-year	13	7.41	17	7.80	21	9.17
50-year	14	7.45	18	7.87	22	9.40
100-year	15	7.44	19	7.86	23	9.41

5 Shore Protection Measures Considered

Several measures were considered for the protection of the shoreline along the west end of Ofu Airport runway. A description of each measure is provided below.

5.1 Revetment

A revetment consists of armoring a shoreline slope designed to hold-the-line (Figure 16) and protect the shoreline slope from wave impacts and erosion. A revetment is suitable in areas of pre-existing hardened shorelines and in some cases along chronically eroding shorelines with limited sediment supply. It may also be appropriate where shoreline recession threatens infrastructure that is not able to be relocated. Materials that are commonly used in revetment construction include stone, concrete armor units, sand/concrete filled geotextile bags, geo-tubes, and rock-filled gabion baskets. Revetments mitigate wave action, there is limited maintenance, and have an indefinite lifespan. Disadvantages however include significant land area requirement, loss of intertidal habitat, erosion of adjacent unreinforced shoreline, limited high water protection, and prevention of the upland from being a sediment source to the system. Environmental considerations include large impact in and out of water, impacts are not reversible, minimal maintenance required, and permits are required.

Revetments were determined to be an acceptable option for the Ofu Airport shoreline. Both rock and tribar revetments have been used successfully by USACE and DPW to protect critical infrastructure such as roadways, airports and schools around Tutuila and Ofu. Contractors in American Samoa are familiar with the construction methods and the work can be completed without specialized equipment. Both a rock revetment and tribar revetment were carried forward into the final array of alternatives, so that armor unit size, availability, cost and environmental impacts could be fully evaluated.

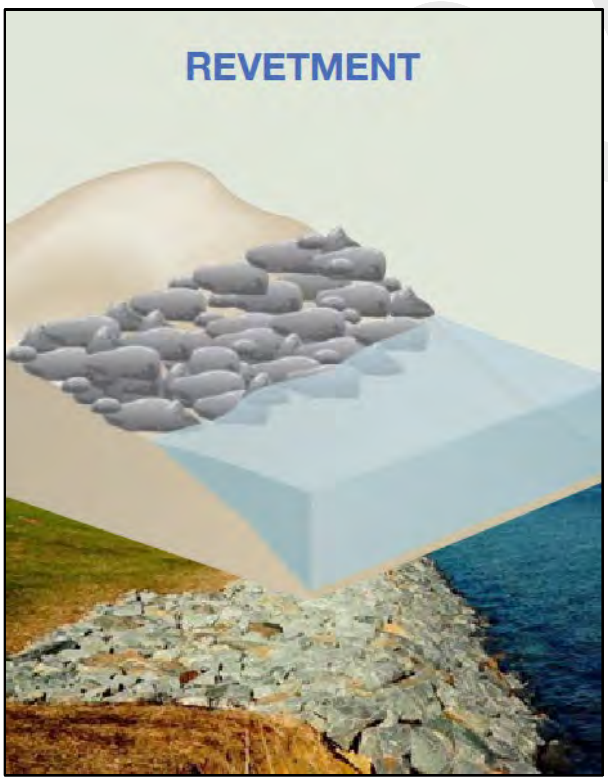

Figure 16. Revetment measure.

5.2 Seawall

A seawall is constructed parallel to the shoreline and functions as a rigid, vertical or near vertical retaining wall (Figure 17). It is intended to hold soil in place, survive the impacts of waves/currents and provide for a stable shoreline. Suitable applications are in high energy settings and sites with pre-existing hardened shoreline structures. These types of structures are commonly used along bay and ocean shorelines. Seawall material options include various types of sheet pile, grouted rock, and prefabricated or cast in place concrete elements. They are suitable for high wave energy environments which are vulnerable to storm surges. Advantages of seawalls include prevention or reduction of storm surge flooding, resistance to strong wave forces, shoreline stabilization behind the structure, low maintenance costs, and a limited footprint. Disadvantages include potential erosion in front of the structure due to wave reflection, disruption of sediment transport leading to beach erosion, higher up-front costs, visually obstructive, loss of intertidal zone, prevention of upland from being a sediment source to the system, and may be damaged from overtopping. They can cause relatively large environmental impacts in and out of the water, impacts may not be reversible, there is minimal maintenance, and permits are required. In American Samoa, seawalls have typically been used in areas without a sandy shoreline or along steep sloped shorelines with a limited available construction width.

Seawalls were determined to be an acceptable option for the Ofu Airport shoreline. Initial seawall options included a concrete rubble masonry (CRM) seawall, sheetpile seawall, and precast concrete panel seawall. However, initial rough order of magnitude (ROM) cost estimates determined that the sheetpile wall would be the greatest cost due to the specialized equipment and material required which are not readily available in American Samoa. The sheetpile wall was therefore screened out from the initial array of alternatives. Other concerns were that sheetpiles can be vulnerable to corrosion, even with cathodic protection, if not properly designed, installed, or maintained. Even minor damage to a sheetpile could lead to corrosion, impact the longevity of the structure, and pose a risk to the environment. The CRM seawall and precast concrete panel seawall were carried forward into the final array of alternatives, so that design, cost and environmental impacts could be fully evaluated.

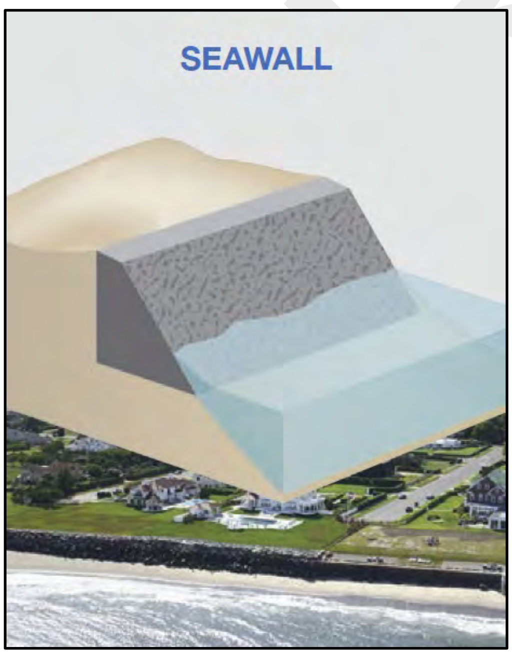

Figure 17. Seawall measure.

5.3 Beach Nourishment with and without Vegetation on Dune

Beach quality sand is added from an adjacent or outside source to nourish an eroding beach (Figure 18). Such nourishment widens the beach and extends the shoreline seaward. Beach nourishment is suitable in low-lying oceanfront areas with available sources of beach quality sand or other native sediments. Vegetated dunes help anchor sand and provide a buffer to protect inland areas from waves, flooding and erosion. Dunes can be strengthened by inclusion of a geotextile tube or rock core. Advantages include the expansion of usable beach area, lower environmental impact than hard structures, flexibility, and ease of redesign along with provision of habitat and ecosystem services. Vegetation can be planted on the dune to increase its resilience to storm events. Disadvantages however include continual sand renourishment required, limited high water protection, application is limited, and there is possible impacts to regional sediment transport. Environmental considerations include large physical footprint requirement, moderate environmental impact, impacts may be reversible, and permitting is required.

Beach nourishment was determined to not be an acceptable option for the Ofu Airport shoreline. As a location with a limited sediment supply, a source of beach quality sand was not identified. Additionally, it was determined that beach nourishment would not provide adequate protection to the runway. In this high wave energy environment, it would provide limited protection during a storm event and would be subject to ongoing erosion. Additionally, the need for regular renourishments would be difficult for the non-federal sponsor to maintain, limiting the longevity of this measure.

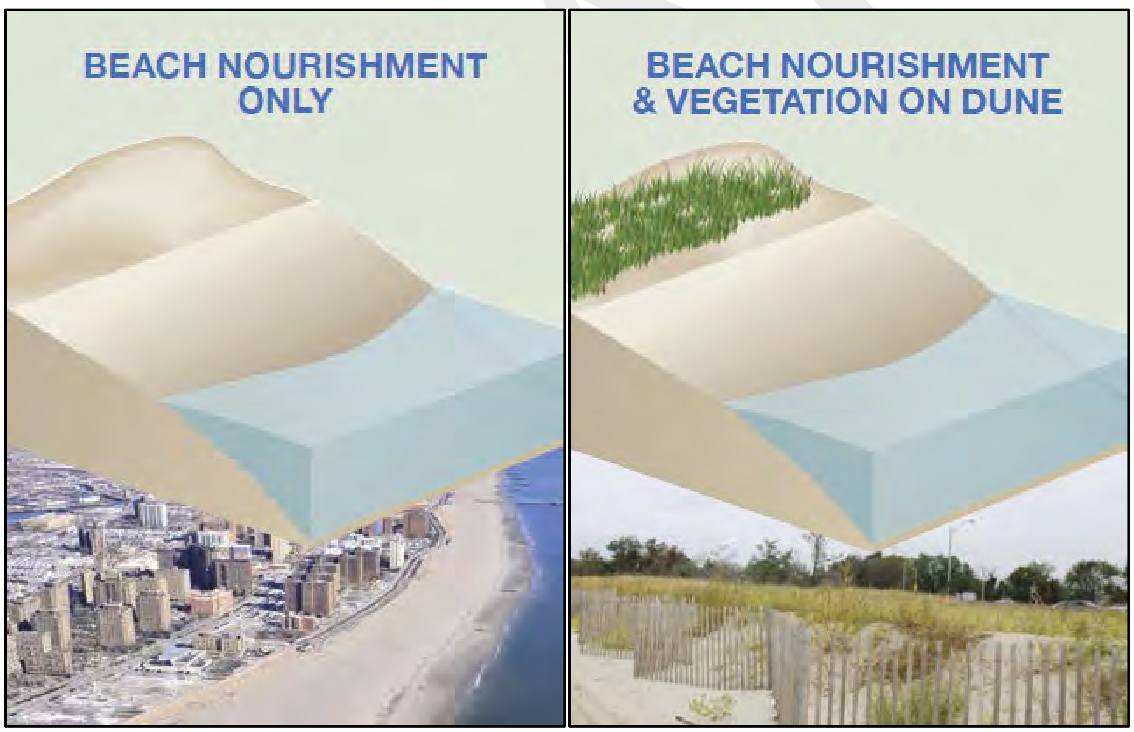

Figure 18. Beach nourishment with and without dune vegetation measure.

6 Comparison of Final Alternatives

6.1 No Action

The no action alternative assumes the existing conditions would continue unchanged into the future. This alternative would not include shoreline protection or stabilization. Erosion would continue and the shoreline will approach the runway pavement, leading to airport closure. Relocation of the runway would be required to prevent damage or undermining of the runway.

6.2 Alternative 1 - Rock Revetment

Alternative 1 consists of a 500 ft rock revetment placed along the shoreline fronting the western end of the runway. The structure consists of two layers of armor stone and two layers of underlayer stone, which sit on top of compacted backfill and a geotextile layer. The structure is secured by an oversized toe stone, which is seated in a trench excavated into the coral reef rock, at an expected depth of -7 ft MSL. The crest of the structure is estimated to be at +10 ft MSL, limited by the runway elevation, and the slope at 1.5H:1V. The structure crest elevation and toe depth may need to be adjusted depending on the results of the topographic and bathymetric surveys and design considerations. A typical revetment cross-section is shown in Figure 19 below.

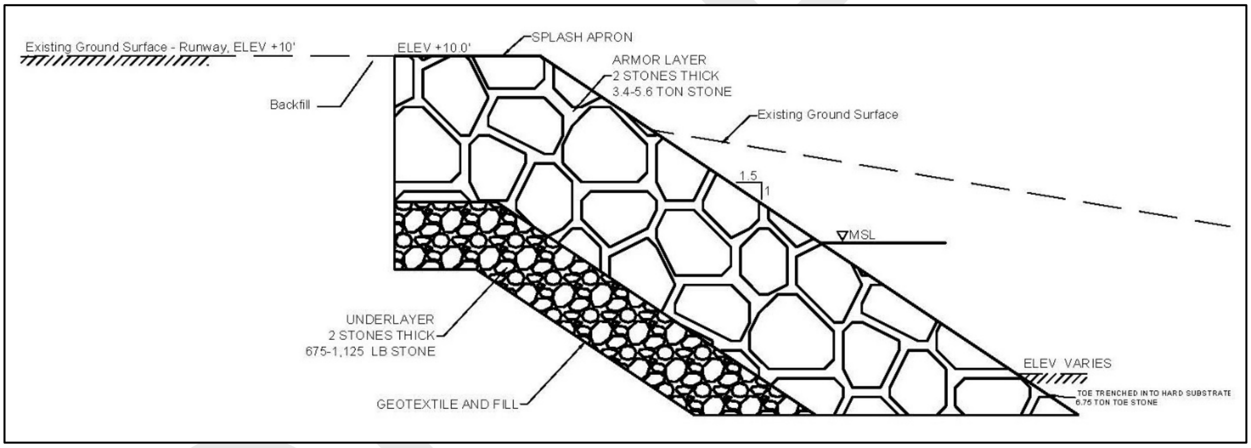

Figure 19: Alternative 1 - Preliminary Rock Revetment Cross Section

6.2.1 Preliminary Stone Sizing

The Hudson Equation was used to determine the appropriate stone sizing of the armor and underlayers. The Hudson Equation is shown below where W is the weight of the required armor stone, γ_r is the specific weight of the armor units, H is the design wave height, K_D is the damage coefficient, S_a is the specific gravity of the armor stone, and cotα is the angle of the breakwater side slope. The K_D value was selected based upon rough angular stones and random placement for breaking waves.

Hudson Equation:

$$W = \frac{\gamma_r H^3}{K_D (S_a - 1)^3 cot\alpha}$$

Table 7 provides the assumed variables and coefficients used in the Hudson Equation calculations.

Table 7. Hudson Equation Coefficients

Specific Weight (γ_r)	154 lb/ft^3
Design Wave Height (H)	7.9 ft
Stability Coefficient (K_D)	2
Specific Gravity (S_a)	2.4
Sideslope Angle (cotα)	1.5

An underlayer is added to support the armor layer such that the armor stones are not directly resting on the geotextile fabric. The underlayer is designed in accordance with the USACE's Coastal Engineer Manual (CEM); the weight of the underlayer stone is 1/10 of the armor layer stones. This size requirement prevents underlayer stones from escaping through voids in the armor layer.

Using the Hudson equation, a 4.5 ton median armor stone weight (W_{50}) will be constructed at a 1.5H:1V slope. The median armor stone diameter is determined to be 3.9 ft, with a layer thickness of 7.8 ft. Additionally, the underlayer stone has a median weight of 900 lbs for the representative diameter of 1.8 ft and a layer thickness of 3.6 ft. Geotextile fabric is placed on compacted fill as the to provide a stable base for the structure. The toe stone has a median weight of 6.75 tons and a diameter of 4.4 ft.

Table 8. Preliminary Stone Sizing

Description	Median Weight, W50	Median Diameter, D50	Layer Thickness
Armor Stone	4.5 tons	3.9 ft	7.8 ft
Underlayer Stone	900 lbs	1.8 ft	3.6 ft
Toe Stone	6.75 tons	4.4 ft	N/A

As a comparison, the rock revetment on the east end of the airstrip is constructed with two layers of armor stone ranging in size from 1,300-2,100 lbs. The structure was built in 1985 and has generally remained stable. However, the large swell event in July 2022 did dislodge some armor stones that needed to be replaced. The calculated stone size for the west end revetment is notably larger than the existing revetment due to the larger design wave heights anticipated under future RSLC conditions.

6.2.2 Runup and Overtopping

Although the design was not optimized to reduce runup and overtopping, due to the vertical elevation restriction of the runway, estimates of runup and overtopping were calculated to evaluate the performance of the alternative.

To compute runup, equations 5.1 and 5.2 from the EurOtop Manual (2018) were used, which describes runup as:

$$\frac{R_{u2\%}}{H_{m0}} = 1.65 * \gamma_b * \gamma_f * \gamma_\beta * \xi_{m-1,0}$$

with a maximum of

$$\frac{R_{u2\%}}{H_{m0}} = 1.0 * \gamma_f * \gamma_\beta \left(4 - \frac{1.5}{\sqrt{\gamma_b * \xi_{m-1,0}}}\right)$$

where, $R_{u2\%}$ is the wave run-up height exceeded by 2% of the incoming waves, H_{m0} is the incident significant wave height, γ_b is the influence factor for a berm, γ_f is the influence factor for roughness elements on a slope, γ_β is the influence factor for oblique wave attack and $\xi_{m-1,0}$ is the breaker parameter.

Overtopping was calculated using equations 5.10 and 5.11 from the EurOtop Manual (2018):

$$\frac{q}{\sqrt{g * H_{m0}^3}} = \frac{0.023}{\sqrt{\tan\alpha}}\gamma_b * \xi_{m-1,0} * \exp\left[-\left(2.7\frac{R_c}{\xi_{m-1,0} * H_{m0} * \gamma_b * \gamma_f * \gamma_\beta * \gamma_v}\right)^{1.3}\right]$$

with a maximum of

$$\frac{q}{\sqrt{g * H_{m0}^3}} = 0.09 * \exp\left[-\left(1.5\frac{R_c}{H_{m0} * \gamma_f * \gamma_\beta *}\right)^{1.3}\right]$$

where, q is the overtopping rate, H_{m0} is the incident significant wave height, $\tan\alpha$ is the structure slope, γ_b is the influence factor for a berm, γ_f is the influence factor for roughness elements on a slope, γ_β is the influence factor for oblique wave attack, γ_v is the influence factor for a wall at the end of a slope, $\xi_{m-1,0}$ is the breaker parameter, and R_c is the freeboard.

As input conditions, six water levels at the structure representing the MSL, MHHW, 2% AEP, and the 2% AEP + 2076 SLC low, intermediate, and high curves in conjunction with the 50-yr return period wave height and peak period for those water elevations were used. These values with their corresponding runup and overtopping values are summarized in Table 9.

Table 9. Runup and Overtopping – Rock Revetment

	MSL	MHHW	2% AEP	2% AEP + 2076 SLC low curve	2% AEP + 2076 SLC int curve	2% AEP + 2076 SLC high curve
Water Level (ft.)	0	1.4	2.9	5.1	5.6	7.4
50-yr wave height (ft.)	3.1	4.4	5.6	7.4	7.9	9.4
50-yr peak period (s)	15	15	15	15	15	15
EurOtop runup (ft)	6.1	8.5	10.8*	14.1*	15.1*	17.8*
EurOtop overtopping rate (cfs/ft)	0	0.002	0.08	1.52	2.47	7.97

**Runup exceeds structure crest, i.e. Runup > Crest Elevation – Water Level*

This analysis shows that the revetment is expected to prevent runup and overtopping during typical current day conditions. However, even with current day design conditions (i.e. 2% AEP water level and 50-yr wave event), some runup and overtopping should be expected. To reduce the impacts of overtopping to the Ofu Airport, the NFS should continue to consider additional adaptation measures, such as elevating the runway or utilizing other modes of transportation.

6.2.3 Construction

Construction of the revetment would occur using conventional land-based earth moving equipment. The revetment would be constructed from the toe (-7 ft. MSL) up to the crest elevation (+10ft. MSL). The coral reef rock will need to be excavated approximately 2 ft. to seat the toe stone. To accommodate the thickness of the structure, the existing ground will need to be excavated approximately 10.2 ft. Excavated material can be used to backfill the beach in front of the structure, or on the ends fronting the tie backs.

6.2.4 Future RSLC and Adaptation Considerations

Given the uncertainty in future RSLC projections, a sensitivity analysis was done by evaluating the use of the high curve to determine stone sizing. As noted above, the 50-yr design water level utilizing the high SLC curve was 7.5 ft and resulted in a 50-year return period design wave height of 9.4 ft. The rock revetment would need to be constructed of 7.7 ton armor stone to be stable under these conditions.

Adaptation measures for the revetment alternative should be considered, to provide adequate shoreline protection within the 100-year adaptation horizon. As discussed above, as water levels continue to rise, more wave energy will propagate to the shoreline and the runway will experience greater and more frequent overtopping. For the rock revetment to remain stable, larger stone sizes would be required and could be placed on top of the existing revetment as an additional layer. This would also increase the crest elevation, therefore, the airport itself would need to be elevated due to the crest elevation constraint.

6.3 Alternative 2 - Tribar Revetment

A tribar revetment would be constructed along the shoreline fronting the western end of the runway to reduce erosion, coastal flooding, and wave attack that could undermine or damage the runway pavement. A typical Tribar revetment cross-section is shown in Figure 20. It was assumed the tribar units would be placed in a single layer, uniformly, as is typical for this type of design. Using design equations similar to the rock revetment design (i.e. Hudson equation), it was determined that a 1-ton tribar unit was the appropriate size. The average layer thickness for a 1-ton unit is 2.6 ft. The individual arm diameter of the 1-ton unit is 1.3 ft., with a unit diameter of 4.1 ft. The weights and diameters for the tribar units are summarized in Table 10.

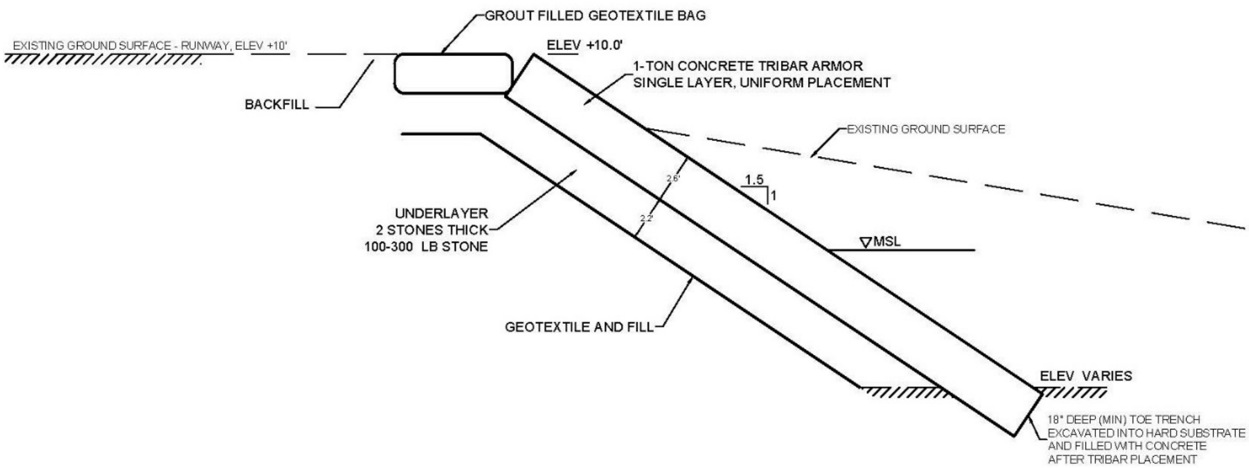

Figure 20: Alternative 2 - Preliminary Tribar Concrete Armor Revetment Cross Section

Table 10. Preliminary Stone Sizing

Description	Median Weight, W50	Median Diameter, D50	Layer Thickness
Tribar Unit	1 tons	4.1 ft (unit)	2.6 ft
Underlayer Stone	200 lbs	1.1 ft	2.2 ft

6.3.1 Runup and Overtopping

Similar to the rock revetment, runup and overtopping was evaluated for the tribar revetment and is summarized in Table 11. This analysis shows that the revetment is expected to prevent runup and overtopping during typical current day conditions. However, even with current day design conditions (i.e. 2% AEP water level and 50-yr wave event), some runup and overtopping should be expected. Overall, runup and overtopping values were less for the tribar revetment than for the rock revetment.

Table 11. Runup and Overtopping – Tribar Revetment

	MSL	MHHW	2% AEP	2% AEP + 2076 SLC low curve	2% AEP + 2076 SLC int curve	2% AEP + 2076 SLC high curve
Water Level (ft.)	0	1.4	2.9	5.1	5.6	7.4
50-yr wave height (ft.)	3.1	4.4	5.6	7.4	7.9	9.4
50-yr peak period (s)	15	15	15	15	15	15
EurOtop runup (ft)	4.4	6.2	7.8*	10.2*	10.9*	12.9*
EurOtop overtopping rate (cfs/ft)	0	0	0.008	0.57	1.13	5.82

**Runup exceeds structure crest, i.e. Runup > Crest Elevation – Water Level*

6.3.2 Construction

The tribar units have fixed dimensions and are placed directly on top of each other in sloped rows. For every one-ton tribar unit added to each row, the crest elevation of the structure would be 2.3 feet higher. Consideration should be taken during design to ensure that the crest elevation of the revetment does not exceed the runway elevation. Additionally, careful placement during construction will ensure that units properly interlock, units are not damaged during placement, and that design dimensions are met.

To provide stability to the toe of the structure, an 18-inch trench would be excavated into hard substrate and filled with concrete after tribar placement. To accommodate the thickness of the structure, the existing ground will need to be excavated approximately 4.8 ft. Excavated material can be used to backfill the beach in front of the structure, or on the ends fronting the tie backs.

6.3.3 Future RSLC and Adaptation Considerations

Consideration was given to the uncertainty in future RSLC projections, and the ability to adapt this alternative within the 100-year adaptation horizon. The sizing of the tribar was evaluated with the 50-yr design water level with high SLC curve and 50-year return period design wave height. The tribar revetment would need to be constructed with a 1.5 ton unit to be stable under these conditions. To adapt the tribar revetment as conditions change, existing tribar units could be replaced with larger ones or an additional layer of units could be placed on top of the existing. This would increase the crest elevation of the structure, therefore, the airport itself would need to be elevated due to the crest elevation constraint.

6.4 Alternative 3 - Concrete Rubble Masonry Seawall

This alternative consists of a concrete rubble masonry (CRM) wall bearing on a reinforced concrete foundation. The proposed CRM wall will act as a gravity retaining wall, using its own weight to resist the lateral earth pressures. This seawall would be constructed using small stone (approx. one-foot diameter) and cement (Figure 21). This alternative would result in a smaller footprint than a rock or tribar revetment and would not be limited by rock size availability. The foundation of the wall would be placed at a depth sufficient to avoid undermining due to scour, preferably into hard substrate, if possible. The disadvantages to this alternative are that it does not dissipate wave energy and thus the wave reflection off the solid vertical wall would increase the likelihood that the remaining beach in front of the structure to be eroded significantly. It is also not as structurally stable as the sloped revetment. The grout between the rocks could erode due to constant wave impacts, and eventually stones would fall out causing the wall to be unstable.

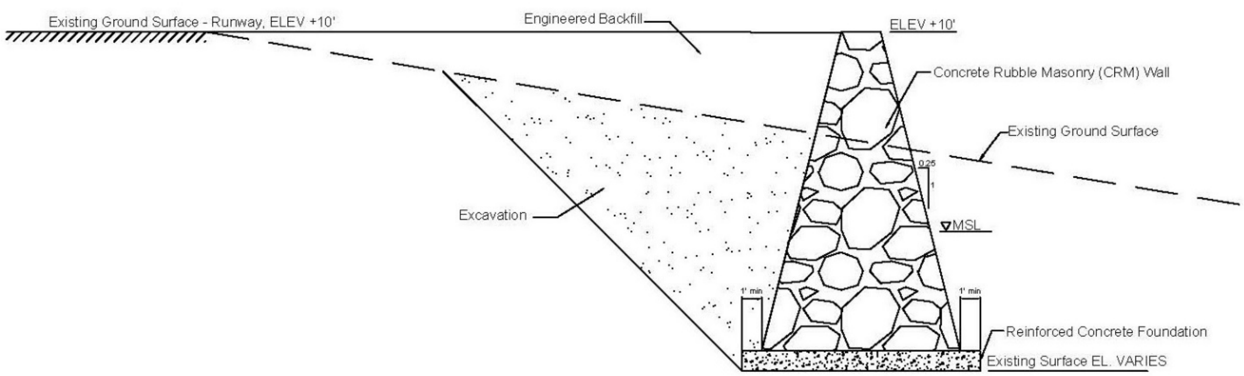

Figure 21. Alternative 3 - Preliminary CRM Wall Cross Section

6.4.1 Overtopping

Although the design was not optimized to reduce overtopping, due to the vertical elevation restriction of the runway, estimates of overtopping were calculated to evaluate the performance of the alternative.

Overtopping was calculated using equation 7.7 from the EurOtop Manual (2018):

$$\frac{q}{\sqrt{g * H_{m0}^3}} = 0.011\left(\frac{H_{m0}}{h\, s_{m-1,0}}\right)^{0.5} * \exp\left(-2.2\frac{R_c}{H_{m0}}\right)$$

for impulsive conditions with lower freeboard where 0 < R_c / H_{m0}< 1.35, and equation 7.8:

$$\frac{q}{\sqrt{g * H_{m0}^3}} = 0.0014\left(\frac{H_{m0}}{h\, s_{m-1,0}}\right)^{0.5} * \left(\frac{R_c}{H_{m0}}\right)^{-3}$$

for impulsive conditions with higher freeboard where $R_c / H_{m0} \geq$ 1.35. The overtopping rate is given by q, H_{m0} is the incident significant wave height, $\tan\alpha$ is the structure slope, γ_b is the influence factor for a berm, γ_f is the influence factor for roughness elements on a slope, γ_β is the influence factor for oblique wave attack, γ_v is the influence factor for a wall at the end of a slope, $\xi_{m-1,0}$ is the breaker parameter, and R_c is the freeboard.

This analysis shows that the CRM seawall will experience some overtopping even during typical current day conditions. Overall, the overtopping rate was greater for the CRM wall than both the rock and tribar revetments due to the limited wave dissipation by the non-permeable structure.

Table 12. Overtopping – CRM Seawall

	MSL	MHHW	2% AEP	2% AEP + 2076 SLC low curve	2% AEP + 2076 SLC int curve	2% AEP + 2076 SLC high curve
Water Level (ft.)	0	1.4	2.9	5.1	5.6	7.4
50-yr wave height (ft.)	3.1	4.4	5.6	7.4	7.9	9.4
50-yr peak period (s)	15	15	15	15	15	15
EurOtop overtopping rate (cfs/ft)	0.02	0.11	0.5	2.4	3.1	6.4

6.4.2 Construction

Construction of the CRM wall would consist of excavating to hard substrate and casting a reinforced concrete foundation in-place on the coral reef rock. Following the construction of the reinforced concrete foundation, a CRM wall will be installed primarily by hand to the planned project heights. After the CRM wall is constructed on top of the concrete foundation, the area should be regraded to the elevation of the existing ground surface. Based on the proposed CRM cross-section, the base foundation would be approximately 12 feet with the total disturbed area being approximately 38 feet due to excavation and backfill of the existing soils.

6.4.3 Future RSLC and Adaptation Considerations

Consideration was given to the uncertainty in future RSLC projections, and the ability to adapt this alternative within the 100-year adaptation horizon. The 50-yr design water level using the high SLC curve was 7.5 ft, and the 100-yr design water level using the intermediate curve was 8.5 ft. While the timing and magnitude of the projections are uncertain, it is important to consider how this alternative can be adapted as conditions change. To increase the level of protection from overtopping, the height of the wall structure would need to be increased. For the CRM wall, this would also require an increase in the foundation width of the structure to maintain stability. Like the other alternatives, the airport itself would need to be elevated due to the crest elevation constraint.

6.5 Alternative 5 - Precast Concrete Panel Seawall

This alternative would consist of precast concrete panel units to construct a 500-ft seawall. The panels can be cast either on-site or cast off-site and transported to the site. Existing conditions indicate a coral reef ledge at -7 feet MSL. This structure relies upon the weight of the structure, and the weight of the earth on top of the buried section to prevent sliding, overtopping due to rotation and resistance to wave forces. The concrete panels were determined to be approximately 1 ft. thick and would extend upward from the existing ground level at the coral reef rock to the top of the runway at +10 ft MSL. The buried panel section would extend landward 14 ft and the entire panel would be no less than 1 ft. thick. A typical cross section of the precast concrete wall is shown in Figure 22.

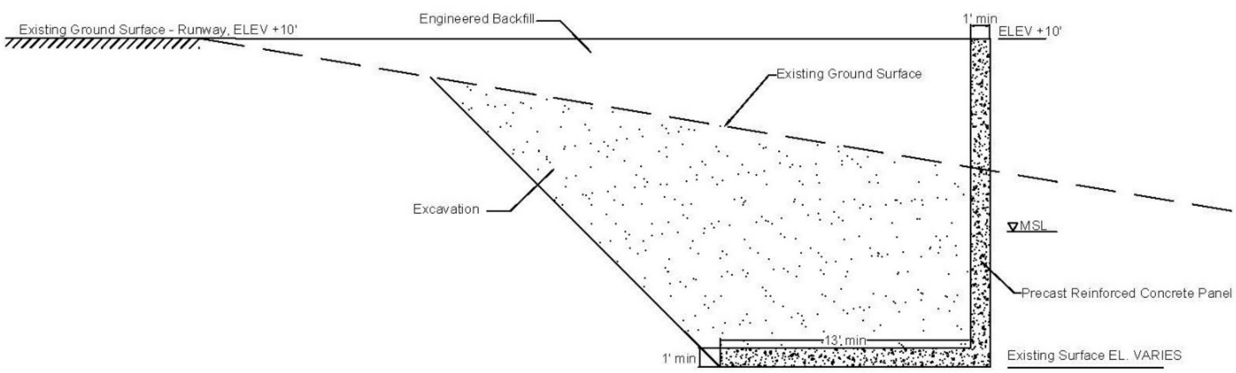

Figure 22. Alternative 5 - Preliminary Precast Concrete Panel Wall Cross Section

6.5.1 Overtopping

Similar to the CRM seawall, overtopping was evaluated for the precast concrete panel seawall and is summarized in Table 13. This analysis shows that the precast concrete panel seawall will experience some overtopping even during typical current day conditions. Overall, the overtopping rates were more for the seawalls than both the rock and tribar revetments.

Table 13. Overtopping – Precast Concrete Panel Seawall

	MSL	MHHW	2% AEP	2% AEP + 2076 SLC low curve	2% AEP + 2076 SLC int curve	2% AEP + 2076 SLC high curve
Water Level (ft.)	0	1.4	2.9	5.1	5.6	7.4
50-yr wave height (ft.)	3.1	4.4	5.6	7.4	7.9	9.4
50-yr peak period (s)	15	15	15	15	15	15
EurOtop overtopping rate (cfs/ft)	0.02	0.11	0.5	2.4	3.1	6.4

6.5.2 Construction

Construction of the precast concrete panel wall will consist of excavating to hard substrate, placing a leveling pad, and then placing the individual wall panels on the leveled surface. Following the construction of the precast concrete panel wall, the area should be regraded to the elevation of the existing ground surface. The final structure footprint would be approximately 14 feet with the total disturbed area being approximately 37 feet due to excavation and backfill of the existing soils.

6.5.3 Future RSLC and Adaptation Considerations

Consideration was given to the uncertainty in future RSLC projections, and the ability to adapt this alternative within the 100-year adaptation horizon. The 50-yr design water level using the high SLC curve was 7.5 ft, and the 100-yr design water level using the intermediate curve was 8.5 ft. While the timing and magnitude of the projections are uncertain, it is important to consider how this alternative can be adapted as conditions change. To increase the level of protection from overtopping, the height of the wall structure would need to be increased. For the precast concrete panel wall, tiebacks could be added to help maintain stability of the structure with the increased height. Like the other alternatives, the airport itself would need to be elevated due to the crest elevation constraint.

7 Summary

The engineering analysis and conceptual designs presented in this appendix were used to develop material quantities as input into the initial cost estimates and to evaluate the suitability of each alternative based on cost, environmental impact, constructability, performance, maintenance, and adaptability under future RSLC conditions. The main report and other appendices present the full analysis, which identified the tribar revetment as the Tentatively Selected Plan based on the least cost alternative that meets the study objectives.

7.1 Post Site Visit Evaluation of Alternatives

A site visit to American Samoa, conducted by the team on December 5-8, 2022, identified concerns about the constructability, performance, and future maintenance of seawall structures on Ofu, which resulted in an additional evaluation of the alternatives.

A site visit of various shoreline protection projects on Tutuila indicated that while rock and tribar revetments were very common, seawalls were used less frequently as shoreline protection measures. Those that were existing were all CRM type seawalls but were typically showing signs of damage by toe scour, undermining or flanking. There were no examples of existing concrete panel seawalls. This assessment was validated during in-person discussions with two of the main contractors in American Samoa (Paramount Builders and McConnell Dowell), the American Samoa Government Department of Public Works (DPW), and a local Sea Grant representative. All confirmed that rock or tribar revetments were frequently implemented as an effective form of shoreline protection throughout American Samoa, whereas seawalls were very limited due to concerns about performance or were used along shoreline areas where protection from waves was less of a concern (i.e. the wall functioned more as a retaining wall than as shoreline protection).

This resulted in significant constructability concerns, particularly with the precast concrete panel seawall. The local contractors confirmed that they had no experience with building precast concrete seawalls, however, they had a high level of capability and experience in rock and tribar revetment construction. In fact, multiple ongoing tribar projects were observed by the team on site. The contractors also indicated that at least 4 different local contractor companies have past experience and skilled labor in rock and tribar revetment construction. During the initial assessment of project cost risks, it was noted that limited availability of rock or concrete could be a cost risk. During discussions with DPW and the local contractors, it was understood that their revetment designs typically include options for both rock and tribar, which allows the contractor to adjust their bid to the most affordable option at that time, taking into consideration their known material availability. Both this design approach and the number of skilled contractors available reduces the cost risk and creates price competitiveness for the revetment alternatives considered for this project, which was taken into account for the current estimates.

The risk to construction quality was also considered. Due to the remoteness of the location, quality assurance oversight is likely to be inconsistent and intermittent, therefore using an established construction technique is a lower risk option. While the specialty construction technique for the precast concrete panel seawall could be learned, the lack of existing skilled labor and unfamiliarity with the installation techniques combined with the remoteness of the location increases the risk that quality issues would be encountered during construction.

In addition to the constructability concerns, potential issues with the long-term performance of the seawall alternatives in this remote coastal environment were considered. Given the limited information available on seawalls as a shoreline protection measure in American Samoa, there is a high degree of uncertainty in how the seawall alternatives will perform at the project site. Due to the wave environment and the limited amount of sand at the project site, it’s possible that remaining sand fronting the seawall alternatives may erode and eventually expose the foundation of the structure. The preliminary designs for both seawalls require the structure to be placed on hard substrate which should reduce the risk of toe scour, but exposure of the foundation does increase like likelihood of damage. Additionally, it was considered that the success or failure of the seawalls was contingent on the performance of the entire structure since they are designed to function as a single unit. The CRM seawall would be comprised of individual stones grouted together and the precast concrete panel seawall consists of individual concrete panels cemented or bolted together. Thus, even localized damage could result in failure of the structure. In contrast, revetments are designed to absorb wave energy and may experience some shifting and settling of individual units without the integrity of the entire structure being compromised. The site visit identified that tribar revetments are a proven technology in American Samoa, with existing structures having little to no damage and requiring minimal maintenance. At Ofu Airport specifically, the rock revetment protecting the shoreline on the east side of the runway has also proven to provide sufficient shore protection in this environment since its construction in 1985. For these reasons, it was determined that there is a high degree of uncertainty in the long-term performance of the seawall alternatives.

Considering both the constructability and performance issues discussed, there is a significant risk that of the seawall alternatives would have a high life cycle cost. Especially for the precast concrete seawall, large equipment (i.e. crane to lift/place panels) would need to be mobilized for a repair of the heavy panels. It was considered that if a repair were required at the existing east-end revetment at the same time (e.g. damage from the same storm), different types of equipment would be required if the west end had a seawall, thus no efficiency would be gained. Responsibility for maintenance of the project would be borne by the non-federal sponsor, thus this poses an increased burden on them over the lifetime of the project.

Based on the constructability, long-term performance, and maintenance concerns discussed above, it was determined that the CRM seawall and precast concrete panel seawall alternatives should not be carried forward in this feasibility study. The remaining alternatives, rock revetment and tribar revetment, will continue to be analyzed according to Section 14 requirements.

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Geotechnical Feasibility Report

Section 14 – Ofu Airport Emergency Shoreline Protection

Ofu, American Samoa
Honolulu District, Pacific Ocean Division

20 January 2023
Status: Draft (Revision 2)

U.S. Army Corps of Engineers
Honlulu District

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

CEPOH-ECE-G 20 January 2023

MEMORANDUM FOR

Civil Works Project Management (CEPOH-PPC), Cindy Acpal

SUBJECT: Geotechnical Feasibility Report for the Section 14 Ofu Airport Emergency Shoreline Protection, Ofu, American Samoa.

1. Enclosed is a Geotechnical Feasibility Report for the Section 14 Ofu Airport Emergency Shoreline Protection in Ofu, American Samoa. Included in this report are discussions of existing geotechnical information pertaining to the project and preliminary geotechnical considerations and recommendations.

2. Contact Carl J. Iwasaki at 808-835-4512 if you have any questions.

CARL J. IWASAKI, P.E.
Geotechnical Engineer
CEPOH-ECE-G

TABLE OF CONTENTS

LIST OF FIGURES

1. INTRODUCTION

The purpose of this report is to present anticipated subsurface conditions and provide preliminary geotechnical considerations as they pertain to the project described herein for the proposed Section 14 Ofu Airport Emergency Shoreline Protection, Ofu, American Samoa. Information and preliminary assumptions in this report were developed through reviews of readily available information and it is intended to be used for planning purposes only. Information in this report is not intended for use in design and construction contract documents.

2. LOCATION AND PROJECT DESCRIPTION

American Samoa is located in the mid-South Pacific Ocean, a part of the Samoan Islands archipelago in Polynesia approximately 2,300 miles southwest of Hawaii (Figure 1). The island of Ofu is in the Manu'a Island group of American Samoa, located about 66 miles east of Tutuila Island.

Ofu Airport (study area) is located on the southern coast of Ofu Island. The 18-acre public airport is operated by the Department of Port Administration (DPA) of the American Samoa Government on property leased from local families. The airport is intended to serve the aviation needs of Ofu and Olosega islands.

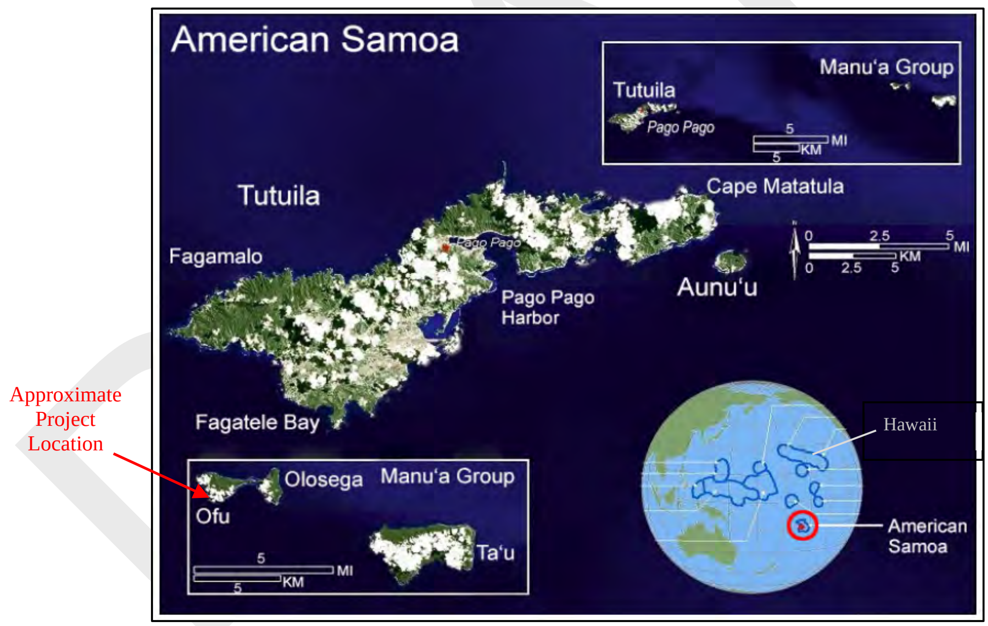


Figure 1. Territory of American Samoa

The low-lying coastline fronting Ofu Airport is subject to frequent storm and wave attack. The west end of the runway shoreline is progressively eroding with the coastline receding further into Ofu Airport's Runway Safety Area (RSA). This coastline erosion was accelerated during Tropical Storm (TS) Evans in 2012 and again more recently by TS Gita that devastated the islands in 2018. Future sea level rise will continue to exacerbate this condition and cause erosion and the resulting damage to accelerate. Continual erosion will result in the imminent closure of the runway.

In July 2022, wave action eroded the shoreline and undermined a portion of the new runway. Repairs were made in the following weeks. Figure 2 shows the undermined runway and Figure 3 shows the completed repairs.

Figure 2. Undermined Runway

Figure 3. Completed Repairs

3. FEDERAL INTEREST DETERMINATION

The Federal Interest Determination (FID) was approved by POD on 4 August 2021 and demonstrated federal interest for conducting shoreline protection measures at Ofu Airport, American Samoa. The Feasibility Cost Share Agreement (FCSA) was executed with the non-Federal sponsor on 11 March 2022.

The feasibility study is intended to identify the most effective, environmentally acceptable, least cost solution for stabilizing the shoreline on the west end of the airport. The identified plan will have federal interest if the cost to construct the shoreline protection measure is less than the cost to relocate the airport.

4. REVIEW OF READILY AVAILABLE INFORMATION

Readily available information on general geologic and subsurface conditions in the vicinity of the project site was reviewed. The sources of this review included available as-built drawings and other readily available geologic information.

As-built drawings for the Ofu Island Airstrip Revetment dated January 5, 1989, indicated that roughly 480 linear feet of rock revetment for shoreline protection near the east end of the Ofu Airport runway was previously constructed. The revetment generally consisted of a 6 feet thick layer of armor stones underlain by 2.5 feet thick stone underlayer on a filter cloth. The weight of the armor stones and underlayer stones ranged from about 1,300 to 2,100 pounds and about 40 to 100 pounds, respectively. The toe of the revetment was wedged against a coral ledge about 3 feet deep at roughly Elevation -3 feet based on Mean Sea Level (MSL) datum.

5. SITE CONDITIONS

5.1. Regional Geology

American Samoa is composed of five volcanic islands in the South Pacific: Aunuu, Ofu, Olosega, Tau, and Tutuila Islands. American Samoa is about 2,300 miles southwest of Hawaii. The total area is about 48,770 acres, or 76 square miles. American Samoa is a territory of the United States. Pago Pago, the principal village and harbor on the main island of Tutuila, is the capital (Nakamura, 1984).

Ofu Island, along with T'au and Olosega Islands are collectively referred to as the Manu'a Islands. This group of islands lies 100 km (60 mi) east of Tutuila. Ofu has a sandy beach area and a pristine coral reef. There is a concrete bridge that connects Ofu to Olosega. These two small islands are the remnants of an eroded large volcano that may have once been a double caldera. Lava flows, pyroclastic beds, and dikes characterize the volcanic rocks exposed on the slopes of the islands. The shorelines present steep cliffs more than 100 m (330 ft) high on the east side of Olosega and on the west side of Ofu (Thornberry, 2008).

Ofu Airport is located on the southern coast of Ofu Island. Based on a Geologic Map by Stice and McCoy (1968), the Ofu Airport runway is generally located on beach deposits (Qb)[See Figure 4].

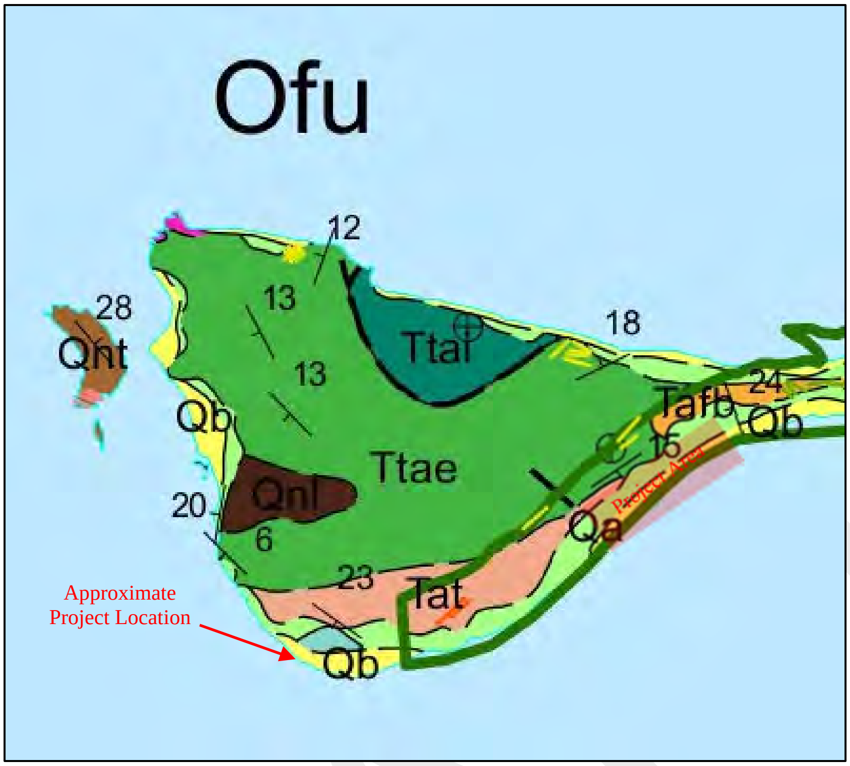


Figure 4. Geologic Map of Ofu Island (Stice and McCoy, 1968)

5.2. Surface Conditions

The site is located along the southern coast of Ofu Island near an existing concrete runway that was recently reconstructed. The surface soil generally consists of beach sand with various basaltic boulders spread out along the beach.

Topographically, the site generally slopes from the east end of the runway toward the ocean to the southwest. Elevations range from about +12 feet at the east end of the runway to sea level over a span of about 100 feet. All elevations in this report are references to Mean Sea Level (MSL) datum.

5.3. Anticipated Subsurface Conditions

Based on readily available information, subsurface conditions at the site are anticipated to generally consist of loose beach sand at the surface underlain by coral reef rock. For planning purposes, the coral reef rock was assumed to be encountered at Elevation -7 feet based on MSL datum.

Groundwater is anticipated to be encountered at Elevation 0 feet based on MSL. It is anticipated that groundwater levels will fluctuate with the tide.

5.4. Seismicity and Earthquake Ground Motions

American Samoa is located near active tectonic-plate boundaries that host many large earthquakes which can result in strong earthquake shaking and tsunamis. Since 1900, 242 magnitude 7 or greater earthquakes have been recorded which equals an average rate of more than 2 large earthquakes per year (Peterson et al, 2012).

Based on Figure 22-13 of ASCE 7-16, the Maximum Considered Earthquake Geometric Mean (MCE_G) Peak Ground Acceleration (PGA) for Ofu is estimated to be 0.24g. Based on this PGA value and anticipated subsurface conditions at the site, it appears that the potential risk for liquefaction is low. However, a Geotechnical Investigation is recommended to check the potential risk for liquefaction and this site.

Per subsection 11.5.4.2 of the American Association of State Highway and Transportation Officials (AASHTO) Load Resistance Factor Design (LRFD) Bridge Design Specifications, 9th Edition (2020), consideration for seismic loading is not required for design of walls and other non-building structures since the PGA is less than 0.4g and liquefaction is not anticipated at this site.

6. ALTERNATIVES AND TENTATIVELY SELECTED PLAN

The study team initially evaluated six (6) mitigation alternatives (Alternatives 0 through 5) in the process of recommending a Tentatively Selected Plan (TSP). The alternatives considered are shown in the list below.

- Alternative 0: No Action
- Alternative 1: Rock Revetment
- Alternative 2: Tribar Revetment (TSP)
- Alternative 3: Concrete Rubble Masonry (CRM) Seawall
- Alternative 4: Sheet Pile Wall (Not carried forward)
- Alternative 5: Precast Concrete Seawall

Alternative 4, a sheet pile wall, was not carried forward because it was determined to be the highest cost alternative and was not environmentally acceptable. Alternative 2, a tribar revetment, was selected as the recommended TSP based on it being the lowest cost alternative. Alternatives 0, 1, 2, 3, and 5 are described in the following sections.

6.1. Alternative 0: No Action

Alternative 0 consist of taking no action to provide shoreline protection. The threat of storm damage in American Samoa will become more frequent and severe over time and long-term sea level rise will likely increase damage to the runway. Ofu Airport and runway will continue to sustain significant damage, leading to imminent risk of airport closure and/or relocation if no action is taken.

6.2. Alternative 1: Rock Revetment

A rock revetment reduces the erosive power of waves by dissipating the wave energy through the interstices of the rock armor units. It is anticipated that the rock revetment can be constructed with local quarried rock bearing on coral reef rock. Construction of the revetment would consist of excavating and keying the toe of the revetment into a coral reef ledge. It is preliminarily estimated that the rock revetment would be constructed from the toe (-7ft. MSL) up to the crest elevation (+10ft. MSL). The rock revetment would be comprised of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of under layer stone, and a double layer of armor stone. An example of a rock revetment is illustrated in Figure 5 below.

Figure 5. Rock Revetment Example

A preliminary rock revetment detail for this project is shown in Figure 6 below.

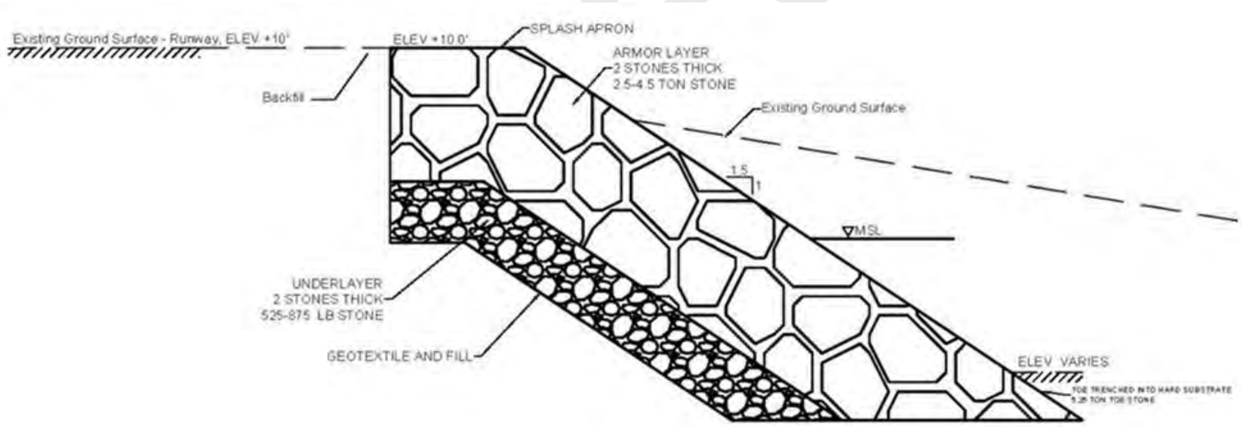


Figure 6. Preliminary Rock Revetment Detail

6.3. Alternative 2: Tribar Revetment (TSP)

Similar to a rock revetment, a tribar revetment reduces the erosive power of waves by dissipating the wave energy through the interstices of the tribar armor units. It is anticipated that the tribar revetment would be founded on coral reef rock with the toe of the revetment keyed into the coral reef ledge. It is preliminarily estimated that the tribar revetment would be constructed from the toe (-7ft. MSL) up to the crest elevation (+10ft. MSL). The tribar revetment would be comprised of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of under layer stone, and a single layer of tribar armor. An example of a tribar revetment is illustrated in Figure 7.

Figure 7. Tribar Revetment Example

A preliminary tribar revetment detail for this project is shown in Figure 8 below.

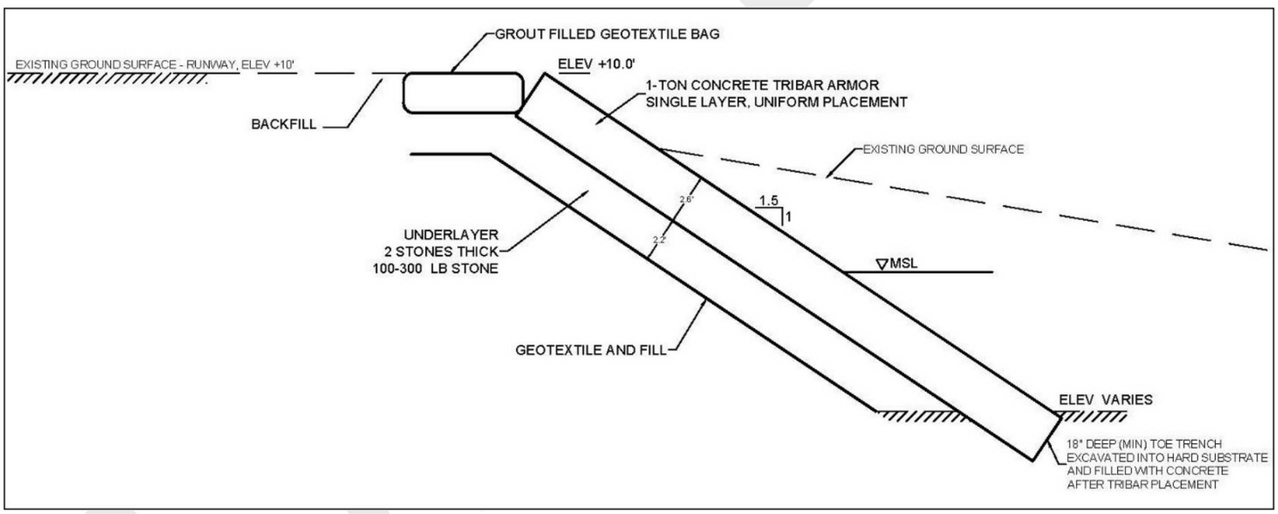


Figure 8. Preliminary Tribar Revetment Detail

6.4. Alternative 3: Concrete Rubble Masonry (CRM) Seawall

This type of seawall generally consists of large rocks held together with cement grout bearing on a reinforced concrete foundation. Construction of the CRM wall would consist of excavating down to coral reef rock and constructing the reinforced concrete foundation on the coral. Following the construction of the reinforced concrete foundation, a CRM wall will be installed to the planned project heights. Figure 9 shows an example of a CRM seawall.

Figure 9. CRM Seawall Example

A preliminary CRM seawall detail for this project is shown in Figure 10 below.

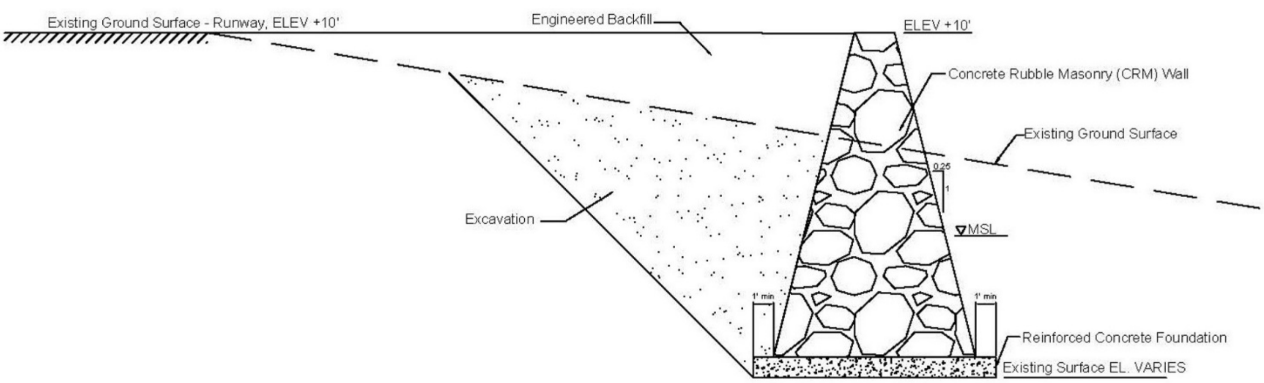


Figure 10. Preliminary CRM Seawall Cross Section Detail

6.5. Alternative 5: Precast Concrete Seawall

A precast concrete seawall consists individual concrete panels that are installed throughout the length of the project. Construction of the precast concrete panel wall would consist of excavating down to coral reef rock and placing the individual wall panels on the coral. A leveling pad below the panels consisting of gravel or lean concrete may be needed. Figure 11 shows an example of a precast concrete seawall.

Figure 11. Precast Concrete Seawall Example

A preliminary precast concrete seawall detail for this project is shown in Figure 12 below.

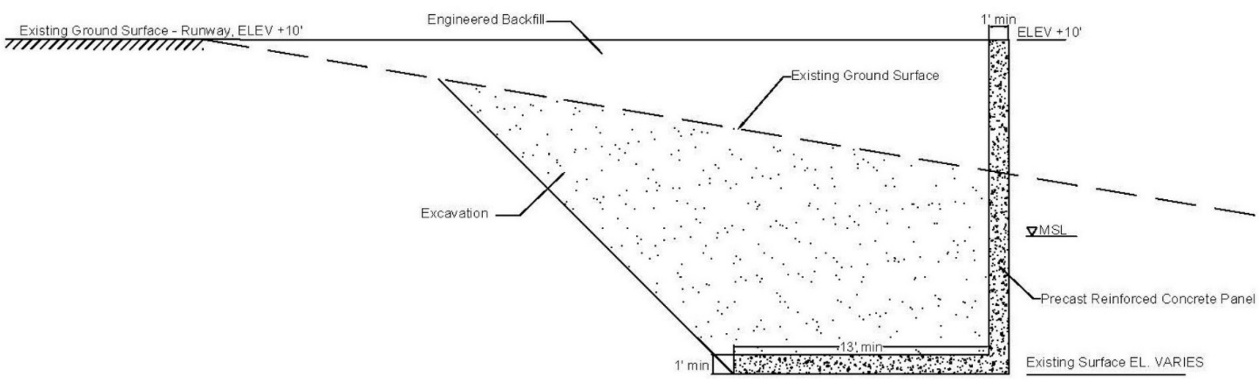


Figure 12. Preliminary Precast Concrete Seawall Detail

7. PRELIMINARY GEOTECHNICAL CONSIDERATIONS OF TSP

Based on reviews of readily available information and assumptions of anticipated subsurface conditions at the project site, constructing a tribar revetment for shoreline protection is feasible from a geotechnical standpoint under static and seismic conditions. It is anticipated that the tribar revetment can be founded directly on coral reef rock with the toe keyed into the coral reef ledge. A formal geotechnical investigation should be performed to evaluate and check the accuracy of these assumptions.

8. GEOTECHNICAL INVESTIGATION RECOMMENDATION

It is recommended that a geotechnical investigation be performed for design of this project, if carried forward. The geotechnical investigation should generally consist of drilling soil test borings at least 20 feet deep spread out along the centerline of the proposed tribar revetment to properly characterize subsurface conditions and identify any geological conditions that would require special considerations during preconstruction engineering and design.

OFU COASTAL STORM DAMAGE REDUCTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
OFU, AMERICAN SAMOA

DRAFT INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

APPENDIX A-2
COST ENGINEERING

A-2 Cost Engineering

US Army Corps of Engineers ®
Honolulu District

US Army Corps of Engineers
Honolulu District

Appendix A-2

Ofu Coastal Storm Damage Reduction

Draft Integrated Feasibility Report and Environmental Assessment

April 2023

1. Project Description

The study purpose is to identify a plan that will provide emergency shoreline protection from coastal erosion adjacent to Ofu Airport.

1.1 Alternatives:

Six major Alternatives were considered for this study (not including NO ACTION).

1.1.1 Alternative 0: No-Action

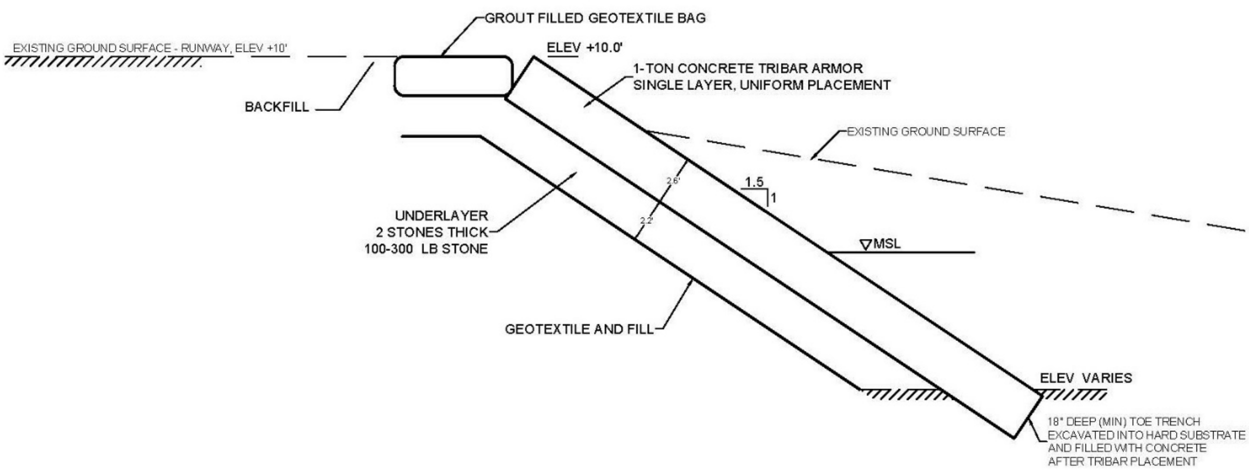
1.1.2 Alternative 1: Rock Revetment

1.1.3 Alternative 2: Tribar Revetment

1.1.4 Alternative 3: Concrete Rubble Masonry (CRM) Seawall

1.1.5 Alternative 5: Precast Concrete Seawall

1.2 Tentatively Selected Plan



Alternative 2: Tribar Revetment

Components:

- Precast concrete tribar units

2. Cost Summary

The following table includes cost summary of the various alternatives. The TSP alternative is shown in YELLOW below as Alternative 2: Tribar Revetment.

			Ofu Alternative Estimates				3/15/2023
			Includes 30 and 31 Account for PED and S&A.				
Alt.		**Measure**	**Quantity**	**U/M**	**Total Direct Cost**	**Contingency**	**Total Project Cost**
Alt. 0	**No Action**				**N/A**	**N/A**	**N/A**
						32%	
Alt. 1	**Rock Revetment**				**$ 9,067,111**	**$ 2,604,346**	**$ 11,671,457**
	01	Lands and Damages	1	LS	84,500	13,600	$ 98,100
	06	Environmental Mitigation	1	LS	20,000	30,000	$ 50,000
	18	Cultural Mitigation	1	LS	0	0	$ -
		Construction					
		Geotextile	1389	SY	16,888	5,404	$ 22,292
		Rock Revetment (Local Basalt)	500	LF	3,312,107	1,059,874	$ 4,371,981
		Associated Cost	1	EA	52,686	16,860	$ 69,546
		Reseeding	1111	SY	24,785	7,931	$ 32,716
		Backfill behind Revetment	56	CY	1,872	599	$ 2,471
		Cultural Resource Monitor	1	EA	152,310	48,739	$ 201,049
		Mob/Demob	1	EA	626,031	200,330	$ 826,361
		Barge Materials from Tutuila	1	EA	2,215,186	708,860	$ 2,924,046
	16	**Construction Subtotal**			6,401,865	2,048,597	8,450,462
	30	**Engineering and Design (25%)**			1,600,466	320,093	1,920,560
	31	**Supervision and Admin (15%)**			960,280	192,056	1,152,336
						32%	
Alt. 2	**Tribar Revetment**				**$ 6,376,044**	**$ 1,835,470**	**$ 8,211,513**
	01	Lands and Damages	1	LS	84,500	13,600	$ 98,100
	06	Environmental Mitigation	1	LS	20,000	30,000	$ 50,000
	18	Cultural Mitigation	1	LS	0	0	$ -
		Construction					
		Geotextile	1,389	SY	16,888	5,404	$ 22,292
		Tribar Revetment	500	LF	2,714,807	868,738	$ 3,583,545
		Associated Cost	1	EA	52,686	16,860	$ 69,546
		Reseeding	1,111	SY	24,785	7,931	$ 32,716
		Backfill behind Revetment	56	CY	1,872	599	$ 2,471
		Cultural Resource Monitor	1	EA	84,617	27,077	$ 111,694
		Mob/Demob	1	EA	786,552	251,697	$ 1,038,249
		Barge Materials from Tutuila	1	EA	797,467	255,189	$ 1,052,656
	16	**Construction Subtotal**			4,479,674	1,433,496	5,913,170
	30	**Engineering and Design (25%)**			1,119,919	223,984	1,343,902
	31	**Supervision and Admin (15%)**			671,951	134,390	806,341
						41%	
Alt. 3	**Concrete Rubble Masonry Seawall**				**$ 7,604,927**	**$ 2,673,099**	**$ 10,278,026**
	01	Lands and Damages	1	LS	55,500	7,800	$ 63,300
	06	Environmental Mitigation	1	LS	20,000	30,000	$ 50,000
	18	Cultural Mitigation	1	LS	0	0	$ -
		Construction					
		Construct CRM Seawall	500	LF	3,165,628	1,297,907	$ 4,463,535
		Reseeding	1,111	SY	24,785	10,162	$ 34,947
		Associated Cost	1	EA	52,686	21,601	$ 74,287
		Cultural Resource Monitor	1	EA	152,310	62,447	$ 214,757
		Mob/Demob	1	EA	786,552	322,486	$ 1,109,038
		Barge Materials from Tutuila	1	EA	1,196,201	490,442	$ 1,686,643
	16	**Construction Subtotal**			5,378,162	2,205,046	7,583,208
	30	**Engineering and Design (25%)**			1,344,541	268,908	1,613,449
	31	**Supervision and Admin (15%)**			806,724	161,345	968,069
						45%	
Alt. 5	**Precast Concrete Seawall**				**$ 6,326,447**	**$ 2,404,230**	**$ 8,730,677**
	01	Lands and Damages	1	LS	55,500	7,800	$ 63,300
	06	Environmental Mitigation	1	LS	20,000	30,000	$ 50,000
	18	Cultural Mitigation	1	LS	0	0	$ -
		Construction					
		Construct Concrete Seawall	500	LF	2,798,152	1,259,168	$ 4,057,320
		Reseeding	1,111	SY	24,785	11,153	$ 35,938
		Associated Cost	1	EA	52,686	23,709	$ 76,395
		Cultural Resource Monitor	1	EA	84,617	38,078	$ 122,695
		Mob/Demob	1	EA	626,031	281,714	$ 907,745
		Barge Materials from Tutuila	1	EA	878,691	395,411	$ 1,274,102
	16	**Construction Subtotal**			4,464,962	2,009,233	6,474,195
	30	**Engineering and Design (25%)**			1,116,241	223,248	1,339,489
	31	**Supervision and Admin (15%)**			669,744	133,949	803,693

3. Basis of Estimate

3.1 Basis of Design

The design details are described in the Ofu Coastal Storm Reduction Integrated Feasibility Report and Environmental Assessment. The alternatives provide the beach locations, site access, and work limits for each alternative. The plans show the proposed alternative level diagrams and quantities allow comparison of the alternatives.

Airport Relocation Cost

The cost to relocate Ofu Airport was calculated by escalating the cost estimate of $76M from the FID Ofu Airport Master Plan/Feasibility Study, which was prepared in 2013. The escalation percentage from 2013 to October 2022 (FY23) was calculated to be 20% based on escalation guidance from the UFC. The escalated cost is approximately $91M.

Alternative 0: No Action
The No-Action Alternative is synonymous with no Federal (Corps) Action. This alternative is analyzed as the future without-project (FWOP) condition for comparison with the action alternatives.

Alternative 1: Rock Revetment
This design involves the construction of 500 ft rock revetment. The revetment would consist of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a double layer of armor stone, and anchoring by an oversized toe stone. The stone sizing of the underlayer and armor layer was determined to be 675-1125 lbs stone for the underlayer, 3.4-5.6 t stone for the armor layer, and 6.75 t stone for the toe. This alternative has the largest footprint of the alternatives included in the final array. At the specified 1.5H:1V slope, the revetment is expected to be 37 feet wide, extending towards the ocean, with a crest elevation of +10 ft MSL.

Alternative 2: Tribar Revetment
This design involves the construction of 500 ft tribar revetment. The revetment would consist of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a single layer of 1 t concrete tribar. The stone sizing of the underlayer was determined to be 100-300 lbs stone. This alternative has the largest footprint of the alternatives included in the final array. At the specified 1.5H:1V slope, the revetment is expected to be 37 feet wide, extending towards the ocean, with a crest elevation of +10 ft MSL.

Alternative 3: Concrete Rubble Masonry (CRM) Wall
This design consists of a gravity retaining wall composed of concrete rubble masonry (CRM) supported on a reinforced cast-in-place concrete foundation. Construction of the CRM wall would consist of excavating the existing soils to the limestone shelf, placing the reinforced concrete foundation, and then installing the CRM wall on top of the concrete base. After construction, the excavated area would be regraded to the elevation of the existing ground surface.

Alternative 5: Precast Concrete Seawall
This design would involve the use of individual cantilever concrete panels to construct 500 ft of seawall. Concrete wall panels would be constructed offsite. Installation of the precast concrete panel wall would consist of excavating the existing soils to the limestone shelf and placing the precast concrete panels. After construction, the excavated area would be regraded to the elevation of the existing ground surface. This design has a top elevation of 10 ft above MSL and a base that is 14 ft wide, with the total disturbed area being approximately 37 ft due to excavation and backfill of the existing soils.

3.2 Basis of Quantities

Quantities were developed using a typical profile provided by the technical team.

3.3 Construction Estimate

Work was predominantly estimated utilizing MII Estimating Software with specified input factors. The alternative analysis included unit costs of all project features and contrasted the options in order to scale relative differences. The next phase is having further design definition that is used to refine the project features.

Major Construction Features for the recommended plan were estimated as follows.

3.3.1 Mobilization & Demobilization

Equipment and Labor is assumed to be available within the American Samoa regional area. However, substantial mobilization and demobilization costs are expected to construct any of the alternatives since the site is on the remote island of Ofu. Estimated mobilization costs have been itemized in the cost estimate.

3.3.2 Demolition

The selected site does not currently have any shore protection, so demolition is not anticipated for this project.

3.3.3 Excavation and Grading

Excavation and grading for placement of the underlayer will be completed by hydraulic excavator. BMPs will be required to protect the surrounding area.

3.3.4 Tribar Placement

Once the geotextile and underlayer are in place, tribar units will be placed by hydraulic excavator or crane. Dewatering will not be required because tribar units will be cast off site.

3.3.5 Tree Removal

The estimate assumes no trees would need to be removed for the precast seawall installation.

3.3.6 Cultural Resource Monitor

The estimate assumes a cultural resource monitor is onsite during active excavation for the precast concrete panels.

3.3.7 General Conditions, Overhead, and Profit

The estimate assumes that the prime contractor will self-perform most of the work. Subcontractors have been added for the seeding work. Prime and Subcontractor markups are shown below.

Prime Contractor		
Markup	**Own Work**	**Sub Work**
JOOH (Running %)	25%	25%
HOOH (Running %)	15%	15%
Profit (Running %)	10%	10%
Bond (Running %)	1%	1%
Subcontractor		
Markup	**Own Work**	**Sub Work**
JOOH (Running %)	10%	10%
HOOH (Running %)	15%	15%
Profit (Running %)	10%	10%
Tribar Fabrication Subcontractor		
Markup	**Own Work**	**Sub Work**
JOOH (Running %)	10%	10%
HOOH (Running %)	15%	15%
Profit (Running %)	10%	10%

3.3.8 Miscellaneous Markups, Assumptions, & General Notes

- Escalation (~0.51%) was taken into account for the alternative analysis to bring the cost to current dollars.
- HTRW and UXO clearance were not included as part of the scope of work.
- Costs for the 30 & 31 accounts (PED and CM respectively) were assumed at 25% and 15% respectively of the contract total.
- Assume 10 hour shifts, 6 days per week. Workers will mobilize from Tutuila and work in 4 week blocks with 1 week breaks in between. Overtime rate is applied in MII.
- MII Equipment rates per EP 1110-1-8, Volume 12, 2022.
- 2022 Davis Bacon Wage Rates for American Samoa were assumed in the estimate.
- The presence of an active quarry on Ofu could not be confirmed. Therefore, the cost estimate assumes all revetment stones, CRM stones, and filter rock will be mined on Tutuila and shipped to Ofu. For the precast alternatives (Tribar and Precast Seawall), the cost estimate assumes aggregate will be mined on Tutuila and the units will be cast on Tutuila and shipped to Ofu.

4. Construction Schedule

The current estimated duration for the project is 3 months of construction with a single construction contract. The starting year of construction has not been determined.

5. Acquisition Plan

The current acquisition strategy is assumed fully open and competitive though an actual contracting plan has yet to be established.

6. Risk Assessment

An abbreviated risk analysis (ARA) was performed to develop a weighted contingency for the construction cost estimate. The current weighted construction contingency for the TSP Alternative 2 is approximately 32%. The contingency accounts for contract acquisition, contractor competition, scope changes, labor availability and cost uncertainties. The concerns outlined in the ARA could have an overall impact on the project. Project costs have the potential to increase due to economic conditions and the level of apparent competition during the solicitation process. Due to the level of technical information available, current plan set provided by the PDT, and Moderate Risk level overall the estimate is considered Class 4 (per ER 1110-2-1302).

7. References

U.S. Army Corps of Engineers, 1993, *Engineering and Design Cost Engineering Policy and General Requirements, Engineering Regulation 1110-1-1300,* Department of the Army, Washington D.C., 26 March 1993.

U.S. Army Corps of Engineers, 1999, *Engineering and Design for Civil Works Projects, Engineering Regulation 1110-2-1150,* Department of the Army, Washington D.C., 31 August 1999.

U.S. Army Corps of Engineers, 2016, *Civil Works Cost Engineering, Engineering Regulation 1110-2-1302,* Department of the Army, Washington D.C., 30 June 2016.

U.S. Army Corps of Engineers, 2019, *Civil Works Construction Cost Index System (CWCCIS), Engineering Manual 1110-2-1304,* Department of the Army, Washington D.C., 31 March 2020.

Unified Facilities Criteria, 2011, *Handbook: Construction Cost Estimating,* Unified Facilities Criteria (UFC) 3-740-05, Department of Defense, 1 June 2011.

8. Attachments

a. MCACES Estimates

b. Abbreviated Risk Analysis

Ofu CAP 14
Estimate Assumptions:

1) General Assumptions: Contractor will mobilize equipment and workers from Tutuila. Workers will stay on Ofu in rented housing for blocks of 4 weeks with 1 week breaks in between. For alternatives that require concrete, assume contractor will mobilize a batch plant. Precast items will be cast on Tutuila to the maximum extent possible. Majority of the work to be performed by the prime contractor. Cultural Resource Monitor will be on site during excavation activities. Laydown area will be either near the runway or at the harbor on the west side of Ofu. Barge costs to transport materials from Tutuila to Ofu are based on a budget quote for chartering "LCU Vessel 2" which has a load capacity of 312T and rate of $23,000. Assume load will be 70% of the maximum. Additional cost is included in this estimate for handling and loading materials.

A) Rock Revetment Assumptions: Toe excavation can be completed without dewatering. Standard BMPs will still be required. Assume rock will be transported to Ofu from Tutuila via barge.

B) Tribar Revetment Assumptions: Toe excavation can be completed without dewatering. Standard BMPs will still be required. Assume tribar units will be cast on Tutuila and transported to Ofu via barge. Mobile batch plant required to produce concrete for the grout tube. Cement and aggregates will be imported from Tutuila.

C) CRM Seawall Assumptions: Excavation will require 1:1 benching and dewatering due to designed depth and location near shore. Standard BMPs will still be required. Assume stone will be transported to Ofu from Tutuila via barge. Assume excavated material can be used as backfill and additional engineered backfill will be imported from Tutuila. Mobile batch plant required to produce grout for the CRM wall. Cement and aggregates will be imported from Tutuila.

D) Precast Concrete Seawall Assumptions: Excavation will require 1:1 benching and dewatering due to designed depth and location near shore.Standard BMPs will still be required. Assume wall sections will be cast on Tutuila and transported to Ofu via barge. Assume excavated material can be used as backfill and additional engineered backfill will be imported from Tutuila.

Estimated by	POH
Designed by	
Prepared by	
Preparation Date	3/15/2023
Effective Date of Pricing	3/15/2023
Estimated Construction Time	Days

Description	Quantity	UOM	ProjectCost
Contract Cost Summary Report			**20,724,662**
Alt 1 Rock Revetment	**500.00**	**LF**	**6,401,866**
Geotextile	**2,056.00**	**SY**	**16,888**
Revetment	**500.00**	**LF**	**3,312,107**
Associated Cost	**1.00**	**EA**	**52,686**
Reseeding	**1,111.00**	**SY**	**24,785**
Backfill behind Revetment	**56.00**	**CY**	**1,872**
Cultural Resource Monitor	**1.00**	**EA**	**152,310**
Mob/Demob	**1.00**	**EA**	**626,031**
Barge Materials from Tutuila	**1.00**	**EA**	**2,215,186**
Alt 2 Tribar Revetment (1 TN Tribar)	**500.00**	**LF**	**4,479,673**
Geotextile	**2,056.00**	**SY**	**16,888**
Revetment (1 TN Tribar)	**1,880.00**	**EA**	**2,714,807**
Associated Cost	**1.00**	**EA**	**52,686**
Reseeding	**1,111.00**	**SY**	**24,785**
Backfill behind Revetment	**56.00**	**CY**	**1,872**
Cultural Resource Monitor	**1.00**	**EA**	**84,617**
Mob/Demob	**1.00**	**EA**	**786,552**
Barge Materials from Tutuila	**1.00**	**EA**	**797,467**
Alt 3 CRM Seawall	**500.00**	**LF**	**5,378,162**
Construct CRM Wall	**500.00**	**LF**	**3,165,628**
Reseeding	**1,111.00**	**SY**	**24,785**
Associated Cost	**1.00**	**EA**	**52,686**
Cultural Resource Monitor	**1.00**	**EA**	**152,310**
Mob/Demob	**1.00**	**EA**	**786,552**
Barge Materials from Tutuila	**1.00**	**EA**	**1,196,201**
Alt 5 Precast Concrete Seawall	**500.00**	**LF**	**4,464,962**
Construct Precast Wall	**500.00**	**LF**	**2,798,152**
Reseeding	**1,111.00**	**SY**	**24,785**
Associated Cost	**1.00**	**EA**	**52,686**

Description	Quantity	UOM	ProjectCost
Cultural Resource Monitor	**1.00**	**EA**	**84,617**
Mob/Demob	**1.00**	**EA**	**626,031**
Barge Materials from Tutuila	**1.00**	**EA**	**878,691**

Abbreviated Risk Analysis

Project (less than $40M): **Ofu Section 14 Feasibility Study**

Project Development Stage/Alternative: **Alternative Formulation**

Risk Category: **Moderate Risk: Typical Project Construction Type**

Alternative: **1-6**

Meeting Date: **3/15/2023**

Total Estimated Construction Contract Cost = $ -

	CWWBS	Feature of Work	Estimated Cost		% Contingency	$ Contingency	Total
1	10 BREAKWATERS AND SEAWALLS	Rock Revetment	$ 6,401,865		32%	$ 2,033,590	$ 8,435,455
2	10 BREAKWATERS AND SEAWALLS	Tribar Revetment	$ 4,479,674		32%	$ 1,422,995	$ 5,902,669
3	10 BREAKWATERS AND SEAWALLS	CRM Seawall With Precast Base	$ 5,378,162		41%	$ 2,207,677	$ 7,585,839
4	10 BREAKWATERS AND SEAWALLS	CRM Seawall - DELETED	$ -		0%	$ -	$ -
5	10 BREAKWATERS AND SEAWALLS	Sheetpile Seawall - DELETED	$ -		0%	$ -	$ -
6	10 BREAKWATERS AND SEAWALLS	Precast Concrete Seawall	$ 4,464,962		45%	$ 2,006,865	$ 6,471,827
7			$ -		0%	$ -	$ -
8			$ -		0%	$ -	$ -
9			$ -		0%	$ -	$ -
10			$ -		0%	$ -	$ -
11			$ -		0%	$ -	$ -
12	All Other	**Remaining Construction Items**	$ -	*0.0%*	0%	$ -	$ -
13	30 PLANNING, ENGINEERING, AND DESIGN	**Planning, Engineering, & Design**	$ -		0%	$ -	$ -
14	31 CONSTRUCTION MANAGEMENT	**Construction Management**	$ -		0%	$ -	$ -
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					$ -	

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.	

Ofu Section 14 Feasibility Study 1-6

Alternative Formulation

Abbreviated Risk Analysis

Meeting Date: 15-Mar-23

Risk Level

	Negligible	Marginal	Moderate	Significant	Critical
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Register

Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level
Project Management & Scope Growth				Maximum Project Growth		**75%**
PS-1	Rock Revetment	• Potential for scope growth, added features? • Sufficient Staffing/Support?	•USACE is very experienced with design and construction of rubble structures. Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. •Additional features not expected. •Environmental Mitigation may be required due to the impact to coral. Accounted for in cost estimate. •Cultural Mitigation may be required. Accounted for in cost estimate.	Moderate	Unlikely	1
PS-2	Tribar Revetment	• Potential for scope growth, added features? • Sufficient Staffing/Support?	•USACE is very experienced with design and construction of concrete and rubble structures. Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. •Additional features not expected. •Environmental Mitigation may be required due to the impact to coral. Accounted for in cost estimate. •Cultural Mitigation may be required. Accounted for in cost estimate.	Moderate	Unlikely	1
PS-3	CRM Seawall With Precast Base	• Potential for scope growth, added features? • Sufficient Staffing/Support?	•USACE is very experienced with design and construction of Seawall structures. Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. •Additional features not expected. •Environmental Mitigation may be required due to the impact to coral. Accounted for in cost estimate. •Cultural Mitigation may be required. Accounted for in cost estimate.	Marginal	Unlikely	0
PS-4	CRM Seawall - DELETED	• Potential for scope growth, added features? • Sufficient Staffing/Support?	•USACE is very experienced with design and construction of Seawall structures. Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. •Additional features not expected. •Environmental Mitigation may be required due to the impact to coral. Accounted for in cost estimate. •Cultural Mitigation may be required. Accounted for in cost estimate.	Marginal	Unlikely	0

PS-5	Sheetpile Seawall - DELETED	• Potential for scope growth, added features? • Sufficient Staffing/Support?	•USACE is very experienced with design and construction of Seawall structures. Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. •Additional features not expected. •Environmental Mitigation may be required due to the impact to coral. Accounted for in cost estimate. •Cultural Mitigation may be required. Accounted for in cost estimate.	Marginal	Unlikely	0
PS-6	Precast Concrete Seawall	• Potential for scope growth, added features? • Sufficient Staffing/Support?	•USACE is very experienced with design and construction of Seawall structures. Additional protection measures or modification to proposed measures may need to be modified due to wave climate but should be reflected in current assumptions. •Additional features not expected. •Environmental Mitigation may be required due to the impact to coral. Accounted for in cost estimate. •Cultural Mitigation may be required. Accounted for in cost estimate.	Marginal	Unlikely	0
Acquisition Strategy					**Maximum Project Growth**	**30%**
AS-1	Rock Revetment	• Contracting plan is not established at this stage of development. • Various technical challenges and related design and construction complexities can result in differing contract strategies that result in less or greater Government risks and resulting project costs.	• Type of contracting strategy will likely be based on project size, district experience, completion of plans and specs, and schedule for construction implementation. Project size and contract strategies can effect ability to bond contractors, bidding competition and Gov't risks verses contractor risks. It is likely to impact overall project costs, larger projects even more so. Contract strategy can greatly influence a final project cost from least risk to greatest: funding availability, contract value, competitive bids, firm-fixed lowest price, best value, design/build, cost plus incentive fee. •Availability of qualified contractors could limit competition.	Marginal	Possible	1
AS-2	Tribar Revetment	• Contracting plan is not established at this stage of development. • Various technical challenges and related design and construction complexities can result in differing contract strategies that result in less or greater Government risks and resulting project costs.	• Type of contracting strategy will likely be based on project size, district experience, completion of plans and specs, and schedule for construction implementation. Project size and contract strategies can effect ability to bond contractors, bidding competition and Gov't risks verses contractor risks. It is likely to impact overall project costs, larger projects even more so. Contract strategy can greatly influence a final project cost from least risk to greatest: funding availability, contract value, competitive bids, firm-fixed lowest price, best value, design/build, cost plus incentive fee. •Availability of qualified contractors could limit competition.	Marginal	Possible	1
AS-3	CRM Seawall With Precast Base	• Contracting plan is not established at this stage of development. • Various technical challenges and related design and construction complexities can result in differing contract strategies that result in less or greater Government risks and resulting project costs.	• Type of contracting strategy will likely be based on project size, district experience, completion of plans and specs, and schedule for construction implementation. Project size and contract strategies can effect ability to bond contractors, bidding competition and Gov't risks verses contractor risks. It is likely to impact overall project costs, larger projects even more so. Contract strategy can greatly influence a final project cost from least risk to greatest: funding availability, contract value, competitive bids, firm-fixed lowest price, best value, design/build, cost plus incentive fee. •Availability of qualified contractors could limit competition.	Marginal	Possible	1

AS-4	CRM Seawall - DELETED	• Contracting plan is not established at this stage of development. • Various technical challenges and related design and construction complexities can result in differing contract strategies that result in less or greater Government risks and resulting project costs.	• Type of contracting strategy will likely be based on project size, district experience, completion of plans and specs, and schedule for construction implementation. Project size and contract strategies can effect ability to bond contractors, bidding competition and Gov't risks verses contractor risks. It is likely to impact overall project costs, larger projects even more so. Contract strategy can greatly influence a final project cost from least risk to greatest: funding availability, contract value, competitive bids, firm-fixed lowest price, best value, design/build, cost plus incentive fee. •Availability of qualified contractors could limit competition.	Marginal	Possible	1
AS-5	Sheetpile Seawall - DELETED	• Contracting plan is not established at this stage of development. • Various technical challenges and related design and construction complexities can result in differing contract strategies that result in less or greater Government risks and resulting project costs.	• Type of contracting strategy will likely be based on project size, district experience, completion of plans and specs, and schedule for construction implementation. Project size and contract strategies can effect ability to bond contractors, bidding competition and Gov't risks verses contractor risks. It is likely to impact overall project costs, larger projects even more so. Contract strategy can greatly influence a final project cost from least risk to greatest: funding availability, contract value, competitive bids, firm-fixed lowest price, best value, design/build, cost plus incentive fee. •Availability of qualified contractors could limit competition.	Marginal	Likely	2
AS-6	Precast Concrete Seawall	• Contracting plan is not established at this stage of development. • Various technical challenges and related design and construction complexities can result in differing contract strategies that result in less or greater Government risks and resulting project costs.	• Type of contracting strategy will likely be based on project size, district experience, completion of plans and specs, and schedule for construction implementation. Project size and contract strategies can effect ability to bond contractors, bidding competition and Gov't risks verses contractor risks. It is likely to impact overall project costs, larger projects even more so. Contract strategy can greatly influence a final project cost from least risk to greatest: funding availability, contract value, competitive bids, firm-fixed lowest price, best value, design/build, cost plus incentive fee. •Availability of qualified contractors could limit competition. Initial research indicates that contractors are not experienced in precast seawall construction.	Marginal	Likely	2
Construction Elements					**Maximum Project Growth**	**25%**
CE-1	Rock Revetment	High risk or complex construction elements, site access, in-water? Special mobilization of plants. Potential for construction modification and claims? The rock quantities will have a very long construction time if existing quarries can't meet the demand.	• Dewatering of excavation may require additional effort than initially estimated. • Working underground poses risks with unknown subsurface conditions.	Marginal	Possible	1
CE-2	Tribar Revetment	Water in Excavation. Potential labor shortages. Limited operation area, weather impacts, construction near active runway.	• Dewatering of excavation may require additional effort than initially estimated. • Working underground poses risks with unknown subsurface conditions.	Marginal	Possible	1
CE-3	CRM Seawall With Precast Base	In-water work. Limited operation area, weather impacts, construction near active runway. The rock quantities will have a very long construction time if existing quarries can't meet the demand.	• Dewatering of excavation may require additional effort than initially estimated. Accounted for in cost estimate. • Working underground poses risks with unknown subsurface conditions.	Moderate	Possible	2
CE-4	CRM Seawall - DELETED	The rock quantities will have a very long construction time if existing quarries can't meet the demand.	• Dewatering of excavation may require additional effort than initially estimated. Accounted for in cost estimate. • Working underground poses risks with unknown subsurface conditions.	Moderate	Possible	2

CE-5	Sheetpile Seawall - DELETED	In-water work. Limited operation area, weather impacts, construction near active runway. The sheetpiling must be shipped from the US and could delay the start of construction.	• Planning will ensure the timely delivery of sheetpiling and should not delay the project. • Working underground poses risks with unknown subsurface conditions.	Moderate	Possible	2
CE-6	Precast Concrete Seawall	Heavy equipment will be required to place precast wall sections.	• Precast wall sections will be heavy and will require mobilization and use of appropriate lifting equipment. • Working underground poses risks with unknown subsurface conditions.	Moderate	Possible	2
Specialty Construction or Fabrication					**Maximum Project Growth**	**65%**
SC-1	Rock Revetment	Numerous assumptions are made w/ a conceptual design, but no special equipment or fabrications are anticipated.	• Major construction is rock. Based on discussion with local contractor, large stone sizes are available in American Samoa. Preliminary data suggests 3-5T stones will be required. • Construction around runway may require additional measures. • Mobilization of equipment and materials a risk for this remote location.	Moderate	Unlikely	1
SC-2	Tribar Revetment	Numerous assumptions are made w/ a conceptual design, but no special equipment or fabrications are anticipated.	• Major construction is precast concrete and all material is assumed to be available locally. • Tribar have been built in AS but there could be limited contractors. • Specialty Tribar formwork may need to be fabricated depending on the final design. • Construction around runway may require additional measures. • Mobilization of equipment and materials a risk for this remote location. • Concrete batch plant may need to be mobilized.	Moderate	Unlikely	1
SC-3	CRM Seawall With Precast Base	Numerous assumptions are made w/ a conceptual design, but no special equipment or fabrications are anticipated.	• Major construction is concrete for the precast wall and all materials are available locally. • Construction around runway may require additional measures. •Concrete batch plant may need to be mobilized. • Mobilization of equipment and materials a risk for this remote location.	Significant	Possible	3
SC-4	CRM Seawall - DELETED	Numerous assumptions are made w/ a conceptual design, but no special equipment or fabrications are anticipated.	• Major construction is rock for the CRM wall and all materials are available locally. • Construction around runway may require additional measures. •Grout plant may need to be mobilized. • Mobilization of equipment and materials a risk for this remote location.	Moderate	Possible	2
SC-5	Sheetpile Seawall - DELETED	Numerous assumptions are made w/ a conceptual design, but no special equipment or fabrications are anticipated.	• Major construction is sheet pile. Additional cost impacts are possible due to steel price volatility and the cost for importing material to American Samoa. • Sheetpile will need to be imported and could lead to delays or additional costs. • Mitigation and sediment monitoring may be required due to sheetpile installation (vibration and sound). • Construction around runway may require additional measures. •Concrete batch plant may need to be mobilized. • Mobilization of equipment and materials a risk for this remote location. • Concern over long term efficacy of sheetpile wall and may corrode and fail.	Significant	Possible	3

SC-6	Precast Concrete Seawall	Numerous assumptions are made w/ a conceptual design, but no special equipment or fabrications are anticipated.	• Major construction is precast concrete and all material is assumed to be available locally. However, local contractors are not well versed in this type of construction. • Specialty seawall formwork may need to be fabricated depending on the final design. • Construction around runway may require additional measures. • Mobilization of equipment and materials a risk for this remote location. • Concrete batch plant may need to be mobilized.	Moderate	Likely	3
Technical Design & Quantities					Maximum Project Growth	30%
T-1	Rock Revetment	Designs are not yet established. Quantities for this feature have not been developed to any level of detail.	• Design and quantities have not been developed in any detail at this point making it likely that the quantities likely change to a degree as design progresses. Most risk is considered in establishing the initial scope. • Limited Geotechnical Information available. May require deeper excavation resulting in re-design and added construction costs. Design and cost estimate used conservative depth quantities.	Marginal	Possible	1
T-2	Tribar Revetment	Designs are not yet established. Quantities for this feature have not been developed to any level of detail.	• Design and quantities have not been developed in any detail at this point making it likely that the quantities likely change to a degree as design progresses. Most risk is considered in establishing the initial scope. • Limited Geotechnical Information available. May require deeper excavation resulting in re-design and added construction costs. Design and cost estimate used conservative depth quantities.	Marginal	Possible	1
T-3	CRM Seawall With Precast Base	Designs are not yet established. Quantities for this feature have not been developed to any level of detail.	• Design and quantities have not been developed in any detail at this point making it likely that the quantities likely change to a degree as design progresses. Most risk is considered in establishing the initial scope. • Limited Geotechnical Information available. May require deeper excavation resulting in re-design and added construction costs. Design and cost estimate used conservative depth quantities.	Marginal	Possible	1
T-4	CRM Seawall - DELETED	Designs are not yet established. Quantities for this feature have not been developed to any level of detail.	• Design and quantities have not been developed in any detail at this point making it likely that the quantities likely change to a degree as design progresses. Most risk is considered in establishing the initial scope. • Limited Geotechnical Information available. May require deeper excavation resulting in re-design and added construction costs. Design and cost estimate used conservative depth quantities.	Marginal	Possible	1
T-5	Sheetpile Seawall - DELETED	Designs are not yet established. Quantities for this feature have not been developed to any level of detail.	• Design and quantities have not been developed in any detail at this point making it likely that the quantities likely change to a degree as design progresses. Most risk is considered in establishing the initial scope. • Limited Geotechnical Information available. May require deeper sheetpile if hard coral is deeper than assumed requiring re-design. Design and cost estimate used conservative depth quantities.	Marginal	Possible	1

T-6	Precast Concrete Seawall	Designs are not yet established. Quantities for this feature have not been developed to any level of detail.	• Design and quantities have not been developed in any detail at this point making it likely that the quantities likely change to a degree as design progresses. Most risk is considered in establishing the initial scope. • Limited Geotechnical Information available. May require deeper excavation resulting in re-design and added construction costs. Design and cost estimate used conservative depth quantities.	Marginal	Possible	1
Cost Estimate Assumptions					**Maximum Project Growth**	**35%**
EST-1	Rock Revetment	• Reliability and number of key quotes? • Assumptions related to prime and subcontractor markups/assignments? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Overuse of Cost Book, lump sum, allowances? • Lack confidence on critical cost items?	• Budgetary material and equipment costs have been obtained for key items (rock, concrete, mobilization). • Material costs are volatile and could possibly change. • Project location on remote island complexity and risk to cost estimate. • Rough labor rates have been obtained and incorporated into the estimate. • Construction market is limited.	Moderate	Possible	2
EST-2	Tribar Revetment	• Reliability and number of key quotes? • Assumptions related to prime and subcontractor markups/assignments? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Overuse of Cost Book, lump sum, allowances? • Lack confidence on critical cost items?	• Budgetary material and equipment costs have been obtained for key items (rock, concrete, mobilization). • Material costs are volatile and could possibly change. • Project location on remote island complexity and risk to cost estimate. • Rough labor rates have been obtained and incorporated into the estimate. • Construction market is limited.	Moderate	Possible	2
EST-3	CRM Seawall With Precast Base	• Reliability and number of key quotes? • Assumptions related to prime and subcontractor markups/assignments? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Overuse of Cost Book, lump sum, allowances? • Lack confidence on critical cost items?	• Budgetary material and equipment costs have been obtained for key items (rock, concrete, mobilization). • Material costs are volatile and could possibly change. • Project location on remote island complexity and risk to cost estimate. • Rough labor rates have been obtained and incorporated into the estimate. • Construction market is limited.	Moderate	Possible	2
EST-4	CRM Seawall - DELETED	• Reliability and number of key quotes? • Assumptions related to prime and subcontractor markups/assignments? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Overuse of Cost Book, lump sum, allowances? • Lack confidence on critical cost items?	• Budgetary material and equipment costs have been obtained for key items (rock, concrete, mobilization). • Material costs are volatile and could possibly change. • Project location on remote island complexity and risk to cost estimate. • Rough labor rates have been obtained and incorporated into the estimate. • Construction market is limited.	Moderate	Possible	2
EST-5	Sheetpile Seawall - DELETED	• Reliability and number of key quotes? • Assumptions related to prime and subcontractor markups/assignments? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Overuse of Cost Book, lump sum, allowances? • Lack confidence on critical cost items?	• Budgetary material and equipment costs have been obtained for key items (rock, concrete, mobilization). • Material costs are volatile and could possibly change. • Project location on remote island complexity and risk to cost estimate. • Rough labor rates have been obtained and incorporated into the estimate. • Construction market is limited.	Moderate	Possible	2
EST-6	Precast Concrete Seawall	• Reliability and number of key quotes? • Assumptions related to prime and subcontractor markups/assignments? • Assumptions regarding crew, productivity, overtime? • Site accessibility, transport delays, congestion? • Overuse of Cost Book, lump sum, allowances? • Lack confidence on critical cost items?	• Budgetary material and equipment costs have been obtained for key items (rock, concrete, mobilization). • Material costs are volatile and could possibly change. • Project location on remote island complexity and risk to cost estimate. • Rough labor rates have been obtained and incorporated into the estimate. • Construction market is limited.	Moderate	Possible	2
External Project Risks					**Maximum Project Growth**	**40%**

EX-1	Rock Revetment	External risk included in the risk register (and contingency) are extreme escalation and delays/impacts by others (outside organizations, municipalities, public interest groups, etc.)	• Project delays increase likelihood of scope growth and cost increases. • Similarly, multiple interest and political groups can result in unexpected changes and delays. • The support for the project is high so cost risks are unlikely. •Inflation could lead to additional costs.	Marginal	Possible	1
EX-2	Tribar Revetment	External risk included in the risk register (and contingency) are extreme escalation and delays/impacts by others (outside organizations, municipalities, public interest groups, etc.)	• Project delays increase likelihood of scope growth and cost increases. • Similarly, multiple interest and political groups can result in unexpected changes and delays. • The support for the project is high so cost risks are unlikely. •Inflation could lead to additional costs.	Marginal	Possible	1
EX-3	CRM Seawall With Precast Base	External risk included in the risk register (and contingency) are extreme escalation and delays/impacts by others (outside organizations, municipalities, public interest groups, etc.)	• Project delays increase likelihood of scope growth and cost increases. • Similarly, multiple interest and political groups can result in unexpected changes and delays. • The support for the project is high so cost risks are unlikely. •Inflation could lead to additional costs.	Marginal	Possible	1
EX-4	CRM Seawall - DELETED	External risk included in the risk register (and contingency) are extreme escalation and delays/impacts by others (outside organizations, municipalities, public interest groups, etc.)	• Project delays increase likelihood of scope growth and cost increases. • Similarly, multiple interest and political groups can result in unexpected changes and delays. • The support for the project is high so cost risks are unlikely. •Inflation could lead to additional costs.	Marginal	Possible	1
EX-5	Sheetpile Seawall - DELETED	External risk included in the risk register (and contingency) are extreme escalation and delays/impacts by others (outside organizations, municipalities, public interest groups, etc.)	• Project delays increase likelihood of scope growth and cost increases. • Similarly, multiple interest and political groups can result in unexpected changes and delays. • The support for the project is high so cost risks are unlikely. •Inflation could lead to additional costs.	Marginal	Possible	1
EX-6	Precast Concrete Seawall	External risk included in the risk register (and contingency) are extreme escalation and delays/impacts by others (outside organizations, municipalities, public interest groups, etc.)	• Project delays increase likelihood of scope growth and cost increases. • Similarly, multiple interest and political groups can result in unexpected changes and delays. • The support for the project is high so cost risks are unlikely. •Inflation could lead to additional costs.	Marginal	Possible	1

OFU COASTAL STORM DAMAGE REDUCTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
OFU, AMERICAN SAMOA

DRAFT INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

APPENDIX A-3
ENVIRONMENTAL RESOURCES

A-3 ENVIRONMENTAL RESOURCES

US Army Corps of Engineers ®
Honolulu District

US Army Corps of Engineers
Honolulu District

Appendix A-3: Environmental Resources

Ofu Airport, American Samoa
CAP Section 14 Emergency Shoreline Protection

Draft Integrated Feasibility Report and Environmental Assessment

April 2023

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Appendix A-3

TABLE OF CONTENTS

LIST OF FIGURES

List of Attachments

**to be inserted when received from NMFS

1 INTRODUCTION

This Appendix to the IFREA and provides a more detailed administrative record of coordination on environmental compliance conducted to date as part of the Ofu Airport, American Samoa - Continuing Authorities Program (CAP), Section 14 Emergency Stream Bank and Shoreline Protection (Project). It further discusses compliance specific to the Territory of American Samoa (Territory).

2 LIST OF STATEMENT AGENCIES

A list of the agencies, organizations, and persons to whom USACE will provide copies of the draft report for review is as follows:

- U.S. Fish and Wildlife Service (USFWS), Pacific Islands Fish and Wildlife Office (PIFWO)
- NOAA National Marine Fisheries Service (NMFS), Pacific Islands Regional Office (PIRO), Protected Resources Division (PRD)
- NMFS, PIRO, Habitat Conservation Division (HCD)
- U.S. Environmental Protection Agency (USEPA)
- American Samoa Environmental Protection Agency (ASEPA)
- American Samoa Department of Marine and Wildlife Resources (DMWR)
- America Samoa Department of Public Works (DPW)
- America Samoa Department of Port Administration (DPA)
- Federal Aviation Administration (FAA) (cooperating agency)
- National Park of American Samoa (NPAS)
- American Samoa Department of Commerce (ASDOC)
- American Samoa State Historic Preservation Office (AS SHPO)
- USDA Natural Resources Conservation Service (NRCS), American Samoa Field Office

3 ENVIRONMENTAL COMPLIANCE

3.1 National Environmental Policy Act (NEPA)

NEPA (*42 USC § 4321 et seq.*) requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their Proposed Actions and reasonable alternatives to those actions. NEPA also established the Council on Environmental Quality (CEQ). As part of the Executive Office of the President, CEQ coordinates federal environmental efforts and is responsible for advising the president on environmental policy matters. CEQ has also promulgated regulations implementing NEPA, which are binding on all federal agencies. These regulations address the procedural provisions of NEPA and the administration of the NEPA process, including preparation of EISs.

The NEPA is applicable to all "major" federal actions affecting the quality of the human environment. A major federal action is an action with effects that may be major, and which are potentially subject to federal control and responsibility. These actions may include new and continuing activities, including projects and programs entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies; new or revised agency rules, regulations, plans, policies, or procedures; and legislative proposals.

3.1.1 NEPA Coordination for the Proposed Project

An integrated Feasibility Report and Environmental Assessment (IFREA) has been drafted for this project and will be provided to all resource agencies and other stakeholders for review and comment during a 30-day public comment period.

Communications with Statement Agencies (Section 2) will continue as part of the agency review of the Draft IFREA. The Federal Aviation Administration (FAA) requested to be a formal cooperating agency for this project.

Coordination on public outreach and information sharing continues with the non-federal sponsor, the DPA. The project will comply with this Act.

3.2 Endangered Species Act (ESA) of 1973

Section 7 of the ESA requires each federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of critical habitat for such species. Federal agencies are further required to consult with the appropriate federal agency, either the USFWS or NOAA-NMFS, for federal actions that "may affect" a listed species or adversely modify critical habitat. Federal agencies must use the best available scientific and commercial data when making an effect determination relating to the impact of their actions.

3.2.1 Specific Territorial Regulations for ESA

The USFWS PIFWO and the NMFS PIRO are the federal regulatory agencies that oversee consultations for compliance with the ESA in American Samoa. The NMFS and USFWS share jurisdiction for recovery and conservation of sea turtles listed under the ESA. NMFS leads the conservation and recovery of sea turtles in the marine environment and USFWS leads the conservation and recovery of sea turtles on nesting beaches (*NOAA 2015*). A Memorandum of Understanding outlines the specific roles of each agency. The USFWS is also responsible for the management of Rose Atoll National Wildlife Refuge.

The American Samoa Department of Marine and Wildlife Resources (DMWR) is the territorial agency responsible for managing and preserving the marine and wildlife resources in American Samoa. DMWR also distributes hunting regulations that control the taking of various wildlife species, including fruit bats and native birds.

Currently, there is no federally designated critical habitat in American Samoa for any species.

3.2.2 ESA Coordination for the Proposed Project

USACE requested technical assistance from USFWS on February 2, 2022 and received a list of species listed or proposed for listing under both NMFS and USFWS jurisdiction that may be present on or in the vicinity of the proposed project location (Reference Number: 2022-0006860-S7-00; see Attachment 1), as well as confirmation that there is no designated or proposed federally designated critical habitat occurring within the immediate vicinity of the proposed study area (Attachment 1).

On February 11, 2022. confirmation from the USFWS via email was received by the USACE indicating that ESA and the Fish and Wildlife Coordination Act (FWCA) as it concerns the Ofu airport shoreline stabilization project to USFWS can be done as a joined consultation, with no need to address FWCA and ESA separately. Any response or reviews from the USFWS will include both FWCA and ESA information. A combined ESA Biological Evaluation and EFH Assessment will be sent to USFWS and NMFS in May 2023.

The USACE will continue to coordinate with the USFWS, NMFS, and the DMWR as part of the public review of this Draft IFR/EA document and throughout the feasibility phase. The project will comply with the Act.

3.3 Fish and Wildlife Coordination Act (FWCA) of 1934

The FWCA (16 USC 661 et seq.) requires federal agencies to coordinate with the USFWS and local state/territorial agencies when any stream or body of water is proposed to be impounded, diverted, or otherwise modified. The intent is to give fish and wildlife conservation equal consideration with other purposes of water resources development projects.

3.3.1 FWCA Coordination for the Proposed Project

USACE has been coordinating with the USFWS, NMFS, and DMWR during the initial stages of planning. The construction of a revetment will require formal coordination to satisfy FWCA compliance. Coordination was initiated with the USFWS in November 2021to develop a scope of work and USFWS completed surveys in February 2023. information from a draft report (USFWS 2023) is incorporated into this Draft IFREA. A final FWCA report is expected from USFWS soon. The project complies with this Act.

3.4 Magnuson-Stevens Fishery Conservation and Management Act (MSA)

MSA (*16 USC § 1801 et seq.*) is the primary law governing fisheries management in U.S. federal waters. MSA is intended to foster long-term biological and economic sustainability of U.S. marine fisheries through the prevention of overfishing, the rebuilding of overfished stocks, and increasing long-term economic and social benefits to ensure a safe and sustainable supply of seafood. MSA extended U.S. jurisdiction from 12 nautical miles to 200 nautical miles and established eight regional fisheries management councils to develop Fishery Management Plans, which must comply with conservation and management standards to promote sustainable fisheries management. The Fishery Management Plans also define Essential Fish Habitat (EFH), which is the aquatic habitat where fish spawn, breed, feed, and grow through various life stages; this habitat includes marine waters, wetlands, coral reefs, seagrasses, and rivers. The Fishery Management Plans further define Habitat Areas of Particular Concern (HAPC), which are high-priority areas that are rare, particularly sensitive, or critical to overall ecosystem functions.

The Western Pacific Regional Fishery Management Council (WPRFMC) is one of eight regional fishery management councils established by Congress in 1976. Under the MSA, it has authority over fisheries seaward of state/territorial waters of Hawaii and the US Pacific Islands and creates and amends management plans for fisheries seaward of state/territorial waters in the US Pacific Islands. Both the American Samoa Archipelago and Pelagic Fishery Ecosystem Plans were approved in 2009 and codified in 2010 (WPRFMC 2009). These Fishery Ecosystem

Plans outline ecosystem approaches to management of fisheries and are amended as necessary.

In 2000, American Samoa began a Community-Based Fisheries Management Program that assists residents in managing negative impacts on their marine resources (*ASCMP 2009*). In this program, residents keep watch on tourists and other residents in the marine environment and locally enforce the rules to prevent harmful activities.

Marine Conservation Plans are also required by the MSA (Section 204(4)) detailing the use of funds collected by the Secretary of Commerce pursuant to fishery agreements (e.g., Pacific Insular Area fishery agreement, quota transfer agreement, etc.). These Marine Conservation Plans are intended to be consistent with the fishery ecosystem plans, identify conservation and management objectives, and prioritize planned marine conservation projects. The Marine Conservation Plans for American Samoa is developed by the Governor and applicable for three years.

3.4.1 Specific Territorial Regulations for MSA

The U.S. has exclusive fishery management authority over all fishery resources within the U.S. Exclusive Economic Zone, which extends from the seaward boundary of American Samoa to 200 nautical miles from the baseline from which the breadth of the territorial sea is measured (Figure 1). However, this authority is delegated to the American Samoa DMWR Fisheries Division for the implementation of fisheries management within waters up to three (3) miles from the coastline of American Samoa. The NMFS PIRO manages fisheries outside of the three-mile offshore boundary around American Samoa. Management plans to protect trophic structure and biodiversity and increase key coral reef fish species are priorities within and outside of existing protected areas (*WPRFMC 2009*).

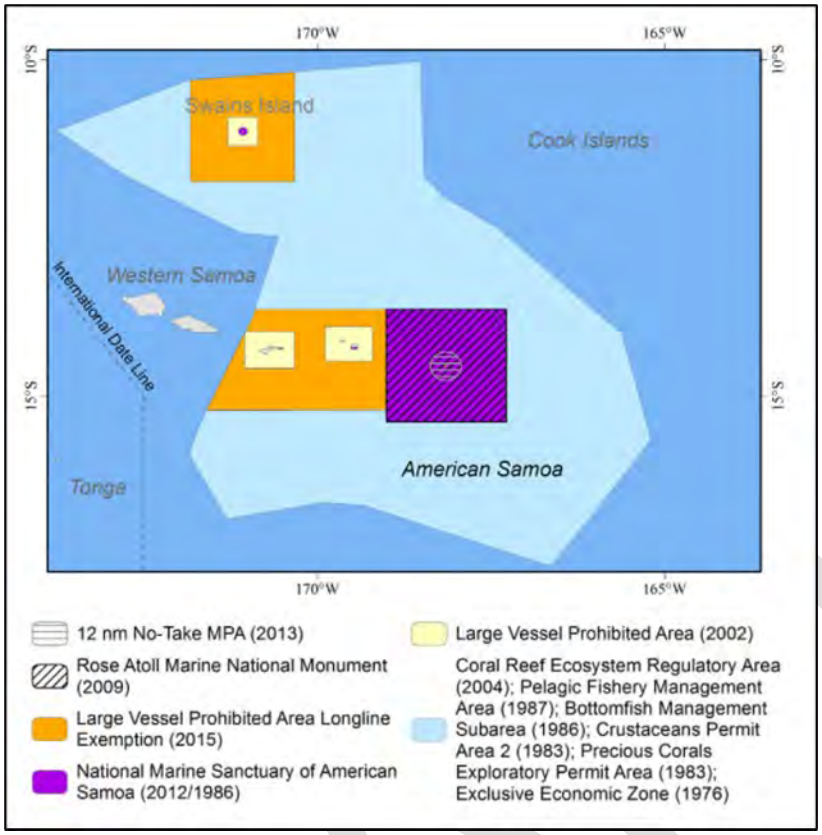

Figure 1: Protected, permitted, and regulated marine areas in American Samoa (https://www.wpcouncil.org/fisheries/american-samoa-archipelago)

The NMFS PIRO is the federal regulatory agency responsible for implementing the MSA, including the EFH provision (Section 305(b)(2) as described by 50 CFR 600.920). The marine water column from the surface to a depth of 1,000 m from shoreline to the outer boundary of the Exclusive Economic Zone (5,150 kilometers/200 nautical miles/230 miles), and the seafloor from the shoreline out to a depth of 400 m around the American Samoa Archipelago were designated as EFH. As such, all surrounding waters and submerged lands around the island of Ofu are designated as EFH and support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council's American Samoa Archipelago and Pacific Pelagic Fishery Ecosystem Plans. The management unit species and life stages found in these waters include eggs, larvae, juveniles, and adults of Bottom-fish and Pelagic MUS. Specific types of habitat considered as EFH include coral reef, patch reefs, hard substrate, artificial substrate, seagrass beds, soft substrate, mangrove, lagoon, estuarine, surge zone, deep-slope terraces and pelagic/open ocean.

Compliance with the EFH provisions of the MSA can also be achieved through the pursuance of the Fish and Wildlife Coordination Act (FWCA, 16 U.S.C. 661-666c). See Section 3.3 of Appendix A-3.

3.4.2 MSA Coordination for the Proposed Project

NMFS, in an email dated November 9, 2021, was alerted to the proposed Project during the early scoping process for this study and coordination with the NMFS office on EFH continues.

Though the proposed project will not impound, divert, deepen a channel of a stream or other body of water, some less than significant, temporary effects on EFH could occur. While minimization measures will be used, some level of EFH consultation will be required. EFH consultation with NMFS PIRO will be initiated concurrently with the public release of the draft NEPA document and during the remainder of the feasibility phase to address any comments received from the NMFS on the draft NEPA document. Per 16 USC 1855(b) and 50 CFR Subpart K, a proposed action that may adversely affect EFH will require some level of consultation with the NMFS. An effects determination on EFH is included in the Draft EFH Evaluation (see Attachment 5). The project will comply with this Act.

3.5 Clean Water Act (CWA) of 1972

CWA establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. and regulating quality standards for surface waters. The CWA defines waters of the U.S. to include all interstate waters, lakes, rivers, streams, territorial seas, tributaries to navigable waters, interstate wetlands, wetlands that could affect interstate or foreign commerce, and wetlands adjacent to other waters of the U.S (WOTUS). The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, without a permit.

- Section 401 of the CWA (33 U.S.C. §1341) ensures that discharge into WOTUS do not violate state, territorial, or tribal water quality standards. States, territories, and authorized tribes where the discharge originates are generally responsible for issuing Water Quality Certifications (WQCs)

- Section 402 of the CWA (33 U.S.C. § 1342) requires that a discharge of any pollutant or combination of pollutants to surface waters that are deemed WOTUS, such as storm water from point or nonpoint sources, be regulated through the National Pollutant Discharge Elimination System (NPDES) permitting program. Section 402(a) provides that the permit-issuing authority may issue an NPDES permit that authorizes the discharge of any pollutant into navigable waters of the United States, upon the condition that such discharge meets all applicable requirements of the CWA and such other conditions as the permitting authority determines necessary to carry out the provisions of the CWA. As part of this program, general NPDES permits are required to regulate storm water discharges associated with deployment or construction activities that disturb one (1) or more acres of land.

- Section 404 of the CWA (33 U.S.C. §1344) establishes a program to regulate the discharge of dredged and fill material into WOTUS, including wetlands. The program is administered by the US Army Corps of Engineers (USACE).

  Although the USACE does not process and issue permits for its own activities, it conducts an internal assessment to ensure that all requirements of Section 404 are met by applying all applicable substantive legal requirements, including application of the Section 404(b)(1) Guidelines, 33 CFR 336.1(a). Under the Section 404(b)(1) Guidelines, an analysis of practicable alternatives is the primary tool used to determine whether a proposed discharge is prohibited. The Section 404(b)(1) Guidelines prohibit discharges of dredged or fill material into waters of the U.S. if a practicable alternative to the proposed discharge exists that would have less adverse impacts on the aquatic ecosystem (including wetlands), if the alternative does not have other significant adverse environmental impacts (40 C.F.R. 230.10(a)). An alternative is considered practicable if it is available and capable of being implemented after considering cost, existing technology, and logistics in light of overall project purpose (40 C.F.R. 230.10(a)(2)).

The Section 404(b)(1) guidelines follow a sequential approach to project planning that considers mitigation measures only after the project proponent shows no practicable alternatives are available to achieve the overall project purpose with less environmental impacts. Once it is determined that no practicable alternatives are available, the guidelines then require that appropriate and practicable steps be taken to minimize potential adverse effects on the aquatic ecosystem (40 C.F.R. 230.10(d)). Such steps may include actions controlling discharge location, material to be discharged, the fate of material after discharge or method of dispersion, and actions related to technology, plant and animal populations, or human use (40 C.F.R. 230.70-230.77). Beyond the requirement for demonstrating that no practicable alternatives to the proposed discharge exist, the Section 404(b)(1) Guidelines also require USACE to compile findings related to the environmental impacts of discharge of dredged or fill material. The USACE must make findings concerning the anticipated changes caused by the discharge to the physical and chemical substrate and to the biological and human use characteristics of the discharge site. These guidelines also indicate that the level of effort associated with the preparation of the alternatives analysis be commensurate with the significance of the impact and/or discharge activity (40 C.F.R. 230.6(b)). The Section 404(b)(1) analysis is in Attachment 6.

- Sections Section 305(b) and 303(d)) of the CWA, respectively, requires States, Territories, and authorized Tribes to assess waterbodies, as well as identify and make a list of those surface water bodies that are polluted. A review of all “existing and readily available” state or territorial surface water quality data must be reviewed and compared compare their water quality standards. Section 303(d) of the CWA authorizes the USEPA to list impaired waters and develop water pollution reduction plans, or Total Maximum Daily Loads (TMDLs), for those waterbodies that are classified as lower quality. The TMDL defines the upper threshold of a given pollutant that a waterbody can contain and still meet water quality standards.

3.5.1 Specific Territorial Regulations for CWA

CWA Section 401: In accordance with CWA Section 401, the American Samoa Environmental Protection (ASEPA) Agency administers the Territory’s 401 Water Quality Certification Program. The objective of the program is to ensure that any Federally permitted activity will not adversely impact the existing uses, designated uses, and applicable water quality criteria of the receiving Territorial waters. Issuance of a Water Quality Certification demonstrates compliance with Section 401 of the CWA.

The protection of water quality of surface waters in American Samoa as implemented by the ASEPA is conducted through the American Samoa Coastal Management Program (ASCMP). The ASCMP promotes the management of natural resources in coastal areas through environmental review of land use activities, land use planning, restoration activities, and education and outreach. Locally, the government of American Samoa employs an interagency Project Notification and Review System (PNRS) process, administered by the American Samoa Department of Commerce (ASDOC). The PNRS process considers public health, safety, and environmental impacts (including impacts to water quality) as part of the review process for proposed development projects. The ASEPA holds a seat on the PNRS board, providing review of environmental impacts, including impacts to water quality. The ASEPA, through its board membership on the PRNS, determines the need for any water quality permits that need to be obtained for any land use permit being brought before the PRNS Board. Upon review through the PRNS, the ASEPA recommends if a proposed project can be issued a 401 Water Quality Certification.

CWA Section 402: In accordance with CWA Section 402, the US Environmental Protection (USEPA) administers the Territory's 402 Water Quality Certification and NPDES Program. The USEPA has not authorized the territory of American Samoa to issue its own NPDES permits; therefore, USEPA Region 9 is the permit-issuing agency for American Samoa. The objective of the program is to ensure that any Federally permitted activity will not adversely impact the existing uses, designated uses, and applicable water quality criteria of the receiving State waters.

CWA Section 404: There are no territorial regulations specific to CWA Section 404 in American Samoa.

CWA Section 305(b) and Section 303(d): The Territory's inland drinking waters are assigned to a class 1 (drinking water), or 2 (not drinking water). For water that is not classified as drinking water, water quality standards are assigned based on the beneficial uses that are to be protected, including aquatic life or swimming (Makiasi et al. 2022).

The Territory's 303(d) and 305(b) integrated water quality report (Makiasi et al. 2022) describes water quality conditions for waters in American Samoa. The report describes that a total of 230.6 miles of American Samoa's 257.5 miles of surface waters were assessed for water quality conditions between 2003 and 2013. Of these 230.6 miles, 210.1 miles were found to be impaired. Contaminants found in these impaired waters include bacteria, total nitrogen, total phosphorus, dissolved oxygen, and turbidity. Surface water quality in American Samoa is most impacted by land use changes impacting hydrology and streamside vegetation, watershed development causing erosion and increased turbidity, and nutrient and bacterial pollution from poorly constructed human and pig waste disposal systems (Makiasi et al. 2022). TMDLs have not yet been developed for any of these impaired waters.

3.5.2 CWA Coordination for the Proposed Project

Regulations and policies that protect water quality and are being considered as part of the proposed Project include CWA Sections 401, 402, and 404.

CWA 401 and 402

The USEPA and ASEPA have been informed about on the proposed project at the initial feasibility stage in November 2021. Section 401 Water Quality Certification will be requested from the ASEPA prior to construction of the project.

The ASEPA, through the Project Review and Notification System, determines the need for any water quality permits that need to be obtained for any proposed project to ensure that environmental concerns, including water quality, are given appropriate consideration. If required, a 401 CWA water quality certification will be obtained from the ASEPA Agency to construction and will be implemented according to the permit conditions imposed by to minimize adverse impacts to water quality. The Proposed Action of implementing the Tentatively Selected Plan encompasses both project construction and operations. With respect to the Section 401 permit, USACE would be responsible for compliance during construction while the American Samoa Department of Port Administration (ASDPA) would need to comply separately with Section 401 for O&M.

Coordination with the USEPA and ASEPA will continue during the draft IFREA public review period and through the remainder of the feasibility phase for this project. If required, Section 401 and 402 Water Quality Certification will be requested from the USEPA and ASEPA prior to construction of the project.

CWA 404

A Draft 404(b)(1) evaluation is included as Attachment 6 of this Appendix. The 404(b)(1) analysis demonstrates that both construction and O&M comply with Section 404. So long as the non-federal sponsor (American Samoa Department of Port Administration) conducts O&M operations within the scope of activities characterized in the environmental assessment, it would comply with Section 404. The project will comply with this Act.

3.6 Coastal Zone Management Act of 1972

Congress enacted the Coastal Zone Management Act (CZMA) (*16 USC § 1451 et seq*.) to protect the coastal environment from growing demands associated with residential, recreational, commercial, and industrial uses (such as state and federal offshore oil and gas development). Coastal states with an approved Coastal Zone Management Plan, which defines permissible land and water use within a state or territory's coastal zone, can review federal actions (such as deployment/construction and operation of a proposed project action) for federal consistency. Federal consistency is the requirement that a proposed action likely to affect any land/water use or natural resources of the coastal zone be consistent with the enforceable policies of a state or territory's program. The CZMA requires NOAA to conduct periodic evaluations of the performance of states and territories with federally approved coastal management programs.

3.6.1 Specific Territorial Regulations for CZMA

In American Samoa, federal consistency determinations under the Coastal Zone Management Act (CZMA) are administered by the American Samoa Department of Commerce (ASDOC) under its Resource Management Division through the American Samoa Coastal Management Program (ASCMP). ASDOC functions as an umbrella agency for networked environmental resource protection in the Territory to ensure that environmental concerns, including water quality, wetlands protection, and coastal zone management, are given appropriate consideration in the decision-making process.

The ASCMP was approved in 1980 and is the federally approved coastal management program for the Territory of American Samoa. The ASCMP has extensive responsibilities under the CZMA, which provides the primary authority for program and has been developed under a unique approach that incorporates both western and traditional systems of management. It has purview over approximately 77 miles^2 of coastal zone and 126 miles of coastline that comprise the seven (7) islands of the Territory.

One of the ASCMP'S main functions (under the auspices of the ASDOC) is to conduct the environmental review process for all land-use activities in American Samoa through PNRS, as previously described under the CWA section. As the chair of the PNRS, the ASDOC is the lead agency for the networked coastal program in American Samoa, which includes eight (8) American Samoa government agencies that share responsibility as members of the PRNS

Review Board. These include the American Samoa Environmental Protection Agency (ASEPA), the American Samoa Historic Preservation Office (ASHPO), the American Samoa Power Authority (ASPA), Department of Health, Department of Marine and Wildlife Resources (DMWR), the American Samoa Department of Parks and Recreation, and the American Samoa Department of Public Works (ASDPW). The PRNS consists of agency directors, or their designees, and meets in a public setting twice monthly to review major land-use permit applications.

3.6.1.1 CZMA Coordination for the Proposed Project

A Draft Consistency Determination evaluation is included as Attachment 7 is this Appendix. The ASDOC has been informed of the proposed project from the initial feasibility stage in November 2021. Coordination with the ASDOC will continue during the draft IFREA public review and through the remainder of the feasibility period. The project will comply with this Act.

3.7 National Historic Preservation Act (NHPA) of 1966

The goal of the NHPA (54 USC 306101) is to empower federal agencies to act as responsible stewards of cultural resources when agency actions affect historic properties. The NHPA established the Advisory Council on Historic Preservation, an independent federal agency that promotes the preservation, enhancement, and productive use of our nation's historic resources, and advises the President and Congress on national historic preservation policy. The NHPA also authorizes the Secretary of the Interior to expand and maintain a National Register of Historic Places composed of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering, and culture.

Section 106 of the NHPA requires federal agencies to consider the effects of their undertakings on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. In carrying out their responsibilities under Section 106, the NHPA requires that federal agencies consult with federally recognized Indian tribes and Native Hawaiian Organizations that attach traditional religious and cultural significance to eligible or listed historic properties that could potentially be affected by the agency's actions. The intent of the consultation is to identify historic properties potentially affected by the undertaking and to seek ways to avoid, minimize, or mitigate any adverse effects on those properties.

The NHPA details a four-step process for Section 106 consultation that requires each federal agency to: 1) initiate a review process to evaluate any proposed action, 2) identify historic properties that could be affected by the proposed federal, or federally licensed, permitted or funded, action, 3) assess whether the action has the potential to affect properties that are listed in or are eligible for listing in the National Register of Historic Places, and 4) resolve the adverse effects.

3.7.1 NHPA Coordination for the Proposed Project

The Corps completed Section 106 consultation with a finding of "no historic properties affected" based on the conclusion that archaeological, cultural, or historical resources are unlikely within the project area based on setting and past disturbance. The American Samoa Historic Preservation Office (ASHPO) agreed with the finding in a letter dated 28 December 2022 with the condition that any excavations over six (6) inches below ground surface be monitored by a qualified archaeologist (Attachment 8). If conditions warrant, archaeological monitoring would be included in the construction specifications and drawings demarcating where archaeological monitors (hired under contract) are to be used. The project will comply with this Act.

3.8 Marine Mammal Protection Act (MMPA)

All marine mammals are protected under MMPA (*16 USC § 1361 et seq*.), which prohibits takes of all marine mammals in the U.S. (including territorial seas) with few exceptions. Permits for scientific research on marine mammals and permits to enhance the survival or recovery of a species, issued under Section 104 of the MMPA are two such exceptions. For T&E marine mammals, any activities that could affect ESA-listed species must be consistent with the ESA as well.

3.8.1 Specific Territorial Regulations for MMPA

All marine mammals, including humpback whales, are protected by federal law through the MMPA, and locally through the government of American Samoa. In 2003, American Samoa declared all its territorial seas to be a whale (and sea turtle) sanctuary (USDOC 2012) and all marine mammal species are protected from commercial and recreational hunting within the three-mile limit of American Samoa territorial waters by virtue of EO No. 005-2003. This action complimented federal and local regulations, including the ESA, that prohibit any harassment or take of marine mammals (and sea turtles).

3.8.2 MMPA Coordination for the Proposed Project

16 USC 1362 defines “take” as “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” No take or harassment of marine mammals are anticipated through the proposed project. The nearshore reef on the island of Ofu is not a known haul out, breeding, or foraging location for marine mammals and no interactions are anticipated. The project will comply with this Act.

3.9 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (*16 USC § 703-712*) was enacted to ensure protection of migratory bird resources that are shared among the U.S., Canada, Mexico, Japan, and Russia. The MBTA makes it unlawful to “pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or egg of any such bird, or any product”.

The responsibilities of federal agencies to protect migratory birds are set forth in EO 13186. USFWS is the lead agency for migratory birds. The USFWS issues permits for takes of migratory birds for activities such as scientific research, education, and depredation control, but does not issue permits for incidental take of migratory birds. The MBTA does not apply to non-native species introduced to the U.S. or its territories by mean of intentional or unintentional human assistance.

3.9.1 Migratory Bird Treaty Act Coordination for the Proposed Project

No take or harassment of migratory birds is anticipated through the proposed action as the proposed project is in disturbed habitat with little to no vegetation or habitat for avian species. However, compliance with the MBTA would be adhered to during the construction phase to prevent incidental take of any native bird species and disturbance of nests, etc. The project will comply with this Act.

3.10 Executive Order (EO) 11198 (as amended by Executive Order 13690) Flood Plain Management

EO 11988 (Floodplain Management; May 24, 1977) requires a Federal agency, when taking an action, to avoid short- and long-term adverse effects associated with the occupancy and the modification of a floodplain. EO 11988 requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In addition, the agency must minimize potential harm to or in the floodplain and explain why the action is proposed. Additional floodplain management guidelines for Executive Order 11988 were provided in 1978 by the Water Resources Council and these have recently been revised as part of Executive Order 13690, signed on January 30, 2015, which amends Executive Order 11988. It should be noted, however, that determination of the proposed flood wall heights is selected based on economic optimization of the NED Plan, not the Federal FRM standard released in Executive Order 13690.

Federal agencies must either avoid funding or permitting critical facilities in the 500-year floodplain or must provide protection to mitigate the flood risk to those facilities. Critical facilities are those facilities for which even a small risk of flooding is too great and include public safety infrastructure (*FEMA 2016*). In accomplishing this objective, “each agency provides leadership and takes action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities” for the following actions:

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities

The National Flood Insurance Program (NFIP) is a federal program managed by the FEMA that allows property owners in participating communities to purchase flood insurance with rates established through the National Flood Insurance Rate Maps.

3.10.1 Executive Order 11198 Coordination for the Proposed Project

An eight-step process is used to ensure compliance with EO 11988; this process involves public review, consideration of practicable alternatives, identification of impacts and measures to minimize those impacts, and presentation of the findings. The NEPA compliance process involves essentially the same basic decision-making process to meet its objectives. Therefore, where possible, the eight-step decision-making process has been integrated into the analysis as presented in the IFREA, as listed below.

Step 1: Determine whether the proposed action is in the base floodplain. *As described throughout the draft IFR/EA for this study, the proposed project is located on the southern coast of Ofu in the Manu'a District of American Samoa. The proposed project site is located within the Va'oto Plain at the Ofu Airport on the southern coast of Ofu on the Va'oto Plain.*

Step 2: Provide early public review of any plans or proposals for action in the base floodplain. *Several opportunities in the form of email communications were provided for public and agency review of the proposed project, as described in the draft IFREA.*

Step 3: If the action is in the base floodplain, determine whether there is a practicable alternative to the action. *The project is intended to provide shoreline protection and is not located within a base floodplain.*

Step 4: Identify beneficial and adverse impacts caused by the proposed action and any expected losses of natural and beneficial floodplain values.
The project is not located within a base floodplain nor do any waterways drain to the proposed project site. *Beneficial and adverse impacts associated with the recommended alternative are identified* and discussed *in the draft IFR/EA.*

Step 5: Determine viable methods to minimize any adverse impacts of the action and methods to restore and preserve the natural and beneficial values. *Potentially adverse impacts are expected to be avoided or minimized through implementation of appropriate mitigation measures, as described in the draft IFR/EA.*

Step 6: Reevaluate the proposed action based on the information generated in Steps 4 and 5. *An iterative plan formulation process was completed, as thoroughly described throughout the draft IFR/EA.*

Step 7: Prepare a Statement of Findings and advise the public if the proposed action will be in the floodplain. *Multiple opportunities have been and will continue to be provided for public and agency review of the proposed project. In addition, the draft IIFR/EA will be made available for public review.*

Step 8: Implement the action after completing the seven evaluation steps. *The project will be implemented after construction of the study if approved to move forward and all pre-construction permits are obtained.*

The project complies with the EO.

3.11 EO 11990 Protection of Wetlands

The purpose of EO 11990 is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, federal agencies are required, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. The EO applies to the following:

- Acquisition, management, and disposition of federal lands and facilities construction and improvement projects that are undertaken, financed, or assisted by federal agencies

- Federal activities and programs affecting land use, including, but not limited to, water and related land resources planning, regulation, and licensing activities.

The procedures require the determination of whether the proposed project would be in, or would affect, wetlands. If so, a wetlands assessment must be prepared that describes the alternatives considered. The procedures include a requirement for public review of assessments. The evaluation process follows the same eight steps as for EO 11988, Floodplain Management. As with EO 11988, this eight-step process can be addressed as part of the NEPA compliance process if an EA or EIS is developed.

3.11.1 Specific Regulatory Considerations for EO 11990

The Project Notification and Review System (PNRS) process as described above considers impacts to wetlands as part of the review process for proposed development projects. Furthermore, the ASCMP promotes the management of wetlands through environmental review of land use activities. The ASCMP manages the Community Based Wetlands Management Program, a grassroots resource management approach whereby villages can participate in managing their local wetlands (*American Samoa DOC 2015*).

The following government agencies are also involved in local wetland management and regulation in American Samoa: National Parks Service; Consolidated Farm Service Agency; Natural Resource Conservation Service; NOAA; USFWS; USEPA; State DMWR; Department of Parks and Recreation; DPW; Economic Development Planning Office; village leaders and councils; and the Zoning Board.

3.11.2 Wetlands Coordination for the Proposed Project

There are no wetlands within the proposed Project Are and no wetlands would be affected by and project activities. This EO is not applicable.

3.12 Clean Air Act of 1972 (42 U.S.C §7401 *et seq*.)

No air quality permits are required for this project. Because the project is located within an attainment area, USEPA's General Conformity Rule to implement Section 176(c) of the Clean Air Act does not apply and a conformity determination is not required.

3.13 Farmland Protection Policy Act of 1981 (7 U.S.C. §4201 *et seq*.)

No prime or unique farmland will be affected by implementation of this project. This Act is not applicable.

3.14 Wild and Scenic River Act of 1968 (16 U.S.C. §1271 *et seq*.)

There are no streams with special designations and no designated wild and scenic rivers in American Samoa (*National Wild and Scenic Rivers System 2015*). This Act is not applicable.

3.15 Estuary Protection Act of 1968 (16 U.S.C. §§1221-26)

No designated Estuary of National Significance will be affected by project related activities. This Act is not applicable.

3.16 Federal Water Project Recreation Act (16 U.S.C. §460(L)(12)-460(L)(21) *et seq*.)

Recreational resources and opportunities are discussed in the draft IFR/EA. The Preferred Alternative does not have any anticipated long-term impacts to recreation. The project complies with this Act.

3.17 Rivers and Harbors Act of 1899, Section 10 (33 USC §403 *et seq*.)

The proposed work would not affect navigable waters of the U.S. The proposed action will be subjected to the public notice and other evaluations normally conducted for activities subject to the Act. The project is in compliance with the Act.

3.18 Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990 (16 U.S.C. §3501 *et seq*.)

There are no designated coastal barrier resource system units that will be affected by this project. These Acts are not applicable.

Attachment 1. ESA species list/letter received from the USFWS Pacific Islands Fish and Wildlife Office

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850

February 22, 2022

In Reply Refer To:
2022-000660-S7-001

Mr. Christopher W. Solek
U.S. Army Corps of Engineers
Los Angeles District
915 Wilshire Boulevard
Los Angeles, California 90017

Subject: Species Letter for USACE Ofu Airport Emergency Shoreline Protection American Samoa

Dear Mr. Solek:

The U.S. Fish and Wildlife Service (Service) received your email on February 7, 2022, requesting a threatened and endangered species list for the USACE Ofu Airport Emergency Shoreline Protection American Samoa on Ofu, American Samoa. The U.S. Army Corps of Engineer's Continuing Authorities Program (CAP), Section 14 (Emergency Stream Bank and Shoreline Protection) is conducting a study to assess whether a Federal interest exists in continuing a cost-share feasibility study with the American Samoa Government, Department of Port Administration for the proposed project of emergency shoreline protection measures along approximately 300-500 feet of shoreline along the western edge of Ofu Airport runway.

This letter has been prepared under the authority of and in accordance with provisions of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq.*), as amended. We have reviewed the information you provided and pertinent information in our files, as it pertains to listed species and designated critical habitat in accordance with section 7 of the ESA. Our data indicate the following federally listed species may be present on or in the vicinity of the proposed project locations: *Eua zebrina*, the endangered American Sāmoa Distinct Population Segment (DPS) tu'aimeo or friendly ground dove (*Gallicolumba stiri*), endangered Central South Pacific (CSP) DPS lauamei ena'ena or green sea turtle (*Chelonia mydas*) and endangered laumei uga or hawksbill sea turtle (*Eretmochelys imbricata*). There is no federally designated critical habitat within the immediate vicinity of the proposed projects.

We appreciate your efforts to conserve endangered species. If you have questions regarding this response, please contact Joy Browning, Fish and Wildlife Biologist (phone: 808-792-9400,

INTERIOR REGION 9
COLUMBIA–PACIFIC NORTHWEST
IDAHO, MONTANA*, OREGON*, WASHINGTON
*PARTIAL

INTERIOR REGION 12
PACIFIC ISLANDS
AMERICAN SAMOA, GUAM, HAWAI'I, NORTHERN MARIANA ISLANDS

Attachment 1 (con't). ESA species list/letter received from the USFWS Pacific Islands Fish and Wildlife Office.

Mr. Christopher W. Solek 2

email: joy_browning@fws.gov). When referring to this project, please include this reference number: 2022-0006860-S7-001.

Sincerely,

AARON NADIG [redacted]

Island Team Manager
O'ahu, Kaua'i, Northwestern Hawaiian Islands and American Sāmoa

cc: American Sāmoa Department of Aquatic and Wildlife Resources

Attachment 2. FWCA Scope of Work from the USFWS Pacific Islands Fish and Wildlife Office.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850

In Reply Refer to:
Project No. 2022-0071112

Christopher W. Solek, Ph.D.
Chief, Regional Planning Section
Environmental Resources Branch, Planning Division
U.S. Army Corps of Engineers
Los Angeles District
915 Wilshire Blvd, Los Angeles CA 90017

SUBJECT: Fish and Wildlife Coordination Act (FWCA): Shoreline Protection - Ofu Airport, American Samoa

Dear Dr. Solek:

The U.S. Fish and Wildlife Service (Service) has received your request for our assistance in assessing marine habitat and biological resources, and potential impacts to those resources, at the site of the proposed Shoreline Protection project at Ofu Airport, American Samoa. The Service is requested to deliver a Fish and Wildlife Coordination Act (FWCA) Report to assist the U.S. Army Corps of Engineers (Corps) in assessing potential environmental impacts of the project and make recommendations for conservation of fish and wildlife resources. The area to be assessed includes the project footprint and adjacent areas of potential impact.

In the attached scope of work and budget we propose a survey plan that will provide qualitative and quantitative marine resource information as well as habitat delineation maps. The quantitative information will include coral abundance and size class distribution, cover of macroalgae, the abundance of non-coral macroinvertebrates, and a characterization of the geomorphological structure. We believe collecting this information will be informative in assessing the impacts of the proposed project. We will maintain coordination with your agency as the data collection progresses in case there is any indication that additional data will be needed.

Given the scope and specific location of this project, we believe our proposed timeline is feasible. However, we do provide caution that deviation from the proposed timeline could be required pending unforeseen circumstances. Though it is not expected, factors that could potentially delay this work

PACIFIC REGION 1

IDAHO, OREGON*, WASHINGTON,
AMERICAN SAMOA, GUAM, HAWAI'I, NORTHERN MARIANA ISLANDS
*PARTIAL

Attachment 2 (con't). FWCA Scope of Work from the USFWS Pacific Islands Fish and Wildlife Office.

Christopher W. Solek, Ph.D. 2

include adverse and unpredictable wind and sea conditions in the project area, and the unpredictable implications of the current COVID 19 pandemic.

We appreciate the opportunity to coordinate with the USACE on the proposed project. If you have any questions regarding this enclosed Scope of Work or Proposed Budget, please contact Biologist Jeremy Raynal at Jeremy_Raynal@fws.gov or by telephone at (808) 792-9423.

Sincerely,

EARL
CAMPBELL [redacted]

Earl Campbell
PIFWO Field Supervisor

Enclosures: (1) Scope of Work
(2) Budget
(3) Required Clauses

Attachment 3. USFWS Draft FWCA Planning Aid Report**

Phase 1 Marine Habitat Characterization

Emergency Shoreline Stabilization, Ofu Airport
Ofu Island, American Samoa

Planning Aid Report - Fish & Wildlife Coordination Act

DRAFT REPORT **March 2023**

Prepared for

U. S. Army Corps of Engineers
Los Angeles, California

Prepared by

Jeremy Raynal, Amanda Pollock and Joy Browning
U. S. Fish & Wildlife Service
Pacific Islands Fish & Wildlife Office
Honolulu, Hawaii

DRAFT
FISH AND WILDLIFE COORDINATION ACT REPORT

PHASE 1 MARINE HABITAT CHARACTERIZATION
EMERGENCY SHORELINE PROTECTION
OFU AIRPIRT

OFU ISLAND, AMERICAN SAMOA

Prepared by:

Jeremy Raynal, USFWS
Amanda Pollock, USFWS
Joy Browning, USFWS

U.S. Fish and Wildlife Service
Honolulu, HI

Tilali Scanlan
Nova Southeastern University
Fort Lauderdale, FL

Casadhe Mahuka
Coral Reef Advisory Group
Pago Pago, American Samoa

Prepared for

U.S. Army Corps of Engineers
Honolulu District

March 2023

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INTRODUCTION

Authority, Purpose and Scope

The Emergency Shoreline Protection project at Ofu Airport is being developed as a cooperative effort between the United States Army Corps of Engineers (Corps) and American Samoan Department of Port Administration (DPA) in Pago Pago, American Samoa. This Emergency Shoreline Protection project is authorized by Section 14 of the 1946 Flood Control Act (P.L. 79-525), as amended. The project will utilize federal funding and requires a Department of the Army Permit, and therefore triggers mandatory consultation under the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 *et seq.*; 48 Stat. 401], as amended (FWCA).

The FWCA provides the basic authority for the Secretary of the Interior, Secretary of Commerce, and the appropriate State fish and game agency to assist and cooperate with Federal, State, and public or private agencies and organizations in the conservation and rehabilitation of aquatic wildlife. This authority is provided to the Secretary of the Interior and delegated to the Service, and subsequently to the Ecological Services Program. The authority provided to the Secretary of Commerce is delegated to the National Marine Fisheries Service (NMFS) via Reorganization Plan No. 4. The authority provided to states and territories is delegated to Natural resource agencies there (e.g. DLNR in Hawaii). The FWCA report acts as one step in informing each of these resource agencies, in addition to the requesting or acting agency, on natural resources present in the proposed project area and potential project impacts to those resources.

The following report is prepared in response to the Corps request that the U.S. Fish and Wildlife Service (Service), Pacific Islands Fish and Wildlife Office (PIFWO) develop a FWCA report to advise Corps on FWCA compliance on the Ofu Airport Shoreline Protection project. An informal request for initial coordination was received by the Service with delivery of the document "Federal Interest Determination, CAP Section 14 Fact Sheet: Emergency Shoreline Protection, Ofu Airport, American Samoa" in an email from Dr. Chris Solek, of the Corps Los Angeles District, dated November 9, 2021. Informal coordination between Corps and the Service continued while project development was delayed due to the COVID 19 pandemic. The Service submitted a final Scope of Work and budget on August 8, 2022 and subsequently provided the following services: 1) collected and evaluated data; 2) analyzed potential project impacts; 3) provided recommendations for impact avoidance, minimization, and mitigation; 4) maintained coordination with Corps, the American Samoa Department of Marine and Wildlife Resources (DMWR), and the National Marine Fisheries Service (NMFS); and 5) drafted the FWCA report to document and present the those services. This FWCA report was prepared under the authority of, and in accordance with, provisions of the FWCA; the Clean Water Act of 1977 [33 USC 1251 *et seq.*; 91 Stat. 1566], as amended (CWA); the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq.*; 87 Stat. 884], as amended (ESA); and other legislation that authorizes the Service to provide technical assistance to conserve trust resources.

The proposed Ofu airport Emergency Shoreline Protection project aims to protect investment, infrastructure, and safe transportation at Ofu and the Manua Islands by hardening the shoreline at the west end of the newly constructed Ofu Airport runway. The Corps is currently assessing

Federal interest in continuing efforts with the DPA to further protect the runway with the proposed project.

The overall scope of the current investigation was to document the existing fish and wildlife resources within the proposed project site and to ensure that the fish and wildlife conservation receives equal consideration with other proposed project objectives. We included qualitative assessment of fish and wildlife resources at the proposed project site, evaluation of potential impacts associated with the proposed project design, and recommendations for fish and wildlife mitigation measures.

Description of Project Area and Proposed Action

American Samoa is a Polynesian archipelago and a U.S. territory located in the South Pacific Ocean about 2,300 miles southwest of Hawaii and 14 degrees south of the equator (Figures 1 and2). Most of the Territory's infrastructure and population is on the main island, Tutuila, in and around the capital of Pago Pago. Ofu is a sparsely populated island in the Manua island chain (Figure 3) located approximately 50 nautical miles east of Tutuila. The Manua Islands are remote and have limited available resources. Residents of Ofu and the neighboring island, Olosega, depend on Ofu's single runway for air transportation to and from the islands, for delivery of food, goods, and medical supplies, and for evacuation in case of emergencies. Air travel provides the only fast and reliable transportation option between the Manua Islands and Tutuila due to long distance over sea, unpredictable sea conditions, and infrequent ferry service.

The proposed project site is located on the southwestern facing coast of Ofu Island (Figures 3 and 4). This coastline is exposed to harsh environmental conditions. Consistent southeast trade winds and south swells, reaching up to 4 meters or more, impact the project site for much of the year. Sea level rise, increasing frequency and intensity of tropical cyclones, and high tides are compounding factors expected to contribute increasingly to shoreline erosion at the Ofu airport area. Recent increases in seismic activity in the Manua islands could also have unpredictable impacts on the local conditions and shoreline erosion at the project site. These factors pose increasing short and long-term threats to the Ofu Airport runway infrastructure, and therefore to the safety and security of the Manua Islands residents.

Reconstruction of the Ofu runway was completed in July 2022 using funding provided by the Federal Aviation Agency. Also in July 2022, king tides and high swells eroded the shoreline at the west end of the new runway and threatened its integrity (Figure 5). Local citizens piled stones by hand to temporarily protect the airstrip but impacts to airport operations may be imminent unless more robust and permanent shoreline protection is completed.

The shoreline at the east end of Ofu runway is protected by a rock revetment that was constructed in 1986 at the request of the American Samoan Government. The existing shoreline stabilization structure extends approximately 381 feet along the shore from sea level to the elevation of the runway, about 9 ft above sea level. The proposed project aims to protect the western side of the runway.

The proposed project footprint extends along the seaward edge of the western end of the current runway and along the beach. Continuing westward from the runway itself, the intertidal zone transitions from beach to reef flat and habitat transitions from sand to pavement and coral reef. The reef crest is about 140 m offshore where there is a high energy surf zone. The relatively steep fore reef slope drops off from there and the 100-fathom curve is approximately 0.6 nautical miles from shore. Coral reefs on Ofu typically include high coral cover and a diverse range of species. The offshore waters include productive economically and culturally important pelagic fisheries.

Project Alternatives Under Consideration

Seven project Alternatives were initially proposed for new construction: 1) no action, 2) airport relocation, 3) rock revetment, 4) tribar revetment, 5) cement rock masonry (CRM) wall, 6) concrete sheet pile wall, and 7) beach fill. The Corps has narrowed alternatives under consideration to include seawalls and revetments only. Both structure types include pros and cons. The proposed seawall designs have relatively small footprints (see Figure 4), likely to cause less initial direct environmental disturbance, but seawalls generally tend to increase erosion and could have greater impact on natural resources over time. Additionally, erosion tends to undercut seawalls over time causing critical structural failure in absence of regular maintenance. Revetments better dissipate wave energy, cause less erosion over time, and tend to require less maintenance, but include a larger project footprint (see Figure 4) and greater immediate impact to natural resources. The revetment alternatives presented for this project include a footprint greater than 30 ft. wide and would eliminate most of the beach for the entire length of the structure.

Three seawall designs are being considered for the proposed project including cement rubble masonry (CRM; Figure 6), sheet pile (Figures 7), and hybrid construction designs. The CRM seawall design is likely to be relatively inexpensive but has a wider footprint than other seawall designs. Sheetpile seawalls require deeper penetration into the substrate than other seawalls. Sheetpile seawalls can have a slim profile with a stable foundation but also tend to degrade over time. Sheetpile seawalls present at Midway Atoll are currently degrading, leading to structural failure, localized erosion, and environmental concerns (Figure 8). Hybrid seawall design would include both CRM and sheetpile construction. This design would likely be less expensive and penetrate less deep underground than a standard sheetpile wall and would have a slimmer profile and a more stable foundation than a CRM seawall.

Revetment design alternatives being considered include rock and tribar construction (Figures 9 & 10). A rock revetment would include a toe that would be notched 1 to 2 ft. into the hard substrate but would otherwise sit on top of the hard substrate. Economic feasibility of this alternative depends on local availability of quality rock. In potential absence or impracticality of using locally sourced rock, the tribar revetment design is an alternative that has been widely used throughout American Samoa. Tribar revetment construction includes interlocking cement structures. There is substantial local experience in working with this material, the resulting construction has proven robust in local conditions, and local people are accustomed to seeing this type of structure in Tutuila so might be comfortable with its appearance.

Prior Fish and Wildlife Service Studies and Reports

USFWS. 2005. Tutuila Harbor Study, Island of Tutuila, American Samoa. Final Fish and Wildlife Coordination Act Report, May 2005. 187 pp.

USFWS. 2005. Leloaloa Shoreline Protection, Island of Tutuila, American Samoa. Final Fish and Wildlife Coordination Act Report, August 2005. 47 pp.

USFWS. 2006. A biological Assessment of Stream and Adjacent Coral Reef Resources, Tutuila Island, American Samoa, August 2006. 104 pp.

USFWS. 2012. Phase 1 Marine Habitat Characterization: American Samoa Shoreline Protection, Tutuila, American Samoa. 127 pp.

Prior Studies and Reports by Other Agencies

USACE. 1985. Section 14 Reconnaissance Report on Shore Protection for Ofu Airstrip, Ofu Island, American Samoa, May 1985.

USACE. 2003. Ofu Airstrip Shore Protection Project Operations and Maintenance Manual, Ofu Island, Territory of American Samoa, August 2003.

USACE. Hurricane Induced Stage-Frequency Relationships for the Territory of American Samoa. TR CHL-98-33.

USACE. 2020. American Samoa Climate Related Vulnerability Assessment for Transportation Infrastructure, April 2020.

Coordination with Federal and State Resource Agencies

9 November 2021 – Corps informed the Service of developing plans for Ofu Airport Project

18 November 2021 – Initial meeting to discuss project plans and early consultation and BMPs

26 January 2022 – Updated milestone dates provided by Corps via email

8 February 2022 – Service provided Corps with draft SOW

9 March 2022 – Consultation meeting with American Samoa DMWR

6 June 2022 – Corps and Service discussed Project Alternatives and Measures and potential concerns for natural resources.

8 August 2022 – Service provided final edits to SOW

28 October 2022 – Corps informed Service and DMWR of project Alternative Recommendation

3 November 2022 – Corps informed Service of change in project plan to concrete seawall.

21 February 2023 – Service in person meeting with DPA, Pago Pago.

22 February 2023 – Service in person meeting with DMWR, Pago Pago.

22 February 2023 – Service briefed Corps of field observations and findings.

28 March 2023 – Service provided Corps and NOAA preliminary results of FWCA study.

FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

U.S. Fish and Wildlife Service Planning Objectives

The mission of the Service consists of working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. In 2016, the Service updated its 1981 mitigation policy to better meet this mission (USFWS, 2016), but has since rescinded the revised 2016 mitigation policy (USFWS, 2018) leaving the 1981 policy in effect. The Service's 1981 Mitigation Policy (USFWS, 1981) outlines internal guidance for evaluating project impacts affecting fish and wildlife resources. The Mitigation Policy complements the Service's participation under NEPA and the FWCA. The Service's Mitigation Policy was formulated with the intent of protecting and conserving the most important fish and wildlife resources while facilitating balanced development of this nation's natural resources. The policy focuses primarily on habitat values and identifies four resource categories and mitigation guidelines. The resource categories are shown in Table 2.

***Table 1: Resource Categories.* Resource categories and mitigation planning goals.**

Resource Category	Designation Criteria	Mitigation Planning Goal
1	High value for evaluation species and unique and irreplaceable.	No loss of existing habitat value.
2	High value for evaluation species and scarce or becoming scarce.	No net loss of in-kind habitat value.
3	High to medium value for evaluation species and abundant.	No net loss of habitat value while minimizing loss of in-kind habitat value.
4	Medium to low value for evaluation species.	Minimize loss of habitat value.

The proposed Emergency Shoreline Protection project measures could directly impact high value sea turtle nesting beach area and coral reef area that meets the description of Resource Category

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2. Other areas that could potentially be impacted by the proposed project meet definitions of Resource Category 3. Turtle nesting habitat and coral reef areas should be considered "high" value due to the marine resources documented and sources cited in this report.

The status of green sea turtles (*Chelonia mydas*) changed from a world-wide population in 2016 to 11 Distinct Population Segments (DPS). This placed green sea turtles in American Samoa into the endangered Central South Pacific DPS (81 FR 20057, April 6, 2016), further increasing the importance of all nesting and foraging habitats. Although geographically widespread in the Pacific, nesting in Central South Pacific DPS occurs at low levels (Seminoff et al., 2015). Like green sea turtles, hawksbill turtles (*Eretmochelys imbricata*) nest on seven islands in American Samoa with very limited data on nesting locations and abundance. Green sea turtles and Hawksbill sea turtles (hereafter referred to as turtles) are restricted to nesting on these remote islands in the Pacific and only in areas where sandy beaches occur above the mean high tide line to reduce potential egg mortality from inundation and flooding. Nesting habitat is decreasing with increasing human development along the coast and shoreline (Tuato'o-Bartley et al., 1993) coupled with beach erosion (Liusamoa per Comm).

Coral reefs are considered scarce based on the local, national, and global decline of coral reefs (Williams et al., 2009; Walsh et al., 2010; Waddell (ed.), 2005; Waddell and Clarke (eds.), 2008; Wilkinson (ed), 1998; Wilkinson (ed), 2000; Wilkinson (ed), 2004; Wilkinson (ed), 2008) and the geographical constraints of coral reefs in the United States. Coral reefs have also been designated as Special Aquatic Sites under the Clean Water Act (CWA). Special Aquatic Sites are defined as "geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values." They are further described as "significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region" (40 CFR Part 230 §230.44/FR v.45n.249).

Designations of Resource Category 2 and Special Aquatic Site require the Service to recommend ways for the action agency to mitigate losses through measures to avoid or minimize significant adverse impacts. In the event losses are unavoidable, measures to rectify immediately, reduce, or eliminate losses commensurate with project permitting or implementation will be recommended under the FWCA. Recommendations will focus on compensation for the replacement of habitat values and ecological functions. An effective and verifiable mitigation program planned and executed by the project proponent is required under NEPA and the CWA.

To this end, it is the policy of the Service to provide federal leadership for the conservation, protection, and enhancement of fish, wildlife, and their habitats by seeking to mitigate their losses with a facilitated, balanced approach to proposed water development actions. The Service's 1981 mitigation planning policies achieve this by the following: 1) State-Federal Partnership, 2) Resource Category Determinations, 3) Impact Assessment Principles, 4) Mitigation Recommendations, 5) Mitigation means and Measures, and 6) Follow-up.

Within these planning policies, the key term *evaluation species* is used to describe the fish and wildlife resources selected for impact analysis. There are two basic approaches to the implementation of evaluation species: 1) selection of species with high public interest, economic value, or both, and 2) selection of species that provide a broad ecological perspective of an area. While some species may be appropriate for both approaches, the Service emphasizes using species that provide a broad ecological perspective.

The evaluation species typically used for sandy coastal ecosystems are turtles. Turtles require the natural sandy beaches in coastal ecosystems to complete the reproduction part of their life cycle. Sea turtles in the Pacific nest on isolated and remote islands with sandy beaches.

The evaluation species typically used for tropical Pacific marine ecosystems include stony corals, seagrasses, and certain benthic algal groups (*Halimeda* meadows or unique coralline algal communities). Some situations may dictate the use of additional benthic species and key fish species as important evaluation species, but the Service currently does not consider fish species in our assessments.

These evaluation species are important as they also relate to other federal agency policies. Coral reefs are generally considered high value habitat and have been defined in the CWA Section 404(b)(1) guidelines as "skeletal deposits, usually of calcareous or silicaceous materials, produced by the vital activities of anthozoan polyps or other invertebrate organisms present in growing portions of the reef." Stony corals are a foundation species to the development of coral reefs and hence are often the central focus of mitigation within the Pacific Island region. Coral reefs are further considered to be Special Aquatic Sites under the CWA 404(b)(1) guidelines. Finally, the 404(b)(1) guidelines also consider vegetated shallows to be Special Aquatic Sites. Within the Pacific Islands, the Service considers *Halimeda* meadows and seagrass communities to be vegetated shallows. Such Special Aquatic Sites are areas that possess special ecological characteristics and contribute to the overall benefit of the ecosystem.

This report includes assessment of potential impacts to ESA listed species (e.g. sea turtles, ESA corals) and additional ecological data collected by the Service in early 2023. Specific attention is applied to understand the resources included under Resource Categories 1 & 2 and potential project impacts to them. Though representative surveys were completed at sites that are most likely to be impacted, it is possible that some valuable resources may have been missed during field surveys. Precautionary plans for mitigation of any potentially resources should be considered.

Resource Concerns

The primary concerns associated with the proposed project include the potential impacts to sea turtle nesting habitat and coral reef ecosystems. This project is expected to have direct impacts to sea turtle nesting habitat. It is not likely to impact reefs directly but could have secondary impacts due to altered flow, erosion, turbidity, and sediment patterns caused by construction activities and by hardening the shoreline. Negative impacts to the shoreline and marine environment can potentially be minimized with appropriate planning and use of best management practices (BMPs), however, some compensatory mitigation might be needed due to expected losses of ESA listed species or their habitat.

The Service's specific planning objective is to collect and provide the Corps and Federal, State, and Territory resource agencies with data on the fish and wildlife resources, particularly marine species and habitats, that are most likely to be impacted by the proposed project. The Service also aims to interpretate those data and provide minimization, avoidance, and mitigation comments, and recommendations to consider during additional project planning and ongoing coordination among the Corps and resource agencies.

EVALUATION METHODOLOGY

Field Data Collection Protocol

Biologist viewed the intertidal zone to approximate the mean high tide line and assess current erosion impacts. Local experts were consulted to gain insight on frequency and intensity of high water events that inundated the sandy beach area, and temporal turtle nesting data.

Geomorphological structure, benthic habitat characteristics, and potential sea turtle nesting areas were surveyed at the proposed project site from the intertidal zone across the reef flat to the surf zone. Surveys were limited to the intertidal zone and reef flat because surf conditions limited safe access to the reef crest and forereef. Data was collected to map and assess potential impacts to benthic resources by the Emergency Shoreline Protection project.

Phase I Habitat Mapping

Phase I survey methodology was used to identify and map benthic marine habitat types, ground truth any information assumed from previously available benthic data sources, and to generally identify benthic habitat and species present.

A team of two biologists collected qualitative information on the habitats and biological communities within the survey area using snorkeling equipment. The survey teams used various available benthic data sources, satellite imagery, daily environmental conditions, and previous local experience to predetermine general areas and specific starting points for the surveys. The total number of transects surveyed was based on the time available and the area to be covered. The survey team was equipped with digital cameras, dive watches, GPS units, and datasheets attached to clipboards to record data. The team collected habitat and biological information along swim paths while towing a pair of floated GPS units. The GPS units were used to mark starting and ending waypoints and were set to automatically record a track log with 5 to 10-second intervals. GPS units were continuously aligned near the team to minimize spatial error between the biologists and the GPS path. The time on digital cameras was synchronized with the GPS units by photographing the time of the GPS unit before entering the water. Any time difference between dive watches and GPS units was recorded for later synchronization. This allowed scientists' observations to be linked to time and approximate locations (GPS coordinates) where the observations were made.

The survey team included a habitat/coral biologist and an algae/invertebrate biologist. All surveyors recorded data on observed habitat zones, debris observations, and protected species, in addition to their assigned focal taxonomic/geomorphologic/ecological groups. Each biologist recorded the estimated distance they were able to effectively observe, as visual assessment range is potentially limited by water clarity, rugosity of habitat, complexity of habitat, water depth, and other environmental conditions that can limit visible distance. One biologist was assigned as the navigator. The navigator followed a pre-determined compass bearing, depth contour, habitat boundary or other criteria used to define the survey transect path. Each biologist collected photographic documentation of significant species and habitat types observed.

Habitat Terminology and Characterization

Terminology used in this report to describe habitat was modified from Battista et al. (2007). Detailed definitions are available from the Pacific Islands Fish and Wildlife Office upon request. Although the classification of Battista et al. (2007) was not developed specifically for impact assessments, the terminology and characterization framework are generally appropriate for the purposes of characterizing habitats for this Phase I survey. The framework described in Battista et al. (2007) included three data layers of habitat information including classification of geographic zones, geomorphological structures, and biological cover. The Service used the terms for geographic zones, geomorphological structures, and major geomorphological structures with slight modification. The "geographic zones" were referred to as "habitat zones", "geomorphological structures" were called "habitat structures", and "major geomorphological structures" were referred to as "major habitat structures."

Habitat zones were generally determined prior to entering the water and verified by the teams during the survey and upon analysis of the qualitative data collected. To verify habitat zones, the habitat/coral surveyor identified habitat structures as accurately as possible while in the water. The navigator led the survey teams along approximated habitat structure boundaries where possible to assist with further delineation between habitat structures. Biological characterization was focused on one side of any observed boundaries to apply appropriately to each specific habitat structure involved in the assessment. This characterization focus was coordinated by the observers and noted on their datasheets. The boundaries between habitat structures were evaluated or refined during the data processing phase (see Habitat Map Production methods). The types of unconsolidated sediments observed were scored as present or absent and categorized as sand, mud, rubble, and cobble.

In addition to characterizing the habitat structures, the habitat/coral surveyor also characterized habitat complexity. The categories of habitat complexity used were the same as used by NOAA's Pacific Islands Fishery Science Center (Brainard et al. 2008; Brainard et al. 2012) and included six categories recorded on a 0-5 scale: 0 for low, 1 for medium-low, 2 for medium, 3 for medium-high, 4 for high, and 5 for very high. "As examples, low habitat complexity is often associated with flat sand plains or rubble habitats; medium habitat complexity is often associated with small to moderate spur and groove, coral or boulder habitats; and high or very high habitat complexity are often observed as high or extreme vertical relief associated with steep spur-and-groove canyons, pinnacles, and walls" (Brainard et al. 2008).

Biotic Characterization

The biologists inventoried biological groups/categories and species observed along the survey transect. Information on the biological groups/categories was recorded every 10 to 60 seconds depending on the habitat area/complexity and speed of swimming. Visual assessment range was recorded. The biotic characterization included three main survey categories including habitat/coral, algae/invertebrate, and ESA corals, and each main category included multiple data collection components as described in the following sections.

Habitat/Coral Characterization

The habitat/coral surveyor also collected information on six different components of the coral population within each surveyed area. These components included the relative abundance of stony corals, stony coral growth forms observed, estimated stony coral sizes present, and presence of non-stony corals (see components 1–6 below). Each observation, and the time of observations (hh:mm:ss) was recorded to identify approximate GPS coordinates for each observation. Approximate radius (m) of areas assessed for coral abundance was recorded. The observer also photographed representative habitats, coral communities, coral colonies, and/or any other notable features.

Component 1 – Habitat structure and sediment were classified continually and with the same frequency as other data. Habitat zones were classified at the start of the dive or when a change of zone was found.

Component 2 – Relative coral abundance was recorded utilizing a modified DACOR method. DACOR stands for dominant (5), abundant (4), common (3), occasional (2), or rare (1). Categories were recorded on a 1-5 scale with 1 being Rare and 5 being Dominant. Zero was used for coral absence. Each category was approximated to represent a broad range of percent coral cover such as 1 – <1% (scattered corals), 2 – <10%, 3 – 10–50%, 4 – 50–80%, and 5 – >80%.

Component 3 – Stony coral growth forms included: 1) lobate/massive, 2) conical, 3) small-branching, 4) medium-branching, 5) large-branching, 6) digitate, 7) columnar, 8) table, 9) plate, 10) foliaceous, 11) encrusting, 12) free-living, and 13) mixed. Possible mixed growth forms included forms like plates-and-column and plates-and-branched, but if other combinations existed, they were recorded as well. The distinction between small and medium branching colonies was made by using the approximate diameter of a pencil (< 1 cm), while the distinction between medium and large branching colonies was made by using the approximate diameter of a small wrist (< 5 cm). For data analysis, these growth forms were lumped into fewer categories including: 1) lobate, microatoll, branching, encrusting, plate-like, and free-living.

Component 4 – For each growth form observed, the sizes observed were recorded as broad size categories, including: 1) small (less than 50 cm), 2) large (greater than 50 cm), 3) mixed (including both small and large colonies), and 4) extra-large colonies (greater than 2 m).

Component 5 – Non-stony coral groups were recorded as present or absent. The groups include: 1) soft corals, 2) zoanthids, 3) gorgonians or sea fans, and 4) black or wire corals.

Component 6 – If coral disease or bleaching was observed, it was noted in the comments section of the datasheet and recorded in the Access database. It was recorded as coral stress (present of absent), and then logged as disease, pale bleached, partial bleached, or complete bleached.

A list of coral species observed in the project area was also produced. A team of two local experts completed a free swim of the project area to identify all coral species observed. Corals were initially identified in the field. Corallites and colonies were also photographed as clearly as possible for species identification verification. Coral species identification was verified by field scientists and an additional local coral expert using the digital imagery.

Algae/Non-Coral Invertebrate Characterization

The algal/invertebrate observer collected information on up to eight different components. These components included relative abundances for seagrass, turf algae, coralline algae, filamentous algae, macroalgae, and several invertebrate groups. The observer also recorded observations on debris. The details for each component are listed below. Locations of each observation were recorded. The visual assessment range was estimated and representative habitats, representative algal and invertebrate communities, algae and invertebrates for species identification, or any other notable feature of interest were photographed.

Component 1 – Relative abundance for seagrass was recorded on a scale of 0–3. Zero was used for seagrass absence. Category 1 represented seagrass abundance that consisted of isolated patches and did not have continuous coverage within an area. Category 2 represented seagrass that has semi-continuous or continuous coverage, but only a low density of blades. Category 3 represented seagrass with continuous coverage and a high density of blades or a tall canopy height. The species of seagrass were recorded.

Component 2 – Relative abundance for turf algae was recorded on a scale of 0–3. Zero was used for turf algae absence. Category 1 represented turf algae that had sparse or patchy coverage and/or low density. Category 2 represented a moderate, semi-continuous coverage and a low to moderate density of turf algae. Category 3 represented continuous coverage and a high density of turf algae. Turf algae were considered to include sparse to thick multi-specific assemblages of diminutive and juvenile algae less than 2–3 cm in canopy height.

Component 3 – Relative abundance for coralline algae was recorded on a scale of 0–3. Zero was used for coralline algae absence. Category 1 represented a sparse or patchy coverage of coralline algae. Category 2 represented a moderate or semi-continuous coverage of coralline algae. Category 3 represented a continuous coverage of coralline algae. Coralline algae were identified as readily visible red or pink corallines on the reef surface. The observer did not look in holes or under rocks to assess the coralline algae abundance.

Component 4 – Relative abundance of filamentous algae and cyanobacteria was recorded on a scale of 0–3. Zero was used for absence of filamentous algae or cyanobacteria. Category 1 represented a sparse or patchy coverage of filamentous algae or cyanobacteria. Category 2 represented a moderate or semi-continuous coverage of filamentous algae or cyanobacteria. Category 3 represented a continuous coverage and a high density of filamentous algae or cyanobacteria. Filamentous algae were defined here as hair-like plants that do not form a substantial thallus or a coherent tissue (definition modified from Huisman et al. 2007, page 254). Common filamentous algae that are representative of this group include *Cladophora* spp. or *Bryopsis hypnoides* (not *Bryopsis pennata*). Common cyanobacteria that are representative of this category include *Lyngbya* spp. and *Hormothamnion* sp.

Component 5 – Relative abundance of macroalgae was recorded on a scale of 0–3. Zero was used for macroalgae absence. Category 1 classification represented sparse or patchy (even individual plants) and a low density of macroalgae. Category 2 classification represented moderate, semi-continuous coverage and a low to moderate density of macroalgae. Category 3 represented a continuous coverage with a high density of macroalgae. In addition to recording the relative abundance, four forms of macroalgae were recorded as being present or absent and included short frondose, tall frondose, *Halimeda* algae, or invasive macroalgae. Short frondose macroalgae was defined as having a maximum canopy height of 20 cm and tall frondose macroalgae was defined as having a minimum canopy height of 20 cm.

Component 6 – Relative abundance for all non-coral invertebrates was recorded on a scale of 0–3. Zero was used for invertebrate absence. Category 1 classification represented an observation of 1–2 individuals. Category 2 classification represented the observation of 3–10 individuals. Category 3 represented the observation of more than 10 individuals. If an aggregation of significantly more than 10 individuals was observed, this was recorded in the comments section. The invertebrate groups included grazing sea urchins, rock boring sea urchins, crown-of-thorns starfish, lobsters, *Pinctada margaritifera*, giant clams, anemones, sea cucumbers, molluscs (strombids, top or turbin shells, Triton's Trumpet, helmet shells, etc.), octopus, seastars (*Linckia* sp., *Culcita* sp., or others), and crinoids. In addition, the presence and absence (but not relative abundance of) sponges and tunicates in all forms and shapes were recorded.

Component 7 – The observation of marine debris (deb) or remnant structure underwater was recorded as present or absent. The type of structure or debris was also recorded (UXO, tires, misc., etc.).

Component 8 – The final component was the compilation of an overall species list for all algae and invertebrate species observed. Species were identified to the lowest taxonomic level possible, either *in situ* or by subsequent examination of photographs taken on-site.

Post-Field Work Data Processing

Data Preparation

Digital images and GPS data were downloaded using appropriate software. Images were placed into daily folders and GPS data were downloaded using DNRGPS 6.0© as a tab-delimited text file (.txt). Benthic data were entered into a Microsoft Access® database. After all data are entered into the Access database, the gps data, dive data, habitat/coral data, and algae/invert data were validated for errors or anomalies. All errors were corrected, and the data were processed for geosyncronization. The final, validated, georeferenced data were stored as a database file (.mdb).

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Data Processing

Habitat map data layers were produced with a series of Service custom built scripts (Marine_Mapping_Model1_v4.R and Marine_Mapping_Model2_v4.R) using R software (R Core Team, 2020). These custom built scripts used several packages including RODBC (Ripley and Lapsley 2020), sf (Pebesma et al. 2020a), raster (Hijmans et al. 2020), rgdal (Bivand et al. 2020a), dismo (Hijmans et al. 2017), deldir (Turner 2020), maptools (Bivand et al. 2020b), rgeos (Bivand et al. 2020c), smoothr (Strimas-Mackey 2020), spatialEco (Evans et al. 2020), cleangeo (Blondel 2019), sp (Pebesma et al. 2020b), gstat (Pebesma and Graeler 2020), R.utils (Bengtsson 2020), and rmapshaper (Teucher et al. 2020). The first script (Marine_Mapping_Model1_v4.R) processed the raw survey data exported from the database file. External data can be incorporated into the data processing including various other resources such as NOAA's Benthic Habitat Maps (Battista et al. 2007), land classification layers, existing DEM layers, or habitat classification from Feature Analyst®. All available benthic classification data were incorporated into the classification layer produced from this project's field data to provide a comparative option for the final classification. After the individual datasets were processed, they were incorporated and combined into the draft classification layer. This draft layer was processed based on comparative criteria and manual interpretation of the results to produce a final classification layer in the second script (Marine_Mapping_Model2_v4.R). The second script also finalized the geoprocessing steps and incorporated a series of interpolations for all the biological groups as described previously.

Initial input layers used to begin the data processing included area enclosure and Target Area shapefiles, and a raw database output file. The Target Area shapefile represented the largest area of expected potential direct impact of the proposed action considering the currently described Project Alternatives. The approximate Target Area was provided by the Corps. The area enclosure shapefile represented a larger area to clip the spatial data so that it could not extend beyond the area of interest. The area enclosure prevents inclusion of extraneous data that could potentially interfere with analyses. The Project Area was defined by a 100 m buffer of the Target Area and the area directly surveyed by divers and is intended to represent the area of highest likelihood of secondary impacts.

During the classification stage, set classification criteria and manual interpretation of the layer classifications were used to finalize classification. The set classification criteria and manual interpretation determined the boundaries of the habitat structures by: 1) direct observation, 2) transects that are swum along habitat structure transition boundaries (e.g. scattered rock in unconsolidated sediment on one side and unconsolidated sediment-sand on the other side), 3) utilizing NOAA's Benthic Habitat Maps where deemed appropriate, or 4) other data sources as described previously (e.g. Feature Analyst outputs based on WorldView-2 imagery) that provided information on habitat structures. These boundaries were assumed to represent a best estimate of actual habitat boundaries based on the available information. After the boundaries were drawn for each habitat character, the edited Theissen polygon was validated to reassure all changes were correct and complete.

The models were also used to generate output tables that included all geodetic area calculations for each major habitat structure, habitat structure, sediment type, and habitat zones.

DESCRIPTION OF FISH AND WILDLIFE RESOURCES AND HABITAT

General

The project Target Area was located directly west and southwest of the western end of the Ofu Airport runway, running parallel to the natural shoreline. The Target Area represents only the primary project impact area and does not reflect the total impact area within the Project Area. While the Project Area was intended to cover the likely area of both direct and indirect effects, it may be larger or smaller than actual impacts.

Appendix A contains the 20 maps depicting the habitats and biological resources within the Project Area. Details of the maps are discussed below. Table 2 shows the breakdown for the Target Area including the surveyed structures, zones, and sediment types. The total area was 3518 m^2. The geomorphological habitat structures were made up of Land (32.8 percent), Scattered Coral Rock in Unconsolidated Sediment (48.8 percent), Pavement (8.1 percent), and Unconsolidated Sediment (10.2 percent). The habitat zones included Land (32.8 percent) and Shoreline Intertidal (67.1 percent). The major geomorphological habitat structures included Land (32.8 percent), Mixed (48.8 percent), Hard Bottom (8.1 percent), and Unconsolidated Sediment (10.2 percent). The sediment present was generally Sand and Rubble.

Intertidal Habitat

Habitat Characteristics

The Target Area included a strip of partially vegetated land (approximately 33 percent of the Target Area) most directly adjacent to the runway and inland of the intertidal zone. The remainder of the Target Area (approximately 67 percent) was Shoreline Intertidal habitat and could be generally considered a sandy beach including rubble, scattered boulders, and a small area of pavement (see Figures 11, 12, and A5 to A8). Some rocks at the site appeared to be deliberately placed to protect the runway from erosion (Figure 13).

Biological Resources

The intertidal habitat located within the Target Area is periodically covered by normal high tides, however, the biological community observed there was largely terrestrial and not captured by our data. Marine biological data was only collected at the seaward extremes of the Target Area and was otherwise absent from the Target Area. It should be noted that some figures in Appendix A appear to indicate low abundance presence of marine species up to approximately 5 m inland from the point where they were observed.

The entire observed Shoreline Intertidal habitat within the target area appears to be suitable habitat for turtle nesting (see Figures 11–14). This includes an area of 2363 m^2 or approximately 67 percent of the proposed Target Area. Egg-laying adults and hatchlings could potentially traverse the beach within the proposed Target Area when moving between nesting sites and the sea. No turtles or turtle nests were observed in by biologists during this study.

Reef Flat Habitat

Habitat Characteristics

The reef flat is located directly seaward of the Target Area and the intertidal zone. The reef flat was characterized by water depth of approximately 0.1–2.0 m over primarily Hard Bottom Pavement with smaller areas of Mixed Habitat Structure consisting of Scattered Coral Rock in Unconsolidated Sediment (Figures 15 and A4 to A7). Habitat complexity at the reef flat was low (Figure A9) with relief generally less than 1 m. Continuing offshore, the surf zone was rough with powerful swells breaking approximately 100 m offshore. The swells pushed whitewater with surge and current making a dynamic physical environment with near continuous flushing of the reef flat with fresh ocean water, particularly at higher tides (Figure 11). The reef flat was shallow and calmer on low tides (Figure 13 and 16).

Biological Resources

The reef flat appeared to be a productive and healthy coral reef habitat overall (Figure 17). Coral cover, diversity, and colony size generally increased progressively from shore to the surf zone (Figure A12). One exception was that the larger microatolls (*Porites sp.*) tended to be closer to shore. The nearest live coral colony to the Target Area was observed 27 m away from the runway cement and approximately 10 m outside the Target Area (Figures 16 and 18). Coral cover was limited to scattered individuals near the low tide mark but quickly progressed to 10-50 percent cover slightly further from shore and near 80 percent coral cover just inside the surf zone where large encrusting and lobate corals and numerous small branching corals dominated. Three species of ESA listed corals were observed and photographed within the Project Area including *Acropora globiceps* (Figure B4), *Acropora retusa* (Figure B9), and *Isopora crateriformis* (Figure B22). Confirmed locations of occurrence were recorded for some of the observed listed corals (*A. globiceps* and *I. crateriformis)* and can be seen in Figure 19.

Crustose coralline algae, frondose algae, and turf algae were common but not dominant throughout the reef flat (Figures A14–A16). *Halimeda* was observed in dense isolated clusters (Figure 20). Filamentous algae and cyanobacteria were uncommon (Figure A17). Seagrass was not observed. Sea cucumbers were observed in approximately 8–10 locations and were therefore moderately common on the reef flat (Figure A18). One crown of thorns starfish (Figure A19) and one giant clam (Figure A20) were observed in in the Project Area. Additional invertebrates were not observed in populations considered significant to define the overall ecosystem characteristics.

PROJECT IMPACTS

The proposed project footprint most significantly consists of sandy beach with scattered rock boulders. The Target Area extends across the intertidal zone approximately to, but generally not including the low water line. The primary potential impacts from this project include direct loss of approximately 2363 m^2 of potential green sea turtle nesting habitat. There is also potential that the project could interfere with turtles attempting to lay eggs or hatching in the area while construction is ongoing.

Impacts to turtle nesting habitat will depend on which Project Alternative is chosen for this project, but the specific impacts of each alternative are currently difficult to quantify with the available information. Seawall alternatives would impact a smaller footprint initially but could require more frequent maintenance and lead to more severe erosion of beach sediments over time compared to revetment alternatives. The proposed revetment alternatives require a greater take of potential turtle nesting habitat initially, and potentially use more intrusive construction methods, but the revetment designs are also expected to require less maintenance and cause less severe erosion of the beach over the long term.

Seaward of the proposed project footprint, the habitat quickly transitions from sand to pavement and coral reef in a way that is relatively typical throughout American Samoa. The coral reefs of Ofu generally include reef flats with high coral cover and a wide range of species diversity. At least three ESA-listed coral species were found within the Project Area. The nearshore coral reefs at Ofu are generally high value ecosystems with particularly high cultural and economic value to locals. These coral reefs warrant conservation with a precautionary approach.

The shoreline at the eastern end of the runway is stabilized by a rock revetment built in 1986. It appears to be a sound structure that serves its intended purpose. However, it was noted in the field that most of the sand has eroded away at the base of the revetment revealing bare pavement. We cannot currently provide specific evidence to support the possibility that this erosion was caused by the revetment or that the erosion has had negative impacts on the adjacent coral reef or infaunal communities. However, it is reasonable to assume that placement of a revetment at the western end of the runway could lead to similar erosion of beach sediments and therefore impact areas outside of the Target Area. Indirect impacts of the project could include loss of coral colonies growing directly adjacent to the new structure. However, coral cover close to shore was relatively low. The closest observed ESA-listed coral colony was about 25 m seaward of the Target Area. Overall, significant negative impacts of the proposed project on coral reef habitat can be considered possible but not likely. Potential secondary impacts to coral reefs and other nearshore marine resources can likely be minimized with adherence to best management practices and recommendations provided below.

RECOMMENDATIONS

1) *The Service recommends going forward with the rock revetment or the tribar revetment alternative designed to minimize potential erosion:*

The proposed revetment alternatives are expected to include greater initial take of beach habitat and extend closer to the reef flat than proposed seawall alternatives would. However, the proposed revetment designs are expected to be more robust and require less maintenance over time. Regular maintenance, as might be required of seawalls, would likely include frequent disturbances to the environment. Frequent disturbances generally provide heightened potential for negative impacts to natural resources.

The revetment alternatives are also expected to cause less severe erosion. While some erosion of the beach at the water edge and the toe of the revetment would be expected, the gradual slope of the revetment structure is expected to dissipate wave energy better that a seawall would. As a result, seawall alternatives are expected to cause undercutting (potentially leading to structural failure) and more extensive and energetic erosion both along the base and at the ends of the wall, which could result in turbidity and sediment impacts to adjacent marine resources.

Any alternative chosen should be designed to minimize erosion of the beach at the ends of the structure as this can cause significant reshaping of larger sections of beach and potentially impact intertidal and nearshore habitats greater than erosion limited to the base of the structure.

2) *The Service recommends that the footprint of the project be reduced as much as possible, within the confines of the chosen alternative, to achieve the required result. Both length and width reductions, and otherwise maximizing distance from the structure to the water would help to reduce potential impacts to important natural resources:*

The project footprint is expected to include nesting habitat for threatened green sea turtles. Any reduction to the project footprint, particularly in longshore length of the structure, will be a reduction to loss of potential green turtle and hawksbill turtle nesting habitat. Any increase in the width of the structure or the distance between the base of the structure and the water will help to minimize potential impacts to marine species and habitats. The shoreline stabilization structure should be constructed as close to the runway structure and as far inland as possible. Vegetation (natural and nature-based solution) is a previously screened project alternative that could potentially be revitalized and used in conjunction with a revetment to meet erosion prevention and environmental goals. Native vegetation is recommended.

3) *The Service recommends all work be completed in a manner to minimize chances of turtle and hawksbill sea turtle interactions:*

On-site work should only be done outside of peak nesting seasons when sea turtles are least likely to lay eggs, incubate, or hatch. In Ofu, green turtle nesting season is generally August–February and hawksbill turtles generally nest September–July, but the peak occurs January–February (Tuatoʻo-Bartley et al. 1993). The service recommends planning work around March–September but it will be important to verify that nesting is not occurring while work is ongoing.

Surveys should be conducted by a trained individual who is familiar with sea turtle tracks, and be undertaken each morning prior to beginning on-site work to ensure that there is no evidence of turtles or turtle nests in the area. If evidence of turtle activity is observed, work should cease and USFWS should be consulted for next steps.

4) *The Service recommends that on-site work should not be conducted at night or with use of artificial lights:*

Sea turtles typically lay eggs and hatch at night or in low light conditions and are attracted to artificial lights. Use of lights can lure turtles away from safe passage and otherwise impact their behavior.

5) *The Service recommends that all work including heavy equipment, movement of sediments, or construction be conducted at low tides to avoid sedimentation and other impacts to the marine environment.*

6) *The Service recommends that heavy machinery only be used from the land side of the Target Area and not be used, driven, or stationed on the beach at any time. All machinery used should be cleaned of potential contaminants at upland sites to ensure that runoff and contamination do not reach the beach or marine ecosystems.*

7) *The Service recommends that any project-related debris, trash, or equipment be removed from the beach or dune if not actively being used.*

8) *The Service recommends project-related materials not be stockpiled in the intertidal zone, reef flats, sandy beach and adjacent vegetated areas.*

9) *The Service recommends the best management practices provided as Appendix C.*

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FIGURES

U.S. Fish & Wildlife Service

2023 Emergency Shoreline Protection Project, Ofu Airport, American Samoa

Figure 1: Eastern Pacific Ocean. Map of the eastern Pacific Ocean showing the location of American Samoa.

24

Figure 2: Samoan Archipelago. Map of the Samoan islands showing the locations of Samoa, American Samoa, and the Manua Islands, American Samoa.

25

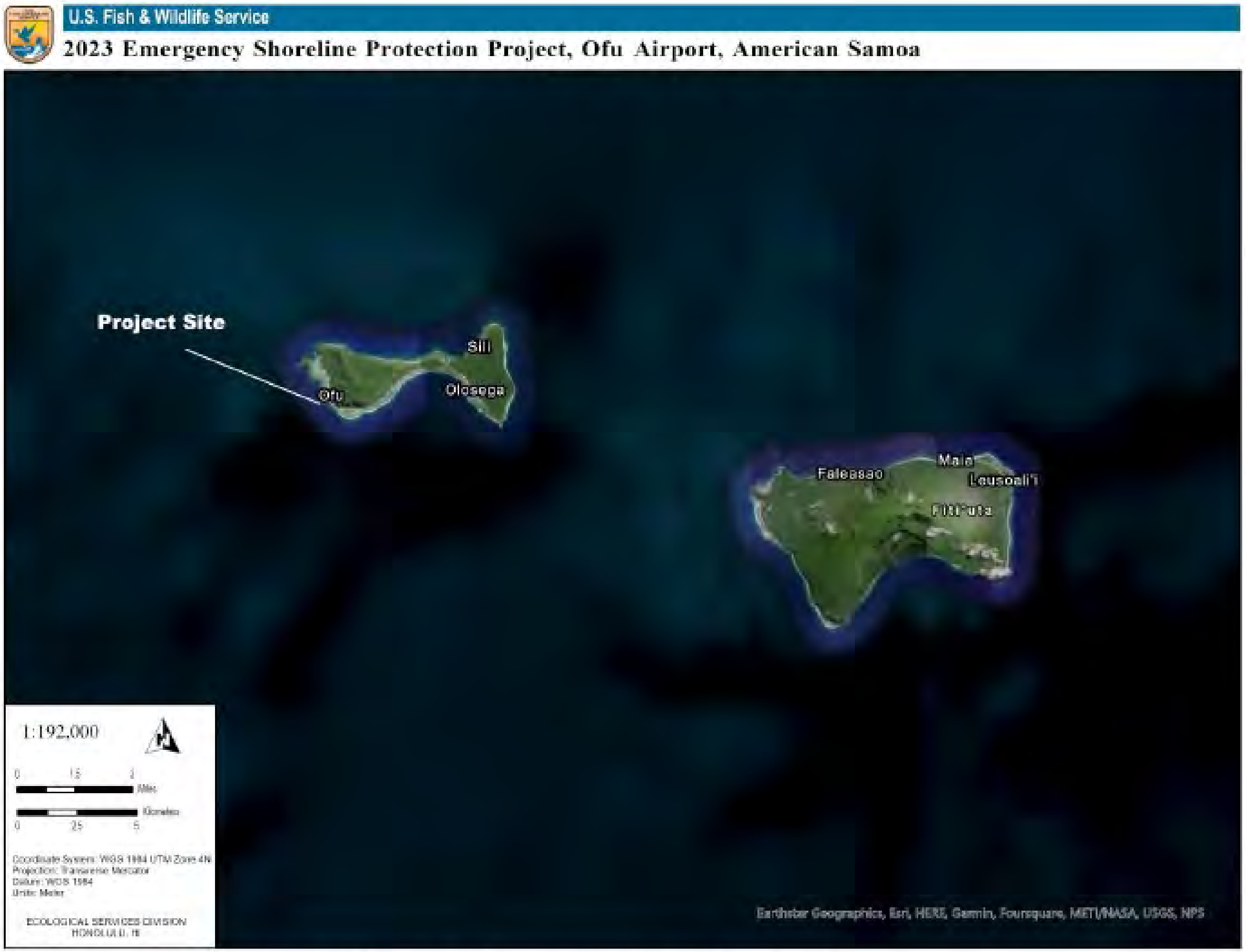

Figure 3: Manua Island Chain. Map of the Manua islands including Ofu, Olosega, and Tau. The project site is located on the southwest coast of Ofu.

26

Figure 4: Project Site. Image of the project site on the east end of the runway on Ofu. The yellow polygon represents the project site, the purple polygon is the approximate footprint of the proposed revetment project alternatives, and the aqua line represents the approximate location of the proposed seawall alternatives.

27

Figure 5: Erosion at New Runway. King tides and large swells combined to impact the newly constructed runway in July of 2022.

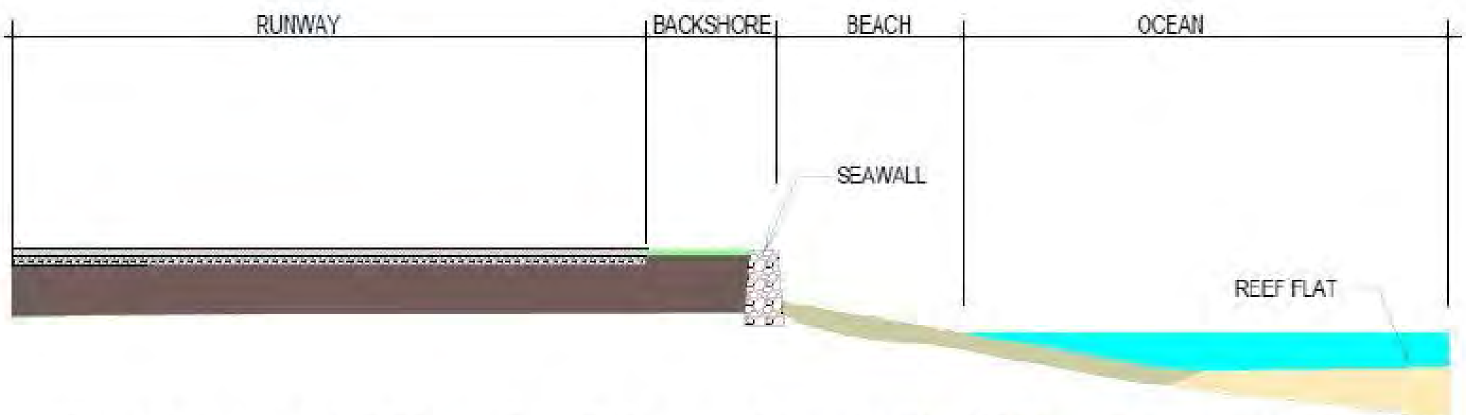

Figure 6: Concrete Rubble Masonry Seawall Alternative. Schematic of the CRM Seawall alternative design. Schematic provided by Corps.

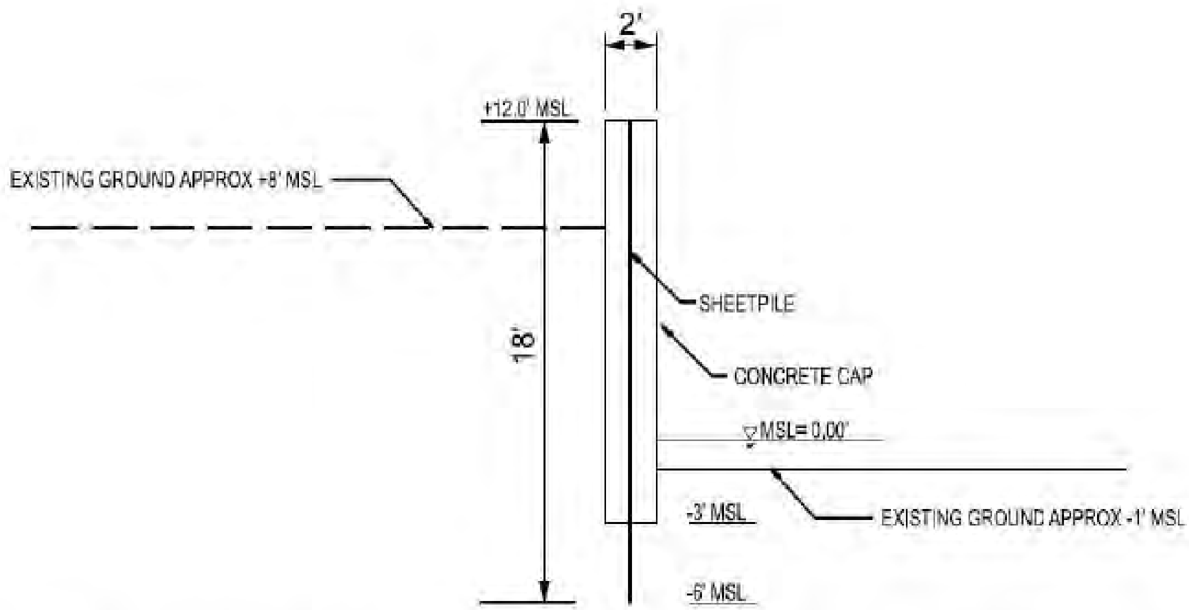

Figure 7: Sheetpile Seawall Alternative. Schematic of the Sheetpile Seawall alternative design. Schematic provided by Corps.

29

Figure 8: Midway Atoll Sheetpile Seawall. Photograph showing degradation of the sheetpile seawall at Midway Atoll. Photo by USFWS.

30

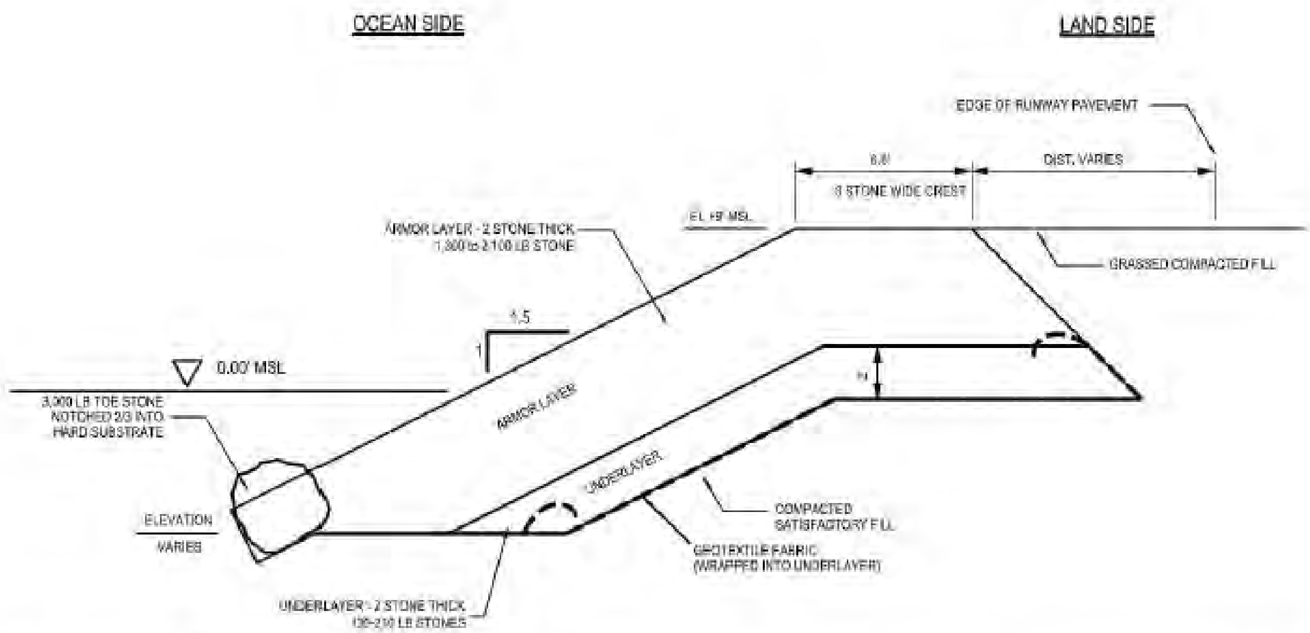

Figure 9: Rock Revetment Alternative. Schematic of the rock revetment alternative design. Schematic provided by Corps.

31

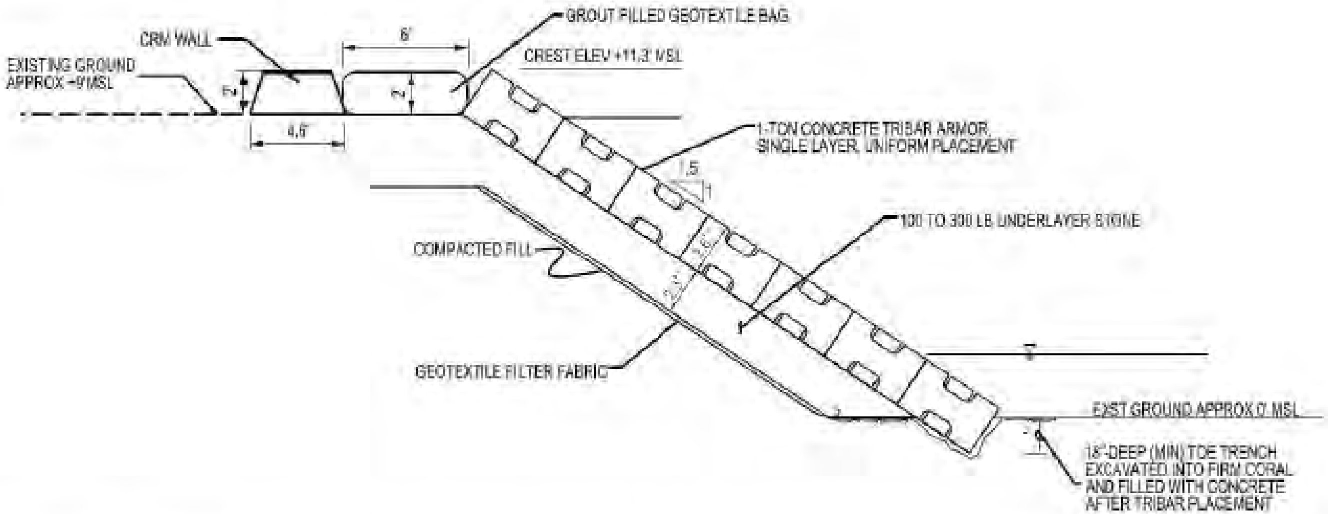

Figure 10: Tribar Revetment Alternative. Schematic of the tribar revetment alternative design. Schematic provided by Corps.

32

Figure 11: Shoreline Habitat Facing Northwest. Shoreline directly adjacent to the runway approximately one hour from high tide conditions. Large swells can be seen breaking on the reef crest. Photograph by Jeremy Raynal.

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Figure 12: Shoreline Habitat Facing Southeast. Shoreline directly adjacent to the runway approximately one hour from high tide conditions. An orange windsock can be seen marking the southeast extremity of the runway area on land. Photograph by Jeremy Raynal.

Figure 13: Current Shoreline Stabilization. The beach adjacent to the runway facing northwest in low tide conditions. Rocks can be seen piled at the end of the runway for shoreline protection. Photograph by Jeremy Raynal.

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Figure 14: Potential Green and Hawksbill Sea Turtle Nesting Habitat. Photograph of the beach habitat facing southeast in low tide conditions. An orange windsock can be seen marking the southeast extremity of the runway area on land. Photograph by Jeremy Raynal.

Figure 15: High Tide Conditions on the Reef Flat. The nearshore reef flat at high tide. The benthic habitat is in approximately 1.5 to 2 m of water. This image shows low coral cover on pavement. The diver is photographing corals to document species present in the Project Area. Photograph by Jeremy Raynal.

Figure 16: Low Tide Conditions. Photograph of the beach and reef flat at low tide. Biologists can be seen measuring the distance between the runway structure and the nearest live corals. Photograph by Jeremy Raynal.

38

Figure 17: Productive Reef Flat. Photograph of the Ofu Airport reef flat showing relatively high coral cover and species diversity. Photograph by Jeremy Raynal

Figure 18: Distance from Runway to Reef. Photograph of biologists measuring the distance from the runway to nearest marine resources of concern. Photograph by Jeremy Raynal.

40

Figure 19: Endangered Species Act Coral Presence. Map showing locations of elected ESA listed corals, *Acropora globiceps* and *Isopora crateriformis*, in the Ofu Airport Project Area. Additional observations of these species and *Acropora retusa* (also an ESA listed species) were made at unconfirmed locations within the Project Area. The Target Area is outlined in yellow.

41

Figure 20: Halimeda. Halimeda as observed in dense isolated clumps in the Project Area. Photograph by Jeremy Raynal.

42

TABLES

Table 2: Area Calculations for Target Area.

AREA TYPE	CLASSIFICATION	AREA (M^2)	PERCENT OF AREA
STRUCTURE	LAND SCATTERED CORAL ROCK IN UNCONSOLIDATED SEDIMENT PAVEMENT UNCONSOLIDATED SEDIMENT	1155 1718 284 360	32.8 48.8 8.1 10.2
	TOTAL	3518	
ZONE	LAND SHORELINE INTERTIDAL	1155 2363	32.8 67.2
	TOTAL	3518	
MAJOR STRUCTURE	LAND MIXED HARD BOTTOM UNCONSOLIDATED SEDIMENT	1155 1718 284 360	32.8 48.8 8.1 10.2
	TOTAL	3518	
SEDIMENT	SAND/RUBBLE	360	100
	TOTAL	360	

APPENDICES

APPENDIX A: Maps of Project Area: Benthic Species and Habitat Characteristics

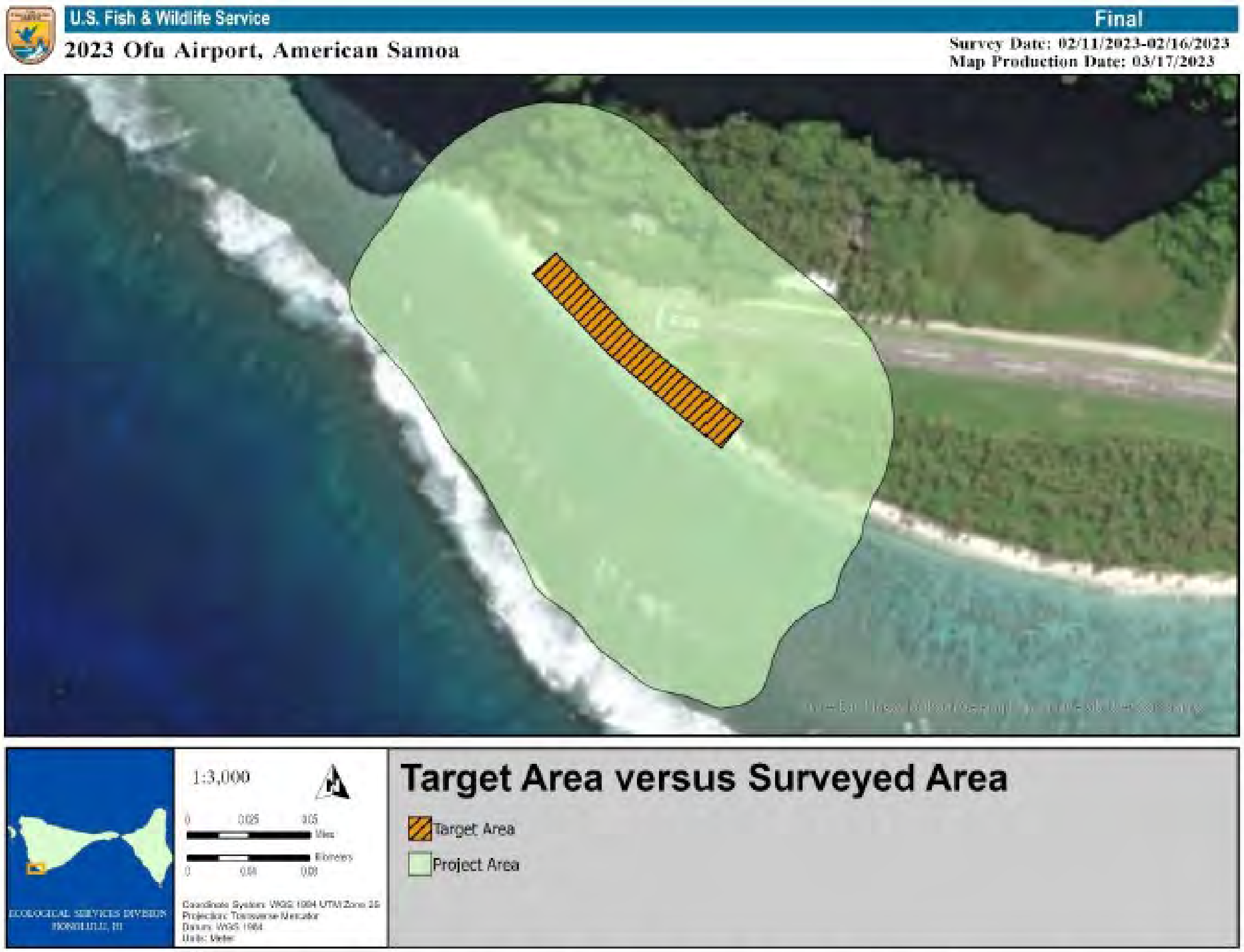

Figure A1. Target Area and Project Area. Map of the Ofu Airport Project Area (total surveyed area plus project footprint) versus the Target Area (potential project footprint area).

46

Figure A2. Area Observed versus Area Not Observed. Map of the Ofu Airport Project Area and areas observed during surveys versus not directly observed by biologists but inferred by the model.

47

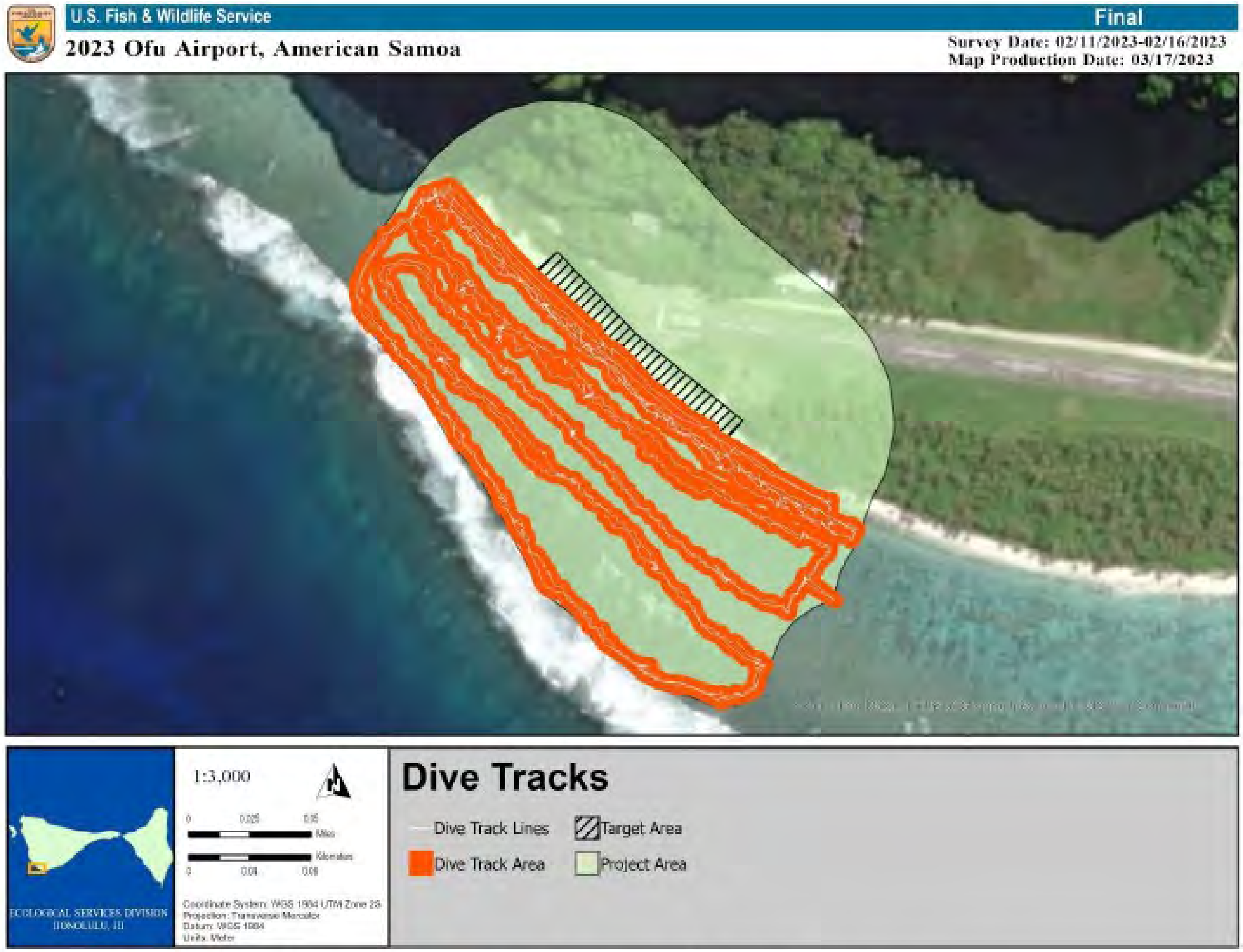

Figure A3. Dive Tracks. Map showing the tracks followed by biologists during surveys.

48

Figure A4. Habitat Zones. Map of observed habitat zones in the Ofu Airport Project Area.

49

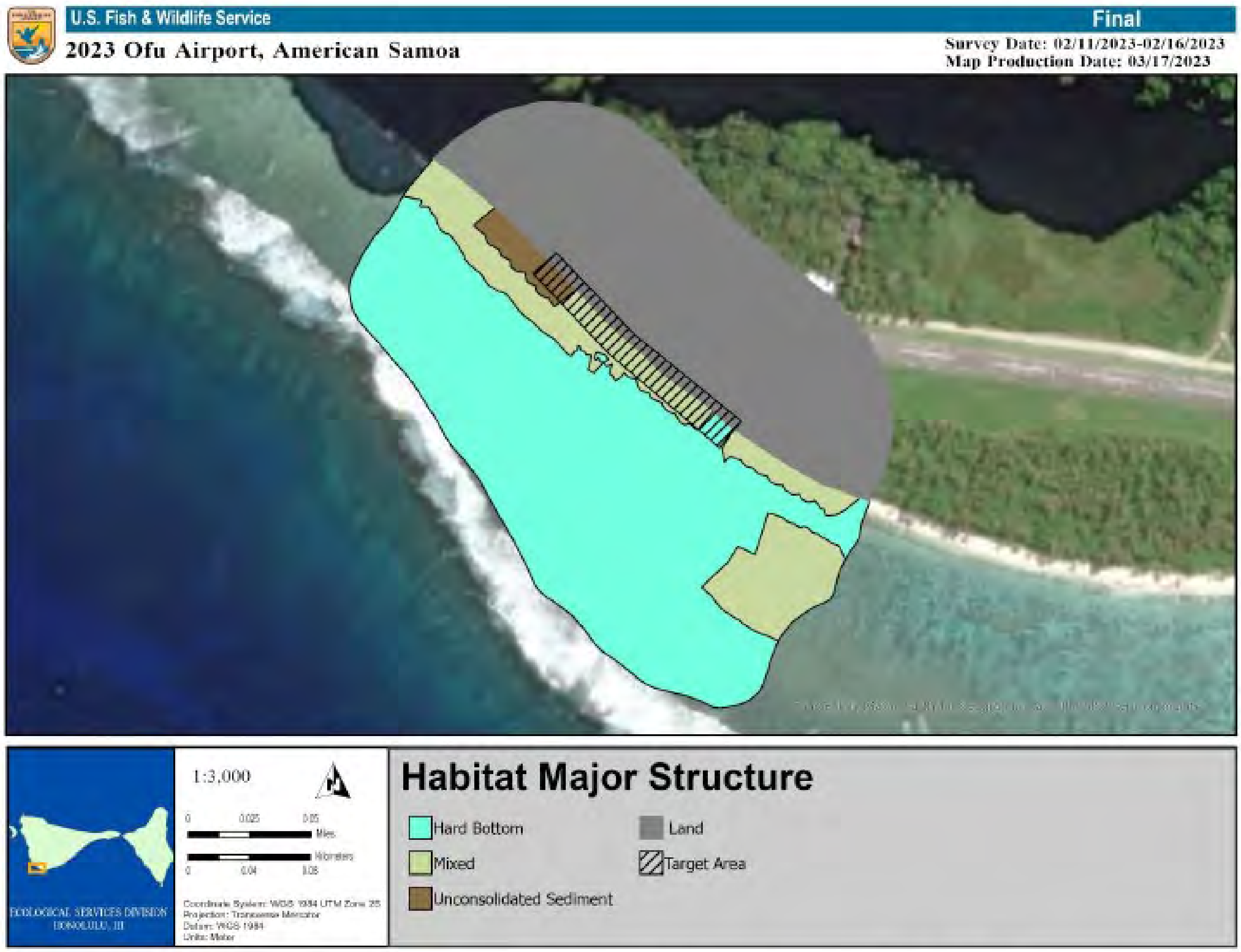

Figure A5. Habitat Major Structure. Map of the Ofu project site structures that the Project Area contains.

50

Figure A6. Sediment Type. Map of the various sediment types that the Ofu Airport Project Area contains.

51

Figure A7. Habitat Structure. Map of the habitat structures within the Ofu Airport Project Area.

52

Figure A8. Habitat Structure within the Target Area. Map of habitat structure contained within the Ofu Airport Target Area.

53

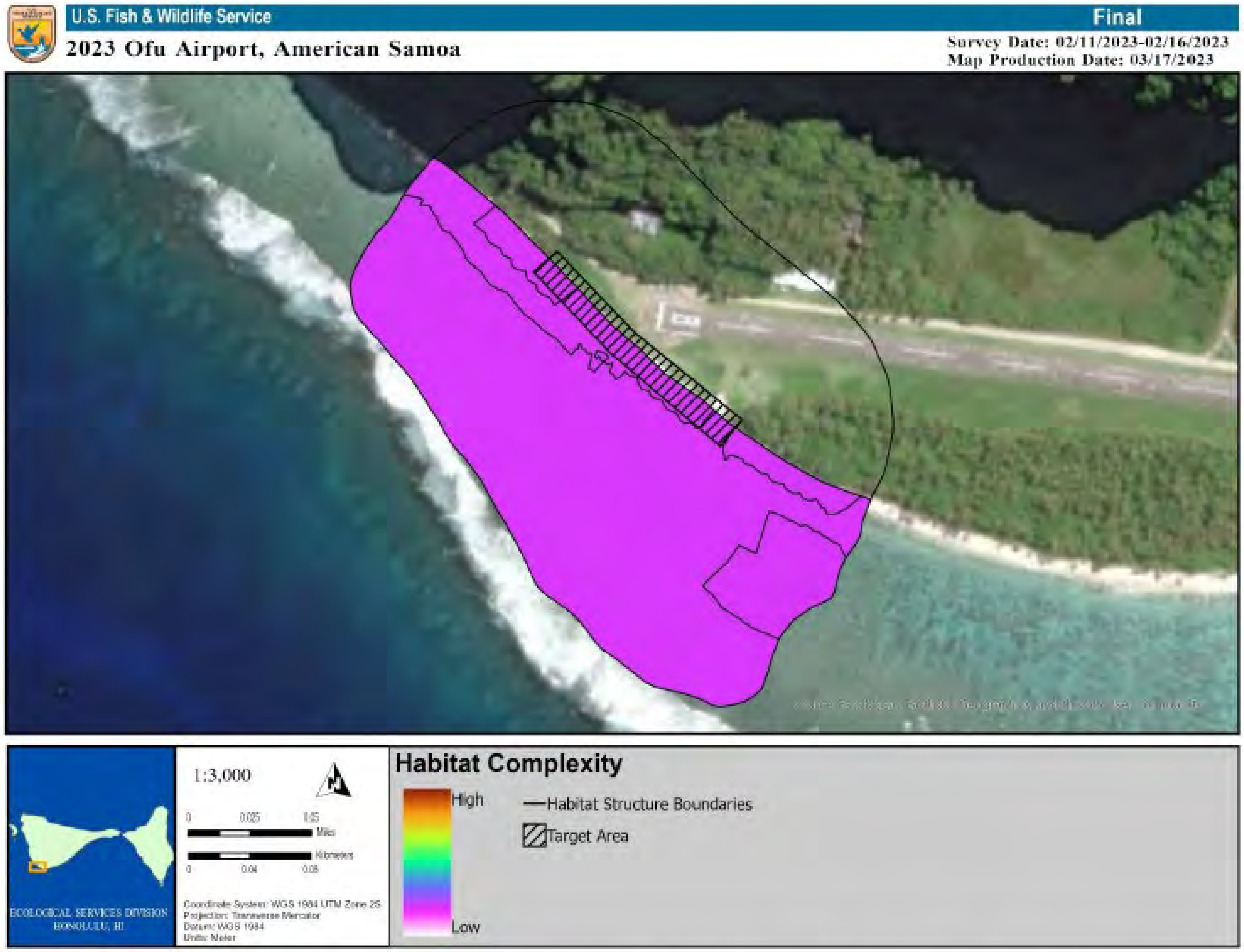

Figure A9. Habitat Complexity. Map of habitat complexity found within the Ofu Airport Project Area.

54

Figure A10. Debris Presence. Map of within the Ofu Airport Project Area indicating that no debris was observed.

55

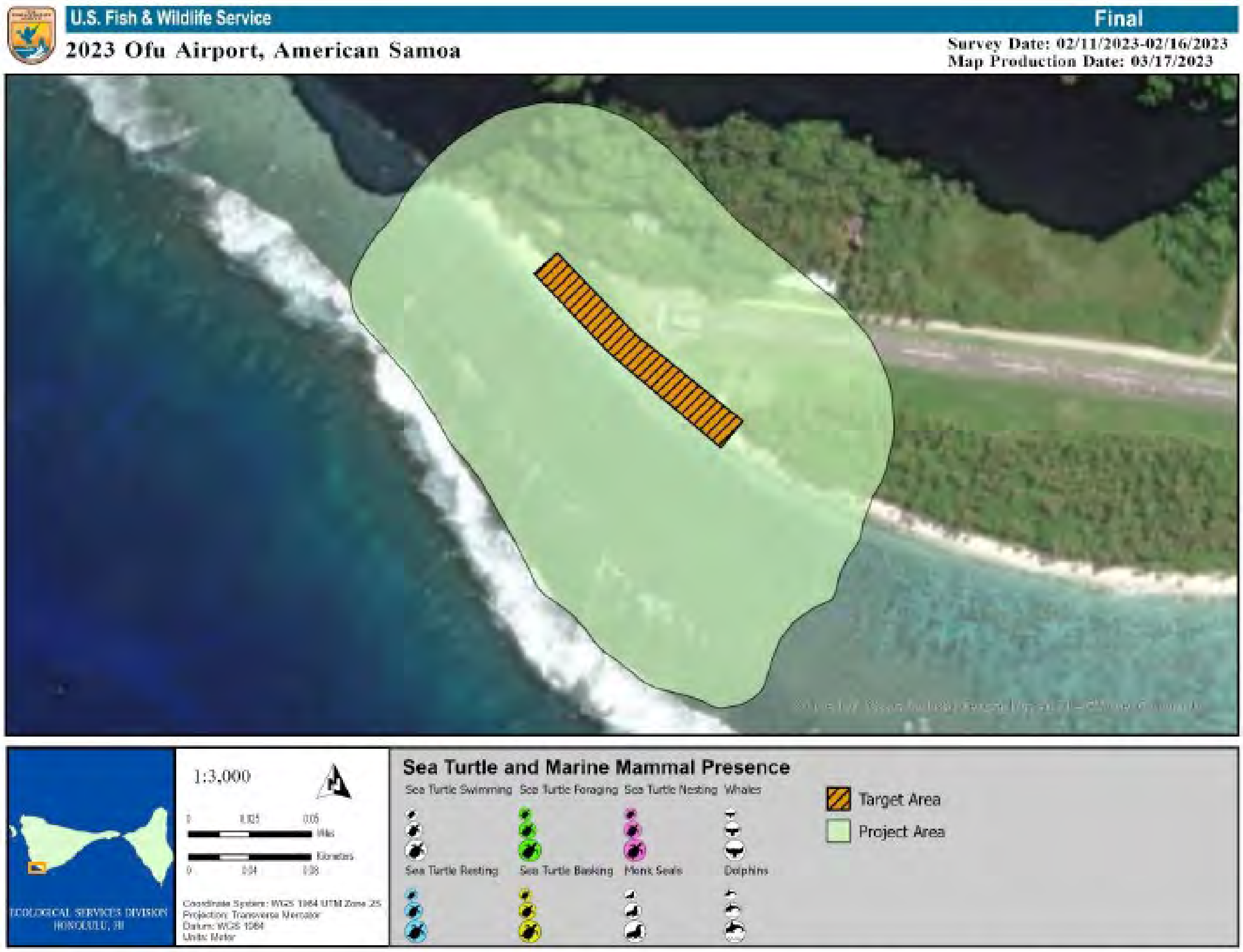

Figure A11. Sea Turtle and Marine Mammal Presence. Map indicating that there were no observations of sea turtles or marine mammals during Service surveys at Ofu Airport.

56

Figure A12. Coral Abundance. Map of coral abundance observed at the Ofu Airport Project Area.

57

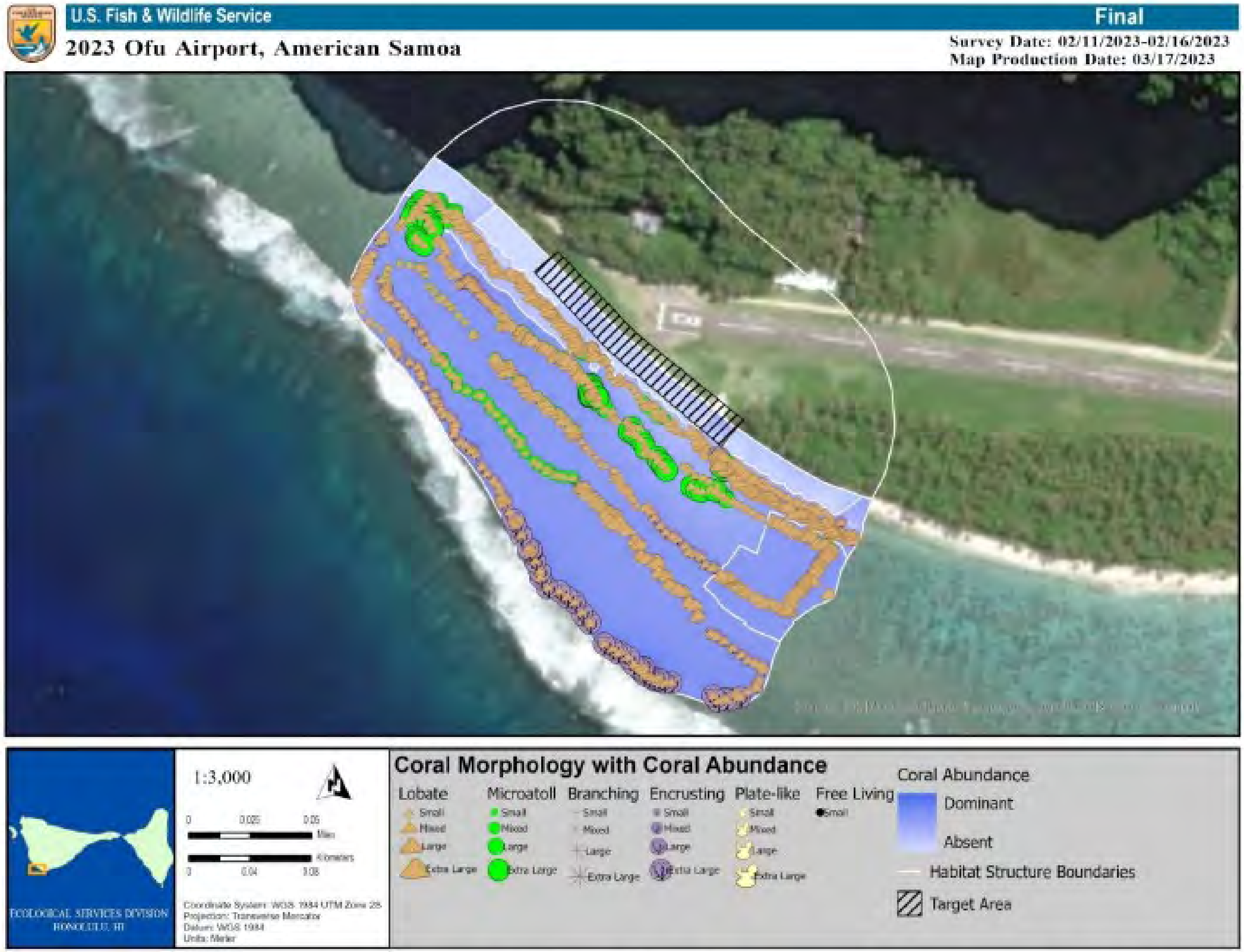

Figure A13. Coral Morphology with Coral Abundance. Map of the coral morphology observed at the Project Area.

58

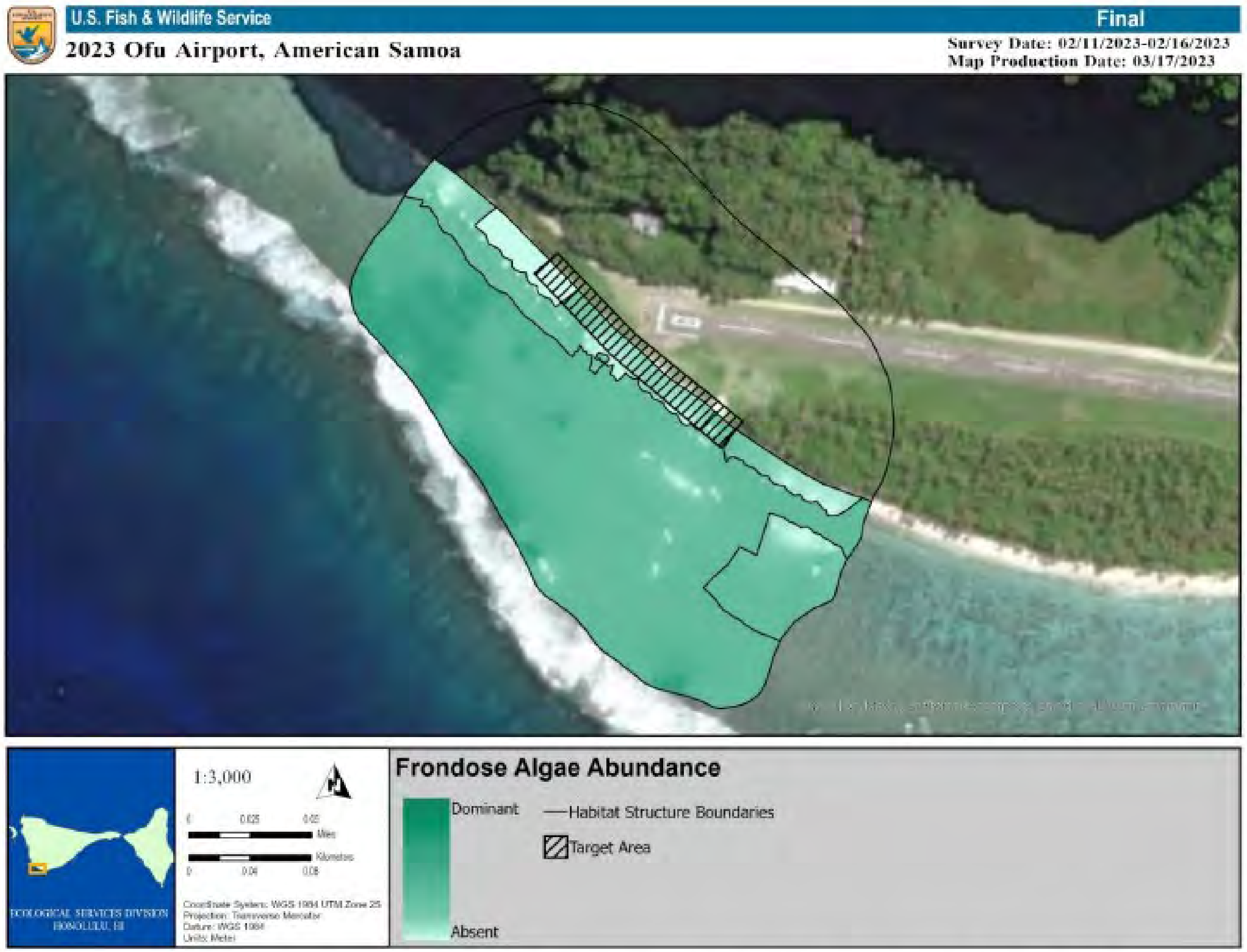

Figure A14. Frondose Algae Abundance. Map of the frondose algae abundance observed at the Ofu Airport Project Area.

59

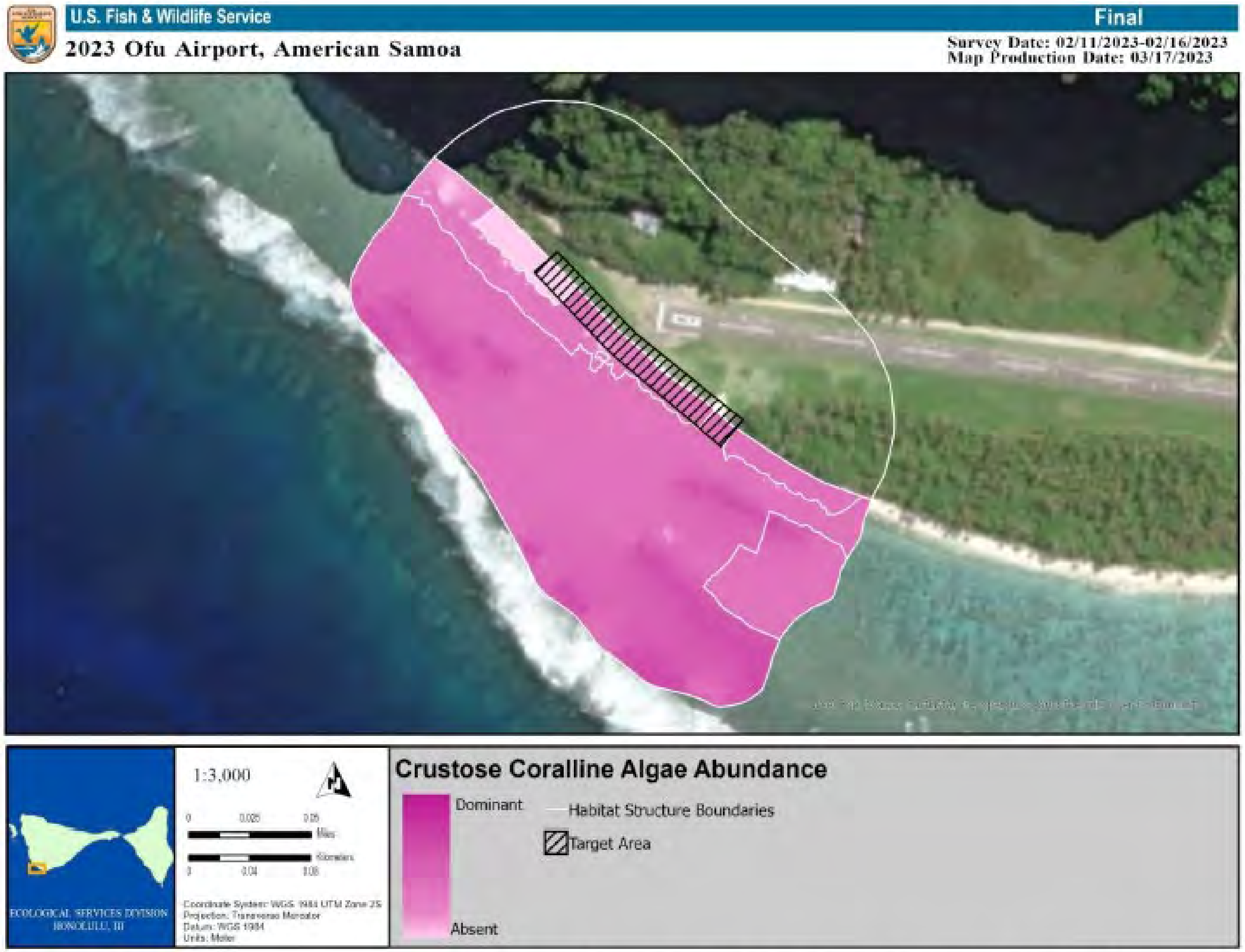

Figure A15. Crustose Coralline Algae Abundance. Map of the CCA abundance observed at the Ofu Airport Project Area.

60

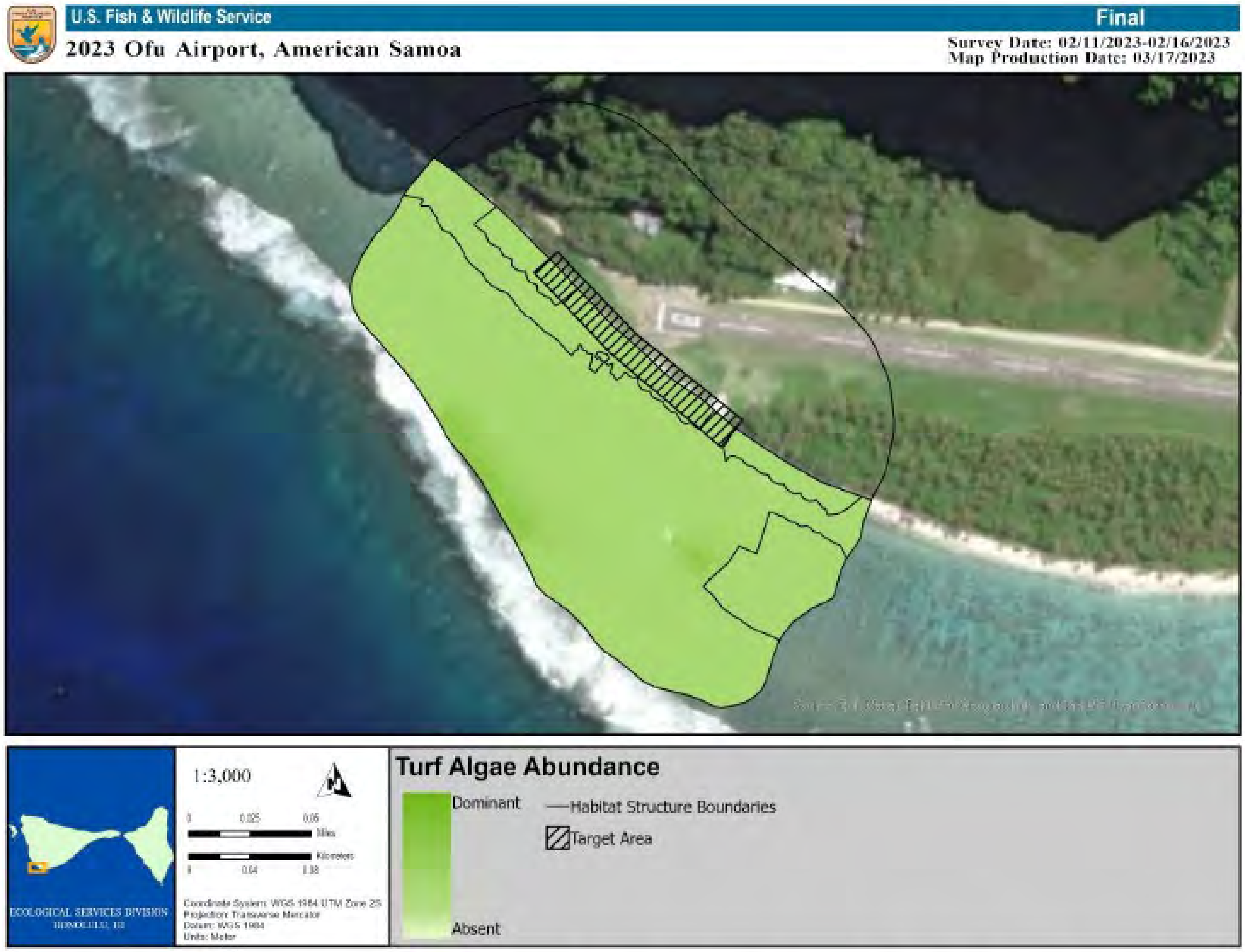

Figure A16. Turf Algae Abundance. Map of the turf algae abundance observed at the Ofu Airport Project Area.

61

Figure A17. Filamentous Algae or Cyanobacteria. Map of the filamentous algae and cyanobacteria observed at the Ofu Airport Project Area.

62

Figure A18. Sea Cucumber Abundance. Map of the sea cucumber abundance observed at the Ofu Airport Project Area.

63

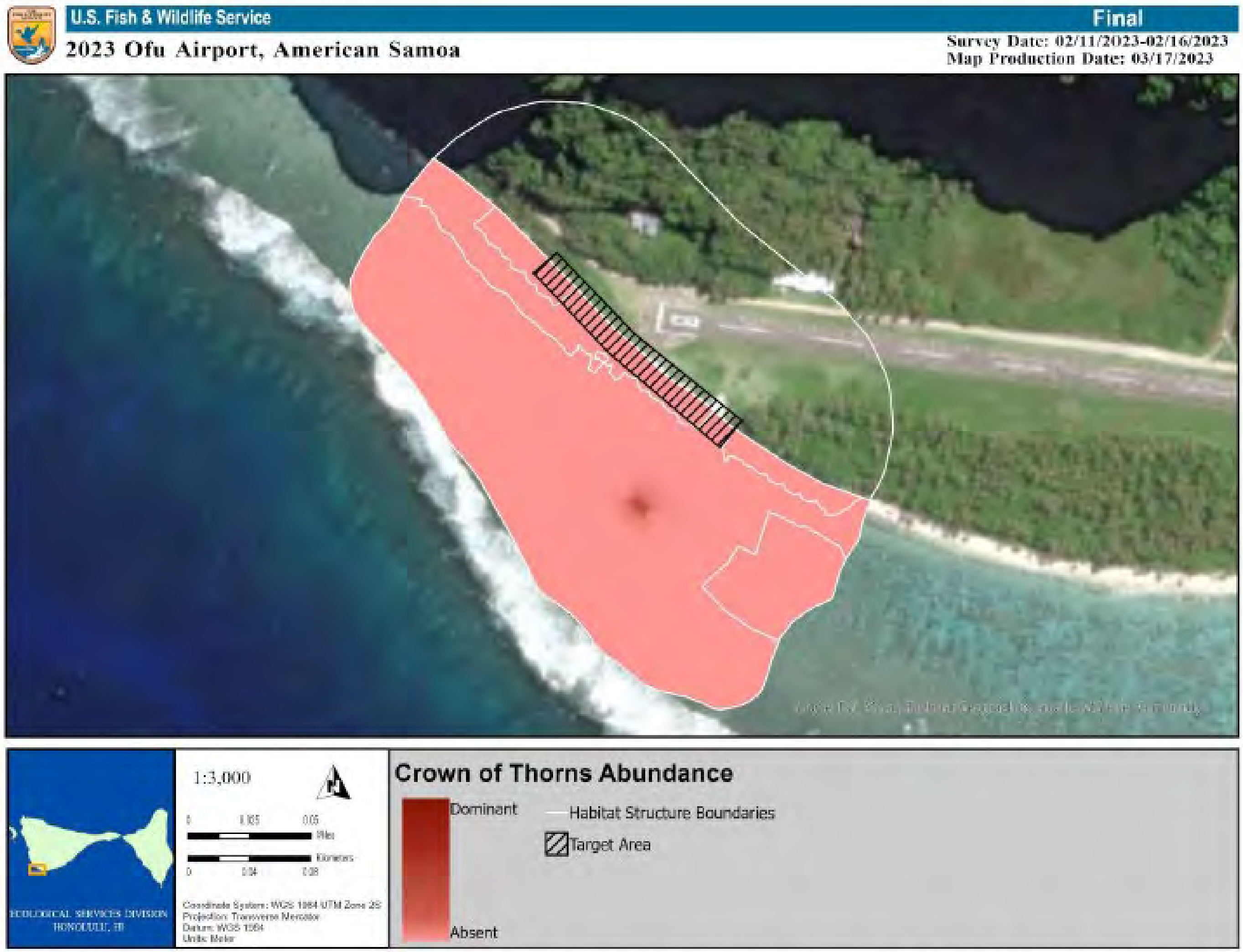

Figure A19. Crown of Thorns Abundance. Map of the COT abundance observed at the Ofu Airport Project Area.

64

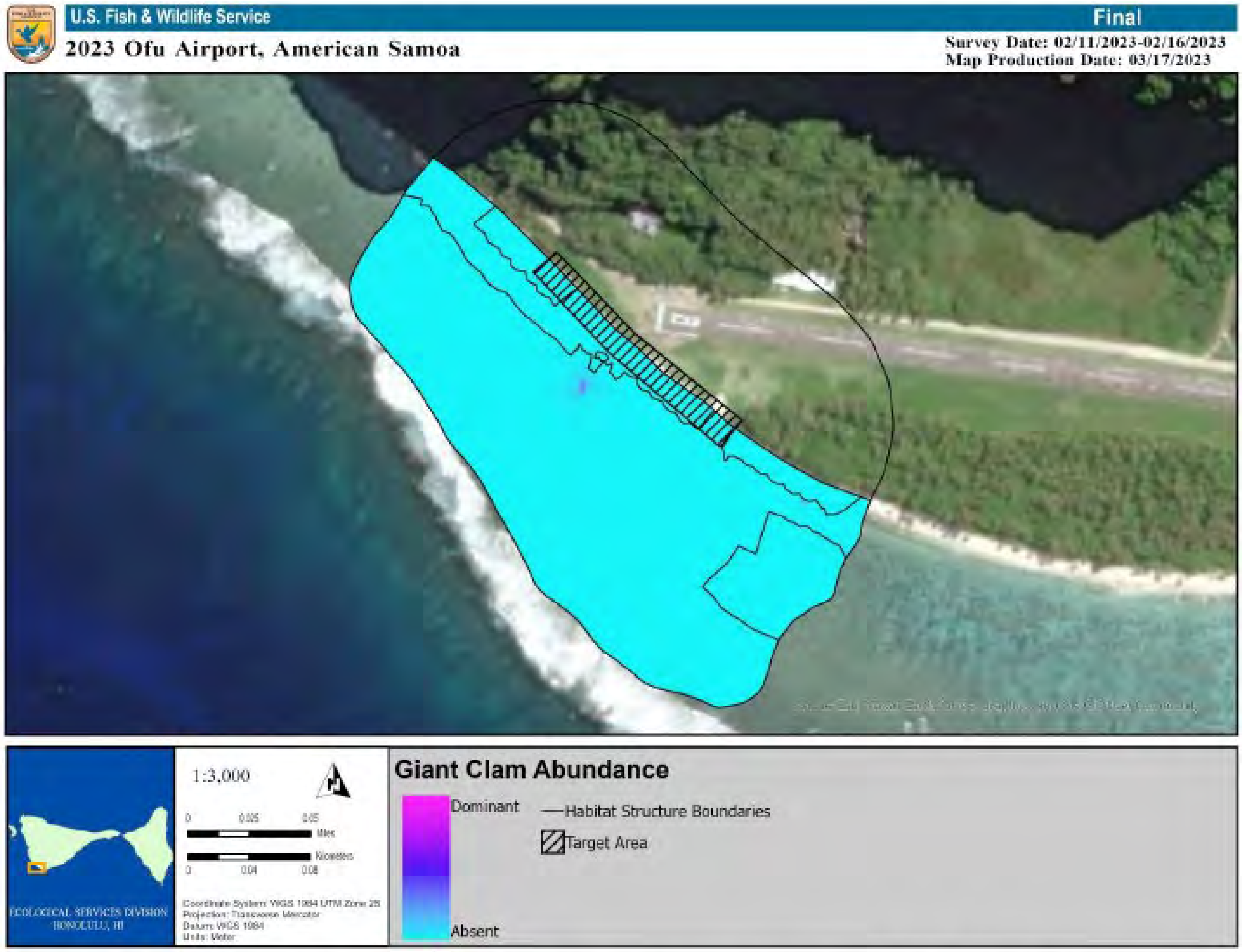

Figure A20. Giant Clam Abundance. Map of giant clam abundance observed at the Ofu Airport Project Area.

APPENDIX B: Coral Species List with Photographs from Ofu Airport Project Area

Figure B1. Acropora abrotanoides. Photos by Tilali Scanlan.

Figure B2. Acropora digitifera. Photos by Tilali Scanlan.

Figure B3. Acropora gemmifera. Photos by Tilali Scanlan.

Figure B4. Acropora globiceps. ESA species. Photos by Tilali Scanlan.

Fgure B5. Acropora intermedia. Photos by Tilali Scanlan.

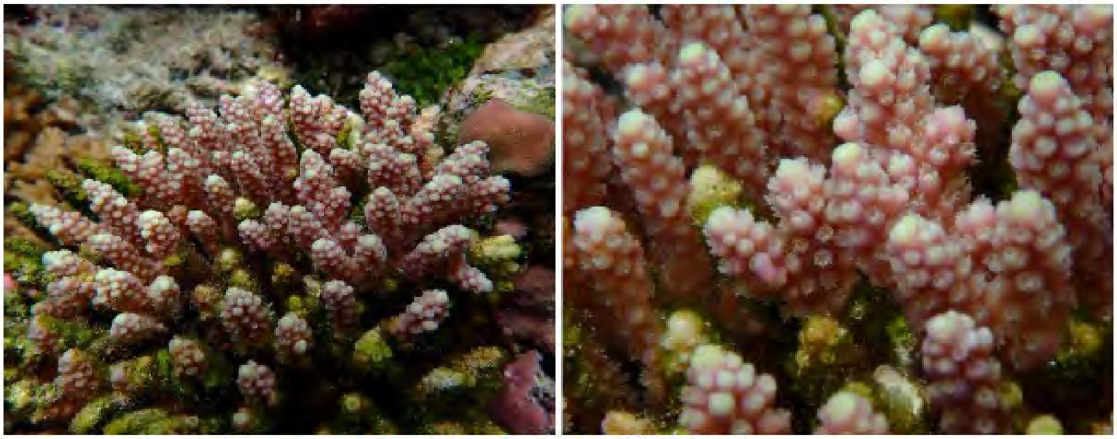

Figure B6. Acropora latistella. Photos by Tilali Scanlan.

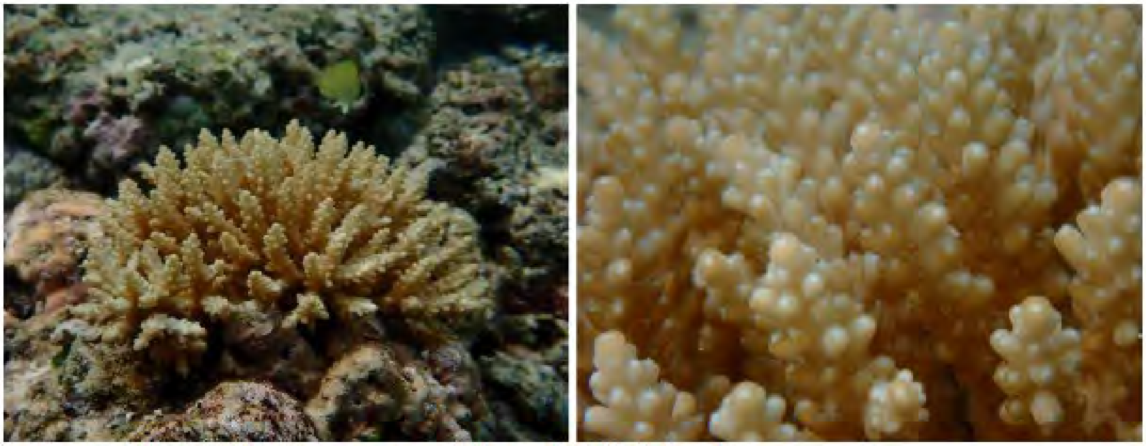

Figure B7. Acropora nana. Photos by Tilali Scanlan.

Figure B8. Acropora palmerae. Photos by Tilali Scanlan.

Figure B9. Acropora retusa. ESA species. Photos by Tilali Scanlan.

Figure B10. Acropora sp. 1. Photos by Tilali Scanlan.

Figure B11. Acropora sp. 2 Photos by Tilali Scanlan.

Figure B12. Acropora surculosa. Photos by Tilali Scanlan.

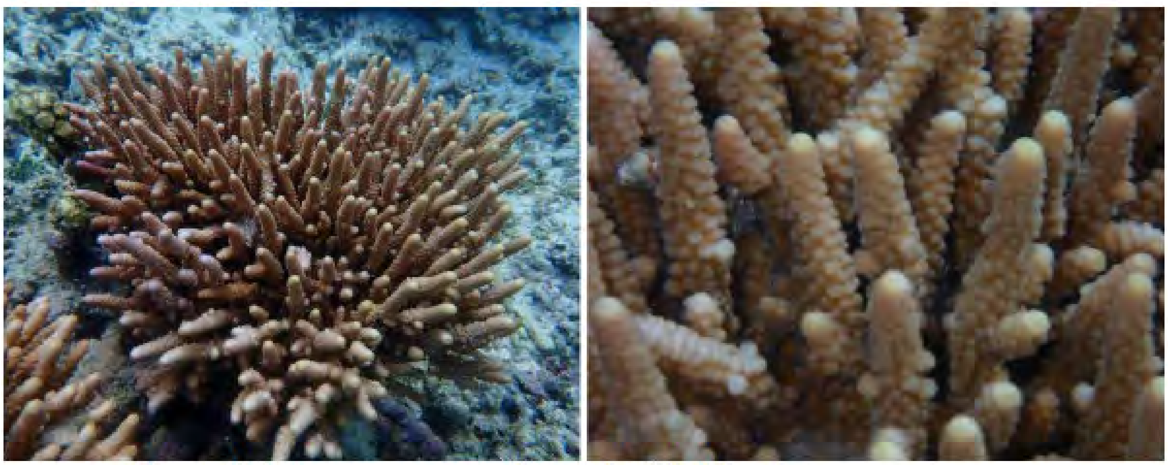

Figure B13. Arcopora verweyi. Photos by Tilali Scanlan.

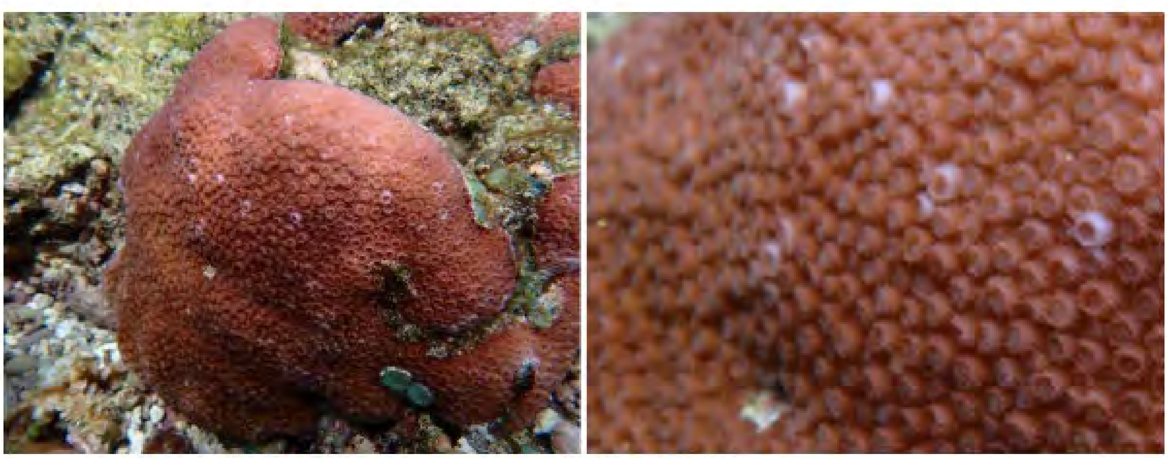

Figure B14. Astreopora sp. Photos by Tilali Scanlan.

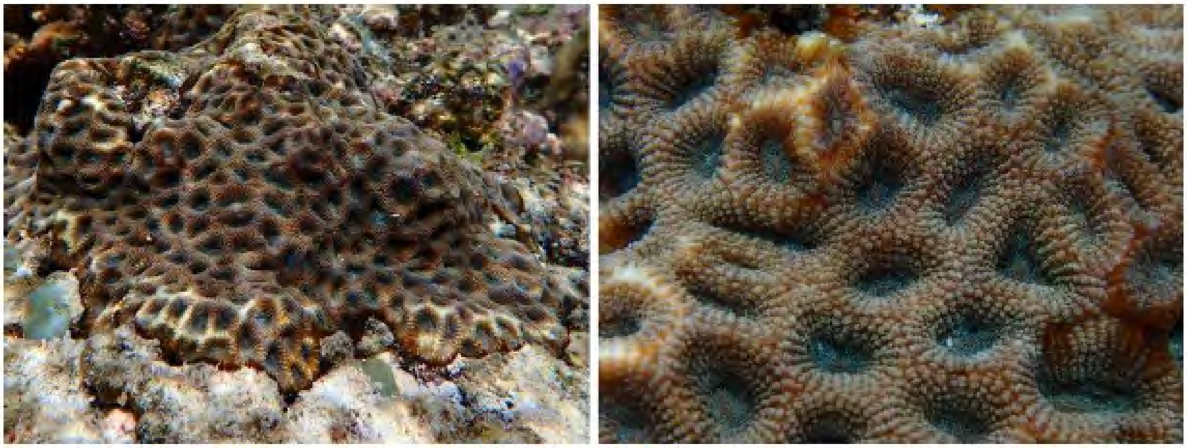

Figure B15. Favites sp. 1. Photos by Tilali Scanlan.

Figure B16. Favites sp. 2. Photos by Tilali Scanlan.

Figure B17. Favites sp. 3. Photos by Tilali Scanlan.

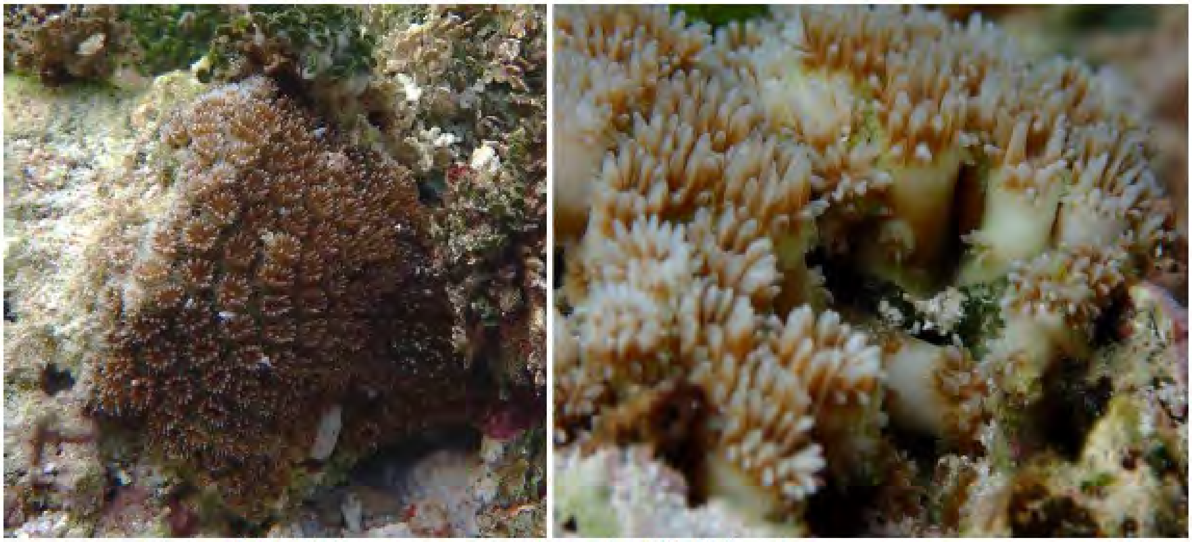

Figure B18. Galaxea astreata. Photos by Tilali Scanlan.

Figure B19. Goniastrea sp. Photos by Tilali Scanlan.

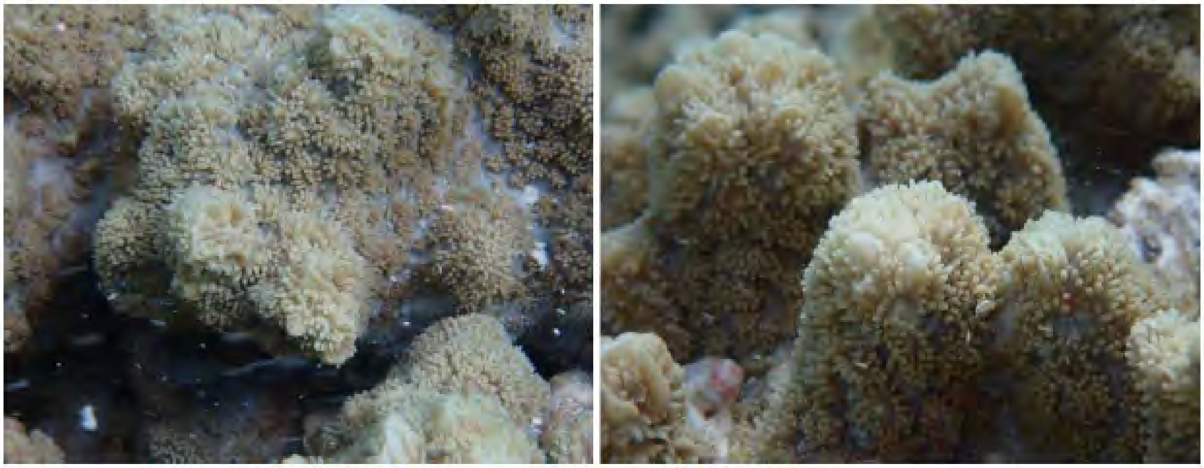

Figure B20. Hodnophora laxa. Photos by Tilali Scanlan.

Figure B21. Hydnophora microcons. Photos by Tilali Scanlan.

Figure B22. Isopora crateriformis. ESA species. Photos by Tilali Scanlan.

Figure B23. Leptoria phrygia. Photos by Tilali Scanlan.

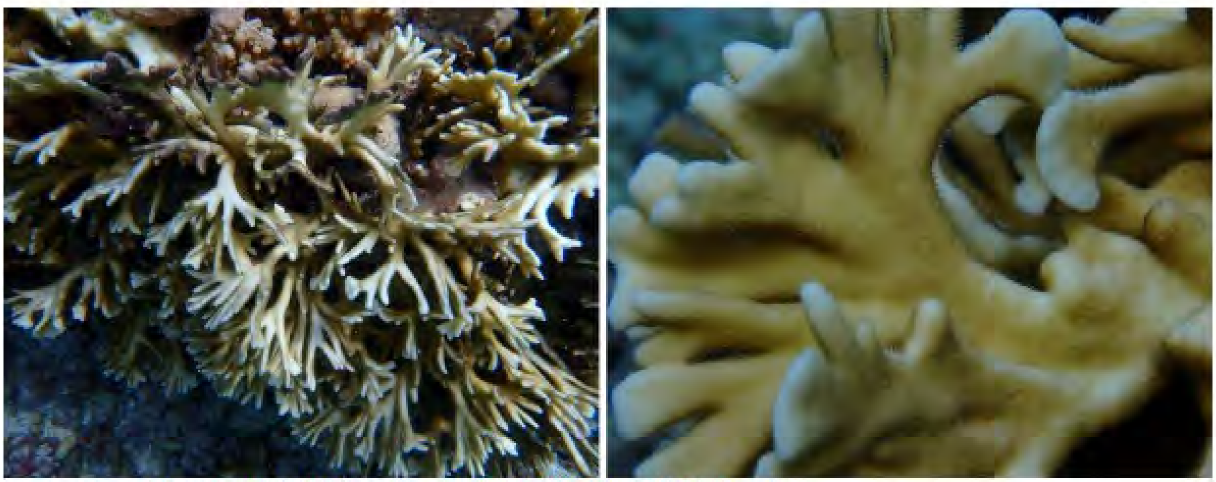

Figure B24. Millepora sp. 1. Photos by Tilali Scanlan.

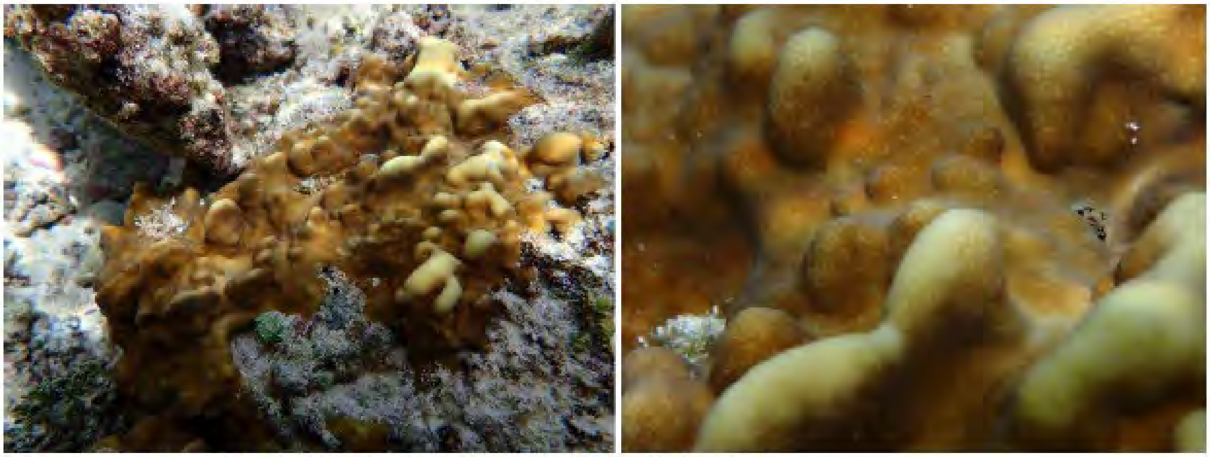

Figure B25. Millepora sp. 2. Photos by Tilali Scanlan.

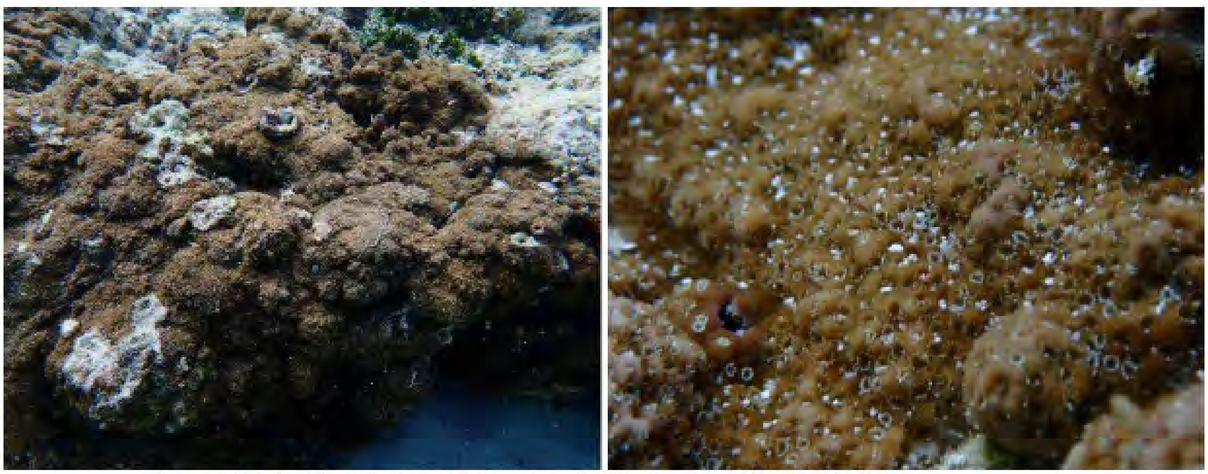

Figure B26. Montipora turgescens 1. Photos by Tilali Scanlan.

Figure B27. Montipra turgescens 2. Photos by Tilali Scanlan.

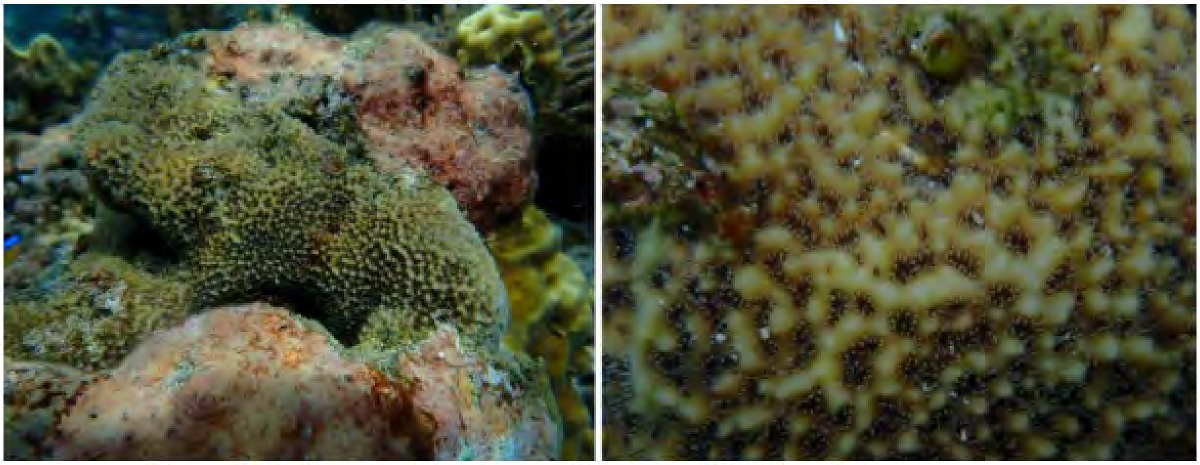

Figure B28. Pavona chiriquiensis. Photos by Tilali Scanlan.

Figure B29. Pavona varians. Photos by Tilali Scanlan.

Figure B30. Pocillopora sp. 1. Photos by Tilali Scanlan.

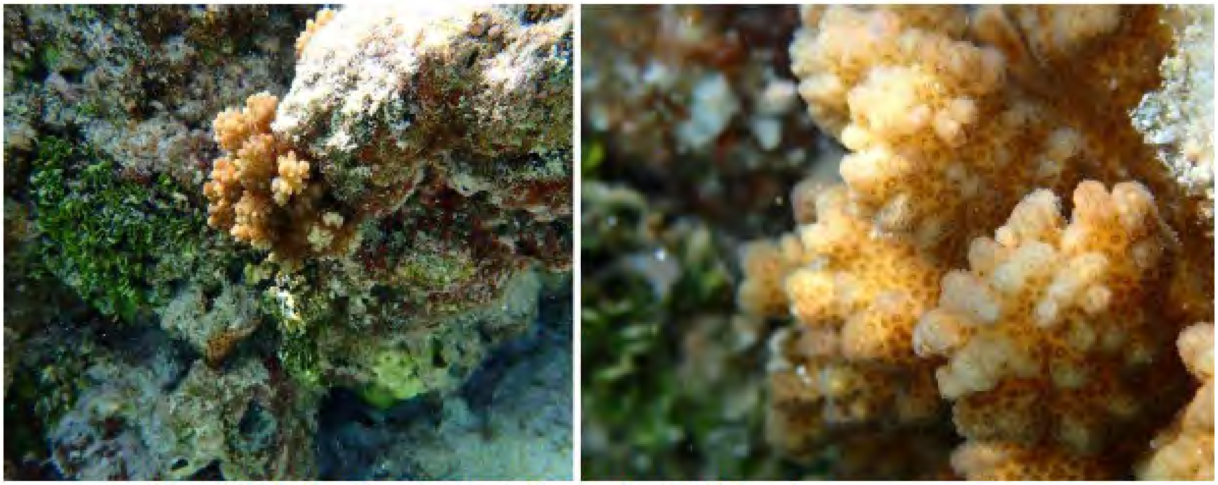

Figure B31. Pocillopora sp. 2. Photos by Tilali Scanlan.

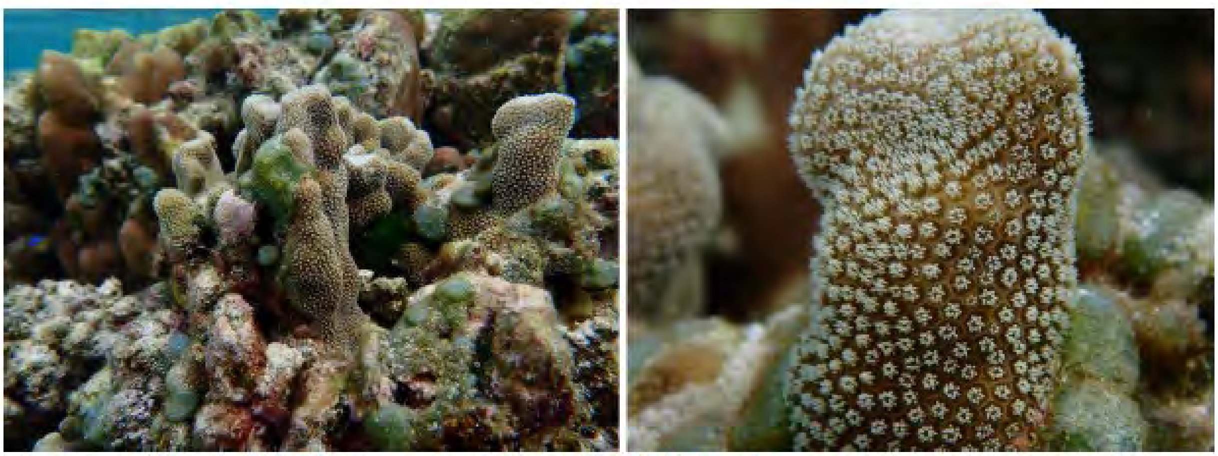

Figure B32. Porites annae. Photos by Tilali Scanlan.

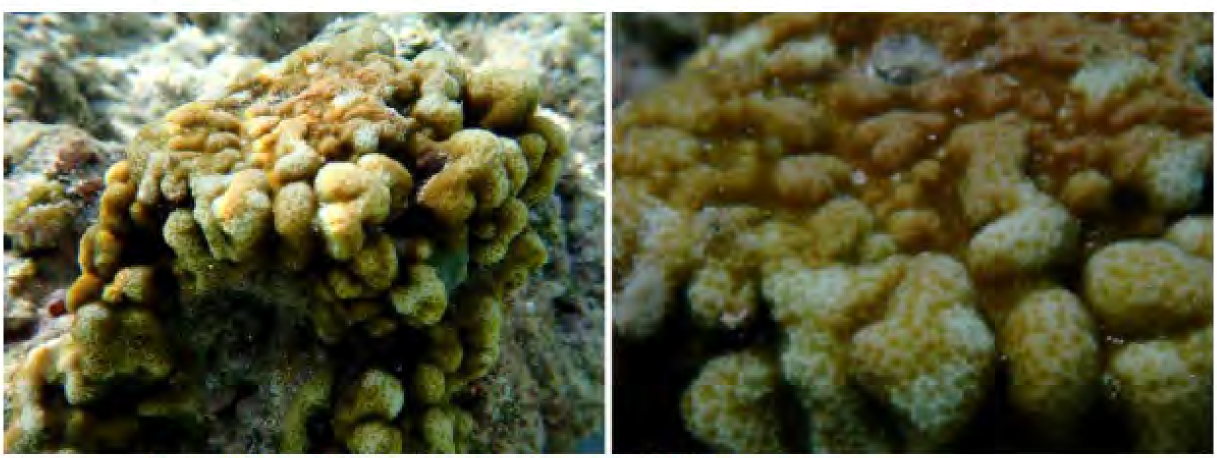

Figure B33. Porites randalli. Photos by Tilali Scanlan.

Figure B34. Porites sp. Photos by Tilali Scanlan.

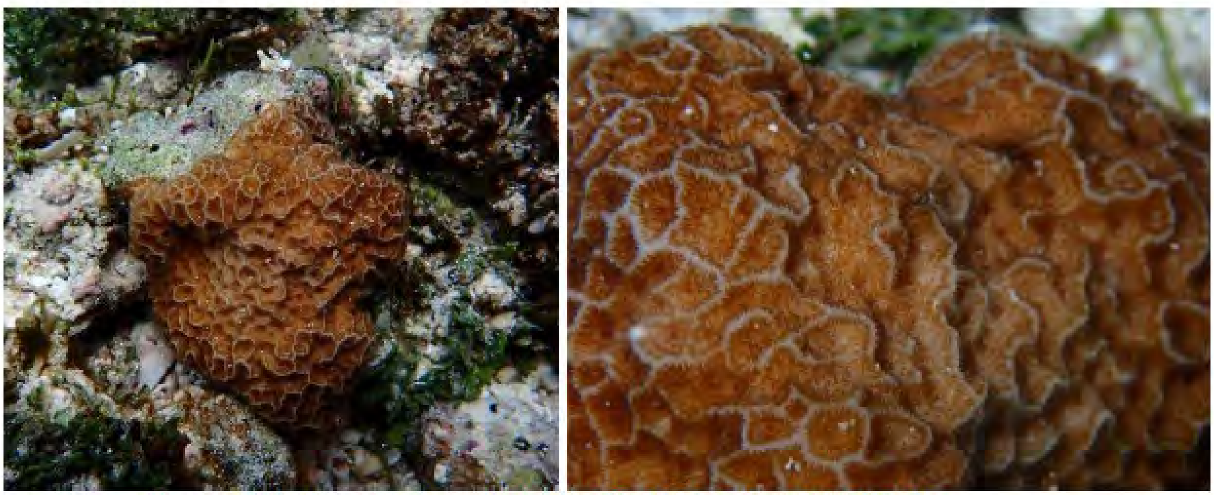

Figure B35. Psammocora profundacella. Photos by Tilali Scanlan.

APPENDIX C: Best Management Practices for Work In and Around Aquatic Environments

U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices

The U.S. Fish and Wildlife Service (USFWS) recommends the following measures to be incorporated into project planning to avoid or minimize impacts to fish and wildlife resources. Best Management Practices (BMPs) include the incorporation of procedures or materials that may be used to reduce either direct or indirect negative impacts to aquatic habitats that result from project construction-related activities. These BMPs are recommended in addition to, and do not over-ride any terms, conditions, or other recommendations prepared by the USFWS, other federal, state or local agencies. If you have questions concerning these BMPs, please contact the USFWS Aquatic Ecosystems Conservation Program at 808-792-9400.

1. Authorized dredging and filling-related activities that may result in the temporary or permanent loss of aquatic habitats should be designed to avoid indirect, negative impacts to aquatic habitats beyond the planned project area.

2. Dredging/filling in the marine environment should be scheduled to avoid coral spawning and recruitment periods, and sea turtle nesting and hatching periods. Because these periods are variable throughout the Pacific islands, we recommend contacting the relevant local, state, or federal fish and wildlife resource agency for site specific guidance.

3. Turbidity and siltation from project-related work should be minimized and contained within the project area by silt containment devices and curtailing work during flooding or adverse tidal and weather conditions. BMPs should be maintained for the life of the construction period until turbidity and siltation within the project area is stabilized. All project construction-related debris and sediment containment devices should be removed and disposed of at an approved site.

4. All project construction-related materials and equipment (dredges, vessels, backhoes, silt curtains, etc.) to be placed in an aquatic environment should be inspected for pollutants including, but not limited to; marine fouling organisms, grease, oil, etc., and cleaned to remove pollutants prior to use. Project related activities should not result in any debris disposal, non-native species introductions, or attraction of non-native pests to the affected or adjacent aquatic or terrestrial habitats. Implementing both a litter-control plan and a Hazard Analysis and Critical Control Point plan (HACCP – see https://www.fws.gov/policy/A1750fw1.html) can help to prevent attraction and introduction of non-native species.

5. Project construction-related materials (fill, revetment rock, pipe, etc.) should not be stockpiled in, or in close proximity to aquatic habitats and should be protected from erosion (e.g., with filter fabric, etc.), to prevent materials from being carried into waters by wind, rain, or high surf.

6. Fueling of project-related vehicles and equipment should take place away from the aquatic environment and a contingency plan to control petroleum products accidentally spilled during the project should be developed. The plan should be retained on site with the person responsible for compliance with the plan. Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of accidental petroleum releases.

7. All deliberately exposed soil or under-layer materials used in the project near water should be protected from erosion and stabilized as soon as possible with geotextile, filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc.

Attachment 4. NMFS FWCA Concurrence**

Attachment 5. Draft Endangered Species Act Biological Evaluation & Essential Fish Habitat Assessment

Ofu Airport, American Samoa

CAP Section 14 Emergency Shoreline Protection Project

Agency: U.S. Army Corps of Engineers
Honolulu District

Activity: Endangered Species Act Biological Evaluation and Essential Fish Habitat Assessment determination regarding the construction of a shoreline protection measure (tribar revetment)

Consulting Agencies: National Marine Fisheries Service
Pacific Islands Regional Office
Protected Resources Division
& Habitat Conservation Division

United States Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Name of ESA office
& Name of FWCA office

U.S. Army Corps of Engineers Honolulu District

Contents

Background/History

The Emergency Shoreline Protection Project at Ofu Airport is being developed as a cost-shared effort between the Honolulu District, U.S. Army Corps of Engineers (USACE) and the American Samoa Government, represented by the American Samoa Department of Port Administration (DPA). This emergency shoreline protection feasibility study is authorized under Section 14 of the Flood Control Act of 1946 (Public Law 79-525), as amended. The project aims to protect investment, infrastructure at Ofu, and safe transportation throughout the Manu'a Islands by reinforcing 500 feet (ft) of the shoreline at the west end of the newly reconstructed Runway 8/26 of Ofu Airport.

Reconstruction of the Ofu runway was completed in July 2022 using funding provided the Federal Aviation Administration (FAA). Immediately after, king tides with high swells eroded the shoreline at the west end of the reconstructed runway and threatened its structural integrity. Local citizens piled stones by hand to temporarily protect the airstrip from further damage but impacts to airport operations are imminent unless more robust and permanent shoreline protection is completed. The shoreline at the east end of Ofu runway is protected by a rock revetment that was constructed in 1986 at the request of the American Samoa Government. The existing shoreline stabilization structure extends approximately 381 ft along the shore from sea level to the elevation of the runway, about 9 ft above sea level. The proposed project aims to protect the western side of the runway in a similar fashion.

To that end, USACE has prepared a Draft Integrated Feasibility Report and Environmental Assessment (IFREA) for the Ofu Airport, American Samoa - Continuing Authorities Program (CAP), Section 14 Emergency Shoreline Protection project (Proposed Action/Federal Action) pursuant to Engineering Regulation 1105-2-100 and the National Environmental Policy Act. The IFREA identifies, evaluates, and discloses all impacts that would result from the implementation of either of several potential alternatives, including the "No Action" alternative (i.e. Future Without Project Condition, modelled under 50 years of different climate change projections), designed to provide emergency shoreline protection within the study area.

The purpose of this Biological Evaluation (BE) is to address the effects of the Proposed Project on species listed or proposed for listing as endangered or threatened and their designated critical habitat pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended, and on Essential Fish Habitat (EFH) designated for federally managed fishery species pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

Early coordination and pre-consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have been ongoing since the feasibility study began in 2020. Consultation was initiated for NEPA, ESA, and EFH with USFWS, Pacific Islands Fish and Wildlife Office (PIFWO), NMFS Pacific Islands Regional Office (PIRO) Habitat Conservation Division, and NMFS PIRO Division Protected Resources Division via email on November 9, 2021. UFWS PIFWO provided a species list on February 23, 2022, and the Final FWCA Scope of work on August 10, 2022. Because American Samoa was essentially closed to travel for 2022, UFWS PIFWO completed FWCA surveys on Ofu on February 16, 2023, and a Draft FWCA report/preliminary findings provided on March 23, 2023. Information from that draft is incorporated herein.

Project Purpose and Need

The purpose of the Proposed Project is to construct emergency shoreline stabilization (tribar revetment) along 500 ft of shoreline at the western edge of the Ofu Airport runway on the island of Ofu in the U.S. Territory of American Samoa to protect critical transportation infrastructure.

Without this project, current airport operations are at high risk of shutdown due to closure of the runway**.**

The shoreline along the western end of the Ofu Airport Runway is progressively eroding with the coastline receding further into the Runway Safety Area (RSA) of Runway 8/26. The RSA is mandated by Federal Aviation Administration (FAA) regulations to accommodate aircraft that may veer off the runway, as well as firefighting equipment. At Ofu Airport, the RSA is already non-standard due to the limited amount of real estate available. The RSA, in theory, should be 150 ft wide, centered on the runway, and extend 300 ft beyond each end of the runway. The RSA currently extends only 100 ft beyond the end of Runway 8/26. An exemption to the FAA design standards allows the airport to remain operational in its current state, however, continual erosion will result in the imminent closure of the runway.

Coastal erosion within the study area was accelerated during Tropical Storm (TS) Evans in 2012 and again more recently by TS Gita that devastated the islands in 2018. After TS Gita, sand and rocks were deposited onto the grassed area and runway from the high storm wave runup. Airport staff quickly cleared this debris from the airport runway in order to restore runway operations. Frequent king tide events result in similar impacts to the runway with wave runup, erosion, and damage to the runway.

USACE has developed potential alternative plans for shoreline stabilization over a 50 year period of analysis (2026-2076) by identifying coastal hazards and potential structural shoreline stabilization management measures within the study area affected by coastal erosion and future changes to sea level.

USACE and the American Samoa DPA evaluated the results of the feasibility study and recommend Alternative 2: Tribar Revetment: construction of a 500 foot (ft) long, 33 ft wide, revetment comprised of engineered, interlocking concrete armor units (i.e. Tribar). The revetment crest elevation of 10 feet (ft) above mean sea level (MSL) meets the USACE 50-year design requirement for sea level change (SLC) and is adaptable to 100-year SLC under the intermediate scenario at 9 ft above MSL. This alternative is considered most practicable with respect to real estate considerations, costs, and logistics as the Tentatively Selected Plan (TSP) and has been tentatively identified as the Least Environmentally Damaging Practicable Alternative and is carried forward for analysis to either confirm the TSP as the recommended plan or select a different alternative. While maximizing net benefits, it has anticipated positive impacts on nearshore water quality (e.g., by minimizing future coastal erosion) and is supported by the American Samoa Government. The American Samoa Government supports Alternative 2 as the TSP.

The proposed Action and Action Area for this project will include an area of permanent impact required for placement of the tribar revetment and an area of temporary impact for access, construction, and staging areas. These are described in detail in Section 2. Section 3 describes the listed species and habitats (including EFH) that could be potentially affected by the proposed Project activities, as well as an analysis of effects of the proposed Action on these species and habitats. Section 4 provides a description of the environmental baseline conditions. Section 5 provides a summary of overall effects of the proposed Action and Section 6 includes a discussion of potential cumulative effects. Section 9 summarizes the measures and best management practices (BMPs) that would be used to avoid and minimize impacts to the natural resources are discussed. Preparation and implementation of these BMPs would reduce the potential construction-related water quality impacts to a less-than-significant level. With implementation of these best management practices, the extent of impacts from the proposed Action are expected to be less than significant.

Description of the PROPOSED Action & Action Area

Description of the Proposed Action

This Proposed Action is the construction of a 500 ft long by 33 ft wide (approximately16,500 ft^2 or 0.38 acres) tribar revetment (Figure 1) along the coast at the west end of the Ofu Airport Runway 8/26. The revetment would consist of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, and a single layer of 1-ton concrete tribar. The stone sizing of the underlayer would range from 100-300 lbs. stone. At the specified 1.5H:1V slope, the revetment is expected to be 33 ft wide, from crest to toe, extending towards the ocean, with a crest elevation of +10 ft Mean Sea Level (MSL). At this time, construction of project features is not anticipated to affect structures at the Ofu Airport.

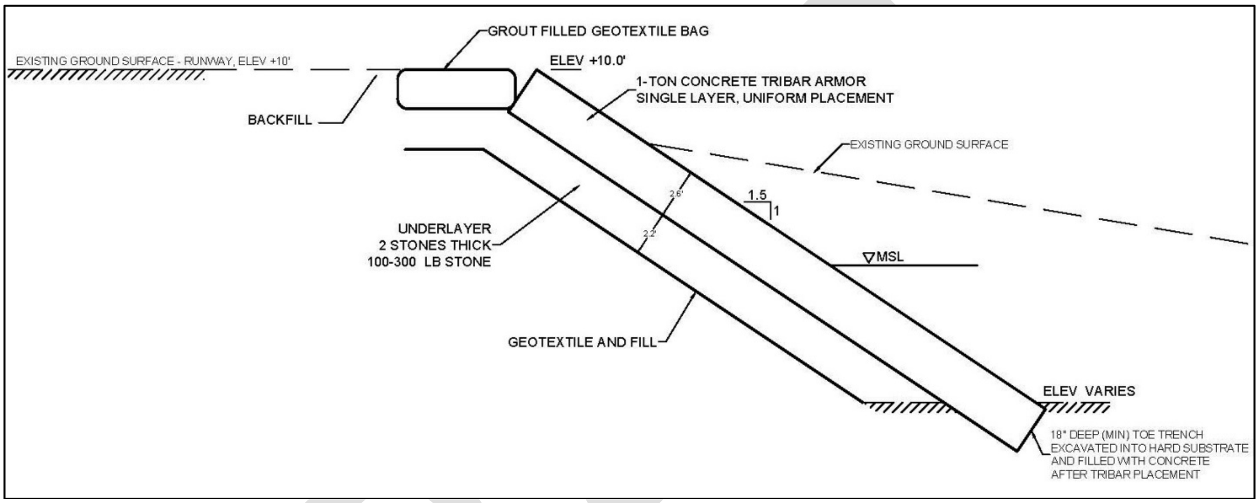

Figure 1. Alternative 2 – Tribar Revetment

Revetments are a type of “hard” sloping coastal engineering structure that runs parallel to the shoreline to protect landward areas and infrastructure from waves, tides, currents, and storm surge (water build up above the average tide level). They can be used in areas exposed to both high and low wave energy.

The major components of the proposed revetment are the tribar armor layer, filter, and toe (see Figure 1). The concrete tribar armor layer is an erosion resistant material that dissipates the energy of storm waves, prevents further recession of the backshore and provides basic protection against wave action. Concrete tribar is appropriate where high value infrastructure is to be protected. The filter layer supports the armor, provides for the passage of water through the structure, and prevents the underlying soil from being washed through the armor. The buried toe prevents displacement of the seaward edge of the revetment. Revetments can be constructed as carefully designed engineered structures protecting long lengths of shoreline with some permeability allowing for increased wave dissipation in the interstices of the revetment in comparison to non-permeable structures such as concrete seawalls that reflect and can accelerate wave energy radially.

There is substantial regional experience in working with concrete tribar, the resulting construction has proven robust given local conditions, and local people are accustomed to seeing this type of structure elsewhere in American Samoa.

Revetments may not prevent on going shoreline recession unless they are properly maintained, and, if necessary, extended. If the foreshore continues to erode, the rock revetment may slump down, becoming less effective as a defense structure, but will not fail completely. Repairs and extensions may be necessary to provide continued backshore protection at the design standard.

Description of the Study Area and Proposed Action Area

American Samoa is an unincorporated territory of the United States, part of the Samoan Islands archipelago in Polynesia in the mid-South Pacific Ocean (Figure 2). The Study Area is located at Ofu Aiport on the island of Ofu within Ofu County in the Manu'a Islands District.

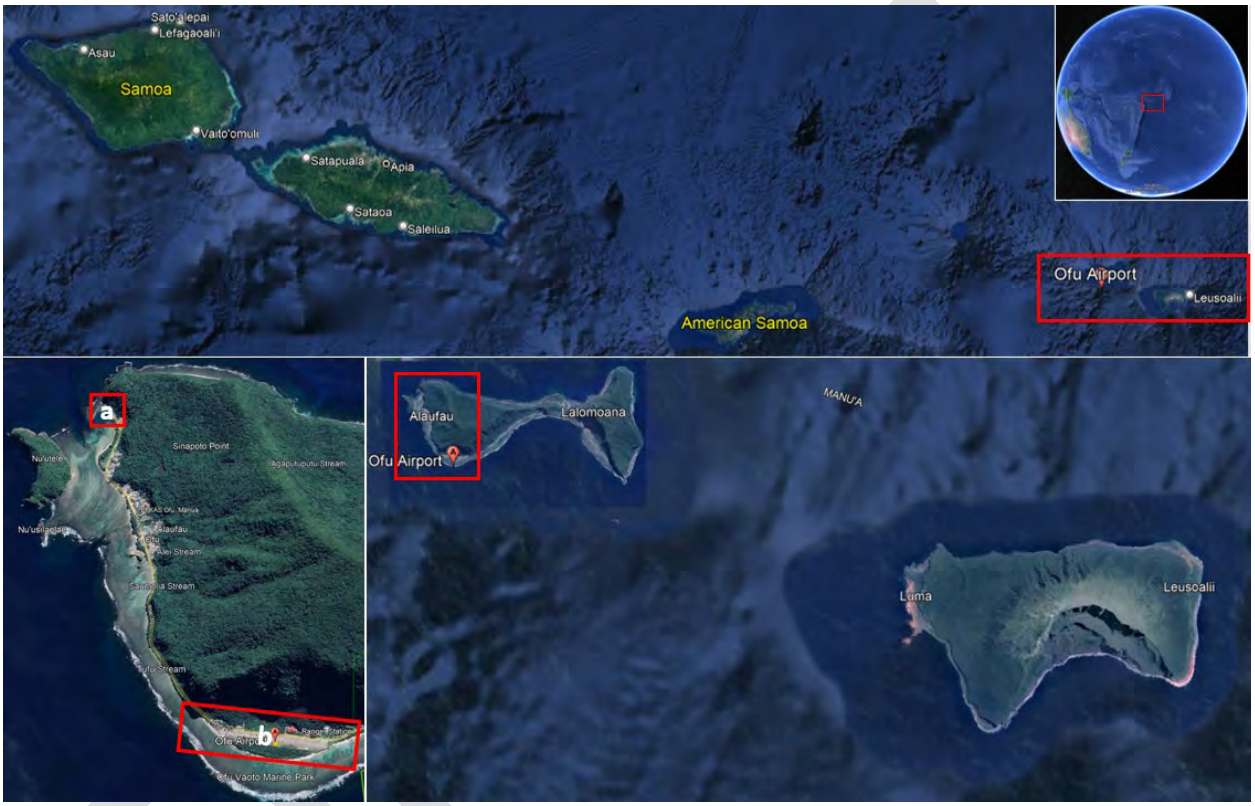

Figure 2. Location of Study Area (in counter clockwise order above, beginning in the lower left) highlighted in red polygons (a. Ofu Harbor to the North and b. Ofu Airport to the South, corresponds to a. and b. in Figure 3) on Ofu Island of the Manu'a Islands of American Samoa in the Pacific Ocean.

The Airport is on the Va'oto Plain at Papaloloa Point along the southern facing coast of Ofu Island (Figure 3). The Va'oto Plain is a wide coastal flat that formed at the base of a steep (almost vertical) cliff abutting the backside of the plain. Ofu Airport is an 18-acre public airport that takes up most of the Va'oto Plain. The airport facility is operated by the American Samoa DPA on property leased from local families. The airport is intended to serve the aviation needs of both Ofu and Olosega islands. Construction materials would arrive on island via the Ofu Harbor; accordingly, the Ofu Harbor is included in the Study Area. The study area encompasses the ESA Action Area and the EFH Review Area within which USACE is evaluating the effects of the proposed action on ESA listed species and designated critical habitat and designated EFH, respectively.

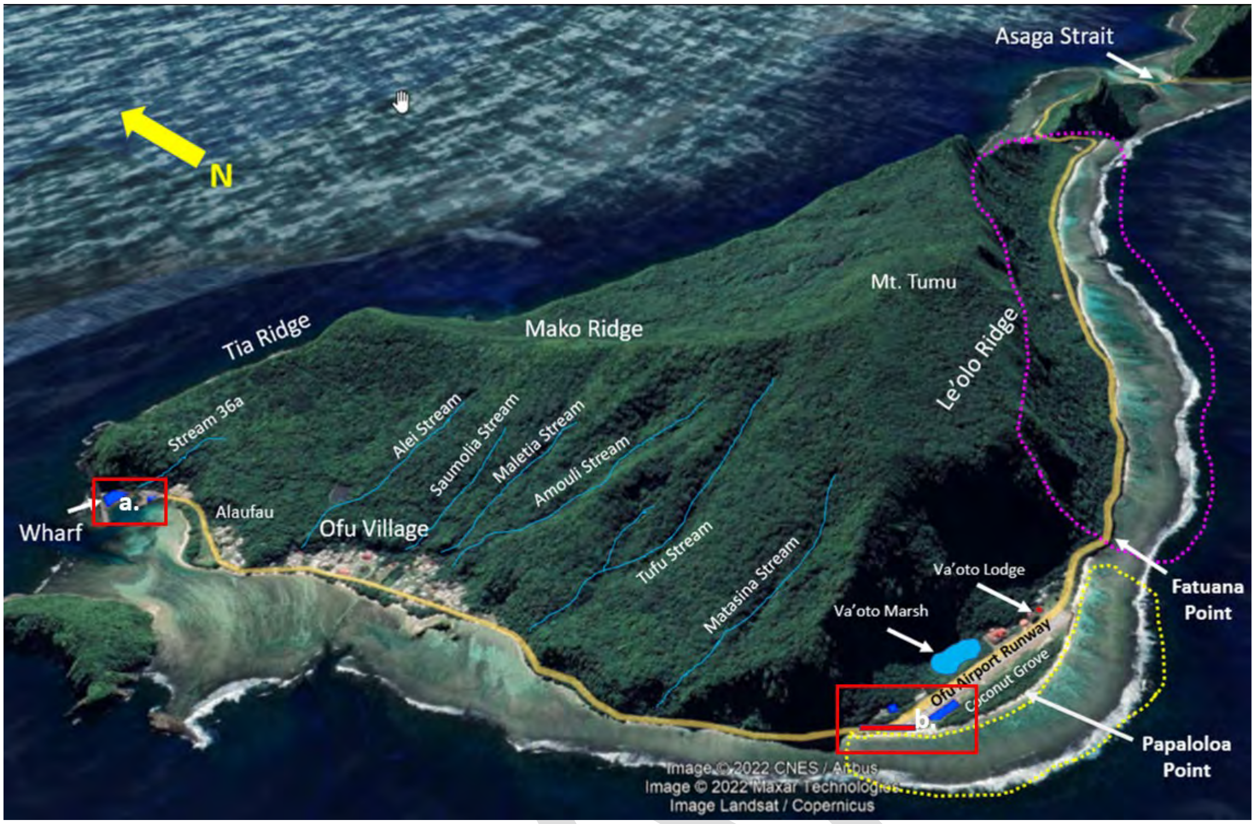

Figure 3. Landscape features of Ofu Island. Red boxes are the general action areas containing the proposed COSAs in dark blue and proposed shoreline protection measure in red. The Ofu-Va'oto Territorial Marine Park is outlined in the yellow dotted line. The Ofu Unit of the National Park of American Samoa is outlined in the pink dotted lines. Streams of the Saute Watershed are in blue.

Two marine protected areas are located on Ofu's southern shoreline within the vicinity of the Ofu Airport: (1) the Ofu-Va'oto Territorial Marine Park, directly adjacent to the proposed Action Area (yellow dotted line on Figure 3), and (2) the Ofu Unit of the National Park of American Samoa (pink dotted line on Figure 3). The Ofu-Va'oto Marine Park is a Territorial Marine Protected Area (MPA) comprising approximately 100 acres that extends approximately one-half mile from Fatuana point to the west end of the Ofu airport runway and from the mean high-water line seaward to the ten-fathom depth curve (60 ft) and includes sandy shore and reef flat habitat. Endangered hawksbill and green sea turtles are documented to nest on the sandy beaches within the Marine Park adjacent to the proposed Action Area (Figure 4).

The ESA Action Area for this project will include the area of permanent impact required for placement of the tribar revetment at the west end of Runway 8/26 at the Ofu Airport (red box b. on Figures 2 and 3 and the orange bar on Figure 4b.), and areas of temporary impact for access, construction, and staging/storage of equipment, material, and vehicles (blue polygons on Figures 3 and 4) within which USACE anticipates direct and indirect impacts to ESA-listed species and designated critical habitat. The ESA Action Area encompasses uplands, nearshore intertidal areas, and proximal marine waters.

The EFH Review Area for this project includes only the area of permanent impact required for placement of the tribar revetment and the area of temporary impact to facilitate construction of the tribar revetment. The EFH Review area encompasses the uplands and nearshore intertidal areas immediately surrounding the tribar revetment and the proximal marine waters fronting the tribar revetment.

Figure 4. The proposed Action Area includes four Construction Staging Areas (COSAs) in blue: a. COSA 3 and 4 at Ofu Harbor (a. in Figure 2), b. COSA 1 and 2 at Ofu Airport (b. in Figure 2). The tribar revetment construction area is depicted in orange.

The four Construction Staging Areas (COSAs) totaling 1.35 acres will be fenced and used for contractor trailers, parking, and the storage, use, and distribution of construction materials and equipment during construction. COSA 1 is a 4,000 ft^2 area at a private residence at the Ofu airport (Figure 3b). COSA 2 is a 22,000 ft^2 area along the south side of the airport runway near the ESA Action Area. Fill/aggregate storage is anticipated to be contained at COSA 2 along the south side of the runway (Figure 3b). COSA 2 would be accessed via the main public road and would require that vehicles are periodically able to traverse across the runway. COSA 3 is a 3,500 ft^2 area at the Ofu Harbor approximately 1.5 miles north of the airport (top orange square in Figure 2, Figure 3a) for storage of tribar. COSA 4 is a 29,000 ft^2 open area also located at the Ofu Harbor for storage of tribar (Figure 3a).

The COSAs are flat, open and cleared, requiring no vegetation removal or other ground disturbance to facilitate construction or provide enough room for construction equipment to operate. Any material stored in the COSAs would be covered to reduce the loss of material due to erosion and avoid impacts to the adjacent environment. The COSAs would be returned to their previous condition upon construction completion. Construction is anticipated to last for one (1) year and would occur at low tide and outside of green and hawksbill sea turtle nesting season (December to June).

The tribar revetment structure will extend 500 ft along the coast of the west end of the Ofu Airport runway and permanently affect 0.38 acres (orange shaded area in Figure 4), 0.07 acres of which is below MSL in the intertidal zone (Figure 1), the rest in uplands. The area of the revetment in the intertidal zone would remain subject to intertidal influences and sediment movement. Construction of the tribar revetment would require temporary excavation of an area of 0.12 acres for construction of the toe (purple area in Figure 4) which would be backfilled with the excavated material upon completion. To accommodate the thickness of the structure, the existing ground will need to be excavated approximately 4.8 ft (Figure 1). Excavated material will be used to backfill the beach in front of the structure, approximating the original ground surface (Figure 1). The Construction work would occur during low tide and not in the water. The design will be further refined in the pre-construction engineering and design phase that follows the feasibility phase.

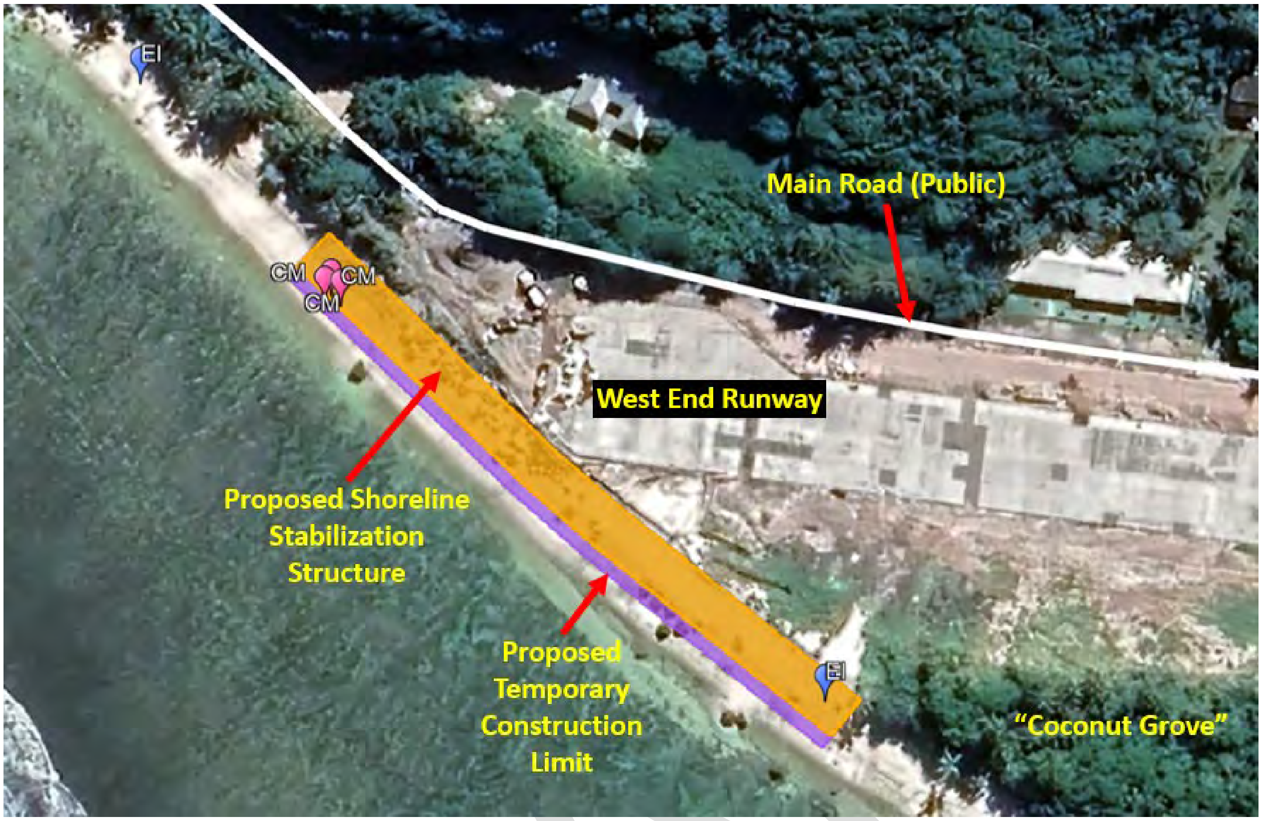

Figure 5. General location and placement of proposed Alternative 2: Tribar Revetment in relation to landscape features: Permanenet Tribar Revetment (orange), temporary toe excavation (purple), and hawksbill (blue teardrop; EI) and green sea turtle (pink teardrops; CM) nests observed in 2017-2019 surveys by DMWR.

Table 1: Proposed Action Area Dimensions

	Area	Height	Length	Width	Surface Area
Permanent	Tribar Construction Area	+10	500 ft	33 ft	16,5000 ft^2
Temporary	Toe Construction Area	-18	500 ft	10.454 ft	5,227 ft^2
Temporary	COSA 1				4,000 ft^2
Temporary	COSA 2				22,000 ft^2
Temporary	COSA 3				3,500 ft^2
Temporary	COSA 4				29,000 ft^2

Listed species, Critical habitat & EFH in the action area

The Action Area includes a strip of partially vegetated land directly adjacent to the runway and inland of the intertidal zone. The remainder of the Action Area is a sandy beach including rubble, scattered boulders, and a small area of pavement. The beach is periodically covered by normal high tides, however, the biological community observed there was largely terrestrial and not captured by our data. Marine biological data was only collected at the seaward extremes of the Action Area and was otherwise absent from the Action Area (USFWS 2023).

The reef flat is located directly seaward of the Action Area and the intertidal zone. The reef flat was characterized by water depth of approximately 0.1 - 2 m over primarily Hard Bottom Pavement with smaller areas of Mixed Habitat Structure consisting of Scattered Coral Rock in Unconsolidated Sediment. Habitat Complexity at the reef flat was low with relief generally less than 1 m. Continuing offshore, the surf zone was rough with powerful swells breaking approximately 100 m offshore. The swells pushed whitewater with surge and current making a dynamic physical environment with near continuous flushing of the reef flat with fresh ocean water, particularly at higher tides. The Reef Flat was shallow and calmer on low tides (USFWS 2023).

Listed Species Likely to be Affected by the Proposed Action

Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), USACE requested technical assistance from USFWS and NMFS and on February 2, 2022 and received the following list of species listed or proposed for listing under both NMFS and USFWS jurisdiction (Table 2) that may be present on or in the vicinity of the study area, as well as confirmation that there is no designated or proposed federally designated critical habitat for these species occurring within the immediate vicinity of the study area (Reference Number: 2022-0006860-S7-00). In addition, there are seven (7) species of threatened Indo-Pacific corals found in the waters off American Samoa (Table 2), three (3) of which were observed in the Project Area (USFWS 2023): *Acropora globiceps*, *Acropora retusa*, and *Isopora crateriformis*.

Table 2. ESA Listed Species potentially present on or in the vicinity of the proposed project location. Key to within table notations: *endemic to American Samoa.

Common Name	Scientific Name	Status	Critical Habitat	Jurisdiction	Observed in Action Area
Sea Turtles					
Green sea turtle, Central South Pacific Distinct Population Segment (DPS) (*laumei ena`ena*)	*Chelonia mydas*	Endangered	No	NMFS in ocean; USFWS on land	No
Hawksbill sea turtle (*laumei uga*)	*Eretmochelys imbricata*	Endangered	No	NMFS in ocean; USFWS on land	No
Terrestrial Species					
striped Eua tree snail (sisi totolo)	*Eua zebrina**	Endangered	No	USFWS	No
friendly ground dove (tuʻaimeo) American Samoa DPS	*Gallicolumba stiri*	Endangered	No	USFWS	No
Coral Species					
small-polyp stony coral	*Acropora globiceps***	Threatened	Pending	NMFS	Yes
small-polyp stony coral	*Acropora jacquelineae*	Threatened	Pending	NMFS	No
small-polyp stony coral	*Acropora retusa***	Threatened	Pending	NMFS	Yes
small-polyp stony coral	*Acropora speciosa*	Threatened	Pending	NMFS	No
colonial stony coral	*Seriatopora aculeata*	Threatened	Pending	NMFS	No
branching frogspawn coral	*Euphyllia paradivisa*	Threatened	Pending	NMFS	No
small-polyp stony coral	*Isopora crateriformis***	Threatened	Pending	NMFS	Yes

Sea Turtles

In American Samoa, sea turtles (*laumei* in Samoan) include the endangered hawksbill sea turtle (*Eretmochelys imbricata*) (NMFS & USFWS 2013) and the endangered green sea turtle (*Chelonia mydas)* (81 FR 20058). In addition, both species are protected by American Samoa Administrative Code (Chapter 09 Fishing Title 24 Ecosystem Protection and Development 24.0959 Sea Turtles), Executive Order 005-2003. Both species are globally distributed throughout tropical and sub-tropical zones. Based on sea turtle surveys conducted across the Central, West, and South Pacific, green sea turtles were found to be 11 times more abundant than hawksbills (Becker et al. 2019). Sea turtles play a vital biological role in maintaining biodiversity and productivity in the coastal ecosystem. Hawksbill sea turtles in particular are known to perform regulatory functions on the coral reefs (Leon & Bjorndal 2002) and are transporters of nutrients to nesting beaches (Bouchard & Bjorndal 2000).

Most sea turtle species are closely tied with the highly threatened coral reef habitat on which they depend for sponges and invertebrate prey (Leon & Bjorndal 2002). Hawksbill sea turtles are the most at risk of the globally distributed sea turtle species (Mortimer 2008). Historically, hawksbill sea turtles were largely exploited for tortoiseshell, while green sea turtles were predominantly killed for consumption. Both species remain at risk from continued harvest, incidental fisheries bycatch, ocean plastics and pollution, and possible predation and poaching of eggs. Sea turtle habitat is threatened by coastal development, coastal armoring, water quality impacts, and light pollution. In addition to direct mortality from human impacts, the survival and recovery of sea turtles is limited by the sensitivity of coastal habitats to environmental and anthropogenic stressors. Coral reefs, an important feeding ground for green and hawksbill sea turtles, are highly sensitive to and threatened by overfishing, terrestrial runoff, and impacts of climate change.

Sea turtles are vulnerable to loss of habitat due to sea level rise and coastal erosion. These factors affect sea turtle nesting habitats and nesting success due to flooding of nests during times of high tide and storms. Increased air and sea temperatures also impact nesting preference and hatchling sex ratios to more females in each nest. Disturbance regimes such as disease, extreme storms, and tsunamis can contribute to sea turtle mortality from direct impacts to nest and adult sea turtles. Non-climate stressors have contributed to increased threats to sea turtles and will be exacerbated by climate impacts by further impacting nesting beaches and hatchling success.

In American Samoa, both species are known to nest and juveniles of both species are commonly found in near-shore coral reef habitats. As is true across the Pacific, the observed abundance of sea turtles in American Samoa decreases with size class. Juveniles are the most common size class, followed by subadults, and adults. New recruits are rare. Hawksbill turtles are the most commonly occurring species in Tutuila and Manu’a Islands (Tagarino 2015). It had been previously assumed that only hawksbills nest on beaches of Tutuila, Aunu’u and the Manu’a Islands (Craig 2009); however, recent tagging work by American Samoa Department of Marine and Wildlife Resources (DMWR) and the National Park of American Samoa have confirmed that a substantial proportion of turtles nesting on Ofu Island are green sea turtles. There is <u>no</u> designated critical habitat for either species in American Samoa.

Both hawksbill and green sea turtles have been documented to nest on Ofu on Vaʻoto Beach fronting the Ofu Airport where the proposed Project is located (Figure 6). USFWS (2023) reported the entire observed beach within the Action Area appears to be suitable habitat for turtle nesting, though no turtles or turtle nests were observed during their survey. Sea turtles are known to nest in two main areas at Vaʻoto Beach (Figure 6) that appear to correlate to the locations of openings/breaks (*avas* in Samoan) in the outer reef that encircles the island. The *avas* are where the turtles enter/exit the inner reef from the open ocean. From these locations, they tend to swim directly to the nearest suitable beach area. Sea turtles have a limited time to come ashore and lay their eggs, so the location of the *avas* is an important factor for nesting beach site selection. Nesting sea turtles also reportedly have high site fidelity to their natal beach and will not automatically choose to nest along another portion of beach should their natal nesting beach be lost to storms, erosion, or development.

Green Sea Turtle

Green sea turtles, the larger of the two species, occasionally forage in the open ocean and coastal waters off American Samoa and low-level nesting occurs on sandy beaches of Tutuila and the Manuʻa Island group, including Ofu Island, but apparently not in great numbers (NMFS & USFWS 1998). The population of green sea turtles in American Samoa belongs to the Central South Pacific DPS as defined by NOAA and the USFWS.

The major nesting site for green sea turtles in American Samoa and a significant source for the Central South Pacific DPS is Rose Atoll, located approximately 100 miles east of the Ofu Island (Tuato'o- Bartley et al. 1993). The green turtles that nest at Rose Atoll likely forage elsewhere in the Central South Pacific where sea grasses and algae are abundant. Green sea turtles tend to be most associated with deep-water coral and seagrass beds. As seagrasses are absent in American Samoa, this may be one reason the species is less common here.

The breeding season for green sea turtles occurs from November to January, when mating activity can often be observed in the water. Nesting occurs at night on sandy beaches, mainly from December to June, peaking in February. Females dig a hole in the sand above the high tide mark and deposit several dozen eggs, a process that takes about three hours. She then covers them with sand to protect them from the sun, heat and predators and returns to the ocean. The newly laid eggs incubate in the sand for 50 to 60 days.

Surveys from 2009 to 2013 documented two (2) green sea turtle nests (NE03 and NE05 in Figure 7a.) above the high tide line and beach slope at Ofu Airport (Tagarino, 2015). One nest was in grass and vines and the other was under beach forest. More recent surveys from 2017-2019 conducted by the DMWR and National Park at Vaʻoto Beach recorded four (4) green sea turtle nests in 2017-2018 (red dots in Figure 7b), and three (3) green sea turtle nests at one location in 2018-2019 (pink dots in Figure 7b). The data indicate that while green sea turtles prefer to nest within the same beach over time, they are not devoted to a specific spot on that beach and while turtle nests have been observed in the Action Area (Figure 4), there is suitable adjacent nesting habitat for the turtles to use throughout the study area.

Hawksbill Sea Turtle

The sandy beaches on American Samoa provide nesting habitat for hawksbill sea turtles which live year-round in the Territory. The population of hawksbill sea turtles in American Samoa is considered a population of significance for the species (Becker et al. 2019), with the beaches in the Ofu, Olosega and Ta'u islands representing a significant area for nesting hawksbill sea turtles in the Territory (Tagarino 2015). Based on sea turtle surveys conducted in the Central, West, and South Pacific, American Samoa had the highest densities of hawksbills, with 0.12 turtles/km recorded on Ta'u Island in the Manu'a Islands group (Becker et al. 2019). Ta'u Island also had the most hawksbill new recruits (7%). Tutuila supported an estimated 50 nesting females per year through the 1990s (NMFS & USFWS 1998). However, recent monitoring studies conducted by the American Samoa DMWR between 2005 and 2010 indicate that fewer than 30 females nest on the beaches of American Samoa (NMFS & USFWS 2013).

On Ofu and Olosega Islands, hawksbill turtles nest every 3-5 years. Nesting season occurs from late August to March, with a peak in nesting activity from November to February. While some data suggest turtle nesting season can potentially occur year-round, there is a definite peak in nesting activity between the months of January and February on the islands.

Surveys from 2009 to 2013 documented three (3) hawksbill nests (NE01, NE02, and NE04 in Figure 7a) at Ofu Airport (Tagarino, 2015). One (1) hawksbill turtle nest was located above the high tide line, one at the top section of the beach slope, and one behind the beach slope. Both nests above the beach slope were in vegetation, one in grass and creeping vegetation, and the other in the beach forest vegetation of mostly *Scaevola* sp. and grass. The nest on the beach slope was in grass and creeping vegetation. More recent surveys from 2017-2019 conducted by the DMWR and National Park at Vaʻoto Beach recorded three (3) hawksbill turtle nests in 2018-2019 (blue dots in Figure 7b). The data indicate that while hawksbill sea turtles prefer to nest within the same beach over time, they are not devoted to a specific spot on that beach and while turtle nests have been observed in the Action Area (Figure 4), there is suitable adjacent nesting habitat for the turtles to use.

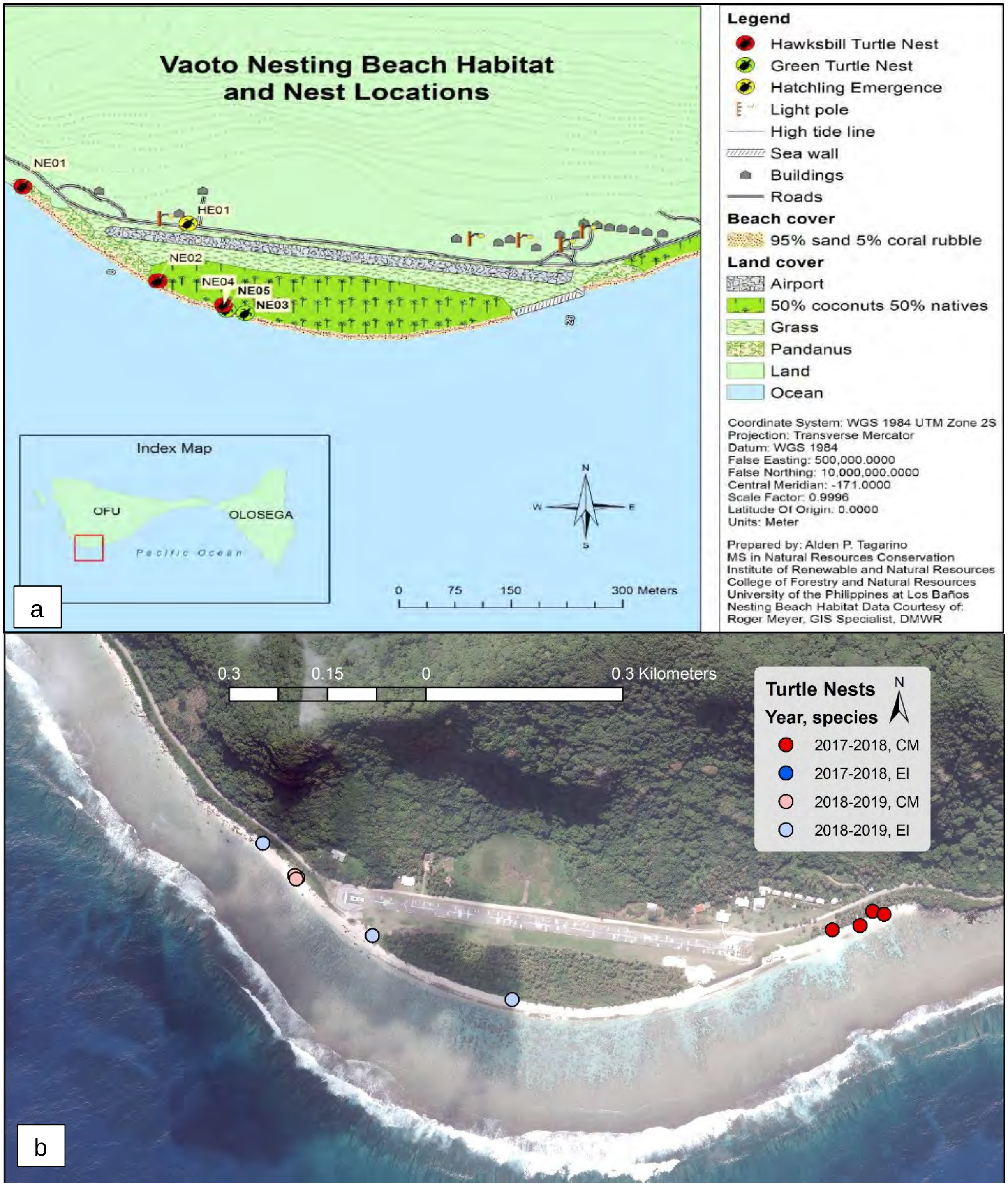

Figure 6: a. Locations of sea turtle nests observed at Va'oto Beach 2009-2013 (from Tagarino 2015). b. Location of hawksbill (EI; blue dots) and green sea turtle (CM; pink and red dots) nests observed at Va'oto Beach at the Ofu Airport 2017-2019 by the Dept. of Marine and Wildlife Resources.

Predation and inundation by water significantly affected the hatching and emergence success of hawksbill nests on Ofu and Olosega Islands as opposed to presence of beach vegetation and nest location (Tagarino, 2015). Management leading to a reduction of predation on sea turtle nests has resulted in increased hatching and emergence success (Engeman et.al., 2009, Dutton et.al., 2004). Sea level rise and climate change implications will have profound effects on the nests in Ofu and Olosega islands given the already significant effect of water inundation on the nests caused by high water surges (Tagarino, 2015). Proximity of the nesting beaches to active lights has been observed to disorient and adversely affect the movement of hatchlings after emergence (Witherington & Martin 1996). For example, four (4) hawksbill hatchlings were found under the streetlight across the western end of the runway on April 8, 2011 (Tagarino, 2015).

Corals: Status and Distribution

Coral reefs are among the most diverse and productive ecosystems on the planet, providing habitat for over 25% of all marine species, including many commercially valuable fishes and invertebrates as well as ESA-listed species such as hawksbill and green sea turtles. They also protect coastlines and vital infrastructure and contribute directly to coastal economies through fisheries, tourism, and recreation. Coral reefs are particularly important to Pacific Island communities that heavily rely on them for food, protection, and income.

Overall, coral reefs in American Samoa are in good condition but the Territory is struggling against threats such as coastal pollution, overfishing, and the impacts of global climate change (NOAA 2018). Known human-induced stressors to the listed species in the waters around American Samoa include the effects of over-fishing (especially for sharks and other predators), land-based sources of pollution, and direct damage and habitat degradation through coastal development activities. Non-point source pollution is now considered the primary pollution source for coastal areas in American Samoa. Sedimentation from natural runoff (the islands are very steep and rainfall is often heavy), exacerbated by hillside and coastal development, is also a significant potential threat to coral reefs of American Samoa. A limited amount of marine debris washes in from offshore and is deposited on American Samoa's coral reefs, the bulk of which originates from land-based activities. Anthropogenic stressors reduce the resistance and resiliency of coral reefs to the compounding effects of global climate change such as ocean warming and ocean acidification.

There are 7 species of threatened Indo-Pacific corals found in American Samoa waters: *Acropora globiceps, A. jacquelineae, A. retusa, A. speciosa, Euphyllia paradivisa, Isopora crateriformis,* and *Seriatopora aculeata.* In November 2020, NMFS proposed to designate critical habitat in American Samoa for these coral species pursuant to Section 4 of the ESA. Under this designation, the entire fringing reef of Ofu and Olosega would be considered critical habitat at depths from 0-67 ft. This designation is still pending and not final.

In 2023 the USFWS was contracted to provide technical assistance in assessing marine habitat and biological resources, and potential impacts to those resources, within the study area under the Fish and Wildlife Coordination Act (FWCA) to assist USACE in assessing potential environmental impacts of the proposed shore protection measures and make recommendations for conservation of fish and wildlife resources. The area assessed included the project footprint and adjacent areas of potential secondary impact. The scope of work for this effort included a survey that provided qualitative and quantitative marine resource information as well as habitat delineation maps. The quantitative information included coral abundance and size class distribution, cover of macroalgae, the abundance of non-coral macroinvertebrates, and a characterization of the geomorphological structure. Preliminary results were provided to USACE in March 2023 to help inform its analysis. These preliminary results have been incorporated as appropriate.

The reef flat immediately adjacent to the Action Area appeared to be a productive and healthy coral reef habitat overall (USFWS 2023). Coral cover, diversity, and colony size generally increased progressively from shore to the surf zone. One exception was that the larger microatolls (*Porites sp.*) tended to be closer to shore. The nearest live coral colony to the Action Area was observed 27 m away from the runway cement and approximately 10 m outside the Action Area. Coral cover was limited to scattered individuals near the low tide mark but quickly progressed to 10-50 percent cover slightly further from shore and near 80 percent coral cover just inside the surf zone where large encrusting and lobate corals and numerous small branching corals dominated (USFWS 2023).

Three (3) of the seven (7) ESA listed species of Indo-Pacific corals known from American Samoa were observed within the vicinity of the Action area: *Acropora globiceps*, *A. retusa,* and *Isopora crateriformis.* Coral cover close to shore was relatively low. The closest observed ESA listed coral colony was approximately 25 meters (82 ft) seaward of the proposed Action Area.

Striped Eua Tree Snail

The endangered endemic striped Eua tree snail (*Eua zebrina,* Gould 1847) in the family Partulidae (USFWS 2020) may be present on or in the vicinity of the proposed Action Area. This species is known from forest habitat on Tutuila and Ofu Island in American Samoa, occurring primarily on leaves but also on trunks and branches of trees (Cowie 1992). The species was once considered abundant in the Territory but is now known only from a few locations. It is still considered the most common species of the native land snails in American Samoa. The most recent surveys have documented the species at multiple localities on central and eastern Tutuila in 1992 and 1998, but only at one locality on Ofu in 1998 (Cowie & Cook 2001). This was the first record of *E. zebrina* on Ofu. This single locality was on the north side of Ofu island where individuals of the species were relatively abundant, with 88 individuals recorded during the timed collecting period (Cowie & Cook 2001). This species was not recorded within the National Park on the south side of the island.

The Eua tree snail is not expected to occur in the sandy, low lying littoral strand vegetation that characterize the proposed Action Area. This species prefers forest habitat and lives primarily on leaves, trunks and branches of trees which are not found in the proposed Study area. This project will have no effect on Eua tree snails.

Friendly Ground Dove

The friendly (or shy) ground-dove (*Alopecoenas* (formerly *Gallicolumba) stairi*) is a medium-sized dove native to the Samoan, Fijian and Tongan archipelagos and Wallis and Futuna Islands. In American Samoa, it is reported to occur primarily in shaded forests or thickets on or near steep, forested slopes, sometimes with an open understory and fine screen or exposed soil (Kayano et al. 2019). They utilize littoral forest and scrub, lowland rainforest, and agroforest and have been observed foraging in forested areas disturbed by human activity (Pyle et al. 2018). It forages on the ground and in the understory for seeds, fruit, and invertebrates (Clunie 1999).

The American Samoa population of the friendly ground-dove was listed as endangered and a Distinct Population Segment (DPS) under the Endangered Species Act in 2016. Historically and currently, the American Samoa DPS of the friendly ground-dove is only known to occur on the islands of Ofu and Olosega (Figure 8). Population trend information is unavailable, but the population has remained consistently small (< 100 individuals) since at least the late 1970s.

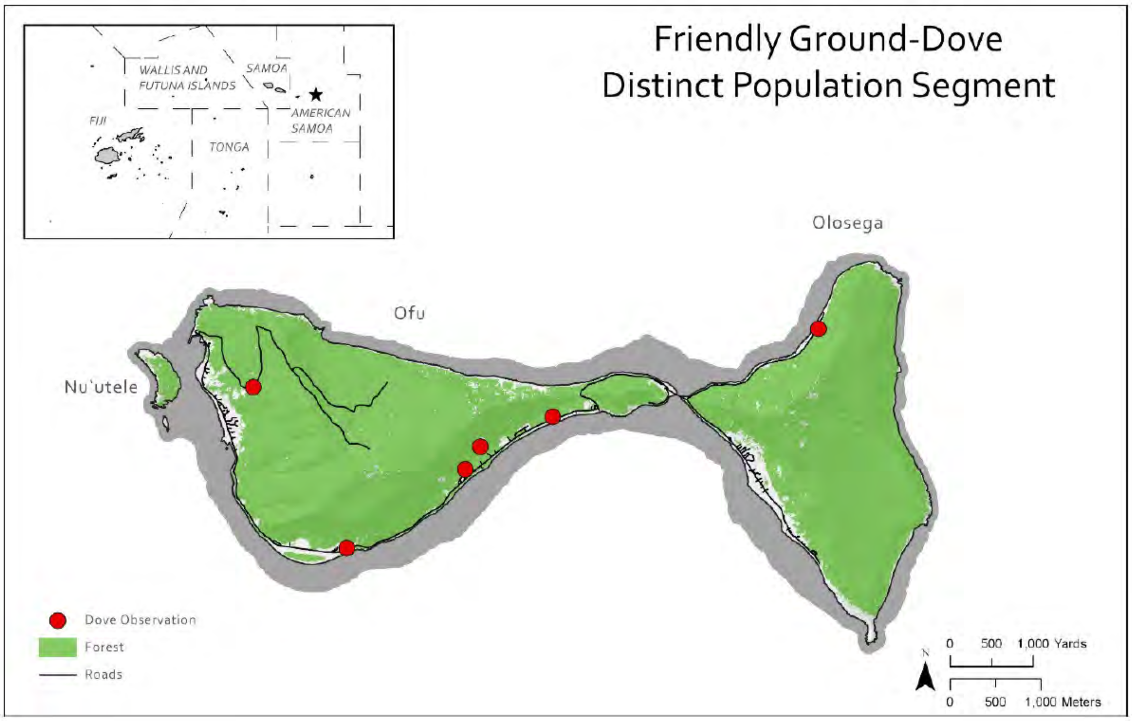

Figure 7: Locations of reported Friendly Ground-dove observations from the late 1970s to 2018 (USFWS 2020).

The friendly ground dove is not expected to be found in proposed action area, preferring littoral forest, lowland rainforest, and agroforest, habitats which would not be impacted by project activities (Figure 8). This project will have no effect on Friendly ground-doves.

Essential Fish Habitat in the Action Area

The water column and bottom and all surrounding waters and submerged lands around the islands of American Samoa are designated as EFH by the NMFS and support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council's American Samoa and Pacific Pelagic Fishery Ecosystem Plans. The MUS and life stages found in these waters include eggs, larvae, juveniles, and adults of Bottom-fish and Pelagic MUS (WPFMC 2009).

In terms of EFH, soft beach substrate that is periodically covered by normal high tide is the primary habitat type and comprises approximately 67% of the of the proposed Action Area (includes sandy beach, rubble, and scattered boulders). The entire observed beach within the proposed Action Area appears to be suitable habitat for nesting sea turtles. Directly seaward of the proposed Action Area and the intertidal zone is a reef flat comprised of healthy corals. The reef flat is characterized by water depth of approximately 0.1 - 2 m over primarily Hard Bottom Pavement with smaller areas of Mixed Habitat Structure consisting of Scattered Coral Rock in Unconsolidated Sediment. Habitat Complexity at the reef flat was low with relief generally less than 1 m. The nearest live coral colony is approximately 27 m away from the edge of runway cement and approximately 10 m outside of the proposed Action Area. Specific habitats considered as EFH are listed in Table 3.

Table 3: EFH for American Samoa Archipelago and Pacific Pelagic Fishery Ecosystem MUS

Habitat	Present in Proposed Action Area

coral reef/reef flat	Yes
patch reefs	No
hard substrate	Yes
artificial substrate	Yes
soft substrate	Yes
surge zone	Yes
lagoon	No
seagrass beds	No
mangroves	No
estuarine	No
deep-slope terraces	No
pelagic/open ocean	No
streams or rivers	No
riparian areas	No
wetlands	No
mudflats	No

There are no riparian areas, streams (including pool and riffle complexes), wetlands, mudflats, seagrass beds, mangroves, estuarine, surge zone, deep-slope terraces and pelagic/open ocean that would be affected by proposed Project activities as these habitat types are either non-existent in the area, very limited in extent within the Ofu lagoon, or are far removed from the area that would be most influenced by project activities. These EFH habitats are not discussed or considered further in this analysis.

Potential Impacts

An effects analysis for constructing the Tribar Revetment was conducted based on the known locations of sensitive species and habitat along the southern coast of the island of Ofu at the west end of the Ofu Airport runway where the feature would be constructed. Compared to other alternatives considered for this proposed Project, implementation of the tribar revetment was determined to be the least costly and would result in minimal adverse effects on coastal resources.

Soft engineering strategies (i.e., natural and nature-based measures) such as vegetation barriers and use of beach fill were considered as potential solutions early in the planning phase of this project. However, these solutions would not be effective in reducing the effects of coastal storm damages in the proposed Action Area. Due to the high wave energy environment in the Action Area, vegetation alone would not provide adequate protection to Ofu Airport over the 50-year period of analysis (2026 – 2076).

Revetments are generally considered to cause less damage to the environment than other types of structures, like vertical seawalls, because they are less prone to wave flanking and limit interference with natural sediment processes, thereby maintaining coastal stability while still allowing some natural coastal processes to occur. Natural shoreline erosion supplies adjacent stretches of coastline with sediment, through longshore drift. Burial of the toe of the revetment maintains an area of shoreline sediment to participate in longshore drift.

Sloping revetments are more effective at dissipating wave energy and less subject to significant loadings because of wave impact. Smooth, vertical seawalls are the least effective at dissipating wave energy; instead, the structures reflect wave energy seawards. Reflection creates turbulence, capable of suspending sediments (Bush et al. 2004), thus making them more susceptible to erosion. The problems of wave reflection and scour can be reduced to some degree by incorporating slopes and irregular surfaces such as tribar into the structure design. Slopes encourage wave breaking and therefore energy dissipation while irregular surfaces scatter the direction of wave reflection (French 2001). Pilarczyk (1990) recommends the use of maximum seawall slopes of 1:3 to minimize scour due to wave reflection. The proposed slope of the tribar revetment is 1:1.5.

Scour at the foot of a sloped revetment is less of concern than at the base of a vertical seawall. As a result, seawall maintenance costs can be high (Pilarczyk 1990).

Revetments are less susceptible to erosive forces that occur in front of the structure. Seawalls, while effective at preventing erosion of the land area behind the wall, often do not stop erosion in front of the structure which affects localized sediment availability (French 2001).

Construction will result in permanent impacts to 0.38 acres and temporary impacts to 0.12 acres to sandy shoreline within the project footprint. Staging would require 1.35 acres distributed at four separate locations. At the specified 1.5H/1V slope, the revetment is expected to be 33-ft-wide, extending towards the ocean. Implementation of this alternative would involve clearing, grubbing, and removal of littoral strand vegetation within the construction limits. Within this area, any vegetation present would be permanently displaced within the footprint of the revetment. In addition, as a structure that slopes toward the ocean, impacts to sandy shore and intertidal marine habitat are increased.

The Eua tree snail reported from Ofu is not expected to occur in the sandy, low lying littoral strand vegetation that characterize the study area. This species prefers forest habitat and lives primarily on leaves, trunks and branches of trees which are not found in the study area. The friendly ground dove is also not expected to be found in this type of habitat, preferring littoral forest, lowland rainforest, and agroforest.

Green and hawksbill sea turtle nesting do occur and both species are documented to nest in the area and could be directly and indirectly impacted by project construction. At least two known nesting sites for these species turtles fall within or are adjacent to the proposed Project footprint (Figures 9 and 10). The amount of nesting habitat lost is less than would be lost under the No Action Alternative /FWOP. During the pre-engineering design phases, opportunities to reduce the overall dimensions of the structure (especially length along the shoreline should be evaluated to minimize impacts to sandy beaches.

The Proposed Action may impact to the intertidal zone (between high and low tide mark) and shallow-water habitats of coral reefs, hard substrate, and soft substrate (in the form of littoral zone vegetation and sandy beach), and their associated wildlife (including ESA species) as described below.

Direct physical impacts

Corals

Physical damage on coral reefs is often associated with the breakage or dislodging of coral colonies but can also manifest itself less severely (e.g., tissue abrasion). Fast growing scleractinian corals, such as branching *Acropora spp*. are particularly vulnerable to physical damage because their carbonate skeletons are less dense and relatively brittle compared to slow growing massive corals. However, under normal circumstances this is actually beneficial to corals. Fragmentation is an extremely important mode of distribution and reproduction for many reef building corals, often allowing them to become locally dominant (Highsmith 1982). Direct physical impacts to coral from the Proposed Action are not expected to occur due to the use of BMPs:

- No corals or coralline algae colonies will be directly handled or intentionally fragmented.

- All efforts will be made to maximize the amount of construction work conducted from the landward (north) side of the project site (closest to the runway).
- Construction activities on beach, splash/spray, and intertidal zones would be minimized to the maximum extent possible.
- There would be no use of boats and in-water activities (e.g., divers or in-water dredges) would not be required to construct the shoreline stabilization measure, so physical impacts to coral or other marine organisms from these sources would not occur through these types of activities.

The project would have no direct effect on corals.

Sea Turtles

The Proposed Action would not result in direct effects or loss of individual green or hawksbill turtles, nor would project activities be expected to reduce habitat availability or degrade such habitat so that it becomes unsuitable at a magnitude or duration that could substantially affect the species population; however, short-term disturbance of beach areas at which the two species have been previously observed to nest could result from the proposed Project activities.

The potential effects to sea turtles that could result from implementation of the proposed Project can be reduced to discountable impacts using the following best management practices (BMPs):

- Restrict all project construction to late-April through early August, the optimal period when no nesting sea turtles would be present on Vaʻoto Beach and nestlings will have emerged and left the area. This would avoid/minimize direct impacts to nesting turtles to discountable levels;
- Conduct pre-construction surveys prior to beginning on-site work to ensure that there is no evidence of turtles or turtle nests in the area. These surveys should be conducted by a biologist or trained individual who is familiar with signs of sea turtle nesting activity (e.g., turtle crawl tracks in sand). If evidence of turtle activity is observed, work should cease and the USFWS should be consulted.
- During the pre-engineering design phases, evaluate opportunities to reduce the overall dimensions any shoreline stabilization structure proposed (especially longitudinal length parallel to the shoreline) to minimize impacts to documented nesting beach locations along the west end of the airport runway that could be potentially impacted by proposed Project activities;
- During the pre-engineering design phases, look for opportunities to site/place the shoreline stabilization structure ABOVE or as close to the current line of littoral vegetation as possible and avoid placement below the high tide mark; vegetation lines typically delineate the general height reached by a rising tide to spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.
- Maximize the amount of construction work that can be conducted from the landward (north) side of the project site (closest to the runway). Minimize construction activities on beach, splash/spray, and intertidal zones. Any structure sited below the high tide mark would potentially exacerbate loss of turtle nesting beach area;
- Avoid construction work at night so that lighting on beaches is minimized to the fullest extent possible;
- Ensure all protection measures for sea turtles be included in all contract specifications and the contractor's Environmental Protection Plan (EPP).

Indirect and long-term physical impacts
Construction of the tribar revetment would retain the existing land contours. Thus, there would be no substantial or permanent increases in water erosion of soils or loss of topsoil in the long term. There would be no changes to the in-situ substrate that would affect functions and services of nay aquatic habitat or species.

In the case of the proposed Project, the loss or degradation of nesting habitat for hawksbill and green sea turtles is the priority concern. Natural coastal erosion processes, exacerbated by climate change and sea level rise, are expected to continue in the absence of the Proposed Action. Loss of turtle nesting beach is naturally expected to continue over time in the absence of any structure being built. Measures to reduce these to discountable impacts include:

- Restoration of areas of beach vegetation using native species to encourage use of alternative areas by nesting sea turtles;
- Contribute to efforts that seek to reduce ambient light caused by artificial night lighting at the airport. This could include investments in efforts to shield/cover any existing lights facing the Vaʻoto Beach or covert to "turtle friendly" outdoor lighting;
- Invest in public awareness campaigns to improve community participation and cooperation to increase local conservation efforts such as turning off of lights outside of residences that illuminate beaches during the peak nesting and hatchling emergence season;
- Invest in nest local nest protection or nest translocation programs to mitigate incidences of nest predation (cages, wire or bamboo mesh placed on top of nests; predator control programs) or translocate nests known to be prone to inundation by tides and rising sea levels;
- Investigate and invest in other climate change mitigation practices in American Samoa pertaining to sea level rise that could benefit sea turtle conservation efforts;
- Work with local officials to evaluate ways to reduce the occurrence of localized sand-mining activities on Vaʻoto Beach that could negatively impact nesting sea turtles.

Introduction of sediments and chemicals (hydrocarbons)

Oil globules can adhere to the coral tissue and soluble oil components can be absorbed from the water column by coral polyps, likely a result of the high lipid content of most corals (Van Dam 2011). Effects on coral colonies include mortality, tissue death, reduced growth, impaired reproduction, bleaching, reduced photosynthetic rates, and decreased cellular lipid content which is correlated with coral fitness. Spills occurring near or at peak reproductive season (e.g., summer spawning months for most jurisdictions in the Western Pacific Region) could adversely affect an entire year of reproductive effort because coral gametes and eggs are buoyant, potentially bringing them into direct contact with floating oil.

Although construction of the revetment is not expected to result in any direct impacts to coral or coralline algae, pre-construction activities (clearing/grubbing/grading of the site) and grading to establish temporary access ramps within the temporary construction area, followed by excavation of the area where the revetment structure would be placed, could result in the discharge of soil and sediments in the form of bulldozer side-cast that could result in temporary discharges of soil and construction materials to tidally influenced areas that could temporarily impact nearshore coralline alga. However, there would be no permanent loss in functions and services, nor would there be an increase in impermeable surfaces that would affect coral. Any biomass stockpiles that would result due to clearing and grubbing would be relocated to an appropriate facility for disposal. Thus, there would be no loss of this resource due to proposed project activities.

Through best management practices, hydrocarbons would not affect any listed species during construction. No dive boats or other seacraft will be used, so no hydrocarbon spills occurring from these sources would occur. No refuse or matter of any kind (including trash, garbage, oil, and other liquid pollutants) would be discharged as a result of project activities.

BMPs could include, but are not limited to, the following:

- Employee/subcontractor training; sequencing of activities to minimize exposure of cleared areas; timing construction to avoid periods of rain, overland flow, and high tides (to the extent possible)
- Minimize extent of clearing and grubbing; maintain existing vegetation (to the extent possible); provide temporary soil stabilization (e.g., mulching; hydroseeding; soil binders, geotextiles, etc.); install silt fencing and/or sediment traps; provide dust control (but avoid excess dust control watering); implement and maintain proper dewatering techniques (if needed); protect and manage stockpiles; cover loose materials in haul trucks; stabilize construction entrance/exit and provide tire wash; revegetate temporarily disturbed areas.
- Regular vehicle and equipment inspection; fueling and maintenance in designated areas; Use of drip pans; Proper storage and disposal techniques; implement spill controls
- Protection of stockpiles; provide watertight dumpsters, with regular waste removal and disposal; proper containment, labeling and disposal of hazardous materials, such as petroleum products, solvents, etc.); regular site inspection and litter collection; salvage and reuse of materials, as appropriate
- Proper storage and handling techniques for concrete-curing compounds; perform washout of concrete trucks in designated areas only; containment in wash water pits; proper disposal of material from washout facilities
- Equipment and vehicle washing in designated areas; provide containment of wash water
- Proper sanitary/septic waste management at the construction site and staging areas.

Entanglement with marine debris

Entanglement with marine debris can occur if construction debris were to become dislodged and float freely through the lagoon and out into open ocean. Floating debris poses a threat to pelagic animals and once it sinks it can become entangled around benthic organisms. Ingestion rates are high among sea turtles and marine mammals. Ingestion rates are considerably lower among fish with documented ingestion limited to approximately 40 species worldwide, or less than one percent of all species. Marine debris can also serve as floatation and aid species dispersal and risks to biosecurity. Through best management practices, entanglement threats are not likely to adversely affect any listed species during this project.

Introduction of invasive species and toxico-pathological agents

Globally, invasive species have displaced native species, caused the loss of native genotypes, modified the physical environment, changed assemblage structures, affected food web dynamics and ecosystem processes, functions and service, impacted human health, and caused substantial economic loss. Invasive species would not affect any listed species during this project with the implementation of these BMPs:

Through the use of best management practices invasive or nuisance species or toxico-pathological agents would not be transferred or introduced from site to site during the course of this project and would have no effect:

- No in-water operations would be conducted under this project.

- All construction equipment, materials and instruments will be examined and rinsed with fresh water prior to use or deployment to ensure no organisms or agents are being introduced or transported between the staging areas and construction site.

Environmental Baseline Conditions

Forereefs around Ofu are subject to very low levels of stress from land-based pollution, fishing, and other recreational and commercial activities. Ofu and Olosega Islands scored the highest in terms of condition for corals and marine algae in American Samoa (NOAA 2018). Ofu Island has a very small human population and limited development. Undeveloped, native evergreen tropical forest accounts for 90 percent of the interior land cover of the island. Residential and commercial development comprises only 2% of the total land use. Cultivated land covers less than one percent (7 acres) of the island. In 1960, Ofu Island had 605 residents, but since 2010 has experienced a dramatic population decline, losing over 2/3 of its population. As of the 2020 US Census, Ofu has 132 residents. Most of the population lives in the villages of Ofu and Alaufau, located about one (1) mile northwest of the airport.

The lagoon along the southern coat of Ofu is occasionally used for recreational and commercial in-water activities such as snorkeling, diving, fishing, and boating. Marine and beach-based water activities, whether traditional subsistence fishing in the historical past or today's more modern boat-based fishing, have always been an important component of Pacific Island economies, including American Samoa (Doulman & Kearney 1991). However, there continues to be relatively little commercial tourism and associated recreation in American Samoa. Only two flights a week operate between Honolulu, Hawaiʻi and Pago Pago International Airport for most of the year. There are several flights daily between American Samoa and neighboring independent Samoa and limited service to a few other destinations. In terms of visitors (non-residents) to Ofu, the majority are scientists conducting research at the National Park. Tourism on the Manuʻa islands has always been limited and growth in tourism is expected to remain slow. Only about 25 tourists visited Ofu over a recent 6-month period. Snorkeling in the coral reefs and hiking in the National Park are the main tourism opportunities for Ofu. The American Samoa Tourism Master Plan noted that due to current difficulties in accessing Ofu, most of the tourism development will occur on Tutuila and not on Ofu. Tourist lodging facilities are currently limited to the Vaʻoto Lodge and home stays with local.

Baseline Water Quality

The Action Area at the Ofu Airport is located on the Va'oto Plain. Marine waters in the vicinity of the Action Area are generally clear and warm with low primary productivity, small seasonal fluctuations in ocean conditions, and larger multiyear fluctuations in response to greater climatic cycles such as the El Niño Southern Oscillation. Coastal waters can experience increased nutrient and sediment levels due to both natural and anthropogenic factors (e.g., cyclones, land-based runoff).

In terms of overall water quality, monitoring data have shown that coastal water quality is consistently good on Ofu and the other Manu'a Islands. Coastal waters fully support all aquatic life uses and indicate no water quality impairments. The beaches on Ofu rarely exceed the American Samoa Water Quality Standard for Enterococcus bacteria (Makiasi et al. 2022). The good water quality in Ofu can be attributed to the remote location, low human population density, and generally well-circulated coastal areas. Periodic algal blooms can occur in front of villages in the Ofu, but studies indicate that the major sources of nutrients to lagoons here are most likely oceanic, atmospheric and/or sedimentary in origin and not derived from animal or terrestrial sources. High volumes of oceanic waters and strong currents flush the lagoons daily and would be expected to rapidly dilute any nutrient input from land.

Reportedly, groundwater beneath coastal lands on Ofu, including groundwater beneath the Ofu Airport, is typically too brackish to be a viable potable water source. Marine biologists have documented excellent underwater visibility in a nearshore depression that extended northwest from Papaloloa Point (Figure 5). Reduced water quality was evident closer to Papaloloa Point. It was also observed that longshore currents in this area flowed to the northwest. The airport has no drainage or storm water pollution control or prevention facilities to control runoff at the terminal or the runway (ASG 2006).

Effects of Climate Change

As in all regions of the world, the climate of the Pacific islands, including American Samoa, is changing. These impacts are already being felt and expected to intensify in the future. In American Samoa, the impact of climate change on some aspect of water resources have been documented for over 50 years (Wallsgrove & Grecni 2016). Climate change impacts, such as the outlook for more frequent and extreme rainfall events, a wetter rainy season, rising air temperatures, rising sea level, and the uncertainty about El Niño–Southern Oscillation (ENSO)-driven seasonal drought can amplify the water management challenges posed by climate variability (Wallsgrove & Grecni 2016). In terms of climate change and its effects on coastal erosion and flooding in American Samoa, the key impacts and challenges are as follows:

- less frequent, but stronger, more intense tropical storms and storm surges are expected;
- increases in the frequency of gale-force winds that produce moderate to high waves is expected in the central-south Pacific;
- increases in sea level rise are anticipated to lead to more frequent and intense coastal flooding and erosion events.

Tropical storms (cyclones) can bring intense winds, torrential rainfall, high waves, and storm surge to all the islands of American Samoa. There is overall scientific consensus that the intensity of tropical cyclone events is likely to increase due to globally warmer temperatures which could lead to the greater potential for loss of life, damage, and public health issues from storms. Generally occurring between November and April, the risk of tropical storms tends to increase during medium-to-strong El Niño events. The increased maximum intensity would be expected to exacerbate the effects coastal flooding and lead to more severe coastal damage. In the area surrounding American Samoa and the southeast Pacific Basin, the overall look out is for fewer, but much stronger intensity, storms in the future. However, it is also expected that the frequency of gale-force winds in the central-south Pacific that produce moderate to high waves will increase and further contribute to coastal erosion and flooding (Keener et al. 2021).

Sea level rise threatens infrastructure, including drinking water, agriculture, housing, and transportation, as well as ecosystems and cultural sites**.** Overall, sea level rise will result in more frequent and extreme coastal erosion and coastal flooding in American Samoa, which could be exacerbated by future increasing seal level variability associated with more extreme El Nino and La Niña events (Widlansky et al. 2015). Because much of American Samoa's infrastructure is located along a narrow band of flat land along the coast, these areas are highly vulnerable to the effects of sea level rise. Relatively small changes in average sea level can have large effects on tidal flood frequency. In addition, land subsidence due to earthquakes can exacerbate the effects of high tide (nuisance) coastal flooding.

Effects of the Action

Effects on listed species, critical habitat, and EFH were considered adverse if implementation of the proposed Project would result in any of the following:

- Substantial loss of a T&E species.
- Reduction of habitat availability or degradation of habitat suitability of a magnitude and/or duration that could substantially affect a T&E species population.
- Substantially interference with the movement of any migratory T&E species.
- Introduction of or contribution to the substantial spread of an invasive species, pests or diseases that would threaten a T&E species.

This Proposed Project will provide shoreline stabilization, in the form of a tribar revetment, along the west end of the Ofu Airport runway. Overall, the project would function to significantly decrease storm-related human health and safety risks associated with closure of the airport due to the damage to the runway from coastal erosion, thereby reducing the number of people subject to these risks, including all the residents of Ofu and Olosega. In addition to reducing health and safety risks to the affected population, critical infrastructure and public facilities (i.e., the airport) would have increased resiliency in response to storm events. Another beneficial impact associated with implementation of the project is heightened awareness of the coastal hazard-related risks through dissemination of project-related information, including an increased understanding of the issues, thereby improving public health and safety. The Proposed project would improve public health by maintaining mobility, timely access to medical facilities, and reduced response times of police and medical personnel during storm events.

Table 4. Effects on ESA Listed Species potentially present on or in the vicinity of the proposed project location. NE = No Effect; NLAA = Not likely to adversely affect. *endemic to American Samoa

Common Name	Scientific Name	Status	Effect
Sea Turtles			
Green sea turtle (laumei ena`ena)	*Chelonia mydas*	Endangered	NLAA
Hawksbill sea turtle laumei uga)	*Eretmochelys imbricata*	Endangered	NLAA
Terrestrial Species			
striped Eua tree snail (sisi totolo)	*Eua zebrina**	Endangered	NE
friendly ground dove (tu‘aimeo)	*Gallicolumba stiri*	Endangered	NE
Coral Species			
small-polyp stony coral	*Acropora globiceps*	Threatened	NLAA
small-polyp stony coral	*Acropora jacquelineae*	Threatened	NE
small-polyp stony coral	*Acropora retusa*	Threatened	NLAA
small-polyp stony coral	*Acropora speciosa*	Threatened	NE
colonial stony coral	*Seriatopora aculeata*	Threatened	NE
branching frogspawn coral	*Euphyllia paradivisa*	Threatened	NE
small-polyp stony coral	*Isopora crateriformis*	Threatened	NLAA

There is no designated critical habitat for any ESA listed species in American Samoa (including corals, see Table 1), so there would be no effect to designated critical habitat for any species.

There would be no effect on the Eua tree snail and friendly ground dove (Table 5), as the Action Area does not contain the preferred type of habitat (e.g., forest) in which these species occur, thus the likelihood of encountering these species within the proposed Action Area is negligible.

This project is not likely to adversely affect ESA-listed coral species in the area. Work would not be conducted in the water and would avoid direct impacts to coral. Indirect impacts to coral in the form of water quality impacts would be temporary (e.g., temporary increased turbidity) and discountable due to the implementation of appropriate BMPs.

The Proposed Action could contribute to a change in the physical conditions of the environment for nesting green and hawksbill sea turtles. Direct impacts would be avoided by constructing the project feature outside of the turtle breeding and nesting season (late-April through early August). This would be the optimal period when no nesting sea turtles would be present on

Vaʻoto Beach and nestlings will have emerged and left the area. This would reduce direct impacts to nesting turtles to discountable effects.

In terms of EFH habitats, temporary impacts to the intertidal zone (between high and low tide mark) and shallow-water habitats could occur, specifically to coral reefs, hard substrate, and soft substrate (in the form of littoral zone vegetation and sandy beach), as wells as associated wildlife found within these habitats, the project has the potential to have minimal, temporary effects on EFH, but by following the proposed avoidance and minimization measures as described, the proposed Action would not be likely to adversely affect EFH. As described above, the effects of this project will be temporary and restricted to a confined area of coastline. In water-work would not be conducted and all practical means to work from the landward side of the project site will be considered so that impacts to EFH are avoided.

6 **Table 5.** EFH for American Samoa Archipelago and Pacific Pelagic Fishery Ecosystem MUS

Habitat	**Present in Proposed Action Area**	**Level of Effect**
coral reef/reef flat	Yes	NLAA
patch reefs	Yes	NLAA
hard substrate	Yes	NLAA
artificial substrate	Yes	NLAA
soft substrate	Yes	NLAA
surge zone	Yes	NLAA
lagoon	Yes	NLAA
seagrass beds	No	None
mangroves	No	None
estuarine	No	None
deep-slope terraces	No	None
pelagic/open ocean	No	None
streams or rivers	No	None
riparian areas	No	None
wetlands	No	None
mudflats	No	None

Cumulative Effects

Cumulative effects are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR Section 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The potential for cumulative impacts to the environment from the proposed action was evaluated by reviewing other projects and activities in the vicinity of the Ofu Airport that could directly or secondarily affect the same environmental resources as the proposed action. The analysis generally includes actions that were recently completed, are currently underway, or are programmed to occur in the foreseeable future, and are directly related to coastal shoreline protection, are located within or proximate to the proposed measure sites and/or would directly or secondarily affect resources in the Va'oto Plain. Based on a review of the related actions, this analysis incorporates the following past projects and activities.

- Small-scale sand mining (where sand is extracted and removed from beaches) reportedly occurs within the vicinity of the west end of the airport runway and may be exacerbating the shoreline erosion problem at this location. Excavated sand is used to repair the main road on Ofu (the American Samoa Department of Public Works offers this as a local service). Mined sand is also used by residents as a low maintenance soil dressing in yards and gardens. The localized effect of sand mining may also have long-term negative effects on sea turtle habitat in a couple of ways. Sand mining creates pits on the beach that potentially have exacerbated erosion near this portion of the runway through loss of sand. In addition, in the process of sand mining, flat, level areas above the high tide mark on the beach ("micro-sites") are artificially created and tend to be attractive to nesting sea turtles. This practice may encourage use of areas that by turtles that may not be naturally viable nesting locations and decrease nesting success.

- In 1986, a Federal Shoreline Protection Project authorized under Section 14 of the Flood Control Act of 1946 was constructed at the request of the American Samoa Government. The project consisted of constructing a 381-ft-long rock revetment fronting the eastern end of the airstrip. The crest elevation of the structure is 9-ft above MSL which is approximately level with the existing runway elevation. The revetment is constructed with a rock armor layer two stones-thick with stones between 1300 to 2100 pounds, a slope of 1:1.3 (vertical to horizontal), and the structure toe placed on rock foundation at approximately 0 ft MSL. The structure is located approximately 1,6500 ft east of the current proposed Project and is still functionally adequate (USACE 2019).

- In 2013, the American Samoa Department of Port Administration (DPA) sponsored an airport master plan/feasibility study through a grant from the Federal Aviation Administration (FAA) Airport Improvement Program to determine the feasibility of maintaining the Ofu airport, restoring passenger service, and looking for specific opportunities for improving airport facilities. An airport master plan is being developed to determine the extent, type, and schedule of development needed to safely accommodate passenger demand at the airport. The recommended development is a twenty-year program being implemented in three planning periods: Phase 1 (2013-2017); Phase 2 (2018-2022); and Phase 3 (2023-2035).

- Beginning in April 2021 and completed in July 2022 through a FAA Airport Improvements project grant as described above, the DPA rehabilitated and reconstructed the entire existing airport runway. Construction scope included demolition of the existing concrete runway and installation of a new runway with supporting infrastructure.

- In late July 2022, a passing extra-tropical storm that coincided with a "king tide" event (exceptionally high tides) resulted in wave runup and erosion that damaged the west end of the runway. Sand and rocks were deposited onto the grassed area and runway from the high storm wave runup. Airport staff were required to quickly clear this debris from the airport runway and make emergency repairs in order to restore runway operations.

The effects of these actions were considered in combination with the degree and timing of the potential adverse and beneficial effects of the proposed alternatives to determine the types and significance of potential cumulative effects on ESA listed species and EFH. For this analysis, implementation of the project is considered cumulatively significant if, in concert with other past, present, or reasonably foreseeable future actions, it would exacerbate the declining status of an identified resource (a resource that is already adversely affected) or create a condition in which an effect is initially minor but is part of an irreversible declining trend.

Based on observations, the existing rock revetment constructed at the east end of the runway may have adversely affected aquatic habitat and degraded the area of sandy shore in front of the structure over time. Exact effects are speculative, but the existing rip rap revetment may have exacerbated loss of sandy beach habitat over time in this area. The runway repair project and emergency repairs may also have had temporary impacts to Waters of the U.S and aquatic habitat during construction. However, most of these actions only involve temporary impacts and would not be expected to result in the long-term loss of aquatic habitat functions and values. As such, from a cumulative perspective, the projects are not expected to contribute incrementally to the loss of aquatic habitat functions and values.

Conclusions

In conclusion, USACE has determined the following for the Proposed Action:

- The proposed Project may affect, but is not likely to adversely affect, ESA-listed sea turtle species with appropriate avoidance measures and monitoring. Insignificant loss of nesting beach habitat is considered unavoidable; however, this loss would be expected to occur under the Future Without Project Conditions. Implementation of BMPs for the project and surrounding area would reduce these to discountable effects.
- The proposed Project is not likely to adversely affect any ESA listed coral species. In general, direct impacts to listed coral species would not occur or are highly unlikely. Potential secondary impacts to coral reefs and other nearshore marine resources in terms of reduced water quality can likely be avoided or minimized to discountable impacts with adherence to best management practices for work in and around aquatic environments.
- The proposed Project will have no effect the ESA-listed tree snail or the friendly-ground dove. Due to the extreme unlikelihood of interactions and lack of appropriate habitat, the project is expected to have no effect on these species.
- The proposed Project is not likely to adversely affect any EFH, the project has the potential to have minimal, temporary effects on EFH, but by following the proposed avoidance and minimization measures as described, the proposed Action would not be likely to adversely affect EFH. As described above, the effects of this project will be temporary and restricted to a confined area of coastline. In water-work would not be expected to be conducted and all practical means to work from the landward side of the project site will be considered so that impacts to EFH are avoided.

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Attachment 6. Draft Clean Water Act Section 404(b)(1) Analysis

INTRODUCTION

Consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other federal planning requirements, the U.S. Army Corps of Engineers, Honolulu District (Corps), and the American Samoa Government, represented by the American Samoa Department of Port Administration, propose to provide Ofu Airport on the island of Ofu in the U.S. Territory of American Samoa with shoreline protection to enable the continued use of Runway 8/26 through implementation of emergency shoreline protection measures along approximately 500 ft of shoreline to protect the western edge of the Ofu Airport runway area. This document presents the U.S. Army Corps of Engineers (USACE) 404(b)(1) evaluation for the study.

The Corps has prepared a Draft Integrated Feasibility Report and Environmental Assessment (IFREA) for the Ofu Airport, American Samoa - Continuing Authorities Program (CAP), Section 14 Emergency Stream Bank and Shoreline Protection (Study). This identifies, evaluates, and discloses all impacts that would result from the implementation of potential shoreline protection measures along approximately 500 ft of shoreline along the western edge of the Ofu Airport runway area on the island of Ofu (the proposed Action Area). The IFREA identifies coastal hazards and analyses a series of potential alternatives, including the "No Action" alternative, to address shoreline protection management in the proposed Action Area

CLEAN WATER ACT SECTION 404(B)(1) REGULATORY BACKGROUND

Under the Clean Water Act (CWA), any person or entity is prohibited from discharging any "pollutant" into "navigable waters" from a point source except in compliance with several statutory provisions, two of which establish permit programs (33 United States Code [U.S.C.] § 1311; see 33 U.S.C.§ 136). Section 404 of the Clean Water Act (CWA) gives the USACE the authority to permit discharges of two types of pollutants: dredged and fill materials (33 U.S.C. § 1342, 1344; 33, Code of Federal Regulation [C.F.R.] §§ 322.5, 323.6). Under section 404, the USACE regulates discharges of dredged or fill material into navigable waters (33 U.S.C. § 1344). Navigable waters are defined as waters of the United States or WOTUS (33 U.S.C. § 1362(7)). A permit from USACE is required prior to discharging dredged or fill material into WOTUS, which are defined in 33 CFR Part 328.3(a) and include a range of wet environments such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds. It also includes the oceans, territorial seas, and waters which are subject to the ebb and flow of the tide.

Section 404(b)(1) provides that the USACE must issue such permits "through the application of guidelines" developed by the United States Environmental Protection Agency (USEPA), found at 33 C.F.R. §§ 320.2(f), 320.4(a)(1), 320.4(b)(4), 323.6(a)). The USEPA issued final guidelines in 1980 (40 C.F.R. Part 230). These guidelines, referred to Section 404(b)(1) Guidelines establish various criteria to be considered by the USACE in evaluating permit applications, one of which calls for evaluation of alternatives to the proposed discharge. For proposed actions to be undertaken by USACE (as is the case for the Proposed Project), the agency does not issue itself a permit but includes a 404 (b)(1) evaluation designed to demonstrate compliance with the 404(b)(1) Guidelines in the NEPA document prepared for the action.

Under the Section 404(b)(1) Guidelines, an analysis of practicable alternatives is the primary tool used to determine whether a proposed discharge is prohibited. The

Section 404(b)(1) Guidelines prohibit discharges of dredged or fill material into WOTUS if a practicable alternative to the proposed discharge exists that would have less adverse impacts on the aquatic ecosystem, including wetlands, as long as the alternative does not have other significant adverse environmental impacts (40 C.F.R. 230.10(a)). An alternative is considered practicable if it is available and capable of being implemented after considering cost, existing technology, and logistics in light of overall project purpose (40 C.F.R. 230.10(a)(2)). The Section 404(b)(1) Guidelines follow a sequential approach to project planning that considers mitigation measures only after the project proponent shows no practicable alternatives are available to achieve the overall project purpose with less environmental impacts. Once it is determined that no practicable alternatives are available, the guidelines then require that appropriate and practicable steps be taken to minimize potential adverse effects on the aquatic ecosystem (40 C.F.R. 230.10(d)). Such steps may include actions controlling discharge location, material to be discharged, the fate of material after discharge or method of dispersion, and actions related to technology, plant and animal populations, or human use (40 C.F.R. 230.70-230.77).

Beyond the requirement for demonstrating that no practicable alternatives to the proposed discharge exist, the Section 404(b)(1) Guidelines also require the Corps to compile findings related to the environmental impacts of discharge of dredged or fill material. The Corps must make findings concerning the anticipated changes caused by the discharge to the physical and chemical substrate and to the biological and human use characteristics of the discharge site.

These guidelines also indicate that the level of effort associated with the preparation of the alternatives analysis be commensurate with the significance of the impact and/or discharge activity (40 C.F.R. 230.6(b)).

BASIC AND OVERALL PROJECT PURPOSE

Basic Project Purpose

The basic project purpose comprises the fundamental, essential, or irreducible purpose of the proposed project, and is used by the Corps to determine whether a project is water dependent. The Section 404(b)(1) Guidelines state that if an activity associated with the discharge proposed for a special aquatic site does not require access or proximity to, or siting within, the special aquatic site in question to fulfill its basic purpose, the activity is not water dependent.

The Basic Project Purpose of the Proposed Project is to construct emergency shoreline stabilization infrastructure along 500 ft of shoreline at the western edge of the Ofu Airport runway on the island of Ofu in the U.S. Territory of American Samoa. The activity is water dependent.

Overall Project Purpose

The overall project purpose serves as the basis for the Corps' section 404(b)(1) alternatives analysis and is determined by further defining the basic project purpose in a manner that more specifically describes the goals and accounts for logistical considerations for the project, and which allows a reasonable range of alternatives to be analyzed. It is critical that the overall project purpose be defined to provide for a meaningful evaluation of alternatives. It should not be so narrowly defined as to give undue deference to the preferred alternative, thereby

unreasonably limiting the consideration of alternatives. Conversely, it should not be so broadly defined as to
render the evaluation unreasonable and meaningless.

The Overall Project Purpose is to develop potential alternative plans for shoreline stabilization by identifying coastal hazards and potential structural shoreline stabilization management measures for an area affected by coastal erosion.

JURISDICTIONAL DETERMINATION

The Study Area is located within the Va'oto Plain along the southern coast of the island of Ofu. The proposed Action Area (where structural shoreline protection improvements would be implemented) is located on the southern coast of Ofu Island at the west end of the runway 8/26 at the Ofu Airport. Although no lakes, rivers, streams (including intermittent streams), riparian areas, wetlands, or natural ponds would be affected by project activities within the proposed Action Area, ocean waters and sandy beach area which are subject to the ebb and flow of the tide could be impacted and would be considered WOTUS.

ALTERNATIVES CONSIDERED

In 2020, the USACE, in coordination with the non-Federal Sponsor, initiated the feasibility phase of the project to evaluate a series of potential alternatives to address coastal flood hazards in the proposed Action Area. Through the plan formulation process, alternatives, each comprised of a set of one or more management measures functioning together, were developed in consideration of the study area problems, opportunities objectives, and constraints, as well as an evaluation of potential environmental impacts. The Corps has prepared a Draft Integrated Feasibility Report and Environmental Assessment (IFREA) for the Study to identify, evaluate, and disclose all impacts that would result from the implementation of potential shoreline protection management measures for critical areas within the proposed Action Area.

Per the 404(b)(1) Guidelines, alternatives analysis required by the National Environmental Policy Act (NEPA) will generally suffice as the alternatives analysis under the 404(b)(1) Guidelines. On occasion, NEPA documents may address a broader range of alternatives than required to be considered under Guidelines or may not have considered the alternatives in sufficient detail to respond to the requirements of these Guidelines. In the latter case, it may be necessary to supplement these NEPA documents with this additional information. The nature of the proposed action may require work within WOTUS or would involve placement of dredged or fill material to WOTUS from project activities. Furthermore, the range of alternatives carried forward under NEPA overlap with the range of alternatives to be considered under the Guidelines. Thus, the range of NEPA alternatives are sufficient for evaluation under the Guidelines.

Feasibility Phase Alternatives

As described in the IFREA/EA, and in addition to the No Action alternative (Alternative 0), a total of seven (7) action alternatives (5 structural, 1 non-structural, and 1 natural and nature-based measure) were evaluated during the feasibility phase:

Structural Measures:

- Rock revetment – consists of a graded slope protected by and underlayer of medium-sized stones and a top layer of heavier armor stones\

- Tribar Revetment – constructed similarly to the rock revetment, but comprised of engineered, interlocking concrete armor units
- Concrete Rubble Masonry (CRM) Wall - involves constructing a concrete rubble masonry rubble wall that is keyed into hard substrate using a precast concrete base
- Sheet Pile Seawall* - involves drilling/driving steels sheet piles in an overlapping pattern concrete columns to form a barrier
- Precast Concrete Seawall – consists of individual cantilever concrete panels placed atop hard substrate

Non-Structural Measures:

- Relocation of Ofu Airport* – involves the relocation of Ofu Airport inland to avoid continued damage from coastal erosion

Natural and Nature-Based Measures:

- Beach Fill* - consists of introducing locally sourced or imported beach sand material to engineer and build up the existing beach to dissipate wave energy. This measure would require periodic beach renourishment to mitigate ongoing erosion and other natural processes.

(* indicates measures not carried forward to focused array of alternatives)

A screening process was then used, based on planning criteria, parametric cost estimates, and initial alternative designs to eliminate those measures that would not be carried forward for consideration in alternative plan development.

One (1) structural, the (1) non-structural measure, and the one (1) natural and nature-based measure were eliminated from further consideration as these did not meet one or more of the planning criteria (i.e., meets one or more of the study objectives, avoids constraints, esp. land tenure consideration and real estate requirements).

One (1) structural measure (Alternative 4) was screened out and not carried forward:

- Sheet Pile Seawall: screened out after consultation with resource agencies due the high costs of deploying specialized equipment and labor to American Samoa, concerns about potential environmental impacts, and concerns about potential failure of the seawall based on documented failures in similar settings. This measure was replaced by a Precast Concrete Seawall design that has been considered in other coastal erosion protection studies in the Pacific.

The one (1) non-structural measure identified was screened out and not carried forward:

- Airport Relocation: This alternative would provide protection from coastal erosion over the 50-year period of analysis. However, this measure is not within the CAP authority and is not considered to be a viable measure due to recent multimillion dollar investments in Ofu Airport infrastructure. Airport relocation was screened out for incorporation in alternative plans. However, the cost of relocation is used as a benchmark for plan selection under CAP Section 14.

The one (1) natural and nature-based measure identified was screened out and not carried forward:

- Beach Fill: Due to the level of storm surge and wave heights in the study area, beach fill as a stand-alone is considered inadequate and would be considered a temporary fix. Beach fill has the potential to be effective in combination with other structural measures. However, local availability of suitable beach fill material is limited, so this measure would be extremely costly to import and maintain. More importantly, renourishment is not covered under the Section 14 authority, therefore, regular renourishment to maintain the effectiveness of the structure would be a non-Federal responsibility. For these reasons, beach fill was screened from further consideration.

Alternatives Analysis

The 404(b)(1) Guidelines prohibit the discharge of dredged or fill material into WOTUS if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. 40 C.F.R. 230.10(a). To be “practicable,” an alternative must be available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.” 40 C.F.R. 230.10(a)(2).

Five (5) alternatives, including the no-action alternative (Alternative 0), were evaluated during the feasibility phase. The four (4) action alternatives include:

- Alternative 1: Rock Revetment
- Alternative 2: Tribar Revetment
- Alternative 3: Concrete Rubble Masonry (CRM) Wall
- Alternative 5: Precast Concrete Seawall

Alternative 1: Rock Revetment

Figure 1 shows the design for Alternative 21: Rock Revetment. This design consists of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a double layer of armor stone, and anchoring by an oversized toe stone. The stone sizing would range from 675 to 1,125 lbs. stones for the underlayer, 3.4 to 5.6 ton-stones for the armor layer, and 6.75-ton stone for the toe. This alternative has the largest footprint of the alternatives included in the final array. At the specified 1.5H/1V slope, the revetment is expected to be 36.6-ft-wide, extending towards the ocean, with a crest elevation of +10 ft MSL.

This alternative would require the removal of littoral strand vegetation and excavation of sediment from the littoral and intertidal zone to construct a sloping, 36.6-foot-wide rock revetment at the specified 1.5H/1V slope.

The minimum estimated real estate requirements for Alternative 1 are:

- 0.42 acres (18,300 ft^2) of shoreline easements for construction of the rock revetment (permanent)
- 0.12 acres (5,227 ft^2) of construction area/access: to accommodate 10 ft of excavation and backfill at toe of project feature (temporary)
- Staging and access: up to 1.35 acres of temporary work area easements (one year)

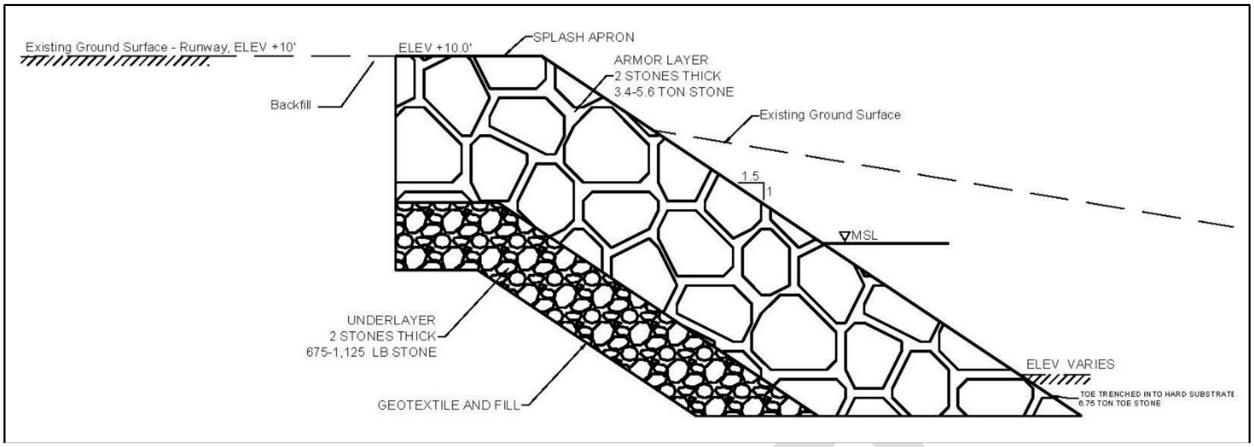

Figure 1: Alternative 1 - Rock Revetment

Alternative 2: Tribar Revetment

Figure 2 shows the latest design for Alternative 2: Tribar Revetment. Alternative 2 includes construction of a 500' long by 33' wide (approximately16,500 ft.2 or 0.38 acres) tribar revetment along the west end of the Ofu Airport Runway 8/26. The revetment would consist of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a single layer of 1-ton concrete tribar. The stone sizing of the underlayer would range from 100-300 lbs. stone. At the specified 1.5H:1V slope, the revetment is expected to be 33 ft wide, extending towards the ocean, with a crest elevation of +10 ft MSL. At this time, construction of project features are not anticipated to affect structures at the Ofu Airport. Staging would require 1.35 acres distributed at four separate locations.

This alternative would require the removal of sparse littoral strand vegetation and excavation of sediment from the littoral and intertidal zone to construct a sloping, 33-foot-wide tribar revetment at the specified 1.5H/1V slope.

The minimum estimated real estate requirements for Alternative 2 are:

- 0.38 acres (16,500 ft^2) of shoreline easements for construction of the tribar revetment (permanent)
- 0.12 acres (5,227 ft^2) of construction area/access: to accommodate 10 ft of excavation and backfill along the structure (temporary)
- Staging and access: up to 1.35 acres of temporary work area easements (one year)

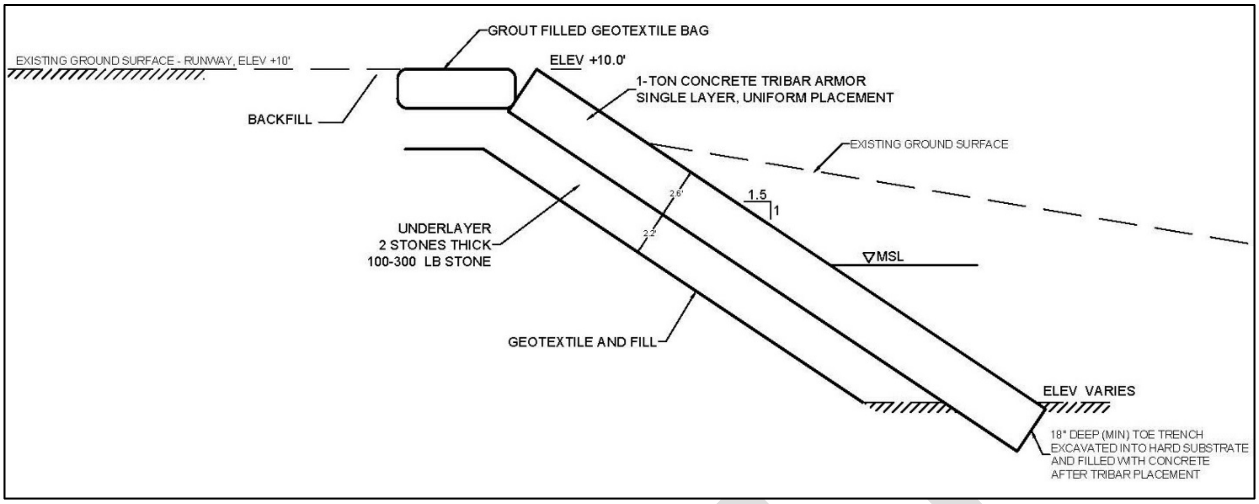

Figure 2: Alternative 2 - Tribar Revetment

Alternative 3: Concrete Rubble Masonry (CRM) Wall

Figure 3 shows the latest design for Alternative 3: CRM Wall. This design consists of a 500-foot gravity wall composed of concrete rubble masonry constructed supported on a reinforced cast-in-place concrete foundation. Construction of the CRM wall would consist of excavating to the limestone shelf, placing the reinforced concrete foundation, and then installing the CRM wall on top of the concrete base. After construction, the excavated area would be regraded to the elevation of the existing ground surface. This design has a total elevation of 10 ft above MSL and a base that is 12 ft wide, with the total disturbed area being approximately 38 ft due to excavation and backfill of the existing soils.

This alternative would require the removal of littoral strand vegetation and excavation of sediment from the littoral zone to construct a 500-foot-long CRM wall of variable width (12-foot base and 10-foot-wide CRM wall with a 2-foot crest) at the specified 1H/0.25V slope. In addition, 38-ft of linear space would be required to excavate and backfill the existing soils.

The minimum estimated real estate requirements for Alternative 3 are:

- 0.14 acres (6,000 ft^2) of shoreline easements for construction of a 500 foot long, CRM wall of variable width (12-foot base and 10-foot-wide CRM wall with a 2-foot crest)
- 0.3 acres (13,000 ft^2) of construction area/access: to accommodate 3826-ft of space to excavation and backfill behind the structure existing soils (temporary)
- Staging and access: up to 1.35 acres of temporary work area easements (one year)

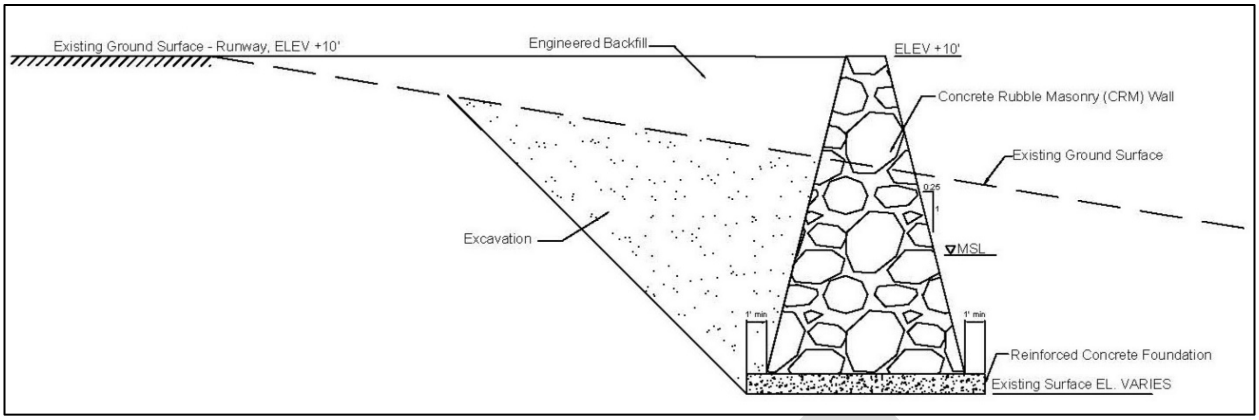

Figure 3: Alternative 3 - CRM Wall

Alternative 5: Pre-cast Concrete Seawall

Figure 4 shows the most recent design for Alternative 5: Precast Concrete Seawall. This design would involve the use of individual cantilever concrete panels to construct 500 ft of seawall. Concrete wall panels would be constructed offsite. Installation of the precast concrete panel wall would consist of excavating to the limestone shelf and placing the panels. After construction, the area behind the seawall would be backfilled to the crest of the structure and the excavated area in front of the wall would be regraded to match the elevation of the existing ground profile. This design has a top elevation of 10 ft above MSL and a base that is 14- ft wide, with the total disturbed area being approximately an additional 347 linear ft. needed due to excavation and backfill of the existing soils.

This alternative would require the removal of littoral strand vegetation and excavation of sediment from the littoral zone to construct a 500-foot long, one-foot-wide pre-cast concrete wall with a 14-foot-wide base at the specified H1/1V soil slope. In addition, a total disturbed area of 37-ft of linear space would be required to excavate and backfill the existing soils.

The minimum estimated real estate requirements for Alternative 5 are:

- 0.16 acres (7,000 ft^2) of shoreline easements for construction of a 500-foot long, 1-foot-wide pre-cast concrete wall with a 14-foot base.
- 0.26 acres (11,500 ft^2) of construction area/access: to accommodate 3723-ft of linear space to excavate and backfill existing soils (temporary).
- Staging and access: up to 1.35 acres of temporary work area easements (one year)

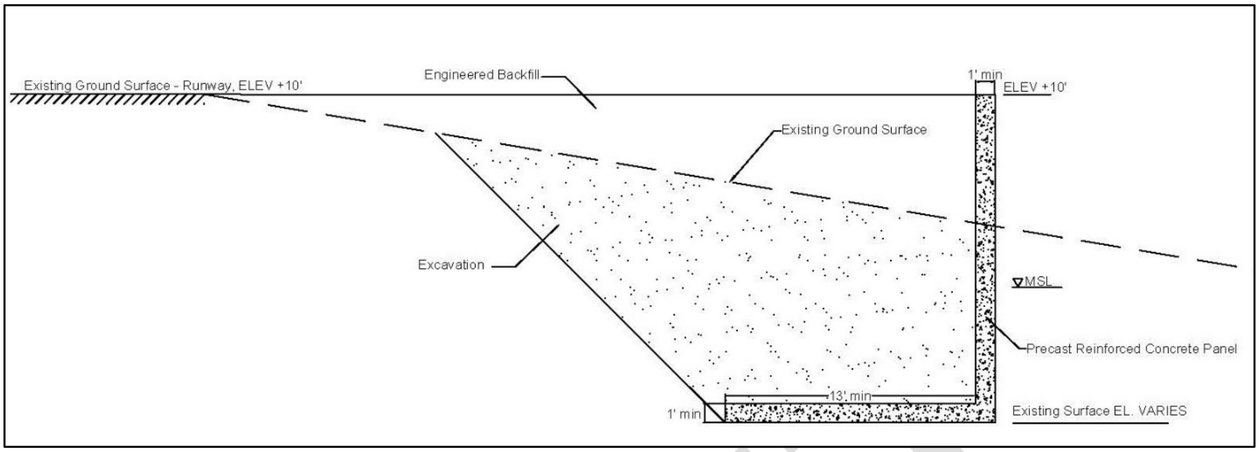

Figure 4 : Alternative 5 - Precast Concrete Seawall

Alternative 1, 2, 3, 4, and 5 are all considered complete and efficient plans. All alternatives effectively address shoreline management problems under the future with-project condition. Alternatives 1 and 2 and 3 consist of revetment designs that use either armor stone or precast concrete armor units and both revetment alternatives were brought forward to the final array. However, material sourcing and availability will play a major factor in refinement of cost estimates. The tribar revetment allows for the use of concrete armor units if locally sourced armor stone is unavailable or too expensive (which may be the case). While a contingency to account for the need to bring in amor stone from outside of Ofu is included in the cost estimate, Alternative 32 (tribar revetment) was brought forward to address residual risk associated with stone availability and pricing. Alternative 21 is considered a potentially cost-prohibitive alternative due to the large amount of amor stone estimated to be required to construct the revetment.

Alternative 3 (CRM wall) was brought forward as a standalone alternative. This measure was replaced by a Pre-cast Concrete Seawall design that has been considered in other coastal erosion protection studies in the Pacific. Both vertical seawall options have a similar effectiveness in providing emergency shoreline protection. However, preliminary cost estimates indicate that the CRM wall is the most expensive alternative.

Alternative 2 (tribar revetment) was identified as the alternative that would be most practicable with respect to real estate consideration, costs, and logistics. Based on the above, Alternative 2 (tribar revetment) is tentatively identified as Least Environmentally Damaging Practicable Alternative (LEDPA) and is carried forward for analysis in this 404(b)(1) evaluation. No other alternatives are carried forward for analysis.

Tentatively Selected Plan: Alternative 2 (Tribar Revetment)

Alternative 2: Tribar Revetment was recommended as the Tentatively Selected Plan (TSP).

Project features include:
- 0.38 acres (16,500 ft^2) for construction of the tribar revetment: 500 linear ft, 33 ft wide (permanent)
- 0.12 acres (5,227 ft^2) for construction area, backfill, and access alongside project feature (temporary)

- Staging Areas: 1.35 acres (temporary):

a. COSA 1: 4,000 sf
b. COSA 2: 22,000 sf
c. COSA 3: 3,500 sf
d. COSA 4: 29,000 sf

Existing Structures in the proposed Construction Area

There are no structures in the proposed construction area. Structures in the vicinity of the Study Area include an airport runaway and airport-associated structures, including the airport terminal, Va'oto Lodge and associated cottages, a ranger station/medical dispensary, a power generator/sub-station building, a radio transmitter, and several private residences (ASG 2006). Project construction is not anticipated to affect these structures.

Permanent Construction Footprint

A permanent shoreline protection easement totaling approximately 0.38 acres (16,500 ft^2) is required for the construction of the tribar revetment. The walls would extend 500-ft along the coast along the west end of the Ofu Airport runway. The design will be further refined post-TSP in consultation with a geotechnical engineer.

Temporary Construction Footprint (TCF)

The temporary construction footprint would include an area of 5,227 ft^2 alongside the permanent structure to access, excavate, and backfill existing soils (0.12 acres of temporary impacts). This is the area outlined in pink as depicted in Figure 5.

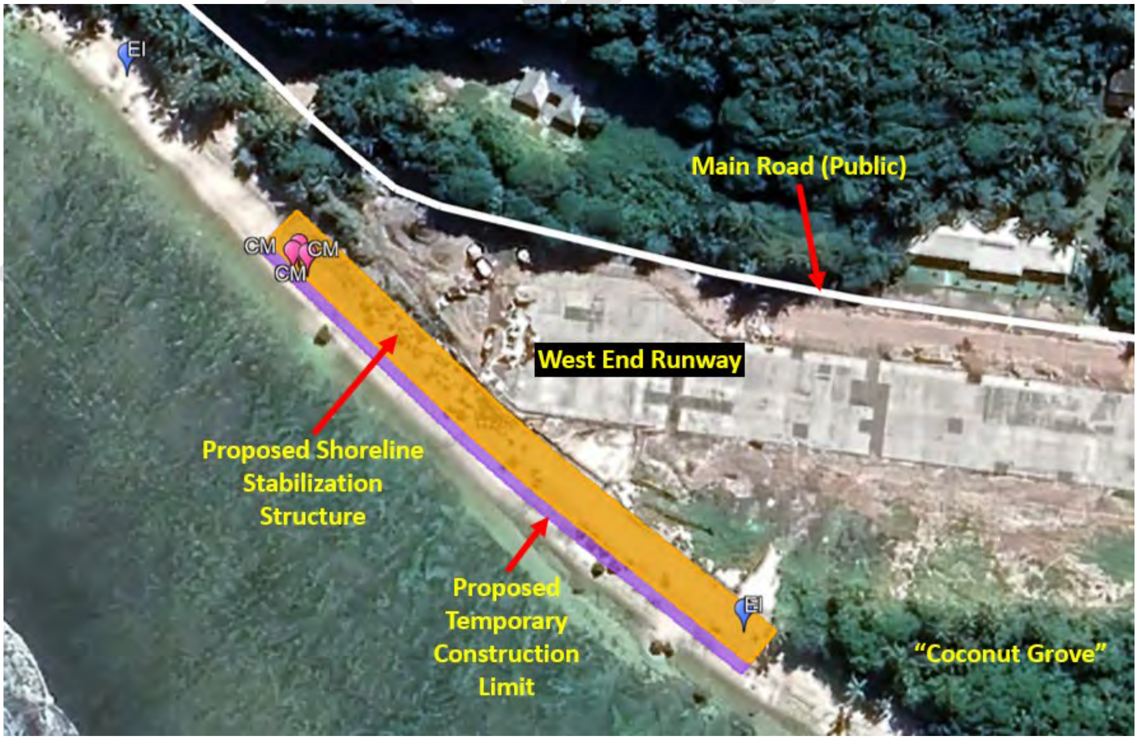

Figure 5. Project Feature Map. The orange shaded is the 0.38-acre tribar revetment (shoreline structure) to be constructed at the west end of the airport runway and the purple shaded area in

pink outline is the 0.12-acre temporary construction zone needs for access, excavation, and backfill of structure.

The proposed staging areas would accommodate construction for the planned structural features. Staging areas and site access must be established for the storage, use, and distribution of construction materials and equipment. Four Construction Staging Areas (COSAs) totaling 1.35 acres staging areas have been identified. Four staging areas have been identified: (1) a 4,000 square foot area at a private residence at the Ofu airport; (2) a 22,000 square-foot area along the south side of the airport runway near the proposed Action Area; (3) a 3,500 square-foot are at the Ofu Harbor (approximately 1.5 miles from the airport); and (4) a 29,000 square-foot open area also located at the Ofu Harbor (see Figure 6).

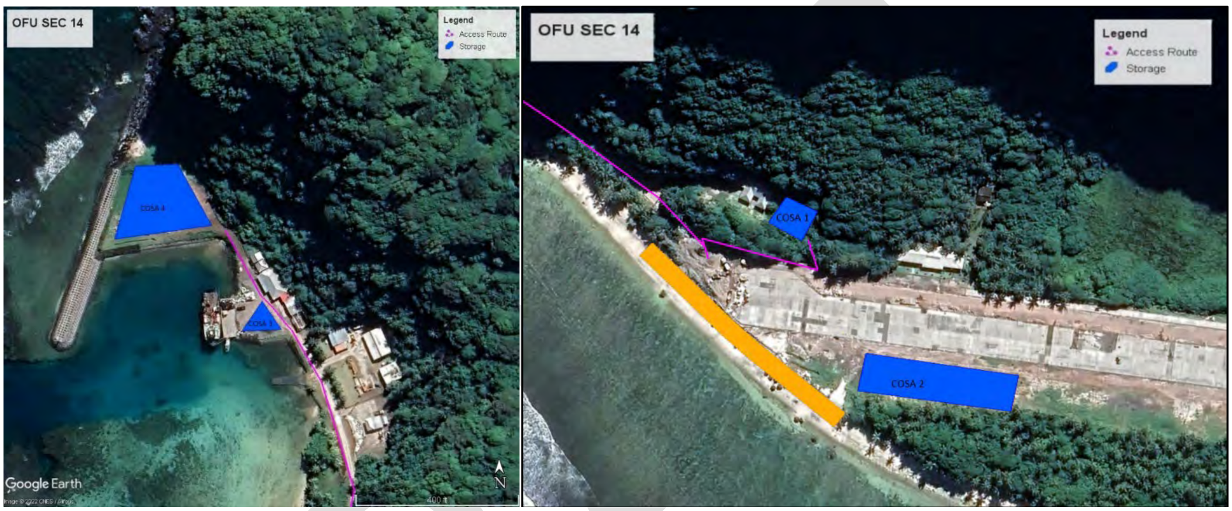

Figure 6. Staging Areas: Left: COSAs 3 and 4 in blue at Ofu Harbor. Right: COSAs 1 and 2 in blue at Ofu Airport. The tribar revetment structure is depicted in orange.

The staging area generally contains contractor trailers, parking, fencing, and storage of equipment and materials. Fill/aggregate storage is anticipated to be contained at COSA 2 along the south side of the runway. Casting & storing the panels would likely occur at the harbor COSA 3 and COSA 4 (Figure 6).

The COSAs are generally flat and within proximity to the proposed project features (either at the airport or 1.5 miles north at Ofu Harbor). No vegetation within the TCF will need to be removed to facilitate construction and provide enough room for construction equipment to operate, as these areas are already open and cleared. Any material stored in the staging area would be covered to reduce the loss of material due to erosion and avoid impacts to the adjacent environment. The staging area would be returned to their previous condition if any unintended damage should occur upon construction completion. Construction is anticipated for one (1) year.

Construction Site Equipment and Access

Required equipment to construct this alternative could include, but is not limited to, the use of a dump truck, flatbed truck, large excavator, backhoe, font/end loader, and possibly a crane to lift the panels or rocks. This equipment would be stored in the staging areas described above.

The project areas can be accessed from the major local public road (Figure 7) on Ofu and the airport runway itself. It is anticipated that personnel, equipment, and imported materials would access project construction along public roadways parallel to the airport runway. Access points identified within the public roadways can be used without additional perpetual real estate interests for operations and maintenance. Access points identified adjoining construction areas outside of the public roadway will be included in temporary work area easements as project features are refined No temporary haul roads are expected to be required. Access points identified adjoining construction areas outside of the public roadway will be included in the TCF as project features are refined. After site preparation and vegetation removal activities, it is anticipated that construction of the shoreline protection measure would occur. Construction is anticipated for one (1) year. Construction damages to the roads will be repaired or replaced upon construction completion.

Figure 7. Main access road on Ofu Island (pink). The proposed staging areas are shown in dark blue.

Operations and Maintenance

Although minimal operations and maintenance (O&M) requirements are expected for the proposed project feature, O&M activities are expected to entail typical periodic inspection of project features, periodic vegetation management (e.g., clearing or mowing of vegetation around the structure and structural repairs on an as needed basis). Structural repairs may be needed periodically to repair damages caused by storms. The nature of the damages would be expected to be similar to those characterized for construction, but the scale would be substantially smaller as repairs would be limited to specific areas of the wall where damages have occurred. Any vegetation removed from O&M activities would be transported to an appropriate facility for disposal.

Characterization of Environmental Effects

The purpose of the Section 404(b)(1) Guidelines is to restore and maintain the chemical, physical, and biological integrity of the WOTUS through the control of discharges of dredged or fill material. Except as provided under CWA Section 404(b)(2), no discharge of dredged or fill material will be authorized if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, as long as the alternative does not have other significant adverse environmental consequences. In accordance with the Section 404(b)(1) Guidelines, the potential short-term or long-term effects of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment must be determined.

The following discussion evaluates impacts of all three alternatives on environmental resources identified in Subpart C through Subpart F of the Section 404(b)(1) Guidelines.

Potential Direct and Secondary Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)

Construction (Direct):

Pre-construction activities (clearing/grubbing/grading of the site) followed by excavation of the area where the wall would be placed could result in temporary discharges of soil and construction materials to WOTUS (ocean or tidally influenced areas). Grading activities to establish temporary access ramps could result in the discharge of soil and sediments in the form of bulldozer side-cast. Grading activities for establishing a work area within the TCF would also be expected to discharge soil in the form of bulldozer side-cast to WOTUS. However, there would be no permanent loss in functions and services of WOTUS nor would there be an increase in impermeable surfaces. Thus, there would be no loss of WOTUS. Clearing and grubbing would result in temporary discharges of biomass stockpiles which would be relocated to an appropriate facility for disposal.

During construction, substrate on the upper coastal terrace and slopes would need to be excavated to place the revetment. Soils naturally compacted from periodic inundation and stabilized via root masses would be disturbed. Distinct strata and areas of soils sorted over time by wind and water would be mixed into a homogeneous mixture as soils are excavated and stockpiled. Thus, there would be native substrate to support aquatic functions and services after construction. After construction all temporary construction elements would be removed. The TCF would be re-graded and disturbed areas would be revegetated if needed.

After construction, initial inundation from incoming tides would cause unconsolidated sediment to enter the water column causing some coastal erosion. Water infiltration would also cause loose soils to settle and reconsolidate. Regrowth of vegetation over time would further trap and consolidate soils. Thus, impacts would be temporary and decrease over time.

Fill proposed for permanent discharge are soil, rocks, and concrete. There would be no permanent loss of WOTUS. Construction would retain the existing land contours. Thus, there would be no substantial or permanent increases in water erosion of soils or loss of topsoil in the long term. There would be no changes to the in-situ substrate that would affect functions and services of WOTUS.

Construction (Indirect): There would be no indirect impacts.

Operation (Direct):

Periodic vegetation management or other O&M activities would yield temporary discharges of biomass stockpiles to WOTUS. All temporary stockpiles would be removed to an appropriate facility for disposal. Periodic structural repairs would result in discharges of concrete, rocks, and in situ riverine substrate as characterized under construction. However, the scale would be substantially smaller because repairs would be limited to specific areas of the revetment where damages have occurred. There would be no changes to the in-situ substrate that would affect functions and services of WOTUS.

Operation (Indirect): There would be no indirect impacts.

Particulates and Turbidity

Construction (Direct):

The TCF would be lined with plastic sheeting anchored by k-rails, large sized sandbags, silt curtains, or something similar to minimize construction-induced erosion in turbidity. Extent of erosion would be commensurate with the energy of localized wave action and storm effects. However, high energy storm flows usually tend to be turbid due to their erosive forces. Thus, it's unlikely that turbidity associated with construction would notably increase turbidity within flows that are naturally turbid. During construction, soils naturally compacted from periodic inundation and stabilized via root masses would be disturbed. After construction, disturbed areas would be re-seeded. Furthermore, vegetation is expected to naturally reestablish in the area due to the climate and existing seed bank. Vegetation growth over time would further stabilize soils. After construction, initial storm flows spreading across the width of the site would result in temporary resuspension of loose soils within the water column. Turbidity would be temporarily increased. However, storm flows would be highly turbid. Thus, the increase in turbidity would not be notable and would subside commensurately as storm flows abate. Furthermore, the rate of resuspension is expected to decrease over time as repeated inundations would result in reconsolidation and re-compaction of loose soils.

Construction (Indirect): There would be no indirect impacts.

Operation (Direct):

Periodic vegetation management activities which would primarily consists of mowing or limited clearing would not notably disturb substrate. Any maintenance would not be performed during periods of high tide (i.e., during or immediately after storm events). Thus, there would be no notable increase in turbidity as a result of vegetation management activities.

Periodic structural repairs would occur on an emergency or non-emergency basis. Emergency repairs would likely occur during full storm events. In such instances, there would be localized increases in turbidity. However, storm flows would be highly turbid. Thus, the increase in turbidity would not be notable and would subside commensurately as storm flows abate.

Non-emergency structural repairs would likely occur outside the storm season with opportunities to divert low flows away from the work site. In such instances, turbidity impacts would be like those characterized under construction. However, the scale would be substantially smaller because repairs would be limited to specific areas of the flood barrier where damages have occurred.

Operation (Indirect):

There would be no indirect impacts.

Contaminants

The proposed project area is located within the Va'oto Plain considered a pristine waterbody by the American Samoa Environmental protection Agency (ASEPA), based on human population density (pristine ≤ 100 mi2), supporting full aquatic life designated uses. Few known issues with contaminants are present. In addition, no freshwater surface water flows to or through the proposed Project area. The site is influenced by coastal waters (tidally influenced) only.

Construction (Direct):

Fill materials to be used for project purposes include native soil, rock, and concrete. Earth-moving activities would disturb naturally compacted soils. Upon contact with the water column, contaminants that could potentially be present within the soils could migrate into the water column. However, because the disturbed soils are native to the area, most of the work would not introduce additional contaminants to WOTUS that are not already present within the native substrate.

Rocks are chemically inert and would not leach contaminants into the water column. Use of earthmoving equipment would increase the potential for accidental releases of fuels and lubricants. Prior to construction activities within or near tidally influenced areas, work areas would be isolated from tidal influence or barriers would be used to divert incoming ocean water from active work areas. When fully isolated from tidal influence, accidental releases of fuels and lubricants would not make direct contact with water. Furthermore, implementation of BMPs below would further minimize migration of contaminants into the water column. With implementation of BMPs, impacts would be short term and minimal. There would be no indirect impacts.

Construction (Indirect): There would be no indirect impacts.

Operation (Direct):

Periodic vegetation management activities and structural repairs would not result in the discharge of contaminated material. Materials likely to be discharged would be limited to in situ earthen fill, rocks, and grout. Impacts would be like those characterized under construction. However, the scale would be substantially smaller because repairs would be limited to specific areas of the revetment where damages have occurred.

Operation (Indirect): There would be no indirect impacts.

Current Patterns and Water Circulation

Construction (Direct):

Construction would not require the temporary or permanent impoundment of tidally influenced waters and there would be no impoundment of tides during construction. Thus, there would be no changes to current patterns and circulation.

Construction (Indirect): There would be no indirect impacts.

Operation (Direct):

Periodic vegetation management activities and structural repairs would not require the temporary or permanent impoundment of flows. Vegetation management activities would be undertaken for the purpose of maintaining the integrity of the revetment. Thus, there would be no changes to current patterns and circulation.

Operation (Indirect): There would be no indirect impacts.

Potential Direct and Indirect Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D)

Threatened and Endangered Wildlife

Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), USACE requested technical assistance from the U.S. Fish and Wildlife Service (USFWS) and on February 2, 2022, received the following list of species listed or proposed for listing under both National Marine Fisheries Service (NMFS) and USFWS jurisdiction.

Common Name	Scientific Name	Status	Critical Habitat	Jurisdiction	Observed in Action Area
Sea Turtles					
Green sea turtle, Central South Pacific Distinct Population Segment (DPS) (*laumei ena`ena*)	*Chelonia mydas*	Endangered	No	NMFS in ocean; USFWS on land	No
Hawksbill sea turtle (*laumei uga*)	*Eretmochelys imbricata*	Endangered	No	NMFS in ocean; USFWS on land	No
Terrestrial Species					
striped Eua tree snail (sisi totolo)	*Eua zebrina*	Endangered endemic	No	USFWS	No

friendly ground dove (tu‘aimeo)	*Gallicolumba stiri*	Endangered	No	USFWS	No
Coral Species					
small-polyp stony coral	*Acropora globiceps***	Threatened	Pending	NMFS	Yes
small-polyp stony coral	*Acropora jacquelineae*	Threatened	Pending	NMFS	No
small-polyp stony coral	*Acropora retusa***	Threatened	Pending	NMFS	Yes
small-polyp stony coral	*Acropora speciosa*	Threatened	Pending	NMFS	No
colonial stony coral	*Seriatopora aculeata*	Threatened	Pending	NMFS	No
branching frogspawn coral	*Euphyllia paradivisa*	Threatened	Pending	NMFS	No
small-polyp stony coral	*Isopora crateriformis***	Threatened	Pending	NMFS	Yes

In November 2020, the NMFS proposed to designate critical habitat in American Samoa for seven (7) species of threatened Indo-Pacific corals found in U.S. Pacific Island waters (*Acropora globiceps, A. jacquelineae, A. retusa, A. speciosa, Euphyllia paradivisa, Isopora crateriformis,* and *Seriatopora aculeata*) pursuant to section 4 of the Endangered Species Act (ESA). Under his designation, the entire fringing reef of Ofu and Olosega would be considered critical habitat at depths from 0-67 ft. This designation is still pending and not final.

Three species of ESA listed corals were observed and photographed during the USFWS (2023) surveys including *Acropora globiceps*, *Acropora retusa*, and *Isopora crateriformis*.

Eua zebrina Gould 1847 is endemic tree snail species known from mature forest areas on Tutuila. The species was once considered abundant in the Territory, but the species is now known only from a few locations. It is still considered the most common species of the native land snails in American Samoa. The American Samoa population of the friendly ground-dove was listed as endangered and a Distinct Population Segment (DPS) under the Endangered Species Act in 2016. Neither species has been observed in the project area no are they expected to occur within the Proposed Action Area (USFWS 2023).

There is currently no designated critical habitat of any species within American Samoa that would be impacted by the proposed Project, therefore there would be no permanent or temporary impacts to any critical habitat. All vegetation within the TCF is comprised of highly disturbed, littoral vegetation. After construction, it is expected that vegetation within the TCF would reestablish quickly due to the tropical climate, abundant adjacent vegetation, and existing seed bank in the soil matrix. Consultation with the U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Endangered Species Act (ESA) for any impacts identified above are underway for direct impacts.

Construction (Direct):

Construction of the Project would not result in a substantial loss of individual green or hawksbill sea turtles, nor would project activities be expected to reduce habitat availability or degrade such habitat so that it becomes unsuitable at a magnitude and/or duration that could substantially affect the species population. In terms of an effects determination for direct effects, there is feasible mitigation available that would avoid direct impacts to nesting sea turtle individuals in terms of placing seasonal restrictions on construction activities and avoiding all construction during periods when turtles are actively nesting in the area. By doing this, direct environmental effects can be reduced to less-than-significant levels.

The potential effects to sea turtles that could result from implementation of any alternative proposed could be avoided and/or minimized using the following best management practices. These BMPS could include, but are not limited to, the following:

- Restrict all project construction to late-April through early August. This would be the optimal period when no nesting sea turtles would be present on Va’oto Beach and nestlings will have emerged and left the area. This would avoid/minimize direct impacts to nesting turtles to less than significant levels.
- During the pre-engineering design phases, evaluate opportunities to reduce the overall dimensions of any shoreline stabilization structure proposed (especially longitudinal length parallel to the shoreline) to minimize impacts to documented nesting beach locations along the west end of the airport runway that could be potentially impacted by proposed Project activities.
- During the pre-engineering design phases, look for opportunities to site/place the shoreline stabilization structure ABOVE or as close to the current line of littoral vegetation as possible and avoid placement below the high tide mark; vegetation lines typically delineate the general height reached by a rising tide to spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.
- Maximize the amount of construction work that can be conducted from the landward (north) side of the project site (closest to the runway). Minimize construction activities on beach, splash/spray, and intertidal zones. Any structure sited below the high tide mark would potentially exacerbate loss of turtle nesting beach area.
- Avoid construction work at night so that construction lighting on beaches is fully minimized possible.
- Ensure all protection measures for sea turtles be included in all contract specifications and the contractor’s Environmental Protection Plan (EPP).

Construction (Indirect):

The final array of alternatives includes both revetments (Alternative 1 and 2) and seawalls (Alternatives 3 and 45) as proposed shoreline stabilization structures at the west end of the Ofu Airport Runway. Both are types of coastal engineering structures that are constructed to run parallel to the shoreline. Also known as “armoring” or “hard structures,” they provide a physical barrier that directly protects inland areas, development, and infrastructure from waves and storm surge. Seawalls are vertical walls that are typically constructed of concrete or stone, while revetments are sloping structures typically composed of rock (also called “rip rap”). Seawalls and revetments provide storm damage protection and erosion control from waves, tides, currents, and storm surge (water build up above the average tide level). They can be used in both exposed areas with high wave energy, as well as in areas with more sheltered conditions with relatively low wave energy.

While seawalls and revetments can help protect landward property and infrastructure from waves and tides, they do not stop (and may exacerbate) erosion. As natural erosive forces continue to remove sediment over time, beaches in front of the hard structures are diminished and can eventually be completely lost over time. Seawalls and revetments themselves can also exacerbate erosion problems by reflecting waves onto the beach in front of them or onto neighboring properties. As these sources of erosion continue, more of the hard structure is exposed, causing more wave reflection and erosion. Therefore, over time, sandy beach may be lost over time due to the proposed project which could impact nesting hawksbill and green sea turtles. It must be stated that natural costal erosion is expected to continue in the absence of this Project, exacerbated by climate change and sea level rise and loss of turtle nesting beach is expected to continue over time in the absence of any project being built. It is difficult to decouple the effects, but the proposed Project could exacerbate beach sand loss and compensatory mitigation may be required. Loss of beach without th project would exceed any loss due to the project.

BMPs could include, but are not limited to, the following:

- Restoration of areas of beach vegetation using native species to encourage use of these areas by nesting sea turtles.
- Contribute to efforts that seek to reduce ambient light caused by streetlights and artificial night lighting. This could include investments in efforts to shield/cover any existing lights facing the Va'oto Beach or covert to "turtle friendly" outdoor lighting.
- Invest in public awareness campaigns to improve community participation and cooperation to increase local conservation efforts such as turning off of lights outside of residences that illuminate beaches during the peak nesting and hatchling emergence season.
- Invest in local nest protection or nest translocation programs to mitigate incidences of nest predation (cages, wire or bamboo mesh placed on top of nests; predator control programs) or translocate nests known to be prone to inundation by tides and rising sea levels.
- Investigate and invest in other climate change mitigation practices pertaining to sea level rise that could benefit sea turtle conservation efforts.

Construction fill would consist of earthen fill, rocks, or concrete. The fill materials are chemically inert and would not leach contaminants into the water column. Short-term impacts to turbidity are not expected to have any negative effects on sea turtles. Thus, the potential for the availability of contaminants from the discharge of dredged or fill material that may lead to the bioaccumulation of such contaminants is low. Consultation with the U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Endangered Species Act (ESA) for any impacts identified above is underway for other potential indirect impacts.

Operation (Direct)

Typical O&M activities entail annual vegetation management. Structural repairs may be undertaken on an as needed basis. Maintenance activities are typically conducted annually. To adequately inspect the revetment, a vegetation free zone (VFZ) on the landward side of the wall would be maintained. If adequate inspections cannot be performed, the amount of vegetation to be removed within the VFZ will be minimized to the extent practicable to facilitate an adequate inspection of the revetment to determine its functionality.

Periodic structural repairs would occur on an emergency or non-emergency basis. In general, the fortified design is also expected to provide an increased level of protection against erosion at the base of the revetment, reducing the potential need for future structural maintenance and repair activities in repaired portions of the revetment.

Emergency repairs would likely occur during storms or just after storms have occurred. In such instances, rocks may be discharged to protect damaged levees. Non-emergency structural repairs would likely occur outside the storm season with opportunities to divert low flows away from the work site. In such instances, potential impacts would be like those characterized under construction. However, the scale would be substantially smaller since repairs would be limited to specific areas of the revetment where damages have occurred.

Direct impacts from operations of the revetment on sea turtles could be avoided and minimized by implementing the BMPs as described for construction.

Operation (Indirect)

Indirect impacts are not anticipated. Potential discharges of fill consist of earthen fill, rocks, or concrete. The fill materials are chemically inert and would not leach contaminants into the water column or result in long term impacts to turbidity. Thus, the potential for the availability of contaminants from the discharge of dredged or fill material that may lead to the bioaccumulation of such contaminants in sea turtles is low.

Other Wildlife

Construction (Direct)

Construction noise and vibration would scatter wildlife present within the construction footprint to adjacent areas whether construction occurs in the littoral zone or in the uplands. However, most general wildlife present in the project area is mobile and adaptive. Furthermore, open spaces adjacent to the project footprint both in-stream and in uplands are adjacent to similarly vegetated areas. Thus, wildlife would be scattered to adjoining areas that have the same habitat. Less mobile invertebrates, amphibians, and reptiles could be buried or crushed by construction equipment. However, loss of individuals would be limited to those located within the construction footprint. Individuals outside the construction footprint would be unaffected.
Upon completion of construction, affected areas would be available for wildlife. Though the area would be initially denuded, quick regrowth of vegetation is expected. Overtime, all functions and services associated with the vegetation such as foraging, nesting, or predation avoidance would be fully restored.

Construction (Indirect)

The fill would consist of earthen fill, rocks, or concrete. The fill materials are chemically inert and would not leach contaminants into the water column or result in long term impacts to turbidity. Thus, the potential for the availability of contaminants from the discharge of dredged or fill material that may lead to the bioaccumulation of such contaminants in wildlife is low.

Operation (Direct & Indirect)

Typical O&M activities entail annual vegetation management. Structural repairs may be undertaken on as needed basis. Direct and indirect impacts would be like those characterized for Threatened and Endangered Wildlife.

Aquatic and Riparian Organisms

In terms of aquatic habitats, there are no riparian areas within the construction footprint, therefore these habitats and associated organisms would not be affected by proposed Project activities. Operations and maintenance would not directly or indirectly impact sanctuaries or refuges.

Marine waters in the vicinity of the proposed Project Area are generally clear and warm, with low primary productivity, small seasonal fluctuations in ocean conditions, and larger multiyear fluctuations in response to greater climatic cycles such as the El Niño Southern Oscillation. Coastal waters can experience increased nutrient and sediment levels due to both natural and anthropogenic factors (e.g., cyclones, land-based runoff). The nearshore zone consists of Indo-Pacific coral reefs, sand channels, basalt outcrops, and associated shallow-water habitats. Reefs support a rich biota of over 900 fishes, 329 corals, 352 snails, other invertebrates such as octopus and giant clams, 237 algae, and two seaweeds. Hawksbill and green sea turtles occasionally nest on Ofu's beaches; humpback whales and spinner dolphins may venture into nearshore waters. Most marine species are widely distributed across the tropical Indo-Pacific region. See following sections for detailed analyses of impacts to marine waters and marine resources.

Operation (Indirect)

There are no riparian areas within the construction footprint, therefore these habitats and associated organisms would not be affected by proposed Project activities.

Construction (Direct & Indirect):

There are no riparian areas within the construction footprint, therefore these habitats and associated organisms would not be affected by proposed Project activities.
Construction of the revetment would not require the temporary or permanent impoundment of flows in any stream. Therefore, riparian and stream-associated aquatic organisms would not be disrupted during construction. Though temporary fill may be discharged to the intertidal zone, there would be no loss of WOTUS. Construction would retain the existing shoreline contours as much as possible.

Operation (Direct & Indirect):

Typical O&M activities entail annual vegetation management. Structural repairs may be undertaken on as needed basis. There are no riparian areas within the construction footprint. Construction of the revetment would not require the temporary or permanent impoundment of flows in any stream., therefore riparian habitats and associated organisms would not be affected by operations or maintenance of the proposed. Vegetation management activities would not result in temporary or permanent loss of WOTUS.

Potential Direct and Indirect Impacts on Special Aquatic Sites (Subpart E)

Sanctuaries and Refuges

Construction (Direct & Indirect):

The Ofu-Va'oto Territorial Marine Park is adjacent to the proposed construction footprint, the nearshore intertidal zone of which could be influenced by project activities. This Territorial Marine Protected Area (MPA) comprises approximately 100 acres that extends approximately one-half mile from Fatuana point to the west end of the Ofu airport runway and from the mean high wa¬ter line seaward to the ten-fathom depth curve (60 ft) and includes sandy shore and reef flat habitat. The eastern boundary of Territorial Marine Park abuts the western boundary of the Ofu Unit of the National Park of American Samoa (Figure 8). The National Park would not be affected by proposed Project activities. The offshore waters of the Territorial Marine Park include a high diversity of corals and fish. Hawksbill and green sea turtle also nest on the sandy beaches within the Territorial Marine Park.

Figure 8. Landscape features of Ofu Island. The proposed shoreline protection measure is in red; proposed staging areas for the project are in dark blue; the Ofu-Va'oto Territorial Marine Park is outlined in yellow dotted line; the Ofu Unit of the National Park of American Samoa by pink dotted lines.

Construction of the revetment is not expected to result in any direct impacts to coral algae within the park (see discussion of coral reefs below) but would have direct and indirect impacts on sea turtle nesting beaches (see Section Subpart D). As described in an earlier section, pre-construction activities (clearing/grubbing/grading of the site) and grading to establish temporary access ramps within the TCF, followed by excavation of the area where the wall would be placed could result in the discharge of soil and sediments in the form of bulldozer side-cast that could result in temporary discharges of soil and construction materials to ocean or tidally influenced areas that could temporarily impact nearshore coralline alga. However, there would be no permanent loss in functions and services, nor would there be in increase in impermeable surfaces that would affect coral. Any biomass stockpiles that would result due to clearing and grubbing would be relocated to an appropriate facility for disposal. Thus, there would be no permanent loss of this resource due to proposed project activities.

Operation (Direct & Indirect):

Periodic vegetation management or other O&M activities would yield temporary discharges of biomass stockpiles to potentially affect nearshore waters within the intertidal area. All temporary stockpiles would be removed to an appropriate facility for disposal. Periodic structural repairs would result in discharges of concrete, rocks, and in situ riverine substrate as characterized under construction. However, the scale would be substantially smaller because repairs would be limited to specific areas of the flood barrier where damages have occurred. As described for construction, there would be no changes to the in-situ substrate that would affect functions and services of resources within the Ofu-Va'oto Territorial Marine Park.

Wetlands

Wetlands consist of areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. See 40 CFR 230.41. No wetlands are within or adjacent to the proposed Project Area, nor would any be impacted by any project activities.

Construction (Direct and Indirect): There are no wetlands designated under state or Federal laws or local ordinances within the construction footprint. Operations and maintenance would not directly or indirectly impact wetlands.

Operation (Direct & Indirect): There are no wetlands designated under state or Federal laws or local ordinances within the construction footprint. Operations and maintenance would not directly or indirectly impact wetlands.

Mudflats

Construction (Direct & Indirect): Mudflats are generally found in intertidal, estuarine or near-shore habitats, deltas, or at river mouths. Although this location is situated along the coastline/intertidal habitat, none of these conditions occur in the proposed Action Area as this is an area of open cost with nor streams draining to it. The proposed discharge would not directly or indirectly affect mudflats.

Operation (Direct & Indirect): Operations and maintenance activities would not directly or indirectly affect mudflats.

Vegetated Shallows

Construction (Direct & Indirect): Vegetated shallows are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as sea grasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems. Vegetated shallows are not present in the proposed Action Area. The proposed discharge would not directly or indirectly affect vegetated shallows.

Operation (Direct & Indirect): Operations and maintenance activities would not directly or indirectly affect vegetated shallows.

Coral Reefs

Coral reefs are among the most diverse and productive ecosystems on the planet, providing habitat for over 25% of all marine species, including many commercially valuable fishes and invertebrates as well as ESA-listed species such as hawksbill and green sea turtles. They also protect coastlines and vital infrastructure and contribute directly to coastal economies through fisheries, tourism, and recreation. Coral reefs are particularly important to Pacific Island communities that heavily rely on them for food, protection, and income.

Overall, coral reefs in American Samoa are in good condition but the Territory is struggling against threats such as coastal pollution, overfishing, and the impacts of global climate change (NOAA 2018). Known human-induced stressors to the listed species in the waters around American Samoa include the effects of over-fishing (especially for sharks and other predators), land-based sources of pollution, and direct damage and habitat degradation through coastal development activities. Non-point source pollution is now considered the primary pollution source for coastal areas in American Samoa. Sedimentation from natural runoff (the islands are very steep and rainfall is often heavy), exacerbated by hillside and coastal development, is also a significant potential threat to coral reefs of American Samoa. A limited amount of marine debris washes in from offshore and is deposited on American Samoa's coral reefs, the bulk of which originates from land-based activities. Anthropogenic stressors reduce the resistance and resiliency of coral reefs to the compounding effects of global climate change such as ocean warming and ocean acidification.

There are 7 species of threatened Indo-Pacific corals found in American Samoa waters: *Acropora globiceps, A. jacquelineae, A. retusa, A. speciosa, Euphyllia paradivisa, Isopora crateriformis,* and *Seriatopora aculeata*. Three (3) of these were observed within the vicinity of the study area: *Acropora globiceps, A. retusa*, and *Isopora crateriformis*. Coral cover close to shore was relatively low. The closest observed ESA listed coral colony was approximately 25 meters (82 ft) seaward of the proposed study area (USFWS 2023).

In November 2020, NMFS proposed to designate critical habitat in American Samoa for these coral species pursuant to Section 4 of the ESA. Under this designation, the entire fringing reef of Ofu and Olosega would be considered critical habitat at depths from 0-67 ft. This designation is still pending and not final.

Construction (Direct & Indirect):

Construction of the revetment is not expected to result in any direct impacts to coral algae. As described in an earlier section, pre-construction activities (clearing/grubbing/grading of the site) and grading to establish temporary access ramps within the TCF, followed by excavation of the area where the wall would be placed could result in the discharge of soil and sediments in the form of bulldozer side-cast that could result in temporary discharges of soil and construction materials to ocean or tidally influenced areas that could temporarily impact nearshore coralline alga. However, there would be no permanent loss in functions and services, nor would there be in increase in impermeable surfaces that would affect coral. Any biomass stockpiles that would result due to clearing and grubbing would be relocated to an appropriate facility for disposal. Thus, there would be no loss of this resource due to proposed project activities.

Operation (Direct & Indirect): Periodic vegetation management or other O&M activities would yield temporary discharges of biomass stockpiles to potentially affect nearshore waters within the intertidal area. All temporary stockpiles would be removed to an appropriate facility for disposal. Periodic structural repairs would result in discharges of concrete, rocks, and in situ riverine substrate as characterized under construction. However, the scale would be substantially smaller because repairs would be limited to specific areas of the flood barrier where damages have occurred. As described for construction, there would be no changes to the in-situ substrate that would affect functions and services of coral reefs.

Riffle and Pool Complexes

Steep gradient sections of some streams can be characterized by riffle and pool complexes. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a coarse substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. Although this habitat type is generally associated with higher-gradient streams, some form of riffle and pool complex may occur where boulders and gravel have accumulated to the extent that they can back up flows to cause pools and allow for increased water velocity or formation of eddies on the downstream side.

Construction (Direct & Indirect): There are no rivers, streams or riffle and pool complexes within the proposed Action Area. Thus, construction would not directly or indirectly affect riffle and pool complexes.

Operation (Direct & Indirect): Operations and maintenance activities would not directly or indirectly affect riffle and pool complexes.

Potential Direct and Indirect Effects on Human Use Characteristics (Subpart F)

Municipal and private water supplies

There are no municipal or private water wells, recharge areas, or intake structures related to water supplies within the proposed Action Area where construction would occur.

Construction (Direct & Indirect): Construction activities would not affect the municipal or private water supply supplies.

Operation (Direct & Indirect): Operations and maintenance activities would not directly or indirectly affect municipal and private water supplies.

Recreational and Commercial Fisheries

Construction (Direct & Indirect): Limited recreational fishing is occasionally conducted from adjacent shoreline areas of Ofu by locals, but typically not from the proposed Action Area as this is located close to the west end of the Ofu airport runaway. In addition, many alternative locations are readily available from which shore fishing could be conducted. Significant direct impacts to recreational fishing a not expected. There would be no indirect impacts to recreational fishing. There are no commercial within the proposed Action Area where construction would occur, so there would be no direct or indirect impacts.

Operation (Direct & Indirect): Operations and maintenance activities would not directly or indirectly affect recreational fishing.

Water-Related Recreation

Construction (Direct & Indirect):

Water-related recreation activities or facilities in the proposed Action Area where construction would occur may occasionally include recreational fishing, sunbathing, snorkeling, and swimming. The shoreline within the proposed Project Area would be temporarily inaccessible to the public during construction activities, but this would be temporary. However, impacts to these activities will be localized and relatively short-lived. In addition, there are ample alternative areas of beach that the public can safely access and utilize during the construction period. Therefore, direct or indirect impacts from construction to water-related recreation are considered less than significant and no mitigation would be required. There are no water-related recreation facilities in the proposed Action Area where construction would occur Construction would not directly or indirectly affect water-related recreation facilities.

Operation (Direct & Indirect):

Operations and maintenance activities would not directly or indirectly affect water-related recreation. There are no water-related facilities in the proposed Action Area that would be affected by operations.

Aesthetics

The constructed tribar revetment is not expected to substantially obstruct broad landscape views (including those of Leolo Ridge or Mt. Tumu), nor is it expected to substantially diminish localized views for residents. Recognizing the effect that shoreline stabilization structures could have on the visual landscape, project siting and design would be conducted in a manner so as to best integrate the structure with the natural characteristics of the site and minimize visual impacts to the extent possible. In particular, the use of any natural topography to minimize the overall size and obtrusiveness of the proposed structure will be investigated. Efforts throughout the planning process would also look for opportunities to minimize the impacts to the extent possible, particularly as related to the overall wall heights. Further refinements would be made during the design phases and would further evaluate opportunities to reduce the dimensions of the revetement, as well as incorporate design details that may otherwise minimize potential visual impacts, such as use of construction materials and/or landscaping to blend the structures into the surrounding environment Implementation of these measures is expected to reduce potential visual impacts to a less-than-significant level.

Construction (Direct & Indirect):

Construction would entail earthmoving activities that would remove vegetation within the construction TCF. A limited number of earthmoving equipment with highly visible paint schemes and colors would be temporarily present at the proposed project site. The TCF would be temporarily devoid of heterogeneous forms and textures as well as a natural color palette associated vegetation, sand, and rocks, and be replaced with a homogeneous concrete structure with various hues of grey. Upon completion of earthwork all construction equipment and materials would be removed. The TCF would remain temporarily barren and would form a distinct rectangular imprint in the vista. Thus, construction would result in temporary impacts to aesthetics. However, vista within the TCF would match the surrounding vista over time.

Parks, national and historical monuments, national seashores, wilderness areas, and research sites

These preserves consist of areas designated under Federal and State laws or local ordinances to be managed for their aesthetic, educational, historical, recreational, or scientific value. 40 CFR 230.54.

Construction (Direct & Indirect):

There are no national and historical monuments or national seashores through the Proposed Project Area. There would be no direct or indirect construction impacts.

Operation (Direct & Indirect): There are no national and historical monuments or national seashores through the Proposed Project Area. There would be no direct or indirect operation and maintenance impacts.

Cumulative Impacts

Present

No maintenance or structural repairs are being implemented at this time as the project has yet to be constructed.

Future

After the construction of the shoreline protection element is completed, a decrease in the need for structural maintenance is expected. Thus, temporary impacts to aquatic services and functions are likely to decrease. Annual vegetation maintenance will need to be conducted and structural repairs will be implemented as needed to repair storm damages. Although the American Samoa Department of Port Administration, as non-federal sponsor, will be is responsible for O&M activities, USACE will continue to exercise permitting authorities pursuant to Section 404 of the Clean Water Act for discharges of dredged or fill material within WOTUS and Section 408 of the Rivers and Harbors Act for modifications to federally constructed structures. Continued receipt of Section 404 and Section 408 permits for the construction, modifications, and maintenance of existing and future infrastructure such as bridges and utilities are anticipated. These non-USACE projects may require issuances of Section 404 and Section 408 permits. With few exceptions, most projects are expected to be small in scope and limited to like-for-like repairs.

EVALUATION AND TESTING (SUBPART G)

Proposed discharges of permanent fill consist of soil, rocks, or concrete. The fill materials are chemically inert and would not leach contaminants into the water column. Soils proposed for discharge are native to site. Work within WOTUS would not introduce additional contaminants not already present within the native substrate. Per 40 C.F.R 230.60(a), testing is not required.

Measures to Minimize Adverse Impacts (SUBPART H)

Some measures, in the form of site-specific best management practices, would need to be implemented to avoid and minimize impacts associated with sedimentation, erosion (e.g., Horsley Witten Group, Inc. 2019) and stormwater contamination. These could include, but are not limited to, the following:

- Employee/subcontractor training; sequencing of activities to minimize exposure of cleared areas; timing construction to avoid periods of rain, overland flow, and high tides (to the extent possible)

- Minimize extent of clearing and grubbing; maintain existing vegetation (to the extent possible); provide temporary soil stabilization (e.g., mulching; hydroseeding; soil binders, geotextiles, etc.); install silt fencing and/or sediment traps; provide dust control (but avoid excess dust control watering); implement and maintain proper dewatering techniques (if needed); protect and manage stockpiles; cover loose materials in haul trucks; stabilize construction entrance/exit and provide tire wash; revegetate temporarily disturbed areas.

- Regular vehicle and equipment inspection; fueling and maintenance in designated areas; Use of drip pans; Proper storage and disposal techniques; implement spill controls
- Protection of stockpiles; provide watertight dumpsters, with regular waste removal and disposal; proper containment, labeling and disposal of hazardous materials, such as petroleum products, solvents, etc.); regular site inspection and litter collection; salvage and reuse of materials, as appropriate
- Proper storage and handling techniques for concrete-curing compounds; perform washout of concrete trucks in designated areas only; containment in wash water pits; proper disposal of material from washout facilities
- Equipment and vehicle washing in designated areas; provide containment of wash water
- Proper sanitary/septic waste management

Preparation and implementation of these best management practices, as well as adherence to other requirements of the land use permit, would reduce the potential construction-related water quality impacts to a less-than-significant level. With implementation of these best management practices, the extent of water quality impacts from the proposed Action are expected to be less than significant.

Attachment 7. Draft Coastal Zone Management Act Federal Consistency Determination

Ofu Airport, American Samoa
Continuing Authorities Program (CAP) Section 14 Emergency Shoreline Protection

U.S. Army Corps of Engineers Honolulu District

April 2023

Contents

INTRODUCTION AND DETERMINATION

This document constitutes the Federal Consistency Determination (FCD) of the Honolulu District of U.S. Army Corps of Engineers (USACE) for the Ofu Airport, American Samoa - Continuing Authorities Program (CAP), Section 14 Emergency Stream Bank and Shoreline Protection (Study). The USACE proposes to implement structural shoreline stabilization measures to reduce the risk of erosion along the western edge of the Ofu Airport runway located on the island of Ofu in the U.S. Territory of American Samoa to enable the continued use of Runway 8/26. The USACE and the non-federal sponsor, the American Samoa Department of Port Administration, have evaluated the results of the Study and recommended Alternative 2: Tribar Revetment as the basis for project construction authorization. USACE has evaluated the recommended alternative and has determined it is consistent to the maximum extent practicable with the American Samoa Coastal Management Act (ASCMA), pursuant to the requirements of the Coastal Zone Management Act of 1972, as amended, (CZMA). The environmental consideration and consistency sections below provide the basis for the finding. The USACE requests the concurrence of the American Samoa Coastal Management Program (ASCMP) with this FCD.

AUTHORITY FOR STUDY

This Study was authorized under Section 14 of the 1946 Flood Control Act, as amended (33 USC 701r). Section 14 authorizes USACE to partner with a non-federal sponsor to study, design, and construct emergency stream bank and shoreline protection for public facilities in imminent danger of failing due to bank failure caused by natural erosion and not by inadequate drainage, by the facility itself, or by operation of the facility.

EP 1105-2-58 limits emergency shoreline protection projects authorized under Section 14 of the Flood Control Act of 1946 to essential public facilities and facilities owned by non-profit organizations that have been properly maintained and are in imminent threat or damage or failure by natural erosion processes on streambanks and shorelines. Eligible facilities include highways, highway bridge approaches, public works, churches, public and private non-profit hospitals, schools, and other public or non-profit facilities offering public services open to all on equal terms. The Ofu Airport qualifies under these parameters. The non-Federal sponsor for this project is the DPA.

STANDARD OF REVIEW

The United States Congress enacted the CZMA in 1972 and the Coastal Zone Act Reauthorization Amendments in 1990 in response to the increasing pressures of overdevelopment on the nation’s coastal resources. These acts made federal financial assistance available to any coastal state or territory willing to develop and implement a comprehensive land and water use program for the designated coastal zone, including unified policies, criteria, standards, methods, and processes for dealing with land and water use decisions of more than local significance.

Under Section 307(c)(1) of the CZMA, 16 USC Section 1456(c)(1), federal activities that affect any land or water use or natural resource of the coastal zone are required to be consistent with the affected state's or territory’s coastal management program to the "maximum extent practicable." Section 15 CFR 930.32 of the National Oceanic and Atmospheric Administration's (NOAA) regulations implementing the CZMA defines "consistent to the maximum extent practicable" as: *"fully consistent with the enforceable policies of management programs unless full consistency is prohibited by existing law applicable to the Federal agency."*

In the U.S. Territory of American Samoa, the American Samoa Coastal Management Program (ASCMP) was issued in response to the enactment of the federal CZMA of 1972 (16 U.S.C. §§ 1451 et seq) and approved by NOAA in 1980. The ASCMP administrative code was adopted pursuant to authority granted the American Samoa Department of Commerce under Public Law 21-35, the American Samoa Coastal Management Act of 1990, ASCA §§ 24.0501 et. seq.

The ASCMP is established as an office within the American Samoa Government. The Department of Commerce is the designated territorial agency, as required by federal law, for the administration and implementation of the ASCMP. The general purpose of ASCMP is to provide effective resource management by protecting, maintaining, restoring, and enhancing the resources of the coastal zone. Federal consistency provisions of the CZMA require that all federally funded, licensed, or permitted projects affecting the coastal zone of American Samoa be conducted in a manner that is consistent with the ASCMP. The ASCMP has designated the entire Territory (totaling approximately 77 square miles with a coastline of 126 miles) and the sea within three (3) miles of the shoreline as a coastal zone. The ASCMP has developed a unique approach to coastal zone management that incorporates both western and traditional Samoan systems.

Chapter 2 Title 26 (Environment Safety and Land Management) of the American Samoa Administrative Code contains the ASCMP Administrative Rules. It provides that the ASCMP Administrative Code is adopted pursuant to authority granted the Department of Commerce under Public Law 21-35, the American Samoa Coastal Management Act of 1990. The Act required the establishment of a system of environmental review, along with economic and technical considerations, at the territorial level intended to ensure that environmental concerns are given appropriate consideration in the land use decision-making process. This Chapter establishes within the Department of Commerce a consolidated land use permitting process, known as the Project Notification and Review System (PRNS), including development standards, procedures for the designation, planning and management of Special Management Areas (SMAs), procedures for environmental assessments, and procedures for determination of federal consistency (Section 4 of the Act).

Section 5 of the Act mandated the establishment of a system of environmental review under a consolidated land use permitting process and project reviews at the territorial level for all uses, developments, or activities which impact the coastal zone, known as the Project Notification and Review System (PNRS). The PNRS was created to implement the ASCMP as established by Executive Orders 03-80 and 07-88, codified as A.S.A.C. §§ 26.0201 et seq. and ensure that environmental concerns, along with economic and technical considerations, are given appropriate consideration in the land use decision-making process. The PNRS Board is comprised of an interdisciplinary consortium of all American Samoa government agencies which have some type of purview or interest in land use decisions in the Territory. The Department of Commerce holds exclusive authority to designate uses subject to land use permit requirements and to approve land use permit applications.

PROJECT DESCRIPTION

Project Location and Background

American Samoa is an unincorporated territory of the United States located in the mid-South Pacific Ocean and part of the Samoan Islands archipelago in Polynesia (Figure 1). The Study

Area is located on the island of Ofu within Ofu County in the Manu'a Islands District. The Study Area is located at the Ofu Airport situated on the Va'oto Plain along the southern facing coast of Ofu. The 18-acre public airport is operated by DPA of the American Samoa Government on property leased from local families. The airport is intended to serve the aviation needs of Ofu and Olosega islands (Figure 2).

The shoreline along the western end of the Ofu Airport Runway 8/26 is progressively eroding with the coastline receding further into the Runway Safety Area (RSA) of Runway 8/26. The RSA is mandated by FAA regulations to accommodate aircraft that may veer off the runway, as well as firefighting equipment. At Ofu Airport, the RSA is already non-standard due to the limited amount of real estate available. The RSA in theory should be 150 ft wide, centered on the runway, and extend 300 ft beyond each end of the runway. The RSA currently extends only 100 ft beyond the end of Runway 8/26. An exemption to the FAA design standards currently allows the airport to remain operational in its current state, however, continual erosion will result in the imminent closure of the runway.

This coastline erosion was accelerated during Tropical Storm (TS) Evans in 2012 and again more recently by TS Gita that devastated the islands in 2018. After TS Gita, sand and rocks were deposited onto the grassed area and runway from the high storm wave runup. Airport staff were required to quickly clear this debris from the airport runway in order to restore runway operations. Similarly, frequent king tide events result in similar impacts to the runway with wave runup, erosion, and damage to the runway.

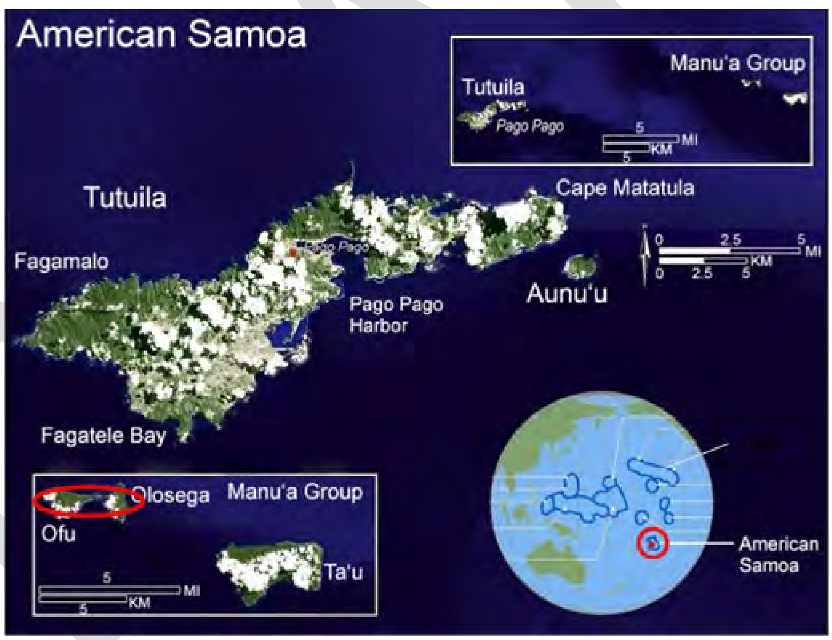

Figure 1. Location of Study Area

Figure 1. *Ofu Airport Location*

The Study Area is located within the Va'oto Plain, a wide coastal flat that formed at the base of a steep (almost vertical) cliff along the southern coast of the island of Ofu. The proposed Action Area (where structural shoreline protection improvements would be implemented) is located on the southern coast of Ofu Island at the west end of the runway 8/26 at the Ofu Airport on the Va’oto Plain at Papaloloa Point.

Need for and Objectives of the Project

Need for Project

The shoreline along the western end of the Ofu Airport is progressively eroding with the coastline receding further into the Runway Safety Area (RSA) of Runway 8/26. The RSA is mandated by FAA regulations to accommodate aircraft that may veer off the runway, as well as firefighting equipment. At Ofu Airport, the RSA is already non-standard due to the limited amount of real estate available. The RSA in theory should be 150 ft wide, centered on the runway, and extend 300 ft beyond each end of the runway. The RSA currently extends only 100 ft beyond the end of Runway 8/26. An exemption to the FAA design standards currently allows the airport to remain operational in its current state, however, continual erosion will result in the imminent closure of the runway.

The purpose of this project is to provide Ofu Airport with shore protection for the continued use of Runway 8/26. Without this project, current airport operations are at high risk of shutdown due to closure of the runway**.**

Objectives

The planning objective for the Study include the following for the 50-year period of analysis starting in 2026:

- Reduce coastal hazard risks to property and critical infrastructure at the Ofu Airport;
- Reduce risk to life safety for residents of Ofu and Olosega islands by minimizing closures of the Ofu Airport.

Plan Formulation

The Plan Formulation process is used to formulate alternative plans and evaluation criteria leading to the recommendation of the Project for implementation. Under the National Environmental Policy Act (NEPA), reasonable alternatives are those that are practical or feasible from a technical or economic perspective and based on common sense. Alternatives must be responsive to the purpose and need. Factors used to determine feasibility include site suitability, economic limitations, consistency with local plans and policies, other plan or regulatory limitations, and jurisdictional boundaries.

The USACE has prepared a Draft Integrated Feasibility Report (IFREA/EA) and Environmental Assessment for the Study that identifies, evaluates, and discloses all impacts that would result from the implementation of potential shoreline protection management measures for critical areas most prone to coastal erosion within the proposed Action Area, specifically along the west end of Runway 8/26.

Details on the process used to formulate alternative plans and evaluation criteria for the Study can be found in the *Draft Integrated Report and Environmental Assessment.*

Project Description

Alternative 2: Tribar Revetment (Figure 3 and 4) was identified as the alternative that would be most practicable with respect to real estate considerations, costs, and logistics as the Tentatively Selected Plan (TSP). Based on the above, Alternative 2 is tentatively identified as Least Environmentally Damaging Practicable Alternative (LEDPA) and is carried forward for analysis. While maximizing net benefits, it, has anticipated positive impacts on nearshore water quality (e.g., by minimizing future coastal erosion) and is supported by the American Samoa Government.

Alternative 2 includes construction of a 500’ long by 33’ wide (approximately16,500 $ft.^2$ or 0.38 acres) tribar revetment along the west end of the Ofu Airport Runway 8/26. The revetment would consist of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a single layer of 1-ton concrete tribar. The stone sizing of the underlayer would range from100-300 lbs. stone. At the specified 1.5H:1V slope, the revetment is expected to be 33 ft wide, extending towards the ocean, with a crest elevation of +10 ft MSL. At this time, construction of project features are not anticipated to affect structures at the Ofu Airport. Staging would require 1.35 acres distributed at four separate locations.

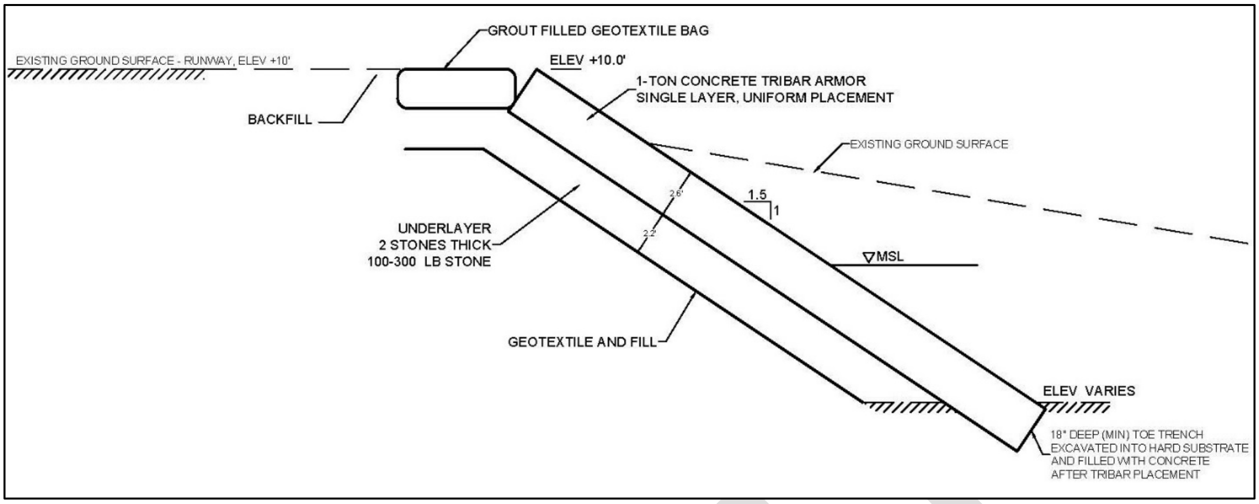

Figure 3: Alternative 2 – Tribar Revetment

Table 1: Alternative 2: Tribar Revetment specifications

• Alternative 2: Tribar Revetment	• Dimensions
Structure Length (ft.)	• 500
Crest Width (ft)	• 6
• Crest Elevation (ft.)	• 10
• Bottom Elevation (ft.)	• -7
• Slope (V:H)	• 1:1.5
• Structure Footprint Width (ft.)	• 33
• Structure Excavation Width (ft)	• 43

Storage of material and equipment will be required, and staging areas have been identified. The staging area would be restored upon construction completion. Construction is anticipated for one (1) year.

Minimal operations and maintenance requirements are expected for the alternative. Periodic inspection of all the features will be required and vegetation clearing and/or repairs may be completed as needed.

The minimum estimated real estate requirements for Alternative 2 are as follows:

1. 0.38 acres for construction of the tribar revetment: 500 linear ft, 33 ft wide permanent)

2. 0.12 acres Construction Area/Access: to accommodate 10 ft of excavation and backfill alongside project feature (temporary)
3. Staging Areas: 1.35 acres (temporary):
    a. COSA 1: 4,000 sf
    b. COSA 2: 22,000 sf
    c. COSA 3: 3,500 sf
    d. COSA 4: 29,000 sf

Figure 4. General location and placement of proposed Alternative 2: Tribar Revetment in relation to landscape features. Location of observed sea turtle nesting locations are also noted by blue and pink teardrops.

Permanent Construction Footprint

A permanent shoreline protection easement totaling approximately 0.38 acres (16,500 ft^2) is required for the construction of the tribar revetment. The revetment would extend 500-ft along the coast along the west end of the Ofu Airport runway. This is the orange shaded area depicted in Figure 4. The design will be further refined post-TSP in consultation with a geotechnical engineer.

Temporary Construction Footprint

1. The temporary construction footprint would include an area of 5,227 square-ft wide alongside the permanent structure to access, excavate, and backfill existing soils (0.12 acres of temporary impacts). This is the area shaded in purple as depicted in Figure 4.

The proposed staging areas would accommodate construction for the planned structural features Staging areas and site access must be established for the storage, use, and distribution of construction materials and equipment. Four Construction Staging Areas (COSAs) totaling 1.35 acres staging areas have been identified. Four staging areas have been identified: (1) a 4,000 square foot area at a private residence at the Ofu airport; (2) a 22,000 square-foot area along the south side of the airport runway near the proposed Action Area; (3) a 3,500 square-foot are at the Ofu Harbor (approximately 1.5 miles from the airport); and (4) a 29,000 square-foot open area also located at the Ofu Harbor (see Figure 5).

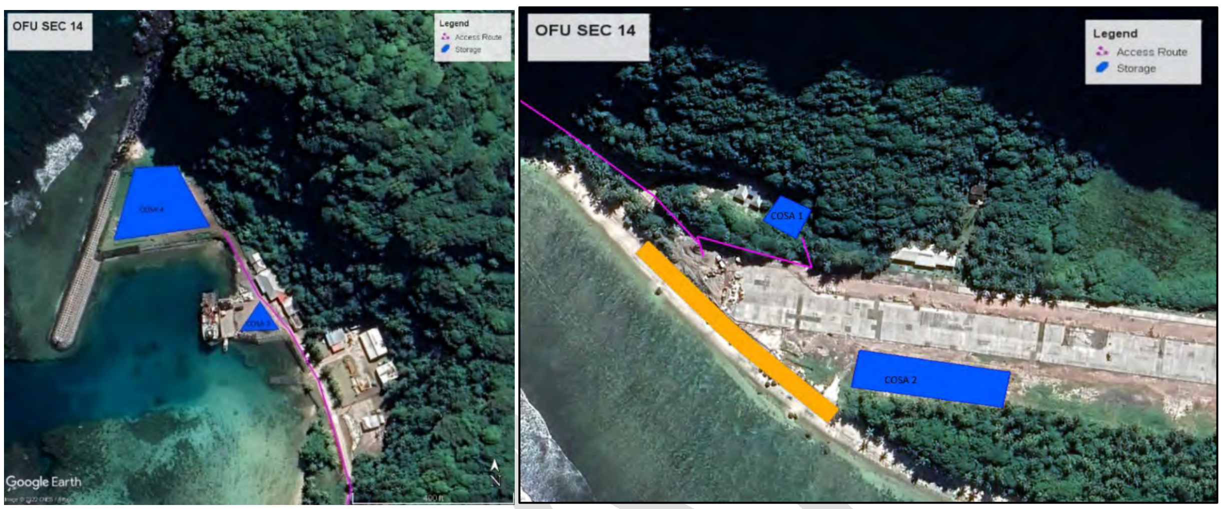

Figure 5. Staging Areas: COSA 3 and 4 at Ofu Harbor on the left and COSA 1 and 2 at Ofu Airport on the right. The tribar revetment structure is depicted in orange.

The COSAs will contain contractor trailers, parking, fencing, and storage of equipment and materials. Fill/aggregate storage is anticipated to be contained at COSA 2 along the south side of the runway. Casting & storing the panels would likely occur at the harbor COSA 3 and COSA 4 (Figure 5).

The staging areas are generally flat and within close proximity to the proposed project features (either at the airport or 1.5 miles distant at the Ofu Harbor). No vegetation within the TCF will need to be removed in order to facilitate construction and provide enough room for construction equipment to operate, as these areas are already open and cleared. Any material stored in the staging area would be covered to reduce the loss of material due to erosion and avoid impacts to the adjacent environment. The staging area would be returned to their previous condition if any unintended damage should occur upon construction completion. Construction is anticipated for one (1) year.

Construction Site Equipment and Access

Required equipment to construct this alternative could include, but is not limited to, the use of a dump truck, flatbed truck, large excavator, backhoe, an excavator(s), font/end loader, and possibly a crane to lift the panels or rocks. This equipment would be stored the staging areas described above.

The project areas can be accessed from the major local public road (Figure 6) on Ofu and the airport runway itself. It is anticipated that personnel, equipment, and imported materials would access project construction along public roadways parallel to the airport runway. Access points identified within the public roadways can be used without additional perpetual real estate interests for operations and maintenance. Access points identified adjoining construction areas outside of the public roadway will be included in temporary work area easements as project features are refined. No temporary haul roads are expected to be required. Access points identified adjoining construction areas outside of the public roadway will be included in the TCF as project features are refined. After site preparation and vegetation removal activities, it is anticipated that construction of the shoreline protection measure would occur. Construction is anticipated for one (1) year. Construction damages to the roads will repaired or replaced upon construction completion.

Figure 6. Main access road on Ofu Island (pink). The proposed staging areas are shown in dark blue.

Operations and Maintenance

Although minimal operations and maintenance (O&M) requirements are expected for the proposed project feature, O&M activities are expected to entail typical periodic inspection of project features, periodic vegetation management (e.g., clearing or mowing of vegetation around the revetment and structural repairs on an as needed basis). Structural repairs may be needed periodically to repair damages caused by storms. The nature of the damages would be expected to be similar to those characterized for construction, but the scale would be substantially smaller as repairs would be limited to specific areas of the revetment where damages have occurred. Any vegetation removed from O&M activities would be transported to an appropriate facility for disposal.

Benefits and Environmental Issues

Benefits

The USACE has evaluated the proposed Project (Alternative 2: Tribar Revetment) and determined that the localized and short term (temporary) environmental impacts from the proposed project would be outweighed by the long-term benefits of increased shoreline protection afforded to the Ofu Airport. Overall, the project would function to decrease health and safety risks associated with airport closures that result due to damage to the airport runway, thereby reducing the number of people subject to health and safety risks brought on by closures of and lack of access to a functioning airport, including the majority of the Ofu and Olosega Island's residents. In addition to reducing health and safety risks to the affected population, critical infrastructure at the Ofu Airport would be protected from storm damage and erosion, thereby contributing to health and safety through increased resiliency in response to coastal flood events. Another beneficial impact associated with implementation of the project is heightened awareness of the coastal hazard-related risks, including an increased understanding of the effects of climate change on critical coastal infrastructure.

In accordance with the Clean Water Act Section 404(b)(1) Guidelines, the USACE must identify and normally select the least environmentally damaging practicable alternative (LEDPA) on the aquatic ecosystem. The proposed recommended plan (Alternative 2) Tribar Revetment has been identified as the LEDPA. A 404(b)(1) analysis can be found in Attachment 6 of Environmental Appendix A-3 of the draft Integrated Feasibility report.

Environmental Issues

The proposed action (recommended alternative or TSP) is construction of a tribar revetment on the southern coast of the island of Ofu at the west end of the Ofu Airport runway.

The water column and bottom and all surrounding waters and submerged lands around the islands of American Samoa are designated as Essential Fish Habitat (EFH) by the National Marine Fisheries Service (NMFS) and support various life stages for the management unit species (MUS) identified under the Western Pacific Fishery Management Council's American Samoa Archipelago and Pacific Pelagic Fishery Ecosystem Plans. The MUS and life stages found in these waters include eggs, larvae, juveniles, and adults of Bottom-fish and Pelagic MUS (WPRFMC 2009). Specific habitats considered as EFH include coral reef, patch reefs, hard substrate, artificial substrate, seagrass beds, soft substrate, mangrove, lagoon, estuarine, surge zone, deep-slope terraces, and pelagic/open ocean.

In terms of aquatic, water-dependent, and EFH habitats, there are no riparian areas, streams (including pool and riffle complexes), wetlands, mudflats, seagrass beds, mangroves, estuarine, surge zone, deep-slope terraces and pelagic/open ocean that would be affected by proposed Project activities. However, impacts to the intertidal zone (between high and low tide mark) and shallow-water habitats could occur, specifically to coral reefs, hard substrate, and soft substrate (in the form of littoral zone vegetation and sandy beach), as wells as associated wildlife found within these habitats.

The Ofu-Va'oto Territorial Marine Park is directly adjacent the proposed Project Area and the offshore waters within this Territorial Marine Park include a high diversity of corals and reef-associated fish. This Territorial Marine Protected Area (MPA) comprises approximately 100 acres that extends approximately one-half mile from Fatuana point to the west end of the Ofu airport runway and from the mean high water line seaward to the ten-fathom depth curve (60 ft) and includes sandy shore and reef flat habitat. The eastern boundary of Territorial Marine Park abuts the western boundary of the Ofu Unit of the National Park of American Samoa which will not be affected by project activities (Figure 7). Hawksbill and green sea turtles also nest on the sandy beaches within the Marine Park and adjacent to the proposed Project area (Figures 4 and Figure 8).

Figure 7. Landscape features of Ofu Island. The proposed shoreline protection measure is in red; proposed staging areas for the project are in dark blue; the Ofu-Va'oto Territorial Marine Park is outlined in yellow dotted line; the Ofu Unit of the National Park of American Samoa by pink dotted lines.

Figure 8: General location and placement of proposed shoreline stabilization structure in relation to landscape features and observed hawksbill and green sea turtle nesting locations (noted by blue and pink teardrops, respectively).

Coral Reefs

Coral reefs are among the most diverse and productive ecosystems on the planet, providing habitat for over 25% of all marine species, including many commercially valuable fishes and invertebrates as well as ESA-listed species such as hawksbill and green sea turtles. They also protect coastlines and vital infrastructure and contribute directly to coastal economies through fisheries, tourism, and recreation. Coral reefs are particularly important to Pacific Island communities that heavily rely on them for food, protection, and income.

Overall, coral reefs in American Samoa are in good condition but the Territory is struggling against threats such as coastal pollution, overfishing, and the impacts of global climate change (NOAA 2018). Known human-induced stressors to the listed species in the waters around American Samoa include the effects of over-fishing (especially for sharks and other predators), land-based sources of pollution, and direct damage and habitat degradation through coastal development activities. Non-point source pollution is now considered the primary pollution source for coastal areas in American Samoa. Sedimentation from natural runoff (the islands are very steep and rainfall is often heavy), exacerbated by hillside and coastal development, is also a significant potential threat to coral reefs of American Samoa. A limited amount of marine debris washes in from offshore and is deposited on American Samoa’s coral reefs, the bulk of which originates from land-based activities. Anthropogenic stressors reduce the resistance and resiliency of coral reefs to the compounding effects of global climate change such as ocean warming and ocean acidification.

There are 7 species of threatened Indo-Pacific corals found in American Samoa waters: *Acropora globiceps, A. jacquelineae, A. retusa, A. speciosa, Euphyllia paradivisa, Isopora crateriformis,* and *Seriatopora aculeata*. Three (3) of these were observed within the vicinity of the study area: *Acropora globiceps, A. retusa*, and *Isopora crateriformis*. Coral cover close to shore was relatively low. The closest observed ESA listed coral colony was approximately 25 meters (82 ft) seaward of the proposed study area (USFWS 2023).

In November 2020, NMFS proposed to designate critical habitat in American Samoa for these coral species pursuant to Section 4 of the ESA. Under this designation, the entire fringing reef of Ofu and Olosega would be considered critical habitat at depths from 0-67 ft. This designation is still pending and not final.

Construction of the revetment is not expected to result in any direct impacts to coral algae. Pre-construction activities (clearing/grubbing/grading of the site) and grading to establish temporary access ramps within the TCF, followed by excavation of the area where the revetment would be placed could result in the discharge of soil and sediments in the form of bulldozer side-cast that could result in temporary discharges of soil and construction materials to ocean or tidally influenced areas that could temporarily impact nearshore coralline alga. However, there would be no permanent loss in functions and services, nor would there be in increase in impermeable surfaces that would affect coral. Any biomass stockpiles that would result due to clearing and grubbing would be relocated to an appropriate facility for disposal. Thus, there would be no loss of this resource due to proposed project activities.

Sea Turtles

In American Samoa, sea turtles (or laumei in Samoan) include the endangered hawksbill sea turtle (*Eretmochelys imbricata*) (US DOC NOAA ONMS 2012) and the endangered green sea turtle (*Chelonia mydas)* (81 FR 20058). In the Territory of American Samoa, both species are protected by American Samoa Administrative Code (Chapter 09 Fishing Title 24 Ecosystem Protection and Development 24.0959 Sea Turtles), Executive Order 005-2003 and the U.S. Endangered Species Act of 1973. There is no designated critical habitat for either species in American Samoa. Both species are globally distributed throughout tropical and sub-tropical zones. In American Samoa, both species are known to nest and juveniles of both species are commonly found in near-shore coral reef habitats. It had been assumed that only hawksbills nest on beaches of Tutuila, Aunu'u and the Manu'a Islands (Craig 2009); however, recent tagging work by American Samoa Department of Marine and Wildlife Resources (DMWR) and the National Park of American Samoa have confirmed that a substantial proportion of turtles nesting on Ofu Island are green sea turtles (see Figure 8).

Baseline Water Quality

The proposed Project Area at the Ofu Airport is located on the Va'oto Plain. There are no streams on the Plain.

Marine waters in the vicinity of the proposed Project Area are generally clear and warm with low primary productivity, small seasonal fluctuations in ocean conditions, and larger multiyear fluctuations in response to greater climatic cycles such as the El Niño Southern Oscillation. Coastal waters can experience increased nutrient and sediment levels due to both natural and anthropogenic factors (e.g., cyclones, land-based runoff).

In terms of overall water quality, monitoring data have shown that coastal water quality is consistently good on Ofu and the other Manu’a Islands. Coastal waters fully support all aquatic life uses and indicate no water quality impairments. The beaches on Manu’a beaches rarely exceed the American Samoa Water Quality Standard (ASWQS) for *Enterococcus* bacteria (ASEPA 2018). The good water quality in Manu’a can be attributed to the remote location, low human population density, and generally well-circulated coastal areas. Periodic algal blooms can occur in front of villages in the Manu’a Islands, but studies indicate that the major sources of nutrients to lagoons here are most likely oceanic, atmospheric and/or sedimentary in origin and not derived from animal or terrestrial sources. High volumes of oceanic waters and strong currents flush the lagoons daily and would be expected to rapidly dilute any nutrient input from land.

Reportedly, groundwater beneath coastal lands on Ofu, including groundwater beneath the Ofu airport, is typically too brackish to be a viable potable water source. Marine biologists have documented excellent underwater visibility in a nearshore depression that extended northwest from Papaloloa Point. Reduced water quality was evident closer to Papaloloa Point. It was also observed that longshore currents in this area flowed to the northwest. The airport has no drainage or storm water pollution control or prevention facilities to control runoff at the terminal or the runway (ASG 2006).

Environmental Effects Analysis

An effects analysis of constructing the recommended alternative (Alternative 2: Tribar Revetment) was conducted based on the known locations of sensitive species and habitat receptors along the southern coast of the island of Ofu at the west end of the Ofu Airport runway where the feature would be constructed.

In terms of an effects analysis for aquatic, water-dependent, and EFH habitats, there are no riparian areas, streams (including pool and riffle complexes), wetlands, mudflats, seagrass beds, mangroves, estuarine, surge zone, deep-slope terraces and pelagic/open ocean that would be affected by proposed Project activities as these habitat types are either non-existent in the area, very limited in extent within the Ofu lagoon, or are far removed from the area that would be most influenced by project activities. These habitats are not considered further in this analysis. However, impacts to the intertidal zone (between high and low tide mark) and shallow-water habitats could occur, specifically to coral reefs, hard substrate, and soft substrate (in the form of littoral zone vegetation and sandy beach), as wells as associated wildlife found within these habitats.

Revetments, seawalls, and bulkheads are types of coastal engineering structures commonly used as shoreline stabilization structures constructed to run parallel to the shoreline. All types of coastal shore protection structures are intended to improve stability by reducing the rate of change in a dynamic coastal system. Also known as “armoring” or “hard structures,” they provide a physical barrier that directly protects inland areas, development, and infrastructure from waves and storm surge. Revetments and seawalls and provide storm damage protection and erosion control from waves, tides, currents, and storm surge (water build up above the average tide level). They can be used in both exposed areas with high wave energy, as well as in areas with more sheltered conditions with relatively low wave energy.

All types of artificial shoreline protection structures can have adverse effects on the coastal environment. Seawalls, in particular, often interfere with natural processes such as causing the reduction of intertidal habitats. However, these effects depend very much on the main wave and sediment transport direction and the design of the structure. The choice of coastal protection measure must be made according to site-specific conditions and primary and secondary goals (such as wave protection, road stabilization, and space conservation). Where sufficient space is available and no conflict with other primary or secondary goals exists, green measures (such as beach nourishments and dune restoration) are often preferred.

The potential environmental impacts for most types of coastal shore protection structures tend to be similar, but there are environmental advantages and disadvantages of each. The environmental impacts may be short-term during construction operations or long-term because of the presence of the structures. Once a structure has been built along a shoreline (and if designed properly), the land behind it should no longer be vulnerable to erosion. However, the wave energy now shifts to the adjoining areas of the coast that are not protected. This can have mixed environmental impacts. The reduction in sedimentation due to decreased erosion may be viewed as a positive effect in many cases. Erosion that is shifted to other areas may result in a negative impact in those locations. Some vertical structures (such as bulkheads) may cause increased wave reflection and turbulence with a subsequent loss of fronting beach. This is usually viewed as a negative impact. In all cases, the overall situation and the various impacts that result must be evaluated carefully to identify potential changes in local hydrologic processes along the shoreline.

Revetments

A revetment is a sloping structure with a facing of erosion resistant material, typically composed of rock (also called “rip rap”) or other materials that, dissipates the energy of storm waves and prevent further recession of the backshore. The major components of a revetment are the armor layer, filter, and toe (see Figure 3). The armor layer provides the basic protection against wave action, while the filter layer supports the armor, provides for the passage of water through the structure, and prevents the underlying soil from being washed through the armor. Toe protection prevents displacement of the seaward edge of the revetment. Revetments can be constructed as carefully designed engineered structures protecting long lengths of shoreline or as roughly placed rip-rap protecting short sections that have been severely eroded.

Permeable revetments can also be built from gabions, tribar, timber or concrete armor units. The function of permeable revetments is to reduce the erosive power of the waves by means of wave energy dissipation in the interstices of the revetment. Concrete may be appropriate where high value infrastructure must be protected and armor rock is difficult to obtain. Concrete is often considered to be more unattractive than rock. In this case of Alternative 2, a single layer of concrete (tribar armor) will be built on top a stone underlayer.

Revetments may not prevent on going shoreline recession unless they are properly maintained, and, if necessary, extended. If the foreshore continues to erode, the rock revetment may slump down, becoming less effective as a defense structure, but will not fail completely. Repairs and extensions may be necessary to provide continued backshore protection at the design standard.

Indirect Effects on Habitats and Species

All types of shoreline stabilization structures (i.e., revetments, seawalls, and bulkheads) can help protect landward property and infrastructure from waves and tides, but they do not stop (and may exacerbate) erosion. As natural erosive forces continue to remove sediment over time, beaches in front of the hard structures are diminished and can eventually be completely lost over time. Seawalls and revetments themselves can also exacerbate erosion problems by reflecting waves onto the beach in front of them or onto neighboring properties. As these sources of erosion continue, more of the hard structure is exposed, causing more wave reflection and erosion. Therefore, over time, sandy beach in front of the structure may be lost over time. In the case of the proposed Project, the loss or degradation of nesting habitat for hawksbill and green sea turtles is the priority concern. It must be stated that natural coastal erosion is expected to continue in the absence of this Project, exacerbated by climate change and sea level rise and loss of turtle nesting beach is expected to continue over time in the absence of any project being built. It is difficult to decouple the effects, but the proposed Project could exacerbate beach sand loss and compensatory mitigation may be required.

Compared to most other alternatives considered in this Study that involved improvements to shoreline stabilization, implementation of Alternative 2 was determined to be the least costly and would result in minimal adverse effects on coastal resources. However, the USACE recognizes that shoreline protection management strategies involving hard engineering techniques are disruptive to ecological processes and could result in adverse effects to marine habitats in the form sandy beach loss and accelerated erosion.

Soft engineering strategies (i.e., natural and nature-based measures) such as vegetation barriers and use of beach fill were considered as potential solutions early in the planning phase of the Study. However, investigations determined these solutions would not be effective in reducing the effects of coastal storm damages in the proposed Action Area.

Beach fill consists of introducing locally sourced or imported beach sand material to engineer and build up the existing beach to dissipate wave energy. This measure would require periodic beach renourishment to mitigate ongoing erosion and other natural processes. Due to the level of storm surge and wave heights in the study area, beach fill as a stand-alone measure, is considered inadequate and would be considered a temporary fix. Beach fill has the potential to be effective in combination with other structural measures. However, local availability of suitable beach fill material is limited, so this measure would be extremely costly to import and maintain. More importantly, beach renourishment is not covered under the Section 14 authority, therefore, regular renourishment to maintain the effectiveness of the structure would be a non-Federal responsibility. For these reasons, beach fill was screened from further consideration.

Due to the high wave energy environment in the project area, vegetation alone would not provide adequate protection to Ofu Airport over the 50-year period of analysis. This measure was not carried forward as a standalone alternative but will be considered in conjunction with other hardened shoreline protection measures.

Revetments Advantages

- Revetments are generally considered to cause less damage to the environment than other type of structures, like seawalls, because they are less prone to wave flanking and limit interference with natural sediment processes, thereby maintaining coastal stability while still allowing some natural coastal processes to occur. Natural shoreline erosion supplies adjacent stretches of coastline with sediment, through a process known as longshore drift. Once a structure like a seawall is constructed, however, the shoreline is protected from erosion and the supply of sediment is halted. Although seawalls prevent erosion of protected shorelines, where the seawall ends, the coast remains free to respond to natural conditions. This causes sediment starvation at sites located alongshore, in the direction of longshore drift and this has the capacity to induce erosion at these sites (French 2001). This flanking effect can cause undermining and instability of the wall in extreme cases.

- Sloping revetments are more effective at dissipating wave energy and less subject to significant loadings as a result of wave impact. Smooth, vertical seawalls are the least effective at dissipating wave energy; instead, the structures reflect wave energy seawards. Reflection creates turbulence, capable of suspending sediments (Bush et al. 2004), thus making them more susceptible to erosion. These loadings increase with water depth in front of the structure because this enables larger waves close to the shoreline. Seawalls are designed to dissipate or reflect incoming wave energy and as such, must be designed to remain stable under extreme wave loadings. The effects of SLR, increased wave heights and increased storminess caused by climate change must all be considered. These issues are less of a concern with revetments. In a worst-case scenario, reflected energy can interact with incoming waves to set up a standing wave which causes intense scouring of the shoreline (French 2001). The problems of wave reflection and scour can be reduced to some degree by incorporating slopes and irregular surfaces into the structure design. Slopes encourage wave breaking and therefore energy dissipation while irregular surfaces scatter the direction of wave reflection (French 2001). Pilarczyk (1990) recommends the use of maximum seawall slopes of 1:3 to minimize scour due to wave reflection. Many seawalls have therefore been more recently conceived to integrate slopes.
- Scour at the foot of a revetment is less of concern than at the base of seawall, a particular problem with vertical seawall designs. Incoming waves impact the structure, causing water to shoot upwards. When the water falls back down, the force on the seabed causes a scour hole to develop in front of the structure. This can cause structural instability and is an important factor leading to the failure of many seawalls. As a result, seawall maintenance costs can be high (Pilarczyk 1990). A similar process occurs on inclined seawalls but in this case, scour will occur away from the foot of the structure.
- Revetments are less susceptible to erosive forces that occur in front of the structure. Seawalls, while effective at preventing erosion of the land area behind the wall, often do not stop erosion in front of the structure which affects localized sediment availability. The problem is caused by replacing soft, erodible shorelines with hard, non-erodible ones. While this protects the valuable property on the landward side, it causes problems in terms of sediment starvation; erosion in front of the seawall will continue at historic or faster rates but the sediment is not replaced through the erosion of the hinterland (French 2001). This can cause beach lowering, which reduces beach amenity value and increases wave loadings on the seawall by allowing larger waves close to the shore.
- Because seawalls are immovable structures, they can also interfere with natural processes such as habitat migration which is naturally induced by sea level change. Seawalls obstruct the natural inland migration of coastal systems in response to SLR, therefore causing coastal squeeze. This process causes a reduction in the area of intertidal habitats such as sandy beaches and saltmarshes because these environments are trapped between a rising sea level and unmoving, hard structures.
- Another potential problem with vertical structures is overtopping. This occurs when water levels exceed the height of the seawall, resulting in water flow into areas behind the structure. Overtopping is not a continuous process but usually occurs when individual high waves attack the seawall, causing a temporary increase in water level which exceeds the structure height (Goda 2000). If the structure is too low, excessive overtopping can remove considerable amounts of soil or sand from behind the wall, thus

weakening it. Further, overtopping water saturates and weakens the soil, increasing pressures from the landward side, which can cause the foot of the structure to ‘kick out’ and collapse (Dean & Dalrymple 2002). Overtopping will become increasingly problematic with SLR, increased wave heights, and increased storminess. When seawalls are regularly overtopped, or when this occurs in major storms, the water can remove soil or sand behind the wall and weaken it. Overtopping water saturates the soil and increases pressures from the landward side, which can cause structural collapse. Sea rise level and potential overtopping must be taken into account in the construction of the seawall. In general, continued erosion can undermine the foot of the structure and threaten its stability.

- Seawalls can also reduce the attractiveness of the landscape. Revetments are more conducive to the incorporation of soft engineering approaches, such as incorporating the use of vegetation, to maintain the natural coastal appearance.

Revetments Disadvantages

- Revetements tend to provide a slightly lower degree of protection against coastal flooding and erosion compared to a structure like a seawall. A well maintained and appropriately designed seawall will “fix” the boundary between the sea and land to ensure no further erosion will occur – this is beneficial if the goal is to protect important infrastructure (like an airport runway).
- Revetments tend to higher space requirement than other coastal structures. Seawalls, especially if vertical seawall designs are selected, have a much lower space requirement than other coastal structures. In many areas, land in the coastal zone is highly sought-after; by reducing the space requirements for coastal shoreline protection, the overall costs of construction may fall. The increased security provided by seawall construction also maintains real estate values and may promote investment and development of the area (Nicholls et al. 2007).
- Based on the nature of their design, revetments tend to slope into the intertidal zone and impact sensitive intertidal habitat receptors mor readily than a vertical seawall.
- Seawalls tend to provide enhanced coastal flood protection against extreme water levels. Provided they are appropriately designed to withstand the additional forces, seawalls will provide protection against water levels up to the seawall design height. When considering adaptation to climate change, another advantage of seawalls is that it is possible to progressively upgrade these structures by increasing the structure height in response to sea level rise. It is important however, that seawall upgrade does not compromise the integrity of the structure. Upgrading the seawall will leave a ‘construction joint’ between the new section and the pre-existing seawall. Upgrades need to account for this weakened section and reinforce it appropriately. Provided they are adequately maintained, seawalls are potentially long-lived structures.
- If appropriately designed, seawalls have a high amenity value – in many countries, seawalls encourage recreation and tourism.

Sediment Transport, Water Volume, and Flow Frequency

Flows on coral reefs are forced by waves, tides, and winds (Monismith 2007). Two distinct cross-reef dynamical regimes on coral reefs exist to classify them as open and closed. Open reefs are characterized by a cross-reef pressure-friction balance, and experience strong cross-reef flows. Closed reefs are characterized by a cross-reef pressure-radiation stress balance, and while cross-reef flows are reduced, along-reef flows are potentially increased. The distinction is useful as the responses to changes in forcing by waves and tides differ between the two regimes.

Although a detailed budget of sediment movement and current velocities for the southern coast of Ofu at Papaloloa Point is not available, the currents along this shoreline tend to run parallel to the shore from east to west. Any type of shore armoring/stabilization structure could potentially cause the beach in front of the proposed revetment to lose sand and reduce the area of beach. Any structure built to stabilize the shoreline here should be constructed as to minimize the loss of sand/sediment that is deposited by natural processes to reduce the area of beach that is used by nesting sea turtles. This effect is noticeable at the east end of the runaway where shoreline armoring (rock revetment) was placed in the 1980s. The sandy beach fronting this structure is much reduced and natural beach rocks are exposed.

Quantitative shoreline sediment movement and nearshore current modeling activities were not conducted for the study. These processes are not expected to significantly increase spatially or temporarily with implementation of the proposed recommended alternative. Lindhart et al (2021) recently conducted coral reef hydrodynamic studies on Ofu. The Ofu reef is a shallow (0 − 2m depth), fringing reef with small pools and narrow channels connecting the pools to the open ocean. Tidally, the reef at Ofu essentially transitions between open and closed behavior. Although based on its geometry, the Ofu reef could be closed, hydraulically, it behaves like and open reef on low tides and like a closed reef on high tides.

Contrary to classic reef hydrodynamic models, the cross-reef flow on Ofu shows no correlation with wave heights. Flow reversal (offshore) occurs at all but the largest wave heights. Cross-reef flow correlates inversely with the depth. At low tide, the flow is directed cross-reef and reverses on high tide. This correlates clearly with the depth on the flat. On low tide, whereas with increasing water depth, the flow deflects towards the channel (north-east). While neither the cross-reef nor the along-reef velocities seem correlated with the wave height, the magnitude of the flow does correlate with it. Based on these observations, it seems the magnitude of the flow on the flat is determined by the wave height, but the direction is determined by the tide.

In general, increasing offshore wave heights increases the flow out of the channel, to a limit. This is not the case for the cross-reef flow, which seems to decrease for larger wave heights. This is interpreted because of the reef being closed. As the reef becomes more closed (and more beach-like), the wave-setup relative to the pool setup decreases as does the onshore pressure gradient, which ultimately reverses.

Effects on Turbidity and Water Quality

Localized and short term (temporary) impacts in the form of temporary water quality degradation (i.e., increased sedimentation and water column turbidity) from excavation and equipment side-casting may occur, mainly during the pre-construction and construction phases of the proposed Project, but these impacts are considered such as to be less than significant to negatively affect the water quality of the nearshore area.

Periodic vegetation management or other O&M activities would yield temporary discharges of biomass stockpiles to potentially affect nearshore waters within the intertidal area. All temporary stockpiles would be removed to an appropriate facility for disposal. Periodic structural repairs would result in discharges of concrete, rocks, and in situ riverine substrate as characterized under construction. However, the scale would be substantially smaller because repairs would be limited to specific areas of the revetment where damages have occurred. As described for construction, there would be no changes to the in-situ substrate that would affect functions and services of coral reefs.

In accordance with ER 1110-2-8153, the proposed recommended plan was reviewed in consideration of impacts due to sedimentation. The proposed recommended plan includes a tribar revetment that will protect the shoreline. This will, therefore, decrease that amount of water impacting Runway 8/26 during frequent storm events. By reducing erosions in this area, the proposed recommended plan could potentially decrease pollutant and sediment loading to the lagoon. Given this, the USACE considered there is a low probability that sediment deposition will occur over sensitive and hard-to-replace habitats, like coral reefs.

Best Management Practices for Water Quality

No construction machinery will be placed, stored, or otherwise located in the intertidal zone at the Lagoon at any time and construction equipment will not need to be washed on or near the intertidal zone. However, temporary effects from increased erosion or sedimentation may occur because of the pre-construction and early phase construction activities that could affect temporarily affect water quality in near shore areas in the form of increased turbidity.

To this end, the contractor for the proposed Project would be required to prepare an Stormwater Pollution Prevention Plan (SWPPP) that will assure that: (a) the contractor will not store any construction materials or waste where it will be or could potentially be subject to erosion and dispersion to the intertidal zone: (b) where practicable, the contractor will use biodegradable (e.g., vegetable oil-based) lubricants and hydraulic fluids, and/or electric or natural gas powered equipment; and (c) immediately upon completion of construction and/or when the staging site is no longer needed, the site shall be returned to its pre-construction state. This SWPPP would be informed by principles and best management practices in the American Samoa Erosion and Sediment Control (ESC) Field Guide ver. 2.0 (Horsley Witten Group, Inc. 2019). The implementation of the practices in this guide are necessary to ensure compliance with the Territorial Environmental Quality Act, Title 24 Water Quality Standards, Pollution Control (A.S.A.C. § 24.0208). Under these regulations, the American Samoa Environmental protection Agency (ASEPA) is required to “prevent negative impacts to receiving waters and ground waters as a result of disruption in natural drainage patterns caused by development.”.

If there is any indication that turbidity or sedimentation rates substantially change during and after certain project activities, adaptive management approaches would be implemented, and a plan be developed. Adaptive Management is a systematic approach for improving resource management by learning from post-project monitoring outcomes (40 CFR 1508.1(s)). Adaptive Management focuses on learning and adapting to create and maintain sustainable resource systems.

The purpose of the proposed Adaptive Management Program is to the provide flexibility over the 50-year life of the Project to modify/adjust future renourishment events in terms of timing, location, volume, construction methods and other elements of the Project if post-construction monitoring data indicates that Project-related impacts are substantially different (e.g., greater, or lesser) that those predicted by the Integrated Feasibility Report.

The key steps in the Adaptive Management process are the following: (1) Design; (2) Implement; (3) Monitor; (4) Evaluate; (5) Assess; and (6) Adjust. For the recommended project, potential scenarios that could trigger an Adaptive Management action include impacts larger than expected, higher erosion in the project area, climate change and sea level rise beyond maximum predicted levels. Should the need for an Adaptive Management action be determined based on subsequent information, it would be implemented accordingly so that any adjustment could be made.

The USACE will continue coordination and informal consultation with USFWS, NMFS, and the DMWR on the above-listed environmental/biological resources. Best Management Practices (BMPs) and environmental commitments would be implemented, and environmental/biological monitoring would occur during construction to avoid and reduce (minimize) impacts to species and EFH.

Cultural Resources:

The USACE completed Section 106 consultation with a finding of “no historic properties affected” based on the conclusion that archaeological, cultural, or historical resources are unlikely within the project area based on setting and past disturbance (ATtachmnet 8 to Appendix A-3). The American Samoa Historic Preservation Office (ASHPO) agreed with the finding, with the condition that any excavations over six (6) inches below ground surface be monitored by a qualified archaeologist. If conditions warrant, archaeological monitoring would be included in the construction specifications and drawings demarcating where archaeological monitors (hired under contract) are to be used.

CONSISTENCY WITH PROVISIONS OF THE AMERICAN SAMOA COASTAL MANAGEMENT ACT

Resource Agency Coordination and Regulatory Compliance

See Section 6 of the IFREA as well as Section 3 of Appendix A-3 for information on agency coordination and regulatory compliance.

Previous Coastal Commission Determination(s)

None previously submitted. This CD is consistent with the requirements of the American Samoa Coastal Management Act to the maximum extent practicable. The USACE finds that the proposed project is consistent with the general policies of the ASCMP and consistent with the coastal zone values and the basic goals of the ASCMP.

SIMILAR PROJECTS THAT RECEIVED AMERICAN SAMOA COASTAL MANAGMENT COMMISSION APPROVAL

None determined at this time.

Attachment 8. NHPA Section 106 Consultation with the American Samoa Historic Preservation Office (ASHPO)

Contents:

8A - Correspondence from USACE to ASHPO

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

Civil and Public Works Branch
Programs and Project Management Division

Tuimalo Elvis P. Zodiacal
Executive Director and Historic Preservation Officer
American Samoa Historic Preservation Office
Executive Offices of the Governor
American Samoa Government
Pago Plaza Suites 210 and 218
Pago Pago, AS 96799

Dear Tuimalo Elvis Zodiacal:

The Honolulu District, U.S. Army Corps of Engineers (Corps) is investigating the feasibility of emergency shoreline protection measures along the shoreline at the western edge of the Ofu Airport runway on Ofu Island, Manu'a County, American Samoa pursuant to Section 14 of the 1946 Flood Control Act, as amended (33 USC 701r). The Corps proposes to construct protective measures along approximately 500 feet of the shoreline on the west side of the Va'oto Plain on the south side of Ofu Island. The shoreline protection project is considered an undertaking pursuant to 36 CFR 800.16(y), and the Corps is responsible for compliance with Section 106 of the National Historic Preservation Act (NHPA). This correspondence is to request comments on the Corps' delineation of the Area of Potential Effects (APE) for this undertaking, historic property identification efforts and to request concurrence with our determination of no historic properties affected for the shoreline protection project.

At this time the Corps is preparing a feasibility report and an Environmental Assessment for the project pursuant to the National Environmental Policy Act in addition to conducting a review in accordance with NHPA as described in 36 CFR § 800.3 through 800.6. The APE includes the shoreline construction location itself, and one or more staging areas for materials and equipment. Four locations are under consideration for staging including two locations at the existing wharf in Ofu Village, at a private home north of the west end of the runway, and on the north side of the western end of the Coconut Grove south of the airport runway. Access to the project area will be on existing roads and driveways. Quarried material would be obtained from an existing quarry on Ofu/Olosega or Tutuila. The construction area would have an area of 1.1 acres, and the staging areas would range from 0.3 acres to 0.5 for a total APE of about 2.5 acres. A diagram of the boundaries of the APE, including potential options for the staging area(s), is enclosed (Enclosure 1). The APE is provided on a USGS quad map, but also on a map using aerial imagery to show the correct relationship between the runway and the shoreline protection project.

8A (con't). – Correspondence from USACE to ASHPO

Construction of the shoreline protection will involve excavation as well as general construction activities. Four options for shoreline protection are being considered in addition to a no action alternative. The four construction options include a rock revetment, a tribar revetment, a concrete rubble masonry (CRM) wall, and a precast concrete seawall. The rock revetment would consist of a graded slope with compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a double layer of armor stone, and anchoring by an oversized toe stone. The tribar revetment would consist of engineered concrete tribar on a graded slope. The CRM wall would be keyed into hard substrate with a precast concrete base and have a triangular profile in cross section. The precast concrete seawall would use individual cantilever concrete panels placed on the limestone shelf. The area inland of either the CRM wall or the precast concrete seawall would be filled to the level of the airfield after the seawall was constructed. The four construction alternatives would all require some excavation along the bank and into the ground surface.

Historic property identification for the Ofu Shoreline Protection project has consisted of literature review primarily of recent academic research on Ofu and review of a draft monitoring report for the recent nearby runway repaving project on the airport. Four archaeological sites have been identified on the Va'oto Plain on the south side of Ofu Island. The Va'oto site (AS-13-13) is on the northeastern side of the plain near the Va'oto Lodge, opposite to the current project location and northeast of the runway. This site is deeply stratified and contains archaeological deposits that date to the initial colonization of the island through about 2,000 BP. Sites AS-13-11 and AS-13-12 were both located between the road and the runway in the vicinity of the wetland, just west of the Va'oto site. The Coconut Grove site (AS-13-37) is located south of the runway on the inland (north) side of a postulated beach ridge rising from a freshwater marsh toward the southern shoreline. This site also dates to between initial colonization and 2,000 BP. A shallow marsh that is used for cultivation lies inland from the Coconut Grove site between the road and the mountain slope. The geomorphology of this portion of the Va'oto Plain is poorly understood but excavations at the Coconut Grove site indicate that there may have been an extensive water body inland of the site through much of prehistory. A survey for road improvements on Ofu that extended from Ofu Village, past the runway and across the channel to Sili Village on Olosega identified the Va'oto site but did not identify any historic properties in the vicinity of the shoreline protection project (Best 1992). Recent archaeological monitoring for the runway repaving project, including a test excavation unit, found that the deposits in the vicinity of the runway were highly disturbed due to the construction of the runway in 1974. No historic properties have been identified in the runway project area. Enclosure 2 contains a more detailed discussion of archaeological research on Ofu Island and specifically within the APE for this undertaking.

8A (con't). – Correspondence from USACE to ASHPO

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Recent king tides on July 14, 2022, impacted the APE and undermined the western end of the runway. Photographs taken after the event (Enclosure 2 Appendix 1) exposed the grade beneath the runway and show the impacts to the shoreline. No artifacts or features are evident in the photographs. The photos also show heavy machinery that was used after the event to repair the damage to the airfield and to attempt protection of the western end of the runway within the shoreline protection project area. These photographs, along with those taken in January 2022 during the final phases of runway construction, illustrate that the APE is previously disturbed, making it unlikely that any historic properties are present.

In accordance with 36 CFR 800.3, the Corps is requesting your review and comments regarding our delineation of the APE for this undertaking. Based on the available information the Corps has determined that the above constitutes a reasonable and good faith effort pursuant to 36 CFR 800.4(b) to identify historic properties and has found that no historic properties will be affected by this undertaking (36 CFR 800.4(d)(1)). The Corps requests your concurrence with this finding.

If you have any specific questions or require clarification, please contact Dr. Julie Taomia, Los Angeles District Archeologist assisting with this project, at (213) 310-2177 or by email at Julie.Taomia@usace.army.mil.

Sincerely,

Rhiannon Kucharski

Rhiannon L. Kucharski, MPIA, WRCP
Chief, Civil and Public Works Branch

Enclosures

8A (con't). – Correspondence from USACE to ASHPO

Ofu Airport Emergency Shoreline Protection

Enclosure 1:

Area of Potential Effect (APE) Map

8A (con't). – Correspondence from USACE to ASHPO

Ofu Airport, Emergency Shoreline Protection Area of Potential Effects
Ofu Island, Manu'a, American Samoa

USGS Quad map. Note: Airport Runway is inaccurately located.

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Ofu Airport, Emergency Shoreline Protection Area of Potential Effects
Ofu Island, Manu'a, American Samoa

Aerial imagery. Note: Airport runway is in the correct location

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Ofu Coastal Storm Damage Reduction

Enclosure 2:

Section 106 Cultural Resources Study and Finding of No Historic Properties Affected for Ofu Airport Emergency Shore Protection, Ofu Island, Manu'a, American Samoa

November 17, 2022

8A (con't). – Correspondence from USACE to ASHPO

US Army Corps
of Engineers

Los Angeles District

Ofu Coastal Storm Damage Reduction

Ofu Island, Manu'a, American Samoa

Cultural Resources Report

Prepared by Julie Taomia, Archeologist
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8A (con't). – Correspondence from USACE to ASHPO

US Army Corps
of Engineers

Los Angeles District

Ofu Coastal Storm Damage Reduction

Ofu Island, Manu'a, American Samoa

Cultural Resources Report

Prepared for

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November 2022

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Abstract

The U.S. Army Corps of Engineers, Honolulu District (Corps) is considering the feasibility of emergency shoreline protection measures along the shoreline at the west end of the Ofu Airport runway on Ofu Island, Manuʻa, American Samoa. This report assesses the potential for the project to affect historic properties in accordance with Section 106 of the National Historic Preservation Act, as amended, under the process established in 36 CFR Part 800. The Corps is the federal agency responsible for Section 106 and NEPA review, and the American Samoa Government, represented by the Department of Port Administration (DPA) is the non-Federal sponsor for the project.

The feasibility study for the project is authorized under Section 14 of the Flood Control Act of 1946, as amended (33 USC 701r) for Emergency Shoreline Protection under the Continuing Authorities Program (CAP). A report documenting the plan formulation process to select a Tentatively Selected Plan (TSP) is in development.

The U.S. Territory of American Samoa is located in the mid-South Pacific Ocean, part of the Samoan Islands archipelago in Polynesia approximately 2,300 miles southwest of Hawaii. The island of Ofu is in the Manuʻa Island group of American Samoa, located about 66 miles east of Tutuila Island. The study area at the Ofu Airport is located on the southern coast of Ofu Island on a relatively flat area called the Vaʻoto Plain. The 18-acre public airport is operated by the DPA of the American Samoa Government on property leased from local families. The airport provides passenger, mail, supplies and medical transport for Ofu and Olosega Islands. The runway was recently rehabilitated and reconstructed in 2021-2022 in a project funded by the Federal Aviation Administration. The shoreline at the western end of the runway is subject to erosion by the ocean, and the Shoreline Protection Project will fortify the shoreline and protect the runway, thereby allowing continued use of the airfield. King tides in July 2022, shortly after completion of the rehabilitation and reconstruction project, undermined the western end of the runway apron and otherwise increased erosion along the western shoreline of the Vaʻoto Plain. The area of potential effects (APE) for the project is defined as the 500 foot long shoreline protection project area and four possible staging areas, two near the shoreline protection project area and two at the Ofu Wharf.

The purpose of this report is to assess the potential for historic properties in the APE and any effects of the project on any historic properties that are present. Background research was conducted for the APE that reviewed academic research in the vicinity of the APE and projects carried out to fulfill Section 106 requirements. In addition, photographs provided by the DPA that were taken in the vicinity of the shoreline protection project area between January and July, 2022, were used to assess the likelihood of historic properties in the APE.

No historic properties have been identified in the APE. The four possible staging area locations have all been used by previous projects and their use by this project will not affect any historic properties. The shoreline protection project area is immediately adjacent to the Ofu airfield, and archaeological monitoring of the recent runway rehabilitation and reconstruction project concluded that the runway area was extensively disturbed during the original construction in 1974. The photographs provided by DPA show that natural processes are affecting the shoreline protection project area, and that heavy machinery has been used to modify the area in which shoreline protection measures would be built. Therefore the conclusion is drawn that no historic properties will be affected by this undertaking.

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Introduction

The U.S. Army Corps of Engineers, Honolulu District (Corps) is considering the feasibility of emergency shoreline protection measures along the west end of the Ofu Airport runway on Ofu Island, Manu'a, American Samoa. The project location is along the west shoreline of the Va'oto Plain on the south side of Ofu Island, extending from approximately the curve in the road at the north extending south along the shoreline west of the airport runway to just west of the northwestern corner of the Coconut Grove south of the runway. The coastline is eroding and threatens the integrity of the runway. Recent king tides in July 2022 undermined the western end of the runway and deposited debris on top of it. The shoreline protection project will prevent future undermining of the runway.

Project Overview and Area of Potential Effects

The Shoreline Protection project is located on Ofu Island, Manu'a, west of the Ofu Airport Runway. An existing shoreline protection project that is located adjacent to the eastern end of the runway was also constructed by the Corps in 1986. The current project proposes to construct shoreline protection measures at the western side of the Va'oto Plain to ensure continued use of the runway for air service to Ofu Island (Figure 1).

Figure 1. Proposed Shoreline Protection Project location

A literature review was conducted between April and November 2022, largely relying on digital reports and publications. Julie M. Taomia, Ph.D., conducted the review and is the author of this report. Recent photographs of the shoreline protection area were also inspected for evidence of historic properties. The investigation is to support the Corps' Section 106 review of the shoreline

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protection project. The scope of work for the investigation included identifying any historic properties in the APE and assessing effects to any historic properties.

The area of potential effects (APE) includes the shoreline protection project area and staging area(s). Four locations are being considered for staging areas, one or more of these will be used by the project. Possible staging areas include two locations at the Ofu Wharf, a private residence on the north side of the island road across from the west end of the runway, and on the northwest end of Coconut Grove adjacent to the project area. The APE is depicted on a USGS topographic map in Figure 2, but aerial imagery is shown in Figure 3 for more accurate spatial representation of the runway location. Figures 4 and 5 provide more detailed views of the shoreline protection project area vicinity and the Ofu Wharf vicinity, respectively.

The shoreline protection project area extends for 500 feet northwest to southeast along the shoreline embankment west of the runway and 60 feet northeast to southwest from the shoreline bank into the ocean. All proposed staging areas were previously used as staging or lay down areas. Access to the project area and staging areas would be on existing roads, and for the Coconut Grove staging area through the project area. The total area of the APE, including all possible staging areas, is approximately 2.1 acres.

Four alternatives are being considered for the shoreline protection project. All would extend for the 500 foot length along the shoreline west of the airfield. Excavations would begin west of the airfield; at the southwestern corner this is a very narrow area. Besides a no action alternative, shoreline protection alternatives under consideration include a rock revetment, a tribar revetment, a concrete rubble masonry (CRM) wall, or a precast concrete seawall. The rock revetment would consist of a graded slope with compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, a double layer of armor stone, and anchoring by an oversized toe stone. The tribar revetment would consist of engineered concrete tribar on a graded slope. Both revetments would have a level area at the top of the bank and then extend at an angle outward toward the ocean along the slope and anchored in hard substrate. The CRM wall would be triangular in cross section and keyed into hard substrate with a precast concrete base. The area inland from the wall would be excavated to facilitate construction. The top of the CRM wall would match the elevation of the airfield, and the area between would be backfilled to the top of the wall. The precast concrete seawall would use individual cantilever concrete panels placed on the limestone shelf. The area inland of the seawall and west of the airfield would be excavated to facilitate construction, and then backfilled to the level of the airfield. The precast concrete seawall would extend one (1) foot minimum above the level of the airfield.

No historic properties were identified as a result of the literature review, and recent photographs of the shoreline protection project area show extensive recent construction activity within that portion of the APE. All proposed staging areas have been previously used as staging areas.

Environmental Setting

The project area is located on a coastal flat on the south side of Ofu Island, a high volcanic island. With Olosega Island Ofu makes up a volcano that dates to between 240,000 and 440,000 years ago. The current shape of the islands has been created by multiple flank failures and debris avalanches (Hart & Jackson 2014). A marsh that is used for taro cultivation is located on the north side of the airport runway against the talus slope. Soils in the project area

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include Urban land-Ngedebus complex, Aua very stony silty clay loam, and possibly some Ngedebus mucky sand (NRCS Web Soil Survey accessed October 31, 2022). The Aua very stony silty clay loam soils are located on the talus slopes against the base of the mountain. The Urban land-Ngedebus complex has a sandy matrix. The two proposed staging areas on the Va'oto Plain would be located on one or more of these soil types. Most of the construction footprint of the project area is located on existing beach, extending into the shoreline bank for a few feet within the limits created by the airfield. The Ofu Wharf portion of the APE falls mostly outside of the defined soils on the NRCS website but is most likely Urban land.

Limited archaeological excavations between the marsh and the Coconut Grove site, not reported in detail as of the date of this report, have indicated that a body of water may have been present inland of the Coconut Grove (Quintus 2015: 77). The coconut grove site is located in the vicinity of the most inland of two ancient beach ridges that are inland of the modern beach ridge. Traditional Polynesian settlement tended to be behind beach berms, and this pattern is seen also at To'aga, in Ofu Village, and on other islands throughout Samoa and Polynesia.

The project location is within the back shore and beach area west of the airfield. Vegetation includes herbaceous strand such as beach morning-glory vine, littoral grasses, beach pea, Polynesian arrowroot and several other plants. Several shrubs mix in with other littoral plants on the sandy beach (Whistler 1994). The top of the bank is managed for visibility for airplanes and following completion of the runway rehabilitation project no longer supports vegetation (see below).

Historical and Prehistoric Background

The Manu'a Islands, with the other Samoan islands, were initially settled by people travelling by canoe from the west. Radiocarbon dates indicate that people arrived on Ofu as early as the 8th century BC. Early settlement was in coastal areas, or areas close to the coast, with later expansion or movement inland (Quintus 2015). Archaeological research has shown that the coastal flat at the time of settlement was narrower than it is today and initial settlement in three locations on the island was against the talus slope, at Ofu Village, the Va'oto Site and To'aga (Quintus 2015; Clark & Quintus 2015; Kirch & Hunt 1993). Additional archaeological research has shown intensive agriculture and habitation in the interior of Ofu Island, and *tia seu lupe* (pigeon catching mounds, star mounds) (Quintas 2015; Quintas *et al.* 2016). *Tia seu lupe* are a late prehistoric development in Samoa related to chiefly competition (Herdrich & Clark 1993). Oral histories relay traditional history of the islands, based on which it is understood that Ofu was under the jurisdiction of the Tu'i Manu'a along with at least Olosega and Ta'u through the period covered by traditional histories. Some oral traditions from Ofu relate stories of warfare among the three islands, and especially between Ofu and Olosega (Klenck 2017).

Western contact began in 1722 when Dutch explorer Jacob Roggeveen traded with Samoans in Manu'a, followed in 1768 by Louis-Antoine de Bougainville and in the 19th century by other European and American explorers, Christian missionaries, and whaling ships. In 1839 Wilkes of the American Exploring Expedition was told by people on Olosega that there were few inhabitants on Ofu because there had been a battle with Olosega and most people on Ofu had been killed. However Wilkes did not attempt to land on Ofu or contact anyone there (Wilkes 1849: 69). At the time of Wilkes' visit in 1839 there was a missionary on Ta'u as well as a number of deserters from European ships.

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Figure 2. Overall area of potential effects located on USGS topographic map. Note that the runway is depicted as extending into the ocean and is also inaccurately located at the southern end of the shoreline protection project and south of the Coconut Grove staging area.

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Figure 3. Overall area of potential effects for Shoreline Protection Project on aerial imagery with more accurate airfield location. Relative locations of runway, shoreline protection project area and Coconut Grove staging area are accurate in this depiction.

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Figure 4. Detail of APE showing shoreline protection construction area and two potential staging area locations.

Figure 5. Detail of portion of APE consisting of potential staging areas at the Ofu Wharf

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An agreement among Germany, England and the United States divided the Samoan archipelago between Germany and the United States in 1900, but the Manu'a Islands did not sign a deed of cession with the United States until 1904. For the first half of the 20th century American Samoa was administered by the U.S. Navy with a Naval Commandant serving as Governor. Substantial defensive structures were built during World War II, and a military hospital was established on Tutuila. In 1951 administration of the Territory was transferred to the Department of Interior. The Department of Interior appointed Governors until 1976 when the first election for Governor was held in American Samoa. The traditional system of governance has been integrated with the government structure of the United States and most chiefly titles continue to be transmitted from one generation to the next. The one exception is the Tui Manu'a. Because the title was translated into English as the King of Manu'a, the United States insisted that the title not be passed on after Tui Manu'a Elisara in order to incorporate Manu'a into the US administered territory.

Site History

The Shoreline Protection project location is immediately adjacent to the west end of the Ofu Airport runway, which was originally built in 1974. The runway was rehabilitated and reconstructed in 2021-2022. Archaeological testing and monitoring for the runway project found disturbed deposits that resulted from bulldozer activity during the original runway construction (Peau 2022). The design plans for the runway rehabilitation project show that the shoreline bank at the western end of the runway is 10 feet high. The design plans show that the southwestern corner of the runway apron sits on top of the shoreline bank, while the northwestern corner is more than 35 feet from the bank. A temporary construction entrance was established for the runway rehabilitation project between the northwestern edge of the runway apron and the shoreline bank to connect with the road to Ofu Village. The northwestern 300 feet of the shoreline protection construction area is within the airfield safety zone; the remaining 200 feet extends to the southeast.

The Department of Port Administration (DPA) has provided photographs of the project area to the Corps that document the shoreline protection area over about six months in 2022. The photos show the project area during runway rehabilitation construction in January 2022, upon completion of runway construction in July 2022, on the morning of July 14, 2022, following the king tides that impacted American Samoa, and photos from later in July 2022 showing repairs to the damage done by the king tides. These photos are included in Appendix 1 and illustrate that the shoreline protection project area is a previously disturbed area. The photographs 1-2 from January 30, 2022, show the runway rehabilitation project and associated staging areas extending up to the edge of the shoreline bank. Photos 3-5 from July 13, 2022, show the finished airfield and the Coconut Grove staging area following construction. Cleared and leveled areas, both paved and unpaved, are shown extending to the edge of the shoreline bank. Photo 6 is a closeup of the western end of the runway apron on the morning of July 14, 2022, showing how the apron was undermined by the wave action. Photo 7 is a view to the southeast of the runway toward Coconut Grove on the morning of July 14, 2022 showing the impacts of the waves, and Photo 8 next to it is a comparison photo from approximately the same location on July 30, 2022 after repairs. Photo 9 shows the backhoe that was brought in to assist with repairs, located within the shoreline protection construction footprint moving rocks and excavating sand on July 27, 2022. Photo 10 is a view from the western runway apron looking southwest toward Coconut Grove on July 13, 2022, and photo 11 next to it shows approximately

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the same location on July 30, 2022 showing the repairs that were done including extension of the protective rock barrier and unpaved apron area. Photos 12 and 13 are two photos of approximately the same view taken on January 30, 2022 and July 30, 2022, respectively. Two rocks in the photo are the same and provide a perspective on rocks that were moved, both brought in and taken away, as well as the sand bench that was built adjacent to the protective rock barrier following the king tides. These photographs illustrate that extensive movement of earth and rock has taken place within the shoreline protection project area and that it is therefore unlikely that any subsurface archaeological deposits are present. None of the photographs show any artifacts or other indications of archaeological features within the project area.

Research Design

The purpose of this investigation is to determine if any historic properties are present within the APE and assess potential effects to any properties that are present in accordance with federal agency responsibility under Section 106 of the NHPA. This investigation will contribute information about settlement patterns in coastal areas of Ofu and add to the record of occupied areas and areas between that were not occupied in the past. The theoretical orientation of this study is largely based on settlement pattern concepts, the distribution of archaeological sites including habitation sites, agricultural sites, and other site types across the landscape. Geomorphology is also considered in assessing the characteristics of locations where lowland or coastal sites in American Samoa are found. Historical accounts indicate that there was traditionally space between villages. To western observers this area often appeared to not be occupied but was often filled with trees, many of them economically important such as breadfruit, coconuts and other cultivated or managed plants. Two archaeological sites have been identified in close proximity to each other on the Va'oto Plain, the Va'oto site and the Coconut Grove site. This study will test if more precontact habitation is located in this relatively small area. Contemporaneous habitation sites on the coast are also located at Ofu Village and To'aga, both about 2 kilometers from the Va'oto Plain. This study will test concepts of spatial distribution of habitation sites on Ofu Island. Based on the amount of archaeological research that has been conducted in the area a literature review was conducted to assess the likelihood of archaeological features and materials at the project location. There are limitations to not investigating the location in person, but the research strategy was augmented with documentation of recent activities at the project site which strengthens the strategy.

Methodology

A literature review of archaeological work on Ofu Island was conducted and combined with a review of documentation of recent activity at the project location. Significant archaeological work has been conducted in the vicinity of the project location within the last two decades that provides information about the locations of archaeological materials in the project vicinity. This strategy was chosen due to the challenges associated with travel to Ofu particularly in the context of the coronavirus pandemic that began in 2020, and in the interest of expediting the shoreline protection project to ensure continued use of the runway for travel to and from Ofu. Recent documentation of activities within the project area, geomorphological evidence for the location of archaeological sites and Samoan spatial models combined with recent archaeological documentation provide a robust assessment of the project area.

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Findings

A literature review was conducted to assess the potential for historic properties within the APE. Initial archaeological work on Ofu was part of Territory-wide surveys (Kikuchi 1963; Clark 1980) or surveys of Manu'a (Hunt and Kirch 1988). The APE consists of discontiguous areas consisting of the location of the shoreline protection project west of the airport runway and four possible staging area locations, two of which are more than 2 kilometers northwest of the primary construction area (Figure 2). The location of the shoreline protection project and adjacent proposed staging areas is on the Va'oto Plain on the southern extent of Ofu Island. Two proposed staging areas in this vicinity are east of the southeast end of the shoreline protection area (Coconut Grove staging area) and north-northeast of the northwestern end of the project area (private Figure 3). Two additional potential staging areas are at the Ofu Wharf (Figure 4). For ease of reference the first will be referred to below as the construction project area, and the latter as the Ofu Wharf area. Results of the literature review within 1 kilometer of each area will be presented separately below, as they do not overlap geographically.

Archaeological projects within one kilometer of the project area have included ongoing academic research programs that have produced multiple publications and presentations (Clark 2011, 2013; Klenck 2017; Quintus *et al.* 2016; Quintus 2015) and projects to meet federal agency responsibilities under Section 106 of the National Historic Preservation Act (NHPA) (Best 1992; Peau 2022.). Archaeological sites identified within one kilometer of the APE are depicted on Figure 6. The sites are represented as points which do not indicate the aerial extent of the sites; for instance, site number AS-13-03 applies to the entire Nu'utele Islet.

Eight archaeological sites have been identified within one kilometer of the construction project area. These include the Va'oto site (AS-13-13) on the eastern side of the Va'oto Plain and Coconut Grove (AS-13-37) site south of the runway. The Va'oto site contains up to six cultural layers and has produced radiocarbon dates as old as 2747-2120 cal BP and coral Uranium-Thorium (U-Th) dates between 2692 and 2323 cal BP (Clark *et al.* 2016). The deposits document some of the earliest habitation on Ofu and in Samoa and contain Polynesian plainware pottery as well as other artifacts and subsistence remains. The Coconut Grove site has also produced archaeological deposits of early habitation on Ofu Island, with radiocarbon dates ranging from 2717-2337 cal BP and U-Th dates between 2692 and 2640 cal BP (Clark *et al.* 2016). AS-13-12 is a raised area with loosely piled rocks along the edges between the road and the airport runway. No artifacts or coral were observed on the site, and the terrace was proposed as a possible agricultural site that may have extended to the wetland area (Best 1992). Site AS-13-11 is a rough semi-circle of volcanic rocks with coral pieces in the center about six feet in diameter between the road and the runway. The site was posited as a burial site but this has not been confirmed (Best 1992). AS-13-10 is a terrace on the inland side of the road just before the road enters the Va'oto Plain. The front bank of the terrace contains some stones which may be the remains of a facing damaged by roadwork or may have been incorporated into building up the terrace. Some small coral fragments were found on the surface of the terrace (Best 1992). Within inland Ofu Island Tufu (AS-13-42) and a star mound, used in prehistory for the chiefly sport of pigeon catching, are the remaining two sites within one kilometer of the construction project area. Tufu is inland of the southwest coast of Ofu and consists of ditch-and-parcel complexes, terraces, circular depressions, a ditched terrace, and an open central space; the features are located north and south of Tufu Stream. Radiocarbon dates from the site range from AD 1024-1795. Features at the site were most likely used for

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Figure 6. Archaeological sites within one kilometer of the Shoreline Protection Project Area of Potential Effects

cultivation and for habitation (Quintus 2015). Star mounds (*tia seu lupe*) are features of late Samoan prehistory (Herdrich & Clark 1993). In addition to these sites, a GIS based exercise conducted by Quintus identified an area east of the star mound where the slope ranged from 0-10 degrees that may indicate the presence of archaeological features (Quintus 2015: 168-169). This area has not been investigated archaeologically. These three areas – Tufu, the star mound

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and the area of relatively level land – are above the cliff to the north of the construction project area.

Two archaeological projects specifically focusing on the area within one kilometer of the Ofu Wharf area have produced reports. Klenk 2017 reported on a project funded by the ASHPO to document cultural resources on Nu'utele Islet (AS-13-03) off the coast of Ofu. The project identified 36 archaeological features and two legendary features. The archaeological features included platforms, a star mound, a pathway, burial or commemorative sites, grinding facets, an earth oven, and a lithic manufacturing site. No radiocarbon or coral dates were obtained by this project. Quintus conducted excavations in Ofu Village within 1 kilometer of the Ofu Wharf area in both the Alaufau and Ofu sections of the village (Quintus 2015). Radiocarbon dates from the deepest cultural layer in the Alaufau excavation unit returned calibrated ages of AD 1408-1452 and the top two layers contained historic era artifacts. Excavations near the talus slope in the Ofu section of Ofu Village in three excavation units produced radiocarbon dates that ranged from BC 781-511 to AD 895-1021 and as late as AD 1498-1796 and 1695-1919. Two additional excavation units seaward from the first three but inland of the main road produced radiocarbon dates of AD 1299-1413 and AD 1261-1387. The sediments in all of the excavation units showed evidence of progradation of the shoreline and deposition of increasing clayey deposits from the interior of the island. Quintus also identified terracing on the mountain slopes inland of Ofu Village that is within one kilometer of the project area. No radiocarbon dates are available for this area.

Conclusion

No archaeological surveys have been conducted within the construction project area and no historic properties have been identified within the APE. The survey along the road identified the Va'oto site on the eastern side of the plain but did not identify any archaeological sites in the vicinity of the shore protection project area on the western side of the Plain (Best 1992). The monitoring report for the 2021-2022 runway rehabilitation project concluded that the airfield was highly disturbed and monitoring ceased after two days and one shovel test unit, with no expectation that additional archaeological deposits would be found (Peau 2022).

The photographs provided by DPA (Appendix 1) illustrate the amount of modern construction activity that has taken place within the shoreline protection project area, as well as natural forces that have modified the shoreline. Even after the king tides there is no evidence of stratified deposits in the shoreline bank and no artifacts or other potentially archaeological materials are evident on the beach. The boulders depicted in the photographs do not exhibit grinding facets characteristic of *foaga* (adze sharpening features). Based on the photographs and the conclusions drawn during the runway rehabilitation project archaeological monitoring it is extremely unlikely that an archaeological site is present at the shoreline protection project location. The landscape of the location does not lend itself to archaeological sites, lacking the beach berms found at the Coconut Grove and To'aga sites. The beachrock evident in the photographs indicates that the shoreline is eroding. If archaeological deposits were present at the shoreline protection project site they should have been exposed by the erosion and especially by the activity of the king tide.

All four of the proposed staging areas have been previously used as staging areas. The two located at the wharf are most likely on artificial fill that was placed when the wharf was constructed and are used on a regular basis by activities related to the wharf and shipping. The

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runway rehabilitation project used these areas for staging and equipment and materials storage. The two staging areas on the Va'oto Plain have also previously been used, both for the runway rehabilitation project. One is located in the yard of a house on the north side of the island road, north of the west end of the runway. The second is located southeast of the shoreline protection project area adjacent to the Coconut Grove. The area used for staging for the Shoreline Protection project would be completely within the area previously used for staging area activities. None of these locations contain any historic properties.

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8A (con't). – Correspondence from USACE to ASHPO

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8A (con't). – Correspondence from USACE to ASHPO

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8A (con't). – Correspondence from USACE to ASHPO

Appendices

Appendix 1

Photographs of Ofu Runway and Shoreline Protection Project Area

Provided by Department of Port Administration, American Samoa Government

2022

8A (con't). – Correspondence from USACE to ASHPO

Photographs

January 30, 2022

Photo 1. View to the southeast, showing southeast corner of runway on top of shoreline bank. Coconut Grove staging area in the background.

Photo 2. View to the northwest. Silt fence and construction area to top of shoreline bank, batch plant and staging area in the background.

1

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July 13, 2022 Construction completed

Photo 3. View to the southeast, completed runway apron along top of shoreline bank. Coconut Grove staging area in background. Shoreline protection project area along bank on right of photo.

Photo 4. View to northwest, completed apron and adjacent leveled ground surface to top of shoreline bank. Yellow markers and gate are at road from Ofu Village to Asaga Straight and Olosega Island. Shoreline protection project area along bank on left of photo.

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8A (con't). – Correspondence from USACE to ASHPO

Photo 5. View to the southeast showing southern 200 feet of shoreline projection project footprint. Coconut Grove staging area in background to top of beach, runway apron and modified ground surface to top of bank.

July 14, 2022, following king tide

Photo 6. View to the northwest showing undermined runway apron.

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8A (con't). – Correspondence from USACE to ASHPO

Photo 7. View to the southeast showing effects of king tide in Coconut Grove staging area vicinity July 14 2022

Photo 8. View to the southeast after repairs in Coconut Grove staging area vicinity July 30, 2022

July 27, 2022, Repairs

Photo 9. View to the northeast showing heavy machinery working in shoreline protection project area, moving rocks and dirt to repair damage done by king tides and to protect airfield.

4

8A (con't). – Correspondence from USACE to ASHPO

Photo 10. July 13, 2022, view to the southeast.

Photo 11. July 30, 2022, view to the southeast following repairs, showing extension of rock barrier and unpaved apron.

Photo 12. January 30 2022 during construction, view to the northwest

Photo 13. July 30, 2022 after repairs following king tide, view to the northwest

The two bottom photos are at slightly different angles but the red rock in the foreground left of both is the same rock, and the black rock in the background with the left edge in the water is also the same rock. Other rocks were moved between photos, and a sand bench was created for added protection of the airfield.

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Attachment 8B. Letter of Concurrence from the American Samoa Historic Preservation Office.

Lemanu P. S. Mauga
Governor

Talauega E. V. Ale
Lieutenant Governor

Executive Offices of the Governor
American Samoa Historic Preservation Office
American Samoa Government
Pago Plaza Suites 210 and 218
Pago Pago, American Samoa 96799

Tuimalo E. P. Zodiacal
Executive Director and Historic Preservation Officer

Phone: (684) 633-2316

December 28, 2022

015-23HP

Rhiannon Kucharski, MPIA, WRCP
Chief, Civil and Public Works Branch
Programs and Project Management Division
Department of the Army
Honolulu District, U.S. Army Corps of Engineers
Fort Shafter, Hawaii 96858-5440

Re: Concurrence for proposed U.S. Army Corps' Ofu Coastal Storm Damage Reduction Project

Dear Chief Kucharski

Thank you for your letter via email by Dr. Julie Taomia, Archeologist, Environmental Resources Branch Planning Division, Los Angeles District, USACE on Wednesday, November 23, 2022 regarding USACE's proposed Ofu Coastal Storm Damage Reduction Project on Ofu Island, Manu'a, American Samoa. Based on my review of the undertaking, I have the following comments.

I concur with the determination of the Areas of Potential Effect (APE) for the above listed undertaking location.

I also concur with the determination of "No Historic Properties Affected" within the APE for this undertaking as defined at 36 CFR 800.4(d)(1) provided that *new ground disturbing activities of more than 6 inches will have archaeological monitoring.* In addition, if any historic properties are discovered during the shoreline protection project process, including site access and preparation, they will be treated as per 36 CFR 800.13 for Post Review Discoveries. Also, a report documenting the archaeological monitoring and any findings shall be provided to my office within a year of the end of the shoreline protection project activities.

Thank you for your time and attention. This correspondence was provided upon the request of the Department of the Army, Honolulu District, U.S. Army Corps of Engineers

Attachment 8B (con't). Letter of Concurrence from the American Samoa Historic Preservation Office.

Fort Shafter, Hawaii to assist with its Section 106 responsibilities under the National Historic Preservation Act of 1966, as amended.

If you have any questions concerning this correspondence, please contact me at (684) 633-2316.

Sincerely,

Tuimalo E. P. Zodiacal, MA, MS
Executive Director and Historic Preservation Officer

Cc: ASHPO Review and Compliance File

Attachment 9. Draft Finding of No Significant Impact (FONSI).

Draft Finding of No Significant Impact

FINDING OF NO SIGNIFICANT IMPACT
for the proposed
Ofu Airport, America Samoa CAP Emergency Shoreline Protection Project

Ofu Island, Ofu County, Manu'a District, Territory of American Samoa

The U.S. Army Corps of Engineers, Honolulu District (USACE) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The Environmental Assessment (EA) dated ___________ addresses the proposed project action (USACE Project) to alter the shoreline within the Va'oto Plain area on the southern coast of Ofu Island, Ofu County, Manu'a District, American Samoa to provide emergency shoreline protection measures for approximately 500 ft of shoreline at the western end of Ofu Airport Runway 8/26. The shoreline here is progressively eroding with the coastline receding further into the Runway Safety Area (RSA) of Runway 8/26; continual erosion will result in the imminent closure of the runway.

The EA, incorporated herein by reference, evaluated five (5) alternatives in detail, including the No Action Alternative, synonymous with no Federal action, and analyzed as the Future Without Project (FWOP) condition for comparison with the four (4) action alternatives, including the Proposed Action. The Proposed Action (Alternative 2) is the recommended plan and entails construction of an approximately 500 linear ft long and 33 ft wide revetment, constructed parallel to the shoreline and extending seaward at a specified slope of 1.5H:1V, to reduce the threat of coastal erosion to the threatened facilities at Ofu Airport. Construction of the revetment will require:

- o Excavation to hard substrate
- o Compacted fill for the foundation and base grade, a geotextile filter fabric, a double layer of 100-300 lbs. underlayer stone
- o Installation of a 1-ton concrete tribar single armor layer
- o Excavation to backfill to the existing surface elevation

- ▪ A crest elevation of 10 ft above MSL meets the USACE 50-year design requirement for sea level change (SLC) and is adaptable to 100-year SLC under the intermediate scenario at 9 ft above MSL.

- Interior drainage requirements, geotechnical, and structural design issues will be refined as the design is further developed.

- The recommended plan is both the Tentatively Selected Plan (TSP) and National Economic Development (NED) Plan.

- Verification of utility impacts, private property constraints, and any potential need for utilities to be relocated due to the construction.

Potential effects were evaluated for all alternatives proposed, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table S-1:

Table S-1: Summary of Potential Effects of the Recommended Plan

	Significant effect	Less than significant effects	No Effect	Beneficial Effect
Geomorphology, Hydrology, Hydraulics,	☐	☐	☒	☐
Terrestrial Habitats and Species	☐	☒	☐	☐
Aquatic Habitat and Species*	☐	☒	☐	☐
Threatened and Endangered species**	☐	☒	☐	☐
Cultural, Historic, and Archaeological Resources	☐	☐	☒	☐
Water Resources and Quality*	☐	☒	☐	☐
Air Quality	☐	☒	☐	☐
Public Health and Environmental Hazards	☐	☐	☐	☒
Noise and Vibration	☐	☒	☐	☐
Socioeconomics and Environmental Justice	☐	☐	☐	☒
Land Use, Utilities, and Public Services	☐	☐	☐	☒
Traffic and Circulation	☐	☒	☐	☐
Recreation	☐	☒	☐	☐
Aesthetics*	☐	☒	☐	☐

*Effect would cause no substantial adverse change in the environment as measured by the applicable significance criteria; however, standard best management practices have been incorporated that would avoid or reduce the environmental effects to less-than-significant levels.
** Effects cannot be reduced to a less-than-significant by standard best management practices. Compensatory mitigation may be required due to impacts on nesting sea turtles and loss of sandy beach habitat.

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan, which include best management practices (BMPs) as detailed in Chapter 4 in the EA.

The USACE published a public notice on _______ which remained open to _______ soliciting public input.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the USACE determined that the Proposed Action will not likely result in adverse effects to federally listed species or their designated critical habitat. Adverse effects can be reduced to less-than-significant levels through implementation of avoidance measures and best management practices (BMPs) as detailed in Chapter 4 in the EA.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined there would be no significant effects to historic properties from the recommended plan. The American Samoa Historic Preservation Office (ASHPO) agreed with the finding in a letter dated 28 December 2022. The USACE has fulfilled the requirements of the NHPA Section 106 requirements for the recommended plan.

Discharge of dredged or fill material would occur within waters of the United States. Therefore, a Clean Water Act Section 404 permit and a water quality certification pursuant to section 401 of the Clean Water Act were required from the American Samoa Environmental Protection Agency.

The USACE has determined that a general conformity determination is not required for the Proposed Action. The Proposed Action complies with the requirements of Section 176(c) of the Clean Air Act.

In accordance with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, the USACE has determined that Environmental Justice Communities would not be subject to disproportionately high and adverse human health or environmental effects because of the Proposed Action. Therefore, the Proposed Action complies with this Executive Order.

No wetlands are located within the proposed project area. Therefore, the Proposed Action complies with Executive Order 11990, Protection of Wetlands.

The Proposed Action would not modify the existing floodplain or flow conveyance capacity of any stream or waterway or change the 100-year floodplain. Therefore, the Proposed Action complies with Executive Order 11988, Floodplain Management.

All applicable laws, executive orders, regulations, and local government plans were considered in the evaluation of the Proposed Action. It is my determination that implementation of the Proposed Action would not cause significant adverse effects upon the quality of the human environment. Based on effects disclosed in the EA and the findings above, it is my decision to grant permission for the Proposed Action, with incorporation of the BMPs.

____
Date

____
Chief, Engineering Division
US Army Corps of Engineers
Honolulu District

OFU COASTAL STORM DAMAGE REDUCTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
OFU, AMERICAN SAMOA

DRAFT INTEGRATED FEASIBILITY STUDY AND
ENVIRONMENTAL ASSESSMENT

APPENDIX A-4
REAL ESTATE

A-4 **Draft Real Estate Report**

US Army Corps
of Engineers ®
Honolulu District

Appendix A-4

Draft Real Estate Plan

Ofu, American Samoa, Coastal Storm Damage Reduction Report
Continuing Authorities Program (CAP)
Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r)

January 2023

Prepared for:
U.S. Army Corps of Engineers, Honolulu District

Prepared by:

Tiffany Murray **Realty Specialist** **USACE Honolulu District**	**Date**

Reviewed by:

Erica Labeste **Chief, Real Estate Branch** **USACE Honolulu District**	**Date**

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Appendix A-4

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1 Executive Summary

The Ofu Coastal Storm Damage Reduction Integrated Feasibility Report and Environmental Assessment (Study) is authorized under Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r).

A Tentatively Selected Plan (TSP) was selected based on cost, ecological output, economic benefits, completeness, effectiveness, efficiency, and acceptability. The TSP includes constructing a tribar revetment of 500 linear feet totaling 0.4 acres. A 23-foot wide construction area and access route are planned alongside the project feature totaling 0.3 acres. Additionally, four staging areas totaling 1.3 acres are planned in close proximity to the project features. The staging area would be restored upon construction completion. Construction is anticipated for one (1) year.

The Real Estate Plan (REP) is generally prepared as an appendix to the Feasibility Report to support the acquisition requirements of the TSP. The REP presents the real estate requirements, proposes the acquisition strategy, develops a cost estimate for real estate acquisition, and incorporates an internal technical review.

The Non-Federal Sponsor (NFS) for the Study is the Government of American Samoa, as represented by the Department of Port Administration (DPA). The NFS is responsible for ensuring that it possesses the appropriate real estate interests for all real property required for the proposed project. The minimum estate required for the tribar revetment is a perpetual flood protection levee easement totaling 0.4 acres. The minimum estate required for staging, construction, and site access are temporary work area easements totaling 1.6 acres. The temporary work area easement is required for one (1) year during project construction.

The estimated real estate cost associated with the TSP is approximately $98,100, including all recommended lands, easements, rights-of-way, relocations, and disposals (LERRDs), administrative costs to be carried out by the NFS, and Government costs for LERRDs monitoring and certification. The NFS will be assessed on its capability to acquire and provide the LERRDs necessary for the proposed project.

2 Authority and Purpose

The Study is authorized under Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r). Funding was received in May 2022 to initiate the Study.

The U.S. Army Corps of Engineers (USACE), in partnership with the Government of American Samoa, is identifying and assessing coastal storm risk management alternatives. Section 14 authorizes USACE to partner with a non-federal sponsor to study, design, and construct emergency stream bank and shoreline protection for public facilities in imminent danger of failing due to bank failure caused by natural erosion and not by inadequate drainage, by the facility itself, or by operation of the facility.

This Study considers implementation of emergency shoreline protection measures along approximately 500 feet of shoreline along the western edge of the Ofu Airport runway. The purpose of the proposed project is to provide Ofu Airport with shore protection for the continued use of runway 8/26.

Past studies include the Reconnaissance Report on Shore Protection for the Ofu Airstrip (1985), Ofu Airstrip Shore Protection Project Operations and Maintenance Manual (2003), Hurricane Induced Stage-Frequency Relationships for the Territory of American Samoa, American Samoa Climate Related Vulnerability Assessment for Transportation Infrastructure (2020), Flood Hazard Study: Tafunafou (1977), Tafuna Plain Drainage Study: Tutuila (1994), and Hydrologic and Hydraulic Engineering Analyses (2016, 2019). The Reconnaissance Report on Shore Protection for the Ofu Airstrip established a federal interest in protecting the Ofu airstrip from coastal erosion occurring on the runway's east shoreline. Based on the study findings, a shoreline protection project was constructed on the east end of the runway in 1986. The Ofu Airstrip Shore Protection Project Operations and Maintenance Manual provided the local sponsor with information on project history, operation and maintenance (O&M) requirements, reporting requirements, emergency operation, and to document as-constructed conditions. The Hurricane Induced Stage-Frequency Relationships for the Territory of American Samoa determined the frequency of flood levels along the shoreline of American Samoa that is caused by the combined effects of astronomical tides and typhoon-induced high water levels. The American Samoa Climate Related Vulnerability Assessment for Transportation Infrastructure assessed the vulnerability of American Samoa's transportation assets to climate related hazards. The Flood Hazard Study evaluated the hydrologic and hydraulic characteristics of the streams and drainageways in the Tafuna area. The findings were adopted by the Federal Emergency Management Agency (FEMA) in May 1991 and used to develop the 1% (100-year) AEP floodplain for the Tafuna area. The Tafuna Plain Drainage Study identified the characteristics and flow paths of the major streams and drainage ways in the Tafuna plain. The information was used by FEMA for the Flood Insurance Rate Maps for Tafuna. The 2016 Hydrologic and Hydraulic Engineering Analysis presented the methodology used and the results of the floodplain management study of the Leaveave Drainageway and Drainageway 2 in Tutuila. The 2019 Hydrologic and Hydraulic Engineering Analysis presented the methodology used and the results of the floodplain management study of Drainageway 4, 5, and Unnamed Stream 15 in Tutuila.

It is assumed that an Environmental Assessment is the appropriate National Environmental Policy Act (NEPA) document for the final array of alternatives. Environmental analysis will comply with all environmental laws as applicable. The analysis is anticipated to be completed by relying on existing literature, remote sensing technologies, and data available from other agencies for use in GIS.

The NFS for the Study is the Government of American Samoa, as represented by the DPA. Section 14 studies have a federal participation limit of $5,000,000. In the Feasibility phase, the first $100,000 is 100% federally funded and the balance is cost-shared 50% federal to 50% non-federal. In the Design & Implementation phase, the cost share is 65% federal to 35% non-federal.

Generally, the Real Estate Plan (REP) is prepared by the USACE Honolulu District (District) as an appendix to the Feasibility Report. The REP presents the real estate requirements, proposes the acquisition strategy, develops a cost estimate for real estate acquisition, and incorporates an internal technical review. USACE Mapping reviews tract ownerships and acreages to prepare exhibits for the REP. USACE Appraisal prepares (or contracts for) and approves a cost estimate or gross appraisal, as needed for acquisitions. USACE Environmental provides applicable compliance memoranda and/or documentation in accordance with NEPA. HEPA, National Historic Preservation Act (NHPA), and USACE Hazardous, Toxic, and Radioactive Waste (HTRW) policy.

Project real estate requirements include a review of NFS-owned parcels as well as recommended lands, easements, rights-of-way, relocations, and disposals (LERRDs) to be carried out by the NFS. LERRDs are requirements that the U.S. Government has determined the NFS must meet for the construction, operation, and maintenance of the project. If LERRDs are required, USACE Real Estate coordinates with the NFS and provides the NFS with a partner packet outlining the NFS's responsibilities and notice informing the NFS of the risks of early acquisition.

The information contained herein is tentative for planning purposes only. Final real property acquisition acreages, limitations, and cost estimates are subject to change after approval of a final Feasibility Report, including plan modifications that occur during the Preconstruction Engineering and Design Phase (PED).

3 Project Description and Location

American Samoa is an unorganized, unincorporated territory of the United States. An unorganized territory is one for which the Organic Act, establishing a civil government, has not been enacted by the U.S. Congress. American Samoa is located in the mid-South Pacific Ocean, a part of the Samoan Islands archipelago in Polynesia. American Samoa consists of five main islands (Tutuila, Aunuu, Ofu, Olosega, and Tau) and two coral atolls (Swains Island and Rose Atoll). Tutuila is the largest and most populous island, with a 58 square-mile land area and approximately 56,000 residents.

The Study area is located on the southern coast of Ofu Island (Figure 2). The 18-acre public airport is operated by the Department of Port Administration (DPA) of the American Samoa Government on property leased from local families. The airport is intended to serve the aviation needs of Ofu and Olosega islands. See Figure 3-1, Study Area.

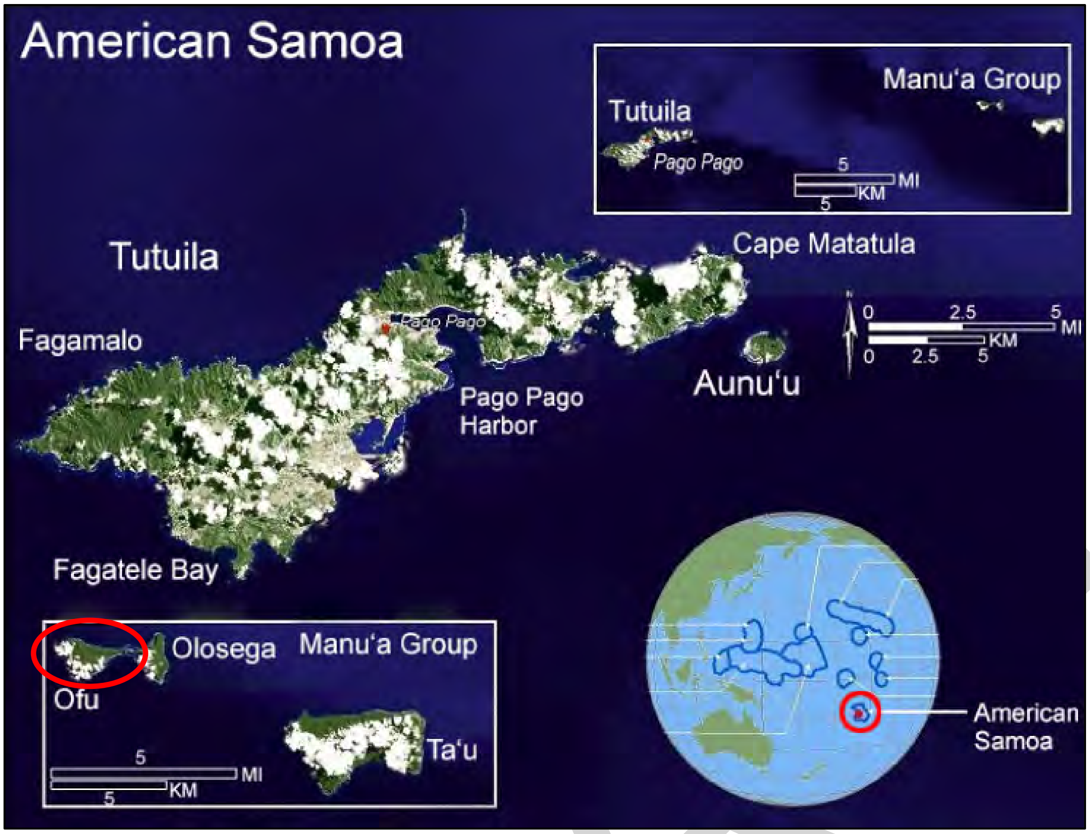

Figure 3-1. Study Area

Figure 3-2. Airport Location

According to past reports, the shoreline along the western end of the Ofu Airport is progressively eroding with the coastline receding further into the Runway Safety Area (RSA) of Runway 8. The RSA is mandated by FAA regulations to accommodate aircraft that may veer off the runway, as well as firefighting equipment. At Ofu Airport, the RSA is already non-standard due to the limited amount of real estate available. The RSA in theory should be 150 feet wide, centered on the runway, and extend 300 feet beyond each end of the runway. The RSA currently extends only 100 feet beyond the end of Runway 8. An exemption to the FAA design standards currently allows the airport to remain operational in its current state, however, continual erosion will result in the imminent closure of the runway.

To combat coastal erosion, a final array of structural alternative plans was formulated through combinations of screened management measures. Final Study alternatives included:

- Alternative 0: No Action
- Alternative 1: Rock Revetment
- Alternative 2: Tribar Revetment
- Alternative 3: Concrete Rubble Masonry (CRM) Wall
- Alternative 5: Precast Concrete Seawall

3.1 Tentatively Selected Plan: Tribar Revetment

Alternative 2: Tribar Revetment was selected as the Tentatively Selected Plan (TSP). Project features include:

1. Tribar Revetment: 500 linear feet, 33 feet wide (0.4 acres)
2. Construction Area/Access: 500 linear feet, 20 feet wide alongside project feature (0.3 acres)
3. Staging Areas: 1.3 acres
    a. COSA 1: 4,000 sf
    b. COSA 2: 22,000 sf
    c. COSA 3: 3,500 sf
    d. COSA 4: 29,000 sf

The revetment would consist of compacted fill as the foundation and base grade, a geotextile filter fabric, a double layer of underlayer stone, and a single layer of 1-ton concrete tribar. The stone sizing of the underlayer was determined to be 100-300 pounds. At the specified 1.5H:1V slope, the revetment is expected to be 33 feet wide, extending towards the ocean, with a crest elevation of +10 ft MSL.

Storage of material and equipment will be required, and staging areas have been identified. The staging areas would be restored upon construction completion. Construction is anticipated for one (1) year.

Minimal operations and maintenance requirements are expected for the alternative. Periodic inspection of all the features will be required and vegetation clearing and/or repairs may be completed as needed.

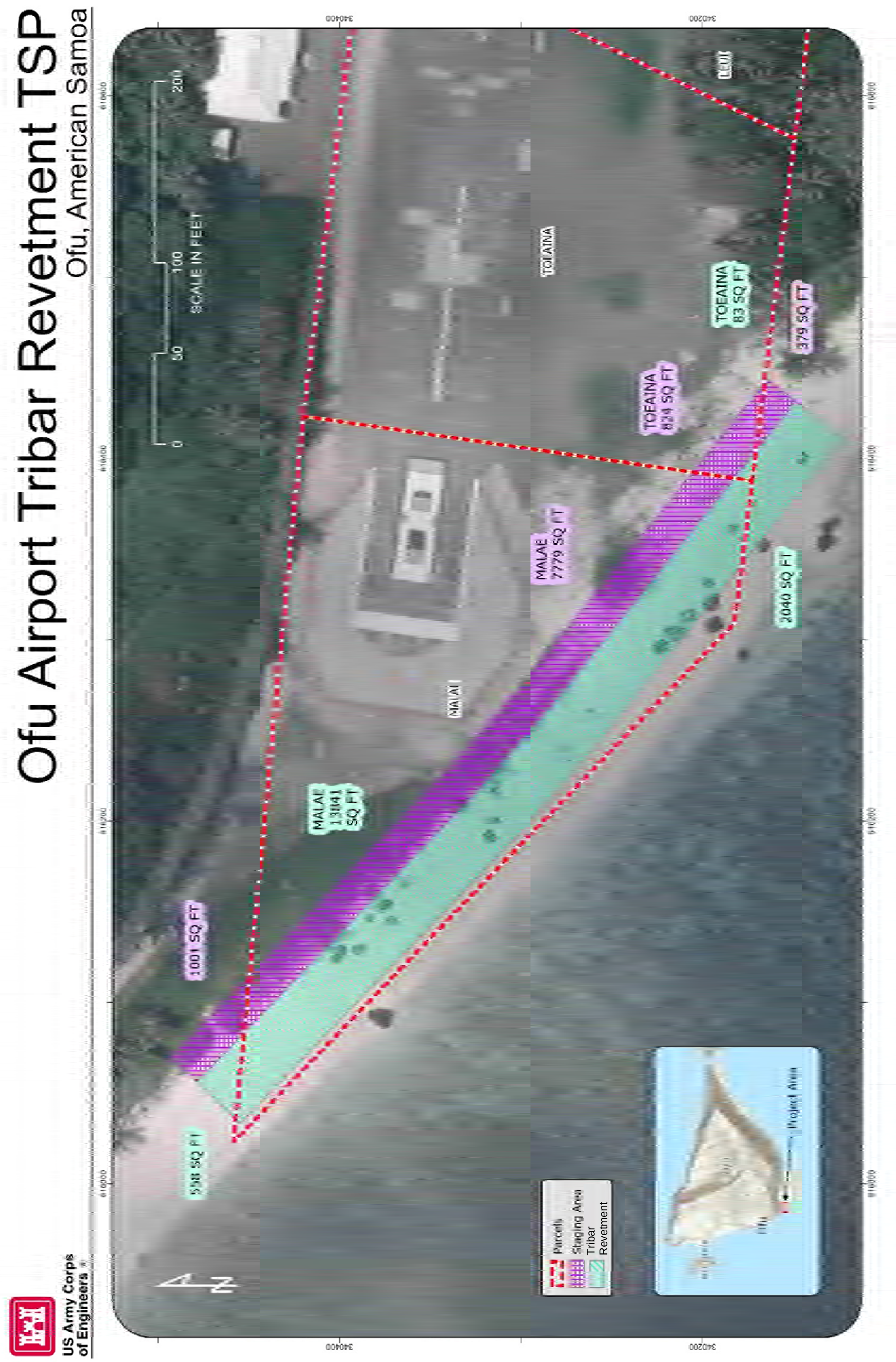

Figure 3-3. Project Feature Map 1

3.2 Structures in the Area

Structures and improvements in the Study area include the airport runway and associated public buildings. Project features are not anticipated to affect these structures.

3.3 Staging and Construction

Four Construction Staging Areas (COSAs) totaling 1.3 acres have been identified. Staging areas and site access must be established for the use and distribution of construction materials and equipment. The staging area generally contains contractor trailers, parking, fencing, and storage of equipment and materials. Casting & storing the panels would likely occur at the harbor COSAs 3 and 4. Fill/aggregate storage is anticipated to be contained at COSA 2 along the south side of the runway. Additionally, construction is planned within a 24-foot-wide corridor alongside the structural project feature.

Figure 3-4. Project Feature Map 2

Figure 3-5. Project Feature Map 3

3.4 Site Access

It is anticipated that personnel, equipment, and imported materials would access project construction along public roadways parallel to the airport. Access points identified within the public roadways can be used without additional perpetual real estate interests for operations and maintenance. Access points identified adjoining construction areas outside of the public roadway will be included in temporary work area easements as project features are refined.

Figure 3-6. Project Access Map

3.5 Ownership by Project Feature

Land ownership and zoning data is extremely limited in American Samoa and has been noted on the Risk Register as a significant real estate risk. Based on a recent March 2022 site visit, complete land ownership records do not exist in the project area.

As an unincorporated territory, the U.S. Department of the Interior has official oversight over American Samoa. American Samoa supports three land tenure forms: communal, freehold, and individual. The following information is summarized from a journal article, *Individual Land Tenure in American Samoa,* in The Contemporary Pacific (Spring 1999).

Communal

According to the American Samoa Government, approximately 90% of land in American Samoa is communal land. Communal land is an integral part of the social organization and is tied to both the kinship system and village organization. The cognatic descent group (‘âiga) are the “owners” of the land. Rights to land use come with membership in the descent group. Membership in the kin group is dependent on two factors: genealogy and service. Until membership is activated through service, rights (including land rights) in a kinship group are considered dormant.

The elected head of the descent group is the matai. A matai administers the family estates and ensures that land is used in the best interests of the ‘âiga. The Final Act of Berlin (Article IV, section 1) signed in 1889 by the United States, Germany, and Great Britain attempted to achieve political stability in the Samoan Islands by resolving land-claim disputes. The commission concluded that a chief’s authority or pule was limited. While it might be strong at the individual level, any sale of ‘âiga or family lands required the consent of the family members. Following the communal land tenure system, a registration system was initiated whereby every matai title was to be registered by 1906. The court assumed all title not registered as invalid. The court also rejected title splitting, whereby two or more titles may be created from a single title.

Freehold

A freehold system also exists in some parts of American Samoa. Freehold land is that granted by the International Claims Commission in Apia before the United States took possession of eastern Samoa. Freehold land may be freely sold or transferred. From the Final Act of Berlin, the International Land Commission and the Supreme Court were established to adjudicate land claims of foreigners in American Samoa. Fourteen percent of the land was awarded to foreigners as freehold land.

Individual

Most of American Samoa’s land is administered as communal land. However, 726 hectares (1,794 acres) are now registered as individually owned, which represents nearly one-quarter of all the land registered in the territory. Individually held land is concentrated in the Tafuna Plain. In 1945, the Supreme Court, for the first time, recognized personal ownership of land other than that of freehold land (*Tuimalu v. Samaile*). The court maintained that such individual property, rather than being returned to the ‘âiga, was inheritable by children of the claimant.

The following table summarizes the land areas and real estate interests by project feature. At this time, lot numbers, owners, and zoning information are unknown for project features.

Table 3-1. Real Estate Interest Required by Project Feature

Project Feature	Approximate Area (Acres)	Owner	Zoning/ Property Class	Interest Required
1. Tribar Revetment	0.01	Communal: Unknown	None	Flood protection levee easement (perpetual)
	0.32	Communal: Malae	None	

	0.01	Communal: Toeaina	None	
	0.05	Communal: Unknown	None	
2. Construction Area/Access	0.02	Communal: Unknown	None	Temporary work area easement (1 year)
	0.18	Communal: Malae	None	
	0.02	Communal: Toeaina	None	
	0.01	Communal: Unknown	None	
3. Staging Areas	0.09		None	Temporary work area easement (1 year)
	0.51		None	
	0.08		None	
	0.67		None	

Private ownership type (communal, freehold, individual).

4 Sponsor’s Real Estate Interests

Based on a review of American Samoa’s land tenure as well as jurisdictional water system, it is assumed that the NFS does not own any interests required for the permanent proposed project feature. Unlike States, the waters adjacent to coastal villages in American Samoa are typically considered to be under local village jurisdiction. Villages traditionally enforce many restrictions on access to and use of coastal resources, according to a journal article, *American Samoa’s Marine Protected Area System: Institutions, Governance, and Scale,* in the Journal of International Wildlife Law & Policy (October 2016).

5 Estates Required

The NFS will provide all LERRDs required for the construction, operation, and maintenance of the project. The NFS is instructed to acquire the minimum real estate interests necessary for the project. LERRDs required for the proposed project include:

5.1 Flood Protection Levee Easement

1. Tribar Revetment: 0.4 acres

The minimum estate required for the tribar revetment is a perpetual flood protection levee easement totaling approximately 0.4 acres.

<u>Flood Protection Levee Easement Standard Estate</u>

A perpetual and assignable right and easement in (the land described in Schedule A) (Tracts Nos, ____, ____ and ____) to construct, maintain, repair, operate, patrol, and replace a flood protection (levee) (floodwall)(gate closure) (sandbag closure), including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads, and pipelines.

5.2 Temporary Work Area Easement

2. Construction Area: 0.3 acres
3. Staging: 1.3 acres

The minimum estate required for construction and staging, including access, is a temporary work area easement totaling approximately 1.6 acres. The temporary work area easement is estimated to be required for one (1) year during project construction.

Temporary Work Area Easement Standard Estate
A temporary easement and right of way in, on, over and across (the land described in Schedule A) (Tracts Nos. _____, _____ and _____), for a period not to exceed ___________________, beginning with date of possession the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a (borrow area) (work area), including the right to (borrow and/or deposit fill, spoil and waste material thereon) (move, store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the Project, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right of way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

6 Federal Projects/Ownership

There are no current proposed project features with prior Federal project credit. Additionally, there are no Federally owned lands within the LERRDs required for the proposed project. Any interest in land provided as an item of local cooperation for a previous Federal project is not eligible for credit. Although a prior Federal shoreline protection project was constructed in 1986 following the Reconnaissance Report on Shore Protection for the Ofu Airstrip, it was constructed on the east end of the runway, outside of the proposed project features.

7 Navigation Servitude

As the Study proposes land features along the shoreline of American Samoa, navigation servitude is not applicable to this Study. The navigation servitude is the dominant right of the Government under the Commerce Clause of the U.S. Constitution (U.S. CONST. art.I, §8,cl.3) to use, control, and regulate the navigable waters of the United States and the submerged lands thereunder for various commerce-related purposes including navigation and flood control. In tidal areas, the servitude extends to all lands below the mean high-water mark. In non-tidal areas, the servitude extends to all lands within the bed and banks of a navigable stream that lie below the ordinary high-water mark.

Generally, it is the policy of the USACE to utilize the navigation servitude in all available situations, whether or not the project is cost-shared or fully Federally funded. Lands over which the navigation servitude is exercised are not to be acquired nor eligible for credit for a Federal navigation or flood control project or another project to which a navigation nexus can be shown.

8 Maps

Maps are intended as a preliminary tool to illustrate the Study area, LERRDs to be acquired, and lands within the navigation servitude. Detailed maps will be provided prior to the Notice to Acquire (NTA) notification to the NFS. For the Study location and Study area, refer to Figures 3-1 and 3-2. For LERRDs requirements, refer to Figures 3-3 to 3-6.

9 Induced Flooding

It is not anticipated that the proposed project would cause any induced flooding.

10 Baseline Cost Estimate for Real Estate

The baseline cost estimate for all project LERRDs is estimated at $98,100, which includes required interests, relocation assistance, incremental real estate contingency, and incidental acquisition costs for both the NFS and Government.

Table 10-1. Baseline Cost Estimate for Real Estate

Real Estate Requirement	Size (Acres)	Cost Estimate
Flood Protection Levee Easements	0.4 acres	$51,100
Temporary Work Area Easements	1.6 acres	$17,000
Improvements		$0
Hazard Removals		$0
Mineral Rights		$0
Damages		$0
Facility/Utility Relocations		$0
Uniform Relocation Assistance		$0
Incremental Real Estate Costs		$13,600
Incidental Acquisition Costs: NFS		$10,000
Incidental Acquisition Costs: Government		$6,400
TOTAL		**$98,100**

Currently, values are based on a preliminary real estate baseline cost estimate. The values for structural features of the baseline cost estimate will be updated to a Land Cost Estimate Report prepared by a licensed USACE appraiser, Northwestern Division, effective December 27, 2022. In accordance with USACE Real Estate Policy Guidance Letter 31, Real Estate Support to Civil Works Planning, a cost estimate is sufficient for projects in which the value of LERRDs is not expected to exceed 15 percent of total project costs. A cost estimate is not an appraisal as defined by the Uniform Standards Professional Appraisal Practice (USPAP); however, it conforms to USACE regulations. Cost is an estimate of fact, not an opinion of value, based upon land planning and engineering design parameters at a specific level of detail. As the design parameters are refined, the engineering and land planning facts may change necessitating a change in the cost estimate.

Incremental real estate costs are estimated at 20% of required real estate costs (flood protection levee easements and temporary work area easements) for risk-based contingencies.

Incidental acquisition costs are estimated to include NFS costs incurred for title work, appraisals, review of appraisals, coordination meetings, review of documents, legal support, and other costs that are incidental to project LERRDs as well as Government costs for staff monitoring and reviewing and approving LERRDs. Based on preliminary discussions with the NFS, it is estimated that there are five (5) communal ownership tracts in the project footprint. Incidental acquisition costs assume NFS costs of $2,000 per acquisition. Incidental Government costs are estimated for NFS monitoring as well as LERRDs certification.

11 Public Law 91-646 Relocation Benefits

No relocations are anticipated for the proposed project. The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, PL 91-646, as amended, commonly called the Uniform Act, is the primary law for acquisition and relocation activities on Federal or federally assisted projects and programs. The NFS is required to follow the guidance of PL 91-646.

12 Minerals, Timber, and Crop Activity

There are no known surface or subsurface minerals that would impact the proposed project. Additionally, no known timber or crops are anticipated to be affected by the proposed project. Project construction is anticipated along the shoreline.

13 Assessment of Sponsor's Acquisition Capability

An Assessment of the NFS's Real Estate Acquisition Capability will be conducted jointly with the NFS in preparation for the final Real Estate Plan. A sample Sponsor's Acquisition Capability Assessment is included in Attachment 1.

14 Zoning

According to the American Samoa Zoning Act (Title 26, Chapter 3), a zoning board has original jurisdiction to zone American Samoa, approve zoning maps, and grant variances. A recent March 2022 site visit and review of American Samoa government records indicate uniform zoning in American Samoa has not been implemented. Therefore, no enactments of zoning ordinances are proposed in lieu of, or to facilitate, acquisition in connection with the proposed project.

15 Acquisition Milestones

The following preliminary schedule estimates twenty-four (24) months for NFS LERRDs planning and acquisition. A final planned timeline below will be mutually agreed upon by USACE Real Estate, Project Management, and the NFS.

The NFS's preliminary acquisition planning is estimated at ten (10) months as follows:

Survey/Map/Title	120 Days
Legal Description	60 Days

Appraisal	120 Days

The NFS's LERRDs acquisition is estimated at fourteen (14) months as follows:

Documentation	120 Days
Negotiation	180 Days
Payment	60 Days
LERRD Certification	60 Days

Generally, an acquisition schedule of 15-18 months is estimated for projects of comparable scope. The typical land acquisition schedule for a proposed project of similar scale has been expanded by six (6) months due to the risk of communal land agreements.

16 Public Facility or Utility Relocations

A preliminary review of the Civil Engineering Appendix and aerial maps indicate, at this phase of design, there are no utility or facility relocations anticipated for the proposed project. Additional utility and facility review will occur as project feature design is refined. The minimal risk of facility/utility relocations is included in the current cost estimate contingency.

17 Environmental Impacts

Potential environmental impacts resulting from the proposed project are being considered, including investigation under NEPA/HEPA, HTRW Policy, National Historic Preservation Act, Clean Water Act, Endangered Species Act, Coastal Zone Management Act, Fish and Wildlife Coordination Act, and Magnuson-Stevens Fishery Conservation and Management Act.

<u>National Environmental Policy Act (NEPA)</u>
It is assumed that an Environmental Assessment is the appropriate NEPA document for the final array of alternatives. Environmental analysis will comply with all environmental laws applicable. Analysis will be completed by relying on existing literature, remote sensing technologies, and data available from other agencies for use in GIS.

<u>Hazardous, Toxic, and Radioactive Waste (HTRW) Policy</u>
At this time, no HTRW issues are anticipated within the project footprint.

<u>National Historic Preservation Act (NHPA)</u>
In accordance with Section 106 of the National Historic Preservation Act (NHPA), USACE will consult with the American Samoa Historic Preservation Division, indigenous groups, and other interested individuals during the feasibility study process. USACE intends to submit a finding of No Historic Properties Affected, however, the finding is currently in the draft stage.

18 Landowner Concerns

No landowner concerns are anticipated at this time. Future plans may include discussions between the NFS and the ‘âiga, the cognatic descent group of communal landowners, and the matai, the elected head of the descent group.

Other stakeholders consist of communities in the Study area, including but not limited to, the American Samoa Environmental Protection Agency and American Samoa Coastal Management Program.

19 Notification to Sponsor

The NFS, Government of American Samoa, as represented by the DPA, is involved in the planning process. The NFS is supportive of the project. The NFS will be provided a Local Sponsor Toolkit and advised of the risks of acquiring LERRDs before the execution of the PPA. A Sample Letter Advising Against Early Acquisition is included in Attachment 2.

Additionally, once the LERRDs are finalized, a Notice to Acquire Letter will be transmitted to the NFS. The Notice to Acquire Letter serves as the formal instruction for the NFS to acquire the real estate interests needed for the proposed project. A Sample Notice to Acquire Letter is included in Attachment 3.

20 Other Relevant Real Estate Issues

There are no other known relevant real estate issues in the Study area.

21 References

National Oceanic and Atmospheric Administration, American Samoa Overview, 2006.

Raynal, Jeremy. *American Samoa's Marine Protected Area System: Institutions, Governance, and Scale,* October 2016, Journal of International Wildlife Law & Policy.

Stover, Marilyn, *Individual Land Tenure in American Samoa, The Contemporary Pacific,* Volume 11, Number 1, Spring 1999, 69–104, University of Hawaii Press.

U.S. Army Corps of Engineers, Honolulu District. *Feasibility Report/Environmental Assessment, Ofu Coastal Storm Damage Reduction,* December 2022.

U.S. Army Corps of Engineers, Northwestern Division. *Land Cost Estimate,* effective December 27, 2022.

Attachment 1: Sponsor's Acquisition Capability Assessment

Assessment of Non-Federal Sponsor's Real Estate Acquisition Capability

Project: Ofu Coastal Storm Damage Reduction Integrated Feasibility Report
Project Authority: Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r)
Non-Federal Sponsor: American Samoa Government
Department of Port Administration
Name, Title
Address
Phone, email

Legal Authority	**Yes**	**No**
1. Does the NFS have legal authority to acquire and hold title to real property for project purposes? (statutory citation)		
2. Does the NFS have the power of eminent domain for the project (statutory citation)		
3. Does the NFS have "quick-take" authority for this project?		
4. Are there any lands/interests in land required for the project that are located outside the NFS's authority boundary?		✓
5. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn?		✓
6. Will the NFS's in-house staff require training to become familiar with the real estate requirements of Federal projects, such as PL 91-646, as amended?		✓
7. If #6 is yes, has a reasonable plan been developed to provide training?		NA
Willingness to Participate	**Yes**	**No**
8. Has the NFS stated its general willingness to participate in the project and its understanding of the general scope and role?		
9. Is the NFS agreeable to signing a Project Partnership Agreement and supplying funding as stipulated in the agreement?		
10. Was the NFS provided the Local Sponsor Toolkit? Date		
Acquisition Experience and Capability	**Yes**	**No**
11. Taking into consideration the project schedule and complexity, does the NFS have the capability, with in-house staffing or contract support, to provide the necessary services, including surveying, appraisal, title, negotiation, condemnation, closing, and relocation assistance, as required for the project?		
12. Is the NFS's projected in-house staffing level sufficient considering its workload?		
13. Can the NFS obtain contractor support, if required, in a timely manner?		
14. Is the NFS's staff located within reasonable proximity to the project site?		
15. Will the NFS likely request USACE assistance in acquiring real estate?		
Schedule Capability	**Yes**	**No**
16. Has the NFS approved the tentative project real estate schedule and indicated its willingness and ability to utilize its financial, acquisition, and condemnation capabilities to provide the necessary project LERRDs in accordance with the proposed project schedule so the Government can advertise and award a construction contract as required by overall project schedules and funding limitations? The anticipated NFS real estate acquisition timeframe for the project is twelve (12) months. **NFS Initials:**		

LERRD Crediting	Yes	No
17. Has the NFS indicating its understanding of LERRD credits and its capability and willingness to gather the necessary information to submit LERRD credits within six (6) months after possession of all real estate and completion of relocations so the project can be financially settled? **NFS Initials:**		

Past Action and Coordination	Yes	No
1. Has the NFS performed satisfactorily on other USACE projects?		
2. Has the assessment been coordinated with NFS?		
3. Does the NFS concur with the assessment? (provide explanation if no)		

With regard to the project, the NFS is anticipated to be:	Select One
Fully Capable: previous experience; financial capability; authority to hold title; in-house staff can perform necessary services (survey, appraisal, title, negotiation, closing, relocation assistance, condemnation) as required by the LERRDs.	
Moderately Capable: financial capability; authority to hold title; can perform, with contract support, necessary services (survey, appraisal, title, negotiation, closing, relocation assistance, condemnation) as required by the LERRDs.	
Marginally Capable: financial capability; authority to hold title; will rely on approved contractors to provide necessary services (survey, appraisal, title, negotiation, closing, relocation assistance, condemnation) as required by the LERRDs.	
Insufficiently Capable (provide explanation): financial capability; will rely on another entity to hold title; will rely on approved contractors to provide necessary services (survey, appraisal, title, negotiation, closing, relocation assistance, condemnation) as required by the LERRDs.	

USACE Prepared by:	NFS Reviewed by:
Tiffany Murray Realty Specialist USACE Honolulu District	Name Title Office
Date:	Date:

USACE Approved by:	
Considering the capability of the NFS and the ancillary support to be provided by contract services, it is my opinion that the risks associated with LERRDs acquisition and closeout of the project have been properly identified and mitigated.	
Erica Labeste Chief, Real Estate Branch U.S. Army Corps of Engineers Honolulu District	Date:

Attachment 2: Sample Letter Advising Against Early Acquisition

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

September 29, 2021

Real Estate Division

SUBJECT: Ofu Coastal Storm Damage Reduction Integrated Feasibility Report, Risks of Early Acquisition

Name
Title, Office
Address
City, State

Dear xx:

Reference is made to the Ofu Coastal Storm Damage Reduction Integrated Feasibility Report (Study) as authorized under Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r). The American Samoa Department of Port Administration on behalf of the American Samoa Government, as the Non-Federal Sponsor, is responsible for ensuring that it possesses the authority to acquire and hold title for all real property required for the proposed project. The Non-Federal Sponsor shall provide one hundred percent (100%) of the lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRDs) as well as operation, maintenance, and repair required by the project.

The United States Army Corps of Engineers, Honolulu District, advises your office that there are risks associated with the acquisition of LERRDs prior to the execution of a Project Partnership Agreement (PPA) or Local Cooperation Agreement (LCA). The American Samoa Government will assume full and sole responsibility for any and all costs and liabilities arising out of premature acquisition. Project risks generally include, but are not limited to:

a. Congress may not appropriate funds to construct the proposed project;
b. The proposed project may otherwise not be funded or approved for construction;
c. A PPA/LCA mutually agreed to by the Non-Federal Sponsor and the Government may not be executed;
d. The Non-Federal Sponsor may incur liability and expense by virtue of its ownership of contaminated lands, or interests therein, whether such liability should arise out of local, state, or Federal laws or regulations, including liability arising out of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended;
e. The Non-Federal Sponsor may acquire interest or estates that are later determined by the Government to be inappropriate, inefficient, or otherwise not required for the project;
f. The Non-Federal Sponsor may initially acquire insufficient or excessive real property acreage, which could result in additional negotiations and or/benefit payments under Public Law 91-646 or additional payment of fair market value to affected landowners;

g. The Non-Federal Sponsor may incur costs or expenses in connection with its decision to acquire LERRDs in advance of the executed PPA/LCA and the Government's Notice to Acquire (NTA).

If you have further questions, please contact the USACE Honolulu District, Real Estate Branch, at (808) 835-4055.

Sincerely,

Erica Labeste
Chief, Real Estate Branch
U.S. Army Corps of Engineers
Honolulu District

Attachment 3: Sample Notice to Acquire Letter

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

September 28, 2021

Real Estate Division

SUBJECT: Ofu Coastal Storm Damage Reduction Integrated Feasibility Report, Notice to Acquire

Name
Title, Office
Address
City, State

Dear xx:

This letter serves as your Notice to Acquire the real estate interests needed from the American Samoa Government for the Ofu Coastal Storm Damage Reduction Project (Project) as authorized under Section 14 of the 1946 Flood Control Act, as amended (33 U.S.C. § 701r). Enclosed are the final Authorization for Entry for Construction, Attorney's Certificate of Authority, and project real estate drawings. Also enclosed is the standard language to be used for the Flood Protection Levee Easement and Temporary Work Area Easement conveyance documents between the American Samoa Government, as the Non-Federal Sponsor, and landowners.

In accordance with the Project Partnership Agreement (PPA) dated xx, the American Samoa Government is responsible for xx% of project costs and shall provide the real property interests and relocations required for the construction, operation, and maintenance of the project. As required by the PPA, the Government has determined the Flood Protection Levee Easements and Temporary Work Area Easements as shown on the real estate drawings are required for project implementation. The PPA also requires the American Samoa Government to comply with the Uniform Relocations and Assistance and Real Property Acquisition Policies Act. 42 U.S.C. § 4601, et. seq., and the Uniformed Regulations, 49 C.F.R. part 24. More information can be found at http://www.fhwa.dot.gov/realestate/realprop.

After acquisition of the required real estate interests, the American Samoa Government shall complete and sign the Authorization for Entry for Construction and Attorney's Certificate of Authority. Please return the original signed authorization documents to the Corps of Engineers, Honolulu District Real Estate Branch, by mail to the address contained in the letterhead. In addition, the American Samoa Government shall provide copies of all conveyance documents for required real estate acquisitions to the Corps of Engineers. The Corps of Engineers requires the conveyance documents prior to advertising a construction contract. Copies of conveyance documents may be scanned and submitted electronically to the contact person below.

If you have any questions, please contact Tiffany Murray, Realty Specialist, at (808) 835-4065 or tiffany.murray@usace.army.mil.

Sincerely,

Erica Labeste
Chief, Real Estate Branch
U.S. Army Corps of Engineers
Honolulu District

Enclosures

OFU COASTAL STORM DAMAGE REDUCTION
CONTINUING AUTHORITIES PROGRAM - SECTION 14
OFU, AMERICAN SAMOA

DRAFT INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

APPENDIX A-5
PUBLIC INVOLVEMENT

A-5 Public Involvement

US Army Corps of Engineers ®
Honolulu District

US Army Corps of Engineers
Honolulu District

Appendix A-5: Public Involvement

Ofu Coastal Storm Damage Reduction, American Samoa

CAP Section 14 Emergency Shoreline Protection

Draft Integrated Feasibility Report and Environmental Assessment

May 2023

1. Introduction

The U.S. Army Corps of Engineers (USACE), Honolulu District, has prepared a Draft Integrated Feasibility Report and Environmental Assessment (IFR/EA) for the Ofu Coastal Storm Damage Reduction Feasibility Study. The study is being conducted under the authority of Section 14 of the Flood Control Act of 1946, as amended, for emergency shoreline protection under the Continuing Authorities Program. The non-Federal sponsor is the American Samoa Government, represented by the Department of Port Administration.

This appendix summarizes public involvement efforts for the feasibility study under the National Environmental Policy Act (NEPA). NEPA requires Federal agencies to consider environmental effects that include impacts to social, cultural, economic, and natural resources. Citizens often have valuable information about the potential environmental, social, and economic effects that proposed federal actions may have on places and resources that they value. Public engagement and involvement is critical to the feasibility process in ensuring public voices are heard and input incorporated, to the extent practicable, into the study process in compliance with NEPA. This includes a public notice, making available to the public the NEPA document (i.e. IFR/EA), public meeting(s), and a public comment period.

2. Public Notice and Availability of IFR/EA

The Draft IFR/EA will be made available to the public for review on the study website at https://www.poh.usace.army.mil/Missions/Civil-Works/Civil-Works-Projects/Ofu-Section-14/ beginning on 22 May 2023. On the same day as posting to the project website, a press release with public notice will be distributed to media contacts both in Hawaii and in American Samoa, as well as through various social media outlets. The non-Federal sponsor will also post the press release to their website and send to the local newspaper.

Consistent with the requirements of NEPA and HRS Chapter 343, the draft IFR/EA will be circulated for a 30-day public review, ending on 21 June 2023. Copies of the draft document will be distributed to a variety of individuals and organizations, requesting their comments on the project. The distribution list for the Draft IFR/EA includes all project stakeholders identified to date. This list includes federal, state and local agencies; elected officials; community groups and organizations; adjacent landowners; libraries; and the news media. The complete distribution list is provided in Appendix A-3 Environmental Resources.

3. Public Meeting

A public meeting will be held on 31 May 2023 at 3 p.m. SST with both virtual and in-person options. The meeting will discuss the study background, tentatively selected plan, and allow the public the opportunity to ask questions and provide comment on the Draft IFR/EA. Additionally, in compliance with Section 106 of the National Historic Preservation Act (NHPA), the public is invited to provide comment on identification and impact to any historic properties.

Date/Time: May 31, 2023, 3 p.m. SST (or 4 p.m. HST)

In-person meeting locations:

- Ofu Airport ARFF Building, Ofu Island
- Pago Pago International Airport, Conference Room, Tafuna, Tutuila

Virtual via Google Meet: https://meet.google.com/znn-hpch-aim
Dial (U.S.): +1-617-675-4444
PIN: 715 816 963 1593#
More phone numbers: https://tel.meet/znn-hpch-aim?pin=7158169631593

4. Public Comment Period

A 30-day public comment period will begin on 22 May 2023 following posting of the Draft IFR/EA and Public Notice to the project website. The public comment period will end on 21 June 2023. Public comments may be submitted to:

By E-Mail:
CEPOH-Planning@usace.army.mil
Subject line: Ofu Section 14 public comment

By Postal Mail:
U.S. Army Corps of Engineers, Honolulu District
Attn: CEPOH-PPC (Ofu)
230 Otake St.
Fort Shafter, HI 96858-5440

5. Public Comments Received

This section will be updated for the Final IFR/EA with comments received during the public comment period.